Class 10 Science Guide for 2023-24 CBSE Board

Class 10 Science Notes and NCERT Solutions

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Chemical reaction and equations

How to Balance the Chemical Reaction:

It is the conservation of the mass due to which we need to balance a chemical reaction, to balance a chemical reaction is very easy,if so far you don't know how to balance it, then go through the whole post, you will definitely become capable to balance the chemical reaction jus know.

Before, we go through the post, let us discuss few important points why is the balance of the chemical reaction needed and why did chemical reaction occured between two substances.

One atom of a substance react to atom of other substance to fulfill the the no. of electrons in their outermost orbital,every atom has a tendency to have a octate of electrons in its outermost orbital,for acheiving this one substance reacts with other substance.

The chemical reaction between two substances results in the formation of new products, according to the law of conservation of the mass, the mass of reactants is always equal to the mass of products during a chemical reaction. The products are formed in a chemical reaction by the exchange of ions or atoms following the rule of constant proportion.

The law of constant proportion states that the atoms in a molecule are always combined in a fixed proportion,as an example in water (H2O), the mass of hydrogen is $2 \times 1 = 2u$, and the mass of oxygen is 8u, so the ratio of the hydrogen and oxygen in water is always 1: 8 whether water is found anywhere in the universe and in any form gas, liquid and solid.

We can understand it by the following example.

$H_2 + O_2 \Rightarrow H_2O$
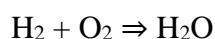
Step 1: First of all count the no. of atoms of the elements in LHS and RHS , as in the above chemical reaction in LHS the no. of hydrogen atoms is 2 and in RHS the no. of atoms of hydrogen is 2, therefore hydrogen atoms are not needed to balance because they are equal in both sides.

Step 2: Now, observing the no. of oxygen atoms in LHS, these are 2. In RHS the no. of oxygen atoms is 1, therefore for balancing the oxygen atom we are needed to change the single water molecules to 2 water molecules in RHS so that there could be 2 oxygen atoms.

$H_2 + O_2 \Rightarrow 2H_2O$
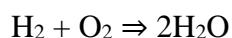
Step 3: Finally, once again let us check the no. of hydrogen and oxygen atoms in LHS and RHS, we find the no. of hydrogen in RHS is 4 and 2 hydrogen atoms in LHS, therefore for balancing the hydrogen atoms we are needed to change the single hydrogen molecule to 2 hydrogen molecules in LHS so that there could be 4 hydrogen atoms.

$2H_2 + O_2 \Rightarrow 2H_2O$
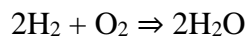
It is the required balance chemical reaction because in LHS and RHS there are equal no. of hydrogen and oxygen atoms.

Example 2: Balance the chemical reaction:$Fe + H_2O \Rightarrow Fe_3O_4 + H_2$

Step 1: In LHS iron atoms are 1 and in LHS these are 3,therefore changing the 1 iron atom to 3 iron atom in LHS

$3Fe + H_2O \Rightarrow Fe_3O_4 + H_2$
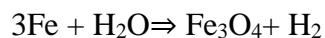
Step 2: In LHS there is 1 oxygen atoms and in RHS these are 4,therefore changing the 1 water molecule to 4 water molecules in LHS such that in LHS no. of oxygen atoms become 4.

$3Fe + 4H_2O \Rightarrow Fe_3O_4 + H_2$
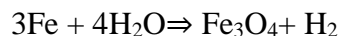
Step 3: Now ,we see that in LHS there are 8 hydrogen atoms and in RHS these are 2,therefore changing the 1 hydrogen molecule to 4 hydrogen molecules in RHS such that in RHS no. of hydrogen atoms become 8

$3Fe + 4H_2O \Rightarrow Fe_3O_4 + 4H_2$
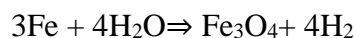
It is a required balance chemical reaction no. of the atoms of each elements are equal in both sides.

Type of Chemical Reactions

The topic "Type of chemical reaction" is very important to understand for all science students and the students who are going to appear in national talent hunt or scholarship entrance exams and other entrance exams. The topic "Type of chemical reaction" will help you to clear many of the doubts which were not cleared to you in earlier classes."Type of chemical reaction" is the basic topic of chemistry so without studying it you can't go in deep of the chemistry.

We have learned that during a chemical reaction atoms of one element do not change into atoms of another element, nor do atoms disappear from the mixture or appear from elsewhere. Actually, chemical reactions involve the breaking and making of bonds between atoms to produce new substances.

Combination reactions

In this chemical reaction, two or more compounds form a single compound.In the following chemical reaction, Calcium oxide reacts vigorously with water to produce slaked lime (calcium hydroxide) releasing a large amount of heat.

$$CaO\,(s)\ +H_2O\,(l) \rightarrow Ca\,(OH)_2\,(aq)$$
$$(Quick\,lime) \qquad\qquad (Slaked\,lime)$$
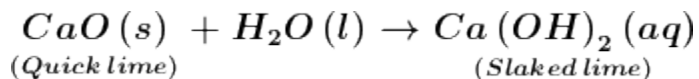
In this reaction, calcium oxide and water combine to form a single product, calcium hydroxide. Such a chemical reaction in which a single product is formed from two or more reactants is known as a combination reaction.

There are several examples of combination reaction, as an example burning of coal, the formation of water from hydrogen and oxygen.

We also observe that in most of the combination reaction heat is evolved, such a combination reaction in which heat is also released known as exothermic reactions. So we can say every exothermic reaction is a combination reaction but it is not necessary that every combination reaction is exothermic, the exothermic reaction is a special case of combination reaction in which heat is released.

The formation of slaked lime with the release of heat from quick lime and water is an example of an exothermic reaction, burning of coal and formation of water are also the examples of exothermic reaction there are several examples of exothermic reactions, some of them are following.

(i) Burning of natural gas

$$CH_4\,(g) + 2O_2\,(g) \rightarrow CO_2\,(g) + 2H_2O\,(g)$$
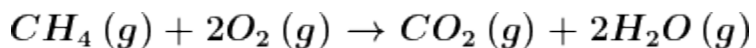
(ii) Respiration reaction is an example of exothermic reaction. During digestion of food carbohydrate broken down into glucose, this glucose combines with oxygen in the cells of our body and forms carbon dioxide and water with the release of energy

Decomposition reactions

This is the reaction in which one product is broken down into two or more products

In this reaction, you can observe that a single reactant breaks down to give simpler products. This is a decomposition reaction. Ferous sulphate crystals $(FeSo_4, 7H_2O)$ lose water when heated and the colour of the crystal changes from light green to white. On further heating white colour changes to dark brown due to the formation of black coloured solid substance ferric oxide (Fe_2O_3), sulphur dioxide (SO_2) and sulphur trioxide (SO_3). Ferric oxide is a solid, while (SO_2) and (SO_3) are gases.

Type of Decomposition reaction

(1) **Thermal decomposition reaction**-When a product is decomposed to simple products after heating it . Decomposition of calcium carbonate to calcium oxide and carbon dioxide on heating is an important thermal decomposition reaction used in various industries. Calcium oxide is called lime or quick lime. It has many uses - one is the manufacture of cement.

$$\underset{lime\,stone}{CaCO_3\,(s)} \overset{Heat}{\rightarrow} \underset{quick\,lime}{CaO\,(s)} + CO_2(g)$$

When potassium chlorate is heated it changes to potassium chloride and oxygen.

$$\underset{Potassium\,chlorate}{2KClO_3\,(s)} \rightarrow \underset{Potassium\,chloride}{2KCl}\,(s) + 3O_2\,(g)$$

When ferric hydroxide heated it is decomposed into ferric oxide and water.

$$\underset{Ferric\,hydroxide}{2Fe\,(OH)_3} \overset{Heat}{\rightarrow} \underset{Ferric\,oxide}{Fe_2O_3} + 3H_2O$$
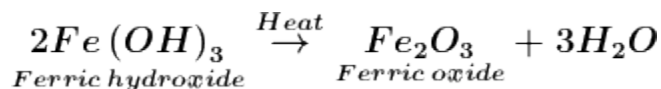
(2) **Electrolysis**-When an electric current is passed through an aqueous solution of a compound and it undergoes the process of decomposition then it is known as electrolysis.
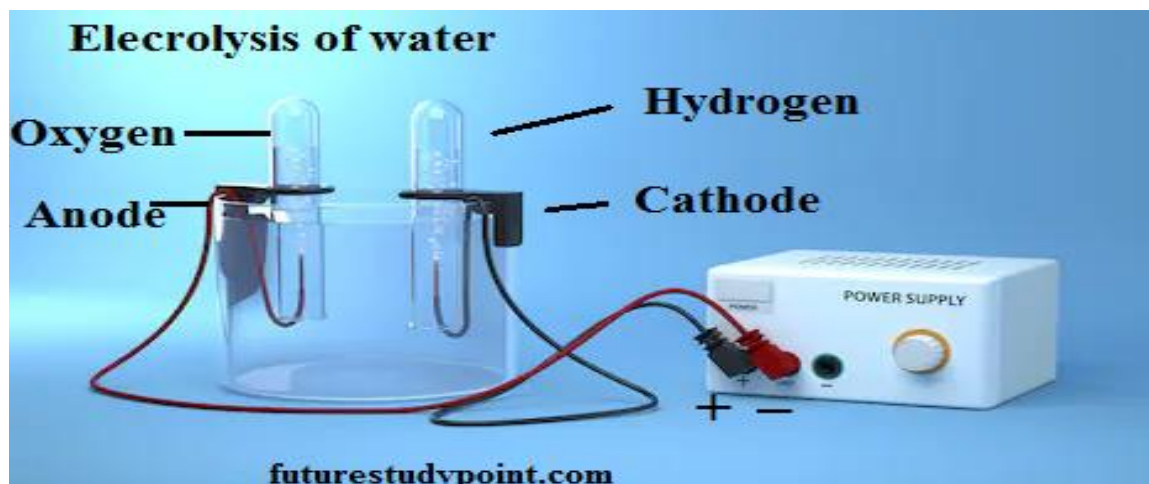
The best example of electrolysis is the electrolysis of water and sodium chloride.

$$2H_2O\,(l) \xrightarrow{Electricity} 2H_2\,(g) + O_2\,(g)$$
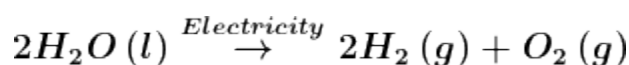
When an electric current is allowed to pass through water contained in an electrolytic device then water is decomposed into oxygen and hydrogen which collected at cathode and anode respectively.

When electrolysis occurs through an aqueous solution of sodium chloride, it is decomposed into sodium and chlorine, sodium is collected at cathode and chlorine is collected at the anode.

$$2NaCl \xrightarrow{Electricity} 2Na + Cl_2$$
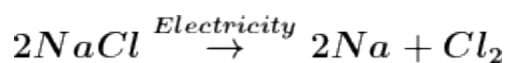
(3) Photo Decomposition- When sunlight is exposed to some substances then decomposition occurs known as photodecomposition.

Placing a small quantity of silver chloride on a glass plate, when sunlight is allowed to pass through it, the white crystals of silver chloride changes to grey color due to the decomposition of silver chloride into silver which is grey in color and chlorine.

$$2AgCl\,(s) \xrightarrow{Sunlight} 2Ag\,(s) + Cl_2\,(g)$$
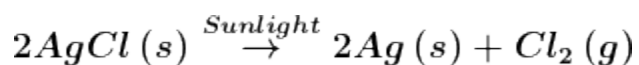
Silver bromide also undergoes photodecomposition in the same way
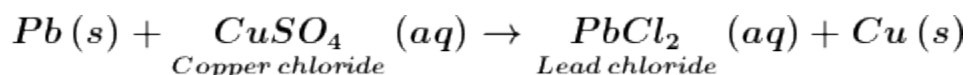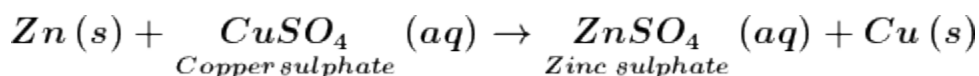
Displacement reaction

The type of chemical reaction in which an atom of high reactive substance displaces an atom of less reactive substance from the molecule of another substance forming a new compound, such a reaction is known as displacement reaction.

Example-The iron nail dipped into the copper solution, changes the blue color of copper sulfate faded and changes to green color due to the displacement reaction.

$$Fe\,(s) + \underset{Copper\ sulphate}{CuSO_4} \rightarrow \underset{Iron\ sulphate}{FeSO_4}\,(aq) + Cu\,(s)$$
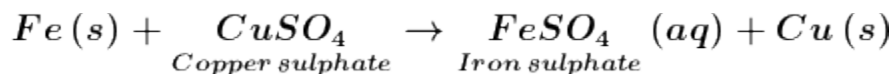
In this reaction iron being more reactive than copper displaces copper atom ad substitutes it forming iron sulfate.

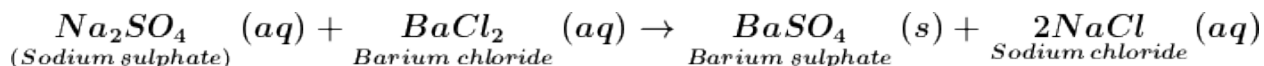Other similar examples of displacement reactions are following.

$$Zn\,(s) + \underset{Copper\ sulphate}{CuSO_4}\,(aq) \rightarrow \underset{Zinc\ sulphate}{ZnSO_4}\,(aq) + Cu\,(s)$$

$$Pb\,(s) + \underset{Copper\ chloride}{CuSO_4}\,(aq) \rightarrow \underset{Lead\ chloride}{PbCl_2}\,(aq) + Cu\,(s)$$

Both of the above reaction shows that zinc and lead is more reactive than copper.

Double displacement reaction

The reaction in which there are an exchange of ions between two reactants are called a double displacement reaction

An aqueous solution of sodium sulfate when allowed to mix up with the aqueous solution of barium chloride, an insoluble substance is formed which is precipitated at the bottom of the test tube, such a reaction is also known as a precipitation reaction

$$\underset{(Sodium\ sulphate)}{Na_2SO_4}\,(aq) + \underset{Barium\ chloride}{BaCl_2}\,(aq) \rightarrow \underset{Barium\ sulphate}{BaSO_4}\,(s) + \underset{Sodium\ chloride}{2NaCl}\,(aq)$$
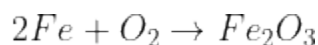
Oxidation reaction

Oxidation is the loss of electrons during a reaction by a molecule, atom, or ion. Oxidation occurs when the oxidation state of a molecule, atom, or ion increased.

Example:

Oxidation is when iron combines with oxygen to form iron oxide or rust. The iron is said to have oxidized into rust.

The chemical reaction is:

$$2Fe + O_2 \rightarrow Fe_2O_3$$

The iron metal is oxidized to form the iron oxide known as rust.

Reduction reaction

The reduction is the gain of electrons during a reaction by molecule, atom or ion. Reduction occurs when the reduction state of a molecule, atom, or ion decreased.

Example:

The reaction between copper oxide and magnesium to yield copper and magnesium oxide:

$$CuO + Mg \rightarrow Cu + Mgo$$
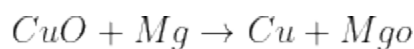
Redox reaction

A reaction in which one reactant undergoes oxidation whereas the other gets reduced during the course of reaction are termed as oxidation-reduction reactions or redox reactions.

Example:

$Fe_2O_3 + 3CO \Rightarrow 3Fe + CO_2$

Here ferric oxide is reduced to iron and carbon monoxide is oxidized to carbon dioxide, ferric oxide is known as oxidizing agent and carbon mono oxide is a reducing agent.

Corrosion

You must have observed that iron particles are shiny when new, but for some time.get coated with a reddish row powder when left for some time. This process is commonly known as rusting of iron. Some other metals also get tarnished in this manner. Have you noticed the colour of the coating formed on copper and silver? When a metal is attacked by substances around it such as moisture, acids, etc., it is said to corrode and this process is called corrosion. The black coating on silver and the grey coating of copper are other examples of corrosion.

Corrosion causes damage to car bodies, bridges, iron railings, ships and to all objects made of metals, especially those of iron. Corrosion of iron is a serious problem. Every year an enormous amount of money is spent to replace damaged iron.

Rancidity

Have you ever tasted or smelt the fat/oil containing food materials left for a long time?

When fats and oils are oxidized, they become rancid and their smell and taste change. Usually, substances that prevent oxidation (antioxidants) are added to foods containing fats ad oils. Keeping food in airtight containers helps to slow down oxidation. Do you know that chips manufacturers usually flush bags of chips with gas such as nitrogen to prevent the chips from getting oxidized?

## Difference between Displacement and Double displacement Reactions:
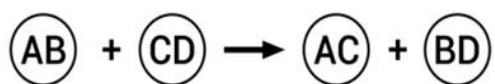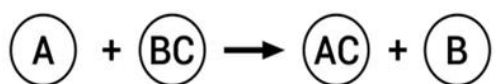
A displacement reaction is a chemical reaction in which a more reactive element substitutes the other element from the solution of its compound while a double displacement reaction is a chemical reaction in which there is the exchange of ions between two reactants.In displacement reaction, aqueous solutions of two compounds are combined then cations and anions of both compounds displace each other.

Displacement Reaction:

The reactivity series of the elements is K>Na>Ca>Mg>Al>C>Zn>Fe>Cu and so on. The element with higher reactivity substitutes other lesser reactive elements from its solution. The reaction between an element and the solution of a compound of another element lies in low grade in the reactivity series then the element which has a higher rank in the reactivity series substitutes the element from the solution of its compound, such a reaction is known as displacement reaction.

$C + AB \rightarrow CB + A$
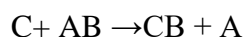
In reactivity series C>A, therefore element C displaces element A and forms a new compound CB freeing A.

Iron nails become brownish in color and the blue color of copper sulfate turns light blue due to the formation of iron sulfate.

Examples:

(i) $Fe(s) + CuSO_4 (aq) \rightarrow FeSO_4 (aq) + Cu(s)$
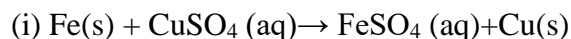
In this reaction Fe is more reactive than Cu, therefore Fe displaces Cu from the solution of $CuSO4$ and forms $FeSO4$.

(ii) $Zn(s) + CuSO_4 (aq) \rightarrow ZnSO_4 (aq) + Cu(s)$
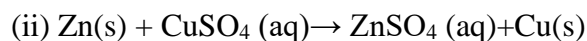
In this reaction Zn is more reactive than Cu, therefore Zn displaces Cu from the solution of $CuSO4$ and forms $ZnSO4$.

(iii) $Pb(s) + CuCl_2 (aq) \rightarrow PbCl_2 (aq) + Cu(s)$
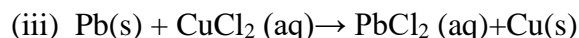
In this reaction Pb is more reactive than Cu, therefore Pb displaces Cu from the solution of $CuCl2$ and forms $PbCl2$.

Double displacement reaction:

A double displacement reaction is a reaction between two compounds in which ions of both compound exchanges with each other making two new compounds.

$A^+B^- + C^+D^- \rightarrow A^+D^- + C^+B^-$

Examples:

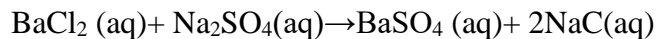$BaCl_2$ (aq)+ Na_2SO_4(aq)→$BaSO_4$ (aq)+ 2NaC(aq)
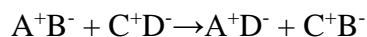
The cations Ba^{2-} and Na^+ displace each other forming new compounds $BaSO_4$ and $2NaCl$.

Precipitation reaction:

Two aqueous compounds form such a compound which is insoluble in water. An example of a precipitation reaction is the reaction between lead nitrate and potassium iodide, both of them are soluble in water and make a clear and colorless solution. When both lead nitrate(aq) and potassium iodide(aq) are combined they form an insoluble substance potassium iodide.

$$Pb\left(NO_3\right)_2(aq) + 2KI\left(aq\right) \rightarrow 2KNO_3\left(aq\right) + PbI_2\left(s\right)$$
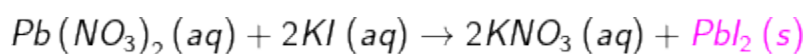
In this double displacement reaction lead iodide an insoluble substance is known as a precipitate.

Neutralization reaction:

Aqueous solutions of base and acid are combined to form aqueous solutions of salt and water, such a double displacement reaction of acid and base is known as a neutralization reaction.

NaOH (aq)+HCl(aq)→NaCl(aq)+ H_2O(l)
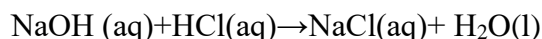
Difference between Combination and Decomposition Reactions:

Difference : Combination and Decomposition reactions
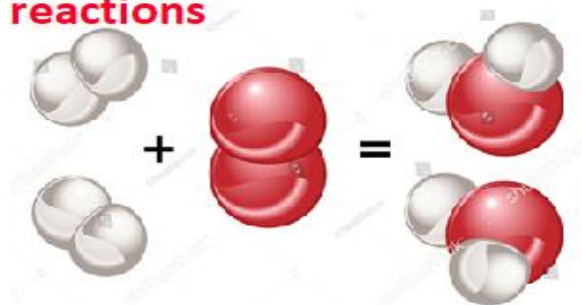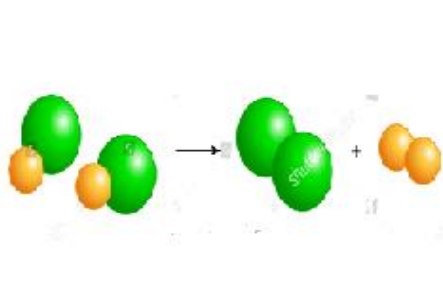
Combination Reaction   Decomposition Reaction

During a chemical reaction when two or more reactants form a single product then such a reaction is known as a combination reaction while a decomposition reaction is the type of reaction in which a single reactant breaks down into two or more products. An example of a

combination reaction is, that calcium oxide reacts with water to form calcium hydroxide and an example of a decomposition reaction is, that calcium carbonate when heated break down into calcium oxide and carbon dioxide.

A combination reaction is the type of reaction in which two or more reactants forms a single product. In simple language, we can say that when two or more substances(elements or compounds) combine to form a single product, the reaction is called a combination reaction.

Examples of Combination reactions:

1-Calcium oxide reacts vigorously with water to produce slaked lime(calcium hydroxide) releasing a large amount of heat.

$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq) + Heat$

In this reaction calcium oxide and water combine to form a single product calcium hydroxide.
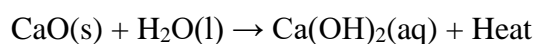
2-Burning of coal

$C(s) + O_2 (g) \rightarrow CO_2(g)$
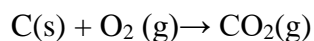
3- Hydrogen and oxygen combine to form water

$2H_2(g) + O_2 (g) \rightarrow 2H_2O(l)$
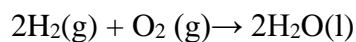
Exothermic reaction:

We observe that in most of the combination reactions heat is also evolved with the formation of the product. Reactions in which heat is also released along with the product formation are called exothermic chemical reactions.

Examples of exothermic chemical reactions:

1-All combustion reactions are exothermic chemical reactions because the coal, petrol, CNG, and LPG get fired at their ignition temperature and release a lot of heat.

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + Heat$

2- Respiration reaction is an exothermic reaction because glucose combines with oxygen forms carbon dioxide, and water and releases heat(energy in the form of ATP).

$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + ATP(Heat)$
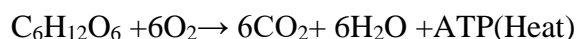
3- Vegetable oil, and compost of the remainder of animals and plants are decomposed into simpler molecules and release heat therefore these reactions are also examples of exothermic reactions.

Decomposition reaction:

A decomposition reaction is a chemical reaction in which one substance is breakdown into 2 or more substances known as a decomposition reaction.

Endothermic reaction:

It can be observed that most of the decomposed reactions are needed a certain amount of energy to break down the reactant. The type of reactions in which heat is absorbed are known as endothermic chemical reactions.

Types of decomposition reactions:

1-Thermal decomposition reaction: The type of reaction in which reactants absorb heat during the formation of the products is known as the thermal decomposition reaction.

Examples:

(i) Crystal of ferrous sulfate when heated, its green colour turns to white and then to brown, it occurs because after heating ferrous sulphate crystal($FeSO4.7H2O$) loses water and anhydrous $FeSO4$ is formed then on further heating it is decomposed into ferric oxide with the release of sulphur dioxide and sulphur trioxide gases..

$$2FeSO_4 \xrightarrow{Heat} Fe_2O_3 + SO_2 + SO_3$$
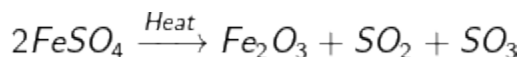
(ii)On heating calcium carbonate it decomposes into calcium oxide and carbon dioxide.

$$CaCO_3\,(s) \xrightarrow{Heat} CaO(s) + CO_2\,(g)$$
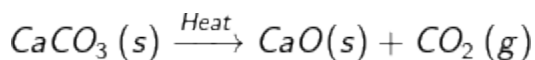
(iii)On heating lead nitrate it decomposes into lead oxide, nitrogen dioxide and oxygen.

Electrolytic decomposition reaction: The type of decomposition reaction which is needed electrical energy for its decomposition is known as an electrolytic decomposition reaction. As an example, if water is passed through the process of electrolysis, it is decomposed into hydrogen and oxygen as below, hydrogen gas is separated at the cathode and oxygen is at the anode.

Electrolysis of Water

$$H_2O\,(l) \xrightarrow{\text{Electrolysis}} H_2\,(g) + O_2\,(g)$$
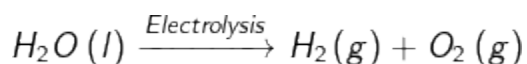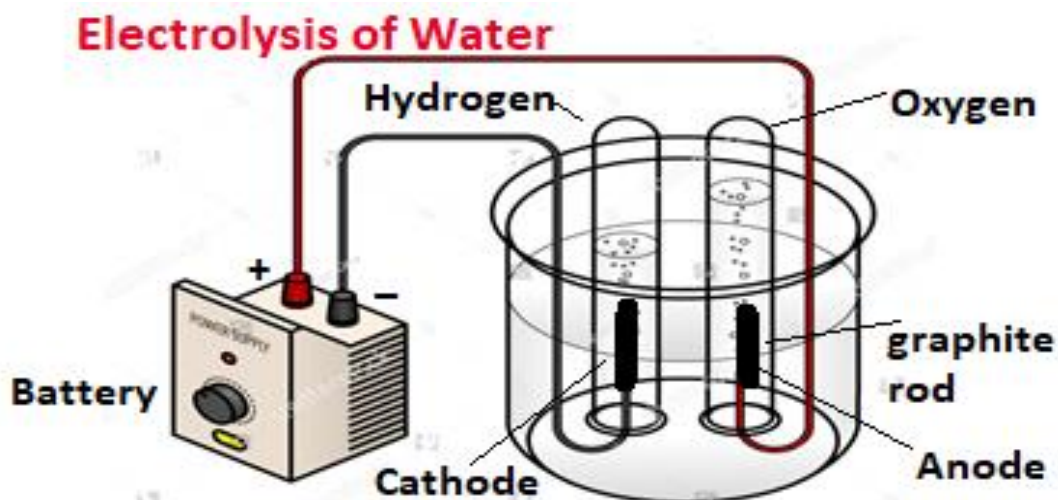
Photo decomposition reaction:

White silver chloride turns grey in presence of the sunlight, this is due to the decomposition of silver chloride into silver and chlorine by the light.

$$2AgCl\,(s) \xrightarrow{\text{Sunlight}} 2Ag\,(s) + Cl_2\,(g)$$
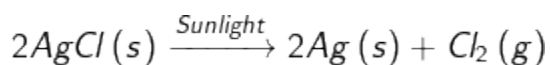
Redox reaction: Reduction and Oxidation reactions:

Redox reaction : Reduction and Oxidation reaction

| Oxygen | Iron | Water | Rust |

$$O_2 \;+\; Fe \;+\; H_2O \;\longrightarrow\; Fe_2O_3H_2O$$
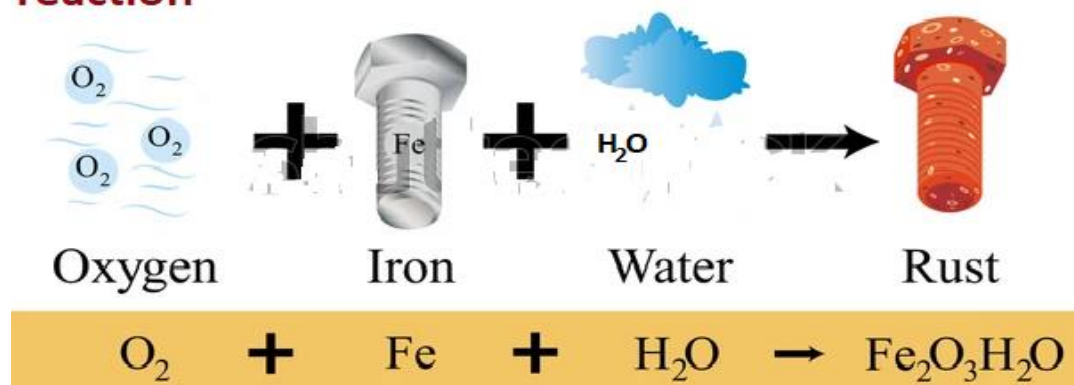
Redox reaction is the type of chemical reaction between two substances in which one substance gains oxygen atoms and another substance loses oxygen atoms. In the redox reaction the substance that gains oxygen atoms is oxidized and another substance that losses oxygen atoms is

reduced. The reaction in which there is the involvement of oxidation and reduction reaction is known as the redox reaction.

The type of chemical reaction in which one substance of participating reactant gains oxygen atoms, electronically oxidation reaction is the chemical reaction in which one substance of participating reactant losses electrons.

$$C + O_2 \rightarrow CO_2$$
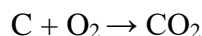
Here carbon gains oxygen atom and forms carbon dioxide. Electronically carbon losses(or shares) its 4 electrons, therefore carbon is oxidized to carbon dioxide.

Oxidation of copper to copper oxide

When we heat copper powder on a china dish, copper powder turns to black colour,the surface of copper powder becomes coated with black copper oxide(II),it is because oxygen is added to copper and copper oxide is formed.

$$2Cu + O_2 \xrightarrow{Heat} 2CuO$$
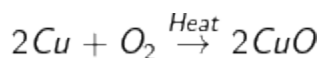
In this reaction oxygen is added to copper, therefore copper is oxidized

Reduction reaction:

The type of reaction in which one substance of participating reactants losses oxygen atoms, electronically reduction reaction is the chemical reaction in which one element of participating reactant gains electrons.

The reaction of copper oxide and hydrogen gas

$$CuO + H_2 \xrightarrow{Heat} Cu + H_2O$$

In this reaction Copper oxide losses oxygen, therefore copper oxide is reduced, electronically copper oxide gains an electron and forms copper.

Redox reaction:

We observe in all the above reaction of oxidation and reduction that if one substance is oxidized then another substance is reduced in short both reaction oxidation and reduction always occurs simultaneously if one substance losses electrons then another substance gains those electrons. The type of reaction in which there is the involvement of oxidation as well as reduction reaction is known as the redox reaction.

$$CuO + H_2 \xrightarrow{Heat} Cu + H_2O$$
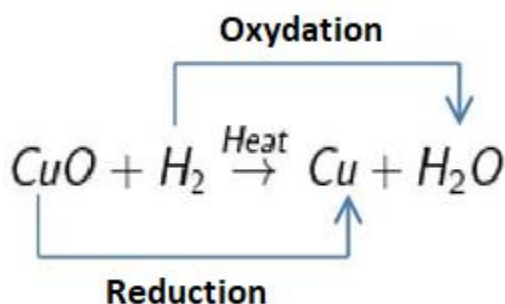
In this chemical reaction, copper oxide is reduced to copper, and hydrogen is oxidized to water.

Some other examples of redox reactions are

$$ZnO + C \rightarrow Zn + CO$$
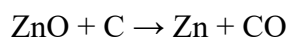
In this redox reaction, zinc oxide is reduced to zink, and carbon is oxidized to carbon mono oxide.

$$MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$$
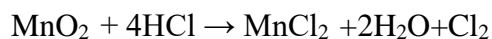
In this redox reaction, Magnesium oxide is reduced to Magnesium chloride and hydrochloride is oxidized to chlorine.

Oxidizing and Reducing Agent:

The oxidation and reduction reactions are always paired together since both of the reactions always occur together so in a single word they are known as redox reactions.

The substance which is reduced in the redox reaction is known as an oxidizing agent and the substance which is oxidized is known as the reducing agent.

Application of Oxidation reaction in real life:

Corrosion: Corrosion means spoilage of the surface of metals when it comes in contact with water, acid, or base, its surface spoils . An example of corrosion is rusting of iron. In presence of oxygen and water, the iron becomes coated with a brown powder substance known as ferric oxide(iron oxide).

Rancidity: Have you observed the unpleasant smell of stale food, it happens because food contains fat and oil that oxidized to new chemicals which are responsible for the bad smell, it is known as rancidity. For avoiding rancidity the antioxidizing agents are used in food.

List of Important Salts and their uses :

List of Important Salts and their uses : Class 10 CBSE Science and the aspirants of competitive entrance exams. Salts are of many types, normal salt, acid salt, basic salt, and double salt. Examples of Normal salts are carbonate chloride,, sulfate, ammonium, , nitrate, ethanoate, sodium, and potassium salts, etc. The salts in which one replaceable hydrogen atom exist known as acid salts like $NaHCO_3$.The salts containing hydroxyl group(OH) known as basic salts like lead oxychloride(Pb(OH)Cl) and double salts contain two positive/negative ions, as an example mineral dolomite $CaCO_3.MgCO_3$. Here we are going to discuss the ways of driving different salts from one of the normal salts(common salts) NaCl which is used by us daily known as Sodium Chloride(eating salt).

Sodium Chloride is separated from these salts. Sodium Chloride is also found in the form of solid-state, there are beds of rock salts worldwide that are formed due to the sea dried up in bygone ages, its colour is brown due to the impurities of other salts. Common salt(NaCl) is a raw material for various chemicals that are used in our daily life such as sodium hydroxide, baking soda.

Sodium Hydroxide: When electricity is passed through an aqueous solution of sodium chloride(brine),it decomposes into sodium hydroxide and chlorine, this reaction is known as chlor alkali process because of the formation of the products like chlorine and NaOH (alkali).

$2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$

Bleaching Powder

The chlorine gas released in the chlor alkali process is utilized in manufacturing bleaching powder. Bleaching powder is produced by the action of chlorine on dry slaked lime [Ca(OH)2].

$$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$$

The reaction of Cl2 on Ca(OH)2 releases bleaching powder (CaOCl2)

Use of bleaching powder: Bleaching powder is used to bleach the fabrics of cotton and linen in the textile industry,it is used to bleach wood pulp in paper factories and also used to bleach washed cloth in laundry.

Bleaching powder also used as an oxidizing agent in many chemical industries and for disinfecting drinking water to make it free of germs.

Baking Soda

Baking soda (NaHCO3) is produced using sodium chloride (brine), carbon dioxide, water, and ammonia, this process is known as the Solvay process by the name of a Belgian industrial chemist who first discovered this process. Solvay process of producing NaHCO3 (also known as sodium ash) is widely used because it is inexpensive since carbon dioxide is recycled to produce more baking soda.

$$NaCl + H_2O + CO_2 + NH_3 \rightarrow NH_4Cl + NaHCO_3$$

In this process ammonium chloride(NH4Cl) and baking soda are formed, On heating the baking soda the following reaction takes place.

Uses of sodium hydrogen carbonate: (i) Baking powder is manufactured by mixing up baking soda and mild edible acid such as tartaric acid.When baking powder is heated or mixed in water,the following reaction takes place.

$$NaHCO_3 + H^+ \rightarrow CO_2 + H_2O + Sodium\ salt\ of\ acid$$
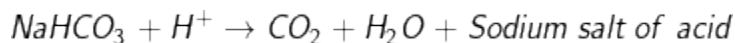
Carbon dioxide produced during the reaction causes bread or cake to rise to make them soft and spongy.

(ii) NaHCO3 is also used as an ingredient in antacids, it neutralizes excess acid in the stomach and provides relief.

(iii) NaHCO3 is also used in soda-acid fire extinguishers, when the mixture of sodium hydrogen carbonate and sulphuric acid enters the place of fire,it heated up and releases a lot of carbon dioxide and some water that keeps oxygen out and fire extinguishes.

Washing Soda: Washing soda(Na2CO3.10H2O) is obtained from sodium chloride.Na2CO3 is obtained by heating sodium hydrogen carbonate thereby recrystallization of sodium carbonate gives washing soda.

$$\underset{\text{Sodium carbonate}}{Na_2CO} + 10H_2O \rightarrow \underset{\text{Wasing soda}}{Na_2CO_3.10H_2O}$$
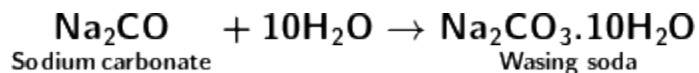
Uses of washing soda: (i) Sodium carbonate(washing soda) is used in glass, soap, and paper industries.

(ii) It is used in manufacturing borax.

(iii) Sodium carbonate is used as a cleaning agent for domestic purposes.

(iv) It is used for removing the permanent hardness of the water.

Plaster of Paris

It is obtained by heating gypsum up to 373 K, it losses water molecules and becomes calcium sulfate hemihydrated (CaSO4.2H20), this is called Plaster of Paris.

$$\underset{\text{Gypsum}}{CaSO_4.2H_2O} \overset{\text{Heat}}{\rightarrow} CaSO_4.\frac{1}{2}H_2O + 1\frac{1}{2}H_2O$$
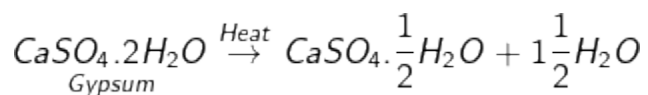
Plaster of paris is used in manufacturing toys and many decorative items, the doctor uses it as a plaster for supporting fractured bones.Plaster of paris is a white powder when mixes up with water,it changes into gypsum once again giving hard solid mass.

$$CaSO_4.\frac{1}{2}H_2O + 1\frac{1}{2}H_2O \rightarrow CaSO_4.2H_2O$$
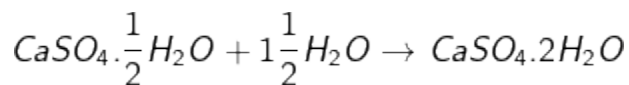
What is pH value and its importance in everyday life?

pH value of a solution shows that a particular solution is acidic, alkaline or neutral. pH value has great importance in manufacturing chemicals and in our everyday life. The term pH was first described by Denish biochemist SΦren Peter Lauritz SΦrensen in 1909, pH is an abbreviation for 'power of hydrogen' where p is the short form of the German word potenz (meaning power or exponent of H(+) ions) and H is the symbol of hydrogen.

Definition of pH:

pH is defined as the negative log of hydrogen ion concentration of a solution.

$$pH = -log_{10}\left[H^+\right]$$

Where $\left[H^+\right]$ shows hydrogen ion concentration

As an example concentration of hydrogen H^+ in water is $1 \times 10^{-7} Mole/litre$

$$pH = -log_{10}10^{-7}$$

$$pH = 7log_{10}10$$

$$\because log_{10}10 = 1$$

pH = 7

Therefore the pH value of water is 7.

The pH value of water is considered neutral, a pH value less than 7 shows that solution is acidic and pH value greater than 7, the solution is basic.

pH Scale:

pH scale is a mixture of several indicators. It is a universal indicator and shows different colors at different concentration of hydrogen ion in a solution. A scale for measuring hydrogen ion concentration in a solution, called pH scale has been developed. On the pH scale, we can measure pH from 0 (very acidic) to 14 (very alkaline).pH should be thought of simply as a number which indicates the acidic or basic nature of the solution. The higher the hydrogen ion concentration, the lower is the pH value. The pH paper is impregnated with several indicators,it is that's why it is capable to detect the pH value of all material(aq) and thus, known as a universal indicator.
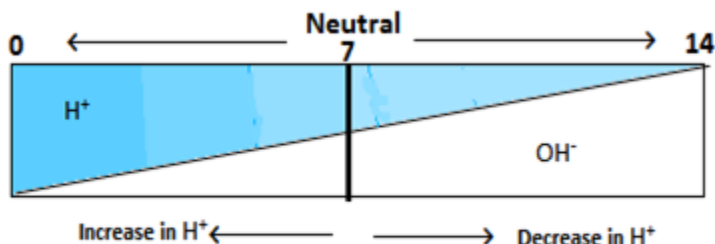
The strength of acids and bases depends on the number of H^+ ions and OH^- ions produced, respectively. Acid that give rise to more H^+ ions are said to be strong acids, and acids that give less H^+ ions are said to be weak acids.

Importance of pH in Everyday's life:

Plants and animals: Our body works within the pH range of 7 to 7.5. A living organism can survive only in a narrow range of pH change. When the pH value of rainwater is less than 5.6 then it is known as acid rain. When acid rain flows through the river or lake, it lowers the pH value of water in them and damages aquatic life.

The pH of the soil: Plants require a specific pH range for their healthy growth. For increasing productivity, it is advisable for farmers to check the soil of the field, from the pH value of soil we can get which plants or crops is suitable in order to increase the yield.

Digestive system: Our stomach produces HCl,it helps us in the digestion of food. HCl maintains the pH value of the stomach in such a way that is compatible with the secretion of enzymes. Extra HCl in our stomach causes pain and irritation that is treated by the use of the base for example milk of magnesia.

The decay of tooth: Tooth decay starts when the pH value is lower than 5.5. In the outer surface of the tooth, the enamel exists which is made of calcium phosphate the strongest substance in our body. It is not dissolved in water but when pH value of mouth is bellow 5.5 the calcium phosphate is corroded. It occurs because bacteria generated due to the food particles available between the teeth produces acids after the degradation of sugar and food particles. To prevent this we have to brush the teeth by a toothpaste since the toothpaste is a base it neutralizes the acid produced by the bacteria.

Self-defense by animals and plants through chemical warfare: Bee -Sting leaves an acid which causes pain and irritation. The use of mild base like baking soda on the sting area gives relief. Stinging hair of nettle leaves injects methanoic acid causing burning pain.

What are the physical and chemical properties of metals?

Physical properties of metals: Metals can be easily identified by their physical properties,metals are generally hard and lustrous substances, some of the metals can be beaten into thin sheets.

This property of metals is known as malleability.The metals can be drawn into wire,such a property is known as ductility of metals.Metals are used for manufacturing vessels for cooking due to their properties of high melting point and high conductivity of heat.Metallic wires are used for electric wiring and coated with polyvinylchloride(PVC) a rubber like material because of their property of conductance of electricity.Metals are used to make musical instruments because of their property of being sonorous.

Metals are regrouped on the basis of their reactivity, metals that are at the top of the series are (K, Na, Ca, Mg, and Al) , these are so reactive that are never found in nature as free elements. The metals in the middle of the reactivity series (Zn, Fe, Pb, etc) are moderately reactive. The metals at the bottom of the reactivity series are least reactive. They are often found in a free state. For example, gold, silver, platinum, and copper are found in a free state, copper and silver are also found in the earth's crust in the form of their oxide or sulfide ores.

Reaction with oxygen: Almost all metals reacts with oxygen to form metal oxides.

Metal + Oxygen → Metal oxide

Examples: When copper and aluminium are heated to air,it combines with oxygen to form copper(I)oxide(black in colour) and aluminium oxide(white in colour).

$2Cu + O_2 \rightarrow 2CuO$

$4Al + 3O_2 \rightarrow 2Al_2O_3$
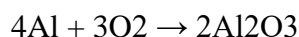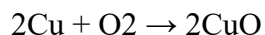
Sodium and potassium are highly reactive metals they combine with oxygen and get fire, it is that's why they are kept inside the kerosene that keeps them away from oxygen.

$4Na + O_2 \rightarrow 2Na_2O$

$4K + O_2 \rightarrow 2K_2O$
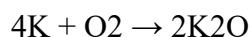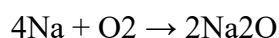
Most of the metalic oxides are insoluble in water but some of them like Na_2O and K_2O dissolves in water and forms alkalis as follows.

$Na_2O(s) + H_2O(l) \rightarrow 2NaOH(aq)$

$K_2O(s) + H_2O(l) \rightarrow 2KOH(aq)$
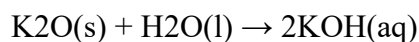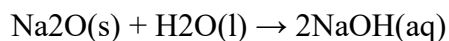
Oxides of metals are basic in nature but oxides of a few of the metals Al, Zn, Sn,Pb, Cu,Be show the properties of acids as well as base, such type of oxides which behaves like acid and base known as amphoteric oxides. Aluminum oxides react with acid and base in the following manner, which means it neutralizes both acid and base-forming salts and water.

$Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 2H_2O$

Al2O3 + 2NaOH → 2NaAlO3 + H2O
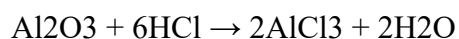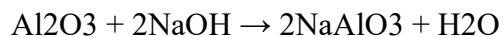
Aluminum oxides reacting with hydrochloric acid form aluminum chloride and reacting with sodium hydroxide forms sodium aluminate.

The reaction of metals with water: Metal reacts with water and produces metal oxide and hydrogen gas, metal oxides that are dissolved in water to further form a metal oxide and a metal hydroxide.

Action of steam on a metal

Metal + Water → Metal oxide + Hydrogen

Metal + Water → Metal hydroxide
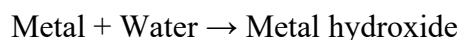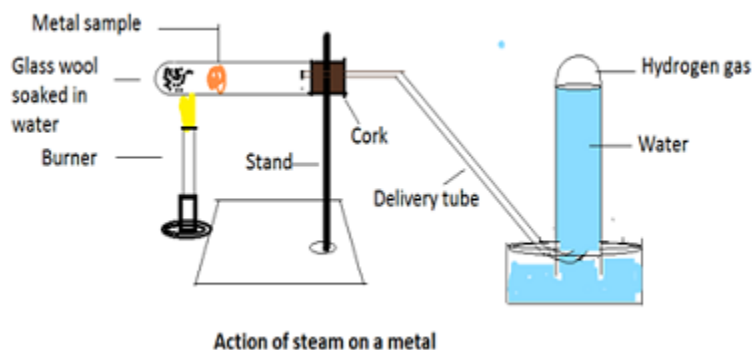
Metals like pottasium and sodium reacts with water violently with cold water,the reaction releases heat in such an extent that evolved hydrogen gas catch fire.

2K(s) + H2O(l) → 2KOH(aq) + H2(g) + heat energy

2Na(s) + H2O(l) → 2NaOH(aq) + H2(g) + heat energy
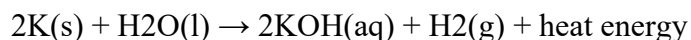
The reaction of calcium with water is less violent with cold water. The heat evolved is not sufficient for the hydrogen to catch fire.

Ca(s) + 2H2O(l) → Ca(OH)2(aq) + H2 + heat energy

Calcium starts floating because the bubbles of hydrogen gas formed stick to the surface of the metal.

Magnesium does not react with cold water. It reacts with hot water to form magnesium hydroxide and hydrogen. It also starts floating due to the bubbles of hydrogen gas sticking to its surface.

Metals like aluminum, iron and zinc do not react either with cold or hot water. But they react with steam to form a metal oxide and hydrogen.

$2Al(s) + 3H_2O(g) \rightarrow Al_2O_3(s) + 3H_2(g)$

$3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$
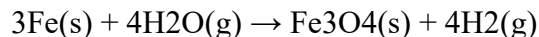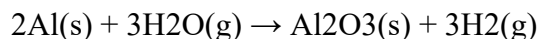
Metals such as lead, copper, silver and gold do not react with water at all.

The reaction of metal with acids: Metals react with acids to give a salt and hydrogen gas.

Metals + Dilute acid $\rightarrow$ Salt + Hydrogen

Examples

$Mg + 2HCl \rightarrow MgCl_2 + H_2$

$Al + HCl \rightarrow AlCl_3 + H_2$
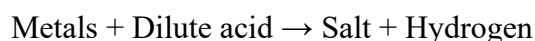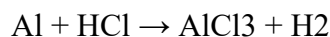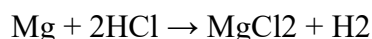
Magnesium and aluminum react with hydrochloric acid gives magnesium chloride and aluminum chloride respectively,all metals react with HCl give hydrogen gas and their corresponding chlorides.

Hydrogen gas is not evolved when a metal reacts with nitric acid. It is because HNO_3 is a strong oxidizing agent. It oxidizes the H_2 produced to water and itself gets reduced to any of the nitrogen oxides (N_2O, NO, NO_2), but magnesium(Mg) and manganese(Mn) react with very dilute HNO_3 to evolve H_2 gas.

Example: $Al + 6HNO_3 \rightarrow Al(NO_3)_3 + 3NO_2 + 3H_2O$

$3Cu + 8HNO_3 \rightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O$
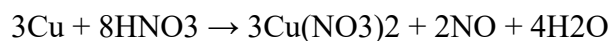
Aluminum and copper react with nitric acid produces aluminum nitrate and copper nitrate with oxides of nitrogen and water.

The reaction of metals with the solutions of other salts: All metals are not equally reactive.The comparison in the reactivity of the metals can be identified through the displacement reaction. When a more reactive metal reacts with the salt solution of less reactive metal, then more reactive metal displaces the less reactive metal and substitutes it to form its own salt as follows.

Metal A + Salt solution of metal B $\rightarrow$ Salts solution of A + Metal B

In the above reaction metal A displaces metal B from its salt forming the salt solution of A indicates that metal A lies at higher lebel in the reactivity series compared to B.

As an example

$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$
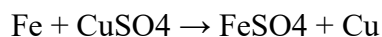
Here the highly reactive iron displaces lower reactive Cu forming ferrous sulphate.

The reactivity series

The reactivity series is on the basis of the activity of the metal also known as activity series.

Metals that are at the top of the series (K, Na, Ca, Mg, and Al) are extracted from their ore by electrolysis,The metals in the middle of the reactivity series (Zn, Fe, Pb, etc) are extracted from their ore by reduction and gold, silver, platinum, and copper are found in a free state.

Why do calcium and magnesium float on the surface of the water?

According to Archimedes' principle the objects which are denser than water they immersed in the water. Calcium and magnesium both are solids and denser than water then what happened to both of these metals when they are drawn into the water, at the start both of them dived into the water but at once comes out and float on the surface of the water, actually, it is not a phenomenon. It is a chemical reaction of water with both of the metals calcium and magnesium. Calcium and magnesium both are very reactive substances, the reaction of water with calcium and magnesium releases hydrogen gas, this hydrogen gas sticks all-around on the surface of the both of the metals in the form of bubbles, and the overall density of the calcium and magnesium become lesser than water, it is that's why calcium and magnesium come out on the surface of the water.

Reaction of calcium and magnesium with water:

$$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$$

$$Mg + 2H_2O \rightarrow Mg(OH)_2 + H_2$$
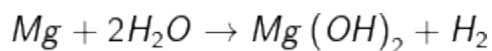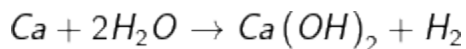
The reaction of calcium and magnesium with cold water and hot water:

The reaction of calcium and magnesium with cold water and hot water: A thin layer of hydrogen gas in the form of bubbles all around the piece of metals and their hydroxides are formed when the reaction takes place with cold water, this reaction stops in a while. The reaction of calcium and magnesium with hot water also produces the same products but the reaction exists for a long time since the hydroxides of calcium and magnesium dissolved in the hot water.

Although in nature calcium and magnesium don't exist in free states because both of them are very reactive substances therefore calcium and magnesium always exist in the form of their compounds.

Extraction of metals as per the activity series
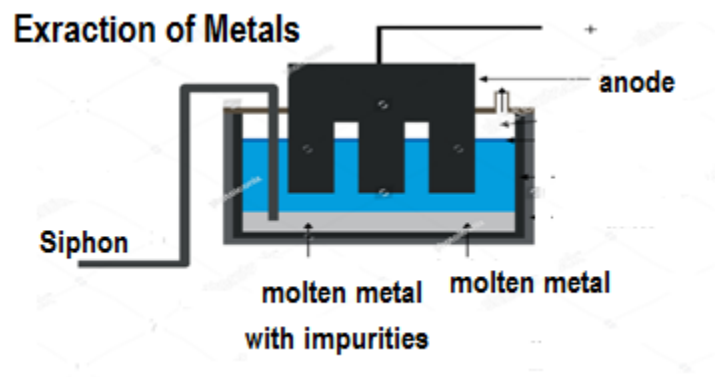
Metals are extracted as per their level in the activity series. Some of the metals are found in the earth's crust in free states and some of them are found in the form of their compound known as ore. The metals are differentiated on the basis of their reactivity known as activity series. The metals at the bottom of the activity series are the least reactive found in a free state for example gold, silver, platinum, and copper are found in the free state. The metals in the middle of the activity series are moderately reactive as example zinc, iron, lead, etc. These metals are found in the earth"s crust in the form of their oxides, carbonates, and sulfides The metals at the top of the activity series are so reactive that they never found in nature as free elements as for example potassium, sodium, calcium, magnesium, and aluminum.

Conclusively, the metals are classified into three groups on the basis of reactivity.(i) Metals of low reactivity (ii) Metals of medium reactivity (iii) Metals of high reactivity. Different techniques are to be used for obtaining the metals falling in each category.

Extraction of metals low in the activity series

The oxides of these metals can be reduced to metals by heating alone. For example, cinnabar (HgS) is an ore of mercury. When it is heated in air, it is first converted into mercuric oxide (HgO). Mercuric oxide is then reduced to mercury on further heating.

$2HgS (s) + 3O_2(g) \rightarrow 2HgO(s) + 2SO_2(g)$

$2HgO(s) \rightarrow 2Hg(l) + O_2((g)$
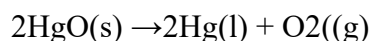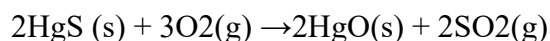
Similarly, copper which is found as Cu2S in nature can be obtained from its ore by just heating in air.

$2CuS(s) + 3O_2g) \rightarrow 2CuO(s) + 2SO_2(g)$

$2CuO + Cu2S \rightarrow 6Cu(s) + SO_2(g)$

The metals in the middle of the activity series such as Fe, Zn, Pb, Cu, etc, are moderately reactive. These are usually available in the earth's crust as sulfides or carbonates. Since it is easier to extract metal from their oxides by the method of reduction, so the sulfides and carbonates of metals must be converted to their metal oxides. Sulfide ores of metals are converted into oxides by heating strongly in presence of excess air, this process is known as roasting.

Carbonate ores are converted into oxides of metal by heating strongly in limited air. This process is known as calculation.

As example zinc is available in the earth as zinc sulfide and zinc carbonate, so ZnO is derived from these ores by the method of roasting and calcination as follows.

Roasting

$2ZnS(s) + 3O_2(g) \rightarrow 2ZnO(s) + 2SO_2(g)$

Calcination

$ZnCO_3(s) \rightarrow ZnO(s) + CO_2(g)$
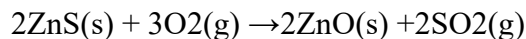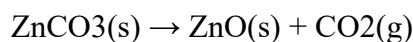
Zinc oxide is then heated with carbon and thus reduced to Zinc.

$ZnO(s) + C(s) \rightarrow Zn(s) + CO(g)$
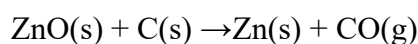
Oxides of the metals can also be reduced to the metal by using the displacement reaction. In this way the metal of higher activity series displaces the required metal from its oxide.

As an example when magnesium oxide is heated with aluminum powder, it gives magnese.

$3MnO(s) + 4Al(s) \rightarrow 3Mn(l) + 2Al_2O_3(s) + Heat$

These displacement reactions are highly exothermic. The amount of heat is so large that metal is produced in the molten state, such reaction is also known as thermit reaction.

$Fe_2O_3(s) + 2Al(s) \rightarrow 2Fe(l) - Al_2O_3(s) + Heat$

This reaction is also used to join railway tracks and cracked machine parts.

Extraction of metals in the top of the activity series

The metals high up in the reactivity series are very reactive, they can't be obtained from their compound by heating with carbon. Carbon is unable to reduce the oxides of Na K Mg and Ca, this is because these metals have more affinity for oxygen than carbon. These metals are extracted by the electrolysis of their molten chlorides. The metal is deposited at the cathode (-ve charged electrode) and chlorine is liberated at the anode (+ve charged electrode). The reactions are

$Na(+) \rightarrow e + Na$

$2Cl(-) + 2e \rightarrow Cl_2$
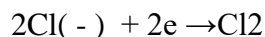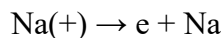
Ionic and Covalent Compounds and the Difference between them

Ionic compounds are the **compounds** in which two oppositely charged **ions** are bounded by an electrostatic force called **ionic** bonds while **covalent compounds** are the **compounds** in which two or more atom similar or dissimilar shares one or more electrons in order to form an octet in the outermost orbital of the participant atoms, these shared electrons are under the impact of nuclear forces (Vander Waal forces) between the nuclei of participant atoms and shared electrons known as a covalent bond. Examples of ionic compounds are sodium chloride, potassium chloride, sodium hydroxide, calcium carbonate, etc. Examples of covalent bonds are carbon dioxide, methane, ethane, etc.

Ionic Compounds

Ionic compounds are the substances that are formed after the exchange of electrons in which one atom donates one or more electrons and another atom gains those one or more electrons in order to form an octet or to get the noble gas structure.

In a response among metals and non-metals, metals commonly free electrons to complete their octet while non-metals acquire electrons to finish their octet. Metals and non-metals usually react to form ionic compounds.

The design of an ionic compound relies upon the general sizes of the cations and anions. Ionic compounds incorporate salts, oxides, hydroxides, sulfides, and most of the inorganic compounds. Ionic compounds are solid in which ions are held together by the electrostatic force between the positive and negative ions.

For instance, the sodium ions attract chloride ions and the chloride ion attract sodium ions. The outcome is a three-dimensional structure of Na+ and Cl–ions, thereby forming crystals of sodium chloride. The crystal of sodium chloride is uncharged on the grounds that the number of sodium

ions is equivalent to the number of chloride ions. The powers of the force of attraction between the ions hold them in the structure.
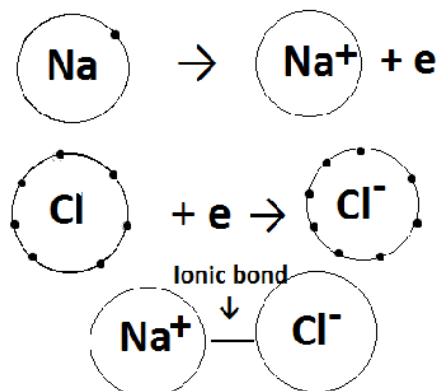
For example reaction between aluminum and chlorine. The aluminum atom has three electrons in its outermost shell. By losing three electrons from its M shell its L shell becomes the outermost shell that has a stable octet. The nucleus of this aluminum atom still has thirteen protons but the number of electrons has decreased to ten. So, a net positive charge is developed on this aluminum atom, giving an aluminum cation Al3+.

On the other hand, the chlorine atom has seven electrons in its outermost orbital. Therefore, it needs only one electron to complete its octet. It can gain this one electron from the electrons lost by the chlorine atom to become an aluminum ion. As three electrons are lost by an aluminum atom while one chlorine atom can gain only one electron, three atoms of chlorine combine with one atom of aluminum to form aluminum chloride.

Properties of Ionic Compounds

Ionic compounds are solid and are somewhat hard because of the strong force of attraction between the positive and negative ions. These compounds are generally brittle and break into pieces when pressure is applied.

Ionic compounds have high melting and boiling points, this is because a considerable amount of energy is required to break the strong inter-ionic attraction.

Ionic compounds are generally soluble in water and insoluble in solvents such as kerosene, petrol, etc.

The conduction of electricity through a solution involves the movement of charged particles. A solution of an ionic compound in water contains ions, which move to the opposite electrode when electricity is passed through the solution. The ionic compound in the solid-state does not conduct electricity because the movement of ions in the solid-state is not possible due to their rigid structure, but ionic compounds conduct electricity in the molten state. This is possible in the molten state since the electrostatic forces of attraction between the oppositely charged ions are overcome due to the heat. Thus, the ions move freely and conduct electricity.

Covalent compounds

Covalent compounds are formed by the atoms of the elements which are unable to form ions due to higher ionic energy that resist to lose or gain electrons, so such atoms share one or more one electrons in order to complete octet in the outermost orbital to gain stability. Generally, covalent bonds are formed by organic compounds and molecules of non-metals, as an example.
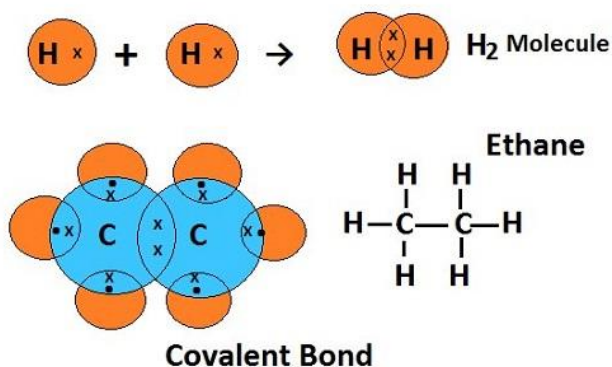
Covalent bonding in carbon

As per the electronic configuration of carbon, it needs to gain or lose 4 electrons to become stable, which seems impossible as:

- Carbon cannot gain 4 electrons to become C4-, because it will be tough for 6 protons to hold 10 electrons and so the atom will become unstable.
- Carbon cannot lose 4 electrons to become C4+ because it would require a large amount of energy to remove out 4 electrons and also the C4+ would have only 2 electrons held by proton, which will again become unstable.

Carbon cannot gain or donate electrons, so to complete its nearest noble gas configuration, it shares electrons to form a covalent bond.

Properties of covalent bond

If the normal valence of an atom is not satisfied by sharing a single electron pair between atoms, the atoms may share more than one electron pair between them. Some of the properties of covalent bonds are:

- Covalent bonding doesn't result in the formation of new electrons. The bonds only pair them.
- They are very powerful chemical bonds that exist between atoms.
- A covalent bond normally contains the energy of about 80 Kilocalories per mole(kcal/mol)
- Covalent bonds rarely break spontaneously after it is formed.
- Covalent bonds are directional where the shells of atoms are half-filled so they showcase specific orientations relative to one another.
- Most compounds having Covalent bonds exhibit relatively low melting points and boiling points.

- Compounds with Covalent bonds usually have lower heat of vaporization.
- Covalent compounds have no free electrons hence don't conduct electricity.
- Covalent compounds are not soluble in water.

Trends in the properties of elements from left to right and up to down in the modern periodic table.

Trends in the properties of elements from left to right and up and down vary. The change in the properties of elements occurs due to the valance electrons and atomic size. Elements are arranged in the Modern periodic table in the increasing order of their atomic numbers. In the modern periodic table, there are 18 vertical columns known as the group of elements and 7 horizontal rows known as periods. The scientists found that there is a relationship between the atomic numbers of elements with their properties and thus concluded to the fact that the properties of elements are the periodic functions of their atomic number. There is periodic changes in the properties of element when we go left to right in a periodic table.In this respect the valency, atomic size, metallic and non-metallic properties of element changes.

Valency:

The valency of elements does not change when we go downwards in a group because all elements has the same valence electrons in a group.If we are going to determine the group number of an element having atomic number 12. The outermost electrons in it are 2, so it's group number is 2, but this technic of calculating group number is applicable for non-transitional metals only.If we have the atomic number of an element 17, the outermost electrons in it are 7 that shows that it's group number is $10 + 7 = 17$,in the case of a few of metals, metalloids, and non-metals, we have to add 10 on the outermost electrons for the calculating group number.The number of shells in electronic configuration shows the periodic number of element.

The way of finding a group and Periodic number of Elements when its Atomic number is given

As an example what are the group number and periodic number of following elements whose atomic number is given as follows.

(i) 15 (ii) 13 (iii) 27 (iv) 7

(i) 15- 2,8,5, the electronic configuration shows that it's outermost electrons are 5 and it is non-metals, therefore group number of the element is =10 +5=15 and periodic number is 3

(ii) 13-2,8,3, the electronic configuration shows that it's outermost electrons are 3, in this case the group number is 10 + 3 = 13 and periodic number is 3

(iii) 27 - 2,8,8, 8, 1,the electronic configuration shows that it's outermost electron is 1, but it is a transitional element so its group number = number of electrons in fourth orbit+ number of electrons in fifth orbit = 8 +1= 9 and periodic number is 5

(iv) 7 -2,5. the electronic configuration shows that it's outermost electrons are 5, it is a non-metals so its group number is = 10+5 = 15 and periodic number is 2.

Atomic size:

The term atomic size refers to the radius of an atom. The atomic size may be visualised as a distance from the nucleus to the outermost orbit of an isolated atom.The atomic radius decreases in moving from left to right along a period. This is due to an increase in positive charge at the nucleus thereby increasing force of attraction between nucleus and orbitals that forces orbitals of electron to come closure to the nucleus.In a group the size of atoms increases because in moving downwards I'm a group e new shell is added.

Metallic and Non-metallic properties:

The metallic property of an element is the tendency of an atom of donating electrons,from left to right the positive charge of the nucleus increases, thus the force of attraction between nucleus and electrons increases thereby moving left to right the metallic property also called electropositivity decreases because electrons are more tightly bounded by the nucleus and thus it is more difficult to donate electrons. In moving downwards the metallic property of the element increases because the force of attraction between the nucleus and outermost orbital decreases and thus it becomes easy to donate electrons.

How to determine Valency,net charge of an ion and Molecular formula of a substance.

Valency: Valency of an element is the holding capacity of an atom of a substance, as we know atom is neutral then how is this capable to react with other atoms of a substance? The reaction of an atom of an element with other atoms is decided by the electrons available in its outermost orbital called valence electrons of an atom. Every atom of a substance has a tendency to have 8 electrons in its outermost orbits, so an atom of a substance can either loss or gains the electrons. When an atom of an element comes in contact with another particular atom, both of them excited to exchange or share the electrons and form molecules. As an example the formation of sodium chloride.

The electronic configuration of Na(11) is= 2,8,1 and of chlorine (17) is =2,8,7

When Na atom comes in contact with Cl atom both of them excited and form ions, the charged particles. It is clear from the electronic configuration of both the atoms that Na losses 1 electron to make an octet in its outermost orbit and Cl atom gains 1 electron to make octet in its outermost orbit.therefore after losing 1e Na forms Na^+ ion and After a gain of 1e Chlorine forms Cl^- ion.

$$Na \rightarrow Na^+ + e, \ Cl + e \rightarrow Cl^-$$
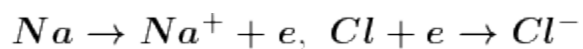
As we know opposite charges attracted each other and so both Na^+ and Cl^- attracted and stuck together and forms a molecule of sodium chloride and such type of bonds between two ions is known as ionic bond.

In the formation of carbon dioxide molecule when carbon atom and oxygen comes in contact with each other in a particular circumstance, they share electrons with each other because carbon can not form ions since it is requiring large amount of energy in exchanging its 4 outermost electrons.
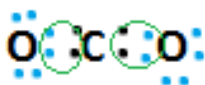
Here, in this case, carbon atoms and oxygen molecules share electrons in fulfilling their outermost orbit. Sharing means, now electrons of carbon and oxygen atoms can enter into each other's orbits and such type of chemical bond is known as Covalent bond.

Net Charge of an ion

Ions are of two kinds on the basis of the number of atoms (a) Mono-atomic ions (b) Polyatomic ions. Monoatomic ions are made of a single atom and Polyatomic ions are made of more than one atoms, when whole of the molecule of a substance ionized then polyatomic ions are formed.These polyatomic ions are also called radicals. The atoms in these polyatomic ions are bonded with covalent bonds and have net charge.

The net charge of polyatomic ions is the sum of charges(or valency) of individual atoms in it, as an example

$$SO_4^{-2}$$
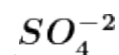
The charge in a sulphur atom is +6 because it shares its 6 electrons to 4 oxygen atoms charge in 4 oxygen atoms = -2×4=-8, so the net charge of sulphate ion is =-8 + 6= -2.

The molecular formula of a substance:

The molecular formula of a substance shows the proportions of all elements in a substance,as an example from the formula of water H_2O we can get the volumes and masses wise ratio of hydrogen and oxygen in the water.

The mass of two hydrogen atoms in water is = 1×2= 2u and of one oxygen atom is =16

The ratio of hydrogen and oxygen in water is = 1: 8

Volume-wise ratio = number of hydrogen atoms: number of oxygen atoms=2: 1

The chemical or molecular formula of a substance is determined by the valency or charges of atoms and ions. Let the valency of a substance X is 2 and of Y substance is 3 then the chemical formula of the substance formed by them is X3Y2.

As an example calcium hydroxide

Valency of Ca is = 2 and the net charge of Hydroxide ion is =-1

Then the number of atoms involved in the formation of a molecule depends on the charges on another atom or radical, as example net charge of hydroxide ion (-1) compels one atom of Ca to combine in it, and charge 2 of Ca compel one ion of OH to combine in it.

Therefore the chemical formula for calcium hydroxide is $Ca\,(OH)_2$

The difference between the soap and the detergent

The soaps are sodium or potassium salts of the long-chain molecules of carboxylic acids and detergents are sulphonic salts of long-chain molecules of carboxylic acids before we understand what is soap and detergent in detail we required to get the knowledge of what is saponification because it is the process used in manufacturing soap.

Saponification is the reaction between ester and sodium or potassium hydroxide producing alcohol and subsequent reaction of sodium or potassium salts of carboxylic acid which is known as soap. This process is completed in two steps.

We need to understand the process of saponification before we study soap and detergent. The process of esterification is also involved in saponification.

1-Formation of the ester

The reaction of alkanol(alcohol) and alkanoic acid(carboxylic acid) producing ester is known as esterification, the example is shown below.

Ethanol + Ethanoic acid → Ester + water

$$C_2H_5OH + CH_3COOH \xrightarrow{conc.H_2SO_4} CH_3COOC_2H_5 + H_2O$$
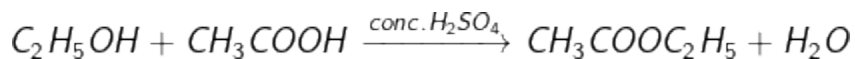
2-Formation of alcohol:

The ester so formed in the above reaction is treated with strong base NaOH or KOH produces alcohol and sodium or potassium salt of carboxylic acid.

$$CH_3COOC_2H_5 + NaOH \rightarrow C_2H_5OH + CH_3COONa$$
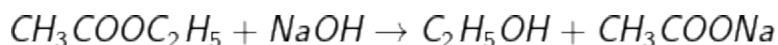
Ester + Sodium hydroxide → Ethyl alcohol + Sodium salt of carboxylic acid

If this reaction occurs in the case when the long chain of alcohol(fatty alcohol) and the carboxylic acid is involved then the soap is produced which is used by us. Soap is two kinds one is derived from sodium hydroxide known as harder soap and the other is derived from potassium hydroxide is known as softer soap. Generally, the formulas of soap are the following. In nature, the long-chain carboxylic acids(fatty acids) and long-chain of alcohol(glycerol) are found linked to each other in the vegetable oil or animal fat, it is that's why soap is produced from both of these things.

Formula of Soap

$$C_nH_{2n+1}COONa$$

Example

$$C_{15}H_{31}COONa, \; C_{17}H_{35}COONa$$
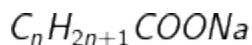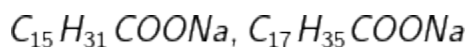
The requirements of detergent is needed because soap does not work in hard water, the hardness of the water is caused by calcium, magnesium, iron, and manganese. These metals react with the soap forming a scum(soap film) which separates the connection between dirt and water thus the dirt remains in its place, so other products called detergent are used to overcome this problem.

Detergents are ammonium or sulphonic salt of the long chain of carboxylic acids which doesn't make scum in the cleansing action of cloth since it doesn't react with calcium, magnesium, iron, and manganese available in the hard water. The detergents are more soluble in water as compared with soap, soaps are completely biodegradable while some of the detergents are non-biodegradable.

The formula of detergent

$C_{18}H_{29}NaO_3S$

Name: Dodecylbenzene sulphonate

Light- Reflection, Refraction, Dispersion, and Scattering
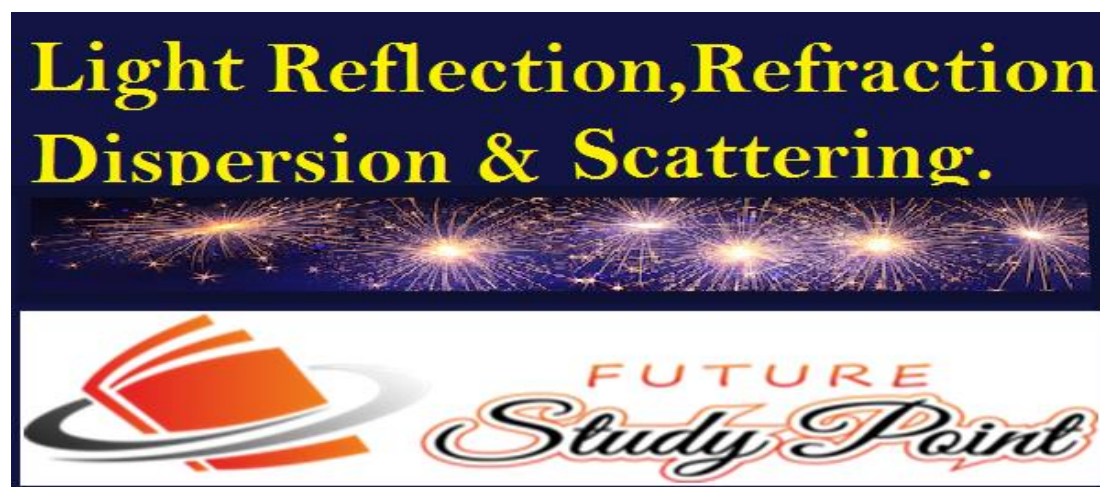
1- The reflection

We see everything in this world due to the presence of light, light rays fall on the object and then send back to our eyes and image of the object formed on the retina of our eyes and thus we become capable to see the object. The sun is the largest source of light to us. it can be said that the Sun is the largest source of energy on the earth, it is because of the virtue of light reflection we use microscope, telescope, radar, etc. When light rays fall on the surface of an object, the surface of the object sends back light rays by a certain angle to another direction, in other words, the phenomenon that light ray bounces off an object is known as reflection.
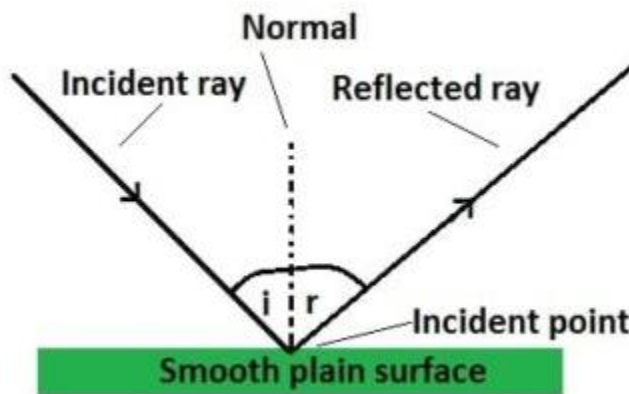
The rule of reflections

(1) When light rays fall on a smooth surface of an object, the incident ray, reflected ray and the normal to the surface on the incident point all lies in the same plane

(2) When light rays fall on a smooth surface of an object, the angle between the incident ray and normal known as the incident angle is always equal to the angle between normal and reflected angle known as the reflected angle.

Diffused reflection

When light rays fall on a rough surface then these are reflected in all directions and rules of reflection are not followed, it is called diffused reflection.

Application of reflection of light- (i) We become capable to see everything due to the reflection of light.

(ii) The 30% radiations of total light energy exposed to the earth are reflected back to space regulates the temperature in the earth, this phenomenon of reflection of light keeps us away from the excess temperature in the earth.

Light- Reflection, Refraction, Dispersion and Scattering

2-The refraction

When light travels from one medium to another medium it deviates from its own path this phenomenon of light is known as refraction. When the light ray transports from rare medium to dense medium it bents towards the normal and when light rays transport from dense medium to rare medium then it bents away from the normal.
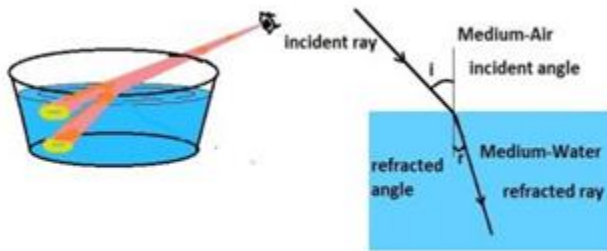
Rules of refraction

(1) When light rays refracted from one medium to another medium then the incident ray, refracted ray and normal lies on the same plane.

(2) **Snell's Law:**The ratio between the sine of an incident angle to the sine of the refracted angle is always constant for a given pair of medium or given pair of the color of light,it is known as Snell's Law.

$$\frac{sini}{sinr} = constant$$

Where i is incident angle and r is refracted angle this constant is also known as the refractive index. If light rays transport from a medium to another medium which is denser then this constant increases because of the decrease in refracted angle and when light travels from dense medium to rare medium then this constant decreases with the increase in refracted angle. This constant tells how much light ray is refracted so it is also known as the refractive index of one medium with respect to another medium.

The angle of refraction depends on the speed of the light between two medium if as compared to the incident angle the angle of refraction is less means the speed of light is slower and if the angle of refraction is more then the speed of light is more, therefore the refractive index of one medium with respect to another medium is given by the ratio of speed between two mediums.

Let the speed of light in medium 1 is v_1 and in medium 2 is v_2 then refractive index of the medium 2 with respect to medium 1 is given by n_{21}

$$n_{21} = \frac{v_1}{v_2}$$

The Refractive index of medium 1 with respect to medium 2 is represented as follows

$$n_{12} = \frac{v_2}{v_1}$$

Absolute refractive index

When the light ray passes to any medium from vacuum or air then the ratio between the speed of light in air or vacuum to speed of light in the medium is known as the absolute refractive index of the medium. It is represented by μ.

$$\mu = \frac{c}{v}$$

Where c is the speed of light in the vacuum and v is the velocity of light in the medium

Critical angle

When a light ray travels from a denser medium to a rare medium, then the angle of incidence for which the angle of refraction becomes 90°, this angle, if allowed to increase, the whole of the incident light reflected back to the denser medium which is known as total internal reflection.
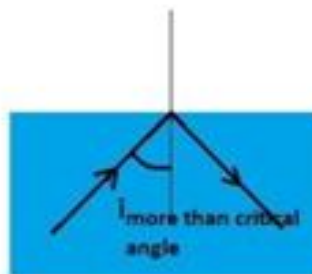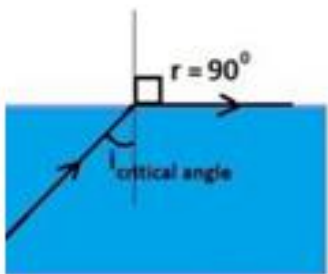
The causes of diamond shine

The diamond is an allotropic form of carbon, carbon has four valance electrons, each carbon atoms form covalent bonds with one another and arranged in the shape of a tetrahedron. In this way whole of the diamond, crystal is made of tiny prisms when light enters into it converted into 7 colors. The critical angle of the diamond is 24° which is the least among all substances, this led

the total internal reflection of the light is maximum inside it. The refractive index of diamond is higher i.e 2.42. Therefore the causes of the diamond shines are the total internal reflection, the higher amount of refraction and dispersion inside it.

3-The dispersion

The splitting of light rays into seven colors is known as the dispersion of light. The dispersion of light occurs because all colors have different wavelengths and different speeds, when light enters in a refracting medium these colours deviates from the original path of the light ray so all colors are refracted in increasing order of wavelength i.e VIBGYOR, V-Violet, I-Indigo, B- Blue, G-Green, Y-Yellow, O-Orange, R-Red.

Dispersion of light through a prism
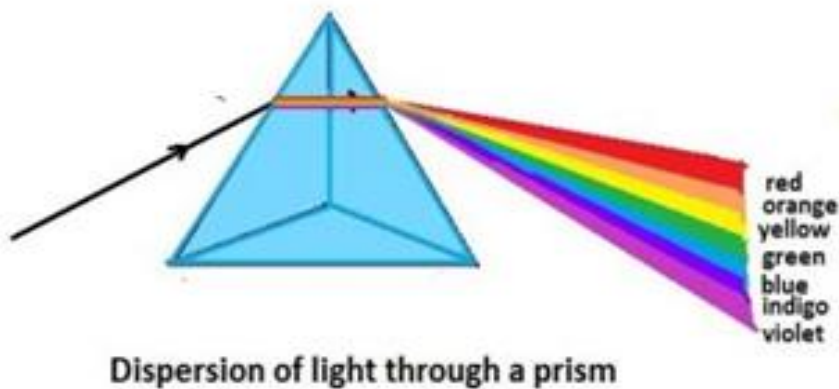
4-The scattering

Scattering occurs due to the individual particles available in the medium, the particles absorb the light and then scatter it in all directions except to the direction of incoming rays. The scattering of light depends on the size of particles. light ray enters into the particle that is absorbed and particles get illuminated. Particles of small size like molecules absorb the lower wavelength colors from the spectrum of light then scatter the same color of light. The color of the sky looks blue because molecules of the gas available in the atmosphere absorb and scatter lower wavelength colors, violet, indigo blue and green among them primary colors are blue and green makes the color of the sky .

Scattering of sun light by the molecules of gas in the atmosphere

What is Wave Length?

Have you observed a regular disturbance in the ocean water which extends up to the basin and people enjoy that disturbance on the beaches? This regular disturbance is known as ocean waves that are caused by the force of gravitational attraction between the Sun and the Earth and the Earth and the Moon. In short, we can say the Sun, the Moon, and the Earth energizes the ocean water and this energy flows in the form of a wave. A wave has a crest and trough and the distance between two successive crests or troughs is known as wavelength. The ocean waves when originating from the depth of the ocean up to the ocean floor, its crest rises thereby extending to the basin(shallow water) and it rises further.
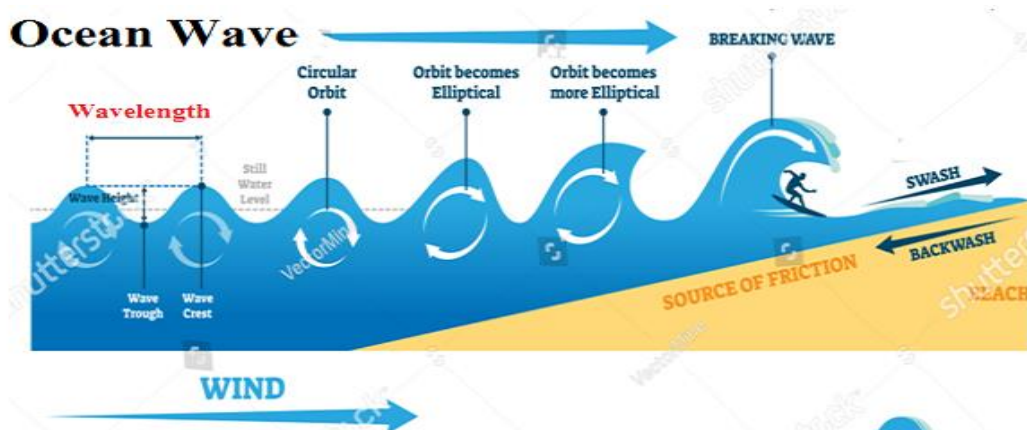
In the same way, the sunlight(light energy) also travels through space as the ocean waves in the water, the light wave doesn't require any medium, the light wave or all other waves also has a crest and tough but sunlight has a large spectrum of individual waves as example visible and invisible. The visible part consists of all the colors red, orange, yellow, green, blue, indigo and violet. The red color has the highest wavelength and the violet color has the least wavelength.

The part of the invisible light is infrared waves which have a wavelength greater than the red color and ultraviolet waves which has a smaller wavelength than violet color. Sound waves also propagate in a similar way,it is requiring medium to flow, when sound waves are produced by a source it makes disturbances in the air or other medium in the form of compression and rarefaction, Compression stands where air molecules are close to each other and rarefaction stands where air molecules are farther from each other. This regular pattern reaches our ears. The distance between two consecutive compressions or rarefactions is the wavelength of the sound waves.

The relationship between wavelength ,velocity and the frequecncy of a wave is following

$V = \lambda F$

Where V is the velocity,F is the frequency and λ is the wavelength of the wave,if wavelength of a wave is higher then its frequency is lower.

Refraction of the light through the Prism:

Prism is a transparent three-dimensional solid shape in which the cross-section area of at least two opposite faces is the same. Let's consider a triangular prism,a triangular prism has two bases of the same opposite triangular planes and three rectangular surfaces of the same cross-sectional area. Let's take the top view of the prism, when a light ray falls on the surface of the prism, it bends towards the normal since light ray bends towards the normal when it passes from a rare medium to a denser medium, then light ray passes from glass to air, it bends away from the normal, what we observe here, there is the angle of deviation between an incoming ray from air to glass and the emerging ray glass to air. The incoming ray is split up into seven colors because the velocity is proportional to the wavelength, since light is made of 7 different wavelengths(i.e colors), the velocities of these colors differ from each other as soon as the light ray enters the prism. When light ray further passes from glass to air, these colors deviated more and we observe a pattern of 7 colors of the light in the decreasing order of their wavelengths 'VIBGYOR'.

Refraction of light through the prism
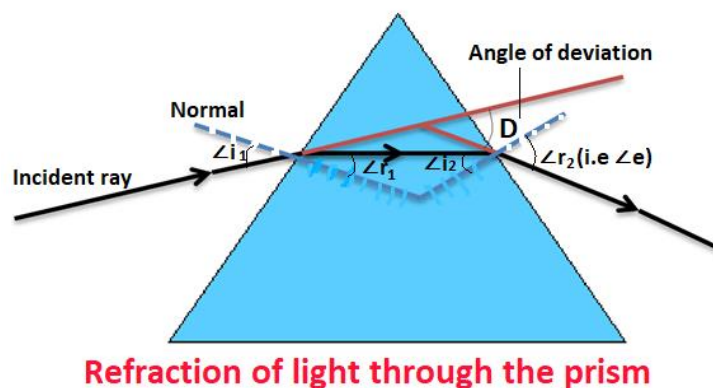
Let the light ray $\overrightarrow{AB}$ incident on one of the surfaces of the prism PQ obliquely,it bents to the normal MN, the incoming light ray forms an angle of incident $\angle i_1$ and refracted ray $\overrightarrow{BC}$ forms an angle of refraction $\angle r_1$,

this refracted ray incident on an opposite surface and forms an $\angle i_2$ The refracted ray further travels from glass to air, in this situation the light ray $\overrightarrow{CE}$ bends away from the normal M'N'and forms an emergent angle. The angle of emergent($\angle e$) is differed by the angle of the incident, this difference between the angle of incident and the angle of emergent is known as the angle of deviation $\angle D$.

Dispersion of the light: Light rays pass from air to glass and split into seven colors because of the refraction of the light and the light is composed of seven colors, when the light ray enters the prism the velocity of all the colors changes, and it happens because the velocity of a wave is the product of frequency and the wavelength.7 colors of the light have different wavelengths due to which all colors move in the glass prism as per their velocity, therefore as the light ray enters the prism, these colors deviate individually then further while moving from glass to air these colors deviates more giving rise the phenomenon of dispersion 'VIBGYOR', the highest velocity is of red color which deviates least and lowest velocity is of violet color which deviates largest.
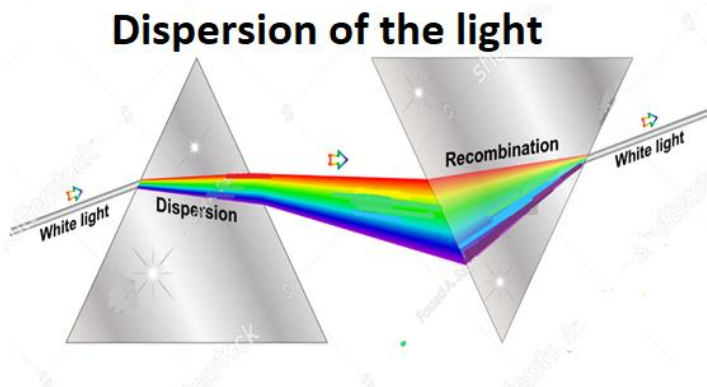
The experiment for showing the light is composed of 7 colors: If we place an inverted glass prism in front of an erected glass prism and allow the dispersed light to pass through the inverted glass prism. All the colors of the light deviate to a single point that results in the merge of all the colors into white color and thus emerging ray is white, it shows that light is made of seven colors.

Why do the star twinkle?

The **star** appears as they are **twinkling** because of physical phenomena known as atmospheric refraction. Refraction is bending of a light ray when it passes from one medium to another medium. The process of the light ray deviates from its own way when it travels from one medium to another medium is known as refraction**.** To understand this you would have to go through your experience, have you seen the things across a fire? You would have observed the

things appears to the eye **flickering** from their places it's reseasoning is that when light ray falls on the things across the fire, the reflected rays pass from cooler air(one medium) to hotter air(another medium) in turn of this light ray deviates from its own path and then reaches to our eyes, due to the change in temperature of the air around the fire caused by the flame of fire changes the density of air, that causes positions of the image of the things changes continuously and the things appear to flicker or twinkle from their places.

(Rare mediam) (Dense mediam) Cooler air

Hotter air Flickered object

Incident ray

Refracted ray
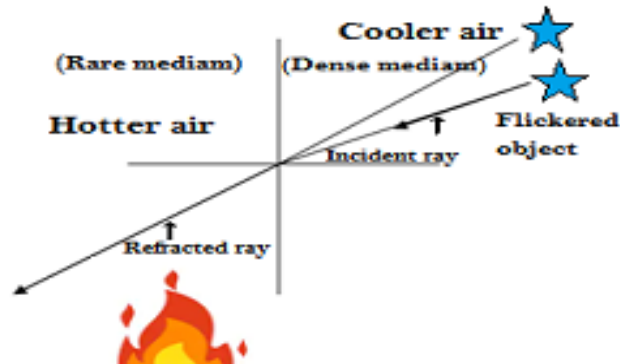
The **twinkling** of the **star** is almost the same phenomenon as described earlier due to the atmospheric refraction**.** The **stars** are too far away from the earth, they look like small light points. The light from them has to pass a very long path. As we know the space between **stars** and the earth is a vacuum, the light travels on the straightway until it reaches the atmosphere of the earth, as soon as the light ray enters the atmosphere of the earth, it starts to refract, and then as a result of continuing refraction of the light through the different layers of the atmosphere reaches to our eyes (the continue refraction of light ray occurs due to different atmospheric layers). After refraction of the light through the atmosphere light ray incident on our eyes, the path of this incident ray varies due to the changing atmospheric conditions, thus we see the changing virtual images of the **star**.

The temperature of these atmospheric layers varies due to variations in atmospheric conditions resulting in the change in the path of refracted ray incidents on our eyes thus giving way to changing virtual positions of the **star** that is why **stars** appear as they are **twinkling.**

Why does Rainbow look like a Bow?

After the rain you have observed a rainbow is seen in the sky, the rainbow is seen by you doesn't mean that it is also being seen by everybody because it depends on the position of the observer and the position of the sun. Rain bow is seen to the observer if the position of the sun is behind him. A Rainbow is seen due to the dispersion of the light by the floating water droplets in the atmosphere. It looks like a bow to the observer because when sunlight enters a water droplet, the dust particle inside the droplet reflects the sunlight, this reflected light passes from denser

medium to rare medium(i.e air), and the light emerged out of the drop in the form of seven colors since the velocity of light slowed down while entering to the drop, all the colors of the light bent as per their wavelength because speed is directly proportional to the wavelength. these split colors enter into another drop which bent it further making the shape of a bow. Actually, the shape of the rainbow is circular but from the ground, only a part of the circle is seen, the observer at a certain height above the ground can see the whole of the circular rainbow.

Refraction through a water droplet

As we know the rainbow is an optical phenomenon that is visible to us as a result of the refraction of the light rays through the floating water droplets in the sky. When a light ray enters the water droplet, all the colors of the light deviated as per their wavelength because the speed of the light slowed down from a rare to a denser medium. This spectrum of seven colors is further reflected by the dust particle inside the water droplet and light ray passes from water to air causing it speed up, these colors of light bents from their original path which causes the shape of the rainbow just as like a bow.

We can observe two rainbows in the sky, one is faint and the other one is dark, it occurs because when light enters the drop refraction is taken place twice, one is when it enters air to water and another when light passes from water to air. The first one is known as the primary rainbow and the second one is known as the secondary rainbow.

Water drop

Dust particle
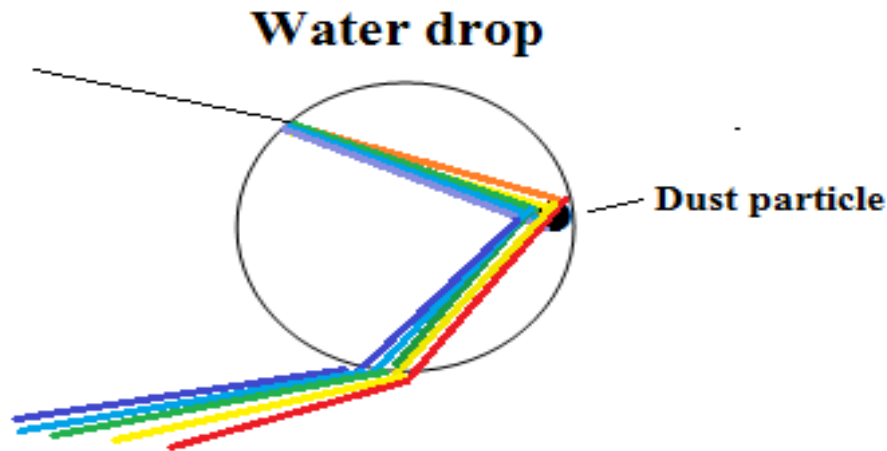
Refraction of light through a glass slab:

Refraction of the light is the deviation of the light ray from its path when it travels from one medium to another medium. When a light ray enters a glass slab, the light ray bends towards the normal since it passes from a rare medium(i.e air) to a denser medium(i.e glass) and emergent rays go away from the normal since it passes from a denser medium (i.e glass) to rare medium(i.e air).

Refraction of light through a glass slab
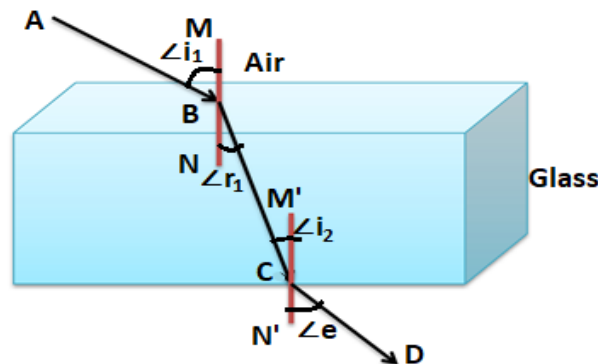
Let the light ray $\overrightarrow{AB}$ enters to one of the face of the glass slab,the normal at a point of the incident(B) is MN then the refracted ray is $\overrightarrow{BC}$ and another normal at the point of the incident (C) is shown by M'N'. The emergent ray that bends away from the normal is represented by $\overrightarrow{CD}$.

Moreover, the angle of incident is $\angle i_1$ (the angle between the incident ray and normal MN) and angle of refraction is $\angle r_1$ which is the angle between the normal MN and refracted angle $\overrightarrow{BC}$,

$\angle i_2$ is another incident angle between the refracted ray $\overrightarrow{BC}$ and the normal M'N' ,$\angle e$ is the emergent angle which is the angle between the normal M'N' and emergent ray $\overrightarrow{CD}$.

Question 1: Is the refraction of the light takes place in the glass slab the same as in the prism?

Ans. Refraction of the light that takes place in the glass slab is not similar to a prism because the faces of the prism are not parallel to each other like the glass slab, therefore emergent ray is not parallel to the incident ray.

Question 2. What is dispersion?

Ans. Dispersion is a phenomenon of the light which is followed by the property of refraction of the light, when a light ray enters a prism, its speed changes since the wavelength of all colors are different therefore their speed also differs from each other, as soon as light enters the prism, it split up into seven colors, when light ray emerges out, all colors deviate as per the sequence of their wavelengths and we see the spectrum of seven colors. The splitting up of the light into seven colors is known as dispersion of the light.

Question 3. Why is the dispersion of the light is not seen through the glass slab?

Ans. The dispersion of the light is not seen through the glass slab because of its geometrical design, its opposite faces are parallel, when light enters to one of the face of a glass slab,it split up into seven colors but when the light ray emerges out of the opposite parallel face, these splitting colors merge into a white light because each color deviates parallel to each other.

Question 3. What is Snell's law ?

Ans. When a light ray passes from one medium to another medium then the refraction of the light takes, it is seen that the ratio between the sine of the incident angle and the sine of the refracted angle is always constant, this one of the laws of refraction known as the Snell's law, this constant is also known as the refractive index of one medium to another medium.

Why does the sky look blue?

The sky looks blue because of the scattering of the light by the particles available in the earth's atmosphere, the earth's atmosphere is composed of small gaseous particles and dust. The smaller gaseous particles scatter the colours of smaller wavelengths (i.e violet, indigo, blue and green). The mixtures of these colours violet, indigo, blue and green make the sky blue colours of the sky. The blue colour of the son's light is faded because of multiple scattering of the light,when a beam of son's light incidents the earth's atmosphere the small gaseous particles scatter the shorter wavelength colours and when reaches the earth's surface, the surface of the earth also reflects it to the space, thus multiple scattering of the light by the particles makes the colour of sky less blue and more white.

The light consists of a large spectrum of waves having different wavelengths, we can see the seven colours of the light through the dispersion of the light, such a spectrum of seven colours is known as visible light. the part of the sun's light which have a higher wavelength than the red colour is known as infrared waves and the part of the sun's light that has a lower wavelength than the violet colour is known as ultraviolet.

Scattering by dust particles or water droplets: The size of the dust particles or water droplets is larger, so when light enters into dust particles or water droplets,it scatters all the colours equally in all direction. The main colours of the light are red,green and the blue,therefore dust particles or water droplets don't contribute in the colour of the light.
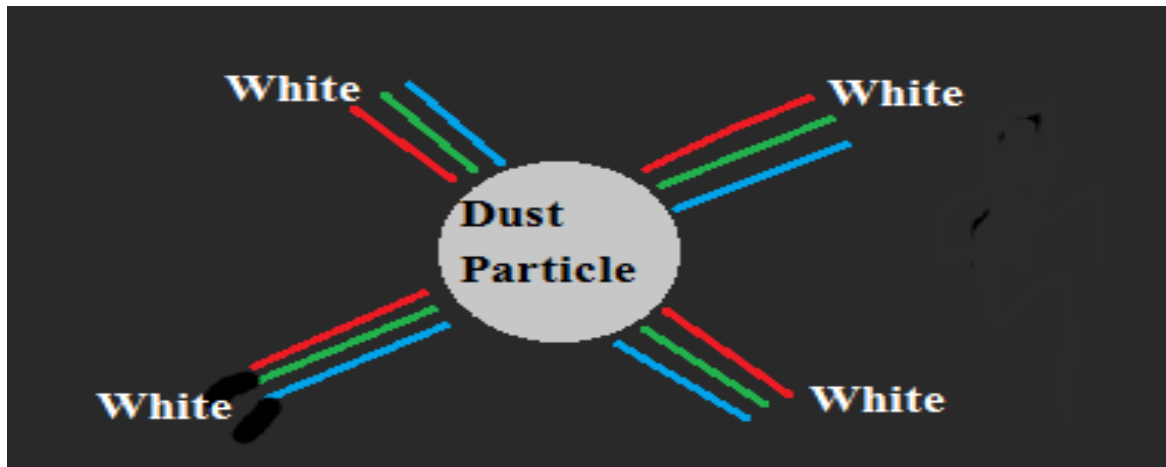
Scattering by gaseous particles(i.e molecules) : The size of the molecules is very small, so when light enters into molecules,it scatters the smaller wavelength colours more compared to others in all directions. The main colours of the light are red, green and blue, since gas molecules in the atmosphere are in trillions, therefore, scattering of blue colours by gas molecules makes the colours of sky looks blue .
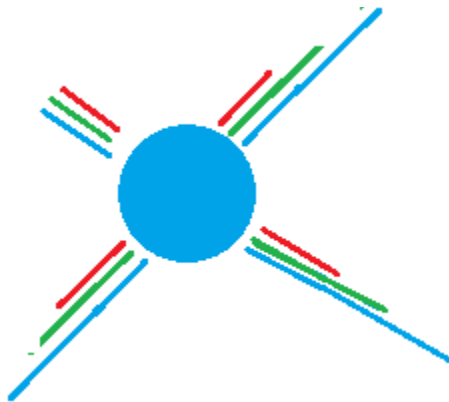
Why do clouds look white ? Clouds are made of tiny droplets of water and dust,when light enters into the droplet, it scatters all the colors equally in all the directions like dust particles,so clouds look white with a background of a blue sky.

Why does Sun look reddish in the evening and morning: Complete Detail

You would have wondered by seeing **why the sun and the surrounding sky appear red during the sunset and sunrise**. **The sun** is on the horizon during the **evening and morning**, which means it is farthest from us compared to the positions of **the sun** at day time. All the colors of sunlight have to pass through a longer distance as compared to the distance of **the sun** in the daytime. All the lower wavelength colors of the light are scattered away by the gas molecules available in the atmosphere, It is only the **red** color which, being of high wavelength, is scattered very little, due to which only **red** color reaches our eyes. The color of the danger signal is always of **red** color because of its higher wavelength so that it could be seen from far away.

Why does the sky look blue but the sun looks red when it is on the horizon?

It looks blue because gaseous particles are very small and huge in number, these small particles scatter the smaller wavelength color blue among three primary colors red, blue, and green. Since blue is one of the three primary colors so it causes the sky looks blue. it may confuse students that when the sun is on the horizon then **why does it happen that the sun's ray appears reddish**, its cause is different from the previous one. Sun is on the horizon in the evening and morning, and gaseous particles available in the atmosphere still scatter the sunlight but all the colors of the least wavelength are scattered away due to which sky looks blue because gaseous particles are huge in quantity but the sun and its rays look reddish because when **the sun** is at the horizon its distance from us is larger due to which larger wavelength color red reaches to our eyes rest of color faded in the way. During the daytime, the sun is nearer to us which causes all the colors scattered equally by the gaseous particles resulting in the sun and sun's rays looking white. You can understand it through an experiment.

The experiment of showing that the Sun appears reddish in the evening and morning:

If this explanation confuses you, you can understand it through the following experiment.

Place a strong source of light (S) of white light at the focus of a converging lens(Convex lens, L1). This lens refracts the light in parallel to the principal axis.

Allowing the beam of light to pass through a transparent glass tank (T) containing clear water.

Allow the beam of light to pass through a circular hole (C) created in cardboard. Obtain a sharp image of the circular hole on a screen(MN) using a second converging lens(Convex lens, L2).

Dissolve about 200 gm of sodium thiosulphate (hypo) in about 2 L of clean water taken in the tank, thereafter add 1 to 2 ml of concentrated sulphuric acid in the water. Here sulfur particles start to form within 2 to 3 minutes,we can observe it from three sides of the tank by seeing the change of white light into blue light, it happened because minute colloidal sulfur particles scatter the smaller wavelength colors of the light(i.e blue).
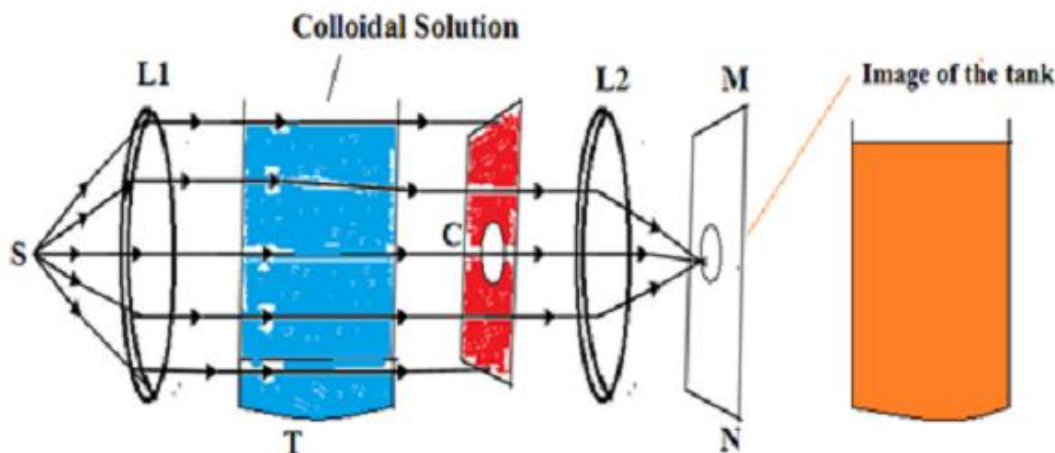
Now, observe the transmitted light from the fourth side facing the circular hole in MN, we see the first orange-red color and then bright crimson red color on the screen.

I think, now it would have cleared your concept clearly, this experiment makes you understand the reason for the bluish color of the sky and the reddish appearance of the sun during sunset and sunrise.

Three sides of the tank are near to our eyes,so the path of the source and our eyes is least, so we see the blue colors because smaller wavelength colors are scattered away by the particles in the same way when the sun is nearest to us, blue colors scattered less while all colors scattered equally, so the sky looks white at the noon. When we see the tank from the fourth side, in this case, the distance between the source and our eyes is the longest, thus only the higher wavelength color reaches our eyes and the colloidal solution looks reddish,it is the same case

when the sun is at the horizon, only red color because of higher wavelength reaches to our eyes and least wavelength colors scattered away in the way.

What are the refractive index, relative refractive index, absolute refractive index, critical angle, and internal reflection?

Refractive index: The Refractive index of a substance(or medium) is the ratio between the velocity of light in a vacuum and the velocity of the light in that substance(or medium). Let the velocity of the light in a vacuum is C and the velocity of the light in the substance is V then the refractive index(μ) of the substance is given by

μ = C/V

Relative refractive index: Relative refractive index of a medium is the refractive index of one medium to another medium is the ratio between the velocity of light in another medium to the velocity of the light in the medium. Let the velocity of the light in the first medium(1) is V_1 and the velocity of the light in another medium(2) is V_2

Considering the refraction of the light through a glass slab

Let light ray is passing from medium 1(air) to medium 2(glass)
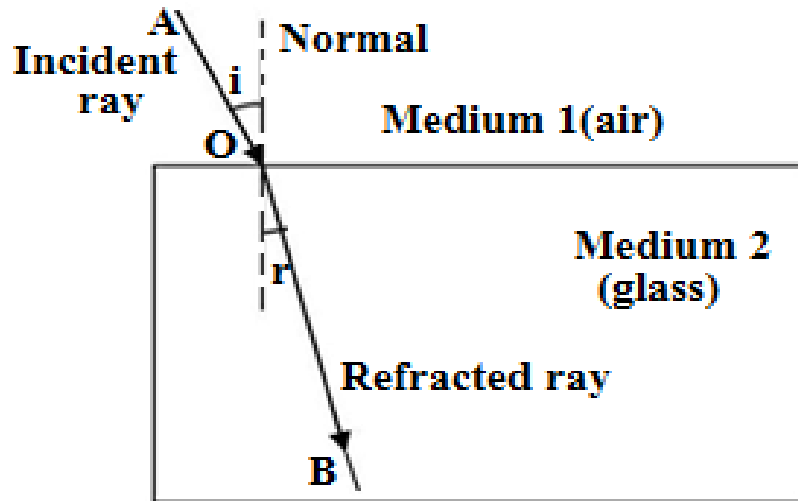
Snell's Law: Snell's law is defined as the ratio between the sine of an incident angle to the sine of a refracted angle is always constant.This constant is actually the refractive index of the material if medium 1 is air or vacuum.

The Refractive index of medium 2 is also given by

$\mu = \sin i / \sin r$

 The refractive index of medium 1 with respect to medium 2 is (n_{12}) is given by

$n_{12} = V_2 / V_1$

And the refractive index of medium 2 with respect to medium 1 is (n_{21}) is given by

$n_{21} = V_1 / V_2$

Therefore if the refractive index of the medium 1 (n_{12}) is given then the refractive index of the medium 2 (n_{21}) is given by

$n_{21} = 1/n_{12}$

Absolute refractive index: In the case of relative refractive index (n_{12}) if medium 1 is vacuum or air then the refractive index of medium 2 with respect to air or vacuum is known as the absolute refractive index(μ).

The absolute refractive index is given by

$\mu = C/V$

Where C is the velocity of the light in the vacuum and V is the velocity of the light in the given medium.

When we talk about the simply refractive index, it is the absolute refractive index. The refractive index of the important substances is given as follows.

Absolute refractive index of some material media

Material medium	Refractive index	Material medium	Refractive index
Air	1.0003	Canada balsum	1.53
Ice	1.31	Rock salt	1.54
Water	1.33	Carbondisulphide	1.63
Fused quartz	1.46	Dense flin tglass	1.65
Turpentine oil	1.47	Ruby	1.71
Benzene	1.50	Saphire	1.77
Crown glass	1.52	Diamond	2.42

Optical density: Optical density of a matter is proportional to the refractive index of the matter, let's take the example when a light ray passes from air to glass, the speed of the light decreases, so we can say that the optical density of glass is more. Optical density is proportional to the refractive index of the matter.

Critical angle: If a light ray passes from medium 1 to medium 2 then the critical angle is the angle of the incident for which the angle of refraction is 90°

Internal reflection: If the angle of incident is more than the critical angle then the refracted ray become as it would appear to be reflected from the interface of both medium that is known as internal reflection. As an example the critical angle of the diamond is 41.1°, when we see a crystal of diamond it shines intensively due to internal reflection.

What is the difference between virtual and real images?

What is the difference between virtual and real image ?
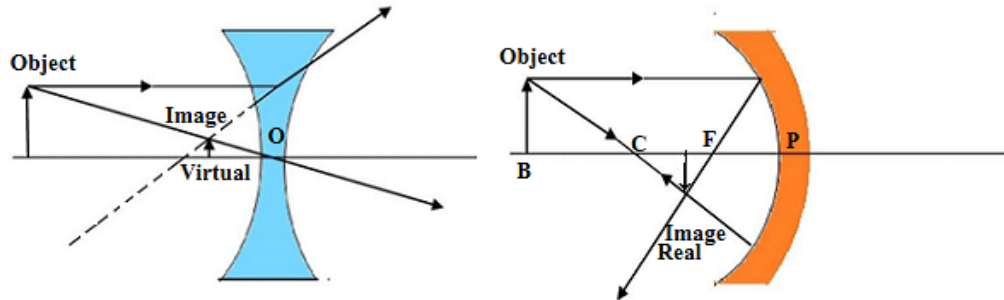
The image formed by the mirror or lens whose shadow is formed on the screen if we place a screen in front of a mirror or lens is known as a real image and the image formed by the mirror or lens whose shadow is not formed on the screen is known as the virtual image if we place a screen in front of a mirror or lens.

Characteristics of the image formed by the plane mirror.:

- The image formed by a plane mirror is virtual and erected.
- The size of the image is the same as the size of the object.
- The distance of the image from the mirror is the same as the distance of the object from the mirror.
- The image is laterally inverted because if we raise our left it would appear in the plane mirror that we have raised our right hand.
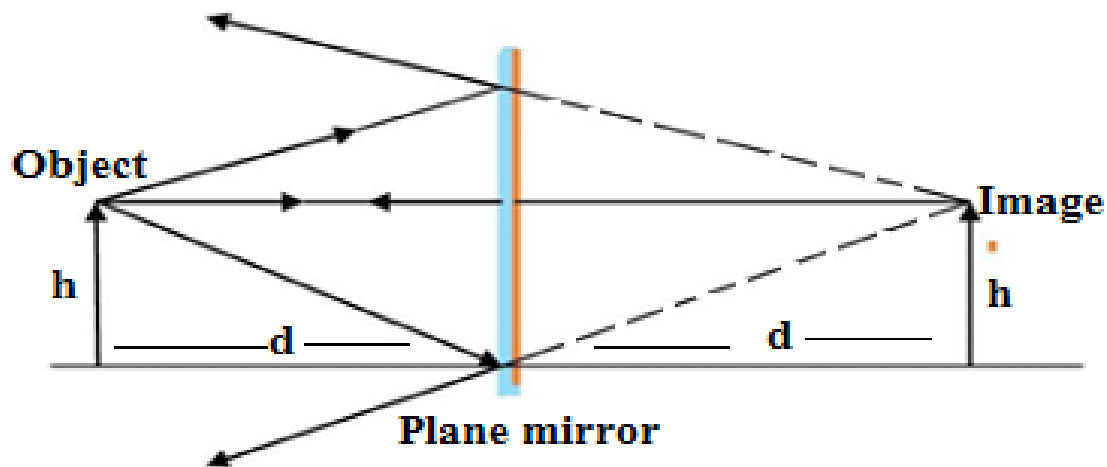
Formation of virtual image: The real image is formed in the side of the mirror or lens where two light rays meet after reflection or refraction and if they don't meet then both light rays are drawn to advance them in the backward direction, and both light rays are advanced until they meet each other that is the point where a virtual image is formed.

The virtual image formed by a convex mirror: The incoming parallel ray incident on the surface of the convex mirror is reflected by it in such a way as it would appear to be originated from a point on the principal axis which is known as the focal point of the convex mirror, so in ray diagram, it is shown by dotted line by advancing it in opposite direction.

Another ray incident on the surface of a convex mirror and reflected in such a way as it would appear to be originated from a point on the principal axis which is known as the centre of the curvature of the convex mirror, so in the ray diagram, it is shown by a dotted line by advancing it in opposite direction, both of these rays meet between pole and the focal point. The image formed by a convex mirror is virtual and erect since it is the point opposite to the surface where the reflection of the light takes place.
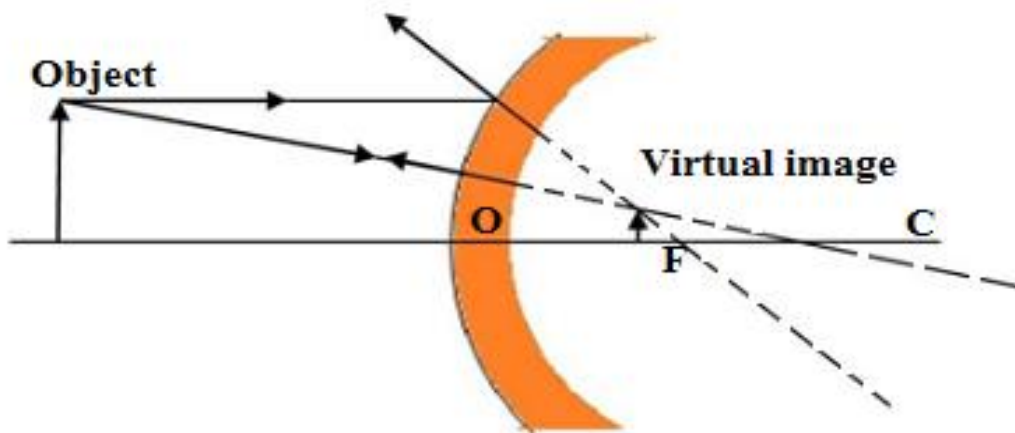
The real image formed by a concave mirror: The incoming parallel ray incident on the surface of the concave mirror and the reflected ray passes through the focal point of the concave mirror. Another ray passes through the centre of the curvature if the object is located at the point beyond the centre of the curvature, both of these rays meet at the point between centre of the curvature and the pole.
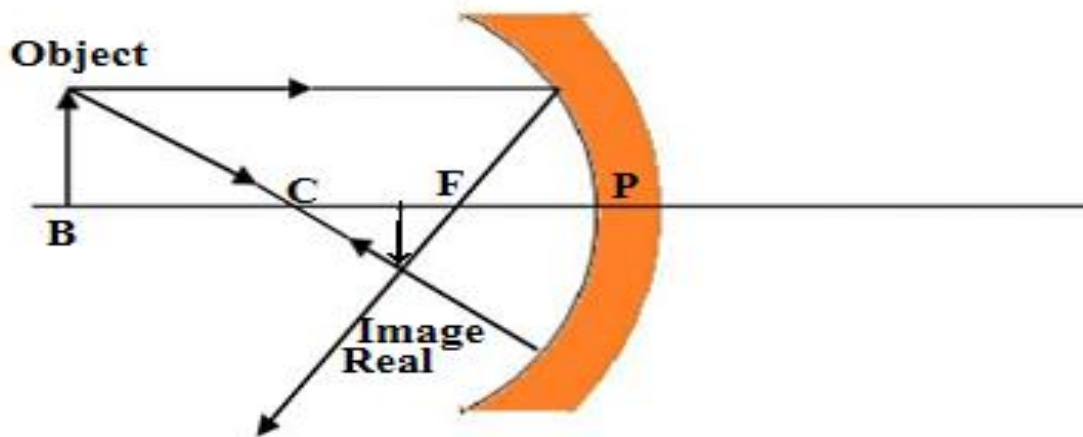
The virtual image formed by a concave lens: When an object is placed at a finite distance a parallel ray is refracted in such a way as it would appear to be originated from a point on the principal axis which is one of the focal points of the concave lens. so in the ray diagram, it is shown by a dotted line by advancing it in opposition to the direction of refraction. Another light ray passes through the optical centre of the concave lens, both of these rays meet between the focal point and the optical centre of the concave lens. The image formed by the concave lens is virtual and erect since it is the point opposite to the direction of refraction.
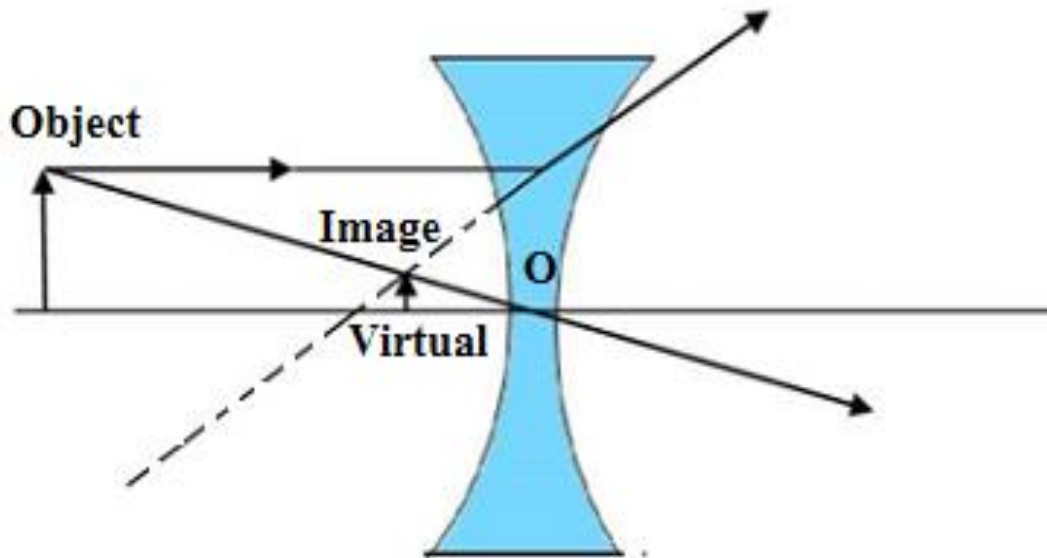
The real image formed by a convex lens: The incoming parallel ray incident on the surface of the convex lens and the refracted ray passes through the focal point of the convex lens. Another ray passes through the centre of the curvature if the object is located at the point beyond the centre of the curvature, both of these rays meet at the point between centre of the curvature and the focal point of the convex lens. The image formed by the convex lens is real and inverted since it is formed in the direction of refraction.
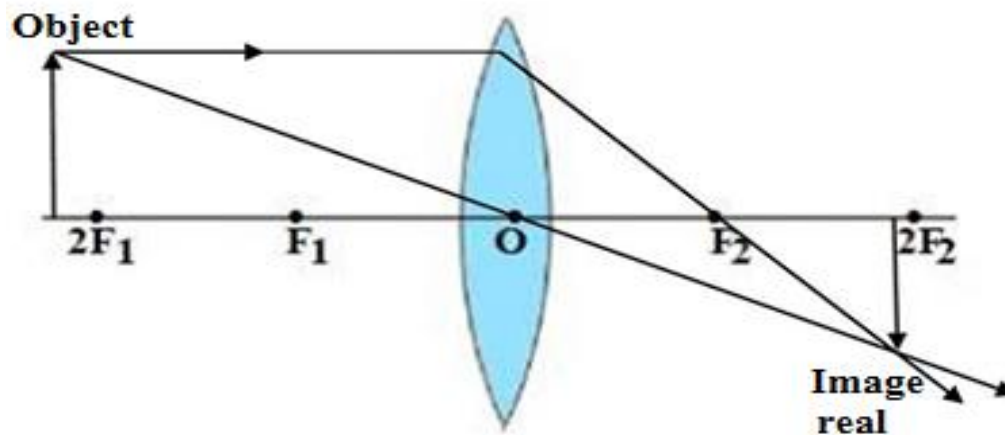
Structure and functions of each part of the eye

The **human eye** is the most sensitive and incredible sense organ among all sense organs because with its help we become able to see beautiful and wonderful colors of the world. We can identify the objects around us to some extent by touch, smell, and sound. It is, however, impossible to detect colors while closing the **eyes. The structure of the human eye** is almost spherical in shape with a diameter of 2.3 cm. **The human eye** is just like a camera, its lens system also projects the images on a screen called the retina just like a camera. Here in this post, we have presented a post-**human eye-structure and functions** of each part which will help you answer each question related to the **structure and functions of the human eye**.

Structure and functions of each part of the eye

The **human eye** is made of three chambers, the first chamber is between cornea and iris which is filled with aqueous humor, the second chamber is between iris and crystalline lens and the third chamber is between the crystalline lens and retina which is filled with vitreous humor. Its two main lenses are the cornea and crystalline lens which refracts light rays and focus to the retina where the inverted image is formed, at the exit of the **eye** the optic nerve gets the signal of the inverted image, this signal transported to the brain than brain deciphers this inverted image to erected image. At the end of the post '**Human Eye - Structure and functions of each part**' please don't forget to write your comment that how did you like our this post **"Human eye-Structure and function of each part"**.

Human Eye, Structure & Functions

Structure of Humane Eye
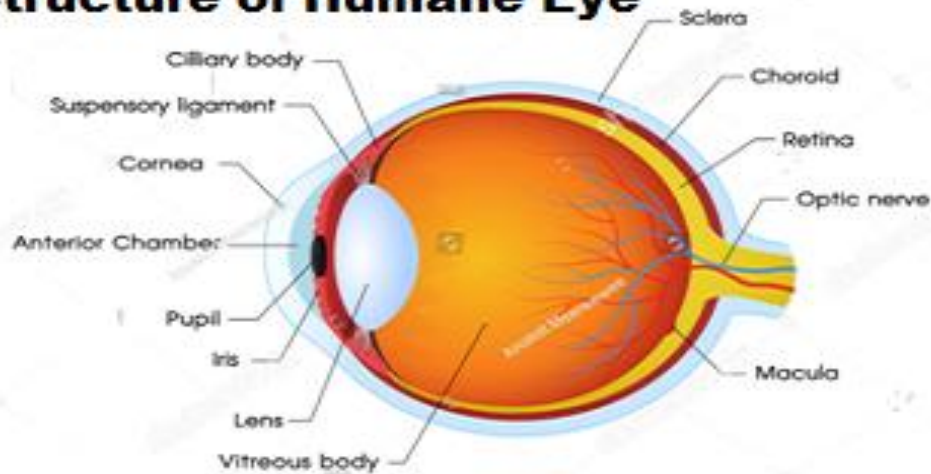
Cornea.

In the **structure of the eye,** the cornea has a very important role. the cornea is a 5 layered transparent vascular tissue made of collagens and cells, it is the outermost lens of the **eye** and bulged in shape, light rays, first of all, fall on it and then refracted into the eye. The 65 to 75 % of the total refraction of the light takes place through it.

Aqueous humor.

Aqueous humor is a transparent fluid between cornea and iris and between iris and lens, it is composed of water vitamins, sugars, proteins, and other nutrients. The role of aqueous humor is to nourish the cornea and lense because both of them does not contain blood vessel. The aqueous humor maintains the intraocular pressure of the **eye** and protects the **eye** from dust, pollen grains, wind, and microbes.

Iris.

The colored part of the **eye** is known as iris, it is located between the cornea and crystalline lens. Iris is made of the dark muscular diaphragm made of connective tissue and muscle covered with pigments responsible for the color of the **eye,** it surrounds the pupil. Iris controls the size of the pupil.

Pupil

The pupil is actually the aperture of the **eye**, It is an opening at the center of the iris and circular in shape, the function of pupil is to allow light to enter the **eye** so it can be focused on the retina. It appears black color because the light focused on the retina is completely absorbed by the retina and is not reflected back.

Christine lens

The Christine lens is basically is an **eye** lens that is transparent and located behind the iris. It is not having blood vessels so it is nourished by aqueous humor that exists between iris and lens. One-third of the total net refraction of light through the **eye** is taken place by the Christine lens. it is made of small flexible smooth muscles called ciliary muscles, these muscles change the shape of the lens. When we see nearby objects, these muscles constrict and radius of curvature of the lens decreases so that images could be focused on the retina and when we see the far objects these muscles dilate and radius of curvature of lens increases so that images could be focused on the retina, this action of **eye** is known as accommodation of **eye.**

Vitreous humor

Vitreous humour is a jelly-like transparent fluid that contains 99% water and it's 1% is sugar, vitamins, proteins, hyaluronic acids, and collagens. This fluid pressurizes the retina to remain in its place and gives the spherical shape to the **eye.**

Retina

The retina is located at the back end of the **eye,** it is made of photosensitive cells called photoreceptors, photoreceptors are of two kinds cones and rods. The rods show us images in dim light or when it is dark, cons show us light during the day time or when light is intense, we see colors of the images because of cons.
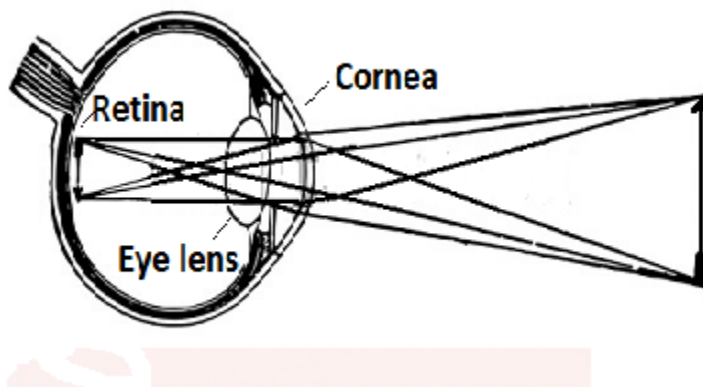
Optic nerve.

The images formed in the retina is inverted, the signal of the image is conducted through the optic nerve to the visual cortex of the brain, the image is decoded by the brain and then we see the inverted image as an erected image.

Myopia, Hypermetropia, and Presbyopia

Our this post **Myopia, Hypermetropia, Presbyopia** is dedicated to developing the knowledge base of 10-grade students or other students who have this topic in their science book. **Myopia** is

the defect of the eye due to which a person is unable to see the distant object, it is also called **nearsightedness** because of the image of the distant objects formed near of the **eye** lens i.e between the **eye lens** and retina. **Hypermetropia** is the defect of the eye due to which a person is unable to see the **nearby** objects, it is also known as **farsightedness** because the image of the object is formed far from the **eye lens** behind the retina. The **presbyopia** is the defect due to which the person is able to see neither far object nor near object due to aging eyes.

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Myopia

Myopia is also called **nearsightedness**, it is the defect of the **human eye** due to which we can't see the distant object, we can see the **nearby** object but after a certain distance, we can not see the objects and the so formed image looks blurred. Generally, **myopia** is occurred during childhood due to the growth of **eyes** within the age of 20 years but it may occur to anybody due to our habit of seeing television by sitting **near** about it, excess reading or improper way of reading, diabetes, etc. To understand **myopia** first it is better to understand the functioning of the **eyes** in seeing the objects, one of the functions of the **eyes** is the accommodation of the eyes.

Accommodation of the eyes

 The **human eye** is just like a camera, its lens system forms an image on a light-sensitive screen called the retina. Our **eye** has the ability to see the **near** and distant objects due to the flexible capability of the crystalline lens behind the cornea, the crystalline lens is composed of fibrous jelly-like material called ciliary muscles when we see the distant object these muscles relax resulting the **eye lens** becomes thin means the radius of curvature of the **eye lens** becomes larger. The larger radius of the curvature results in a larger focal length of the lens focusing the image of the object at the retina.

Accommodation of the eyes
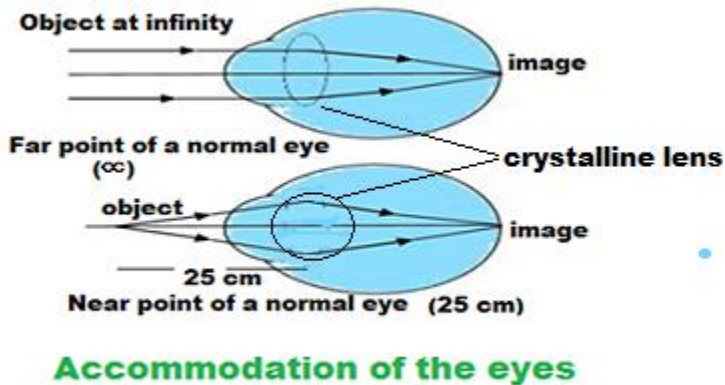
When we see the nearer object the ciliary muscle contracts reducing the radius of the curvature of lens thereby decreases the focal length of the lens and thus focusing the image of the object at the retina, thus a healthy **eye** is capable to see near and far objects. The property of the eyes of adjusting its focal length to see the nearby and distant object is known as accommodation of the eye.

Myopia is caused by bulging cornea due to which the radius of the curvature of the whole of the eye decreases and the focal length of the eye is decreased, the eye becomes unable to focus the image of distant objects at the retina and thus image is formed near the eye lens, it is that's why this defect of the eye is called nearsightedness or myopia, as a result of this defect of eye(myopia) the far objects look blurred. The maximum distance at which an object could be seen by a myopic eye is known as its far point beyond this far point image is formed near the eye lens instead of at the retina.
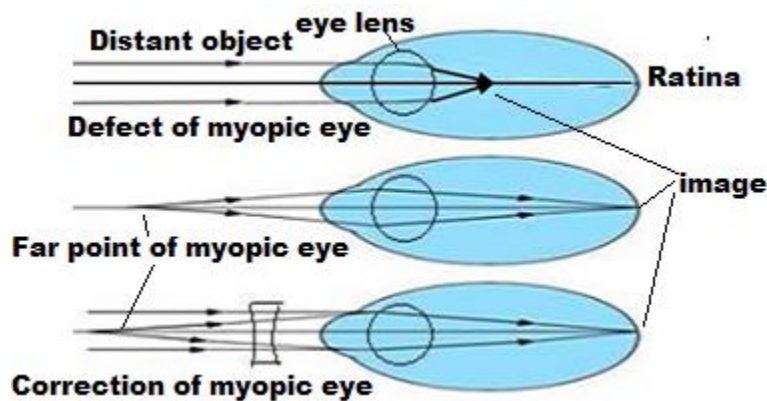
Treatment of myopic eye- The myopic eye is treated by applying a concave lens of a particular focal length, depends on the far point, as an example shown below.

Example- If the far point of an eye of a person is 100 cm, then find the type of lens and its focal length used for the treatment of clearing his vision.

Answer. The far point of the person's eye 100 cm reveals that he can not see the things beyond 100 cm, so he is needed a diverging lens(concave) of focal length f so that the image could be formed at the far point of the eye as seen in the following diagram.

1/f = 1/v - 1/u

f = ?, v = −100 cm, u = α

1/f = 1/(-100) - 1/(-∝)

1/f = -1/100 +0

1/f = -1/100

f = −100 cm

Hence the power of the lens will be

P(in diopter) = 1/f(in meter)

Where P is the Power of the lens

P = 1/(-1) = -1D

Power of the lens = −1 D

Its meaning is the lense required for such an eye is −1 D , after applying this lens the person could see beyond the distance of 100 cm.

Hypermetropia

This is the defect of an eye due to which a person is capable to see the distant objects but is unable to see the nearby object. Hypermetropia occurred when the ciliary muscles of the Christlinine lens unable to contract and thus focal length of the eye lens increase that image of the nearby objects is formed beyond the retina that is far from the eye lens that's why hypermetropia is also called farsightedness.
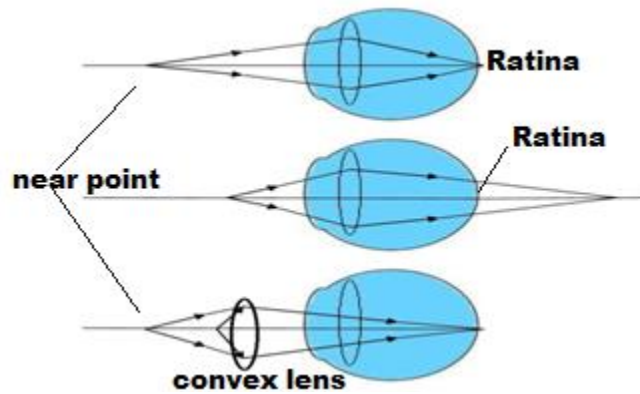
Example- An eye 's near point is 50 cm, find the treatment of this eye to correct vision.

Answer. Near point 50 cm means that the eye is unable to see the object nearer to 50 cm, thus the given eye is suffering from hypermetropia.To overcome this problem a convex lens of focal length f must be used so that if now the distance is 25 from the lens then the image could be formed at the near point of the eye.

u =– 25 cm

v = – 50 cm

1/f = 1/v - 1/u

1/f = 1/(-50) - 1/(-25)

1/f = -1/50 + 1/25

1/f = (-1+2)/50

1/f = 1/50

f = 50

The focal length of the convex lens is 50 cm

50 cm = 0.5 m

P(in diopter) = 1/f(in meter)

Where P is the Power of the lens

P= 1/0.5= +2D

Presbyopia

Presbyopia is caused due to aging, it occurs because the ciliary muscles of the Crestline lens become unable to contract and relax, as a result of this, the human eye is unable to see the object near and far object, this is the defect called presbyopia.

The treatment of such a defective eye is to use a bifocal lens a concave lens and a convex lens such that the lower end of the eyeglass is convex through which the patient of presbyopia can see nearby objects and the upper part of the glass is the concave lens through which he can see the distant object.

What is a potential difference across an electric field?

Clear your concept **what is a potential difference across an electric field?** You can understand the **potential difference** by questioning yourself and visualizing it how does the wind blow from one place to another place. The wind blows from a **higher pressure zone** to a **lower pressure zone**, the factors which maintain atmospheric pressure are humidity, dust, pollution etc. The atmospheric pressure is the pressure of air exerted by air all around us to our body. In Rajasthan during summer the sand existing in the Thar desert is heated, the sand mixes with surrounding air particles increase atmospheric pressure. The pressure of other area becomes lesser than this makes the gusty and dusty air flows from Rajasthan to other areas. The water flows from a **higher altitude** to a **lower altitude**. The matter flows from **high concentration** to **lower concentration.**
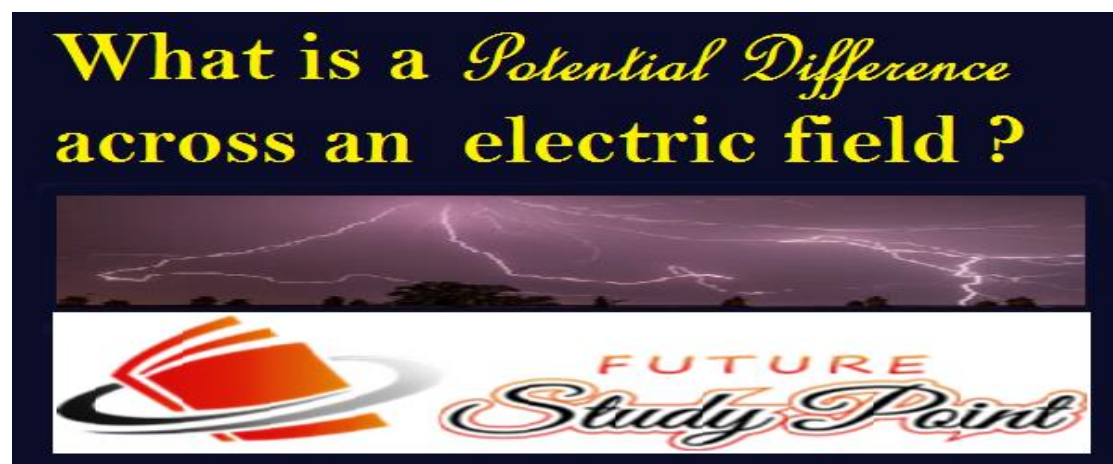
As the flow of wind required a **pressure difference** between two areas, the flow of liquid is needed the difference in altitudes and flow of matter is needed the difference in concentration, in the same way, the flow of charge is also needed an **electric potential difference** between two

points.Now the question is what is the potential difference before we talk about **potential difference** let's think what is a work in physics,it is simply defined as the product of force and displacement.

Here, the points are discussed as follows.

- Potential Energy in gravitational and Electrical fields
- Electrical Potential
- Electrical Potential Difference
- The causes of lightning and thunder

What is a potential difference across an electric field?

Let an object of mass m is lifted up to the height of h, then the work is done =F.d. Here F = gravitational force applied by the earth on the object= mg, g = gravitational acceleration and d= h

The work is done = mg.h

Now we shall talk about what is energy, energy is defined as the capacity of doing work, or it is simply a transfer of energy from one object to another object. The work done on the given object when lifted to a certain height h is the energy transferred to the object from the person who lifts the object. Initially, when the object was on the ground, its energy was accommodated into the earth, so at the ground, its energy is supposed as zero. In the height of h the energy of object = mgh, the object is stationary so this energy is the **potential** energy of the object.
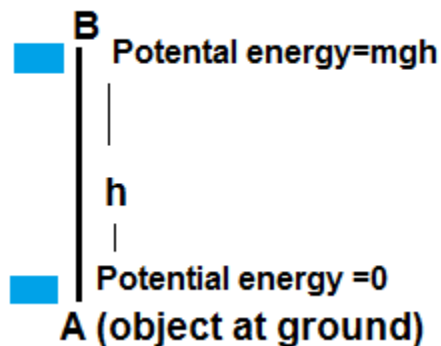
Here we can say the **potential** of point B, is mgh in a gravitational field.

Now we will discuss the **electric potential** of a point in an **electric field**, The electric potential of a point in an electric field is the work done on a unit charge while displacing it from infinity to that point. The **electric field** could be supposed in solids, liquids, gas or anywhere within the universe. For defining the **electric potential** of a point we need a point of reference, we take that point of reference infinity, the **electric potential** of the infinity is supposed as zero. The **electric**

potential of two points in an electric field from the same point of reference (i.e infinity) causes the flow of **electric current** that is known as electric **potential difference** or simply the **potential difference** between those points. The **electric potential** of a point within the electric field is actually the capacity of a charged particle to move within an **electric field**.
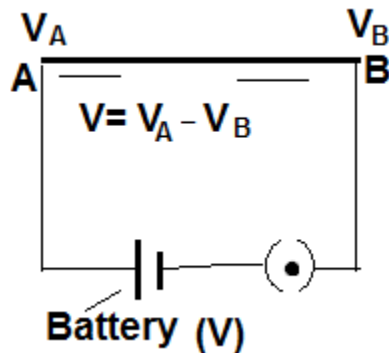
Electric potential difference across a conductor, $V = V_A - V_B$

Where $V_A - V_B$ are the **potential** of both ends of the conductor

A unit charge is = 1 coulomb charge

The work is done on a 1-coulomb charge = V

The work is done on charge Q in placing it from A to B will be

W = VQ

$$\therefore V = \frac{W}{Q}$$

How does **electric potential difference** generate between clouds and the earth? The water vapor rises above in the sky because it is hotter than the air in the earth when it loses its energy, the temperature reaches to below freezing temperatures and water vapor changes into tiny crystals of the ice. The frictions between the crystals generated electrons and two kinds of charged particles are formed, the negative charge heavier than positive sink below at the bottom of the cloud. An **electric potential difference** generated due to opposite charges within the clouds which causes flow of the current inside the cloud, when this voltage is in excess, **lightning and thunder** is produced.
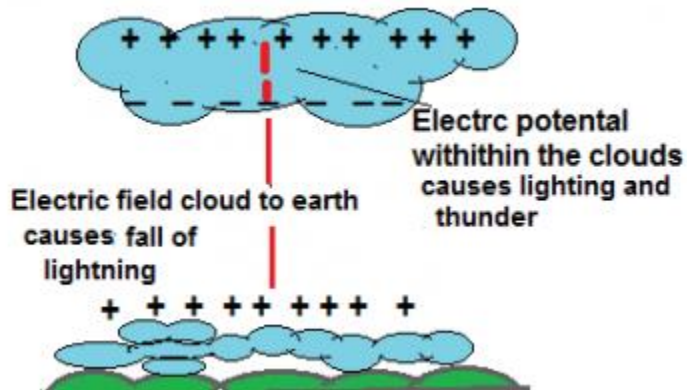
Sometimes when some shorts of positive charge is generated on the surface of the earth, **a high potential difference** developed between **clouds and the earth** which results in large amount of **current** flow from cloud to the earth which is capable to glow 100 w of bulb for 100 days, it is known as fall of **lightning.**

Electrical Resistance and Conductance

Here you can find the complete detail of the theory of electrical resistance and conductance which is useful for competitive exams and science students. We hope you would clear all your concept of electric resistance and conductance from the published post -Complete detail of electrical circuit resistance and conductance. The topic 'Complete detail of electrical resistance and conductance is written by an expert. The electrical resistance is such a physical quantity that is always unwanted quantity in an electrical circuit but on the other hand, we utilize its great applications in our life.

The electric resistance of any substance is the physical property of a substance that opposes the flow of electric current, It was a German scientist Siemon George Ohm first observe this phenomenon of the matter and discovered Ohm's law in 8 January 1926. He found the relationship between voltage and current. Conductance is also the physical property of matter which is the ease of flowing electric current means it is the ability of a matter to flow a charge in it.

Electrical resistance

Ohm's 'law states that electric current is directly proportional to the potential difference between the ends of a conductor, the electric resistance is the physical property of the matter which opposes the flow of electric current. The unit of resistance is represented by the last letter (24 th) of Greek alphabet Ω uppercase omega named Ohm after the name of German Physicist George Simon Ohm.

$V \propto I$

$V = IR$

Where V is the voltage across a conductor and i is the electric current generated by the voltage across its ends. The electric resistance of conductors like silver, copper, aluminum, and iron is low, three of them, copper, aluminum, and iron are mostly used to build electric wire because silver is not found abundantly in the earth thereby costlier compared to rest of all the metals. All the matters which allow the flow of the electric current is known as the conductors. The resistance of the matter like plastic, air, soil etc is too higher to allow the flow of electric current so these matters are known as insulators.

The electric resistance in a circuit is required to control the electric current, the resistance of cables and wire is neglected when a net resistance of a circuit is calculated. The components that are used to control electric current are known as resistors,you would have seen the filament of an electric bulb made of spiral tungsten wire, tungsten is used in that because its resistance is higher, this higher resistance causes it to heat up enough to glow. The heating elements in the iron, toaster, electric pan, electric pressure cooker, electric shower, etc are bigger versions of the filaments. Have you observed how a voltage is controlled in a stabilizer or volume of a musical instrument or television, actually in all these cases we increase or decrease the electric resistance through a variable resistor attached with the volume knob.

esistance of tungusten wire makes it to glow

Electric bulb

Battery
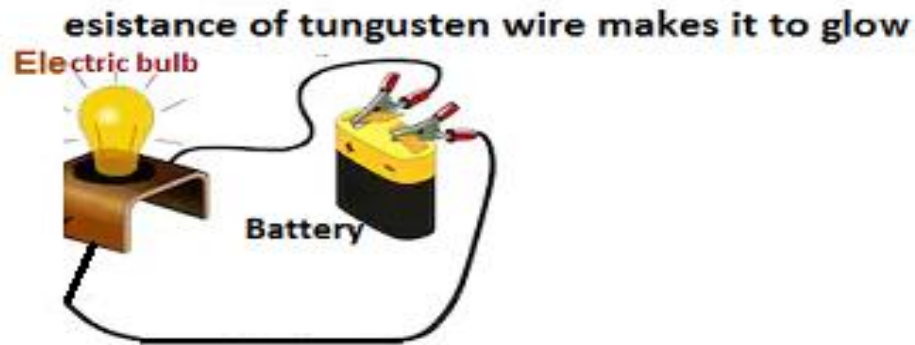
The resistance of a conductor is directly proportional to the length of the conductors, you can get it through the example of a water pipe, the speed of water is slower in a pipe have more length compared to the pipe of the same radius but of shorter length.The flow of electrons in the wire and the flow of water in the water pipe can be supposed as the same idea.

$R \propto l$ .....(i)

The resistance of the conductor is inversely proportional to the cross-sectional area of the conductor. You can get it through the example of water flows slower in the thinner pipe compared to the wider pipe if both pipes are of the same length.

$R \propto 1/A$

From (i) and (ii) we have

$R = \rho . l/A$

R= Resistance

l= length of the conductor

ρ = Specific resistance of the matter

It is that's why the heater wire and tungsten wire is designed into the spiral shape of the coil so as to accommodate its sufficient length in the smaller area of the heater and bulb.

The combination of the resistance- The ways of connecting resistors are of two kinds.(i) Series connections (ii) Parallel connections

(i) Series connections- In the electric circuit when the positive terminal of one resistor is connected to the negative terminal of another resistor then such a combination of resistors is known as the series connections.
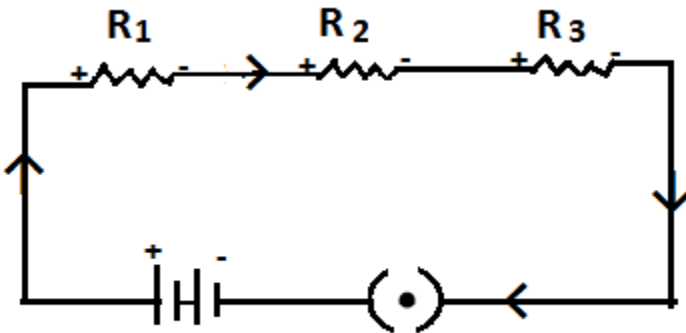
The net resistance of the circuit is the sum of magnitudes of all the resistors in series. In series connection, the voltage of the battery is distributed across each resistor in the proportion of their value ,as we know the length is directly proportional to the resistance, so to get the net resistance of the circuit all the individual resistances should be added.

$R_T = R_1 + R_2 + R_3$

Where R_T is the total net resistance of the circuit

The Parallel Connection - When the positive terminal of all the resistors are connected to the positive terminal and the negative terminal of all the resistors are connected to the negative terminal of a battery, then such a combination of the circuit is known as a parallel connection. In parallel connection of resistors, the voltage across each resistor is the same but current drawn by each resistor is in proportion to their magnitude of the resistance.
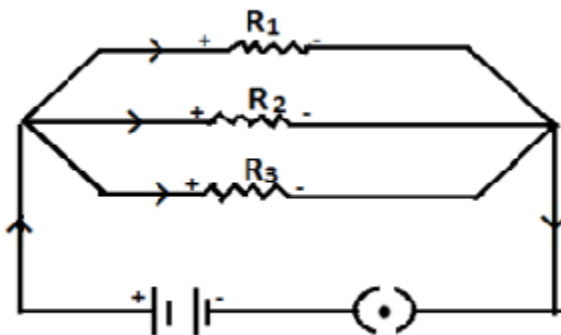
As we know the resistance is inversely proportional to the area of cross-section of the conductor, hence the net resistance R_T of parallel combinations of resistors is calculated as a sum of the reciprocal of their resistance.

$1/R_T = 1/R_1 +/R_2 +R_3$

$R_T = (R_1 \ R_2 \ R_3 \ )/(R_2 \ R_3 +R_3 \ R_1 +R_1 \ R_2 \ )$

Electrical resistance and conductance

Conductance

Conductance of the Circuit- The conductance(G)of the circuit is inverse of the resistance

$G = 1/R$

From Ohm's law $V = iR$

$R = V/I$

$G = I/V$

The conductance of a substance is the ratio between the electric current and voltage, conductance is the ease with which an electric current passes through a substance, when voltage is constant across an electric component then conductance is directly proportional to the electric current flowing through it.

Unit of conductance is the inverse of Ohm i.e Mho or Siemen, if i =1A and voltage is 1 volt then one unit of conductance is 1 ampere/volt or 1 Mho or 1 Siemen or simply 1S.

Conductivity

As the conductance is inverse of resistance, on the same way the conductivity is inverse of resistivity.

The conductance of a given material depends on the following physical parameters

The conductance of a substance is inversely proportional to the length of the conductor and directly proportional to the area of the cross-section of the conductor, therefore it can be expressed in terms of the following formula

$R = \rho. \ l/A$

$\rho = RA/l$

$\sigma = 1/\rho$

$\sigma = l/RA$

R = l/σA

The unit of conductivity is

= (the unit of l)/[unit of R×unit of A)

=m/(Ωm²)

Unit of $\sigma = m/\Omega m^2$

= 1/Ωm = S/m [S=1/Ω,unit of conductance,i.e Siemen)

Unit of conductivity is Siemen/meter

The conductivity of few metals

Metal	Resistivity	Conductivity
Silver	1.50×10^{-8}	6.30×10^7
Copper	2.44×10^{-8}	4.10×10^7
Gold	1.68×10^{-8}	1.68×10^7
Aluminum	2.82×10^{-8}	3.5×10^7
Iron	1.0×10^{-7}	1.00×10^7
Calcium	3.36×10^{-8}	2.98×10^7
Tungsten	5.60×10^{-8}	1.79×10^7

Electric Current and its Heating Effect

The heating effect of the **electric current** means when an **electric current** flows through a conductor, then it becomes **heated**, do you know what is the mechanism that **the heater** glows reddish, irons become **heated** when you connect those to an **electric circuit**.

Electric Current and its Heating Effect

In this post, you will get all the answers to the questions which confuse almost all students.

What is **resistance**, charge, **electric current**, **the heating effect of current?**

Why is the direction of **electric current** is opposite to the flow of electrons?

When a **current** flows through a conductor, **heat** is dissipated through it. This **heat** energy is nothing but a work done by a flowing charge to overcome the **resistance** of the conductor.

Resistance. It is a characteristic of a substance opposing the flow of **electric current**.

According to Ohm's law, there is the following relationship between resistance, potential difference and current

$V = IR$

Where R is the resistance, V is the potential difference and I is the current

Charge

It is one of the properties of the substance when the exchange of electron takes place either the atom loses electrons or gains electrons if it lose electrons then atom transforms into cation and if it gains electrons it forms an anion. In the liquid, the cation drifts towards the negative electrode, and the anion drift towards the positive electrode maintaining the flow of **electric current**.

Neutral Atom

loss of electron(s)

gain of electron(s)

Cation

Anion
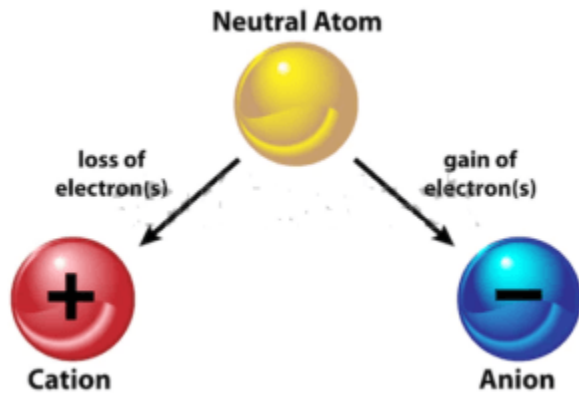
In solids or say metals, the **current** flow due to the flow of electrons, in metallic atoms, the valance electrons loosen because of the weak force of attraction exerted by the positive charge at the nucleus. These free electrons move freely within the conductor, when a battery is connected in the circuit a potential difference is developed across both of the ends of the conductor that compel the electrons to move from one end to another end generating the current. The emission of charge takes place in a quantized way. The charge emitted in the form of ne, where e= charge in an electron.

$Q = ne$

$e = 1.6 \times 10^{-19} C$

$n = 1C/(1.6 \times 10^{-19} C) = 6.25 \times 10^{18}$

Therefore the number of electrons in 1C charge

What is current?

 The current is the rate of flow of charge.

$i = Q/t$

Where i is the electric current, Q is the charge and t is the time

Why is current shown in the direction from positive to negative?

The way in which **current** flows in the circuit is, the negative terminal emits **ne negative charge** and at the same time **positive terminal** emits a positive charge of the amount **ne**, it is the way how current flows in the circuit. The direction of the **current** is shown in the direction of a positive charge. Ever since Benjamin Franklin discovered electricity the direction of current conventionally is shown from positive to negative or it may be assumed that as all the types of **current flow from high magnitude to lower magnitude** as the **wind blows** from **high pressure** to **lower pressure**, water flows from a **higher altitude** to **lower altitude**, matter flows from

high concentration to **lower concentration,**on the same way **direction of current** is logically is shown from **positive to negative**.

The SI unit of charge is the coulomb, so the unit of current = C/s= ampere

What is electrical energy?

Electric energy is the heat energy dissipated due to the resistance in the circuit.

The relation between work done, voltage and charge is given by the following formula.

$V = W/Q$

Here W is the work done on charge Q carrying it from one end of the conductor to another end against the resistance of the conductor, this work done is dissipated in the form of heat. this heat increases as per the time the current accessible in the circuit.

As we know $V = iR$, $Q = it$

Work = Energy transferred = Heat dissipated

$W = H$

$V = W/Q \Rightarrow W = VQ$

$P = W/t = VQ/t = Vit/t = iV$.......(i)

Power = Volage × Electric current

From Ohm's law, we have, $V = iR$, substituting in eq.(i)

$P = i \times iR = i^2 R$, Power = current^2× Resistance

Since Work = Power/time ⇒Enegy = Power/time (Work↔Energy) ⇒H = P/t

Here energy means the heat dissipated through a current-carrying conductor

H = Pt = Vit from (i)

H = iR.it, From (4)

H = i^2Rt

Henceforth the heating effect created by an electric current, through a conductor of resistance, R for a time period t is given by H = i^2Rt. This relation is called Joule's equation of electrical heating.

Application of heating effect is used in day to day life as an example of electric iron and heater, mostly an alloy nichrome is used made of nickel, chromium, and iron although third component iron could be substituted by other metals.

Nichrome is used in heating effect because it has high resistance, after even an excess of heating it is never oxidized, so it is long-lasting.

This is the study stuff useful for high school students, please write your comment and subscribe to this website if you liked it.

Class X Science Important notes of chapter 12 -Magnetic effect of electric current-I

Q1. Show the magnetic field lines across a bar magnet.

Magnetic field lines through a bar magnet- Magnetic field around a magnet means the area where magnetism is present, it is shown by the magnetic field lines or we can say that magnetism is present only along these lines and is absent between them. These magnetic field lines are originated from the north pole and merge into the south pole of the magnet.
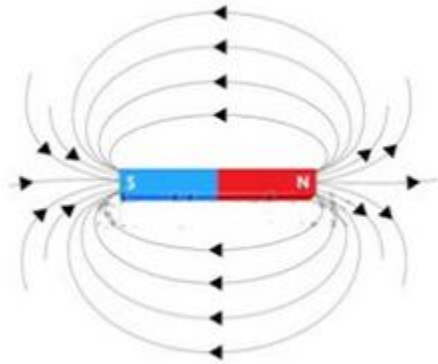
Q2.What are the properties of magnetic field lines?

Properties of Magnetic field lines-(i)Magnetic field lines originates from the north pole and merge into the south pole.

(ii) The direction of magnetic field lines outside of the magnet is from north to south pole and south to north inside the magnet.

(iii) Two magnetic field lines never intersect each other.

(iv) Magnetic field lines are continuous and form closed loops means they don't have the end and beginning points.

Q3. Why don't two magnetic field lines intersect each other?

Ans. Magnetic field lines show the direction of the magnetic field, the tangents on magnetic field lines show the direction of the magnetic field, every point on the lines show the direction of the magnetic field because tangents can be drawn with respect to every point. If magnetic field lines would intersect each other then two tangents on the same point will show two different directions of the magnetic field, one from north to south and other from south to north which is not possible so they never intersect each other.

Q4. Explain the right-hand thumb rule.

Ans. Imagine that you are holding a straight current-carrying conductor in such a way that your thumb shows the direction of current then your fingers wrap around it will show the direction of the magnetic field.

Direction of magnetic field
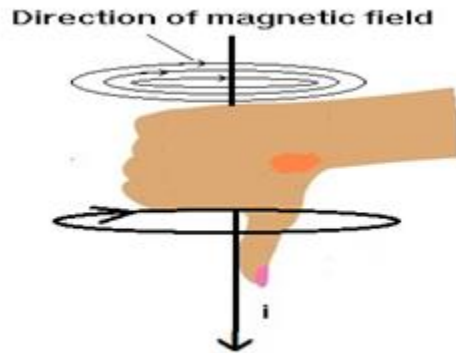
Q5.How can you show the direction of the magnetic field if the current is moving in the direction of the east in a wire?

Ans. According to the right-hand rule of the magnetic field, if a current is moving in the eastward direction the direction of the magnetic field around it will be in the clockwise direction as seen in the following figure.

Direction of magnetic field
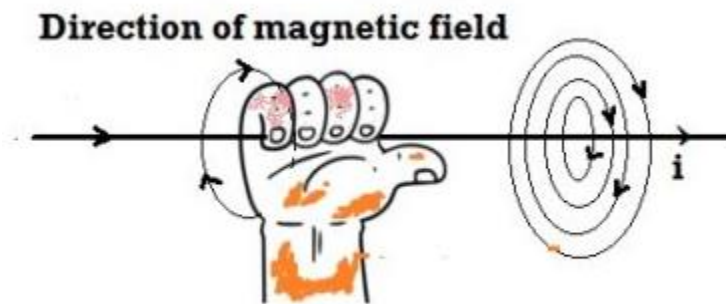
Q6.What will be the direction of the magnetic field if the direction of the current is in the west direction?

Ans. According to the right-hand rule of the magnetic field, if a current is moving in the west direction the magnetic field around it will be in the anticlockwise direction as seen in the following figure.

Direction of magnetic field
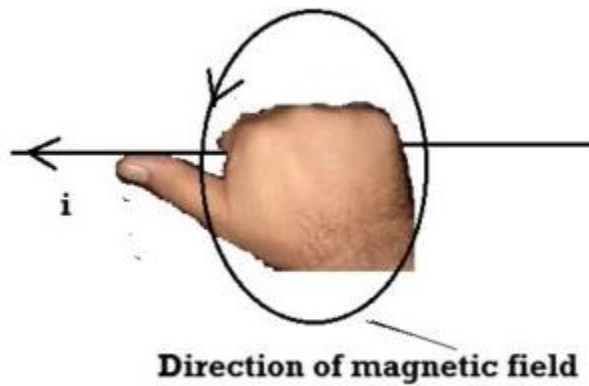
Q7.Show the magnetic field across a current-carrying conductor.

Ans. A current-carrying conductor generates a magnetic field around it,it is known as electromagnetism or simply magnetic effect of electric current. The magnetic field lines of force around it is shown by the concentric circles .the circles are closer near the conductor shows the higher intensity of the magnetic field, the circles farther from the conductor shows less intensity of the magnetic field. The intensity of the magnetic field around the conductor is directly proportional to the electric current passing through it. The direction of the magnetic field around it either has checked clockwise or anticlockwise depending on the direction of the current along the conductor.
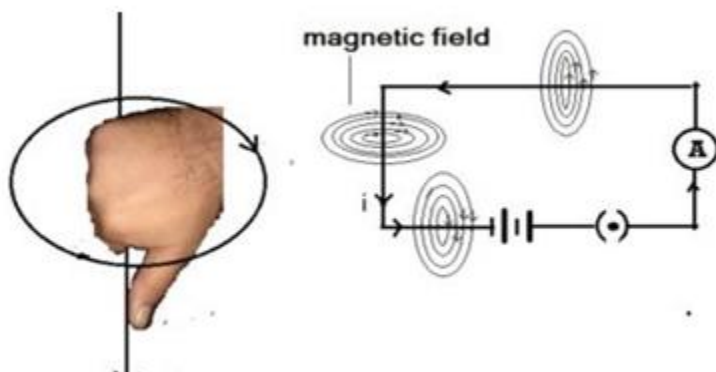
It is clear from the right-hand thumb rule

The direction of current   Direction of the magnetic field

South   Clockwise

North   Anticlockwise

West	Anticlockwise
East	Clockwise

Q8. Show the magnetic field across a current-carrying circular loop.

Ans. The magnetic field line of force at every point of current carrying circular loop are concentric circles around each segment of it, the size of circles becomes larger towards the centre of the circular loop and at the centre the magnetic field lines become straight.

The direction of the magnetic field line is perpendicular to the plane of the circular loop. The ends of the line passing through the centre make the north and south poles.
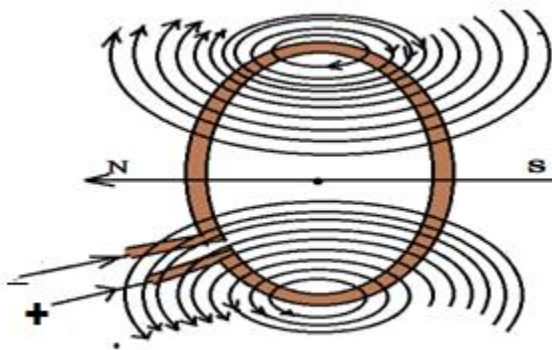
The strength of the magnetic field of a current-carrying circular conductor depends on the following factors.

The magnetic field of the circular loop is proportional to the amount of current flowing through it

The magnetic field of the circular loop is inversely proportional to its radius

The magnetic field of the circular loop is proportional to the number of turns in it

Q9.Consider a circular loop of wire lying on the plane of the table. Let the current pass through the loop clockwise. Apply the right-hand rule to find out the direction of the magnetic field inside and outside the loop.

Ans. Here circular loop is lying on the table, considering the current is passing through the loop clockwise, the current is in the upward direction in the left part of the loop and downward direction in the right part of the loop, imagine to arrange the right hand such that thumb is showing the direction of current then the tips of finger wrapped around it shows the direction of the magnetic field, the direction of the magnetic field is shown by concentric circles around it, these concentric circles extend from the upper part of the table to lower part of the table, it is

clear that the direction of magnetic field lines generated by the circular loop is in the upward direction outside of the circular loop and downward direction inside the loop, in other words, the direction of the magnetic field generated by such a loop perpendicular to the plane of table. The north pole of this loop will be the face touching the table as field lines emerge from there and the front face is the south pole because field lines merge here.
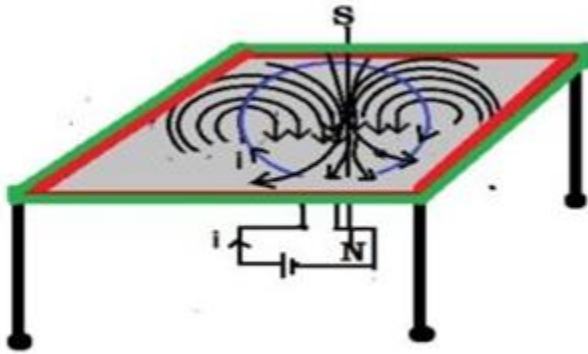
Q1. What is a solenoid? Show the magnetic field through a solenoid.

Ans. The solenoid is a winding of wire in the shape of a cylinder, it works just like a bar magnet one of its end connected with the negative terminal of the battery become north pole and other end connected with the positive terminal become a south pole of the solenoid. The direction of the magnetic field is followed by the right-hand thumb rule, If the direction of current in it is from right to left then the direction of the field is anticlockwise and if the direction of current is from left to right then field direction is clockwise. The magnetic field around a solenoid is shown bellow. The strength of the magnetic field around it is proportional to the amount of current flowing in it and the number of turns in the coil.

Q2. State Flaming's left-hand rule.

Ans. If three fingers, middle finger, thumb and four fingers of the left hand are to be stretched perpendicular to one another in such a way that the middle finger shows the direction of the current, four-finger shows the direction of the magnetic field then thumb will show the direction of magnetic force.

Force

Field

Current
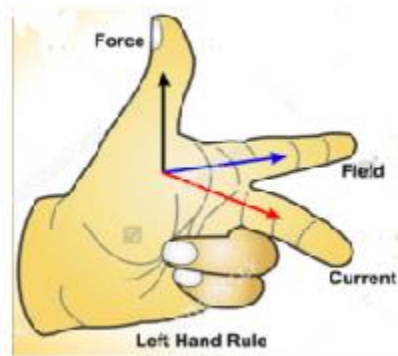
Left Hand Rule

Q3. State Flaming's right-hand rule.

Ans. The right-hand fingers thumb, four-finger, and middle finger are to be stretched 90° to one another in such a way that four-finger shows the direction of the magnetic field, thumb shows the direction of motion of the conductor then middle finger will show the direction of induced current in the conductor.

Direction of Field

Direction
of Force

Field

Direction
of Current

Q4.What is electromagnetic induction?

Ans. When a conductor moves in a magnetic field or magnetic field around it varies a voltage is produced across the ends of the conductor known as electromagnetic induction and the kind of current passed through it is known as induced current.

As an example, if in a coil we insert a magnet directing its north pole into the coil then the indicator of galvanometer deflected left side, it is because of a voltage produced across the conductor due to the change in the magnetic field.

When we enter the magnet directing its south pole inside it then the indicator of the galvanometer deflects the right-hand side, it is because of the direction of current changes across the coil.
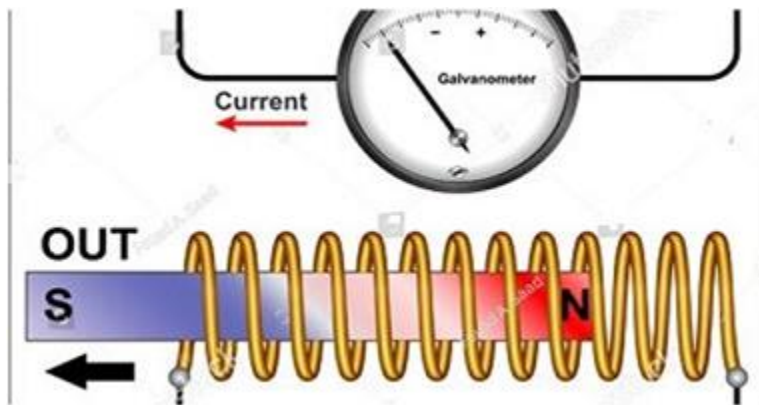
Q5.Draw a label diagram of an electric motor. Explain its principle and working. What is the function of a split ring in an electric motor?

Ans.

The basic principle of an electrical motor is based on the property of magnets that opposite poles attract each other and similar poles repel.

In the first figure, a couple of magnetic force between N-S and S - N tends to rotate the suspended magnet at the middle of a showcase magnet. On the same case, a coil between two poles N and S of two different magnets also arranged to be rotated .
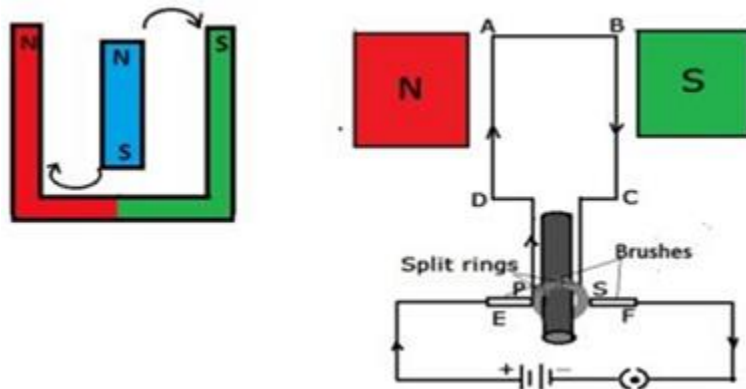
Principle- The electric motor is based on the principle of electromagnetic, the rule is, if a charge moves or current is flowing through a conductor in a magnetic field then a magnetic force is exerted on the charge or conductor. The direction of the force on the conductor is given by the right-hand rule of Flaming which is already discussed in question number (3).

Working- When motor is switched on , the current moves from D to A perpendicular to the direction of the magnetic field from left to right then a downward force is applied on AD which tends to move AD in the downward direction and when current moves B to C an upward force is applied on BC which tend to move BC in the upward direction, a couple of forces in AC and BC rotate the coil between N and S pole of both magnet.

Role of the split ring- The split rings are connected to the brushes which are used to pass current from the circuit to the armature(coil) , the split ring changes the direction of electric current and maintains the direction of current in one way only that's why these split rings are known commutator (means communicator) . It works like this after half rotation position of AD is replaced by BC and the direction of current reversed, the split rings S and P also change their positions in place of each other but brushes E and F remains on their position, so the split ring S come in contact of the brush E and the direction of current is maintained in a unidirectional way or in other words the current flows in the same direction as before and armature of the motor carried to rotate in the same direction.

Importance of DNA Copying and Variation among organisms:
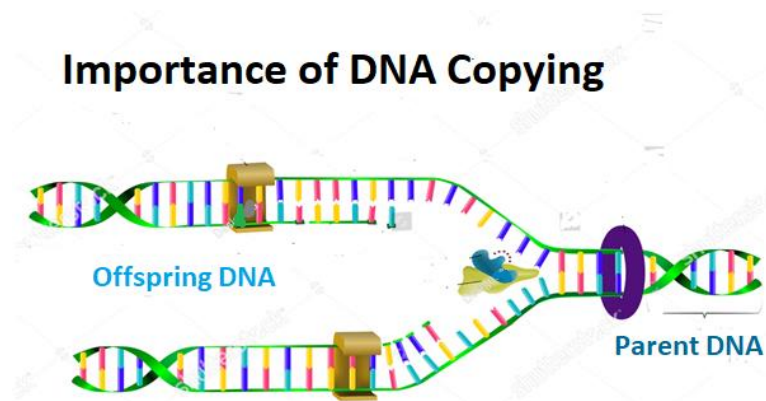
Creation of DNA copies in reproduction:

The organism of the same species looks similar because their body design is the same, reproduction among the organism involves making copies of the blueprint of the body design.

Chromosomes in the nucleus of the cell contain information for the inheritance of features from parents to the next generation in the form of DNA. The DNA in the cell nucleus is the information source for making proteins, therefore the most important event during the reproduction is the creation of the DNA copy. Reproductive cells use chemical reactions to build copies of their DNA in a reproducing cell, one copy of DNA remains in the original cell and the other one is pushed out which instantly generates additional cellular apparatus for maintaining life processes subsequently the DNA copy is separated, each with its own cellular apparatus, this is how the cell divides to give rise to two cells.

Is the DNA of the offspring is identical to the DNA of the Parent?

Two DNA copies are accommodated by two identical cells during the process of reproduction actually not absolutely identical, the extent of accuracy of both DNA copies depends on the biological reaction between both parent cells. It is expected that copying the DNA will have some variation each time from one generation to the next generation but may not be similar to the original one. If variations occur are acute then DNA copy might not work with the cellular apparatus it inherits, such a cell simply dies.

Creation of the DNA during the meiosis in the process of reproduction, there are some changes in its formation, DNA of the offspring cell is different from the parent cell due to the biological reaction between both parent cells.The change in the DNA is the change in the information of inheritance, this altered DNA copy will code for the protein different from the original one.It depends on the extent of accuracy in DNA replication, and how much similarity there is between parent and offspring. Variation during reproduction is the tendency of the organisms that leads the path of evolution

Importance of Variation:

Variation in DNA replication helps to increase the population of organisms in a nitches, changes in DNA and body design is actually maintenance of body design features that allow the organism to use that particular niche. Variation in DNA replication is linked to the stability of the population of species.

However, nitches can change beyond the control of the organisms, as an example temperature on the earth were to be increased by global warming. Most of the bacteria would die, but the few variants resistant to heat would survive and grow further. Variation is thus useful for the survival of species over time.

Hormone System of our Body: Endocrine System

Animals including humans have a complicated procedure for the functioning of different types of life processes for example respiration, digestion, reproduction, excretion, etc. On account of the functioning of different organs, they have the sensory system and endocrine system for control and coordination. The Endocrine System is liable for the compound coordination of all organs in systems. Various physiological functions of our bodies are heavily influenced by the endocrine system. It comprises all the glands of our body that releases different chemicals for example hormones and enzymes. Endocrine glands are ductless glands. Hormones assume a fundamental part in executing different functions in the body including growth, repair, and development of the body, in turn, the functioning of these organs supports the sensory system.

Endocrine glands in the animals coordinate with the nervous system,endocrine glands are pituitary gland, the pineal gland, the thyroid, the parathyroid, the thymus, the pancreas, the adrenal gland, and the hypothalamus.

The endocrine system is a hormone system, endocrine systems are found in all mammals, birds, fish, etc. This system of hormones includes all the glands located in different parts of our body.

Hormones are made by the glands and released into the bloodstream or the fluid surrounding cells, the receptors which are found in different parts of our body recognize and respond to the hormones.

Function of the hormones: Hormones are chemical messengers that are released into the bloodstream and act on an organ in another part of the body. Hormones reach to all parts of the body, and only target cells with compatible receptors are equipped to destine a particular function.

The hormone receptors that are produced within the cells, these receptors switch on or switch off specific biological processes in cells, tissues, and organs.

Hormones control or regulate many biological processes, such as Insulin is produced by the pancreas for controlling the body's sugar level

Hypothalamus: The hypothalamus connects our endocrine system to our nervous systems. The hypothalamus controls the endocrine system . Hyopothelemus maintains the balance of our body for example body temperature, hemostasis(water absorption by the kidney), heart rate, blood pressure, electrolyte balance, appetite, sleep cycles, and production of the substance that affects the release of hormones from the pituitary glands.

Pituitary gland: The pituitary gland receives signals from the hypothalamus which are delivered by the hypothalamus gland. The pituitary gland produces its own hormones, several of which act on other endocrine glands,the pituitary gland regulates the secretion of all body hormones in endocrine system,it is that's why it is also known as master gland of humane body.

Thyroid gland: The thyroid gland is responsible for the growth and development and maturation of vertebrates and also regulates metabolism.

Adrenal glands: The adrenal gland is located in the brain, it consists of two glands the cortex and medulla. Both glands produce hormones that control stress levels and regulate blood pressure, glucose metabolism, and hemostasis.

Pancreas: The pancreas is located in the lower part of the abdomen and is responsible for producing glucagon and insulin. Both hormones help regulate the concentration of glucose in the blood.

Gonads: Gonads are reproductive glands, in male, it exists as testes and in female as ovaries, the testes and ovaries release androgen, estrogens, and progestins but the released amount is different in male and female. All of these hormones regulate growth, development, and reproductive cycles.

Difference between the homologous and analogous structure of organs

Homologous Organs   Analogous Organ

Bird's leg   Bat's leg   Bird's wing   Bat's wing
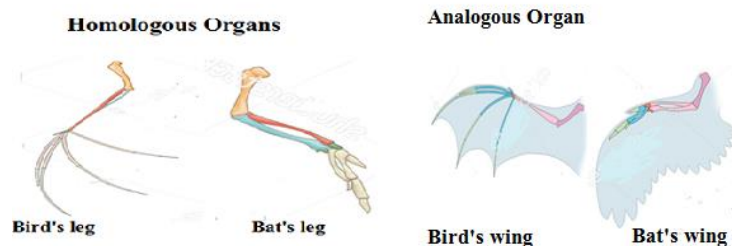
Difference between the homologous and analogous structure

The structures which have the same anatomy, morphology, embryology, and genetics but have different functions are called homologous structures. Structures of organs that look externally similar but don't have the same function are known as homologous structures. Analogous structures are the structures that perform the same function but these structures are found in the

organisms that have different looks, out of these clues scientists conclude that these organisms had different ancestors.

We can work out the evolutionary relationships of the species we see around us. We can do this by identifying hierarchies of characteristics between species. Similarities among organisms allow us to group them and then study the groups. The characteristics of the organisms mark a very basic difference in body design, because of the specialization of cell types and tissues. The more characteristics two species have in common, the more closely they are related, if it is so then more recently they would have a common ancestor.

Difference between the homologous and analogous structure of organs:

Homologous structures: Homologous is the Greek word, homo means same, and logos mean relation that means originated from the same ancestor. In the descendants, this structure may or may not have the same function. The homologous structures evolved as a result of adaptation to various environments.

The structures which have the same anatomy, morphology, embryology, and genetics but have different functions are called homologous structures. Structures of organs that look externally similar but don't have the same function are known as homologous structures.

Homologous Organs

Bird's leg   Bat's leg
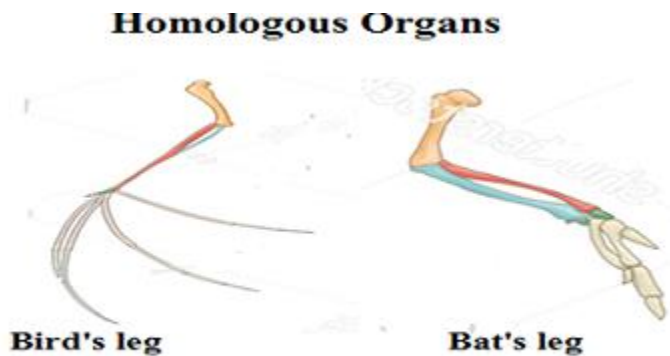
Analogous structures: Analogous is the word that came out from the word analogy which means two different things are adapted to the environment for doing the same thing. Analogous structures are the structures that perform the same function but these structures are found in the organisms that have different looks, out of these clues scientists conclude that these organisms had different ancestors.

Examples of the Homologous structures: The animals with four legs and birds (two legs and two wings), these organisms are tetrapods (animals with four limbs). Four limbs in birds and bats show the example of homologous structures that tell us that birds and bats inherited four limbs from a common ancestor.

Examples of the analogous structures: The wings of the bat and wings of birds are an example of analogous organs since the wings of bat are the cover of the skin stretched between bones of

the fingers and arms while birds' wings consist of features that are extended all along the arms,it shows that bat and the birds got their wings from different ancestors.

Analogous Strucures

Wings of Bat   Wings of Bird
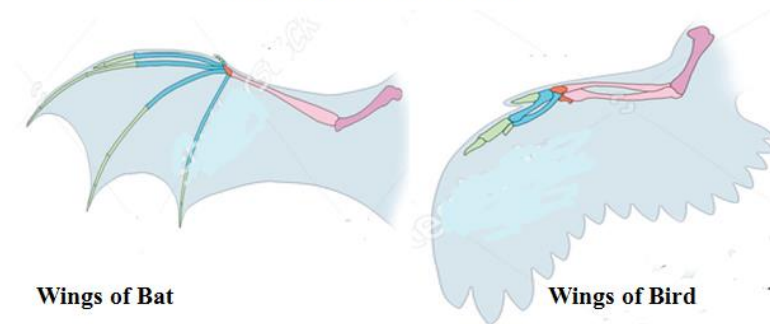
The structure and anatomy of the heart
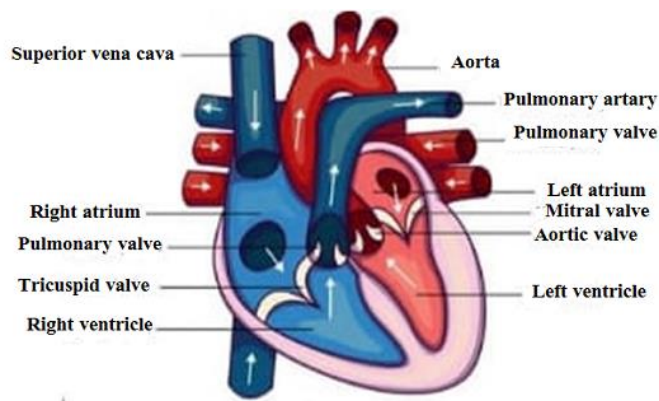
The heart is a muscular organ that is as big as our fist, the heart is located just behind and slightly left of the breast bone. The heart works like a pump, It pumps blood through the network of arteries and veins.arteries.veins and heart all together are called the transportation system of our body, because nutrients, water, oxygen, and carbon dioxides are transported through the blood. Since Co2 and O2 are transported through the heart so it is designed to have four chambers.

The heart gets deoxygenated blood from all parts of the body and pumps out oxygenated blood to all parts of our body.

The heart has different chambers to prevent the oxygen-rich blood from mixing with the blood containing carbon dioxide.

You can study how does the heart function through a step by step way.

1. Oxygen-rich blood from the lungs comes to the thin-walled upper chamber of the heart on the left, the left atrium.

2. The left atrium dilates when it is collecting the blood from the lungs. The left atrium then contracts while next chamber, the left ventricle expands so that the blood is transferred into it.

3. The left ventricle then contracts and thus blood is pumped out to all body parts.

4. Deoxygenated blood comes from the body to the upper chamber on the right, the right atrium.

5. Right ventricle receives the deoxygenated blood through a valve from the right atrium and then sends it to the lungs through the pulmonary artery for oxygenation of blood.

Structure Of Heart

The heart is made up of three layers of cardiac tissue

- Epicardium
- Myocardium
- Endocardium

These layers are surrounded by the pericardium a thin outer lining protecting the heart. The two small upper chambers are atriums and the two larger lower chambers are the ventricles, there left and right sides of the heart are separated by a wall of muscle known as the septum.

The mechanism of the heart

The right atrium receives deoxygenated blood from the veins, vena cava from the upper and lower parts of the body, and then pumps it to the right ventricle.

The right ventricle receives blood from the right atrium and pumps it to the lungs through the pulmonary artery

The left atrium receives the oxygenated blood from pulmonary veins. The right ventricle receives blood from the left atrium.,The right ventricle which is the strongest chamber of the heart creates our blood pressure due to vigorous contractions.

The right ventricle sends oxygen-rich blood to all parts of the body through the aorta. the biggest artery of the circulatory system.

Q-How Does The Exchange Of Gas Takes Place In Fishes?

Ans. Fishes have only two chambers to their hearts and the blood is pumped to the gills, is oxygenated there, and passes directly to the rest of the body. Thus, blood goes only once through the heart in the fish during one cycle of passage through the body.

Q-Why does not oxygenated blood and deoxygenated blood mix together in blood vessels or in the heart?

Ans. The oxygenated blood is received by the left atrium through the pulmonary vein then it is sent to the left ventricle through a valve that maintains the unidirectional flow of blood then it is pumped out through the biggest blood vessel aorta . Deoxygenated blood is received by the right atrium and then it is sent to the right ventricle through a valve between them making the one-directional flow of the blood. The left and right part of the heart is separated by a muscular layer known as the septum that prevents the mixing of blood. The base of the pulmonary vein, pulmonary artery, and aorta is connected to the chambers of the heart through the valves that prevent backflow of the current.

Human digestive system structure and functions

The human digestive system is an alimentary canal of 8 -10 meters. The human digestive system is a hollow tube from the mouth to anus called an alimentary canal. The role of the human digestive system is digestion, absorption, and excretion through 5 main digestive organs. The human digestive system is helped by so many glands to carry on the process of digestion. Each organ of the human digestive system has its specific work in the digestion of food.
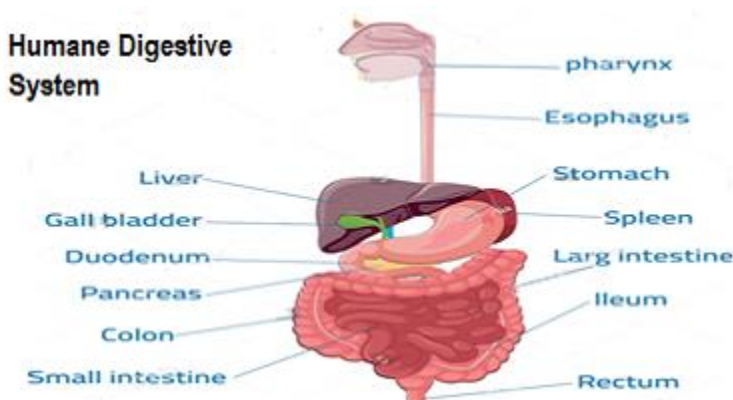
Human digestive system structure and functions

Humans have the 11 systems of organs, among them, the digestive system is the most significant system on the grounds that the nourishment we take is processed through it and changed over into glucose which when responds with oxygen during the respiration reaction releases vitality to all systems of the body accomplishing their specific work.

The human digestive system is an empty track of the length 30 feet divided into 8 parts. These parts are specialized to perform different functions. Future study point is introducing here what happens to the food once it enters our body. After you go through the whole posts of the human digestive system you could become able to answer of each question related to the digestion of

food. Understanding the anatomy of the digestive system will also enable you to take care of your digestion network. In the post of the human digestive system, you will study the role of each part of the alimentary canal one by one so that you will be through with the topic.

Mouth

The food is torn, cut, and ground by the teeth, the role of teeth is to prepare food so that it could be swallowed easily because the lining on the walls of the alimentary canal is quite soft, in the mouth, the food is wetted to make its passage smooth. When we eat something our mouth waters, actually this is saliva secreted by the salivary glands. Salivary glands are located throughout the mouth. The role of salivary glands is to produce saliva which mixes with food. The food is complex in nature, it is needed to be broken down into smaller molecules so that it could be absorbed by the alimentary canal, saliva contains salivary amylase an enzyme that converts complex molecules of carbohydrate to sugar, it is the very first stage of digestion in the mouth. You can experience it by chewing a piece of bread for a long time it will start to taste the sweetness as the sugars are released.

Oesophagus
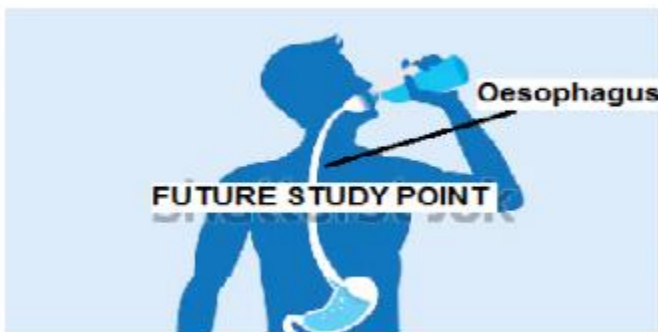
From the mouth, the food is taken to the stomach through the food pipe which is known as the oesophagus. The food moves through the alimentary canal in a regulated manner called the peristaltic movement. Peristaltic moments is contraction and dilation of circular muscles of the alimentary canal, in this moment muscle next to the swallowed food is dilated and the muscles attached to the backword of food is contracted, the peristaltic moments occur throughout the gut, in this way, food swallowed by us is not reversed back and maintains one-way traffic of food and liquids swallowed by us. The peristaltic moments occur immediately when we swallow the food.

The stomach
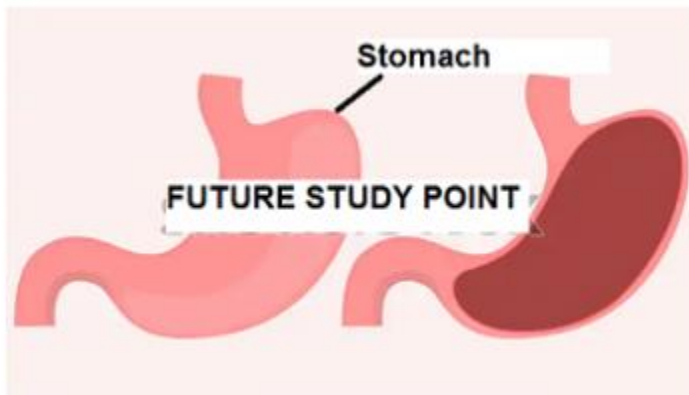
The stomach is a large organ that expands when food enters it, the muscular walls of the stomach help in mixing the food thoroughly with digestive juices. The stomach wall contains numerous gastric glands that secrete hydrochloric acids, pepsin, and mucus. The hydrochloric acid creates an acidic medium which facilitates the action of the enzyme pepsin. The pepsin digest the protein available in the food, protein is digested partially in the stomach. The mucus secreted by the walls of the stomach protects the inner lining of the stomach walls from the action of hydrochloric acid.

The small intestine is the longest part of the gastrointestinal tract (alimentary canal), The small intestine is about 4.75m to 6m (15 to 20 feet) long and has an average diameter of 2.5 cm (1 inch). The length of the small intestine differs in various animals depending on the food they eat. Herbivores eating grass need a longer small intestine to allow the cellulose to be digested. Meat is easier to digest, hence carnivores like tiger have a shorter small intestine. The small intestine of human is made of duodenum, jejunum, and ilium.
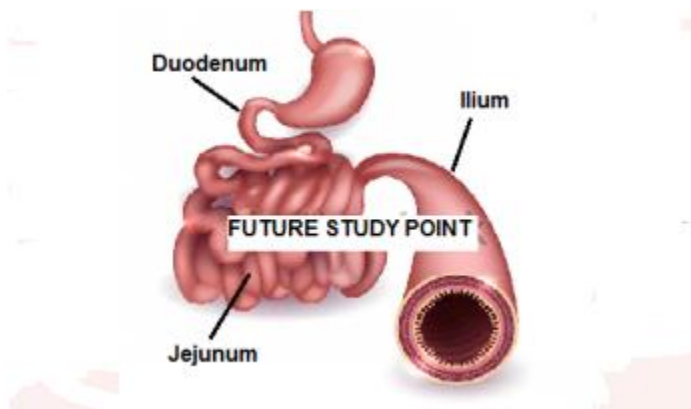
The duodenum connects the stomach to the small intestine, the exit of food from the stomach is regulated by a sphincter muscle which releases it in small amounts into the small intestine, most digestive enzymes enter the small intestine in the duodenum. The food rest in the stomach for about 30 to 60 minutes, the partially digested food is called chyme slowly enters the duodenum, in the duodenum, the chyme mixes with bile secreted by the liver and juices secreted by the pancreas. The fat enters the small intestine in the form of large globules, the bile secreted by the liver breakdown it into small globules. In the duodenum trypsin released by pancreas digest proteins, pancreatic amylase digest carbohydrate, and lipase digest fats.

The pancreas also secrets two hormones insulin which regulates blood sugar and glucagon which works with insulin to control blood sugar levels. The food is further digested and absorbed in the jejunum and ilium, the jejunum is the middle part of the small intestine. Most digestion and absorption of nutrients takes place in the jejunum. The ilium is the last and longest part of the small intestine. The ilium absorbs nutrients from the digested food and empties the waste into the large intestine. The walls of small intestine secrete different types of enzymes that convert carbohydrates into glucose, protein into amino acids and fats into fatty acids. The role of each enzyme is given bellow.

Maltase, sucrase, and lactase - digestion of carbohydrate

Intestinal lipase - digestion of fat (convert fat into fatty acids)

Intestinal peptidase- Digestion of protein

Large intestine
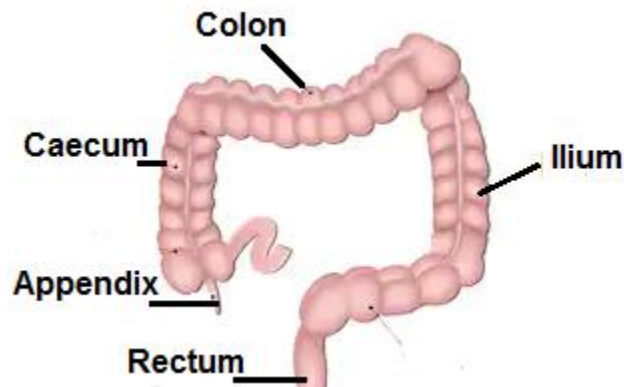
The large intestine is divided into three parts caecum, colon, and rectum. The small intestine is connected to caecum through the ileocecal valve which maintains one-way traffic of the intestinal contents. The function of the caecum is to absorb remaining water and salts available in the undigested food. The large intestine contains 500 species of different bacteria, these bacteria synthesize vitamin K which is also absorbed here. The undigested food further moves down and the rests of water is reabsorbed and thus undigested food is prepared here to be emptied into the rectum. When the body is ready for a bowl moment the waste dumped into the rectum.

Anatomy of the Human brain
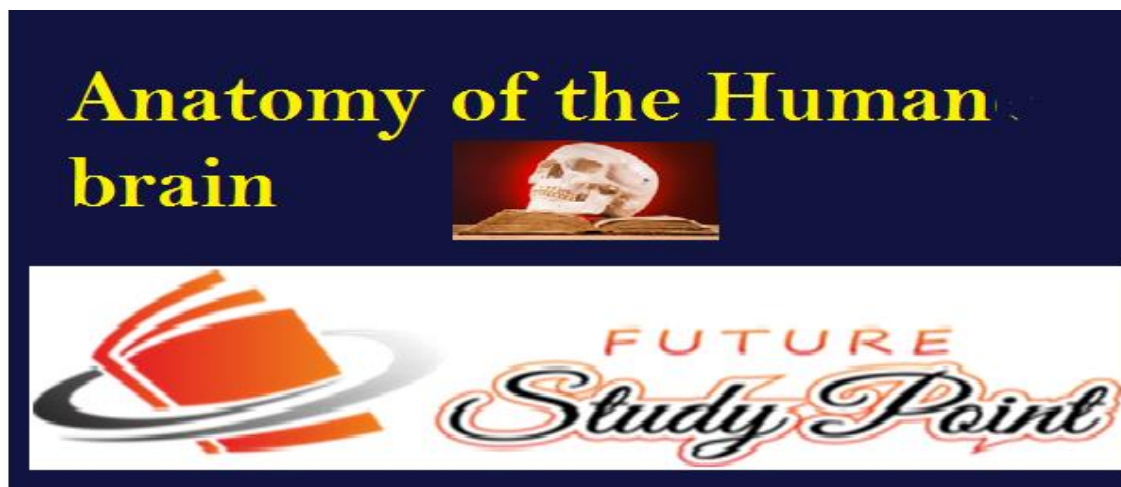
The **human brain** is just like a computer,as the components of the computer are responsible for the different type of process or task on the same way there are different parts of the **brain** which controls the different type of functions inhumane body. **The human brain functions** 24 hours even in the state of sleep and syncope or unconsciousness,it is that's why sometimes you visualize a variety of dreams and keep remembering them. The functioning of all organs of our

body is controlled by the **human brain**, all the systems of our body are under the control of our **brain**,it is the reason that the **human brain** has different units for fulfilling different type of functions in our system. Here we shall discuss them one by one.

The brain is shielded by the skull,the gap between the brain and the skull is filled by the cerebrospinal fluid.

Cerebrospinal fluid(CSF) is a fluid that circulates within hollow space in the skull and the spinal cord.CSF is produced by a special cell, the ependymal of the brain every day.

CSF protects the brain from mechanical shocks and dampening minor jolts.CSF provides buoyancy for the brain, the brain is suspended inside the skull,it is that's why it has neglected weight.

The main parts of the brain are following

1-Forebrain 2-Midbrain 3-Hindbrain

1-Fourbrain

Fourbrain is the largest part of the brain, it is subdivided into following parts.

(i)Cerebrum (ii) Hypothalamus (iii) Thalamus

(i)Cerebrum

The cerebrum is the largest part of the brain, it is composed of two cerebral hemispheres that are joined together by white coloured dense band fibre called corpus callosum.The surface of the cerebrum is further divided into four lobes.

1.Frontal lobe: It executes the function of speech, planning, reasoning, problem-solving activities, and movements of body orgon.

2.Parietal lobe:It integrates sensory inputs informing single perception, so its main function is of sensation and perception.

1. **Frontal lobe**: It is associated with parts of speech, planning, reasoning, problem-solving, and movements.
2. **Parietal lobe**: Help in movements, the perception of stimuli and orientation,as an example temperature, touch and taste.
3. **Occipital lobe**: It is related to visual processing as an example colour.
4. **Temporal lobe**: This region is related to perception and recognition of memory, emotions ,auditory stimuli, and interpretes the information from ear in the form of sound of words.
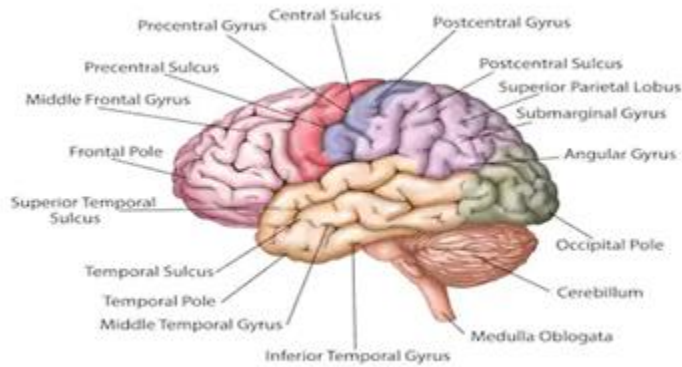
(ii) Thalamus.

The thalamus is a small part of cerebrum located above the brain stem. Its role is to relay sensory information from the sense organs, eyes, nose,skin,ear and eyes. It is also responsible for transmitting motor information for movement and coordination.It is also responsible to store new memories and past memories.

(iii)Hypothalamus

Hypothalamus is a small and important part of the cerebrum,it is located bellow thalamus and above the pituitary gland.It is considered the principal part of the cerebrum. The hypothalamus though is the size of a pea but it performs highly specialized functions. It performs the following functions.

(i) It maintains homeostasis (maintaining our body temperature normal)

(ii) Responds to variety of signals like temperature,hunger, control in eating and smell

(iii)Level of hormones circulated in our body

(iii) Controles stress hormone

(iv) It produces a different type of hormones like oxytocin, thyroid glands, growth hormone, prolactin, dopamine

2-Midbrain

Midbrain is composed of techtom and tagmentum

Tagtom.The tectum is a small portion of the brain, specifically the dorsal part of the midbrain. It serves as a relay centre for the sensory information from the ears to the cerebrum. It also controls the reflex movements of the head, eye and neck muscles. It provides a passage for the different neurons moving in and out of the cerebrum.

Tagmentum: Tegmentum is a region within the brainstem. It is a complex structure with various components, which is mainly involved in body movements, sleep, arousal, attention, and different necessary reflexes. It forms the platform for the midbrain and connects with the thalamus, cerebral cortex, and the spinal cord.

3-Hind brain:

It contains (i) Cerebellum (ii) Medula Oblongata (iii) Pons

(i) Cerebellum

The cerebellum is the second largest part of the brain, located at the top of brain stem in the posterior of the medulla and pons. The cerebellum and cerebrum are separated by the cerebellar tentorium and transverse fissure. The cortex is the outer surface of the cerebellum and its parallel ridges are called the folia. Apart from this, the cerebellum has the cerebellar pendulous, cerebellar nuclei, anterior and posterior lobes. The cerebellum posterior lobes. The cerebellum consists of two hemispheres, the outer grey cortex and the inner white medulla. It is mainly responsible for coordinating and maintaining body balance during walking, running, riding, swimming, and precision control of the voluntary movements. The main functions of the cerebellum include:

1.It senses equilibrium

2.Transfers information

3.Coordinates eye movement

4.It enables precision control of the voluntary body movements.

5.Predicts the future position of the body during a particular movement.

6.Both anterior and posterior lobes are concerned with the skeletal movements.

7.The cerebellum is also essential for making fine adjustments to motor actions.

8.Coordinates and maintains body balance and posture during walking, running, riding, swimming.

A PICTURE OF GOOD HEALTH
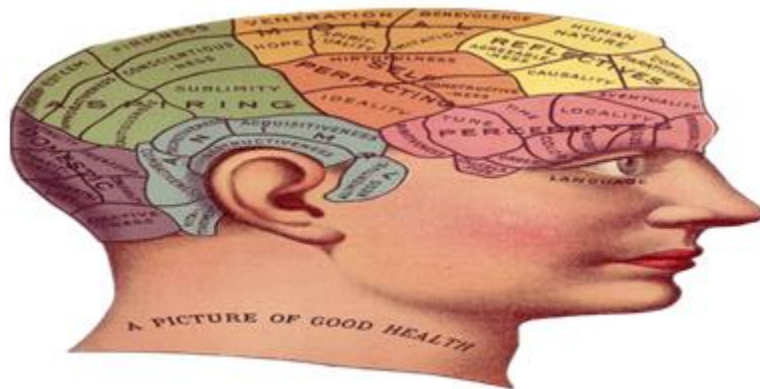
(ii)Medula Obloganta:

The medulla oblongata is located bellow the cerebellum at the brainstem. It's primary role is to control heart beats, breathing and digestion, it connects the spinal cord, pons to cerebrum and also helps in maintaining posture.

(iii) Pons

The pons is the primary structure of the brain stem present between the midbrain and medulla oblongata. It serves as a relay signals between the lower cerebellum, spinal cord, the midbrain, cerebrum and other higher parts of the brain. The main functions of the pons include:

(i)Controlling sleep cycles.

(ii)Regulating the magnitude and frequency of the respiration.

(iii)Transfers information between the cerebellum and motor cortex.

(iv)Pons is also involved in sensations, such as the sense of taste, hearing, and balance.

Modes of reproduction used by single organisms-Asexual reproductions

When Birth of new generation occures due to the involvement of single parent,then such a reproduction is known as asexual mode of reproduction where new individual is delivered by a solitary parent. The new individual delivered are hereditarily and physically is indistinguishable from one another, i.e., they are identical to their parent.

Asexual reproduction is seen in both multicellular and unicellular life forms. The asexual reproduction doesn't include any sort of gamete combination and there won't be any adjustment

in the quantity of chromosomes by the same token. Reproduced organism acquires similar genes as the parent, aside from certain situations where there is an opportunity of rare mutation to occur.

Asexual Reproduction
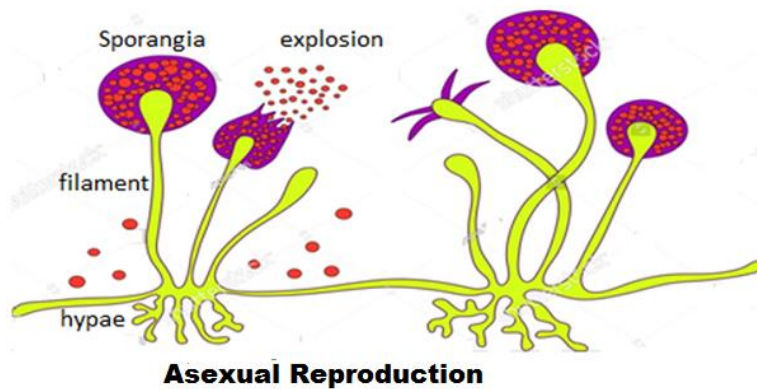
Fission

For unicellular organisms, cell division, or fission., leads to the creation of new individuals. Many different patterns of fission have been observed. Many bacteria and protozoa(amoeba,euglena, paramecium etc) simply split into two equal halves during cell division, it is known as binary fission. Splitted cells are known as daughter cells, these daughter cells are identical to each other and to their parent cell. In organisms such as Amoeba, etc the splitting of the two cells during division can take place in any plane but the division of euglena takes place longitudinally.

Binary Fission in Amoeba
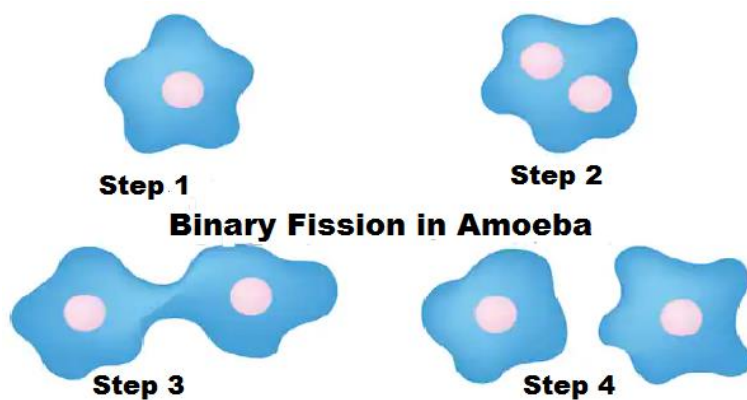
Some of the single-celled organisms, such as the malaria parasite, plasmodium , divide into numerous of daughter cells simultaneously, it is known as **multiple fission**,each of splitted

daughter cells are identical to each other and to their parent cell. Multiple fission also occurs in other single-cell organisms like sporozoans and algae
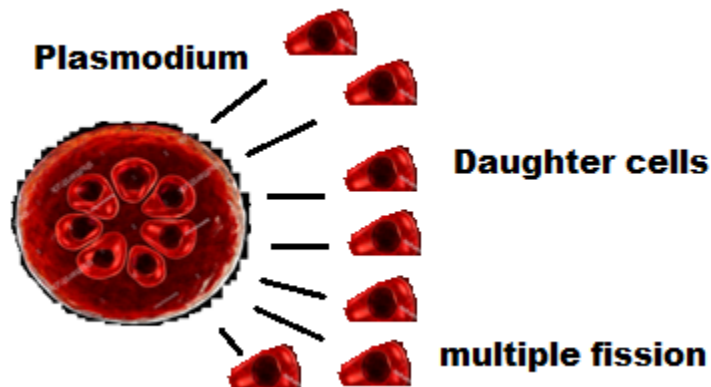
Fragmentation:

In this mode of asexual reproduction parental body divided into two or more fragments,later each fragment develops into a new individual.In multi-cellular organisms with relatively simple body organization, simple reproductive methods can still work. Spyro Gyra, for example simply breaks up into smaller pieces upon maturation. These pieces or fragments grow into new individuals. The fragmentation of the organism is not possible in other multicellular organisms because they are not simply a random collection of cells. In other multicellular organism has specialized cells organized as tissues, and tissues are organized into organs,so cell by cell division in them is not possible and thus, need to use more complex ways of reproduction.
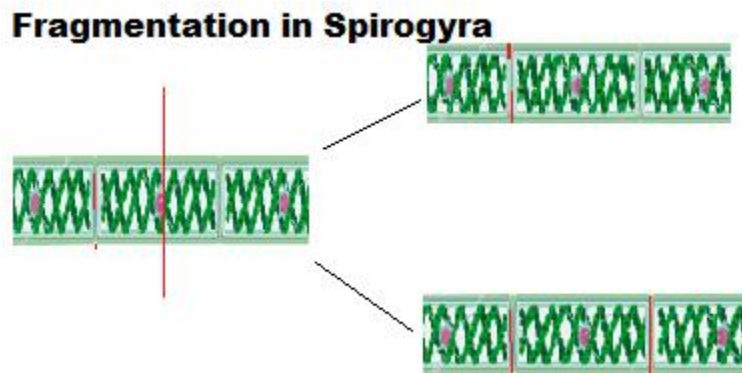
Regeneration:

Some of the organism have speialised cells,which can differentiate and grow into new organism,such of the organisms designed in such a way that they are capable to grow new individuals from their body parts, as an example the animal with simple body design Hydra and Planaria can be cut into any number of pieces, and each piece grow into a complete organism.

This is known as regeneration. Regeneration in the organism is carried out by specialized cells. These cells proliferated and make a large number of cells. From this mass of cells, different cells undergo changes to become various cell types and tissues. These changes take place in an organized sequence referred to as development.
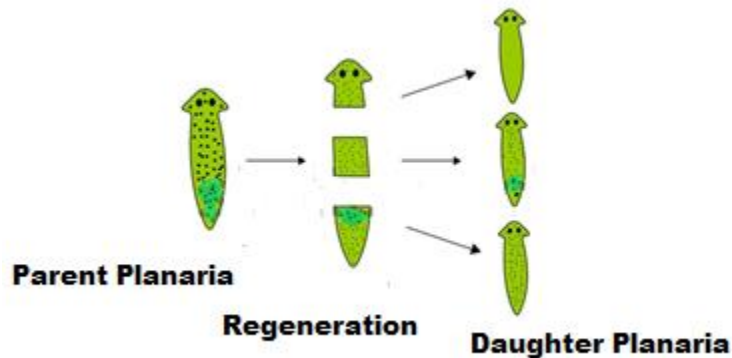
Budding:

Some of the organism uses regenerative cells and for this buds developed in their body. Each buds develops into a new organism,it is known as budding. In hydra, a bud develops as an outgrowth due to repeated cell division at one specific site.These buds develops into tiny individual and when fully mature.detach from the parental body and become new individuals.
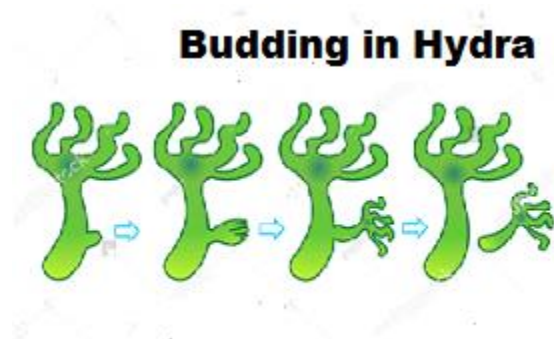
Vegetative Propagation:

Plants can be reproduced under appropriate conditions through their vegetative parts such as roots, stems, leaves, and buds. This property of vegetative propagation is used in methods such as layering or grafting to grow many plants like sugarcane, roses, and grapes for increasing the rate of productivity in agriculture since plants used in vegetative propagation can bear flowers and fruits faster than those produced from seeds. Such methods are useful in the propagation of plants such as banana, orange, rose, and jasmine that has lost the capacity to produce seeds.

Buds

Bryaophyllum

Spore Formation:

In many multi-cellular organisms, specific reproductive parts are created known as sporangia,it is a tiny blob on a stick structure developed in some of plants, fungi, bacteria, and algae. The sporangia contain reproductive cells known as spores. Spores are covered by thick walls that protect them until they come into contact with another moist surface, the interaction of moist and sporangia leads the sporangia blasted and spores spread in the air, and again when these spores come in contact to a moist surface these can begin to grow into a new individual.

Sporangia   explosion

filament

hypae

Spore formation
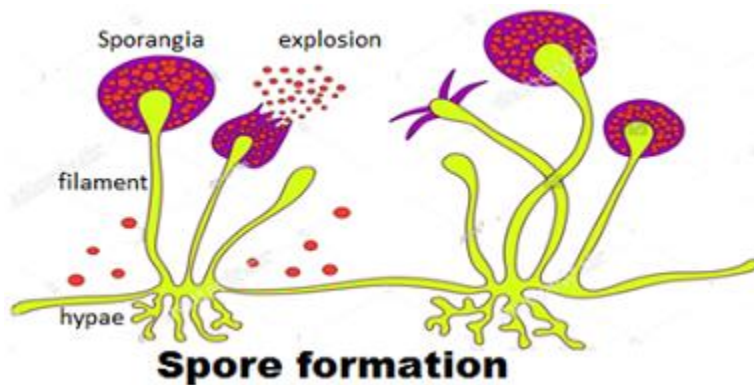
What is the greenhouse effect?

The greenhouse effect is named it greenhouse effect because practically it has been seen that in a herbarium the plants inside it and its green floor absorb the heat of transmitted light from the sunlight, this heat is unable to escape the glass house because this warm air becomes unable to transfer to the surrounding colder region due to the glass, that increases the heat inside it, the same effect is seen on the atmosphere of the earth but here the molecules of carbon dioxide, methane absorbs incoming light rays and the light rays reflected by the surface of the earth, consequently albedo (total reflection of a light rays from the earth) decreases, thus earth atmosphere warms up. The warming of the earth's atmosphere is known as the greenhouse effect.

What is the greenhouse effect?

The light ray enters the atmosphere of the earth, naturally, our atmosphere regulates the temperature of the earth since 29 % of total incoming solar energy is reflected by the clouds, atmospheric particles, and bright surfaces of the earth like sea ice and snow, rest of the 71 % solar energy is absorbed by dust particles, water vapor, and the earth surface. The increasing air pollution is caused by the greenhouse gases like CO2(carbon dioxide) and CH4(methane) trapped the solar energy which decreases the amount of reflected solar energy and consequently increases the heat on the earth, this is all about the greenhouse effect.
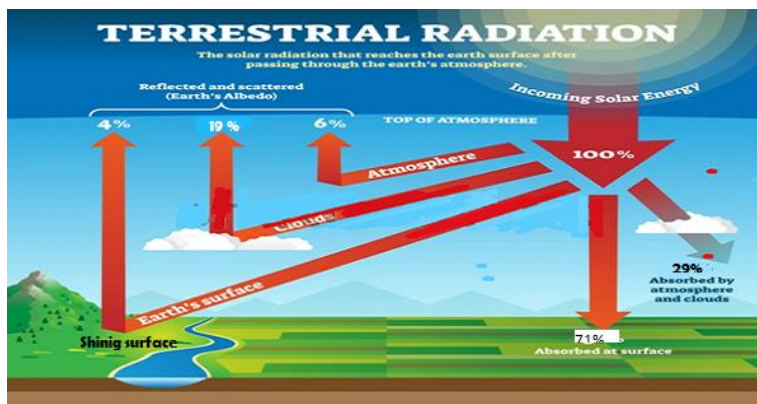
Why is it named the greenhouse effect?

It is named greenhouse because it has been seen that if sunlight is allowed to pass through the greenhouse made of glass whose floor is implanted with green plants, the light that passes through the glass is absorbed by the plants and its green floor warms up the air inside the glass house, this warm air trapped inside the glass. A similar process happens in the earth's atmosphere but in this case, the light is trapped by the molecules of carbon dioxide and methane.

The causes of the greenhouse effect:

The cause of the greenhouse effect is increasing pollution due to the industries, vehicles, deforestation, and the use of poly bags. The factories and vehicles release different gases like nitrous oxide, carbon dioxide, methane, hydrochlorofluorocarbon, hydrofluorocarbon, and so on. The molecules of these gases are of larger size, so the cluster of such molecules reflects back the light rays towards the earth, this process increases the temperature on the earth.

Global warming:

Global warming is the result of the greenhouse effect, as we know the greenhouse effect is caused due to the greenhouse gases, these gases trapped the solar energy, thus sunlight doesn't escape away from the earth,it causes the growth in the average temperature of the earth's atmosphere resulting in global warming. The large molecules of carbon dioxide and methane released by vehicles and factories absorb incoming solar energy and reflected back the solar radiation towards the earth reflected by the surface of the earth that causing an increase in the temperature of the earth. This increment in the earth's temperature is known as global warming. Global warming causes the melting of glaciers in Antarctica, and snow of mountains which may cause to increase in the sea level. If the whole of the ice of the earth melts away 2 billion population of the earth will submerge into the ocean.

Prevention of greenhouse effect:

Humans are required to attain sustainable development and decrease the level of greenhouse gases, therefore all of us needed to promote the following points to prevent greenhouse gases.

- Implant trees
- Use public vehicles
- Control the number of private vehicles
- Avoid the use of polybags
- Control the usage of electricity produced by thermal power plant
- Discover anti-pollutant substances
- Minimize the use of refrigerator and AC since the greenhouse gases are used in them
- Use the sustainable methods in the development of the industries
- Discovering the proper technics for cleaning the rivers, ponds, and the lake

Food chain and food web in an ecosystem

Meaning of food chain

A food chain in an ecosystem defines that one organism depends on other organisms for its survival. In a food chain energy is transferred from one organism to another organism. A food chain starts with producer organisms (Plants). All food chains are processed in the presence of bacteria on the earth.

Trophic level - Each step or level of the food chain forms a trophic level. The autotrophs or the producers are at the first trophic level. Autotrophs fix up the solar energy and make it available for heterotrophs or consumers. The herbivores or the primary consumers come at the second trophic level, small carnivores or secondary consumers at the third trophic level, and larger carnivores or the tertiary consumer forms the fourth trophic level.
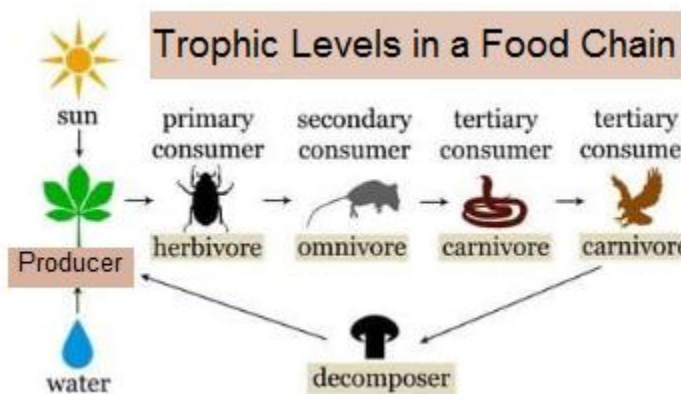
First Trophic Level: The trees , grass, and ferns form the first trophic level in the terrestrial ecosystem, and algae, seaweed, etc form the first trophic level in the marine ecosystem.

Second Trophic Level: The primary consumers eating plants forms second trophic level like rats,insects, small birds, frogs ,small fish etc.

Third Trophic Level: Secondary consumers eating the animals of second and first trophic level form fourth trophic level as an example snake, large fish, etc.

Fourth Trophic Level: Tertiary consumers eating the animals of second and third trophic levels form the fourth trophic level as an example owl, dog, cat, etc.

Fifth Trophic Level: Tertiary consumers eating the animals of first, second, third trophic, and fourth levels form the fourth trophic level as for example eagle, lion, etc.

Decomposer: Decomposers are not part of any food chain but these are an important part of the ecosystem since decomposers eat dead animals and plants converting them for energy.

Mechanism of Food Chain - Plant (producer) gets energy from sunlight and convert it into chemical energy. This energy supports all the activities in the world. From plants, the energy is transferred to heterotrophs and decomposers, as we know when one form of energy is changed to another, there is a loss of energy due to the surroundings that can't be regained.

The transfer of energy

(i) The green plants in a terrestrial ecosystem capture at least 1% of the energy of sunlight that falls on their leaves and convert it into food.

(ii) When green plants are eaten by herbivores, a great deal of energy is lost as heat to the environment. Some amount of the energy is utilized in digestion. And in doing work and rest goes towards the growth and reproduction. An average of 10% of the total energy driven from the food taken is turned into its own body and made available for the next level of consumer. Since little energy is available for the next level of consumers, the loss of energy at each step is so great that very little usable energy remains after four trophic levels. There are greater numbers of individuals at the lower levels of an ecosystem.

Food web: Each organism is generally eaten by two or more organisms by other kinds of organisms which in turn are eaten by two or more. Other kinds of organisms which in turn are eaten by several other organisms. There is the relationship of one food chain to several other food chains.So instead of a straight line food chain, the relationship can be shown as a series of branching lines called a food web.

Biological Magnification

Human lies on the top level of any food chain. Several pesticides and chemicals are utilized in to protect the crop from diseases and pests. These chemicals are either washed down into the soil or into the water bodies. From the soil, these are absorbed by the plants, and from the water bodies these are taken by fishes and aquatic plants. These chemicals accumulated as the trophic level rises up and ultimately maximum consumption is taken place by humans,it is known as biological magnification.

Ozone Layer and How it is Getting depleted

The earth's atmosphere is made up of several layers. The troposphere is the lowest part of the earth's atmosphere that extends from the earth's surface up to 10km in altitude. All human activities occur in the troposphere. The next layer is the stratosphere which continues from 10km to about 50km. Ozone is concentrated in a layer in the stratosphere from 15 to 30 km above the earth's surface. The ozone layer in the stratosphere, absorbs the portion of the radiation from the Sun, preventing it from reaching the surface of Earth.

When sunlight reaches the stratosphere, the ultraviolet rays of sunlight split up oxygen molecule(O2) into its two atoms. The high reactivity of the oxygen atom forces it to combine with oxygen molecules resulting in the formation of ozone molecules.

$O2 \rightarrow O + O$

$O2 + O \rightarrow O3$

Ozone(O3) is a molecule formed by three atoms of oxygen. While O2.which we normally refer to as oxygen, is essential for all aerobic forms of life.Ozone performs an essential function. It shields the surface of the earth from ultraviolet(UV) radiation from the Sun. This radiation is highly damaging to organisms, for example,it is known to cause skin cancer and cataract in human beings, UV rays also has its harmful effects on plant life and marine life.

Ozone at the higher levels of the atmosphere is a product of UV radiation acting on oxygen (O2) molecules.The higher energy UV radiations split apart some molecular oxygen (O2) into free oxygen (O) atoms. These atoms then combine with the molecular oxygen to form ozone as shown -

$$O_2 \xrightarrow{UV} O + O$$

$$O + O_2 \rightarrow O_3 \ (Ozone)$$
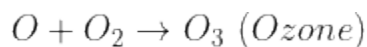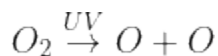
Depletion of Ozone Layer

The ozone molecule is destroyed when it comes with the contact of a chlorine atom, one chlorine atom can destroy 100000 ozone molecules. It occurs when compounds containing chlorine are

exposed to ultraviolet rays the compounds which release chlorine or similar elements like bromine are responsible for the depletion of ozone layers. The amount of ozone in the atmosphere began to drop sharply in the 1980s. This decrease has been linked to synthetic chemicals like chlorofluorocarbons (CFCs) which are used as refrigerants and in fire extinguishers, such compounds which causes depletion of the ozone layer are known as Ozone Depletion Substance(ODS), the other ODS are Hydrochlorofluorocarbon(HDFCs), Carbon tetrachloride and Methyl chloroform which releases chlorine, the ODS which releases bromine are Halons and Methyl bromide. in 1987, the United Nations Environment Programme (UNEP) succeeded in forging an agreement to freeze CFC production at 1986 levels and control the production of other ODS.

Nature contribution in depletion of O3 layer

The volcano's eruption also affects the ozone layer indirectly. The aerosol produced as a result of volcano eruption when reaches to stratosphere it boosts up the activity of chlorine or bromine atoms although its contribution in depletion of the ozone layer is very less as compared to human-created ODS.

Ozone Hole

An example of the ozone hole is the Annual ozone 'hole' over Antarctica, it is not that ozone is completely absent in that particular region, actually, the amount of ozone is exceptionally low in that region. This happens at the beginning of the southern hemisphere spring (august-October) . The scientist has surveyed that ozone depletion is not limited to the region over the south pole, some of the latitudes over North America, South America, Europe, Asia, and many areas of Africa are also have been seen a decrease in the amount of ozone.

NCERT Solutions of class 10 science chapter 1- Chemical Reactions and Equations

Q1.Why should a magnesium ribbon be cleaned before burning in air?

Ans. Magnesium is a very reactive metal. When stored it reacts with oxygen to form a layer magnesium oxide on its surface. This layer of magnesium oxide is quite stable and prevents further reaction of magnesium with oxygen. The magnesium ribbon is cleaned by sandpaper to remove this layer so that the underlying metal can be exposed to the air.

Q2.Write the balanced equation for the following chemical reactions.

(i) Hydrogen + Chlorine → Hydrogen chloride

(ii) Barium chloride + Aluminium sulphate → Barium sulphate +Aluminium chloride

(iii) Sodium + Water → Sodium hydroxide + Hydrogen

Ans.

- $H_2 + Cl_2 \rightarrow 2Hcl$
- $3BaCl_2 + Al_2SO_4 \rightarrow 3Ba_2SO_4 + 2AlCl_3$
- $2Na + 2H_2O \rightarrow 2NaOH + H_2$

Q3.Write a balanced chemical equation with state symbols for the following reactions.

(i) Solutions of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride.

(ii) Sodium hydroxide solution (in water) reacts with hydrochloric acid solution (in water) to produce sodium chloride solution and water.

Ans.

- $Cl_{2(aq)} + Na_2SO_{4(aq)} \rightarrow BaSO_{4(s)} + NaCl_{(aq)}$
- $NaOH_{(aq)} + HCl_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(l)}$

Q4.A solution of a substance 'X' is used for whitewashing.

(i) Name the substance 'X' and write its formula.

(ii) Write the reaction of the substance 'X' named in (i) above with water.

Ans.(i) The substance 'X' is calcium oxide. Its chemical formula is CaO.

(ii) Calcium oxide reacts vigorously with water to form calcium hydroxide (slaked lime).

$$\underset{Calcium\ oxide(Quick\ lime)}{CaO\ (s)} + \underset{Water}{H_2O\ (l)} \rightarrow \underset{Calcium\ hydroxide(slaked\ lime)}{Ca\ (OH)_2\ (aq)}$$
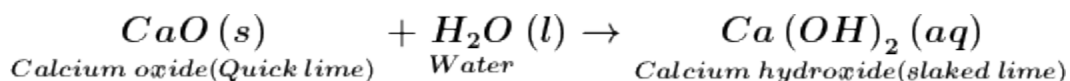
Q5.Why is the amount of gas collected in one of the test tubes in Activity 1.7 double of the amount collected in the other? Name this gas.

Ans.Water (H_2O) contains two parts hydrogen and one part oxygen. Therefore, the amount of hydrogen and oxygen produced during electrolysis of water is in a 2:1 ratio.
During electrolysis, since hydrogen goes to one test tube and oxygen goes to another, the amount of gas collected in one of the test tubes is double of the amount collected in the other.

Q1.Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

Ans. When an iron nail is placed in a copper sulphate solution, iron displaces copper from copper sulphate solution forming iron sulphate, which is green in colour.

$$\underset{Iron}{Fe\ (s)} + \underset{Copper\ sulphate(blue\ colour)}{CuSO_4\ (aq)} \rightarrow \underset{Iron\ sulphate(Green\ colour)}{FeSO_4\ (aq)} + \underset{Copper}{Cu\ (s)}$$
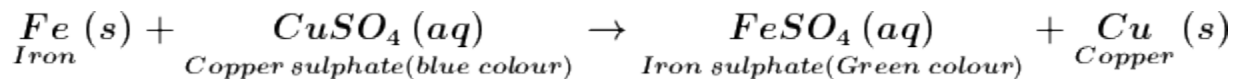
Therefore, the blue colour of copper sulphate solution fades and green colour appears.

Q2.Give an example of a double displacement reaction other than the one given in Activity

Ans. Sodium carbonate reacts with calcium chloride to form calcium carbonate and sodium chloride.

$$\underset{Sodium\,carbonate}{Na_2CO_3} + \underset{Calcium\,chloride}{CaCl_2} \rightarrow \underset{Calcium\,carbonate}{CaCO_3} + \underset{Sodium\,chloride}{NaCl}$$
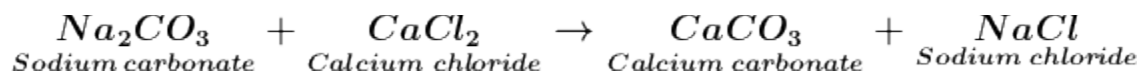
In this reaction, sodium carbonate and calcium chloride exchange ions to form two new compounds. Hence, it is a double displacement reaction.

Q3.Identify the substances that are oxidised and the substances that are reduced in the following reactions.

(i)4Na$_{((s)}$ + O$_{2(g)}$ → 2 Na$_2$O$_{(s)}$

(ii)CuO$_{(s)}$ + H$_{2(g)}$ → Cu$_{(s)}$ + H$_2$O$_{(l)}$
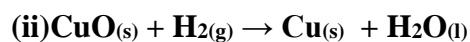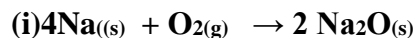
Ans.

(i) Sodium (Na) is oxidised as it gains oxygen and oxygen gets reduced.

(ii) Copper oxide (CuO) is reduced to copper (Cu) while hydrogen (H2) gets oxidised to water (H2O).

Exercise solution

Q1.Which of the statements about the reaction below are incorrect?

2PbO$_{(s)}$ + C$_{(s)}$ → 2Pb$_{(g)}$ + CO$_2$
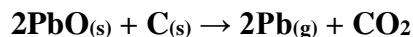
(a) Lead is getting reduced.

(b) Carbon dioxide is getting oxidised.

(c) Carbon is getting oxidised.

(d) Lead oxide is getting reduced.

(i) (a) and (b)

(ii) (a) and (c)

(iii) (a), (b) and (c)

(iv) all

Ans.

(i)(a) and (b)

Q2.Fe_2O_3 + 2Al → Al_2O_3 + 2Fe
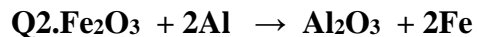
The above reaction is an example of a

(a) combination reaction.

(b) double displacement reaction.

(c) decomposition reaction.

(d) displacement reaction.

Ans.(d) The given reaction is an example of a displacement reaction.

Q3.What happens when dilute hydrochloric acid is added to iron filings? Tick the correct answer.

(a) Hydrogen gas and iron chloride are produced.

(b) Chlorine gas and iron hydroxide are produced.

(c) No reaction takes place.

(d) Iron salt and water are produced.

Ans.(a) Hydrogen gas and iron chloride are produced. The reaction is as follows:

$Fe_{(s)}$ + $2HCl_{(aq)}$ → $FeCl_{2(aq)}$ + $H_{2(g)}$
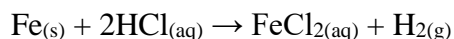
Q4.What is a balanced chemical equation? Why should chemical equations be balanced?

Ans.A reaction which has an equal number of atoms of all the elements on both sides of the chemical equation is called a balanced chemical equation.

The law of conservation of mass states that mass can neither be created nor destroyed. Hence, in a chemical reaction, the total mass of reactants should be equal to the total

mass of the products. It means that the total number of atoms of each element should be equal on both sides of a chemical equation. Hence, it is for this reason that chemical

equations should be balanced.

Q5.Translate the following statements into chemical equations and then balance them.

(a) Hydrogen gas combines with nitrogen to form ammonia.

(b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.

(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

(d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

Ans.

- $2H_{2(g)} + N_{2(g)} \rightarrow 2NH_{3(g)}$
- $2H_2S_{(g)} + 3O_{2(g)} \rightarrow 2H_2O_{(l)} + 2SO_{2(g)}$
- $3BaCl_{2(aq)} + Al_2SO_{4(aq)} \rightarrow 2Ba_2SO_{4(aq)} + 3BaSO_{4(s)}$
- $2K_{(s)} + 2H_2O_{(l)} \rightarrow 2KOH_{(aq)} + H_{2(g)}$

Q5.Balance the following chemical equations

(a)HNO₃ + Ca(OH)₂ →Ca(NO₃)₂ + H₂O

(b)NaOH + H₂SO₄ → Na₂SO₄ + H₂O

(c)NaCl + AgNO₃ → AgCl + NaNO₃

(d)BaCl₂ + H₂SO₄ → BaSO₄ + HCl

Ans. (a)$2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$

(b)$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

(C) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$
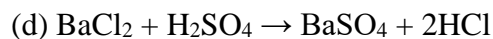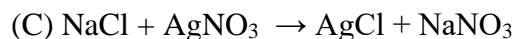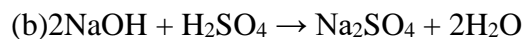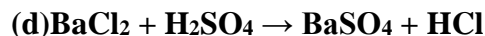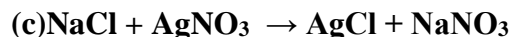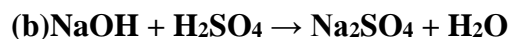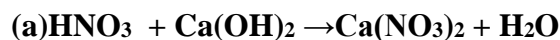
Q7.Write the balanced chemical equations for the following reactions.

(a) Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water

(b) Zinc + Silver nitrate → Zinc nitrate + Silver

(c) Aluminium + Copper chloride → Aluminium chloride + Copper

(d) Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride
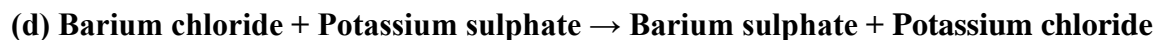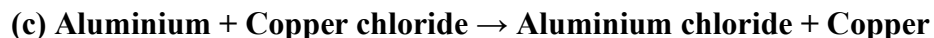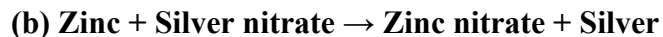
Ans.

- $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
- $Zn + 2AgNO_3 \rightarrow ZnNO_3 + 2Ag$
- $2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$
- $BaCl_2 + K_2SO_4 \rightarrow BaSO_4 + 2KCl$

Q8.Write the balanced chemical equation for the following and identify the type of reaction in each case.

(a)Potassium bromide (aq) + Barium iodide (aq) → Potassium iodide (aq) + Barium bromide(s)

(b) Zinc carbonate (s) → Zinc oxide (s) + Carbon dioxide (g)

(c) Hydrogen (g) + Chlorine (g) → Hydrogen chloride (g)

(d) Magnesium (s) + Hydrochloric acid (aq) → Magnesium chloride (aq) + Hydrogen (g)

Ans.

(a)$2KBr_{(aq)} + BaI_{(aq)} \rightarrow KI_{(aq)} + 2BaBr_{(s)}$; Double displacement reaction

(b)$ZnCO_{3(s)} \rightarrow ZnO_{(s)} + CO_{2(g)}$; Decomposition reaction

(c)$H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$; Composition reaction

(d)$Mg_{(s)} + HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$; Displacement reaction

Q9.What does one mean by exothermic and endothermic reactions? Give examples.

Ans.Exothermic reaction-Chemical reactions that release energy in the form of heat, light, or sound are called exothermic reactions.

Example: Mixture of calcium oxide and water to yield calcium hydroxide, and heat. In other words, exothermic reactions are combination reactions.

$CaO + H_2O \rightarrow Ca(OH)_2 + heat$
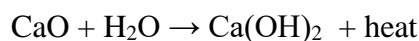
Reactions that absorb energy or require energy in order to proceed are called endothermic reactions.

For example: In the process of photosynthesis, plants use the energy from the sun to convert carbon dioxide and water to glucose and oxygen.

$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
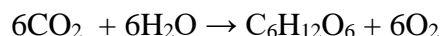
Sunlight

Q10.Why is respiration considered an exothermic reaction? Explain.

Ans.Energy is required to support life. Energy in our body is obtained from the food we eat. During digestion, large molecules of food are broken down into simpler substances such as glucose. Glucose combines with oxygen in the cells and provides energy. The special name of this combustion reaction is respiration. Since energy is released in the whole process, it is an exothermic process.

$$C_6H_{12}O_6 + \underset{Oxygen}{6O_2} \rightarrow \underset{Carbon\ dioxide}{6CO_2} + \underset{Water}{6H_2O} + Energy$$
$$\underset{Glucose}{}$$

Q11.Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions.

Ans. Decomposition reactions are those in which a compound breaks down to form two or more substances. These reactions require a source of energy to proceed. Thus, they are the exact opposite of combination reactions in which two or more substances combine to give a new substance with the release of energy.

$$Decomposition\ reaction\ ;\ 2H_2O \xrightarrow{Electrolysis} 2H_2O + O_2$$

$$Combination\ reaction\ ;\ CaO + H_2O \rightarrow Ca(OH)_2 + Heat$$
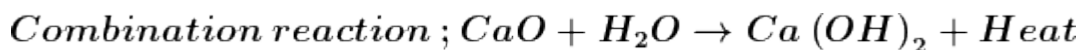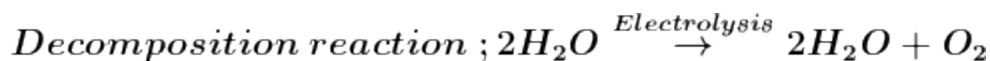
Q12.Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

Ans.

- Thermal decomposition:

$$\underset{Ferrous\ sulphate}{FeSO_4\,(s)} \xrightarrow{Heat} \underset{Ferric\ Oxide}{Fe_2O_3\,(s)} + \underset{Sulphur\ Oxide}{SO_2\,(g)} + \underset{Sulphur\ trioxide}{SO_3\,(g)}$$

- Decomposition by light

$$\underset{2Silver\ chloride}{2AgCl} \xrightarrow{Light} \underset{Silver}{2Ag} + \underset{Chlorine}{Cl_2}$$
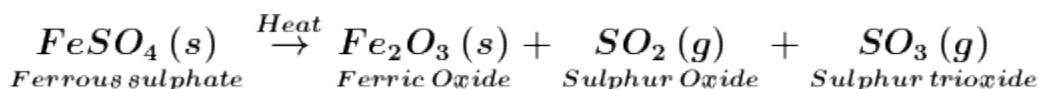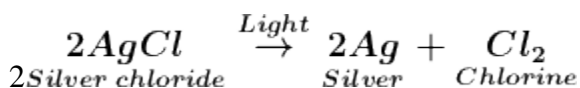
(c)Decomposition by electricity

$$Al_2O_3 \xrightarrow{\text{Electricity}} 2Al + O_2$$
Aluminium oxide → Aluminium + Oxygen
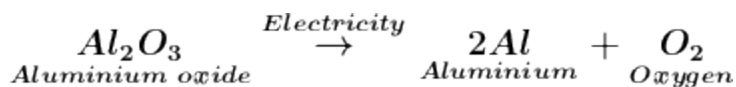
Q13.What is the difference between displacement and double displacement reactions? Write equations for these reactions.

Ans.In a displacement reaction, a more reactive element replaces a less reactive element from a compound.

A + BX → AX + B; where A is more reactive than B

In a double displacement reaction, two atoms or a group of atoms switch places to form new compounds.

AB + CD → AD + CB
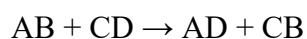
For example:

Displacement reaction:

$CuSO_4$ + Zn → $ZnSO_4$ + Cu

Double displacement reaction:

Na_2SO_4 + $BaCl_2$ → $BaSO_4$ + 2NaCl
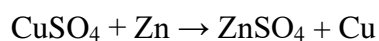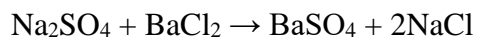
Q14.In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.

$$2AgNO_3\,(aq) + Cu\,(s) + Cu\,(NO_3)_2\,(aq) + 2Ag\,(s)$$
Silver nitrate + Copper + Copper nitrate + Silver
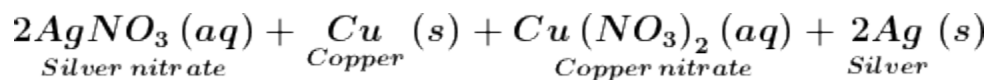
Q15.What do you mean by a precipitation reaction? Explain by giving examples.

Ans.A reaction in which an insoluble solid (called precipitate) is formed is called a precipitation reaction.

For example:

$$Ca\,(OH)_2\,(aq) + CO_2\,(g) \rightarrow CaCO_3\,(s) + H_2O\,(l)$$
Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water
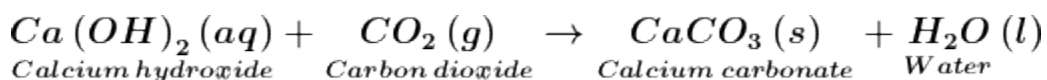
In this reaction, calcium carbonate is obtained as a precipitate. Hence, it is a precipitation reaction.

Another example of a precipitation reaction is:

$$Na_2SO_4\,(aq) + BaCl_2\,(aq) \rightarrow 2NaCl\,(aq) + BaSO_4$$

Sodium sulphate   Barium chloride   Sodium chloride   Barium sulphate
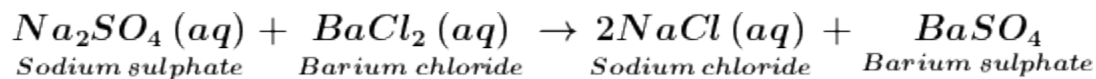
In this reaction, barium sulphate is obtained as a precipitate.

Q16.Explain the following in terms of gain or loss of oxygen with two examples each.

(a) Oxidation

(b) Reduction

Ans.

(a) Oxidation is the gain of oxygen.

For example

(a) In equation (i), H_2 is oxidized to H_2O and in equation (ii), Cu is oxidised to CuO. (b) Reduction is the loss of oxygen.

(b) In equation (i), CO_2 is reduced to CO and in equation (ii), CuO is reduced to Cu.

Q17.A shiny brown-coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.

Ans.'X' is copper (Cu) and the black-coloured compound formed is copper oxide (CuO). The equation of the reaction involved on heating copper is given below.

$$\underset{\text{Shiny brown in colour}}{2Cu} + O_2 \xrightarrow{Heat} \underset{\text{Black in colour}}{2Cu}$$
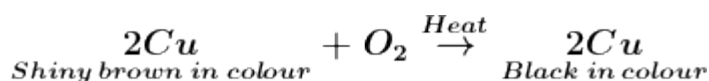
Q18.Why do we apply paint on iron articles?

Ans. Iron articles are painted because it prevents them from rusting. Rusting of iron is an oxidation reaction , when iron particles are exposed to water and air, it forms a hydrated iron oxide which is soft substance and is breakable. When painted, the contact of iron articles from

moisture and air is cut off. Hence, rusting is prevented their presence is essential for rusting to take place.

$$4Fe + 3O_2 + n\,H_2O \rightarrow 2Fe_2O_3.n\,H_2O$$

Hydrated iron oxide

Q19.Oil and fat containing food items are flushed with nitrogen. Why?

Ans. Nitrogen is an inert gas and does not easily react with these substances. On the other hand, oxygen reacts with food substances and makes them rancid. Thus, bags used in packing food items are flushed with nitrogen gas to remove oxygen inside the pack. When oxygen is not present inside the pack, rancidity of oil and fat containing food items is avoided.

Q20.Explain the following terms with one example each.

(a) Corrosion

(b) Rancidity

Ans.

(a) Corrosion:

Corrosion is defined as a process where materials, usually metals, deteriorate as a result of a chemical reaction with air, moisture, chemicals, etc.

For example, iron, in the presence of moisture, reacts with oxygen to form hydrated iron oxide.

This hydrated iron oxide is rust.

(b) Rancidity:

The process of oxidation of fats and oils that can be easily noticed by the change in taste and smell is known as rancidity.

For example, the taste and smell of butter changes when kept for long.

Rancidity can be avoided by:

1. Storing food in air tight containers

2. Storing food in refrigerators

3. Adding antioxidants

4. Storing food in an environment of nitrogen

NCERT Solutions of class 10 science chapter 2- Acids, Bases and Salts

Page No: 18

1. You have been provided with three test tubes. One of them contains distilled water and the other two contain an acidic solution and a basic solution, respectively. If you are given only red litmus paper, how will you identify the contents of each test tube?

Answer

If the colour of red litmus does not change then it is acid. If the colour of red litmus changes to blue then it is base. If there is a slight change in the colour of red litmus (such as purple) then it is distilled water.

Page No: 22

Q1. Why should curd and sour substances not be kept in brass and copper vessels?

Ans. Curd and other sour substances contain acids. Therefore, when they are kept in brass and copper vessels, the metal reacts with the acid to liberate hydrogen gas and harmful products, thereby spoiling the food.

Q2. Which gas is usually liberated when an acid reacts with a metal? Illustrate with an example. How will you test for the presence of this gas?

Ans. Hydrogen gas is usually liberated when an acid reacts with metal.

Take a few pieces of zinc granules and add 5 ml of dilute H_2SO_4. Shake it and pass the gas produced into a soap solution. The bubbles of the soap solution are formed. These soap bubbles contain hydrogen gas.

$H_2SO_4 + Zn \rightarrow ZnSO_4 + H_2 \uparrow$
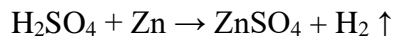
We can test the evolved hydrogen gas by its burning with a pop sound when a candle is brought near the soap bubbles.

Q3. Metal compound A reacts with dilute hydrochloric acid to produce effervescence. The gas evolved extinguishes a burning candle. Write a balanced chemical equation for the reaction if one of the compounds formed is calcium chloride.

Ans. $CaCO_{3\ (s)} + 2HCl_{(aq)} \rightarrow CaCl_{2\ (aq)} + CO_{2\ (g)} + H_2O_{(l)}$
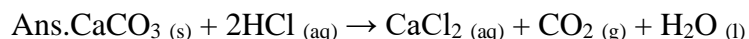
Calcium Carbonate + Hydrochloric acid → Calcium Chloride + Carbon dioxide + Water

Page No: 25

Q1. Why do HCl, HNO$_3$, etc., show acidic characters in aqueous solutions while solutions of compounds like alcohol and glucose do not show acidic character?

Ans.When HCl or HNO$_3$ are mixed with water then they dissolve in water to form H$^+$ or H$_3$O$^+$ ions which shows their acidic character. For example, just see the following reactions

HCl $_{(aq)}$ → H$^+$ + Cl$^-$

H$^+$+ H$_2$O → H$_3$O$^+$
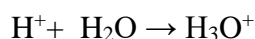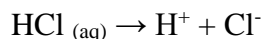
When alcohols and glucose are mixed with water then they do not dissolve to form ions. Hence they do not show acidic character.

Q2. Why does an aqueous solution of acid conduct electricity?

Ans.The presence of hydrogen (H$^+$) or hydronium (H$_3$O$^+$) ions in the aqueous solution of an acid are responsible for conducting electricity.

Q3. Why does dry HCl gas not change the colour of the dry litmus paper?

Ans.Dry HCl gas does not change the colour of the dry litmus paper because it has no Hydrogen ions (H$^+$) in it.

Q4. While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid?

Ans.Since the process of dissolving an acid in water is exothermic, it is always recommended that acid should be added to water. If it is done the other way, then it is possible that because of the large amount of heat generated, the mixture splashes out and causes burns.

Q5. How is the concentration of hydronium ions (H$_3$O$^+$) affected when a solution of an acid is diluted?

Ans.When an acid is diluted, the concentration of hydronium ions (H$_3$O$^+$) per unit volume decreases. This means that the strength of the acid decreases.

Q6. How is the concentration of hydroxide ions (OH$^-$) affected when excess base is dissolved in a solution of sodium hydroxide?

Science and Maths NCERT solution for Class 9 to 11 class

Ans.The concentration of hydroxide ions (OH⁻) would increase when excess base is dissolved in a solution of sodium hydroxide.

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Q1. You have two solutions, A and B. The pH of solution A is 6 and the pH of solution B is 8. Which solution has more hydrogen ion concentration? Which of these is acidic and which one is basic?

Ans.A pH value of less than 7 indicates an acidic solution, while greater than 7 indicates a basic solution. Therefore, the solution with pH = 6 is acidic and has more hydrogen ion concentration than the solution of pH = 8 which is basic.

Q2. What effect does the concentration of $H^+_{(aq)}$ ions have on the nature of the solution?

Ans.If the concentration of $H^+_{(aq)}$ ions is increased (>10-7) then the solution becomes acidic and if the concentration of $H^+_{(aq)}$ ions is decreased (<10-7) then the solution becomes basic in nature.

Q3. Do basic solutions also have $H^+_{(aq)}$ ions? If yes, then why are these basic?

Ans. Yes, the basic solution also has H^+ ions. However, their concentration is less compared to the concentration of OH^- ions that makes the solution basic.

Q4. Under what soil condition do you think a farmer would treat the soil of his fields with quick lime (calcium oxide) or slaked lime (calcium hydroxide) or chalk (calcium carbonate)?

Ans.If the soil is acidic and improper for cultivation, then to increase the basicity of soil, the farmer would treat the soil with quick lime or slaked lime or chalk.

Page No: 33

Q1. What is the common name of the compound $CaOCl_2$?

Ans.Bleaching Powder.

Q2. Name the substance that on treatment with chlorine yields bleaching powder?

Ans. Calcium hydroxide [$Ca(OH)_2$]

Q3. Name the sodium compound which is used for softening hard water.

Ans. Washing soda ($Na_2CO_3.10H_2O$)

Q4. What will happen if a solution of sodium hydrocarbonate is heated? Give the equation of the reaction involved.

Ans. When sodium hydrogen carbonate is heated then sodium carbonate and water is formed along with the evolution of carbon dioxide gas.

Q5. Write an equation to show the reaction between Plaster of Paris and water.

$$\underset{\text{Plaster of Paris}}{CaSO_4 \cdot \frac{1}{2}H_2O} + \frac{1}{2}H_2O \Rightarrow \underset{\text{Gypsum}}{2\,CaSO_4}$$
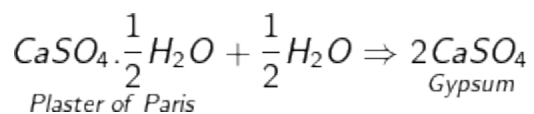
NCERT Solutions of class 10 science chapter 2-Acids,Bases and Salts

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Exercise

Q1. A solution turns red litmus blue, its pH is likely to be

(a) 1

(b) 4

(c) 5

(d) 10

Ans. (d) 10

Q2. A solution reacts with crushed egg shells to give a gas that turns lime-water milky. The solution contains

(a) NaCl

(b) HCl

(c) LiCl

(d) KCl

Ans. (b) HCl

Q3. 10 mL of a solution of NaOH is found to be completely neutralised by 8 mL of a given solution of HCl. If we take 20 mL of the same solution of NaOH, the amount of HCl solution (the same solution as before) required to neutralise it will be

(a) 4 mL

(b) 8mL

(c) 12 mL

(d) 16 mL

Ans. (d) 16 mL

Q4. Which one of the following types of medicines is used for treating indigestion?

(a) Antibiotic

(b) Analgesic

(c) Antacid

(d) Antiseptic

Ans.(c) Antacid

Q5, Write word equations and then balanced equations for the reaction taking place when −

(a) dilute sulphuric acid reacts with zinc granules.

(b) dilute hydrochloric acid reacts with magnesium ribbon.

(c) dilute sulphuric acid reacts with aluminium powder.

(d) dilute hydrochloric acid reacts with iron filings.

Ans.

(a) H_2SO_4 (aq) + Zn (s) → $ZnSO_4$ (aq) + H_2 (g)

(b) 2HCl (aq) + Mg (s) → $MgCl_2$ (aq) + H_2 (g)

(c) $3H_2SO_4$ (aq) + 2Al (s) → $Al_2(SO_4)_3$ (aq) + $3H_2$ (g)

(d) 6HCl (aq) + 2Fe (s) → $2FeCl_3$ (aq) + $3H_2$ (g)

Q6. Compounds such as alcohols and glucose also contain hydrogen but are not categorized as acids. Describe an activity to prove it.

Ans.Two nails are fitted on a cork and are kept it in a 100 mL beaker. The nails are then connected to the two terminals of a 6-volt battery through a bulb and a switch. Some dilute HCl is poured in the beaker and the current is switched on. The same experiment is then performed with glucose solution and alcohol solution.

Observations:

It will be observed that the bulb glows in the HCl solution and does not glow in the glucose solution.

Result:

HCl dissociates into H^+ and Cl^- ions. These ions conduct electricity in the solution resulting in the glowing of the bulb. On the other hand, the glucose solution does not dissociate into ions. Therefore, it does not conduct electricity.

Conclusion:

From this activity, it can be concluded that all acids contain hydrogen but not all compounds containing hydrogen are acids.

That is why, though alcohols and glucose contain hydrogen, they are not categorised as acids.

Q7. Why does distilled water not conduct electricity, whereas rain water does?

Ans. Distilled water cannot conduct electricity because it does not contain ions while rain water conducts electricity as it contains ions due presence of dissolved salts in it.

Q8. Why do acids not show acidic behaviour in the absence of water?

Ans. Acids do not show acidic behaviour in the absence of water because the dissociation of hydrogen ions from an acid occurs in the presence of water only.

Q9. Five solutions A, B, C, D and E when tested with a universal indicator showed pH as 4, 1, 11, 7 and 9, respectively. Which solution is

(a) neutral?

(b) strongly alkaline?

(c) strongly acidic?

(d) weakly acidic?

(e) weakly alkaline?

Arrange the pH in increasing order of hydrogen-ion concentration.

Ans. (a) Neutral →Solution D with pH 7

(b) Strongly alkaline →Solution C with pH 11

(c) Strongly acidic →Solution B with pH 1

(d) Weakly acidic →Solution A with pH 4

(e) Weakly alkaline →Solution E with pH 9

The pH can be arranged in the increasing order of the concentration of hydrogen ions as: $11 < 9 < 7 < 4 < 1$.

Q10. Equal lengths of magnesium ribbons are taken in test tubes A and B. Hydrochloric acid (HCl) is added to test tube A, while acetic acid (CH_3COOH) is added to test tube B. In which test tube will the fizzing occur more vigorously and why?

Ans. The fizzing will occur strongly in test tube A, in which hydrochloric acid (HCl) is added. This is because HCl is a stronger acid than CH_3COOH and therefore produces hydrogen gas at a faster speed due to which fizzing occurs.

Q11. Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd? Explain your answer.

Ans. The pH of milk is 6. As it changes to curd, the pH will reduce because curd is acidic in nature. The acids present in it decrease the pH.

Q12. A milkman adds a very small amount of baking soda to fresh milk.

(a) Why does he shift the pH of the fresh milk from 6 to slightly alkaline?

(b) Why does this milk take a long time to set as curd?

Ans. (a) The milkman shifts the pH of the fresh milk from 6 to slightly alkaline because in alkaline condition, milk does not set as curd easily.

(b) Since this milk is slightly basic than usual milk, acids produced to set the curd are neutralized by the base. Therefore, it takes a longer time for the curd to set.

Q13. Plaster of Paris should be stored in a moisture-proof container. Explain why?

Ans. The Plaster of Paris should be stored in a moisture-proof container as it absorbs water from moisture and turn into hard substance (Gypsum) as shown in following chemical equation.

Q14. What is a neutralization reaction? Give two examples.

Ans.A reaction in which an acid and base react with each other to give a salt and water is termed as neutralization reaction.For Example:

(i) $NaOH + HCl \rightarrow NaCl + H_2O$

(ii) $HNO_3 + KOH \rightarrow KNO_3 + H_2O$
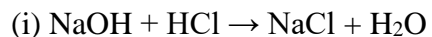
Q15. Give two important uses of washing soda and baking soda.

Ans. Two important uses of washing soda are:

- It is used in the glass, soap, and paper industries.

- It is used to remove the permanent hardness of the water.

Two important uses of baking soda are:

- It is used as baking powder. Baking powder is a mixture of baking soda and a mild acid known as tartaric acid. When it is heated or mixed in water, it releases CO_2 that makes bread or cake fluffy.

- It is used in soda-acid fire extinguishers.

NCERT Solutions of class 10 science chapter 3-Metals and Non-Metals

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Q1. Give an example of a metal which

(i) is a liquid at room temperature.

Ans.Mercury

(ii) can be easily cut with a knife.

Ans. Sodium

(iii) is the best conductor of heat.

Ans.Silver

(iv) is a poor conductor of heat.

Ans. Mercury and Lead

Q2. Explain the meanings of malleable and ductile.

Ans.Malleable: Substances that can be beaten into thin sheets are called malleable. For example, most of the metals are malleable.

Ductile: Substances that can be drawn into thin wires are called ductile. For example, most of the metals are ductile.

Page no: 46

Q1. Why is sodium kept immersed in kerosene oil?

Ans.Sodium is a high reactive element. If it is kept in open it can explosively react with oxygen to catch fire. Hence to prevent accidental damage sodium is immersed in kerosene oil.

Q2. Write equations for the reactions of

(i) iron with steam

(ii) calcium and potassium with water

Ans.

(i) $3Fe_{(s)} + 4H_2O_{(g)} \rightarrow Fe3O_{4 (aq)} + 4H_{2 (g)}$

(ii) $Ca_{(s)} + 2H_2O_{(l)} \rightarrow Ca(OH)_{2 (aq)} + H_{2 (g)} + Heat$

$2K_{(s)} + 2H_2O_{(l)} \rightarrow 2KOH_{(aq)} + H_{2 (g)} + Heat$
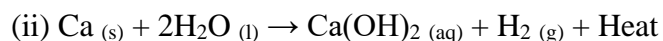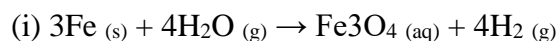
Q3. Samples of four metals A, B, C and D were taken and added to the following solution one by one. The results obtained have been tabulated as follows.

Metal	Iron(II) sulphate	Copper(II) sulphate	Zinc sulphate	Silver nitrate
A	No reaction	Displacement		
B	Displacement		No reaction	
C	No reaction	No reaction	No reaction	Displacement
D	No reaction	No reaction	No reaction	No reaction

Use the Table above to answer the following questions about metals A, B, C and D.

(i) Which is the most reactive metal?

(ii) What would you observe if B is added to a solution of copper (II) sulphate?

(iii) Arrange the metals A, B, C and D in the order of decreasing reactivity.

Ans.

(i) B is most reactive metal.

(ii) B will displace copper from copper sulphate.

(iii) Arrangement of metals in the order of decreasing reactivity B>A>C>D.

Q4. Which gas is produced when dilute hydrochloric acid is added to a reactive metal? Write the chemical reaction when iron reacts with dilute H_2SO_4.

Ans. Hydrogen gas is evolved when dilute hydrochloric acid is added to a reactive metal.

When iron reacts with dilute H2SO4, iron (II) sulphate with the evolution of hydrogen gas is formed.

$$Fe_{(s)} + H_2SO_{4\ (aq)} \rightarrow FeSO_{4\ (aq)} + H_{2\ (g)}$$
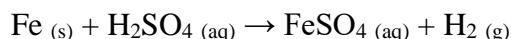
Q5. What would you observe when zinc is added to a solution of iron (II) sulphate? Write the chemical reaction that takes place.

Ans. When zinc is added to iron (II) sulphate then it will displace the iron from iron sulphate solution as shown in the following chemical reaction.

$$Zn_{(s)} + FeSO_{4\ (aq)} \rightarrow ZnSO_{4\ (aq)} + Fe_{(s)}$$
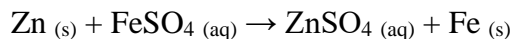
Page No: 49

Q1. (i) Write the electron-dot structures for sodium, oxygen and magnesium.

(ii) Show the formation of Na_2O and MgO by the transfer of electrons.

(iii) What are the ions present in these compounds?

Ans.

(i) The representation of elements with valence electrons as dots around the elements is referred to as electron-dot structure for elements.

(ii) Formation of compound by transfer of electrons

(iii) The ions present in Na_2O are Na^+ and O^{2-} ions and in MgO are Mg^{2+} and O^{2-} ions.

Q2. Why do ionic compounds have high melting points?

Ans.Ionic compounds have strong electrostatic forces of attraction between the ions. Therefore, it requires a lot of energy to overcome these forces. That is why ionic compounds have high melting points.

Page No: 53

Q1. Define the following terms.

(i) Mineral (ii) Ore (iii) Gangue

Ans.

(i) Mineral: The naturally occurring compounds of elements are known as Mineral.

(ii) Ore: Minerals from which metals can be extracted profitably are known as ores.

(iii) Gangue: The impurities present in the ore such as sand, rocks etc are non as gangue.

Q2. Name two metals which are found in nature in the free state.

Ans.The metals at the bottom of the reactivity series are mostly found in free state. For example: gold, silver, and platinum.

Q3. What chemical process is used for obtaining a metal from its oxide?

Ans.Metal can be extracted from its oxide by the process of reduction.Extraction of metal from its oxide.

Page No: 55

Q1. Metallic oxides of zinc, magnesium and copper were heated with the following metals.

Metals	Zinc	Magnesium	Copper
Zinc Oxide	—	—	—
Magnesium Oxide	—	—	—
Copper Oxide	—	—	—

In which cases will you find displacement reactions taking place?

Ans.

Metal	Zinc	Magnesium	Copper
Zinc Oxide	No reaction	Displacement	No reaction
Magnesium Oxide	No reaction	No reaction	No reaction
Copper Oxide	Displacement	Displacement	No reaction

Q2. Which metals do not corrode easily?

Ans.

Metals which have low reactivity such as silver, gold does not corrode easily.

Q3. What are alloys?

Ans. An alloy is the homogeneous mixture of two or more metals or metals and non metals. For example brass is an alloy of copper and zinc.

Page No: 56

Excercise

Q1. Which of the following pairs will give displacement reactions?

(a) NaCl solution and copper metal

(b) MgCl₂ solution and aluminium metal

(c) FeSO₄solution and silver metal

(d) AgNO₃solution and copper metal.

Ans.(d) AgNO₃solution and copper metal.

Q2. Which of the following methods is suitable for preventing an iron frying pan from rusting?

(a) Applying grease

(b) Applying paint

(c) Applying a coating of zinc

(d) all of the above.

Ans. (c) Applying a coating of zinc

Q3. An element reacts with oxygen to give a compound with a high melting point. This compound is also soluble in water. The element is likely to be

(a) calcium

(b) carbon

(c) silicon

(d) iron

Ans. (a) calcium

Q4. Food cans are coated with tin and not with zinc because

(a) zinc is costlier than tin.

(b) zinc has a higher melting point than tin.

(c) zinc is more reactive than tin.

(d) zinc is less reactive than tin.

Ans. (c) zinc is more reactive than tin.

Q5. You are given a hammer, a battery, a bulb, wires and a switch.

(a) How could you use them to distinguish between samples of metals and non-metals?

(b) Assess the usefulness of these tests in distinguishing between metals and non-metals.

Ans.

(a) With the hammer, we can beat the sample and if it can be beaten into thin sheets (that is, it is malleable), then it is a metal otherwise a non-metal. Similarly, we can use the battery, bulb, wires, and a switch to set up a circuit with the sample. If the sample conducts electricity, then it is a metal otherwise a non-metal.

(b) The above tests are useful in distinguishing between metals and non-metals as these are based on the physical properties. No chemical reactions are involved in these tests.

Q6. What are amphoteric oxides? Give two examples of amphoteric oxides.

Ans.Those oxides that behave as both acidic and basic oxides are called amphoteric oxides.

Examples: aluminium oxide (Al_2O_3), zinc oxide (ZnO)

Q7. Name two metals which will displace hydrogen from dilute acids, and two metals which will not.

Ans.Iron and aluminium will displace hydrogen from dilute acids as they more reactive then hydrogen. Mercury and copper cannot displace hydrogen from dilute acids as they are less reactive than hydrogen.

Page No: 57

Q8. In the electrolytic refining of a metal M, what would you take as the anode, the cathode and the electrolyte?

Ans. In the electrolytic refining of a metal M:

Anode → Impure metal M

Cathode → Thin strip of pure metal M

Electrolyte → Solution of salt of the metal M

Q9. Pratyush took sulphur powder on a spatula and heated it. He collected the gas evolved by inverting a test tube over it, as shown in figure below.

Collection of gas
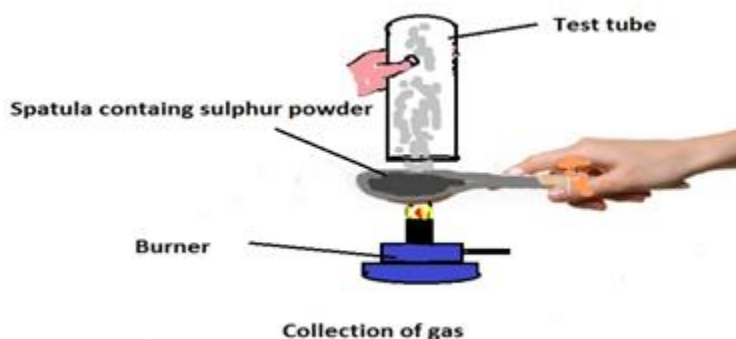
(a) What will be the action of gas on

(i) dry litmus paper?

(ii) moist litmus paper?

(b) Write a balanced chemical equation for the reaction taking place.

Ans.

(a) (i) There will be no action on dry litmus paper.

(ii) The colour of litmus paper will turn red because sulphur is a non-metal and the oxides of non-metal are acidic in nature.

(b) $S_{(s)} + O_{2(g)} \rightarrow SO_{2 (g)}$
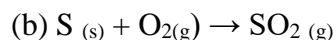
Q10. State two ways to prevent the rusting of iron.

Ans. Two ways to prevent the rusting of iron are:

- Oiling, greasing, or painting: By applying oil, grease, or paint, the surface becomes waterproof and the moisture and oxygen present in the air cannot come into direct contact with iron. Hence, rusting is prevented.

- Galvanisation: An iron article is coated with a layer of zinc metal, which prevents the iron to come in contact with oxygen and moisture. Hence, rusting is prevented.

Q11. What type of oxides are formed when non-metals combine with oxygen?

Ans. When non-metals are combined with oxygen then neutral or acidic oxides are formed. Examples of acidic oxides are NO_2, SO_2 and examples of neutral oxides are NO, CO etc.

Q12. Give reasons

(a) Platinum, gold and silver are used to make jewellery.

(b) Sodium, potassium and lithium are stored under oil.

(c) Aluminium is a highly reactive metal, yet it is used to make utensils for cooking.

(d) Carbonate and sulphide ores are usually converted into oxides during the process of extraction.

Ans.

(a) Platinum, gold, and silver are used to make jewellery because they are very lustrous. Also, they are very less reactive and do not corrode easily.

(b) Sodium, potassium, and lithium are very reactive metals and react very vigorously with air as well as water. Therefore, they are kept immersed in kerosene oil in order to prevent their contact with air and moisture.

(c) Though aluminium is a highly reactive metal, it is resistant to corrosion. This is because aluminium reacts with oxygen present in air to form a thin layer of aluminium oxide. This oxide layer is very stable and prevents further reaction of aluminium with oxygen. Also, it is light in weight and a good conductor of heat. Hence, it is used to make cooking utensils.

(d) Carbonate and sulphide ores are usually converted into oxides during the process of extraction because metals can be easily extracted from their oxides rather than from their carbonates and sulphides.

Q13. You must have seen tarnished copper vessels being cleaned with lemon or tamarind juice. Explain why these sour substances are effective in cleaning the vessels.

Ans. Copper reacts with moist carbon dioxide in air to form copper carbonate and as a result, copper vessel loses its shiny brown surface forming a green layer of copper carbonate. The citric acid present in the lemon or tamarind neutralises the basis copper carbonate and dissolves the layer. That is why, tarnished copper vessels are cleaned with lemon or tamarind juice to give the surface of the copper vessel its characteristic lustre.

Q14. Differentiate between metal and non-metal on the basis of their chemical properties.

Ans.

Metals	Non-metals
Metals are electropositive.	Non-metals are electronegative.
Oxides of metals are basic in nature.	Oxides of non-metals are acidic in nature.
Metals displace hydrogen from dilute acid.	They can't replace hydrogen from dilute acid.
Metals form chlorides which are ionic compounds.	Non-metals form chlorides which are covalent compounds.
They react with water to form oxides and hydroxides. Some metals react with cold water, some with hot water, and some with steam.	They do not react with water.

Q15. A man went door to door posing as a goldsmith. He promised to bring back the glitter of old and dull gold ornaments. An unsuspecting lady gave a set of gold bangles to him which he dipped in a particular solution. The bangles sparkled like new but their weight was reduced drastically. The lady was upset but after a futile argument the man beat a hasty retreat. Can you play the detective to find out the nature of the solution he had used?

Ans. The solution he had used was Aqua regia. Aqua regia is Latin word which means 'Royal Water'. It is the mixture of concentrated Hydrochloric acid and concentrated nitric acid in the ratio of 3:1. It is capable of dissolving metals like Gold and Platinum. Since the outer layer of the gold, bangles is dissolved in aqua regia so their weight was reduced drastically.

16. Give reasons why copper is used to make hot water tanks and not steel (an alloy of iron).

Ans. Copper does not react with cold water, hot water, or steam. However, iron reacts with steam. If the hot water tanks are made of steel (an alloy of iron), then iron would react vigorously with the steam formed from hot water. $3Fe + 4H_2O \rightarrow Fe_3O_4 + H_2O$

That is why copper is used to make hot water tanks, and not steel.

Metals are the elements that lead to heat and conduct electricity and are maleable and ductile.As an example Iron (Fe), Aluminum (Al), Silver (Ag), Copper (Cu), Gold (Au), Platinum (Pt), Lead (Pb), Potassium (K), Sodium (Na), Calcium (Ca) and Magnesium (Mg) etc.

Metals are elements that form positive ions by losing electrons during a chemical reaction. In this way, metals are known as Electropositive Elements.

What are the physical and chemical properties of metals?

Physical Properties of Metals

Hardness: Most of the metals are hard, aside from alkali metals, for example, sodium, potassium, lithium, and so on are delicate metals. These can be cut by utilizing a blade.

Quality: Most of the metals are solid and have high conductivity. Along these lines, large number of appliances are made utilizing metals, for example, copper (Cu) and iron (Fe).

State: Metals are strong at room temperature aside from mercury (Hg),mercury exist in liquid state at room temperature, cesium and gallium have very low melting point even they can melt on the palm.

Sound: Metals produce ringing sound, in this way, metals are Sonorous. Sound of metals is otherwise called Metallic sound. This is the reason that metal wires are utilized in making musical instruments, electric and the school bells.

Conduction: Metals are a decent transmitter of heat and electricity. This is the reason that electric wires are made of metals like copper and aluminium.

Flexibility: Metals are ductile. This implies metals can be beaten into a slender sheet. Due to this property, iron is utilized in making large ships.

Malleability: Metals are malleable. This implies metals can be brought into slim wire. On account of this property, a wire is made of metals.

NCERT Solutions for class 10 science chapter 4-Carbon and its Compounds

Page no 61

Q1.What would be the electron dot structure of carbon dioxide which has the formula CO_2?

Ans.The electron dot structure of CO_2 is

Electron dot structure of CO_2

O=C=O
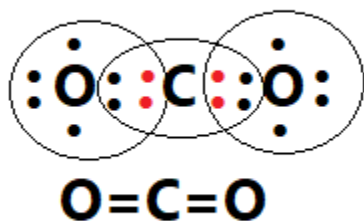
Q2.What would be the electron dot structure of a molecule of sulphur which is made up of eight atoms of sulphur? (Hint − the eight atoms of sulphur are joined together in the form of a ring.)

Ans.Electron dot structure of a sulphur molecule

S_8
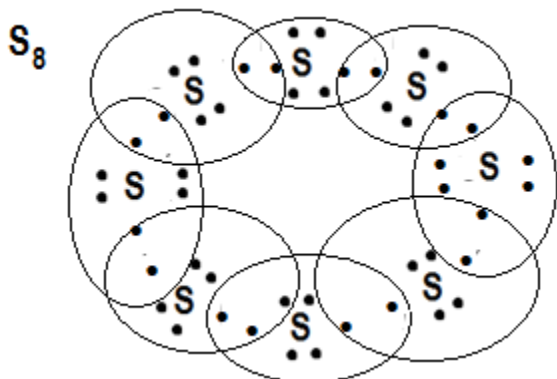
Q1.How many structural isomers can you draw for pentane?

Ans. Three structural isomers are possible for pentane.

(i) n-pantane (ii) Isopantane (iii) Neopantane

(i) H H H H H
     | | | | |
H–C – C –C– C –C–H
     | | | | |
     H H H H H

(ii) H
      |
      H   H   H
      | | |
H– C – C – C –C –H
      | | |
      H   H H

      |
      H — C — H
          |
          H

(iii) H   C — H
            H
       H | H
       | | |
H–C–C– C– H
    H | H
    H —C— H
        |
        H
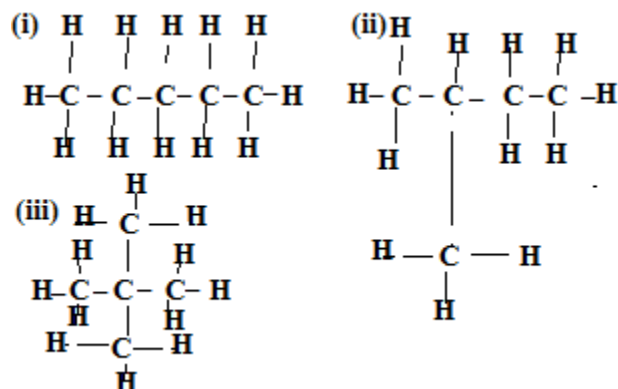
Q2.What are the two properties of carbon which lead to the huge number of carbon compounds we see around us?

Ans.The two features of carbon that give rise to a large number of compounds are as follows:

(i) Catenation − It is the ability to form bonds with other atoms of carbon.

(ii) Tetravalency − With the valency of four, carbon is capable of bonding with four other atoms.

Q3.What will be the formula and electron dot structure of cyclopentane?

Ans. The formula for cyclopentane is C_5H_{10}. Its electron dot structure is given below.

Page no 69
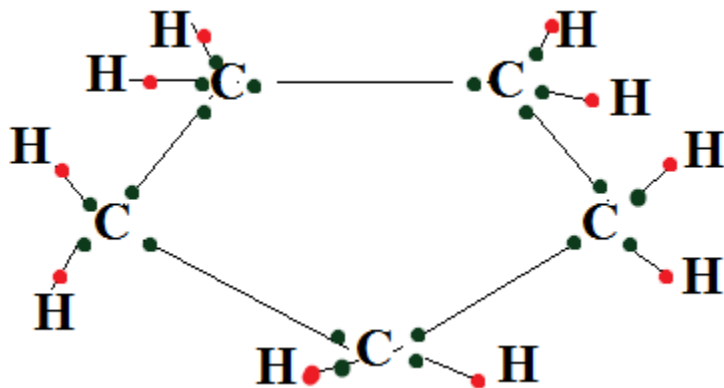
Q4.Draw the structures for the following compounds.

(i) Ethanoic acid (ii) Bromopentane.

(iii) Butanone (iv) Hexanal

Are structural isomers possible for Bromo pentane?

Ans.

(i) Ethanoic Acid

(ii) Bromopantane

(iii) Butanone

(iv) Haxanal
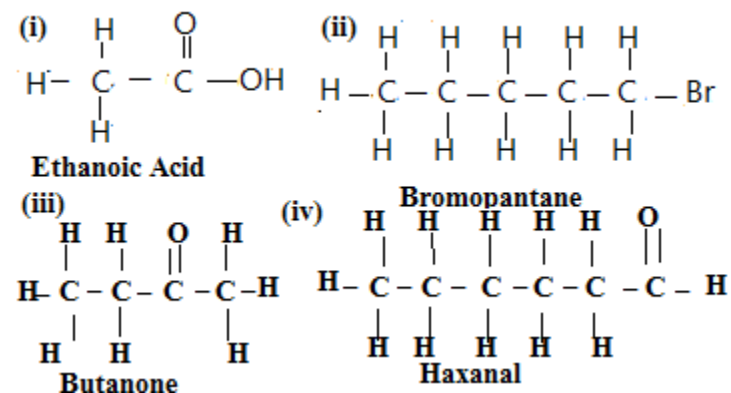
(ii) There are many structural isomers possible for Bromo pentane. Among them, the structures of three isomers are given.

(i) 1-Bromopantane (ii) 2-Bromopantane   (iii) 3-Bromopantane

(i)

(ii)

(iii)

Page no 68
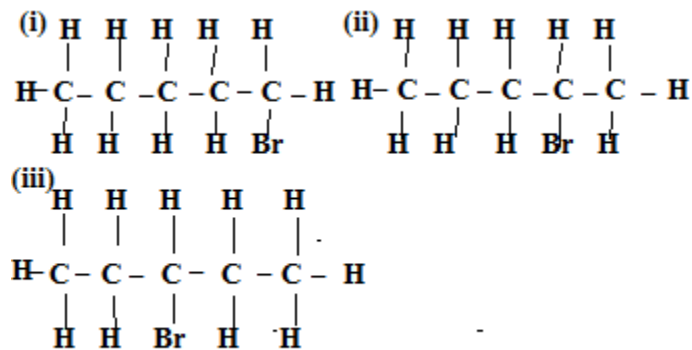
Q1.How would you name the following compounds?

(i) CH_3-CH_2-Br (ii) H – C = O (with H above C)

(iii)
```
     H  H  H  H
     |  |  |  |
H– C – C – C– C – C ≡ C
     |  |  |  |
     H  H  H  H
```
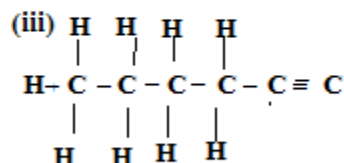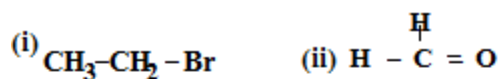
Ans.

(i) Bromoethane

(ii) Methanal (formaldehyde)

(iii) Hexyne

Q2.Why do ionic compounds have high melting points?

Ans.Ionic compounds have strong electrostatic forces of attraction between the ions. Therefore, it requires a lot of energy to overcome these forces. That is why ionic compounds have high melting points.

Page no 71

Q1.Why is the conversion of ethanol to ethanoic acid an oxidation reaction?

Ans.

CH_3CH_2OH + (Alkaline $KMnO_4$) → CH_3COOH

Since the conversion of ethanol to ethanoic acid involves the addition of oxygen to ethanol, it is an oxidation reaction.

Q2.A mixture of oxygen and ethyne is burnt for welding. Can you tell why a mixture of ethyne and air is not used?

Ans.When ethyne is burnt in air, it gives a sooty flame. This is due to incomplete combustion caused by limited supply of air. However, if ethyne is burnt with oxygen, it gives a clean flame with temperature 3000°C because of complete combustion. This oxy-acetylene flame is used for welding. It is not possible to attain such a high temperature without mixing oxygen. This is the reason why a mixture of ethyne and air is not used.

$2HC \equiv CH + 5O_2 \rightarrow 4CO_2 + 2H_2O + Heat$
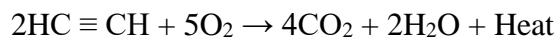
Q1.How would you distinguish experimentally between alcohol and carboxylic acid?

Ans.We can distinguish between an alcohol and a carboxylic acid on the basis of their reaction with carbonates and hydrogen carbonates. Acid reacts with carbonate and

hydrogen carbonate to evolve CO_2 gas that turns lime water milky.

Ex. $CH_3COOH(aq) + NaHCO_3(s) = CH_3COONa(s) + H_2CO_3(aq)$

$CH_3COOH(aq) + Na_2CO_3(s) = CH_3COONa(s) + H_2O(l) + CO_2(g)$
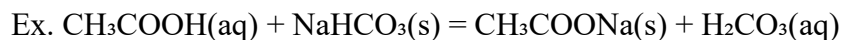
Alcohols, on the other hand, do not react with carbonates and hydrogen carbonates.

Q2.What are oxidising agents?

Ans.Some substances such as alkaline potassium permanganate and acidified potassium dichromate are capable of adding oxygen to others. These are known as oxidizing agents.

Q1.Would you be able to check if water is hard by using a detergent?

Ans.Detergents are ammonium or sulphonate salts of long chain carboxylic acids. Unlike soap, they do not react with calcium and magnesium ions present in hard water to form scum. They give a good amount of lather irrespective of whether the water is hard or soft. This means that detergents can be used in both soft and hard water. Therefore, it cannot be used to check whether the water is hard or not.

Q2.People use a variety of methods to wash clothes. Usually after adding the soap, they 'beat' the clothes on a stone, or beat it with a paddle, scrub with a brush or the mixture is agitated in a washing machine. Why is agitation necessary to get clean clothes?

Ans.A soap molecule has two parts namely hydrophobic and hydrophilic. With the help of these, it attaches to the grease or dirt particle and forms a cluster called micelle. These micelles remain suspended as a colloid. To remove these micelles (entrapping the dirt), it is necessary to agitate clothes.

Exercise

Q1.Ethane, with the molecular formula C_2H_6 has

(a) 6 covalent bonds.

(b) 7 covalent bonds.

(c) 8 covalent bonds.

(d) 9 covalent bonds.

Ans.(b) Ethane has 7 covalent bonds.

Q2.Butanone is a four-carbon compound with the functional group

(a) carboxylic acid.

(b) aldehyde.

(c) ketone.

(d) alcohol.

Ans.(c) The functional group of butanone is ketone.

Q3.While cooking, if the bottom of the vessel is getting blackened on the outside, it means that

(a) the food is not cooked completely.

(b) the fuel is not burning completely.

(c) the fuel is wet.

(d) the fuel is burning completely.

Ans.(b) While cooking, if the bottom of the vessel is getting blackened on the outside, then it means that the fuel is not burning completely.

Q4.Explain the nature of the covalent bond using the bond formation in CH_3Cl.

Ans. The structure of CH_3Cl is given below.

CH₃Cl

$$\text{H---C---Cl}$$

```
         H
         |
  H ---- C ---- Cl
         |
         H
```
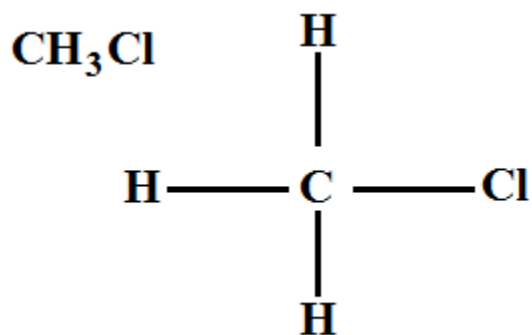
Carbon can neither lose four of its electrons nor gain four electrons as both the processes require extra amount of energy and would make the system unstable. Therefore, it completes its octet by sharing its four electrons with other carbon atoms or with atoms of other elements. The bonds that are formed by sharing electrons are known as covalent bonds. In covalent bonding, both the atoms share the valence electrons, i.e., the shared electrons belong to the valence shells of both the atoms.

Here, carbon requires 4 electrons to complete its octet, while each hydrogen atom requires one electron to complete its duplet. Also, chlorine requires an electron to complete the octet. Therefore, all of these share the electrons and as a result, carbon forms 3 bonds with hydrogen and one with chlorine.

Q5.Draw the electron dot structures for

(a) ethanoic acid.

(b) H₂S.

(c) propanone.

(d) F₂.

Ans.

(a)Ethanoic acid

(c)Propanone

(b)H₂S

(d)F₂
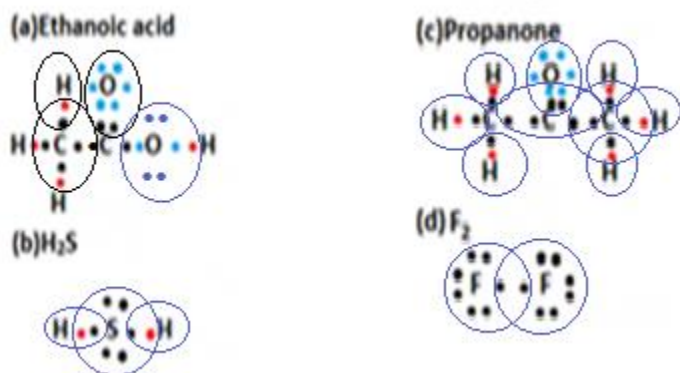
Q6.What is a homologous series? Explain with an example.

Ans.A homologous series is a series of carbon compounds that have different numbers of carbon atoms but contain the same functional group. For example, methane, ethane, propane, butane, etc. are all part of the alkane homologous series. The general formula of this series is C_nH_{2n+2}.

Methane CH_4

Ethane CH_3CH_3

Propane $CH_3CH_2CH_3$

Butane $CH_3CH_2CH_2CH_3$

It can be noticed that there is a difference of $-CH2$ unit between each successive compound.

Q7.How can ethanol and ethanoic acid be differentiated on the basis of their physical and chemical properties?

Ans.Ethanol is a liquid at room temperature with a pleasant odour while ethanoic acid has vinegar-like smell. The melting point of ethanoic acid is 17°C. This is below room

temperature and hence, it freezes during winters.

 Ethanoic acid reacts with metal carbonates and metal hydrogencarbonates to form salt, water, and carbon dioxide gas while ethanol does not react with them.

Q8.In the electrolytic refining of a metal M, what would you take as the anode, the cathode and the electrolyte?

Ans.In the electrolytic refining of a metal M:

Anode → Impure metal M

Cathode → Thin strip of pure metal M

Electrolyte → Solution of salt of the metal M

Q9.Why are carbon and its compounds used as fuels for most applications?

Ans.Most of the carbon compounds give a lot of heat and light when burnt in air. Saturated hydrocarbons burn with a clean flame and no smoke is produced. The carbon compounds, used as a fuel, have high calorific values. Therefore, carbon and its compounds are used as fuels for most applications.

Q10.Explain the formation of scum when hard water is treated with soap.

Ans.Soap does not work properly when the water is hard. A soap is a sodium or potassium salt of long chain fatty acids. Hard water contains salts of calcium and magnesium. When soap is added to hard water, calcium and magnesium ions present in water displace sodium or potassium ions from the soap molecules forming an insoluble substance called scum. A lot of soap is wasted in the process.

Q11.What change will you observe if you test soap with litmus paper (red and blue)?

Ans.Since soap is basic in nature, it will turn red litmus blue. However, the colour of blue litmus will remain blue.

Q12.What is hydrogenation? What is its industrial application?

Ans.Hydrogenation is the process of addition of hydrogen. Unsaturated hydrocarbons are added with hydrogen in the presence of palladium and nickel catalysts to give saturated hydrocarbons.

This reaction is applied in the hydrogenation of vegetables oils, which contain long chains of unsaturated carbons.

Q13.Which of the following hydrocarbons undergo addition reactions: C_2H_6, C_3H_8, C_3H_6, C_2H_2 and CH_4.

Ans. Unsaturated hydrocarbons undergo addition reactions. Being unsaturated hydrocarbons, C_3H_6 and C_2H_2 undergo addition reactions.

Q14.Give a test that can be used to differentiate chemically between butter and cooking oil.

Ans. Butter contains saturated fats. Therefore, it cannot be hydrogenated. On the other hand, oil has unsaturated fats. That is why it can be hydrogenated to saturated fats (solids).

Q15.Explain the mechanism of the cleaning action of soaps.

Ans. The cleansing action of soaps: The dirt present on clothes is organic in nature and insoluble in water. Therefore, it cannot be removed by only washing with water. When soap is dissolved in water, its hydrophobic ends attach themselves to the dirt and remove it from the cloth. Then, the molecules of soap arrange themselves in micelle formation and trap the dirt at the centre of the cluster. These micelles remain suspended in the water. Hence, the dust particles are easily rinsed away by water.

NCERT Solutions of class 10 science chapter 5- Periodic Classification of Elements

Page No: 81

Q1. Did Dobereiner's triads also exist in the columns of Newlands' Octaves? Compare and find out.

Ans. Yes, Dobereiner's triads also exist in the columns of Newlands' Octaves. One such column is Li, K, Na.

Q2. What were the limitations of Dobereiner's classification?

Ans. Limitation of Dobereiner's classification: All known elements could not be classified into groups of triads on the basis of their properties.

Q3. What were the limitations of Newlands' Law of Octaves?

Ans. Limitations of Newlands' law of octaves:

- It was not applicable throughout the arrangements. It was applicable up to calcium only. The properties of the elements listed after calcium showed no resemblance to the properties of the elements above them.

- Those elements that were discovered after Newlands' octaves did not follow the law of octaves.

- The position of cobalt and nickel in the group of the elements (F, Cl) of different properties could not be explained.

- Placing of iron far away from cobalt and nickel, which have similar properties as iron, could also not be explained.

Page No: 85

Q1. Use Mendeleev's Periodic Table to predict the formulae for the oxides of the following elements:

K, C, Al, Si, Ba.

Ans. K is in group 1. Therefore, the oxide will be K_2O.

C is in group 4. Therefore, the oxide will be CO_2.

Al is in group 3. Therefore, the oxide will be Al_2O_3.

Si is in group 4. Therefore, the oxide will be SiO_2.

Ba is in group 2. Therefore, the oxide will be BaO.

Q2. Besides gallium, which other elements have since been discovered that were left by Mendeleev in his Periodic Table? (any two)

Ans.Scandium and germanium.

Q3. What were the criteria used by Mendeleev in creating his Periodic Table?

Ans. Mendeleev used atomic mass of the elements as the unique criteria of the elements. He proposed that the chemical properties of elements are the periodic function of their atomic masses. And thus, he arranged the elements in the increasing order of their atomic masses.

Q4. Why do you think the noble gases are placed in a separate group?

Ans. Noble gases are inert elements. Their properties are different from all other elements. Therefore, the noble gases are placed in a separate group.

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Q1. How could the Modern Periodic Table remove various anomalies of Mendeleev's Periodic Table?

Ans. Various anomalies of Mendeleev's Periodic Table removed as follows in the Modern Periodic Table:

- Elements are arranged in the increasing order of their atomic number in the Modern Periodic Table, thus there was no need for keeping more than one element in one slot.

- In the Modern Periodic Table, there was no problem of the place of isotopes, as isotopes have the same atomic mass with different atomic numbers.

- Elements having the same valence electron are kept in same group.

- Elements having same number of shells were put under the same period.

- Position of hydrogen became clarified in as it is kept in the group with the elements of the same valence electrons.

Q2. Name two elements you would expect to show chemical reactions similar to magnesium. What is the basis for your choice?

Ans. Calcium (Ca) and strontium (Sr) are expected to show chemical reactions similar to magnesium (Mg). This is because the number of valence electrons (2) is same in all these three elements and since chemical properties are due to valence electrons, they show the same chemical reactions.

Q3. Name (a) three elements that have a single electron in their outermost shells.

(b) two elements that have two electrons in their outermost shells.

(c) three elements with filled outermost shells.

Ans.(a) Lithium (Li), sodium (Na), and potassium (K) have a single electron in their outermost shells.

(b) Magnesium (Mg) and calcium (Ca) have two electrons in their outermost shells.

(c) Neon (Ne), argon (Ar), and xenon (Xe) have filled outermost shells.

Q4. (a) Lithium, sodium, potassium are all metals that react with water to liberate hydrogen gas. Is there any similarity in the atoms of these elements?

(b) Helium is an unreactive gas and neon is a gas of extremely low reactivity. What, if anything, do their atoms have in common?

Ans.(a) Yes. The atoms of all the three elements lithium, sodium, and potassium have one electron in their outermost shells.

(b) Both helium (He) and neon (Ne) have filled outermost shells. Helium has a duplet in its K shell, while neon has an octet in its L shell.

5. In the Modern Periodic Table, which are the metals among the first ten elements?

Ans. Among the first ten elements, lithium (Li) and beryllium (Be) are metals.

6. By considering their position in the Periodic Table, which one of the following elements would you expect to have maximum metallic characteristics?

Ans. Since Be, lies to the extreme left-hand side of the periodic table, Be is the most metallic among the given elements.

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Excercise

Q1. Which of the following statements is not a correct statement about the trends when going from left to right across the periods of periodic Table.

(a) The elements become less metallic in nature.

(b) The number of valence electrons increases.

(c) The atoms lose their electrons more easily.

(d) The oxides become more acidic.

Ans.(c) The atoms lose their electrons more easily.

Q2. Element X forms a chloride with the formula XCl_2, which is solid with a high melting point. X would most likely be in the same group of the Periodic Table as

(a) Na

(b) Mg

(c) Al

(d) Si

Ans. (b) Mg

Q3. Which element has

(a) two shells, both of which are completely filled with electrons?

(b) the electronic configuration 2, 8, 2?

(c) a total of three shells, with four electrons in its valence shell?

(d) a total of two shells, with three electrons in its valence shell?

(e) twice as many electrons in its second shell as in its first shell?

Ans.

(a) Neon

(b) Magnesium

(c) Silicon

(d) Boron

(e) Carbon

Q4. (a) What property do all elements in the same column of the Periodic Table as boron have in common?

(b) What property do all elements in the same column of the Periodic Table as fluorine have in common?

Ans.

(a) Valency equal to 3.

(b) Valency equal to 1.

Q5. An atom has electronic configuration 2, 8, 7.

(a) What is the atomic number of this element?

(b) To which of the following elements would it be chemically similar? (Atomic numbers are given in parentheses.)

N(7) F(9) P(15) Ar(18)

Ans.

(a) The atomic number of this element is 17.

(b) It would be chemically similar to F(9) with configuration as 2, 7.

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Q6. The position of three elements A, B and C in the Periodic Table are shown below –

Group 16	Group 17
–	–
–	A
–	–
B	C

(a) State whether A is a metal or non-metal.

(b) State whether C is more reactive or less reactive than A.

(c) Will C be larger or smaller in size than B?

(d) Which type of ion, cation or anion, will be formed by element A?

Ans.

(a) A is a non-metal.

(b) C is less reactive than A, as reactivity decreases down the group in halogens.

(c) C will be smaller in size than B as moving across a period, the nuclear charge increases and therefore, electrons come closer to the nucleus.

(d) A will form an anion as it accepts an electron to complete its octet.

Q7. Nitrogen (atomic number 7) and phosphorus (atomic number 15) belong to group 15 of the Periodic Table. Write the electronic configuration of these two elements. Which of these will be more electronegative? Why?

Ans.

Nitrogen (7): 2, 5

Phosphorus (15): 2, 8, 5

Since electronegativity decreases with moving from top to bottom in a group, thus Nitrogen will be more electronegative.

Q8. How does the electronic configuration of an atom relate to its position in the Modern Periodic Table?

Ans.

In the modern periodic table, atoms with similar electronic configurations are placed in the same column. In a group, the number of valence electrons remains the same.

Elements across a period show an increase in the number of valence electrons.

Q9. In the Modern Periodic Table, calcium (atomic number 20) is surrounded by elements with atomic numbers 12, 19, 21, and 38. Which of these have physical and chemical properties resembling calcium?

Ans.

The element with atomic number 12 has same chemical properties as that of calcium. This is because both of them have the same number of valence electrons (2).

Q10. Compare and contrast the arrangement of elements in Mendeleev's Periodic Table and the Modern Periodic Table.

Ans.

Mendeleev's Periodic Table	Modern Periodic Table
Elements are arranged in increasing order of their atomic masses	Elements are arranged in increasing order of their atomic number
There are 8 groups	There are 18 groups
Each group is divided in subgroups (a) and (b)	Groups are not divided in subgroups
Group for noble gas is not present as noble gases were not discovered by that time	A separate group is meant foe noble gases
There was no place for isotopes	Rectified as slots are determined according to the atomic number.

Class X science best explained NCERT solutions of the chapter 6-Life Process(Biology part)

Q1. Why is diffusion insufficient to meet the oxygen requirements of multicellular organisms like humans?

Ans. Unicellular organisms are directly in contact with the environment so their requirement of oxygen is fulfilled by simple diffusion while the body of multi-cellular organisms like humans contains specialized cells and tissues for different kinds of functions. Hence due to the complex structure of the body, multi-cellular organisms can not meet the complete requirement of oxygen by the way of diffusion because their cells are not directly in contact with the surrounding environment.

Q2.What criteria do we use to decide whether something is alive?

Ans. All the things which have the movements like walking, breathing or growing are generally used to decide something is alive or not but there are invisible movements like the movement of molecules which results to have different functions like cellular respiration, digestion, etc results in the formation of different molecules in the living body, in short, all these activities are known as life processes. So the presence of the life process is the criteria to decide something is alive.

Q3.What is the outside raw material used for by an organism?

Ans. The raw material required by an organism depends on its complexity and surrounding environment, the raw materials needed to all organisms are as follows.

Food- The food is obtained from outside of the body for getting energy.

Water-Water is used for the digestion of food.

Oxygen- Oxygen is needed to breakdown food into carbon dioxide and energy.

Carbon dioxide- Carbon dioxide is needed to plants for the process of photosynthesis.

Q4.What processes would you consider essential for maintaining life?

Ans. Life processes such as respiration, transportation, excretion, nutrition, reproduction etc are needed for maintaining life.

Q5.What are the differences between autotrophic nutrition and heterotrophic nutrition?

Ans.

Sr.No.	Autotrophic nutrition	Heterotrophic nutrition
1	Food is synthesized from simple inorganic raw materials such as CO_2 and H_2O.	Food is obtained from autotrophs. This food is then broken down by the enzymes.
2	Chlorophyll is required	Chlorophyll is not required

3	Food is generally prepared at day time	Food can not be obtained at all time
4	All the green plants and some bacteria have this type of nutrition.	All the animals and fungi have this type of nutrition.

Q6.Where do plants get each of the raw materials required for photosynthesis?

Ans.The following raw materials required for photosynthesis

(i) CO_2 enters the cells of leaves through stomata.

(ii) Water is absorbed by the roots of plants.

(iii) Sunlight is absorbed by chlorophyll and other green parts of the plants.

Q7.What is the role of the acid in our stomach?

Ans. The role of acid HCl secreted by the wall of the stomach to kill the bacteria ingested with the food and maintains the ph. value of stomach so that enzymes could be secreted from the stomach wall for the digestion of food. It also activates the secretion of digestive juices in the pancreas, which further breaks down the food before absorption of the food in the intestine.

Q8.What is the function of digestive enzymes?

Answer- The function of digestive enzymes like amylase, lipase, pepsin, trypsin, lactase, maltase, etc secreted by stomach, pancreas, and small intestine is to breakdown complex food particles into simple food particle. These simple particles can be easily absorbed by the blood and thus transported to all cells of the body.

Q9.How is the small intestine designed to absorb digested food?

Ans. The small intestine has millions of tiny finger-like projections called villi. These villi are designed to increase the surface area for efficient absorption of food. Within these villages many blood vessels are present that absorb digested food and carry it to the bloodstream, then it is transported to every cell of the body.
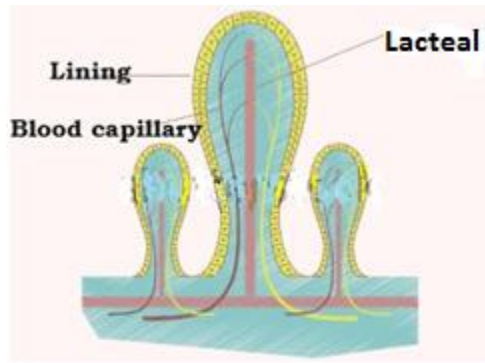
Q10.What advantages over an aquatic organism does a terrestrial organism have with regard to obtaining oxygen for respiration?

Answer- The amount of oxygen in the air is higher than the oxygen dissolved in the water. The terrestrial animals do not have to breathe faster for obtaining oxygen like aquatic animals because they get oxygen from the atmosphere whereas aquatic animals take oxygen from water so they are needed adaptation for getting required oxygen and thus breathe faster as compared to terrestrial animals.

Q11.What are the different ways in which glucose is oxidized to provide energy in various organisms?

Answer- During the cellular respiration in all organism 6 C atoms molecule of glucose is broken down into 3 C atoms molecule of pyruvate. Thereafter further pyruvate is broken in different ways in case of different organisms.
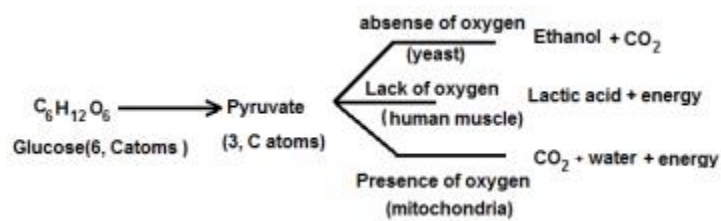
Anaerobic respiration- It occurs in the absence of oxygen. In yeast during the process of fermentation pyruvate is converted into ethanol, CO_2, and energy.

Aerobic respiration- It occurs in the presence of oxygen. In this process, pyruvate converted into CO_2, water, and energy. The release of energy is more in the case of Aerobic respiration as compared to Anaerobic respiration.

Lack of oxygen- It occurs due to vigorous activities. Due to lack of oxygen, the molecule of pyruvate converted into lactic acid and energy which results in cramp in muscles.

Q12.How is oxygen and carbon dioxide transported in human beings?

Answer-Carbon dioxide-As a result of respiration in our body cells CO_2 is formed which dissolves in the plasma of blood, this deoxygenated blood carried out from all parts of our body through the veins then it is transported to the lungs through the pulmonary artery. In the lungs, CO_2 diffused out and expelled out through the nostril.

Oxygen-Oxygen inhaled by us reaches to the lungs where it is diffused into the blood transported by the heart through the pulmonary artery and combines with hemoglobin forming oxyhemoglobin and then carried to the heart through the pulmonary veins. This oxygenated blood is pumped out by the heart to all parts of the body through the arteries and thus oxygen reaches every cell.

Q13.How are the lungs designed in human beings to maximize the area for the exchange of gases?

Answer- When we inhale air the diaphragm which separates the abdomen from the lungs dilated and as a result, the lungs also dilated as air comes into the lungs. Then O_2 diffuses into the blood through alveoli of the lungs which is made up of many capillaries. During the exhale the diaphragm contracted and space between the lungs and diaphragm becomes less which makes the lungs contracted and CO_2 diffuses into the lungs through alveoli of the lungs and expelled through our nostril.

Q14.What are the components of the transport system in human beings? What are the functions of these components?

Answer-Heart- The role of the heart is to receive deoxygenated blood from all parts of the body and send it to the lungs for oxygenation thereafter pumps this pure blood to all parts of the body.

Blood – Blood is called a connective tissue because each cell of the body gets nutrients, oxygen, water, etc from the blood. The blood transports waste products released by each cell of the body.

Blood vessels- The blood vessels are of three kinds.

(i) Veins- The role of veins is to carry deoxygenated blood from all parts of the body to the heart.

(ii) Artery- The role of the artery is to transport oxygenated blood to all parts of the body.

(iii)Capillaries- The role of the capillary is to serve oxygenated blood from arteries to tissues of our body and feed deoxygenated blood from the tissues back to veins.

Q15.Why is it necessary to separate oxygenated and deoxygenated blood in mammals and birds?

Answer- The mammals and birds live almost every part of the earth. They are required more energy for maintaining their body temperature because these kinds of organisms exist in hotter and cooler both places. The birds and animals have separate oxygenated and deoxygenated blood for getting an efficient supply of oxygen. So, efficient supply of oxygen releases more energy that is required by their body to maintain body temperature.

Q16.What are the components of the transport system in highly organized plants?

Answer- There are two kinds of conducting tissues in highly organized plants.

(i) Xylem- The role of xylem is to conduct water and minerals absorbed by the roots from the soil to the leaves.

(ii) Phloem- The role of phloem is to conduct food prepared by the leaves to all parts of the plant.

Q17.How are water and minerals transported in plants?

Answer- The root cells take mineral in the form of ions from the soil, it makes the difference in concentration between roots and soil, thus making a steady movement of water by the way of osmotic pressure. All xylem cells of roots, stem, and leaves are connected, the water transports from one cell to another through osmosis and ultimately reaches to leaves. Transpiration(loss of water from leaves) from the leaves increases this suction pressure, it forces the water into the xylem cell of the roots from the soil and thus maintains the flow of water and minerals from roots to leaves.

Q18.How is food transported in plants?

Ans. The food is transported through phloem tissues. All phloem cells of leaves, stem, and roots are connected. The food prepared by the leaves have more concentration compared to other parts obviously so it transported to other parts by the process of osmosis, the energy for this process is imparted by the ATP released during the photosynthesis.

Q19.Describe the structure and functioning of nephrons.

Answer- The nephron is the basic filtering unit of kidneys (cell of the kidney). It is responsible for removing waste products, stray ions and excess water. The main components of the nephron are glomerulus, Bowman's capsule and long renal tubule.
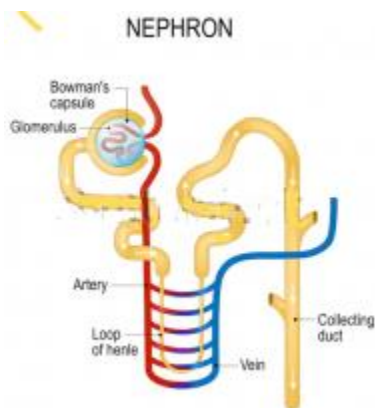
NEPHRON

- The blood enters the kidney through the renal artery which branches into many capillaries associated with glomerulus.
- Blood advances into Bowman's capsule and here water and solutes transfers to nephron.
- In the proximal tubule, some substances such as amino acids, glucose and salts are selectively reabsorbed and unwanted molecules are added in the urine.
- The filtrate then moves down into the loop of Henle where more water is absorbed.
- From here, the filtrate moves upwards into the distal tube and finally to the collecting duct. Collecting duct collects urine from many nephrons.
- The urine formed in each kidney enters a long tube called the ureter. From ureter, it gets transported to the urinary bladder and then into the urethra.

Q20. What are the methods used by plants to get rid of excretory products?

Ans. The excess water in the leaves excreted by the way of transpiration. The excess CO_2 and O_2 are excreted by the way of respiration and photosynthesis through the stomata of leaves respectively. The unwanted products like non-starch polysaccharides and certain hydrophobic substances which are referred to as gum generally stored in old xylem or in leaves.Certain waste products stored in the vacuole of cells.

Q21. How is the amount of urine produced regulated?

Answer-The amount of urine produced depends on excess water and waste material dissolved in it. The habitat of organism regulates urine production in the body. The hormone such as Antidiuretic hormone (ADH) secreted by the hypothalamus a part of the brain which is stored and released by pituitary glands is also acted on the kidney for controlling the amount of water excreted in the urine.

Q22. The kidneys in human beings are a part of the system for

(a) Nutrition

(b) Respiration

(c) Excretion

(d) Transportation

Answer-In human beings kidneys are a part of the system for excretion.

Q23.The xylem in plants are responsible for

(a) Transport of water

(b) Transport of food

(c) Transport of amino acids

(d) Transport of oxygen

Answer- The xylems in plants are responsible for the transport of water.

Q24.The autotrophic mode of nutrition requires

(a) Carbon dioxide and water

(b) Chlorophyll

(c) Sunlight

(d) All of the above

Answer-(d) The autotrophic mode of nutrition requires carbon dioxide, water, chlorophyll, and sunlight.

Q25.The breakdown of pyruvate to give carbon dioxide, water and energy takes place in

(a) cytoplasm

(b)mitochondria

(c)chloroplast

(d)nucleus

Answer- The breakdown of pyruvate to give carbon dioxide, water, and energy takes place in mitochondria.

Q26.How are fats digested in our bodies? Where does this process take place?

Answer- The fat in the food entered the small intestine in the form of a large globule (spherical pills). The bile acid secreted by the liver converts this large globule into a small globule or emulsify the fat (transformation of fat into small droplets). After the emulsification of fat, the lipase secreted by the pancreas further breaks down the fat into fatty acids and glycerol which is then absorbed by the intestine. This process of fat digestion occurs in the small intestine.

Q27.What is the role of saliva in the digestion of food?

Answer-The digestion of food is initiated from the mouth. The saliva is secreted from a salivary gland located at the bottom of the tongue. The role of saliva moistens the food and makes food bolus so that the food could be swallowed easily. Saliva contains the enzyme amylase which changes carbohydrate into simple sugar like maltose and dextrin which is further broken down in the small intestine.

Q28.What are the necessary conditions for autotrophic nutrition and what are its byproducts?

Answer-The autotrophic nutrition takes place through the process of photosynthesis. The required condition for photosynthesis is CO_2, water, chlorophyll pigments, and sunlight. Carbohydrates and oxygen are the byproducts of autotrophic nutrition.

$$6CO_2 + 6H_2O \xrightarrow[Chlrophyll]{Sunlight} C_6H_{12}O_6 + 6O_2$$
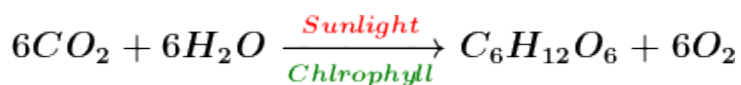
Q29.What are the differences between aerobic and anaerobic respiration? Name some organisms that use the anaerobic mode of respiration.

Aerobic respiration	Anaerobic respiration
It takes place in the presence of oxygen	It takes place in the absence of oxygen
It involves the exchange of gases between the organism and the environment	Exchange of gases between an organism and outside environment is absent
It occurs in cytoplasm and mitochondria	It occurs only in the cytoplasm
It always releases CO2 and H2O	The products formed depends on organisms
It yields 36 ATP's	It yields 2 ATP's

Ans. The anaerobic respiration occurs in yeast, some of the bacteria, worms in intestine like askaris and tapeworm etc.**Q30. Q30.How are the alveoli designed to maximize the exchange of gases?**

Answer-Alveoli has a thickness of almost one cell, has a balloon-like structure and moist surface and surrounded by many blood capillaries, these millions of alveoli extended on the surface of lungs increase the surface area of lungs and provides more exposure for the exchange of gases. During inhale and exhale the ribs lifted up and diaphragm flattened air is sucked into the lungs

and CO_2, O_2 exchanged through the millions of alveoli by the way of diffusion from blood to alveoli and alveoli to the blood.

Q31.What would be the consequences of a deficiency of hemoglobin in our bodies?

Answer- The oxygen is transported by hemoglobin from the heart to all parts of the body through arteries. The deficiency of hemoglobin in the blood will result in less supply of oxygen in our body cell which may cause exhaustion, dizziness or shortness of breath. Deficiency of hemoglobin may also cause anemia.

Q32.Describe double circulation in human beings. Why is it necessary?

Answer- Double circulation means the heart receives deoxygenated blood from all parts of the body through the veins and transports oxygenated blood to all parts of the body through the arteries. It is required to make the circulatory system more efficient and maintain body temperature.

Q33.What are the differences between the transport of materials in xylem and phloem?

Ans.

Xylem	Phloem
Xylem tissues help in the transports of water and minerals.	Phloem tissues help in the transports of the food
Water is transported upwards from roots to parts of the plants.	Food is transported in both upward and downward directions.
Transport in xylem occurs with the help of simple physical forces such as simple transpiration pull.	Transport of food in the phloem requires energy in the form of ATP.

Q34.Compare the functioning of alveoli in the lungs and nephrons in the kidneys with respect to their structure and functioning.

Ans.

Alveoli	Nephron
Alveoli are tiny balloon-like structure present inside the lungs	Nephrons are tubular structure present inside the kidney
The walls of alveoli are one cell thick and it contains an extensive network of blood capillaries.	Nephrons are made of glomerulus, Bowman's capsules and long renal tube.
The exchange of gases CO2 and O2 takes place between the blood of capillaries that surrounds alveoli and gases present in the	The blood enters the kidney through the renal artery. The blood is entered here and the nitrogenous waste in the form of urine is

alveoli.

Alveoli are the sites of gaseous exchange.

collected by collecting duct.

Nephrons are the basic filtration units.

You can compensate us

Class 10 Science NCERT Solution of the Chapter 7-Control and Coordination

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Q1. What is the difference between a reflex action and walking?

Ans..Reflex action is the involuntary action that occurs in response to a particular stimulus around us. The reflex action occurs without involvement of conscious areas of brain responsible for thinking. Reflex action is the exchange of communication between the peripheral nerves and brain through spinal cord..On the other hand voluntary actions are those which occur under the control of cerebrum , the largest part of the brain which is responsible for thinking, memory, emotions and intelligence. Walking is the action that requires thinking so it is a voluntary action.

Q2. What happens at the synapse between two neurons?

Ans. In response to the stimulus the nerve impulse generated and reaches to axon located at the end of neuron , the impulse triggers the neuron to generate a chemical known as neurotransmitter,the space between two neurons where this event occurs known as synapse, the generated neuron transmitter then transports to dendrite of next neuron and produces nerve impulse,this is the ways how the communication is exchanged from all cells of the body to the brain.

Q3. Which part of the brain maintains posture and equilibrium of the body?

Ans.Cerebellum which is a part of Hind brain is responsible for Controls the motor functioning hence it is the part reengaged in the maintenance of posture and equilibrium of the body.

Q4. How do we detect the smell of an agarbatti (incense stick)?

Ans.Smell of an agarbatti is detected by Nose, olfactory receptors present in the nose sends electrical signal to the fore brain. Fore brain interprets this signal as the incense stick to be detected as smell.

Q5. What is the role of the brain in reflex action?

Ans. Reflex actions are formed instantaneously in response to the stimulus that has no time to think. For instance the sensory nerves that detect the heat are connected to the nerves that move the muscles of the hand. Such a connection of detecting the signal from the nerves (input) and responding to it quickly (output) is known as reflex arc.

Reflex action are generated in spinal cord and the information also reaches brain. This helps the brain to record this event and remember it for future use. Brain helps the person the person to get awareness of the stimulus and prevent himself from that situation again.

Q6. What are plant hormones?

Ans. Plant hormones are the organic substances produces at certain sites of the plant and are translocated to other parts based on the requirement. Plant hormones help to coordinate growth, development and responses to the environment. Ex: Auxin's Gibberlin's, cytokines, abscisic acid and ethylene.

Q7. How is the movement of leaves of the sensitive plant different from the movement of a shoot towards light?

Ans.

S.No	Movement of leaves of the sensitive plant	Movement of shoot towards light
`1	It does not depend on the direction of stimulus applied.	Depends on the direction of stimulus applied.
2	Called as Nastic movement	Called as tropic movement
3	Touch is the stimulus	Light is the stimulus
4	Caused by the sudden loss of water from the swellings at the base of leaves	Caused by the unequal growth on the two sides of the shoot.
5	Not a growth movement	Growth movement

6   Occurs very fast   Occurs slowly

Q8. Give an example of a plant hormone that promotes growth

Ans. Auxins and Gibberellins are the hormones responsible for the growth of plants.Auxins are responsible for the cell elongation in shoot and also regulate growth.Gibberellin is responsible for stem elongation and germination.

Q9. How do auxins promote the growth of a tendril around a support?

Ans. Auxins are the plant hormones produced at the tip of a shoot and root. Auxins are present at the tip of tendrils. When tendrils are attached around any support their growth is slowed down as auxins are sensitive to touch. This make them move to the other side of the tip to get support this makes the other side grow faster than the side of tendril in contact with the support and the tendril bends towards the support.

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Q10. Design an experiment to demonstrate hydrotropism in plants.

Ans.Procedure :

i. Plant a seedling in a vessel containing soil.

ii. Adjacent to the seedling put a porous pot containing water.

iii. Leave the set up for few days.

Observation :

iv. On examining the roots it is observed that the roots bend towards the source of water and do not grow straight.

result :

It confirms that plant shows hydrotropism as the roots bend towards the porous pot of water. As hydrotropism is a plant growth response in which the direction of growth is determined by a stimulus of the gradient in water concentration.

Water in porous pot

Pea seedling

Hydrotropism
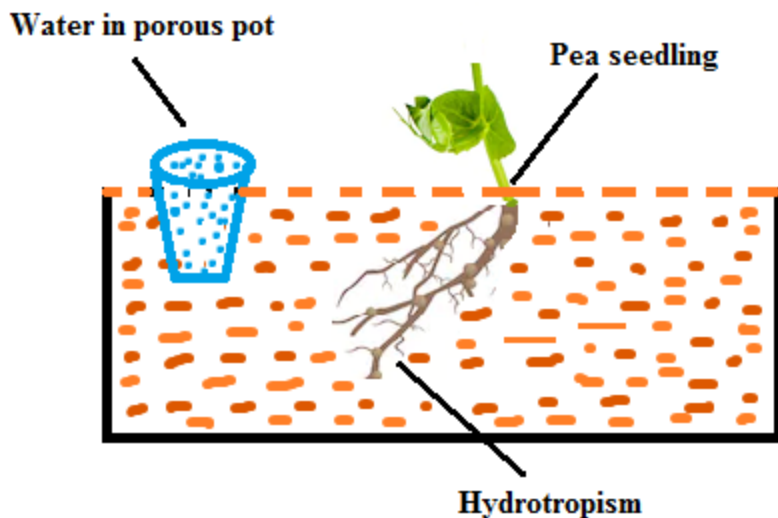
Q11.How does chemical coordination take place in animals?

Ans. Chemical coordination takes place in animals with the help of chemical messengers called as hormones. Hormones are the chemic fluids that are secreted by specific glands of the endocrine gland. Hormones regulate the growth, development, and homeostasis of the animals.

Q12.Why is the use of iodized salt advisable solution:

Ans.Usage of Iodized salt is advisable to avoid the deficiency of Iodine. If the intake of iodine is low, the release of thyroxine from the thyroid gland will be decreased. This affects fat, carbohydrate and protein metabolism

Thus a person may have a goiter problem in case if the intake of iodine is lowered

Q13.How does our body respond when adrenaline is secreted into the blood?

Ans. Adrenaline hormone is secreted in large amounts when a person is frightened, or mentally disturbed. When it reaches the heart, it beats faster to supply more oxygen to our muscles. The breathing rate also increases because of the contractions of the diaphragm and the rib muscles. It also raises the blood pressure and allows more glucose to enter into the blood. All these responses together enable our body to deal with emergency situations.

Adrenaline is a hormone secreted when a person is frightened or mentally disturbed. When Adrenaline reaches heart, the heartbeat will increase to increase blood supply to our muscles. Adrenaline also increases the breathing rate because of the contraction of the diaphragm and the rib muscles. Adrenaline rush also increases blood pressure and allows entry of more glucose into the blood. These altogether occur when our body responds to the secretion of adrenaline into our blood.

Q14.Why are some patients of diabetes treated by giving injections of insulin?

Ans. Diabetes is a condition where insulin hormone is produced less or stopped by pancreatic cells of a person. Insulin regulates blood glucose by converting extra glucose to glycogen. When insulin is not produced adequately person's blood glucose level which leads to adverse effects. In order to maintain insulin and blood glucose level diabetes patients are treated with injections of insulin.

Q15. Which of the following is a plant hormone?

(a) Insulin

(b) Thyroxin

(c) Oestrogen

(d) Cytokinin

Answer is d) cytokinin.

Cytokinin is a plant hormone whereas Insulin, Thyroxin, Oestrogen are the hormones produced by animals.

Q16.The gap between two neurons is called a

(a) Dendrite.

(b) Synapse.

(c) Axon.

(d) Impulse.

Solution:

The answer is (b) Synapse

Dendrite is a short branched extension of a nerve cell, along which impulses received from other cells at synapses are transmitted to the cell body.

An axon or nerve fiber is a long, slender projection of a nerve cell or neuron in vertebrates that typically conducts electrical impulses known as action potentials away from the nerve cell body. The function of the axon is to transmit information to different neurons, muscles, and glands.

Impulse an electrical signal that travels along axon.

Q17.The brain is responsible for

(a) Thinking.

(b) Regulating the heartbeat.

(c) Balancing the body.

(d) all of the above.

Answer is (d) all the above

Brain is responsible for thinking, brain regulates the heartbeat, and it balance the body.

Q18.What is the function of receptors in our body? Think of situations where receptors do not work properly. What problems are likely to arise?

Ans. Receptors are present throughout our body mainly sense organs. Receptors collect the information about changes that happen around us and send the signal to information to brain which render effector mechanism against the change. When receptors do not work properly, the environmental stimuli are not able to create nerve impulses and body does not respond.

Q19.Draw the structure of a neuron and explain its function.

Ans. Neurons are nerve cells which are functional units of the nervous system. Three main parts of neurons are Dendrites, Axons and cell body.

Structure of Nueron
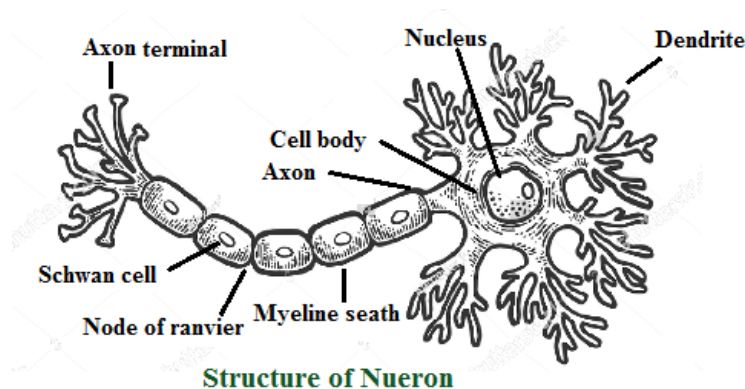
Dendrite: Detects information and sends it to cell body

Cell Body: Maintains growth of the cell

Axon: Conducts messages away from cell body and signal to next neuron.

Q20.How does phototropism occur in plants?

Ans. Directional movement and growth of plant in response to light is called as phototropism. Phototropism occurs due to increased auxin on the dark side and decreased auxin on the illuminated side. Because of presence of more auxin, leaf in the darker side grows faster causing it to bend towards the source of light.

Q21.Which signals will get disrupted in case of a spinal cord injury?

Ans. In case of a spinal cord injury Reflex action – Impulses from various body parts will not be conducted to brain. Message from brain will not be conducted to various organs of the body.

Q22.How does chemical coordination occur in plants?

Ans. Plant growth, development and responses to the environment is controlled and coordinated by a special class of chemical substances known as hormones. Hormones are produced in one part of the plant and are transported to all the needy parts of the plant. The five major types of phytohormone are auxins, gibberellins, cytokinins, abscisic acid, and ethylene. These phytohormones are either growth promoters (such as auxins, gibberellins, cytokinins, and ethylene) or growth inhibitors such as abscisic acid.

Q23.What is the need for a system of control and coordination in an organism?

Ans. There are various organs in an organism. These organs must be carefully controlled and coordinated for the survival of an organisms. In the body of an organism various fluids are secreted from the glands of the endocrine system. These hormones are responsible for the overall growth and development of an organism. All others daily decision that includes voluntary and involuntary action are controlled by central nervous system (CNS).

Coordination is needed for all human activities we perform. Our nervous system receives information from surroundings which is processed and response is ilicited. The endocrine system (hormonal system) helps in integrating various metabolic activities like reproduction, development, and all reflex actions (cope up with various give up situations).

The hormonal system in plants helps in process of photosynthesis; they need carbon dioxide, water and sunlight. The stomatal opening in leaves opens up to allow in carbon dioxide gas, the roots bend towards water and the stem grows towards sunlight, the tendrils in climbing pants are supported by the hormonal system of the plant body.

Thus, we have need of control and coordination system in an organisms.

Q24.How are involuntary actions and reflex actions different from each other?

Ans.

Reflex actions   **Involuntary actions**

1. Rapid automatic responses to a stimulus without the conscious involvement of the brain	1. Occurs without the consciousness of an organism
2. Controlled by spinal cord	2. Controlled by mid brain or medulla oblongata
3. Very quick and instantaneous	3. Relatively slower
4. May involve any muscle or a gland	4. Involves only smooth muscles
5. Can be conditioned	5. Cannot be influenced by external conditioning
Examples: Blinking of eyes, salivation	Examples: Beating of heart, blood circulation

Q25.Compare and contrast nervous and hormonal mechanisms for control and coordination in animals.

Ans.

Nervous control	Hormonal Control
1 It is consist of nerve impulses between PNS, CNS and Brain.	1 It consists of endocrine system which secretes hormones directly into blood.
2 Here response time is very short.	2 Here response time is very long.
3 Nerve impulses are not specific in their action.	3 Each hormone has specific actions.

4 The flow of information is rapid.   4 The flow of information is very slow.

Q26.What is the difference between the manner in which movement takes place in a sensitive plant and the movement in our legs?

Ans.

Sl. no	Movement in sensitive plants		Movement in our legs
1	The movement in a sensitive plant is a response to stimulus (touch) which is an involuntary action.	1	Movement in our legs is a voluntary action.
2	No special tissue is there for the transfer of information	2	A complete system CNS and PNS is there for the information exchange.
3	Plant cells do not have specialized protein for movements.	3	Animal cells have specialized protein which help muscles to contract.

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NCERT solutions for class 10 Chapter 8 How do organism reproduce

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Q1.What is the importance of DNA copying in reproduction?

Ans.DNA copying in reproduction is important because of the following features

(i) DNA coping maintains the characteristics of the species according to the change in the environment.

(ii) It is a code for designing the species in the next generation.

(iii) DNA copying is the key to evolution,it leads to the formation of new species.

(iv) DNA copying evokes the survival of the organism.

Q2.Why is variation is beneficial to species but not necessarily for the individual?

Ans. Variation is beneficial to the species because variation provides means of adaptability of the species in a particular nitch.If the variation is not there among the species then the species might be finished . Variation is not necessarily beneficial to the individual because in the changing condition few individuals may be extinct or die out but a percentage of the species modifies them and follows survival for the fittest one and thus new species are originated that is the formula for evolution of evolution.

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Q1. How does binary fission different from multiple fission?

Ans.

Binary Fission	Multiple Fission
In binary fission parent cell divedes into two equal half daughter cells	In multiple fission parent cell divides into more than two daughter cells
This process occurs in favourabe condition	This process occurs in unfavourable condition
Binary fission takes place in amoeba,paraemecium	Multiple fission takes place in plasmodium etc

Q2.How will an organism be benefitted if it reproduces through spores?

Ans. An organism be benefitted if it reproduces through spores because spores are covered with thick layers that defend them from adverse conditions as for example heat and cold. The spores

can be transferred from one place to other through the animal, air and water, therefore it benefits them to have well productivity. When spores get favourable conditions(moisture) they explode and settle down on the earth and grow again. All these features make the spores live successfully in unfavourable conditions.

Q3. Can you think of reasons why more complex organisms can not give rise to new individuals through regeneration?

Ans. All complex organisms have different systems for different functions in the body. Systems are made of organs, all organs are made of tissues and all tissues are made of cells, thus complex organisms are highly differentiated to performed specialized functions. The key point in the case of the complex organism that different types of tissues are composed of different type of cells, so any cut to the part of a complex organism, can not be reproduced to an organism, as an example any part of the human body can not be reproduced to a new individual,in contrary to this body of simple organism are made of similar types of the cell,therefore any part of their body can be reproduced to new individual.

Q4.Why is vegetative propagation is practiced for growing some types of plants?

Ans. Vegetative propagation is used to grow plants that don't generate seeds, for example, rose, jasmines, and other plants.

Vegetative propagation also protects plants from diseases.

Vegetative propagation also maintains the quality of the plant because the plants which are produced through vegetative propagation are more similar than the plants produced by the seeds.

Q5.Why is DNA copying an essential part of the process of reproduction?

Ans. DNA copying is an essential part of the process of reproduction because this process transfers the characteristics of the parent to the offspring. DNA transferred to the next generation is not the exact copy of the parent,it varies from generation to generation, this variation of DNA copying protects the organism from changing environment.

Page : 140

Q1.How is the process of pollination different from fertilization?

Ans. The process of transferring pollen from the male part of the flower(anther) to the female part of the flower (stigma) is known as pollination and the fusion of male and female gametes is known as fertilization.

Pollination   Fertilization

The process of transferring pollen from the male part of the flower (anther) to the female part of the flower (stigma) is known as pollination	The process of uniting male gametes and female gametes is known as fertilization
Pollination occures only in the plants	Fertilization is the common process that occures in every organisms
Pollination is external process since it takes place in external part of the flowers	Fertilization is the internal process that takes place inside the body of organism
There are two types of pollination self pollination and cross pollination	There are two types of fertlization internal fertilization and external fertilization.

Q2.What is the role of seminal vesicles and prostate glands?

Ans. The role of seminal vesicles and prostate glands is to secrete fluids that are part of semen, the fluids secreted by seminal vesicles make two-thirds part of the semen, it prepares the passage for sperms. Prostate glands secret the fluids that contain nutrients and slightly alkaline in nature, it nourishes the sperms and neutralizes the acidic medium in the urethra and vaginal track.

Q3. What are the changes seen in girls when at the time of puberty?

Ans. At the time of puberty, girls have some changes.

Their breast enlarged

Hips become in a rounded shape

The pitch of sounds increases

Q4. How does the embryo get nourishment inside the mother's body?

Ans. The embryo inside the uterus is connected to the uterine wall through a special tissue placenta that is developed in the mother's body during the pregnancy. The nutrients from the blood of the mother transfer to the embryo through the placenta and when the embryo develops to the foetus then waste products also transfers from the foetus to the mother's blood in the same way.

Q5. If a woman is using Copper-T, will it help in protecting her from sexually transmitted diseases?

Ans. Copper -T is an intrauterine contraceptive divice , in this device copper ions prevents sperms to reach eggs and thus it cancels the fertilization process in the uterus. Since it does not

provide any barrier against the mixing of fluids of two individuals therefore sexually transmitted disease can not be protected through Copper-T.

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Exercise

Q1. Asexual reproduction takes place through budding in

(a) Amoeba

(b) Yeast

(c) Plasmodium

(d) Leishmania

Ans.(b) Yeast

Q2. Which of the following is not a part of the female reproductive system in human beings?

(a) Ovary

(b) Uterus

(c) Vas deferens

(d) Fallopian tube

Ans.(c) Vas deferens

Q3. The anther contains

(a) Sepals

(b) Ovules

(c) Pistil

(d) Pollen grains

Ans.(d) Pollen grains

Q4. What are the advantages of sexual reproduction over asexual reproduction?

Ans. The advantages of sexual reproduction over asexual reproduction are following.

(i) The organisms produced by sexual reproduction have the character of both the parents.

(ii) During sexual reproduction variations in DNA occurs this change is necessary for the adaptability of the organism in changing environment.

(iii) The organisms produced by the asexual reproduction are just a clone,there is no variation which is necessary for the evolution of species, in this respect the organisms produced by sexual reproduction can survive in a better way.

Q5. What are the functions performed by the testis in human being?

Ans. The testis in human being produces sperms and testosterone hormone which is responsible for building up body mass and muscles. The testis also produces androgen an important hormone responsible to develop secondary sexual characteristics like body hair growth, voice change, bone and muscle development.

Q6.Why does menstruation occur?

Ans. The ovary of women releases an egg every month and at the same time uterus prepares itself to receive a fertilized eggs, the inner lining of the uterus thickened and blood supplied by the body to the inner lining of the uterus for the formation of the embryo but when eggs are not fertilized this thicken layer inside the uterus broken up slowly and results in menstruation.

Q7.Draw a labelled diagram of the longitudinal section of a flower.

Q8. What are different methods of contraception?

Ans. The different methods of contraception are used as follows

Barrier method: In this method sperms are prevented by applying a barrier like condoms for males and females, diaphragm in female,in this method a cap is installed at the opening of the cervix that prevents sperms to drift onwards.

Pills: The pills contain hormones that are utilized to block eggs and thus fertilization doesn't take place, two types of pills are used oral pills and vaginal pills.

Surgical method: For males, the kind of surgery vasectomy is utilized in which vase deferens is blocked and transportation of sperms are prevented to go further into the vagina. For female tubectomy is utilized in which the fallopian tube is blocked so the fertilized eggs don't enter the uterus.

Intra-Uterine Devices: These devices are used in females in which the device in implanted into the fallopian tubes and thus flow of fertilized eggs is blocked, its example is Copper T.

Important terms used in the NCERT Solutions of Class 10 Science Chapter 9 Heredity and Evolution

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Heredity: We look like our parents due to the process of heredity, heredity is the transmission of the traits from one generation to the next generation, as an example colour of the eye, blood group or diseases like diabetes etc.

Genes: Heredity is determined by genes, genes are transmitted from one generation to the next generation in the form of pair of traits known as alleles, alleles are copies of genes. One copy of the gene from the sperm and other copy from the egg is transmitted to the next generation.

Homozygous and Heterozygous traits: When transmitted copies of the genes (alleles) are identical then it is a homozygous trait for that gene and when both transmitted copies are different then it is heterozygous for that gene.

Dominant and Recessive trait: The traits which are highlighted in next-generation are known as dominant traits and the traits which are suppressed in next-generation are known as Recessive traits.

NCERT Solutions of Class 10 Science Chapter 9 Heredity and Evolution

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Q1. If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the population, which trait is likely to have arisen earlier?

Ans. In asexual reproduction, the parent cell reproduces a similar daughter cell. It is given to us that trait B exists in 60 % of the population of a species and trait A exists in 10 % of the total

population of the species since trait B represents a larger population as compared with trait A therefore trait B is likely to have arisen earlier.

Q2. How does the creation of variations in a species promote survival?

Ans. The creation of variation in a species promote survival because variation protects the species from adverse atmospheric condition, in changing atmospheric condition the variation causes the species to adapt themself, as an example bacteria variants that are fitted in adverse condition like heat and cold survive better, such bacteria spreads faster compared to those bacteria which couldn't fit in that condition. Therefore the creation of variation in a species promotes survival.

Page 147

Q1. How do Mendel's experiments show that traits may be dominant or recessive?

Ans. Mendel shows that traits may be dominant or recessive through his experiment of monohybrid cross (single trait). In his first experiment, he considered a single trait i.e tallness of pea plant, for that he fertilized a tall plant(TT) to a dwarf plant (tt), which results in all tall plants in the F1 generation, thereafter he fertilized two TT plants of F1 generation through artificial pollination and found the result in F2 generation that one-fourth plants were seen, dwarf. Mendel concluded to that fact the tall plants produced in F1 generation were not the real tall TT plants which he had taken for the experiment, practically those plants of the F1 generation were Tt plants means the dwarfness of the plants were not seen, here in F1 generation tallness of pea plants shown is a dominant trait and since dwarfness is not seen in F1 so it is a recessive trait.

Plants taken for experiments =(TT),(TT)

F1 generation = (Tt),(Tt),(Tt),(Tt), in Tt, T trait is dominant, t trait is recessive

F2 generation =(Tt),(Tt),(Tt),(tt), in Tt, T trait is dominant, t trait is recessive and in tt, t trait is dominant and T is recessive.

Q2. How do Mendel's experiments show that traits are inherited independently?

Ans. Mendel's experiments show that traits are inherited independently, for this experiment he took two pea plants differing from each other by two characters, he crossed one plant with yellow and rounded seed to another plant with green and wrinkled seed. In (F1) first-generation, it results in the plants with yellow rounded seeds, and F2 generation results in the plants with round yellow, round green, and wrinkled yellow seeds, thus Mendel concluded to the fact that traits are inherited independently.

Q3. A man with blood group A marries a woman with blood group O and their daughter had blood group O, Is this formation enough to tell you which of the traits - blood group A or O - is dominant? Why or why not?

Ans. The information that a man with blood group A marries a woman with blood group O and their daughter had blood group O is not sufficient to tell that blood group A or O is dominant. The father's blood group A tells that it may have homozygous traits AA or heterozygous AO, mother's blood group O tells that she may have homozygous trait OO or AO. Since genotypically 50-50 % of traits has to be transferred to next-generation, In both the cases the daughter must have the blood group O, therefore we can't say which of traits A or O is dominant since generally A, B and AB traits are dominant and O is recessive.

NCERT Solutions of Class 10 Science Chapter 9 Heredity and Evolution

Q4. How is the sex of the child determined in human beings?

Ans. In a human being, the male has the XY chromosomes where x shows the trait of female and y shows the trait of male and a female has XX chromosomes where both traits show the trait of girls. Therefore in males, 50 % of chromosomes are of each one X and Y, when fertilization occurs Y chromosomes in sperm fuse X chromosomes in eggs,a boy is produced, and when X chromosome in sperm fuses X chromosome in female a girl is produced.
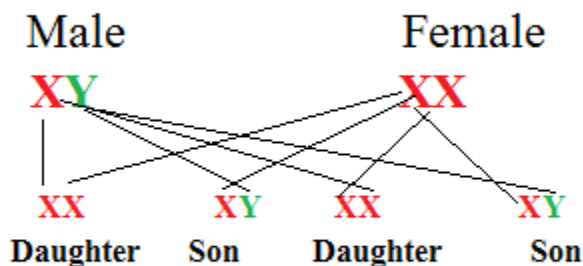
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Q1. What are the different ways in which individuals with a particular trait may increase in a population?

Ans. The population of an individual with a particular trait may increase in a population in the following ways.

(i). The trait is beneficial to the population: A group of species use camouflage to blend into their surrounding, it helps them to defend from predators, such traits help them to increase their population. For example, the green colour in beetles is favourable as it helps them camouflage against predators.

(ii). Genetic drift: if a population faces an accident such that majority of its members get killed, the remaining members will pass on their traits to the subsequent generations. This will lead to an increase of the trait in the population.

(iii). By mutation: In reproduction during cell division the mistake in DNA copying is beneficial for the species to survive in changing circumstances, thus helps the species to increase their population.

(iv). Naturally Selection: If a trait is useful to the population, it will increase naturally. It may be direct the evolution of species population by adaptions to fit their environment better.

Q2. What are traits acquired during the lifetime of an individual not inherited?

Ans. The acquired traits during a lifetime of an individual are influenced by the surroundings. These traits are not coded by the DNA of the germ cells, this happens because an acquired trait involves a change in non-reproductive tissues(somatic cells) which cannot be inherited.

Q3. Why are the small numbers of surviving tigers a cause of worry from the point of view of genetics?

Ans 1. The small number of surviving tigers is a cause of worry because it can result in the loss of genetic variability. This sudden extinction of the tigers and their genes will affect the diversity of nature. The decrease in the tiger population results in a decrease in the genetic pool of tigers. This might even lead to extinction.

2. During the long process of evolution, these tigers carry the genes which have made them adapt to the particular environment. Genes responsible for the survival would not be able to contribute to future generations survival if the tigers became extinct due to any disease or by hunting.

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Q1. What factors could lead to the rise of a new species?

Ans. There are many factors that lead to the rise of a new species. Listed below are a few factors:

1. Genetic drift

2. Natural selection

3. Genetic mutation

4. Reproductive isolation

5. Environmental factors on the isolated populations.

6. Quantum of genetic variant inherited from one generation to the next generation.

Q2. Will geographical isolation to be a major factor in the speciation of a self-pollinating plant species? Why or why not?

Ans. No, geographical isolation will not be a major in the speciation of self-pollinating plant species. Geographical isolation creates the separation of the population. It is because in self-pollinating species, new variants are not formed and they do not show any variation in the population. After self-pollination, the homozygous line evolve. In contrast, after cross-pollination, the homozygous line evolves and it results in the variation of traits in the population.

Q3. Will geographical isolation to be a major factor in the speciation of an organism that reproduces asexually? Why or why not?

Ans. No, geographical isolation will not be the major factor in the speciation of asexually reproducing organisms. This is because there is no exchange of genetic material with the other species in such organisms. They pass on the parent DNA to the offspring which leaves no chance of speciation.

NCERT Solutions of Class 10 Science Chapter 9 Heredity and Evolution

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Q1. Give an example of characteristics being used to determine how close two species are in evolutionary terms.

Ans. In the example of man and ape, both of these two organisms are closed to each other in evolutionary terms because they have similar body designs as an example the hair in their body and mammary glands. In the case of the fish and man, the fish have jaws, vertebral columns and a brainbox which is matched with the man but the fish looks quite different from the man leads to the distant relationship between both of the organisms. There are two characteristics to determine how close are two species are in evolutionary terms.

Homologues and analogues organs are two characteristics to determine how close are two species are in evolutionary terms.

Homologous organs are similar organs in basic structure but perform different functions, this characteristic shows divergent evolution.

Analogous organs are different organs in basic structure but perform the same function, these characteristics show convergent evolution.

Q2. Can the wing of a butterfly and the wing of a bat be considered homologous organs? Why or why not?

Ans. No, the wings of the bat and the wings of the butterfly should not be considered as homologous organs because they have different structures and origins but have the same function of flying so they are analogous organs.

Q3. What are fossils? What do they tell us about the process of evolution?

Ans. Fossils are the preserved remains or traces of animals, plants and other organisms from the past.

Fossils help us in many ways like:

1. They give great insight into the evaluation. For example, the pattern of fossil distribution gives us an idea of the time in history when various species were formed and extinct.

2. They help us in establishing evolutionary relations between present organisms. Example: Archaeopteryx (connecting link between reptiles and birds).

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Q1. Why are human beings who look so different from each other in terms of size, colour and looks said to belong to the same species?

Ans. All human beings, even though they have different sizes, colour and looks, belong to the same species because they have similar DNA sequences and have descended from the same ancestors. Also, they are capable of reproducing among themselves. These variations may have arisen due to environmental factors, mutation and mixing characteristics during reproduction.

Q2. In evolutionary terms, can we say which among bacteria, spiders, fish and chimpanzees have a 'better' body design? Why or why not?

Ans. No, we cannot say that there is a better body design as these organisms evolved according to their needs to survive in the environment. If a chimpanzee has strong limbs capable of multiple actions, the bacteria can survive in extreme conditions where other organisms cannot. Hence there is no better body design.

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NCERT Solutions of Class 10 Science Chapter 9 Heredity and Evolution

Exercises

Question no.1 exercises NCERT Solutions of Class 10 Science Chapter 9 Heredity and

Q1. A Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing white flowers. The progeny all bore violet flowers, but almost half of them were short.

This suggests that the genetic make-up of the tall parent can be depicted as:

(a) TTWW

(b) TTww

(c) TtWW

(d) TtWw

Ans. (c) TtWW

Question no.2 exercises NCERT Solutions of Class 10 Science Chapter 9 Heredity and

Q2. An example of homologous organs is:

(a) our arm and a dog's fore-leg

(b) our teeth and an elephant's tusks

(c) potato and runners of grass

(d) all of the above

Ans. (d) All of the above

Question no.3 exercises NCERT Solutions of Class 10 Science Chapter 9 Heredity and

Q3. In evolutionary terms, we have more in common with:

(a) a Chinese school-boy

(b) a chimpanzee

(c) a spider

(d) a bacterium

Ans. (a) a Chinese school-boy

Question no.4 exercises NCERT Solutions of Class 10 Science Chapter 9 Heredity and

Q4. A study found that children with light-coloured eyes are likely to have parents with light coloured eyes. On this basis, can we say anything about whether the light eye colour trait is dominant or recessive? Why or why not?

Ans. Let the trait of light -coloured eye is represented by LL, in this study children have the trait LL with their parents having the traits LL, in this case, it is obvious that parents with LL will produce children with LL trait, in homozygous LL of parent we can't say that light eye colour trait is dominant or recessive until we have the information of at least three generations.

Question no.5 exercises NCERT Solutions of Class 10 Science Chapter 9 Heredity and

Q5. How are the areas of study evolution and classification interlinked?

OR

Two areas of study namely 'evolution' and classification are interlinked. Justify this statement.

Ans. Classification of organisms tells us how closed are organism to each other that information feeds us about their common ancestor. The differentiation among the organisms tells us the distant relationship among them, these variations among the species enable them to adapt to particular environmental conditions, this is all about evolution.

Question no.6 exercises NCERT Solutions of Class 10 Science Chapter 9 Heredity and

Q6. Explain the terms analogous and homologous organs with examples.

Ans. **Analogous Organs:** The organs which have a different basic structure to each other between two organisms but perform the same functions. As an example, the wings of birds and insects are different in structure, both of them are evolved independently but the wings of both of them are used for flight.

Homologous organs: The organs which have a similar structure between two organisms but perform different functions. As an example, the wings of birds and fins of fish, both of them evolved from the same origin, but fins of fish are used to swim and wings are used to flight.

Question no.7 exercises NCERT Solutions of Class 10 Science Chapter 9 Heredity and

Q7.Outline a project which aims to find the dominant coat colour in dogs.

Ans. We choose one male dog of homozygous black colour(BB) and a female dog of homozygous white colour (ww) and cross them, then observing the colour coat in the offspring.

First-generation of such parent dogs shows (Bw, Bw, Bw, Bw), all are heterozygous black where black colour is dominated

If we cross two heterozygous black dogs, then puppies in the next generation will be (BB, Bw, Bw,ww),1 homozygous black, two heterozygous black where black colour is dominated and 1 homozygous white dog.

The ratio between the dogs of different pair of genes are 1:2 :1

If total puppies produced in second generations are 40 in number

The number of homozygous black puppies are $=(1/4)\times40=10$

The number of heterozygous black puppies are $=(2/4)\times40=20$

The number of homogeneous white puppies are $=(1/4)\times40=10$

Question no.8 exercises NCERT Solutions of Class 10 Science Chapter 9 Heredity and

Q8.Explain the importance of fossils in deciding evolutionary relationships.

Ans. The fossils give us the following information

(i) Evolutionary process of life in the earth.

(ii) The structure of the organism that enables us to link with present creatures available on the earth.

(iii) Fossils of theropods dinosaurs and dinosaurs with features give us an idea that birds are descended from the dinosaurs.

(iv) Wich animals evolved earlier and which were evolved later

(v) The fossils which were found near the surface are more complex than the fossils which were found deeper inside the earth.

Question no.9 exercises NCERT Solutions of Class 10 Science Chapter 9 Heredity and

Q9.What evidence do we have for the origin of life from inanimate matter?

Stanley L. Miller and Harold C. Urey gave proof with respect to the beginning of life from inanimate matter. They managed an environment like that that existed on early earth. The environment had molecules like ammonia, methane, hydrogen sulfide and water, but no oxygen.

The blend was kept up at a temperature just underneath 100°C and sparkes were passed through the combination of gases. They observed the result after a weak, 15% carbon from methane had been changed over to simple molecules of carbon like amino acids which make up protein particles. In this way, life emerged on earth.

Question no.10 exercises NCERT Solutions of Class 10 Science Chapter 9 Heredity and

Q10.Explain how sexual reproduction gives rise to more viable variations than asexual reproduction. How does this affect the evolution of those organisms that reproduce sexually?

Ans. Sexual reproduction gives rise to more viable variations than asexual reproduction because in asexual reproduction there is neglected error in DNA that results in neglected variations in the offspring, In asexual reproductions, the progeny is either more or less similar to the parents. So there are more chances of the organism to be extinct due to lack of variations.

In sexual reproduction during gamete, formation meiosis occurs between homologous chromosomes of male and female and cell division takes place which brings about new gene formation which is transferred to a new generation, in this matter natural selections is processed, in the natural selection those variations which have more adaptive value undergoes to the formation of new species.

Question no.11 exercises NCERT Solutions of Class 10 Science Chapter 9 Heredity and

Q11.How is the equal genetic contribution of male and female parents ensured in the progeny?

Ans. In the human cell, there is a total of 46 chromosomes or 23 pairs of chromosomes. During the process of reproduction, each pair of chromosomes contributes one chromosome to the offspring, thus half of the chromosomes are transferred to children from each parent. Among 23 pairs of chromosomes, 22 pairs are the same in male and female which are known as autosomes and the rest one pair is sex chromosomes that are different in male and female and decide the sex of the child. In males, there is a pair of XY chromosomes and female XX pair. When X of male reproduces X of female then offspring is a female and when Y of female reproduces X or female then the offspring is a male.

Question no.12 exercises NCERT Solutions of Class 10 Science Chapter 9 Heredity and Evolution

Q12.Only variations that confer an advantage to an individual organism will survive in a population. Do you agree with this statement? Why or why not?

Ans. In sexual reproduction, the variations that confer an advantage to an individual will survive in a population. All the variation occurring are not beneficial for the survival of the organism, only those variables which have more adaptive value in changing environment causes the survival of the species.

Variation among the species makes them fit for changing environments. The organism which is adamant about the changes themselves can't survive in changing environment.

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Extract

Students are required to study each NCERT Solutions for class 10 chapter 9 Heredity and Evolution ,some of questions are advised to study minutely for the preparation of the exams.

Q2. How does the creation of variations in a species promote survival?(page 143)

Q1. How do Mendel's experiments show that traits may be dominant or recessive?(page 147)

Q4. How is the sex of the child determined in human beings?(page 147)

Q3. Why are the small numbers of surviving tigers a cause of worry from the point of view of genetics?(page 150)

Q1. What factors could lead to the rise of a new species?(page 151)

Q1. A Mendelian experiment consisted of breeding tall pea plants bearing violet flowers with short pea plants bearing white flowers. The progeny all bore violet flowers, but almost half of them were short.

This suggests that the genetic make-up of the tall parent can be depicted as:

(a) TTWW

(b) TTww

(c) TtWW

(d) TtWw

Q4. A study found that children with light-coloured eyes are likely to have parents with light coloured eyes. On this basis, can we say anything about whether the light eye colour trait is dominant or recessive? Why or why not?

Q5. How are the areas of study evolution and classification interlinked?

**Q6. Explain the terms analogous and homologous organs with examples.**

Q8.Explain the importance of fossils in deciding evolutionary relationships.

Q9.What evidence do we have for the origin of life from inanimate matter?

NCERT solution of Class 10 Science Chapter 10 Light Reflection and Refraction

 NCERT solutions of chapter 10 'Light reflection and refraction' are created by an expert of Future Study Point, these **NCERT solutions of chapter 10 'Light reflection and refraction** are prepared for helping the **class 10** students to boost their preparation of exams and complete their school assignments. All **NCERT solutions** of **chapter 10** are the solutions of the questions mentioned within the pages and of back exercises of **chapter 10 of class 10 science NCERT** textbook prescribed by CBSE the most reputed board of India. Here each question is explained

by step by step way so all students can understand these **NCERT solutions** easily, however, if you face any type of problem then you can write it in the comment box, you will get its reply without any delay.
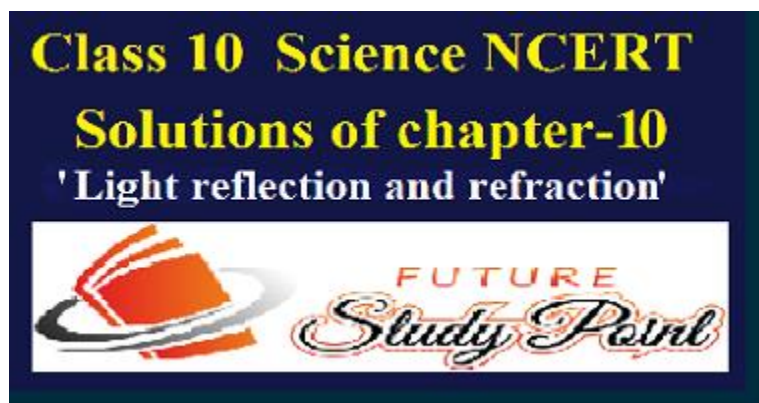
Light Reflection and Refraction

Chapter 1-Light reflection and refraction is part of the physics portion of the **NCERT science textbook** of **10 class.** The **NCERT solutions** of **chapter 10, light reflection and refraction** provide you with complete knowledge of the topics. All **NCERT solutions** of **chapter 10** of the **science NCERT textbook** are explained here readily and scientifically. The **NCERT solutions** of **chapter-10 of class 10 NCERT science** textbook are based on characteristics of **light** i.e laws of **reflection and refraction**, the image formation by the spherical mirrors and lenses, refractive index, power of lense and magnification of lenses and mirrors.

Light- Reflection, Refraction, Dispersion and Scattering

Why do the stars twinkle?

Why do the star twinkle?

Most important science questions -class 10 CBSE

**Solutions of Class 10 science question paper-2020**

NCERT Solutions of class 10 science chapter 10 -Light Reflection and Refraction

You can also download PDF-NCERT Solutions of class 10 science chapter 10 -Light Reflection and Refraction

Q1. Define the principal focus of a concave mirror.

Answer. Light rays that are parallel to the principal axis of a concave mirror converge at a specific point on its principal axis after reflecting from the mirror. This point is known as the principal focus of the concave mirror.
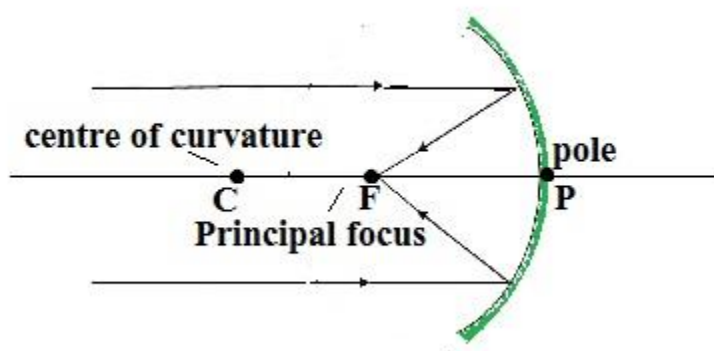
Q2.The radius of curvature of a spherical mirror is 20 cm. What is its focal length?

Answer. Radius of curvature, R = 20 cm

Radius of curvature of a spherical mirror = 2 × Focal length (f)

⇒f = R/2 = 20/2 = 10

Hence, the focal length of the given spherical mirror is 10 cm.

Q3.Name the mirror that can give an erect and enlarged image of an object.

Answer. When an object is placed between the pole and the principal focus of a concave mirror, the image formed is virtual, erect, and enlarged.

Q4. Why do we prefer a convex mirror as a rear-view mirror in vehicles?

Answer. Convex mirrors give a virtual, erect, and diminished image of the objects placed in front of them. They are preferred as a rear-view mirror in vehicles because they give a wider field of view, which allows the driver to see most of the traffic behind him.

NCERT Solutions of class 10 science chapter 10 -Light Reflection and Refraction

Page no 171

Q1.Find the focal length of a convex mirror whose radius of curvature is 32 cm.

Answer.Radius of curvature, R = 32 cm

Radius of curvature = 2 × Focal length (f)

R = 2f

⇒f = R/2 = 32/2 = 16

Hence, the focal length of the given convex mirror is 16 cm.

Q2. A concave mirror produces three times a magnified (enlarged) real image of the object placed at 10 cm in front of it. Where is the image located?

Answer. Magnification produced by a spherical mirror is given by the relation,

Let the height of the object, h_o = h

Then, the height of the image, h_I = −3h (Image formed is real)

h_I/ h_o = -v/u

-3h/h = -v/u

v/u = 3

Object distance, u = −10 cm

v = 3 × (−10) = −30 cm

Here, the negative sign indicates that an inverted image is formed at a distance of 30 cm in front of the given concave mirror.

NCERT Solutions of class 10 science chapter 10 -Light Reflection and Refraction

Page no 176

Q1. A ray of light traveling in air enters obliquely into water. Does the light ray bend towards the normal or away from the normal? Why?

Answer. The light ray bends towards the normal. When a ray of light travels from an optically rarer medium to an optically denser medium, it gets bent towards the normal. Since water is optically denser than air, a ray of light traveling from air into the water will bend towards the normal.

Q2.Light enters from air to glass having a refractive index 1.50. What is the speed of light in the glass? The speed of light in a vacuum is 3×10^8 m s^{-1}.

Answer.Refractive index of a medium n_m is given by,

$\Rightarrow n_m = C/v$

$\Rightarrow 1.50 = (3 \times 10^8)/v$

$\Rightarrow v = (3 \times 10^8)/1.50$

$\Rightarrow v = 2 \times 10^8$

S0, the speed of light in the glass is 2×10^8 m/s.

Q3.Find out, from Table, the medium having the highest optical density. Also, find the

medium with the lowest optical density

Answer.Highest optical density = Diamond

Lowest optical density = Air

The optical density of a medium is directly related to the refractive index of that medium. A medium which has the highest refractive index will have the highest optical density and vice-versa.

It can be observed from table 10.3 that diamond and air respectively have the highest and lowest refractive index. Therefore, diamond has the highest optical density and air has the lowest optical density.

Q4.You are given kerosene, turpentine and water. In which of these does the light travel fastest? Use the information given in Table.(Refer to question no-3).
Answer.The speed of light in a medium is given by the relation for refractive index. The relation is given as

Let refractive index of the medium is n_m, velocity in air is 'v' and velocity in the medium is v_m

$$n_m = \frac{v}{v_m}$$

$$v_m = \frac{v}{n_m}$$

v_m is inversely proportional to n_m

It can be inferred from the relation that light travels the slowest in the material which has the highest refractive index and travels the fastest in the material which has the lowest refractive index.

It can be observed from table 10.3 that the refractive indices of kerosene, turpentine, and water are 1.44, 1.47, and 1.33 respectively. Therefore, light travels the fastest in water.

Q5. The refractive index of diamond is 2.42. What is the meaning of this statement?

Answer. Refractive index of a medium n_m is related to the speed of light in that medium v by the relation:

$\Rightarrow n_m = C/v$

$\Rightarrow v = C/2.42$

Where, c is the speed of light in vacuum and v in the air

The refractive index of diamond is 2.42. This suggests that the speed of light in the diamond will reduce by a factor 2.42 compared to its speed in air.

NCERT Solutions of class 10 science chapter 10 -Light Reflection and Refraction

Page no.184

Q1.Define 1 dioptre of power of a lens.

Answer.The power of lens is defined as the reciprocal of its focal length. If P is the power of a lens of focal length F in meters, then

F = 1/P

P = 1/F, if F = 1m, then P = 1D

The S.I. unit of power of a lens is Dioptre. It is denoted by D.

1 dioptre is defined as the power of a lens of focal length 1 meter.

Q2.A convex lens forms a real and inverted image of a needle at a distance of 50 cm from it. Where is the needle placed in front of the convex lens if the image is equal to the size of the object? Also, find the power of the lens.

Answer. When an object is placed at the center of curvature, $2F_1$, of a convex lens, its image is formed at the center of curvature, $2F_2$, on the other side of the lens. The image formed is inverted and of the same size as the object, as shown in the given figure.

It is given that the image of the needle is formed at a distance of 50 cm from the convex lens. Hence, the needle is placed in front of the lens at a distance of 50 cm.

Object distance, u = −50 cm

Image distance, v = 50 cm

Focal length = f

Applying the lens formula

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{f} = \frac{1}{50} - \frac{1}{-50} = \frac{2}{50}$$

f = 25 cm = 0.25 m

The relationship between power and focal length of the lens is

$$P = \frac{1}{f\ (in\ meter)}$$

$$P = \frac{1}{0.25} = 4$$

Hence, the power of the given lens is +4 D.

Q3.Find the power of a concave lens of focal length 2 m.

Answer. Focal length of a concave lens, f = -2 m

The relationship between power of the lens and its focal length is following

$$P = \frac{1}{f\ (in\ meter)}$$

$$P = \frac{1}{-2} = -0.5$$

Here, a negative sign arises due to the divergent nature of concave lens.

Hence, the power of the given concave lens is −0.5 D.

NCERT Solutions of class 10 science chapter 10 -Light Reflection and Refraction

Exercises

Q1. Which one of the following materials cannot be used to make a lens?

(a) Water

(b) Glass

(c) Plastic

(d) Clay

Answer.(d) A lens allows light to pass through it. Since clay does not show such property, it cannot be used to make a lens.

Q2. The image formed by a concave mirror is observed to be virtual, erect and larger than the object. Where should be the position of the object?

(a) Between the principal focus and the center of curvature

(b) At the center of curvature

(c) Beyond the center of curvature

(d) Between the pole of the mirror and its principal focus.

Answer.(d) When an object is placed between the pole and principal focus of a concave mirror, the image formed is virtual, erect, and larger than the object.

Q3.Where should an object be placed in front of a convex lens to get a real image of the size of the object?

(a) At the principal focus of the lens

(b) At twice the focal length

(c) At infinity

(d) Between the optical centre of the lens and its principal focus.

Answer.(b) When an object is placed at the center of curvature in front of a convex lens, its image is formed at the center of curvature on the other side of the lens. The image formed is real, inverted, and of the same size as the object.

Q4.A spherical mirror and a thin spherical lens have each a focal length of −15 cm. The mirror and the lens are likely to be

(a) both concave

(b) both convex

(c) the mirror is concave and the lens is convex

(d) the mirror is convex, but the lens is concave

Answer. (a) By convention, the focal length of a concave mirror and a concave lens are taken as negative. Hence, both the spherical mirror and the thin spherical lens are concave in nature.

Q5.No matter how far you stand from a mirror, your image appears erect. The mirror is likely to be

(a) plane

(b) concave

(c) convex

(d) either plane or convex

Answer.(d) A convex mirror always gives a virtual and erect image of smaller size of the object placed in front of it. Similarly, a plane mirror will always give a virtual and erect image of same size as that of the object placed in front of it. Therefore, the given mirror could be either plane or convex.

NCERT Solutions of class 10 science chapter 10 -Light Reflection and Refraction

Q6. Which of the following lenses would you prefer to use while reading small letters found in a dictionary?

(a) A convex lens of focal length 50 cm

(b) A concave lens of focal length 50 cm

(c) A convex lens of focal length 5 cm

(d) A concave lens of focal length 5 cm

Answer.(c) A convex lens gives a magnified image of an object when it is placed between the radius of curvature and focal length. Also, magnification is more for convex lenses having a shorter focal length. Therefore, for reading small letters, a convex lens of focal length 5 cm should be used.

Q7.We wish to obtain an erect image of an object, using a concave mirror of focal length 15 cm. What should be the range of distance of the object from the mirror? What is the nature of the image? Is the image larger or smaller than the object? Draw a ray diagram to show the image formation in this case.

Answer.Range of object distance = 0 cm to15 cm A concave mirror gives an erect image when an object is placed between its pole (P) and the principal focus (F).

Hence, to obtain an erect image of an object from a concave mirror of focal length 15 cm, the object must be placed anywhere between the pole and the focus. The image formed will be

virtual, erect, and magnified in nature, as shown in the given figure.

Q8.Name the type of mirror used in the following situations.

(a) Headlights of a car

(b) Side/rear-view mirror of a vehicle

(c) Solar furnace

Support your answer with reason.

Answer.(a) Concave (b) Convex (c) Concave

Explanation

(a) Concave mirror is used in the headlights of a car. This is because concave mirrors can produce a powerful parallel beam of light when the light source is placed at their principal focus.

(b) Convex mirror is used inside/rearview mirror of a vehicle. Convex mirrors give a virtual, erect, and diminished image of the objects placed in front of it. Because of this, they have a wide field of view. It enables the driver to see most of the traffic behind him/her.

(c) Concave mirrors are convergent mirrors. That is why they are used to construct solar furnaces. Concave mirrors converge the light incident on them at a single point known as the principal focus. Hence, they can be used to produce a large amount of heat at that point.

Q9.One-half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer experimentally. Explain your observations.

Answer. The convex lens will form a complete image of an object, even if its one half is covered with black paper. It can be understood as the following fig.

When the lower half of the lens has covered this case, two rays of light coming from the object is refracted by the upper half of the lens. These rays meet at the other side of the lens to form the

image of the given object, as shown in the figure.

Q10. An object 5 cm in length is held 25 cm away from a converging lens of focal length 10 cm. Draw the ray diagram and find the position, size and nature of the image formed.

Answer.Object distance, $u = -25$ cm

Object height, $h = 5$ cm

Focal length, $f = +10$ cm

According to the lens formula,

Position of the image is at 16.67 cm in front of the lense

Magnification' of the lens is given

The negative value of image height indicates that the image formed is inverted. Therefore image hight is 3.3 cm,position of image is at 16.67 cm in front of the lens and the image form is inverted

The position, size, and nature of the image are shown in the following ray diagram.

NCERT Solutions of class 10 science chapter 10 -Light Reflection and Refraction

Q11. A concave lens of focal length 15 cm forms an image 10 cm from the lens. How far is the object placed from the lens? Draw the ray diagram.

Answer:

Focal length of concave lens (OF$_1$), $f = -15$ cm

Image distance, $v = -10$ cm

According to the lens formula,

The negative value of u indicates that the object is placed 30 cm in front of the lens. This is shown in the following ray diagram.

Q12.An object is placed at a distance of 10 cm from a convex mirror of focal length 15 cm. Find the position and nature of the image.

Answer.Focal length of convex mirror, f = +15 cm

Object distance, u = −10 cm

According to the mirror formula,

Q13.The magnification produced by a plane mirror is +1. What does this mean?

Answer.Magnification produced by a mirror is given by the relation

The magnification produced by a plane mirror is +1. It shows that the image formed by the plane mirror is of the same size as that of the object. The positive sign shows that the image formed is virtual and erect.

Q14.An object 5.0 cm in length is placed at a distance of 20 cm in front of a convex mirror of radius of curvature 30 cm. Find the position of the image, its nature and size.

Answer.Object distance, u = −20 cm

Object height, h = 5 cm

Radius of curvature, R = 30 cm

Radius of curvature = 2 × Focal length

R = 2f

f = 15 cm

According to the mirror formula,   The positive value of image height indicates that the image formed is erect. Therefore, the image formed is virtual, erect, and smaller in size.

Q15.An object of size 7.0 cm is placed at 27 cm in front of a concave mirror of focal length 18 cm. At what distance from the mirror should a screen be placed, so that a sharp focused image can be obtained? Find the size and the nature of the image.

Answer.Object distance, u = −27 cm

Object height, h = 7 cm

Focal length, f = −18 cm

According to the mirror formula,

The negative value of magnification indicates that the image formed is real.

The negative value of image height indicates that the image formed is inverted.

NCERT Solutions of class 10 science chapter 10 -Light Reflection and Refraction

Q16.Find the focal length of a lens of power −2.0 D. What type of lens is this?

The negative sign of its focal length shows that it is a concave lense.

Q17.A doctor has prescribed a corrective lens of power +1.5 D. Find the focal length of the lens. Is the prescribed lens diverging or converging?

Answer:

$$f = \frac{1}{P\,(in\ dioptor)}$$

$$F = \frac{1}{1.5} \approx 0.67$$

Therefore the focal length of the lens is 0.67 m

The positive sign of its focal length shows that the given lens is converging(convex).

⇒In the chapter Light reflection and refraction chapter, 10 of class 10 is very important for class 10 students. The whole of the chapter is oriented on the properties of light ray (i) Reflection of light (ii) Refraction of light.

Light: Light is energy which when falls on our eyes gives us a visual effect of anything we see. Light energy is used by plants for the process of photosynthesis, so we can say that the biggest source of light on the earth is the Sun.

Reflection of light: When a light ray falls on an opaque object, it is bounced back by the object to another direction, known as the reflection of light.

Laws of reflection of the light: (i) Incident angle is equal to the reflected angle.

(ii) The incident ray, normal and the reflected rays, all lie on the same plane.
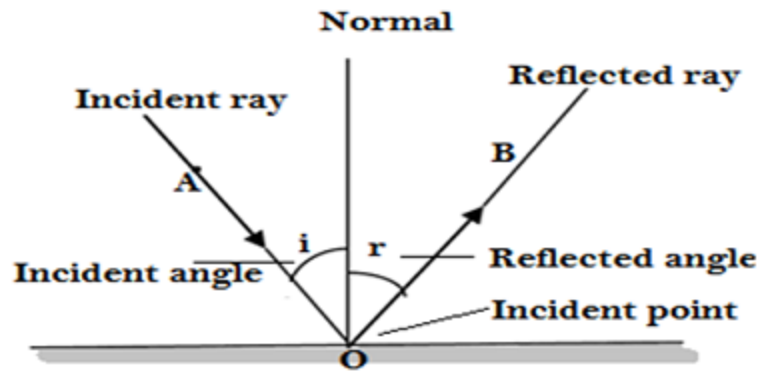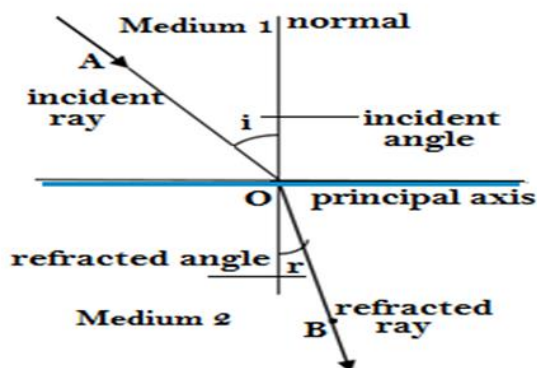

Refraction of light ray: When light rays passes from one medium to another medium it deviates from its path,this phenomena of light is known as refraction of light.

The Laws of refraction: There are two laws of refraction of light.

(i) The incident ray, incident point and reflected ray all lie on the same plane.

(ii) The ratio between sine of incident angle and reflected angle is constant.

$$\frac{sin i}{sin r} = constant$$

NCERT solutions for class 10 science chapter 11-The Human Eye and Colourful world

Q1. What is meant by the power of accommodation of the eye?

Ans. When we see distant objects the ciliary muscles in the crystalline lens dilates which causes an increase in focal length of the eye lens and we see the distant objects, these muscles contract causing a decrease in the focal length of the eye that enables eyes to see nearby objects. The ability of the lens to adjust its focal length to clearly focus rays coming from distant as well from a near object on the retina is known as the power of accommodation of the eye.

Q2. A person with a myopic eye cannot see objects beyond 1.2 m distinctly. What should be the type of corrective lens used to restore proper vision?

Ans. The person with a myopic eye who can't see objects beyond 1.2 m should use a concave lens (diverging lens) of a focal length of 1.2 m so that the image of the objects formed near the eye lens could be shifted to the retina.

Q3. What are the far point and near point of the human eye with normal vision?

Ans. The minimum point of the object from the eye, which can be seen distinctly without strain is called the near point of the eye. For a normal person's eye, this distance is 25 cm, and the far point is the maximum distance at which the human eye is capable to see clearly, as example, we can see the stars which are too much far from us, therefore far point is infinity.

Q4. A student has difficulty reading the blackboard while sitting in the last row. What could be the defect the child is suffering from? How can it be corrected?

Ans. A student has difficulty in reading the blackboard while sitting in the last row, which means he is unable to see the objects after a certain distance, therefore the student is suffering from short-sightedness or myopia. Myopia can be corrected by the use of a concave or diverging lens of appropriate power.

NCERT solutions for class 10 science chapter 11-The Human Eye and Colourful world

Exercise

Q1. The human eye can focus on objects at different distances by adjusting the focal length of the eye lens. This is due to

(a) presbyopia

(b) accommodation

(c) near-sightedness

(d) far-sightedness

Ans. (b) accommodation

Due to the accommodation of the human eye can focus objects at different distances by adjusting the focal length of the eye lens.

Q2. The human eye forms an image if an object at its

(a) cornea

(b) iris

(c) pupil

(c) retina

Ans(d) Retina
The retina is the layer of nerve cells lining the black wall inside the eye. This layer senses light and sends signals to the brain so you can see.

Q3.The least distance of distinct vision for a young adult with normal vision is about
(a) 25 m
(b) 2.5 cm
(c) 25 cm
(d) 2.5 m

Ans(c) 25 cm
25 cm is the least distance of distinct vision for a young adult with normal vision.

Q4.The change in focal length of an eye lens is caused by the action of the
(a) pupil
(b) retina
(c) ciliary muscles
(d) iris

Ans(c) ciliary muscles
The action of the ciliary muscles changes the focal length of an eye lens.

NCERT solutions for class 10 science chapter 11-The Human Eye and Colourful world

Q5. A person needs a lens of power -5.5 dioptres for correcting his distant vision. For correcting his near vision he needs a lens of power +1.5 dioptre. What is the focal length of the lens required for correcting
(i) distant vision and (ii) near vision

Ans. The power (P) of the lens of focal length as is given by the relation power (P) = 1/f ⇒f =1/P
(i)The person needs a lens of power -5.5 dioptres for correcting his distance vision

∴ He would need a lens with the focal length = 1/P = 1/-5.5D = 0.1818 m ≈0.182 m=18.2 cm

(ii) The person needs a lens of power -5.5 dioptres for correcting his near vision

∴ He would need a lens with the focal length = 1/P = 1/+1.5D = 0. 6666 m ≈0.667 m=66.7 cm

Q6. The far point of a myopic person is 80 cm in front of the eye. What is the power of the lens required to correct the problem?

Ans. The far point of a myopic person is 80 cm means the image formed of the object is near the eye lens between the eye lens and retina when it is placed at a distance of more than 80 cm(i.e ∞). The eye lens is a convex lens, therefore we are required power of lens that could focus image at a distance,v = -80 cm

The object is placed at a distance of more than 80 cm i.e u = ∞

According to lens formula, we can find the required focal length f of the lens

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{f} = \frac{1}{-80} - \frac{1}{\alpha}$$

$$\frac{1}{f} = \frac{1}{-80}$$

f = -80

The focal length f of the lens is = -80 cm = -0.80 m

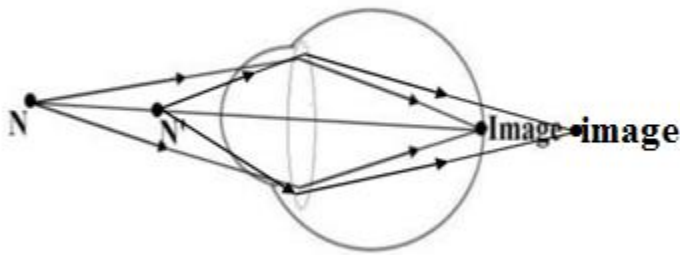The power of the lense is = 1/f(m) = -1/0.80 m =-1.25 D

Negative sign shows that lens required to correct given myopic eye is concave lens.

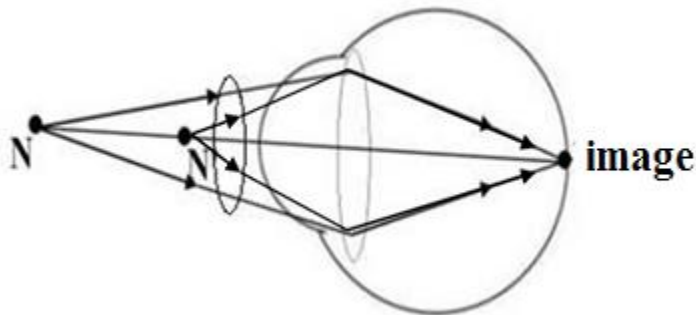## NCERT solutions for class 10 science chapter 11-The Human Eye and Colourful world

Q7.Make a diagram of how hypermetropia is corrected. The near point of the hypermetropic eye is 1 m. What is the power of the lens required to correct the defect? Assume that the near point of the normal eye is 25 cm.

Ans. Hypermetropia is the defect of the eye in which a person can not see the objects lying nearer to a certain distance because its image is formed beyond the retina

The distance nearer to which a person can not see known as the near point of the hypermetropic eye, here in the diagram it is shown by N and the near point of the normal eye is N'(25 cm)

For correcting a hypermetropic eye, a convex lens is used so that the net focal length of the eye lens and lens enables the ray of the nearby object to focus its image at the retina.

The near point of the hypermetropic eye is 100 cm, which means the person with such a defect can't see the object nearer to 100 cm.

If the object is placed at 25 cm then we are needed a lens that is able to focus the virtual image of the object at 100 cm, for this, we are needed a convex lens that enables us to shift of the image formation behind the retina to the retina.

Applying the lens formula

1/f = 1/v - 1/u

u = -25 cm,v = -100 cm

1/f = 1/-100 - 1/-25

1/f = -1/100 +1/25

= (-1 +4)/100 = 3/100

f = 100/3 =33.33

Focal length of the lens is 33.33 cm ≈0.33 m

Power of the lens ,P = 1/f =1/.33 m ≈ +3 D

Q8. Why is normal eye not able to see clearly the objects placed closer than 25 cm?

Ans. A normal eye is not able to see the objects placed closer than 25 cm clearly because the ciliary muscles of the eyes are unable to contract beyond a certain limit and as a result, the image of the object formed beyond the retina and we couldn't see the object properly.

Q9. What happens to the image distance in the eye when we increase the distance of an object from the eye?

Ans. When we increase the distance of an object from the eye, the ciliary muscles of the crystalline lens expand causing an increase in focal length of the eye lens and thus image distance is unchanged, the image is formed at the retina as before.

NCERT solutions for class 10 science chapter 11-The Human Eye and Colourful world

Q10. Why do stars twinkle?

Ans. Stars are very far from us, the light ray from star continually refracted through different layers of the atmosphere, the temperatures of these atmospheric layers varies and thus their densities also vary due to which the path of starlight to our eyes changes that changes the virtual image of the star within little span of time,this effect makes our eyes to see the star twinkle.

Q11. Explain why the planets do not twinkle?

Ans. Unlike stars, planets don't twinkle. Stars are so distant that they appear as pinpoints of light in the night sky, even when viewed through a telescope, but planets are very near to us as compared to star they look like a disc,a bunch of rays reaches to our eye through little atmospheric refraction,it is that's why planet do not twinkle.

Q12. Why does the sun appear reddish early in the morning?

Ans. White light coming from the sun has to travel more distance in the atmosphere before reaching the observer. During this, the scattering of all colored lights except the light corresponding to red color takes place and so only the red colored light reaches to the observer. Therefore the sun appears reddish at sunrise and sunset.

Q13. Why does the sky appear dark instead of blue to an astronaut?

Ans. The sky appears dark instead of blue to an astronaut, as the scattering of light does not take place outside the earth's atmosphere due to the absence of gas particles.

Summary of the chapter 11-The Human Eye and Colourful world

Structure of the human eye

Cornea: It is a transparent layer that covers the pupil and iris of the eye and contributes maximum refraction of the total refraction of the incident rays into the eye.

Aqueous humor: It is watery fluids that contain nutrients that regulate the pressure on the eye and repairs the cells of the cornea, pupil and iris after the cornea light is refracted through the aqueous humor and focused to the iris and pupil.

Pupil: This is a black dot at the center of the eye,it is an opening to the eyes which allows light rays to enter the eye.

Iris: Iris controls the amount of light entering the eye by controlling the size of the pupil.

Crystalline lens: Crystalline lens is made of ciliary muscles which vary the focal length of the eye by their expansion and contraction and enable us to see the distant and nearby objects.

Vitreous humor: Vitreous humor is jelly-like fluids that fill the space between crystalline lens and retina, it gives a shape to the eyeball and helps in the refraction of light ray focussing it to the retina.

Retina: After refraction, the light ray falls at the retina which converts the light signal to an electrical signal then these electrical signals are transported to the brain through the optic nerve. The electric signals are interpreted by the visual cortex of the brain we see the object.

Defects of the eye

The eye has three defects (i) myopia (ii) hypermetropia (iii) presbyopia

Myopia: Myopia is also known as nearsightedness, in this defect a person is unable to see after a certain distance. The distance at which a person with the myopic eye is able to see known as the far point of the myopic eye, it is treated by applying a convex lens to the eye. This defect occurs due to the bulged cornea that decreases the focal length of the eye lens and the image of objects forms near to the eye lens instead of at the retina,so the image of the distant objects looks blurred

Hypermetropia: Hypermetropia is also known as farsightedness, in this defect a person is unable to see nearby objects. The minimum distance to which a person with the hypermetropic eye is able to see known as the near point of the hypermetropic eye, it is treated by applying a concave lens to the eye. This defect occurs due to the non-contraction of the ciliary muscles of the crystalline lens that makes the eye lens thinner, in this defect eye become unable to accommodate to see nearby objects and the image of nearby objects forms beyond the retina that is far from the eye lens, so the image of the nearby objects looks blurred

Presbyopia: Presbyopia generally occurs in old age, in this defect, the human eye is unable to see the nearby object as well as far objects, the eye becomes unable to accommodate to see the objects,it occurs because of weakening of ciliary muscles. It is remedied by applying a bifocal lens a combination of the concave and convex lens.

Cataract: Cataract occurs due to injury to the eye or diabetes, in this defect the eye lens turns cloudy due to the ruptured tissues in the eye lens, anybody suffering from cataract can't see the objects clearly, it is treated by surgery and then by applying glasses.

NCERT solutions for class 10 science chapter 11-The Human Eye and Colourful world

Q1. What is meant by the power of accommodation of the eye?

Ans. When we see distant objects the ciliary muscles in the crystalline lens dilates which causes an increase in focal length of the eye lens and we see the distant objects, these muscles contract causing a decrease in the focal length of the eye that enables eyes to see nearby objects. The ability of the lens to adjust its focal length to clearly focus rays coming from distant as well from a near object on the retina is known as the power of accommodation of the eye.

Q2. A person with a myopic eye cannot see objects beyond 1.2 m distinctly. What should be the type of corrective lens used to restore proper vision?

Ans. The person with a myopic eye who can't see objects beyond 1.2 m should use a concave lens (diverging lens) of a focal length of 1.2 m so that the image of the objects formed near the eye lens could be shifted to the retina.

Q3. What are the far point and near point of the human eye with normal vision?

Ans. The minimum point of the object from the eye, which can be seen distinctly without strain is called the near point of the eye. For a normal person's eye, this distance is 25 cm, and the far

point is the maximum distance at which the human eye is capable to see clearly, as example, we can see the stars which are too much far from us, therefore far point is infinity.

Q4. A student has difficulty reading the blackboard while sitting in the last row. What could be the defect the child is suffering from? How can it be corrected?

Ans. A student has difficulty in reading the blackboard while sitting in the last row, which means he is unable to see the objects after a certain distance, therefore the student is suffering from short-sightedness or myopia. Myopia can be corrected by the use of a concave or diverging lens of appropriate power.

NCERT solutions for class 10 science chapter 11-The Human Eye and Colourful world

Exercise

Q1. The human eye can focus on objects at different distances by adjusting the focal length of the eye lens. This is due to

(a) presbyopia

(b) accommodation

(c) near-sightedness

(d) far-sightedness

Ans. (b) accommodation

Due to the accommodation of the human eye can focus objects at different distances by adjusting the focal length of the eye lens.

Q2. The human eye forms an image if an object at its

(a) cornea

(b) iris

(c) pupil

(c) retina

Ans(d) Retina
The retina is the layer of nerve cells lining the black wall inside the eye. This layer senses light and sends signals to the brain so you can see.

Q3.The least distance of distinct vision for a young adult with normal vision is about
(a) 25 m
(b) 2.5 cm
(c) 25 cm
(d) 2.5 m

Ans(c) 25 cm
25 cm is the least distance of distinct vision for a young adult with normal vision.

Q4.The change in focal length of an eye lens is caused by the action of the
(a) pupil
(b) retina
(c) ciliary muscles
(d) iris

Ans(c) ciliary muscles
The action of the ciliary muscles changes the focal length of an eye lens.

NCERT solutions for class 10 science chapter 11-The Human Eye and Colourful world

Q5. A person needs a lens of power -5.5 dioptres for correcting his distant vision. For correcting his near vision he needs a lens of power +1.5 dioptre. What is the focal length of the lens required for correcting
(i) distant vision and (ii) near vision

Ans. The power (P) of the lens of focal length as is given by the relation power $(P) = 1/f \Rightarrow f = 1/P$
(i)The person needs a lens of power -5.5 dioptres for correcting his distance vision

$\therefore$ He would need a lens with the focal length $= 1/P = 1/-5.5D = 0.1818$ m ≈ 0.182 m=18.2 cm

(ii) The person needs a lens of power -5.5 dioptres for correcting his near vision

$\therefore$ He would need a lens with the focal length $= 1/P = 1/+1.5D = 0.6666$ m ≈ 0.667 m=66.7 cm

Q6. The far point of a myopic person is 80 cm in front of the eye. What is the power of the lens required to correct the problem?

Ans. The far point of a myopic person is 80 cm means the image formed of the object is near the eye lens between the eye lens and retina when it is placed at a distance of more than 80 cm(i.e ∞). The eye lens is a convex lens, therefore we are required power of lens that could focus image at a distance,v = -80 cm

The object is placed at a distance of more than 80 cm i.e $u = \infty$

According to lens formula, we can find the required focal length f of the lens

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{f} = \frac{1}{-80} - \frac{1}{\alpha}$$

$$\frac{1}{f} = \frac{1}{-80}$$

f = -80

The focal length f of the lens is = -80 cm = -0.80 m

The power of the lense is = 1/f(m) = -1/0.80 m =-1.25 D
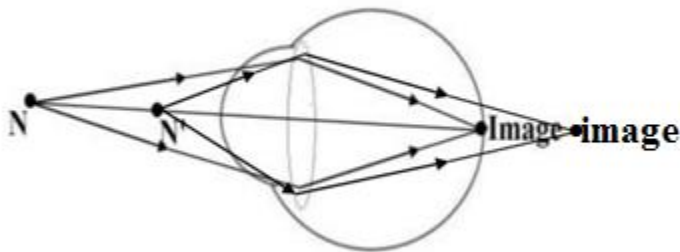
Negative sign shows that lens required to correct given myopic eye is concave lens.

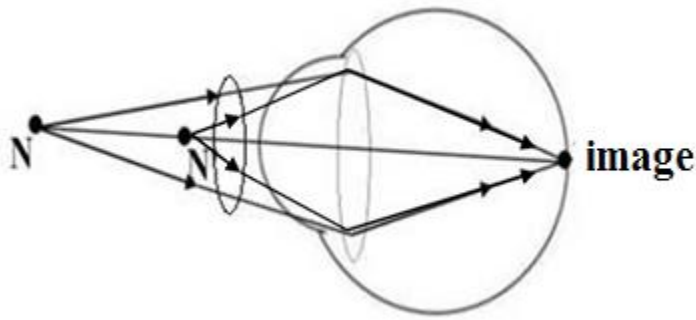## NCERT solutions for class 10 science chapter 11-The Human Eye and Colourful world

Q7.Make a diagram of how hypermetropia is corrected. The near point of the hypermetropic eye is 1 m. What is the power of the lens required to correct the defect? Assume that the near point of the normal eye is 25 cm.

Ans. Hypermetropia is the defect of the eye in which a person can not see the objects lying nearer to a certain distance because its image is formed beyond the retina

The distance nearer to which a person can not see known as the near point of the hypermetropic eye, here in the diagram it is shown by N and the near point of the normal eye is N'(25 cm)

For correcting a hypermetropic eye, a convex lens is used so that the net focal length of the eye lens and lens enables the ray of the nearby object to focus its image at the retina.

image

The near point of the hypermetropic eye is 100 cm, which means the person with such a defect can't see the object nearer to 100 cm.

If the object is placed at 25 cm then we are needed a lens that is able to focus the virtual image of the object at 100 cm, for this, we are needed a convex lens that enables us to shift of the image formation behind the retina to the retina.

Applying the lens formula

$1/f = 1/v - 1/u$

$u = -25$ cm, $v = -100$ cm

$1/f = 1/-100 - 1/-25$

$1/f = -1/100 + 1/25$

$= (-1 + 4)/100 = 3/100$

$f = 100/3 = 33.33$

Focal length of the lens is 33.33 cm ≈ 0.33 m

Power of the lens, $P = 1/f = 1/.33$ m $\approx +3$ D

Q8. Why is normal eye not able to see clearly the objects placed closer than 25 cm?

Ans. A normal eye is not able to see the objects placed closer than 25 cm clearly because the ciliary muscles of the eyes are unable to contract beyond a certain limit and as a result, the image of the object formed beyond the retina and we couldn't see the object properly.

Q9. What happens to the image distance in the eye when we increase the distance of an object from the eye?

Ans. When we increase the distance of an object from the eye, the ciliary muscles of the crystalline lens expand causing an increase in focal length of the eye lens and thus image distance is unchanged, the image is formed at the retina as before.

NCERT solutions for class 10 science chapter 11-The Human Eye and Colourful world

Q10. Why do stars twinkle?

Ans. Stars are very far from us, the light ray from star continually refracted through different layers of the atmosphere, the temperatures of these atmospheric layers varies and thus their densities also vary due to which the path of starlight to our eyes changes that changes the virtual image of the star within little span of time,this effect makes our eyes to see the star twinkle.

Q11. Explain why the planets do not twinkle?

Ans. Unlike stars, planets don't twinkle. Stars are so distant that they appear as pinpoints of light in the night sky, even when viewed through a telescope, but planets are very near to us as compared to star they look like a disc,a bunch of rays reaches to our eye through little atmospheric refraction,it is that's why planet do not twinkle.

Q12. Why does the sun appear reddish early in the morning?

Ans. White light coming from the sun has to travel more distance in the atmosphere before reaching the observer. During this, the scattering of all colored lights except the light corresponding to red color takes place and so only the red colored light reaches to the observer. Therefore the sun appears reddish at sunrise and sunset.

Q13. Why does the sky appear dark instead of blue to an astronaut?

Ans. The sky appears dark instead of blue to an astronaut, as the scattering of light does not take place outside the earth's atmosphere due to the absence of gas particles.

Summary of the chapter 11-The Human Eye and Colourful world

Structure of the human eye

Cornea: It is a transparent layer that covers the pupil and iris of the eye and contributes maximum refraction of the total refraction of the incident rays into the eye.

Aqueous humor: It is watery fluids that contain nutrients that regulate the pressure on the eye and repairs the cells of the cornea, pupil and iris after the cornea light is refracted through the aqueous humor and focused to the iris and pupil.

Pupil: This is a black dot at the center of the eye,it is an opening to the eyes which allows light rays to enter the eye.

Iris: Iris controls the amount of light entering the eye by controlling the size of the pupil.

Crystalline lens: Crystalline lens is made of ciliary muscles which vary the focal length of the eye by their expansion and contraction and enable us to see the distant and nearby objects.

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NCERT solutions of class 10 science chapter 12- Electricity

Page no. 200

Q1.   What does an electric circuit mean?

Ans. An electric circuit continuous closed path which allows the flow of electric current through it, the component of an electric circuit are battery, plug key and conducting wire.

2- Define the unit of current.

Ans. S.I unit of electric current is ampere (A),1 ampere is the flow of 1-coulomb electric charge per second. The relationship between electric current and time is as follows.

$$Q = it \Rightarrow i = \frac{Q}{t}$$

Let Q = 1 C, t = 1 s then i= 1 coloumb/second = 1 A, If 1 coulomb charge is flowed for 1 second then the amount of current flowed within the circuit is known as 1 A.

Q3. How many electrons are in 1-coulomb charge.

Ans. The charge in 1e is $= 1.6 \times 10^{-19} C$

$1.6 \times 10^{-19} C$ charge is equivalent to 1e

Then 1 C is equal to = $\dfrac{1}{1.6 \times 10^{-19} C} \times 1C = 6.25 \times 10^{18}$

Therefore 1-coulomb $= 6.25 \times 10^{18} e's$

Page no. 202

Q1. Name a device that helps to maintain a potential difference across a conductor.

Ans. Any source of electricity like a battery or electric generator helps to maintain a potential difference across a conductor.

Q2.What is meant by saying that potential difference between two point is 1V.

Ans. The relationship between voltage, work done and charge is V = W/Q, if V =1V which means 1 joule of work done by 1 coulom charge from one end to another end of a conductor is known as 1V.

Q3. What will be the energy required to 1C charge in moving from one point to another if the potential difference between the points is 6V?

Ans. The work done is also defined as the transfer of energy, s0 let energy E is required to transfer 1C charge from one point to another

The given potential difference = 6V and charge(Q) = 1C

The relationship between voltage, work done and the charge is

$$V = \frac{W}{Q}$$

As work done(W) =energy transfer(E)

$$V = \frac{E}{Q}$$

E = VQ = 6 V × 1C = 6

∴ The energy required to transfer 1 C charge from one point to another is 6 joule

PAGE NO. 209

Q1 . On what factors does the resistance of a conductor depend ?

Ans.   Resistance of conductor depends on (i) Resistivity of the matter the conductor is made up of (ii) Length of the conductor (iii) Area of the cross-section of the conductor (iv) The type of matter

Q2.Will current flow more easily through a thick wire or thin wire of the same material when connected to the same source? Why?
Ans. The relationship between length, the cross-sectional area of the conductor is given by $R = \rho \frac{l}{A}$ which shows that resistance is inversely proportional to the area,ρ is constant for same kind of material since the area of cross-section of the thicker wire is more so its resistance will be lesser than the thinner wire , since the conductance is inverse of the resistance so current flows more easily through the thicker wire as compared to thinner wire.

Q3.Let the resistance of an electrical component remains constant while the potential difference across two ends of the component decreases to half of its former value. What change will occur in the current through it?

Ans. We are given the resistance of an electrical component(R) →constant, Let initial voltage is = V and current= i_1

Modified voltage $= \dfrac{V}{2}$ and let the modified current $= i_2$

According to ohm's law, voltage = current × rasistance

$$i_1 = \dfrac{V}{R} \; .... \; (i)$$

$$i_2 = \dfrac{V/2}{R} = \dfrac{V}{2R} \; .... \; (ii)$$

Solving (i) and (ii) we have

$$\dfrac{i_1}{i_2} = \dfrac{V/R}{V/2R} = \dfrac{2}{1}$$

$$i_2 = \dfrac{i_1}{2}$$

Therefore the electric current through the electrical component becomes half of the former value of the electric current.

Q4 –Why are the coils of electric toasters and electric irons made of an alloy rather than a pure metal?

Ans .- The coils of electric toasters and electric irons made of an alloy because an alloy is differed from metal in the following characteristics.

(i) Higher resistivity compared to the metal (ii) It is not oxidized easily like metals (iii) The alloy doesn't melt readily at the higher temperature

Q5- Use the data in Table 12.2 of the NCERT book to answer the following questions :

	Material	Resistivity(Ω m)
	Silver	1.60×10^{-8}
Conductors	Copper	1.62×10^{-8}
	Aluminum	2.63×10^{-8}

	Tungsten	5.20×10^{-8}
	Nickel	6.84×10^{-8}
	Iron	10.0×10^{-8}
	Chromium	12.9×10^{-8}
	Mercury	94.0×10^{-8}
	Manganese	1.84×10^{-6}
Alloys	Constantan (Alloy of Cu and Ni)	49×10^{-6}
	Manganin (Alloy of Cu, Mn, and Ni)	44×10^{-6}
	Nichrome (Alloy of Ni, Cr, Mn, and Fe)	100×10^{-6}
	Glass	$10^{10} - 10^{14}$
Insulators	Hard rubber	$10^{13} - 10^{16}$
	Ebonite	$10^{15} - 10^{17}$
	Diamond	$10^{12} - 10^{13}$
	Paper (Dry)	10^{12}

(a) which among iron and mercury is a better conductor?

(b) Which material is the best conductor?

Ans.(a) As seen in the table the resistivity of both elements are given bellow

Iron- 10.0×10^{-8} Ωm

Mercury - 94.0×10^{-8} Ωm

The resistivity of mercury is more than the iron and as we know the conductivity is inverse of resistivity so iron is a better conductor than mercury.

(b) From the above table, silver has the lowest resistivity which implies that it is the best conductor.

Page 213

Q1- Draw a schematic diagram of a circuit consisting of a battery of three cells of 2V each, a 5Ω resistor, a 8 Ω resistor and a 12 Ω resistor and a plug key, all connected in series.

Ans.

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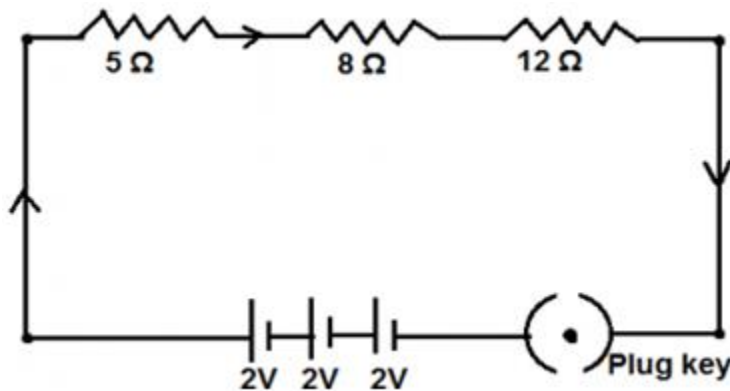
Q2. Redraw the circuit of the above question, putting in an ammeter to measure the current through the resistors and a voltameter to measure the voltage across the 12Ω resistor. What would be the reading in the ammeter and the voltameter?

Ans.

Ans. Total voltage = 2x3 = 6V

Total resistance of the circuit = 5 + 8 + 12 = 25Ω

Using the Ohm's law V = IR⟹ I = V/R = Voltage/Total resistance

Total current = V/R = 6/25 = 0.24A

Hence voltage across the 12Ω resistor $= I \times R = 0.24 \times 12 = 2.88V$
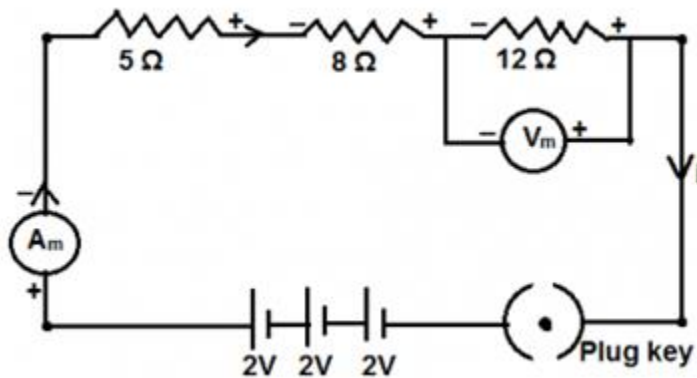
So, the reading of ammeter $=0.24$ A and reading of voltameter$= 2.88\Omega$.

Page-216

Q1.Judge the equivalent resistance when the following resistors are connected in parallel.

(a) 1Ω and $10^6\Omega$

(b) 1Ω, $10^3\Omega$, and $10^6\Omega$

(a) When both 1Ω and $10^6\Omega$ are connected in parallel then net resistance will be less than the lower resistance 1Ω.

Let the equivalent resistor of both the resistors is $= R$

$$\frac{1}{R} = \frac{1}{1} + \frac{1}{10^6} = \frac{1 + 10^6}{10^6}$$

$$R = \frac{10^6}{1 + 10^6} = 0.9999 \approx 1$$

Therefore equivalent resistor $\approx 1\ \Omega$

(b) Let the equivalent resistor is R

$$\frac{1}{R} = \frac{1}{1} + \frac{1}{10^3} + \frac{1}{10^6}$$

$$R = \frac{10^6}{10^6 + 10^3 + 1} = \frac{1000000}{1001001} = 0.999$$

Therefore equivalent resistance is 0.999 Ω

The equivalent resistance in both cases is slightly less than the minimum individual resistance.

Q2. An electric lamp of 100 Ω, a toaster of resistance 50 Ω and a water filter of resistance 500 Ω are connected in parallel to a 220 V source. What is the resistance of an electric iron connected to the same source that takes as much current as all three appliances and what is the current flows through it?

Ans. Resistance of electric lamp R_1 = 100 Ω, resistance of toaster R_2 = 50 Ω, resistance of water filter R_3 = 500Ω

Voltage = 220 V

Therefore net resistance R will be as following

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\frac{1}{R} = \frac{1}{100} + \frac{1}{50} + \frac{1}{500}$$

$$\frac{1}{R} = \frac{5 + 10 + 1}{500} = \frac{16}{500}$$

Applying the Ohm's law V = IR, where I is total current flowing through the circuit

$$I = \frac{V}{R} = \frac{220}{500/16} = \frac{220 \times 16}{500} = 7.04$$
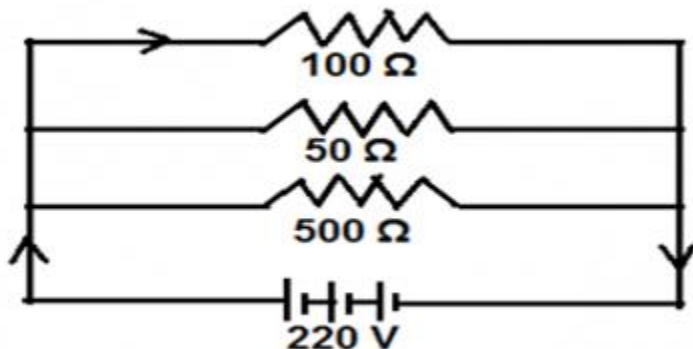
Hence total current flowing through the circuit =7.04 A

Let the resistance of electric iron = R_e, current flowing through it is (I)= 7.04 A, Voltage across it(V) = 220 V

Applying Ohm's law

$$R_e = \frac{V}{I} = \frac{220}{7.04} = 31.25$$

Hence the resistance of electric iron = 31.25Ω and the current will flow through it = 7.04 A

Q3. What are the advantages of connecting electrical devices in parallel with the battery instead of connecting them in series?

Ans. The advantages of connecting electrical devices in parallel with the battery instead of connecting them in series are the following.

(i) The net resistance of the circuit is reduced when all the appliances are connected in parallel and thus less electrical energy is consumed.

(ii) In a parallel connection, if one appliance is disconnected others are unaffected while in series if one appliance is disconnected others are also disconnected.

Q4.How can three resistors of resistances 2Ω, 3Ω and 6Ω be connected to give a total resistance of (a) 4Ω (b) 1Ω?

Ans.(a) In order to get the equivalent resistance of 4 Ω, 3Ω and 6Ω resistor should be connected parallel and 2Ω resistor in series

(b) In order to get the equivalent resistance of 2Ω, 3Ω and 6Ω should be connected in parallel
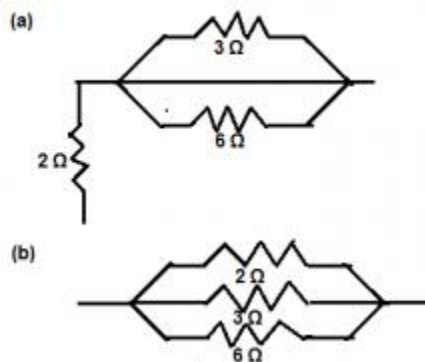
Q5. What is (a) the highest (b) the lowest total resistance that can be secured by combinations of four coils of resistance 4 Ω, 8Ω, 12 Ω and 24 Ω respectively.

Ans- (a) The highest resistance is secured by combining all four coils of resistance in series

R_H = 4Ω + 8Ω +12Ω +24Ω = 48 Ω

(b) The lowest resistance is secured by combining all four coils of resistance in parallel.

$1/R_P$ = ¼ + 1/8 + 1/12 + 1/24

R_P = 24/12

R_P = 2Ω

Therefore highest and lowest resistance can be secured by the combination of the given coils of resistance are 48 Ω and 2 Ω respectively.

page no 218

Q1.Why does the cord of an electric heater not glow while the heating element does ?

Ans. The cord of an electric heater is made up of metallic wire such as copper or aluminum which has low resistance while the heating element is made up of an alloy (nichrome) which has more resistance than its constituent metals.As we know heat produced(H) is $H = I^2Rt$, where R is the resistance of the conductor ,so heating element glows while the cord of heater does not.

Q2. Compute the heat generated while transferring 96000C of charge in one hour through a potential difference of 50 V.

Ans. q =96000 C, V = 50V, t = 1h

$H = I^2Rt = VIt = vq$

= 50 x 96000

=48 x 10^5J

Q3.An electric iron of resistance 20 Ω takes a current of 5 A. Calculate the heat developed in 30 s.
Ans. R = 20Ω, I = 5A, t = 30 s

$H = I^2Rt$

$= 5^2 \text{ x } 20 \text{ x } 30$

$= 15000J$

$= 1.5 \text{ X } 10^4J$

Page no. 220

Q1.What determines the rate at which energy is delivered by a current?

Ans. Electric power determines the rate at which energy is released by a current.

Q2- An electric motor takes 5A from a 220 V line. Determine the power of the motor and the energy consumed in 2h.

Ans. I = 5A. V = 220 V, t = 2h

P = VI = 220 X 5 = 1100 W

Energy consumed = Pt = 1100 x 2 = 2200wh

Textbook questions

Q1- A piece of wire of resistance R is cut into five equal parts. These parts are then connected in parallel . If the equivalent resistance of this combination is R', then the ratio R/R' is

(a) 1/25   **(b)1/5**   **(c) 5**   **(d) 25**

Ans. After cutting the wire in five equal parts each of piece will have the R/5 resistance, When connected in parallel their equivalent resistance R' will be as following.

1/R' = 1/(R/5) + 1/(R/5) + 1/(R/5) + 1/(R/5) + 1/(R/5)

1/R' = (5/R)x 5 = 25/R

R/R' = 25

Q3-An electric bulb is rated 220 V and 100 W. When it is operated on 110 V, the power consumed will be

(a) 100 W

(b) 75 W

(c) 50 W

(d) 25 W

Ans. (d)It is the resistance of bulb which will remain constant so for calculating it, we have

Power = Voltage $\times$ Current

$P = V \times I = V \times V/R = V^2/R$ (Ohm's law I = V/R)

$R = V^2/P = 220^2/100$

So power will be consumed at 110 V

$P = V^2/R = 110^2/(220^2/100)$

$= (110^2/220^2) \times 100$

$= 25$ W

See the video for Q1 and Q2 and please subscribe our website and Utube Channel

Q4-Two conducting wires of the same material and of equal lengths and diameters are first connected in series and then parallel in a circuit across the same potential difference . The ratio of heat produced in series and parallel combinations would be

 (a)   1: 2

 (b) 2: 1

 (c)   1 : 4

 (d)   4: 1

Ans. When both the wire connected in series their equivalent resistance = R + R = 2R

Let the heat produced when wires are connected in series and in parallel is H1 and H2 respectively.

Heat = Power $\times$ time = Voltage $\times$ Current $\times$ time = Voltage $\times$ (Voltage/Resistance)$\times$time

So, heat consumed,$H_1 = V^2t/R = V^2t/2R$

When both are connected in parallel , the equivalent resistance will be as following.

1/R' = 1/R + 1/R

1/R' = 2/R

R' = R/2

In case of parallel connection heat produced , H_2 = V²t/(R/2)= 2V²t/R

Therefore

H_1/H_2 = (V²t/2R) X(R/2V²t)

= 1/4

H_1 : H_2 = 1 : 4

Q5- How is the voltameter connected in the circuit to measure the potential difference between two points ?

Ans. A voltmeter is connected in parallel across any two points in a circuit to measure the potential difference between them with its positive terminal to the point of higher potential and negative terminal to the point showing lower potential of the source.

Q6. A copper wire has a diameter 0.5 mm and a resistivity of 1.6 x 10⁻⁸ Ωm. What will be the length of this wire to make its resistance 10Ω? How much does the resistance change if the diameter is doubled?

Ans. We are given the diameter of copper wire , d = 0,5 mm ⇒ $r = \dfrac{0.5}{2} \times 10^{-3}$

$\rho = 1.6 \times 10^{-8}$ (Resistivity of the wire) and resistance, R = 10Ω

Using the following relationship

$R = \rho \dfrac{L}{A}$

$\because A = \pi r^2$

$\therefore L = R \times \dfrac{\pi r^2}{\rho}$

$$L = 10 \times \frac{3.14 \times [(0.5/2) \times 10^{-3}]^2}{1.6 \times 10^{-8}}$$

= 122.6 m ≈ 123 m

Let the resistance of copper wire become R' when its diameter is changed

Diameter is doubled, the radius of copper wire is also doubled, applying the following equation

$$R = \rho \frac{L}{A}$$

$$R = \rho \times \frac{L}{\pi r^2} \ldots\ldots (i)$$

Modified radius = 2r and let modified resistance, R'

$$R' = \rho \times \frac{L}{\pi (2r)^2} = \rho \times \frac{L}{4\pi r^2} \ldots\ldots (ii)$$

From (i) and (ii) we have

$$\frac{R}{R'} = \frac{4}{1}$$

$$R' = \frac{R}{4}$$

Hence resistance will become one-fourth of the original resistance when the diameter of wire is doubled.

Q7. The values of the current I flowing in a given resistor for the corresponding values of potential difference V across the resistor are given below.

I (amperes)	0.5	1.0	2.0	3.0	4.0
V (volts)	1.6	3.4	6.7	10.2	13.2

Plot a graph between V and I and calculate the resistance of that resistor.

Ans. Plotting the voltage on Y-axis and current on X-axis
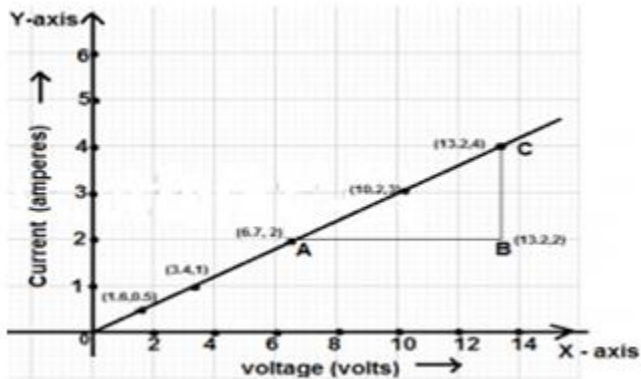
According to Ohm's law, Resistance (R) $= \Delta$ Voltage/ΔCurrent = AB/BC

$$R = \frac{AB}{BC} = \frac{13.2 - 6.7}{4 - 2} = \frac{6.5}{2} = 3.25$$

Therefore the resistance of the wire = 3.25 Ω

Q8. When a 12 V battery is connected across an unknown resistor, there is a current of 2.5 mA in the circuit. Find the value of the resistance of the resistor.

Ans. Applying Ohm's law, voltage = current $\times$ resistance

$V = IR$

$R = V/I$, 1 A = 1000 mA, so 2.5 mA = 0.0025 A

$R = 12 /0.0025 = 4800$

Therefore the resistance of the resistor = 4800 Ω

Q9. A battery of 9V is connected in series with resistors of 0.2 Ω , 0.3Ω , 0.4Ω , 0.5Ω and 12 Ω respectively. How much current would flow through the 12Ω resistor?

Ans. Net resistance, R_T = 0.2 + 0.3 + 0.4 + 0.5 + 12 = 13.4Ω, Total voltage in the circuit,V = 9V

Applying the Ohm's law, Voltage = current $\times$ resistance

$I = V/R = 9/13.4 = 0.67A$

Since all the resistors are in series, the same current, 0.67 A flows through the 12 Ω resistor

Q10. How many 176Ω resistors (in parallel) are required to carry 5A on a 220 line ?

Ans. Let the n resistors are connected in parallel, so the net resistance R_T

$1/R_T =$ $1/R + 1/R + 1/R \ldots \ldots 1/R_n$

$1/R_T = n \times 1/R$

$R_T = R /n$

Applying the Ohm's law, Current, I $= V/ R_T = V/R/n = nV/R$

$n =$ $R I /V = 176 \times 5 / 220 = 4$

Therefore the required number of resistors are =4

Q11.Show how you would connect three resistors, each of resistance 6Ω , so that the combination has a resistance of (i) 9Ω (ii) 4Ω

Ans.
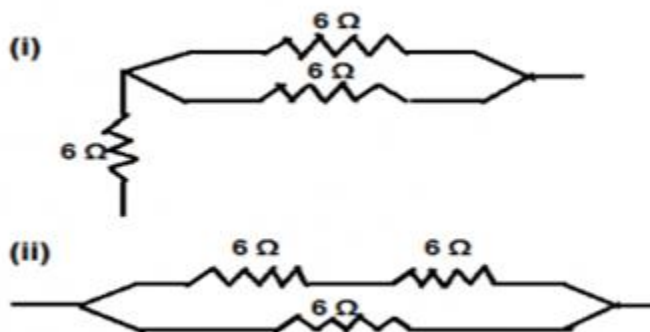
(i) When two 6 Ω resistances are in parallel and the third is connected in series, then the equivalent resistance will be 9Ω

$1/R_P = (1/6 + 1/6) \Rightarrow R_P = 3Ω$

6Ω in series , then net resistance,$R_T = 3Ω + 6Ω = 9Ω$

(ii) When two 6Ω resistors are in series and third is in parallel to them ,then

$R_S = 6 + 6 = 12\Omega$

$1/R_T = 1/12 + 1/6 \Rightarrow R_T = 4\Omega$

Q12. Several electric bulbs designed to be used on a 220 V electric supply line, are rated 10 W. How many lamps can be connected in parallel with each other across the two wires of 220 V line if the maximum allowable current is 5A?

Ans. Let n bulbs each of power 10 w and of resistance R are connected in parallel

Power of each bulb, $P = V \times I = V \times V/R = V^2/R = 220^2/R$ (where R is net resistance of n bulbs)

$P = 220^2/R$ .... (i)

Net resistance of the circuit, $R' = V/I = 220/5 = 44\ \Omega$

$$\frac{1}{R'} = \frac{1}{R} \times n$$

$R = nR' = 44n$......(ii)

Putting the value of R in eq.(i)

$p = 220^2/44n$

We are given the value of P= 10 W

$10 = 220^2/44n \Rightarrow n = (220 \times 220)/440 = 110$

Hence the 110 bulbs can be connected in parallel

Q14. Compare the power used in the 2Ω resistor in each of the following circuits.

(i) A 6 V battery in series with 1Ω and 2Ω resistors, and

(ii) A 4 V battery in parallel with 12Ω and 2Ω resistors

Ans.

(i) We are given

Voltage, V = 6V, Net resistance of the circuit, $R_T = 1 + 2 = 3\Omega$

Applying Ohm's law

$I = V/R = 6/3 = 2A$

current flow through the 2Ω resistor = 2A

So, the power used in 2Ω, $P_S = i^2R = 2^2 \times 2 = 8$ W

(ii)12 Ω and 2Ω are connected in parallel to 4V battery, so the voltage across each one will be= 4V

R = 2 Ω, Voltage across 2 Ω resistor, V = 4V

Power used across 2Ω, $P_P = V^2/R = 4 \times 4/2 = 8$ W

Power consumed through 2Ω resistor in each case will be same 8W

Q15. Two lamps, one rated 100 W at 220 V, and the other 60 W at 220 V, are connected in parallel to the electric mains supply. What current is drawn from the line if the supply voltage is 220 V?

Ans. We are given, the voltage, V = 220 V, Power of both lamps are 100 W and 60 W, Let the resistance across 100W lamp is and across 60 W lamp is R_{60}.

$P = V^2/R_{100}$

$100 = 220^2/R_{100}$

$R_{100} = 22 \times 22 = 484$ Ω

Similarly $R_{60} = 220^2/60 = 4840/6$ Ω

Current drawn by 100 W bulb = 220/484 = 0.45 A(Ohm's law, i= V/R)

Current drawn by 60 W bulb = (220/4840) x 6 = 0.27A

Q16.Which uses more energy,a 250 W TV set in 1 hr, or a 1200 W toaster in 10 minutes?

Ans. Energy consumed by 250 W TV set in 1 hr=Power × time = 250 x 1 = 250 Wh.

Energy consumed by 1200 W toaster in 10 min =Power × time= 1200 × 10/60 =200 Wh(10 min=10/60 hr

So , energy consumed by TV set is more than the energy consumed by toaster in the given timings.

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Q17. An electric heater of resistance 8Ω draws 15 A current from the service mains 2 hours. Calculate the rate at which heat is developed in the heater.

Ans. We are given the resistance of heater, R = 8Ω, current through the resistance, i = 15 A, Time, t= 2 hours

Rate of heat developed = $H/t = I^2Rt/t$

$= 15^2$ x 8

$= 225$ x 8

$=1800$ J/s

18-Explain the following.

(a) Why is the tungsten used almost exclusively for filament of electric lamps?

(b) Why are the conductors of electric heating devices, such as bread –toasters and electric irons, made of an alloy rather than a pure metal?

(c) Why is the series arrangement not used for domestic circuits?

(d) How does the resistance of a wire vary with its area of cross-section?

(e) Why are copper and aluminum wires usually employed for electricity transmission ?

Ans.

(a) Tungsten has a high melting point and has the virtue of emitting light at high temperatures.

(b) An alloy has more resistivity, high melting point and it does not oxidize like the metals.

(c) In series connection, all the appliances have a different potential difference as per their resistances.

(d) The resistanceof wire is inversely proportional to its area of the cross-cross section.

(e) Aluminum and copper has a lower resistivity, which makes them the best conductors.

Summery of the chapter 12-Electricity where from these NCERT questions are taken

Electric charge: Electric charge is the property of the matter,it is of two kinds positive and negative. The negative charge is constituted by the electrons revolving around the nucleus of the

atom and the positive charge constituted by the protons at the nucleus of the atom. In metal outermost electrons i.e valance electrons are loosely packed, these electrons are free to move from one atom to another atom throughout the body of metal, when a potential difference is produced across the metallic conductor in a closed circuit, these free electrons move from one end of the conductor to another end. The electric charge flows from one end of the conductor to another end intermittently and it has been observed by the scientist that the amount of flowing charge is the integral value of the charge in an electron. The charge is represented by the following equation.

Q = ne

Where Q is the charge, n= number of electrons and e= charge in one electron

If $Q = 1$ coulomb, $e = 1.6 \times 10^{-19}$C

So, $n \approx 6 \times 10^{18}$

We can say that the flow of a group of 6×10^{18} electrons constitutes 1 coulomb of charge

Electric Current: The rate of flow of current is known as current,it is measured in ampere.

$$i = \frac{Q}{t}$$

Where Q is the total charge flowed in the circuit in certain time, t is time taken by the flowing charge from one end of the circuit to another end and i is amount of current.

Ohm's Law: A German scientist Jeorge Simon Ohm observed that flow of electric current is proportional to potential difference between across a conductor.

$$V \propto i$$

V = iR

Where R is the constant of proportionality known as **Resistance** of the circuit, resistance is the property of the conductor opposing the electric current, it is measured in Ohm(Ω).

Voltage: Voltage is a force known as the electromotive force that compels the electrons to flow from the negative terminal to the positive terminal. The voltage in a battery is produced by the chemical reaction, the electrons produced in chemical reactions attracted by the positive terminal of the battery and repelled by the negative terminal of the battery, this resulted in an electromotive force developed across the battery, when the battery is connected in an electric circuit this e.m.f causes the flow of electrons from one end of the circuit to another end. The amount of voltage is measured in Volt.

Voltage across a conductor is defined as the work done by a unit charge in flowing from one end to another end. It is given by

$$V = \frac{W}{Q}$$

Where W is work done or electrical energy transferred from one end of the conductor to another another end and Q is total amount of the charge flowed from one end to another end, V is voltage or potential difference

The factors affecting the resistance of a conductor: The resistance of the conductor is affected by its length and cross-sectional area. The resistance of a conductor is proportional to its length and inversely proportional to its cross-sectional area. The resistance of a thicker wire of a certain length is less than the thinner wire of the same length and the resistance of a long wire of a certain diameter is larger than the shorter wire of the same diameter.

Specific resistance (Resistivity): Resistivity is the property of a substance that opposes the flow of current in per unit length of the substance. The resistivity of a substance is constant in a fixed temperature. The resistivity of all substances are different.

The resistivity is given by the following formula.

$$\rho = \frac{RA}{l}$$

Where ρ is the resistivity of a substance, A is the crossectional area of the conductor, l is the length of the conductor.

The combination of electric resistance: In an electric circuit a group of resistors can be combined in two ways because the resistance is affected by the length of the conductor and by the crossectional area of the conductor.

Series Connection: The resistance is proportional to the length of the conductor,so in series connection, the positive terminal of one resistor is connected to the negative terminal of another resistance and the net resistance of the circuit is the sum of individual resistances in a straight forward way. Let there are 3 resistors connected in series as follows.

Let the net resistance of the circuit is R_T

So,

$$R_T = R_1 + R_2 + R_3$$

Parallel Connection: Since the resistance of the circuit is inversely proportional to the cross sectional area of the conductor, so In this type of connection positive terminals of all the resistors are connected to the positive terminal of the battery and the negative terminals of all the resistors are connected to the negative terminal of the battery, the inverse of net resistance is termed as the sum of the inverse of individual resistance. Let 3 resistors are connected in parallel connection as follows.

Let the net resistance of three resistors is R_T

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

Conductance and Conductivity: Conductance is the opposite to resistance,it is the property of a conductor that allows the flow of electric current through it. Conductivity is the property of the substance that allows the flow of electric current in per unit length of the substance.

Heating effect of electric current: The work done by unit charge from one end of the conductor to another end is dissipated in the form of heat.

$$V = \frac{W}{Q}$$

Replacing W by H(heat dissipated)

$$V = \frac{energy\ dissipated}{Q}$$

$$V = \frac{H}{Q}$$

H = VQ

We know Q = it

H = Vit

From Ohm's law, V = iR

H = iR.it = i²Rt

H = i²Rt

The above equation is known as Joul's equation of electric heat

Electric Power: The rate at which the electrical energy is dissipated is known as electric power,it is measured in Watt.

$$P = \frac{W}{t} = \frac{H}{t}$$

$$P = \frac{i^2Rt}{t}$$

P= i²R

P= iR.i = V×i

Where P is electric power, Voltage across the conductor and i is electric current.

The commercial unit of power is a kilowatt

1KWh = 1000 W

The commercial unit of electrical energy is Kilowatt-hour that is equivalent in joules as follows.

$$1KWh = 3.6 \times 10^6 J$$

$$1Wh = 3600J$$

You can compensate us

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$$1Wh = 3600J$$

STUDY THE CHAPTER 13 IN NOTES SECTION

NCERT solutions of chapter 14 -sorces of energy

Q1, What is a good source of energy?

Ans.A good source of energy would be one have following properties.

1.The fuel used by us would do large amount of work per unit volume or mass.

2.The fuel would be easily accessible.

3.The fuel would be easy to store.

4.It is most important that a fuel must be economical.

Q2.What is a good fuel?

Ans. A good fuel must have following qualities.

1.Proper heat be released on burning.

2.It should release least amount of smoke.

3.It should be available easily.

Q3.If you could use any source of energy for heating your food, which one would you use and why?

Ans. We use LPG, the liquid petroleum gas for heating the food since it releases larger amount of energy on heating it produces least amount of heat and easily available and most important that it is economical.

NCERT solutions of chapter 14 -sorces of energy

Page no. 348

Q1.What are the disadvantages of fossil fuels?

Ans.Burning of fossil fuel like coal and petroleum products releases carbon dioxide, carbon monoxide, nitrogen oxides sulphur dioxide. some of these gases are responsible for increasing pollution due to green house effect and some of them causes acid rain which pollutes water bodies and soil .

Q2.Why are we looking at alternate sources of energy?

Ans. The fuel coal and petroleum products are the major sources of energy, these are non-renewable sources ,thus limited in stock, it takes krores of years in their formation inside the earth over and above excess use of coal and petroleum products leads pollution which is dangerous for human health and survival of other organism like plants and animals. We are needed alternative sources of energy that could meet our requirement of energy and prevent us from increasing pollution.

Q3.How has traditional use of wind and water energy been modified for our convenience?

Ans.In past the energy of flowing water was used to provide mechanical energy like grinding the grains and wind was used for separating the grains out of chaff and lifting the ground water through a windmill. Now both of water and wind are used as a renewable source of energy for

the production of electricity, hydropower plants are used, in which obstructed water(dam) preserves potential energy the falling water from a certain height   is capable to rotate the rotor that moves the armature of the dynamo thereby produces electricity and energy of wind is also used to rotate the rotors of windmills and further it rotates the armature of dyomo and produces electricity.

Page no. 253

Q1.What kind of mirror concave, convex or plain would be the best suited for use in a solar cooker? Why?

Ans.Solar cooker is used for cooking food so concave mirror is used in it because concave mirror converge the sun rays at its focal point that increases the temperature inside it and thus accessed to cook the food.

Q2. What are the limitations of energy that can be sustained from the ocean?

Ans. The ways of driving energy from the oceans are tidal energy, wave energy and ocean thermal energy. The tides sometimes high and low due to varying position of moon and the earth, tidal energy is harnessed by constructing a dam across a narrow opening to the sea, the turbine fixed at opening and then rising of tides gives mechanical energy to turbine which is converted into electrical energy but such areas are limited in the coast of sea.

The waves in the sea is generated by the strong winds blowing across the sea, at the sea shore by the use of devices this wave energy is utilised to rotate the turbine and producing electricity but areas of such strong waves are very limited.

There is a difference in temperature of surface water of sea and of depth, this temperature difference is utilised to run turbine of gerator and thus electricity is produced,but for the production of electricity in such a way the difference between the surface of ocean and depth should be 20 K or more

Q3. What is geothermal energy?

Ans.The heat is generated due to the collision between tectonics plates inside the earth that forms molten rocks,these molten rocks are pushed upward and trapped in certain region inside the earth ,when underground water come in contact with these hot rocks steam is generated.Sometime hot water from that region finds outlet at the earth surface ,such outlets at the earth surface known as hot springs. The steam trapped in rocks is routed through a pipe to a turbine and used to generate electricity.

Q4.What are the advantages of nuclear energy?

Ans.Nuclear energy is derived through the process of nuclear fission in which the nucleus of heavy atom is fragmented into two atoms of lighter nuclei in this process massive heat is generated,this heat is utilised to produce heat and further for the production of electricity. The

fission of uraniumg atom produces 10 millions times the energy we get from the combustion of single carbon atom.

NCERT solutions of chapter 14 -sorces of energy

Page no. 253

Q1.Can any source of energy be pollution free? Why or why not?

Ans. There is not any source which is pollution free ,fossil fuels generate green house gases like carbon dioxide, carbon monoxide, nitrogen dioxide and sulphur dioxide even renewable sources are not pollution free like solar energy, actually solar energy is pollution free but the devices used for this purpose are manufactured by the industry has certain expiry and ultimately mixes with soil causing soil pollution. Nuclear energy geothermal energy wind energy also releases other types of pollutions.

Q2.Hydrogen has been used as a rocket fuel, Would you consider it a cleaner fuel than CNG? Why or why not?

Ans.Hydrogen is used as a rocket fuel that is the best alternative of fossil fuel. Hydrogen on burning produces water as a result of its reaction with atmoshpheric oxygen, while CNG on burning produces water and carbon dioxide although as compared with other fossil fuels it is least poluted .Therefore hydrogen is cleaner fuel than CNG.

NCERT solutions of chapter 14 -sorces of energy

Page no 254

Q1.Name two energy sources that you would consider to be renewable. Give reasons for choices.

Ans. The best renewable sources of energy are to be considered solar energy and geothermal energy, both sources of these energy are non -exhaustible and are convenient to use and releases neglected pollution to the earth other sources of energy like ocean and wind energy are accessible only in certain areas but these sources of energy could be accessed to everywhere in the earth.

Q2.Give the names of two energy sources that you would consider to be exhaustible. Give reasons for your choices.

Ans. Two sources of energy coal and petroleum products are exhaustible .Since at present most of the energy we utilise in vehicles, aeroplane ,ship and power plants comes from fossil fuels. It takes millions of years in their processing so their excess use will lead to be finished out of the earth .

NCERT solutions of chapter 14 -sorces of energy

Exercises

Q1.4 solar water heater cannot be used to get hot water on

(a) a sunny day   (b) a cloudy day

(c) a hot day   (d) a windi day

Ans. (b) a cloudy day

Q2.Which of the following is not an example of a biomass energy source?

(a) Wood   (b) gobar gas

(c) nuclear energy   (d) coal

Ans.(d) nuclear energy

Q3.Most of the sources of energy we use represent stored solar energy.Which of the following is not ultimately derived from Sunis energy.

(a) geothermal energy   (b) Wind energy

(c) nuclear energy   (d) bio mass

Ans. (c) nuclear energy

Q4.Compare and contrast fossil fuel and the Sun as a direct sources of energy .

Ans. Fossil fuel is exhaustible and Sun is ever green thus it's non -exhautible source of energy

Fossil fuels are costlier than Sun's energy.

There are limited sources of fossil fuels inside the earth and it's biggest portion is inside the bottom of ocean which is very difficult to be explored while sun's energy is uniformly distributed on the earth.

Fossil fuels on burning releases harmful products like CO_2,CH_4,NO_2 and SO_2 which causes air pollution .Energy of sun is derived through solar panel which releases neglected pollution .

We can use the energy of fossil fuel in all seasons but Sun's energy can't be used on a rainy or cloudy day.

Fossil fuels are conventional and Sun is non-conventional source of energy.

Q6.Compare and contrast bio-mass and hydroelectrity as sources of energy.

Ans. Bio-mass and hydroelectricity both are renewable sources of energy, we wouldn't have to worry about bio-mass and hydroelectricity sources getting used up the way fossil fuels would get finished one day.

Bio-mass like wood, charcoal and biogas on burning releases harmful gases while hydroelectricity doesn't release such gases.

Bio-mass as a biogas plant is easy and economical to install but establishing a hydroelectricity plant we are needed to build a large dam .The dams can be constructed only a limited number of places preferably in hilly areas. Large areas of agricultural land and human habitation are to be sacrificed as they get submerged. The vegetation which is submerged rots under anaerobic conditions and gives rise to large amounts of methane which is also a green house gases.

In spite of using both sources of energy bio-mass and hydroelectricity for the purpose of energy, they are used for other purposes also. The slurry in biogas plants has to be changed periodically, so it is used as a manure and large lake formed on the surface of dam is used to develop fisheries tourism and for irrigation purposes.

Q6.What are the limitations of extracting energy from -

(a) the wind? (b) waves? (c) tides?

Ans(a)The kinatic energy of wind is harnessed by the windmill. Windmills consist of a structure similar to a large electric fan that is erected at some height on a rigid support. To generate electricity, the rotatory motion of the windmill is used to turn the turbine of the electric generator. The support of a single windmill is quite small and cannot be used for commercial purposes. Therefore, a number of windmills are erected over a large area, which is known as wind energy farm. The energy output of each wind mill in a farm is coupled together to get electricity on a commercial scale. Therefore wind energy farms can be established only at those places where wind blows for the greater part of a year. The wind speed should also be higher than 15 km/h to maintain the required speed of the turbine .For a 1 MW generator ,the farm needs about 2 hectares of land. Since tower and blades of the windmill are exposed to rain sun storm and cyclone, they need a high level of maintenance.

(b) In order to extract energy from the waves, very strong ocean waves are needed.

(c) In order to extract energy from the tides, the sun, the moon and the earth should be in a straight alignment and the tides should be very strong.

Q7. On what basis would you classify energy sources as

(a) renewable and non-renewable?

(b) exhaustible and inexhaustible?

Are the options given in (a) and (b) the same?

Ans(a) Renewable and non-renewable:

Renewable resources are those which replenish on their own and are easily available in nature. Like solar energy, tidal energy, wind energy, bio mass.

Non-renewable energy resources are those which do not replenish on their own and have limited availability in nature. Like fossil fuels which includes petroleum, coal and natural gas.

(b) exhaustible and inexhaustible:

Exhaustible source of energy are those which deplete after few hundred years. Like coal and petroleum.

Inexhaustible source of energy are those which do not deplete and are available in abundant quality. Like solar and wind energy.

Q8. What are the qualities of an ideal source of energy?

Ans. Following are the qualities of an ideal source of energy:

1. It should be economical

2. It should be easy available

3. Pollution free

4. Easy transportation and storage

5. The amount of energy produced when burnt should be huge.

Q9. What are the advantages and disadvantages of using a solar cooker? Are there places where solar cookers would have limited utility?

Ans. Advantages:

The heat source for a solar cooker is sunlight. It is a clean renewable and inexhaustible source of energy. As its availability is unlimited, it will be pocket- friendly.

Disadvantages:

It doesn't work on a Cloudy day.

Q10.What are the environmental consequences of the increasing demand for energy? What steps would you suggest to reduce energy consumption?

Ans. Industrialization demands for more energy and to fulfil these demands fossil fuels are used as they are readily available. Due to their harsh usage, it has an impact on the environment. Too much exploitation of fossil fuels had led to greenhouse effect resulting in global warming.

But there are few possibilities of reducing this by reducing the usage of fossil fuels and opting for alternate sources of energy. Reduce the unnecessary usage of electricity and water. Opt for public transportation and lessen using own vehicles. These are a few small steps that can be implemented to reduce energy consumption.

NCERT solutions of class 10 science chapter 15-Our Environment
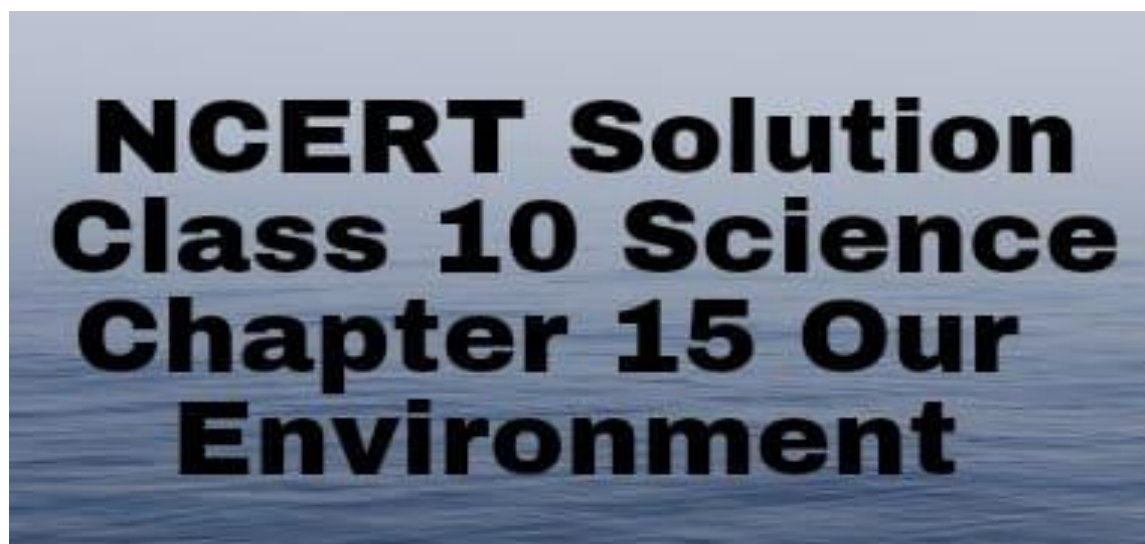
NCERT solutions of Class 10 science chapter 15-our environment are created here for helping the class 10 students to boost their preparation of the cbse board exam. All NCERT solutions are explained scientifically in a proper way. NCERT solutions of class 10 science chapter -15 will give complete idea of the environment in which we are living.

The chapter -our environment is consist of useful peaces of information regarding the safeguard of bour environment because our environment is in danger by the excess use of fossil fuels, here in this chapter there are given complete idea about the settlement of waste materials whether it is biodegradable or non-biodegradable wastes.

NCERT solutions of class 10 science chapter 15-Our Environment

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PDF-NCERT solutions of class 10 science chapter 15-Our Environment

Q1.Why are some substances biodegradable and some non-biodegradable?

Ans. The food eaten by us is digested by us, digestion is the process in which enzymes secreted by our body breaks up the complex molecules into simple molecules, on the same way molecules of some of the waste or dead animal or plants are changed to simple molecules through the bacteria available in the environment and then absorbed by the soil as nutrients. and minerals., these processes are known as biological processes and such substances which are acted by enzymes in settling them to their different components known as biodegradable.

Some of the substances buried by us or eaten by us are not changed to their components by the biological processes or bacteria known as non-biodegradable, such as plastic, coal, and other hydrocarbons. These substances may be inert and simply persist in the environment for a long time or may harm our ecosystem.

Q2.Give any two ways in which biodegradable substances would affect the environment.

Ans. The bacteria act on waste material like food peels of vegetables and fruits, dead animals and their reminders dumped in the dustbin and the open area convert them into their comments, in this process, foul-smelling gases are released that makes impure air of the adjoining area.

The dumping of biodegradable waste also breeds mosquito and flies which carries bacteria to our food items and their bite to our body causing different kind of diseases.

Q3.Give any two ways in which non -biodegradable substances would affect the environment.

Ans. The food items packaged by polythene when eaten by the cow or other animal, it is choked up inside their intestine that may cause their death.

If the use of polythene is continued, its layer on the earth will obstruct the rainwater to go inside the soil of earth would result in the agricultural field becoming barren and underground water lowering up seeking the dryness inside the earth and the land will be fragmented into many pieces.

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Q1.What are trophic levels? Give all examples of a food chain and state the different trophic levels in it.

Ans. The trophic levels are groups of animals in which every organism gets food from the environment in such a way that they depend on each other.

Example. Snake, frog, insects grass in which grass is first trophic level, insects second trophic level, frog third trophic level, and the snake is fourth trophic level.

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Q2.What is the role of decomposers in the ecosystem?

Ans. The role of decomposers or so-called saprophytes decomposes the dead plants and animals and their reminders into their components that are absorbed by the soil. Decomposers (bacteria) convert atmospheric nitrogen gas into nitrogenous compounds making the soil enriched with nutrients for plants.

Page no. 264

Q1.What is ozone and how does it affect any ecosystem?

Ans. When UV rays of sunlight incident on our atmosphere, it split up oxygen molecules into atoms. Since oxygen atom is highly reacted, it combines with an oxygen molecule and thus forms ozone gas, the layer of ozone protects us from dangerous UV rays that cause skin cancer, so if UV rays are allowed to enter the atmosphere, the survival of all the organisms will be endangered. Ozone gas itself is a harmful gas to human health.

Q2.How can you help in reducing the problem of waste disposal? Give any two methods.

Ans. The waste disposal can be treated with three R's reuse reduction and recycle. We have to minimize the use of non-biodegradable substances like plastics and polythene and prefer them to be recycled and reuse

The waste material which is biodegradable can be used to generate energy since biodegradable substances are ultimately transformed into the soil, so that can be used to build small beautiful regions adaptable for different kinds of plants which may become a tourist spot.

Exercise

Q1. Which of the following groups contain only biodegradable items?

(a) Grass, flowers, and leather

(b) Grass, wood, and plastic

(c) Fruit-peels, cake, and lime-juice

(d) Cake, wood, and grass

Ans. The groups (a) Grass, flowers and leather (c) Fruit,-peels, cake and lime-juice (d) Cake, wood and Grass are consist of all biodegradable items and the group (b) Grass, wood and plastic don't contain all biodegradable items because plastics is non -biodegradable item.

Q2. Which of the following constitute a food chain?

(a) Grass, wheat, and mango

(b) Grass, goat, and human

(c) Goat, cow, and elephant

(d) Grass, fish, and goat

Ans.(b) Grass, goat, and human

Q3. Which of the following are environmental-friendly practices?

(a) Carrying cloth bags to put purchases in while shopping

(b) Switching off unnecessary lights and fans

(c) Walking to school instead of getting your mother to drop you on her scooter

(d) All of these above

Ans. (d) All of these above

Q4. What will happen if we kill all the organisms in one tropic level?

Ans. If we kill all the organisms of one trophic level, it will lead to an increase in the number of organisms at the lower trophic level and a decrease in the number of organisms at the higher trophic level. This will result in disruption in the food web and hence the ecosystem.

Q5. Will the impact of removing all the organisms at a trophic level be different for different trophic levels? Can the organisms of any trophic level be removed without causing any damage to the ecosystem?

Ans. Yes, the impact of removing all the organisms at a trophic level will be different for different tropic levels. It will not be possible to remove any organism in any trophic level without causing damage to the ecosystem.

Q6. What is biological magnification? Will the levels of this magnification be different at different levels of the ecosystem?

Ans. Biological magnification can be defined as the progressive increase in the concentration of non-biodegradable wastes in the food chain. As there is an increase in the magnification at the primary level of the ecosystems, all the other levels do get affected and the concentration may vary when compared to the first level.

Q7. What are the problems caused by the non-biodegradable wastes that we generate?

Ans. Following are the problems caused by the non-biodegradable wastes:

1. These substances cannot be decomposed by microorganisms.

2. As the quantity increases, dumping becomes a problem.

3. Non-biodegradable wastes like heavy metals may enter the food chain in the upper trophic levels.

4. They may escape to the groundwater which causes soil infertility and disturbance in ph of the soil.

Q8. If all the waste we generate is biodegradable, will this have no impact on the environment?

Ans. The production of a large amount of biodegradable waste will create a threat to the environment. The degradation of such a huge amount of biodegradable material requires a large number of decomposers that are not available. Incomplete degradation will result in the breeding ground for flies causing the spread of diseases. The emission of foul smell can also make life miserable.

Q9. Why is damage to the ozone layer a cause for concern? What steps are being taken to limit this damage?

Ans. The ozone layer is a protective cover for the earth. It prevents harmful UV rays from entering the earth as these rays are harmful and can result in skin cancer. But the air pollutants like chlorofluorocarbons (CFCs) are the main reason for the depletion of ozone layers. Too much UV rays are harmful to plants as they affect photosynthesis, destroy planktons and decomposers. These are the reasons why damage to the ozone layer is a cause of concern.

Steps taken to limit this is that many developing and developed countries have signed and are obeying the directions of UNEP(United Nations Environment Programme) to freeze or limit the production and usage of CFCs.

NCERT Solutions for Class 10 Science Chapter 16 Management of Natural Resources

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NCERT Solutions for Class 10 Science Chapter 16 Management of Natural Resources

Q1.What changes can you make in your habits to become more environment-friendly?

Ans. We can make following changes in our day to day life to become more environment friendly

(i) We have to control the consumption of water as an example we should not leave the tap running while brushing the teeth.We have to fix the leakage of pipe and tap without delaying .

(ii) The production of electricity is required huge amount of coal and hidal projects are limited in number that required huge space and money to build up so we have to control the consumption of electricity,we should not leave the fan,cooler,AC and bulbs running unecessarily.

(iii) We should walk by feet or throgh bycycle to the places which are located near us that will save petrol and electricity.We should also try to use public vehicles while going to office or to visit somewhere that will minimize polutions.

(iv) We have to follow three R's Reduce,Reuse,Recycle because the objects made of plastics are non degradable which effects our environment badly.

 Q2.What would be the advantages of exploiting resources with short-term aims?

Ans. The exploitation of resources with short term goal will increase rate of development in the industrial field and improve the living standard of the people,the overall economy would be rised up but resources are non sustainable therefore the depleteion of resources will lead our future

generation in risk,so the uses of resources should be planned for longer term so that other alternatives could be explored.

Q3.How would these advantages differ from the advantages of using a long-term perspective in managing our resources?

Ans. It is more advantageous to use the resources for long term perspective because in this method other alternatives can be found .Longer term perspective of using resources will develop our economy in a sustainable way.The conservation of the resources will fulfil the requirement of future generation also.

NCERT Solutions for Class 10 Science Chapter 16 Management of Natural Resources

Q4.Why do you think that there should be an equitable distribution of resources? What forces would be working against an equitable distribution of our resources?

Ans.As far as natural resources are concern ,these resources like land,minerals etc should be distributed equally on the basis of the population so that every individual could be benefitted but these are unequally distributed due to the following factors.

(i) The domination of powerful people and ecomically rich people on the resources

(ii) The resources are distributed on the basis of region

(iii) The curroped and greedy people on the earth

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Q1.Why should we conserve forests and wildlife?

Ans. Since forest is the shelter of many live forms so the conservation of forest leads to defend extinction of many animals. Forest pruduces oxygen and prevents soil erosion ,thus takes parts in maintaining water cycle and oxygen cycle and consumes carbon di oxides to keep the healthy environment for all the organisms.

Q2.Suggest some approaches towards the conservation of forests.

Ans. Some of the steps suggested here for the conservation of forests are following

(i) The villagers are requested to use LPG as a fuel for cooking the foods instead of the wood they get from the tree or plants.

(ii) There should be regular program for the plantation of the trees,for this government should hire villagers,in this way they can get employment and inspiration to grow tree.

(iii)All the forests should be supervised by the goverment by employing the security forces.

(iv) Using the sustainable way of the development means avoiding the construction of dams,factory and building at he expense of demolition of forests.

NCERT Solutions for Class 10 Science Chapter 16 Management of Natural Resources

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Q1. Find out about the traditional systems of water harvesting/ management in your region.

Ans.The traditional systems of water harvesting management in our region is tals,wells,canals,ponds and reservoirs made by the goverments for the purpose of drinking water and irrigation.Roof tanks are also used for harvesting rain water at the top of building for collecting rain water for the use of bath and washing cloths.

Q2.Compare regions.the above system with the probable systems in hilly/ mountainous areas or plains or plateau.

Ans. In the hilly regions glaciers are main source of the water ,the kuls(thin kanals) are made by the man from river which flows from high altitude region to lower altitude regions to catter terrance farming in the regions and tanks are made at the top of the regions which is connected through the pipe lines from the river then peripheral pipelines are distributed to each home for the use of drinking water.In the plains canals,ground water through borewells and wells are used for drinking water. In the plataow region the ponds ,chech dams in the river and cheruvu which are the reservoir used to store rain water for irrigation purpose.

Q3.Find out the source of water in your region/locality. Is water from this source available to all people living in that area?

Ans. In our region the water comes from Yamuna canal,Ganga canal and grandwater through submershible pump which is dug by the people privately,but the drinking water is still insufficient and avaialable for all the people of the area.

NCERT Solutions for Class 10 Science Chapter 16 Management of Natural Resources

Exercise

Q1.What changes would you suggest in your home in order to be environment-friendly?

Ans. We suggest the following changes in our home in order to be environment -friendly

(i) If there is leakage in the taps and pipe line of water,it should be fixed without any delay and avoid wastage of water,using the soapy water after washing the cloths in plants.

(ii) Avoiding misuse of the electricity by controlling the usage of AC,fan,referigerator,bulbs and other electrical appliances. Using the mechanical juicer mixer and grinder operated by the hand.

(iii) Using the cloth made bags instead of polythene,using the disposable paper glass

(iv) Selling the things to junkyard shops which are made of non-biodegradable sustances such as plastics for recycling process.

Q2.Can you suggest some changes in your school which would make it environment friendly.

Ans. Teachers and students should use the public transport or school bus for going to and returning from school instead of private vehicles if school is near to home then using the bycycle.

Segregating the non biodegradable and nonbiodegradable substances and managing their disposal in different ways nonbiodegradable substances by following the three R's Reduce,Recycle and Reuse and using the municipal dustbin for biodegradable substances.

The students and staff should take care of swiching of the fans and bulbs after finishing the class

All the staff and students should communicate to administrative staff about any kinds of leakage of taps and in water pipe lines.

Q3.We saw in this chapter that there are four main stakeholders when it comes to forests and wildlife. Which among these should have the authority to decide the management of forest produce? Why do you think so?

Ans. The four main stakeholders when it comes to forests and wildlife are following.

(i) The people who live in and around the forests

(ii) Forest department

(iii) The industrialists

(iv)The forest and wildlife activists

Among these stakeholders the forest department should have authority to decide the managment of forest produce because forest department is a govenment authority in which all the employees are appointed by an entrance exams so they are more efficient in managing the forest produce.The forest department can use the government resources in managing the forest and wild life.

Q4.How can you as an individual contribute or make a difference to the management of (a) forests and wildlife, (b) water resources and (c) coal and petroleum?

Ans.As an individual we can contribute or make a difference to the management of forests and wildlife by the following ways.

(i) We should not cut the trees or plants instead we have to plant tree on regular basis.

(ii)We should take part in the program Van Mahotsav for increasing awareness among the masses.

(iii)We should use less quantity of the paper.

(iv)We shouldn't use the products made of animal skin.

As an individual we can contribute or make a difference to the management of water resources by the following ways.

(i) Managing the leakage in the pipelines and taps by complaining the concerning authority

(ii)Using the bucket for bathing instead of shower

(iii) Harvesting the rain water for irrigation purpose

As an individual we can contribute or make a difference to the management of coal and petroleum by the following ways.

(i) Using the public transport to save the petrol and CNG.

(ii)Using the slolar technology for cooking the food for saving LPG and coal

(iii)Covering short distances by foot or bycycle

Q5.What can you as an individual do to reduce your consumption of the various natural resources?

Ans.As an individual we can do to reduce our consumption of the various natural resources by

(i) Using LED bulbs for the light for saving electricity

(ii)Using the public transports and covering the short distances by foot or bicycle for saving petrol

(iii) Using solar heater for heating the water

(iv) Using stairs instead of elevaters and lifts for saving the electricity.

(v) Using bucket for bathing instead of shower for saving water

Q6.List five things you have done over the last week to (a) conserve our natural resources. (b) increase the pressure on our natural resources.

Ans. Five things I have done over the last week to conserve our natural resoures

(i) Saved electricity by switching off TV,coolar,fans and AC when not in use and replaced all the ordinary bulbs by the LED bulbs.

(ii) Saved water by using the bucket instead of shower

(iii)Saved electricity by heating the water through solar heater instead of using electrical heater

(iv) Used public transport and bicycle for saving petrol

(v) Used pressure cooker for cooking the food for saving LPG.

Five things I have done over the last week to increase the pressure on our natural resources

(i) Used a bike to cover a short distance

(ii)Forgot to swith off the fan

(iii)Used AC

(iv)Washed cloths in running water

(iv) Forgot to switch of the motor and thus water tank overflowed

Q7.On the basis of the issues raised in this chapter, what changes would you incorporate in your lifestyle in a move towards the sustainable usage of our resources?

Ans.The changes should be incorporated in our life style in a move towards the sustainable usage of our resources

(i) Managing the leakage of the taps and water pipe by arranging a plumber to correct it

(ii)Using the recycled products and reducing the use of the things made of non biodegradable substances

(iii)Using the proper use of the paper

(iv)Using the public transport as far as possible

(v) Harvesting the rain water

(vi) Planting trees

Solutions of Class 10 Science Question Paper for Term 1 Preboard Examination (First) 2021 -22 Class 10 Science

Q1. In the given chemical equation 'A ' stands for:

Zn + A → ZnSO4(aq) + Cu

A. H2SO4   B. HNO3   C. HCl   D.CUSO4

Ans. D.CUSO4

Explanation: The reaction is a displacement reaction in which Zn being more reactive than Cu displaces copper in CuSO4 and forms ZnSO4

Q2.Identify the change in the colour of the lime water during this experiment.

A.transparent to milky (white)   B. yellow to milky(white)   C. bluish to milky(white) D.reddish to milky(white)

Ans.A.transparent to milky (white)

Explanation: Lime water is colourless or we can say transparent,when CO2 enters in it,it forms Calcium Carbonate which is milky(white) in colour and precipitated at the bottom of the container

$Ca(OH)2(aq) + CO2(g) \rightarrow CaCO3\downarrow(s) + H2O(l)$
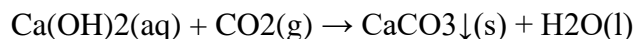
Q3. is only for Visually impaired Candidates

The chemical formula of lime water is

A. CaO   B. CaCO3   C. Ca(OH) 2   D. CaCl2

Ans. C. Ca(OH) 2

Q4. Metal + Dilute acid → Salt + Hydrogen

The above chemical reaction not occur with

A. H2SO4   B. HCl   C. HNO3   D. Both A and B

Ans.   C. HNO3

Explanation: The reaction, Metal + Dilute acid → Salt + Hydrogen, doesn't occur if dilute acid is HNO3 because HNO3 releases more oxygen ions in an aqueous state so it is a strong oxidising agent when HNO3 reacts with metal H2 gas released but instantly it is oxidized to H2O.

Q5. Which of the following correctly represents a balanced chemical equation?

A. Na + O2 → Na2O   B.2Na + O2 → 2 Na2O C. 4Na + O2 → 2Na2O D.Na +2O2 →2Na2O

Ans. C. 4Na + O2 → 2Na2O

Explanation: In LHS and RHS,there are same number of Na and O atoms

Q6.pH of a compound A is indicated on pH scale. Which statement is not true about this compound.

A.it has more H+(aq) than OH-(aq) B.it is sour in taste C.it is basic in nature D.it is acidic in nature

Ans. C.it is basic in nature

Explanation: Compound A has pH value less than 7 indicated that it has more H+ions than OH- ions so it is acidic nature and we know every acid is sour in taste

Q7.pH of compound A indicated on a pH scale is 5. Which statement is not true about this compound.

A. it has more H +(aq) than OH -(aq) B. it is sour in taste C.it is basic in nature D.it is acidic in nature

Ans. A. it has more H +(aq) than OH -

Explanation: Since the pH value of the compound A is 5 which is less than 7,so it will have more H+ ion than OH-,so the compound A is acidic in nature

Q8. When 1 g copper powder is heated in a china dish,it becomes coated with black copper oxide beacause:

A.copper is reduced   B.copper is oxidised C.copper is first reduced and then oxidised D.copper is first oxidised and then reduced

Ans.B.copper is oxidised.

Explanation: When copper is heated, copper oxide is formed which is black in colour

2Cu + O2 → 2CuO
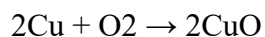
Since there is a gain of oxygen atom when Cu is transformed into CuO,therefore Cu is oxidised

Q9.A reaction between magnesium (s) and copper sulphate solution is categorized as:

A.Combination reaction   B.Decomposition reaction   C.Double displacement reaction D.Displacement reaction

Ans. D.Displacement reaction

In the reaction between magnesium and copper supphate solution magnesium being more reactive displaces Cu in copper sulphate solution,so it is an example of displacement reaction

$Mg + CuSO_4 \rightarrow MgSO_4 + Cu$
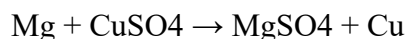
Q10.Neutral salts are formed by the reaction between a

A. weak acid and strong base B.weak base and strong acid C,strong acid and strong base D.both A and B

Ans.C, strong acid and strong base

If weak acid reacts with strong base then salts formed is alkaline in nature.If weak base reacts with strong acid then salts formed is acidic in nature and when strong acid reacts with strong base then salts formed is neutral in nature.

Q11. Turmeric paper indicator turns red in

A.Acidic medium   B. Basic mmedium   C. Both (A) and (B)   D.Neutral medium

Ans.B. Basic medium

Turmeric is acidic in nature, so when it is added to acid reaction doesn't take place and its colour remains yellow but when it is added to base its colour turns yellow to red because of a neutralization reaction.

Q12.Balanced chemical equation :

A.justifies the law of conservation of mass B.justifies the law of conservation of energy

C.have different mass of reactants and product D.both (A) and (C)

Ans..justifies the law of conservation of mass

According to the law of conservation mass, the mass of reactants is always equal to the mass of reactants during chemical reactions or in other words, no new atoms are formed during chemical reactions hence the number of atoms in reactants is equal to the number of atoms in products,

therefore we are needed to balance chemical reactions in order to follow the conservation of mass.

Q13.Which are the products formed during aerobic respiration inside the cell:

A. CO2 +H2O +Energy   B. CO2 +H2O   C.H2O +Energy   D.CO2 +Energy

Ans.A. CO2 +H2O +Energy

Aerobic respiration occures in presence of oxygen,in this reaction the molecule of glucose break down into CO2 ,water and energy is stored in the form of ATP

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + ATP$$
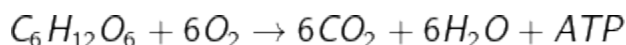
Q14.Where is nephron located in the given picture of excretory organ system?

A. i   B. ii   C. iii   D. Both i and iii

Ans.C. iii

The kidney is shown by iii in the figure made of the special type of cells called nephrons,kidney is capable to filter all toxicity in the blood like extra urea through the nephrons.The extra urea is stored in the urinary bladder which is passed through the urethra as shown by i in the figure.

Question no 15 is only for Visually impaired Candidates

Q15. Where are nephrons located in human excretory organ system.

A.Kidney   B. uretor   C. urinary bladder   D.both A and B

Ans. A.Kidney

Q16. Identify X,Y and Z in the following equation of photosynthesis.

$$6CO_2 + 6X \xrightarrow[Sunlight]{Y} C_6H_{12}O + 6Z$$
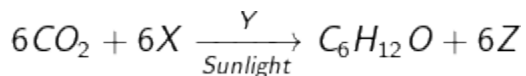
A. X= water   Y = chlorophyll   Z = oxygen

B. X=chlorophyll   Y = water   Z = oxygen

C. X=water   Y = oxygen   Z = chlorophyll

B. X=water   Y = nitrogen   Z = chlorophyll

Ans.A. X= water   Y = chlorophyll   Z = oxygen

Photosynthesis occurs in presence of chlorophyll and sunlight,in this process carbon dioxide reacts with water and starch and oxygen molecules are formed,therefore Y is chlorophyll,X is water and Z is oxygen.

Q17.During breathing:

A. air is inhaled and carbon dioxide is exhaled.

B.oxygen is inhaled and oxygen is exhaled.

C.air rich in oxygen is inhaled and air rich in carbon dioxide is exhaled.

D.air rich in carbon dioxide is inhaled and air rich in oxygen is exhaled.

Ans.C.air rich in oxygen is inhaled and air rich in carbon dioxide is exhaled.

Explanation: The inhaled air by us contains the gases available in our atmosphere nitrogen, oxygen and carbon dioxide and the gases nitrogen and carbon dioxide are exhaled by us, therefore air rich in oxygen is inhaled and air rich in carbon dioxide is exhaled.

Q18.Study the given diagram and select the option which gives correct identification and main function.

A. X = stomach produces bile

B. Y = small intestine absorbs digested nutrients

C. Z = liver store HCl

D. X =pancreas produces pancreatic juice

Ans.B. Y = small intestine absorbs digested nutrients

The complete digestion of the food and absorption takes place in small intenstine, for this intestinal wall contains a figure-like structure known as villi increase the surface area of the intestinal walls compatible for absorption of nutrients.

Q19 **is only for Visually impaired Candidates**

Q19.Select the correct organ and its main function in human digestive system.

A. liver - produces bile

B. small intestine - release enzyme that help in digestion of cellulose

C.stomach -produces pancreatic juice

D.pancreas - releases HCl

Ans.A. liver - produces bile

The function of the liver is to produce biles which emulsifies the fat available in the food takn by us.

Q20. Which fuction is not performed by bile juice during digestion.

A. emulsification of fat   B. make the food alkaline

C. help in digestion of cellulose   D. none of the above

Ans.C. help in digestion of cellulose

The function of bile juice is to break down larger fat globule into smaller globule so that pancreatic juice lipase act on it to digest fats completely, biles also make the food alkaline so that pancreatic juices act on it to break down the food completely.

Q21.Which of the following mirror is used for wider view in shopping mall ?

A. big plane mirror   B.big convex mirror   C.big concave mirror   D. any spherical mirror

Ans. B.big convex mirror

Explanation: The convex mirror is a diverging mirror, the images formed by it are virtual , errected and small that's we can see the wider view in shopping malls by using it.

Q22.Which is not a characteristic of the image formed by a concave mirror.

A. always erect   B.usually inverted and of different size

C.real   D. Both (A) and (C)

Ans.A. always erect

Explanation: A concave mirror usually shows real and inverted images of different sizes when the object is kept in different positions, the exceptional case is when the object is located between the focal point and pole in which the image is formed by it is virtual and erect.

Q23. Identify the type of mirror X and Y in the given figure.

A. X = converging mirror , Y = diverging mirror

B.X = diverging mirror ,   Y = converging mirror

C.X = plane mirror , Y = concave mirror

D.X = concave mirror Y = plane mirror

Ans.A. X = converging mirror , Y = diverging mirror

Explanation: In a concave mirror the reflecting surface is bent and the curved surface is polished, when the parallel light rays incidents on it, it converges them on the focal point located on the principal axis, it is that's why the concave mirror is known as a converging mirror.

In a convex mirror, the reflecting surface is bulged and the bent surface is polished, when the parallel light rays incidents on it,it diverges them when these rays extend towards the backside of the mirror then they meet on a focal point located in the principal axis, it is that's why the concave mirror is known as a diverging mirror.

Q24. The radius of curvature of a converging mirror is 20 cm. Its focal length will be

A. 20 cm B. -10 cm C. +10 cm D. -20 cm

Ans. B. -10 cm

Explanation: The radius of curvature of a spherical mirror or lens is twice the focal length of the mirror or lens, since the given mirror is a converging mirror(concave mirror),so the sign of the focal length must be negative according to sign convention.

-f = R /2= 20/2 ⇒f = -10 cm

Q25 is only for Visually impaired Candidates

Q25. What will be the focal length of a concave mirror whose radius of curvature is 30 cm?

A. 40 cm B. 15 cm C. 30 cm D. 20 cm

Ans.B. 15 cm

Explanation: Refer to Q24.

Q26.The phenomenon of twinkling of stars is observed due to:

A. atmospheric refraction B dispersion of light

C.scattering of light D. both (A) and (B)

Ans.A. atmospheric refraction

Explanation: The atmosphere of the Earth is made of different layers, when light ray from the star enter it , it refracts continuously through different layers of the earth atmosphere and reaches to our eye, since the earth atmosphere changes from time to time, so the position of the images of stars changes accordingly,it gives the twinkling effect of the stars.

Q27. Relationship between SI unit of power of a lens and SI unit of focal length is :

A. 1D = 1 m   B. 1D = 1m²

C.1D = 1/m   D. 1D = 1/m²

Ans.C.1D = 1/m

Explanation: The relationship between power(P) of a lens and its focal length(f) is

P = 1/f

Where power is measuered in dioptor(D) and focal length is measured in meter

When P = 1D,then 1D = 1/1m = 1/m

Q28.Power of a concave lense is

A.Positive   B. negative

C.can be positive or negative   D. never be negative

Ans.B. negative

Explanation: The relationship between focal length and power of a lens is

P(D) = 1/f(m)

Since the focal length of the concave lens is negative, therefore power is also negative.

Q29. In the given diagram the path of a ray of light passing through a glass prism is shown correctly-

Ans. B

Q30 is only for Visually impaired Candidates

Q30.When beam of white light fall on one face of a prism, a spectrum is formed on the screen. In this spectrum which colour bends the most and which the least.

A. red and violet   B.violet and red   C. blue and red   D. violet and yellow

Ans.D. violet and yellow

Explanation: When a light ray passes through the prism,it dispersed the light ray into seven colours, the pattern of the colour is seen below to upper VIBGYOR, which is an increasing order of the wavelengths. Violet colour has the least wavelength, so it bends or deviates the most while red colour has the largest wavelength, so it bends or deviates least.

SECTION B

Q31. Identify X and Y in the given equation.

$$2AgCl(s) \xrightarrow{X} 2Ag\,(s) + Y(g)$$
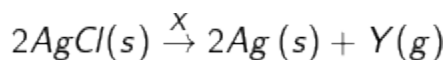
A. X= sunlight,Y =Cl2   **B. X = heat, Y = Cl**

C. X= current   **D. X= water,Y= Na**

Ans.A. X= sunlight,Y =Cl2

Explanation: Silver chloride decomposes into silver and chlorine gas in presence of sunlight,it is an example photodecomposition reaction

Q32.Some amount of HCl is added to the solution of MgO for which a given graph is drawn. As per the graph what will be the nature of the solution after adding 5 drops of HCl in it.

A. acidic   **B.basic**   **C.neutral**   **D. none of the above**

Ans.C.neutral

Explanation: MgO is a basic oxide, when HCl is add to it,MgO neutralizes it

$MgO + 2HCl \rightarrow MgCl2 + H2O$
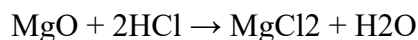
Magnesium oxide and Hydrochloride forms salt (MgCl2) and water

Q33 is only for Visually impaired Candidates

Q33. When some amount of an acid and a base of some strength and quantity are mixed together, what will be the pH and nature of the resulting mixture.

A. 5; neutral   **B.6; basic**   **C. 7; neutral**   **D.acidic**

Ans.C. 7; neutral

Explanation: The same strength of the base and acid neutralizes each other and the pH value of the resulting solution is 7.

Q34. Those metallic oxide which can dissolve in water are called:

A. alkali   **B. amphoteric oxide**   **C. acidic oxide**   **D.neutral oxide**

AnsA. alkali

The metallic oxide which can dissolve in water are called alkali because these metallic oxide reacts with water and forms base,as an example

Q35.Which is correctly matched in column l with the items in column ll

	Column l	Column ll
A.	Iron	Highly malleable
B.	Mercury	Liquid at room temprature
C.	Gold	Stored in kerosene
D.	Sodium	Form bluish on exposure air

Ans. B. Mercury : Liquid at room temperature

Q36. Chemical formula of bleaching powder is:

A. CaOCl2   **B.CaCl2**   **C.Na2CO3.10H2O**   **D.CaSO4.2H2O**

Ans.A. CaOCl2

Explanation: Bleaching powder is formed when chlorine gas is passed through the dry slaked lime ,Ca(OH)2

$Ca(OH)2 + Cl2 \rightarrow CaOCl2 + H2O$
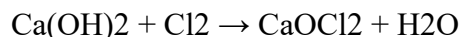
Q37. The best way to prevent tooth decay is to use toothpaste regularly,because it is:

A. Acidic in nature   **B.Basic in nature   C.Neutral in nature   D.Corrosive in nature**

Ans. B.Basic in nature

Explanation: The food particles stucked between the teeth generates bacteria,these bacteria breakdown the food , in this reaction certain amount of acid is also released which causes small

halls on the surface of tooth .Therefore we are required to brush our teeth by applying tooth paste because it is basic in nature that neutralizes the acid formed by the bacteria preventing the formation of the cavities on the tooth.

Question No.38 to 42 consist of two statements - Assertion (A) and Reason (R).Answer these questions selecting the appropriate option given below:

(A) Both A and R are true and R is correct explanation of A

(B) Both A and R are true and R is not the correct explanation of A

(C) A is true and R is false.

(D)A is false and R is true.

Q38. Assertion: Plaster of Paris is used by doctors for setting fractured bones.

Reason: When Plaster of Paris is mixed with water it sets into hard mass.

Ans.(A) Both A and R are true and R is correct explanation of A

Explanation: When gypsum is heated upto 120° and smashed into fined powder then this powder is known as plaster of paris,it is mostly found in Paris the capital of France

$$CaSO_4.2H_2O \xrightarrow[Heat]{120^0} CaSO_4.\frac{1}{2}H_2O + 1\frac{1}{2}H_2O$$
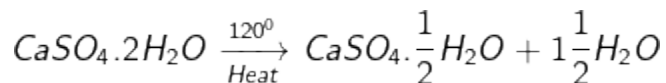
When plaster of paris is mixed with water it is again converted to Gypsum which is a hard mass.When doctor apply the plaster of paris after mixing it with water in the fractured area of the body,it changes into Gypsum,that supports the fractured bones and sets it into the place.

Q39.Assertion: The burning of a candle also shows the physical change.

Reason: In physical change new substance is formed.

Ans.(C) A is true and R is false.

Explanation: Burning of candle has two changes physical change because as per the time its size decreases and it melts (solid to liquid) and chemical change occurs because of the formation of CO2 and H2O.

Q40.Assertion: Xylem and phloem are the vascular tissue in the plant.

Reason: Xylem and phloem do not help in transportation of water,minerals and food in the plant.

Ans.(C) A is true and R is false.

Explanation: Xylem and phloem are called vascular tissue because these tissues are responsible for the transportation of food , water and minerals. Xylem tissues transports water and minerals from root to the leaves and after photosynthesys the resulting food is transported by the phloem tissues to all other parts of the plants.

Q41. Assertion: The sun appears white at noon.

Reason: Only a little of the blue and violet colour of light is scattered.

Ans.(C) A is true and R is false.

Explanation: The sun appears white at noon because all types of colours scattered equally because at that time sun is nearest to us,therefore all the colours reaches to our eyes which resulted sun appears white at noon.

Q42.Assertion: When zinc is added to iron sulphate solution no change observed.

Reason: Zinc is more reactive than iron.

Ans.Zinc is more reactive than Fe in reactivity series,so when zinc is added to FeSO4 solution,Zn displaces Fe and forms ZnSO4.FeSo4 is of light green colour , when Zn is added the colour of solutions turns colourless due to the formation of ZnSO4.

Q43.Which part of the blood helps in clottig of blood ?

A.Plasma   B.RBC's   C.Platelets   D.WBC's

Ans.C.Platelets

Fibrozen is a type of protein in the plasma which is converted into threadlike protein fibrin on contact with sticky surface caused by the injured blood vessel.Fibrin trap platelets to form blood clot which known as blood coagulation or clotting of the blood.

Q44........helps in translocation of food in plants.

A. Xylem   B.Phloem   C.Mesophyll cells   D.Root hairs

Ans. B.Phloem

Explanation: After the process of photosynthesis the food is distributed to all parts of plants from the leaves of the plant body above the leaves and bellow the leaves.The food is transported from one phloem cell to another phloem cell by the process of osmosis,the process of transfering food from one part of plant to another part is known as translocation of food.

Q45.Which is the correct order option among i,ii and iii in the given diagra of human heart ?

(i) Aorta-supply oxygenated blood to body

(ii) left ventricle - have oxygennated blood

(iii) left atrium -collect dxyeogenated blood from body

A. i and ii   B. ii and iii   C.i and iii   D. i,ii and iii

Ans. i and ii

Explanation: The oxygenated blood in the heart is recieved by left atrium through pulmonary veins when left atrium contracts, this oxygenated blood enters dilated left ventricle and then left ventricle conntracts and blood is supplied to all body parts through aorta. On the same time dioxygenated blood recieved by right atrium from all body parts through upper vena cava and lower vena cava,when right atrium is dilated,when it contracts then right ventricle dilates and receives dioxygenated blood ,when right ventricle dilates ,the dioxygenated blood send to lungs through the pulmonary altery.

Q46. is only for Visually impaired Candidates

Q46. Between i,ii and iii pair of parts of human heart and its functions are correctly matched.

i. Aorta - supply oxygenated blood to body

ii. left ventricle -have oxygenated blood

iii.left atrium - collect deoxygenated blood from body

A. i and ii   B. ii and iii   C. i and iii   D. i,ii and iii

A. i and ii

Refer to the explanation for Q45

Q47.When light passes from denser to rare medium then,which of the following statement is true-

A. angle i > angle r   B. angle i < angle r   C.angle i = angle r   D. refraction will not takes place

Ans.B. angle i < angle r

Explanation: When light passes from denser medium to rare medium,light ray bent away from the normal,so the angle of refraction is > angle of incident.

Q48.An object is placed at 20 cm in front of a concave mirror of focal length 10 cm,the image of the obeject is formed at

A. at C   B. between C and F   C. behind the mirror   D. P and F.

Ans. The position of the object, u = -20 cm, focal length,f = -10 cm, the position of image,v = ?

Applying the mirror formula

1/f = 1/v +1/u

1/(-10) = 1/v +1/(-20)

-1/10 + 1/20 = 1/v

(-2 +1)/20 = 1/v

-1/20 = 1/v

v = -20

The image is located at the distance 20 cm in front of the mirror =2×10 = 2f,means at C ,the centre of curvature of the mirror

Q49. Match the words of column l with that of column ll

Sr.No	Column 1		Column ll
K	Slivary amylase	i.	Secreted in stomach
L	Pepsin	ii	Breakdown protein
M	Lipase	iii	Breakdown starch to sugar
N	HCl	iv	Breakdown fats

A. K = i,L = ii,M=iii, N= iv   B. K = iv,L = iii,M=ii, N= i

C. K = iii,L = ii,M=i, N= iv   D. K = iii,L = ii,M=iv, N= i

Ans.   D. K = iii,L = ii,M=iv, N= i

Explanation: Slivary amylase is secreted by slivary gland located at the root of the tongue and initiates the digestion of food inside the mouth by converting the carbohydrate(starch) into sugar.In the stomach pepsin is secreted which help to digest protein partially,HCl is also secreted by the stomach which helps to maintain pH value of stomach and in killing the bacteria.When partially digested food from the stomach reaches to intenstine ,lipase secreted by the pancreas breakdown the fats .

Q50. During respiration,Yeast converts glucose into:

A.ethenol   B. lactic acid   C.carbon dioxide   D.both (A) and (C)

Ans. A.ethenol

Explanation: In the Yeast anaerobic respiration takes place ,in this condition alcohol is produced as a waste product as the carbon dioxide is produced in aerobic respiration.

Q51. If the angle between incident ray and reflected ray is 60°. Then the angle of incidence is:

A. 60°   B. 30°   C.15°   D. 90°

Ans. Since $\angle i = \angle r$

We are given that the angle between incident ray and reflected ray $= 60°$

$\angle i + \angle r = 60°$

$\angle i + \angle i = 60°$

$2\angle i = 60°$

$\angle i = 30°$

Q52. While looking at the diagram ,a student concluded the following:
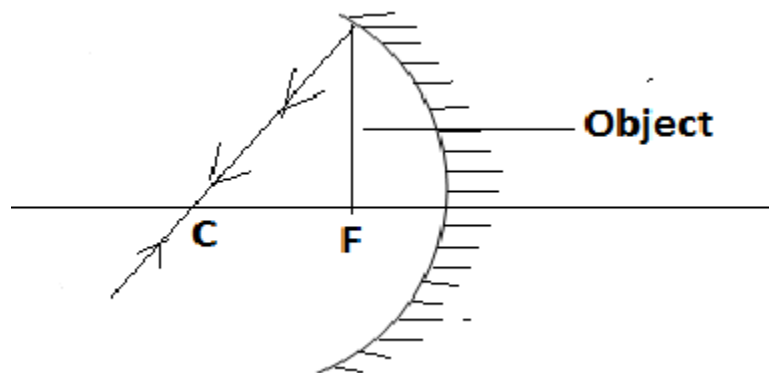
(i) the image of the object will be a virtual one

(ii) the reflected ray will travel along the same path as the incident ray but in opposite direction.

(iii) the image of the object will be inverted.

(iv) this is a concave mirror and hence the focal length will be negative.

Which of the above statements is /are correct :

A. (i) and (ii)   B. (i) and (iii)   C. (ii),(iii) and (iv)   D. (i),(ii) and (iv)

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SECTION A

Q1.An element M has atomic number 12

(a) Write its electronic configuration (b) Write its group number

Ans.Atomic number of M =12

Since Atomic number = no. of electrons

M_{12}= 2,8,2

(b)No of orbitals= 3 and balance electrons =2

Therefore group no. is 2 and the number of periods is 3

Q2.The diagram below shows part of the periodic table.

(a) Which elements would react together to form covalent compounds?

(b) Between the two elements W and Z, which will have a bigger atomic radius? Why?

Ans. (a) Covalent bonds are formed by the elements which couldn't form ions, Y and Z elements lie in the group 16 and 18,

therefore both Y and Z are non-metals, both have the tendency to receive electrons, therefore, they can't form ions instead they form Covalent bonds when reacting together.

(b)Between the two elements W and Z, Z will have a bigger atomic radius since atomic size decreases from left to right in the periodic table because of increasing positive charges.

Q3.How are covalent compounds different from ionic compounds? List their two characteristics properties.

Ans. Covalent compounds are formed when two elements share the electrons, the elements in a covalent compound are bonded by a covalent bond of the type of single, double, or triple bond depending upon the no. of electrons shared while ionic compounds are formed due to the formation of cation(+ ion) and anion(- ion), the force of attraction between two opposite ions creates an ionic bond between the elements.

Characteristic properties: Covalent compounds are bad conductors of electricity and their melting points is lower.

Ionic compounds are good conductors of electricity and their melting points are higher.

Q4.In-circuit five resistance of 50 ohm,20 ohms,15 ohm, and 20 ohm and 10 ohms are connected in series with a 6 V battery. Find total resistance and total current in the circuit.

Ans. Five resistance of 5 ohm,20 ohms,15 ohm, and 20 ohm and 10 ohms are connected in series

The total current is equivalent resistance(R_t) of 5 resistors

R_t= (5 +20+ 15+20+10)Ω =70Ω

Let total current in the circuit is I,then total current is

I = V/R$_s$= =6V/70Ω =3/35 A

Q5.Mustard was growing in two fields-A and B. While field A produced green-colored seeds, field B produced yellow coloured seeds.It was observed that in field A, the offspring showed only the parental trait for consecutive generations, whereas in field B, the majority of the offspring showed a variation in the progeny. What are the probable reasons for these?

Ans. The offspring of green coloured seeds produce the seeds that have parental traits for consecutive generations is the result of sexual reproduction as a result of self-pollination between the similar flowers while offspring of yellow seeds produced in field B showed a variation in the progeny because of the cross-pollination between the dissimilar flowers.

OR

If we cross purebred tall (dominant) pea plant with purebred dwarf (recessive) pea plant we will get pea plant of the F1 generation. If we now self cross the plant of the F1 generation, then we obtain pea plants of the F2 generation.

(a)What do the plants of the F1 generation look like?

(b)State the ratio of tall plants to dwarf plants in the F2 generation.

Ans.(a)If we cross purebred tall (dominant) pea plant(TT) with purebred dwarf (recessive) pea plant (tt)we will get pea plant of the F1 generation, according to the law of inheritance (monohybrid cross), After crossing (TT) and (tt), the progeny in first-generation are Tt, Tt, Tt, Tt which are **heterozygous tall plants** in which tallness is dominated and dwarfness is recessive

(b)After crossing two plants of first-generation (Tt and Tt), plants in second-generation are produced TT, Tt,Tt, tt

In second-generation plants TT -homozygous tall, Tt and Tt-Hetrogygous tall, and tt-homozygous dwarf

Hence the ratio of tall plants to dwarf plants in the second generation is 3: 1

Q6.For the current-carrying solenoid as shown below.

(a)Explain where magnetic field strength will be maximum and minimum and why?

(b)How will you recognize the south pole and north pole in the solenoid?

Ans. (a)Magnetic field lines originate from the north poles and merge in the south pole. Magnetic field strength is maximum at the poles because no. of magnetic field lines per unit area

at the poles are more as compared to the rest of space around the solenoid and magnetic field strength is minimum at the middle because magnetic field lines per unit area are least at the middle.

(b) The end of the solenoid connected to the positive terminal of the battery is the south pole and the other end of the solenoid connected to the negative terminal of the battery forms the north pole.

OR

(a) What is the principle of an electric motor?

(b) What is the function of brushes and split rings?

Ans.(a) The principle of the electric motor is based on the Flaming's left-hand rule, the Flaming's left-hand rule states that if we stretch our left hand in such a way that index finger, middle finger, and thumb are in the right angles to one another and index finger shows the direction of the magnetic field, middle finger shows the direction of current then thumb will show the direction of the force.

In the electric motor when a current is allowed to flow in a rectangular coil under the impact of a magnetic field then a force is produced which is perpendicular to the direction of the current and magnetic field that spins the coil.

(b) The brushes allow the flow of electric current from stationary wires of power supply and the moving coil and since AC current reverses its direction after a half cycle so the role of split ring is to reverse the direction of electric current or it maintains the uni-direction of the current which enables coil of the motor to move in one direction only.

Q7.What is biological magnification? Will the levels for this magnification be different at different levels of the ecosystem?

OR

What is meant by food chain? The number of trophic levels in the food chain is limited? Give reasons to justify the statement.

Click the link and study you will get answers of both questions **Food chain and food web in an ecosystem**

SECTION -B

Q8.From the following elements:

$_4$Be ; $_9$F ; $_{19}$K ; $_{20}$Ca

(i)Select the elements having one electron in the outermost shell.

(ii) Two elements of the same group.

(iii)Write the formula and mention the nature of the compound formed by the union of $_{19}$K and element X (2,8,7).

Ans.(i) The electronic configuration of the given elements are given as

$_4$Be = 2,2

$_9$F = 2,7

$_{19}$K =2,8,8,1

$_{20}$Ca =2,8,8,2
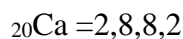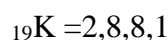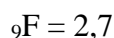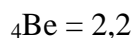
Therefore the element having one electron in the outermost shell is $_{19}$K

(b) Generally balance electrons are related to the group no

Group no of the given elements are

$_4$Be →valance e's =2 implies that group no is 2

$_9$F →valance e's =7 implies that group no is 10 +7=17 (add 10 to the no. of balance electrons in case of non-metals)

$_{19}$K →valace e's =1 implies that group no is 1

$_{20}$Ca →balance e's =2 implies that group no is 2

Therefore group no of $_4$Be and $_{20}$Ca are the same

(c)The compound formed by $_{19}$K and element X (2,8,7) is decided by their valance electrons

$_{19}$K has 1 valance electron so it tends to donate its one electron, thus it forms K$^+$ion

X (2,8,7) has 7 valance electrons it tends to receive one electron, thus it forms X$^-$ion

The valency of K is +1 and the valency of X is -1, therefore formula of the compound formed by K and X is KX and the nature of this compound is an ionic compound.

Q9.(a) How many isomers are possible for the compound with the molecular formula C_4H_{10}? Draw the electron dot structure of the branched-chain isomer.

(b) How will you prove that C₄H₁₀ and C₅H₁₂ are homologous?

Ans. The molecular formula of the given compound is C_4H_{10} states that it is butane

The possible isomers of butane are 2
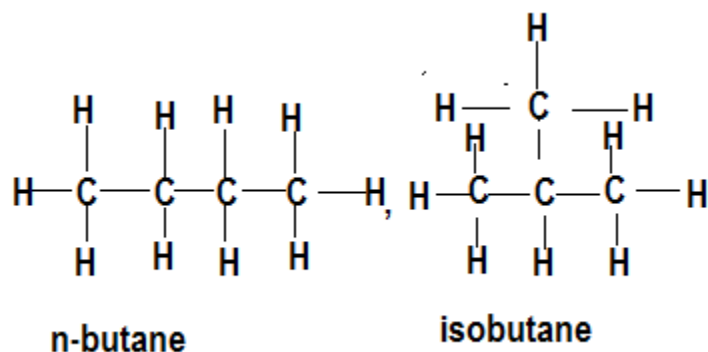
n-butane   isobutane

Where second one(isobutane) is the branched-chain isomer

(b) The given compounds C_4H_{10} and C_5H_{12} are homologous because both have the same formula C_nH_{2n+2} and the same properties.

OR

Give a reason why carbon neither forms C^{4+} and C^{4-} ions but forms covalent compounds which are bad conductors of electricity and have low melting and boiling points.

Ans. The carbon atom has 4 valence electrons so either it can gain 4 electrons or donate 4 electrons to form C^{4+} and C^{4-} ions, if it gains 4 electrons then a number of (6+4 =10) electrons is a burden for 6 protons to bind them towards the nucleus, therefore it can't form C^{4-} ion . If a C atom donates 4 electrons, but to free 4 electrons excess energy is required due to the strong force of attraction towards the nucleus created by 6 protons, therefore the C atom can't form C^{4-} ion.

It is the insufficiency of the carbon atom to form ions, therefore it shares the electrons with other atoms during a chemical reaction and thus forms a covalent bond. Since all valence electrons are shared in the formation of covalent bonds therefore there are no free electrons to conduct electricity, so such types of compounds are bad conductors of electricity. In the molecule of these compounds, each atom is bonded with a strong covalent force that leads to weak molecular force between two molecules which results in them having low melting and boiling points.

Q10.Two pea plants -one with round yellow seeds (RRYY) and another with wrinkled green (rryy) seeds produce F1 progeny that has round, yellow (RrYy) seeds. When F1 plants are self-pollinated, which new combination of characters is expected in F2 progeny? How many seeds with these new combinations of characters will be produced when a total of 160 seeds are produced in the F2 generation? Explain with reason.

Ans. Two pea plants - one with round yellow seeds (RRYY) and another with wrinkled green (rryy)

Seeds produce in F1 that has round, yellow (RrYy) seeds

The gametes transfer from F1 to F2 are (Rr) and (Yy)which can be combined as (RY),(Ry),(rY),(ry)

The alleles (RY),(Ry),(rY),(ry) further can be arranged by random selection giving out the type of plants in the F2 generation

inkled green is 9:3: 3:1

Since a total of 160 seeds are produced in the F2 generation

The no. of round yellow seeds = (9/16)×160 =90

The no. of round green seeds = (3/16)×160 =30

The no. of wrinkled yellow seeds = (3/16)×160 =30

The no. of wrinkled green seeds = (1/16)×160 =10

Q11.Two lamps, one rated 60 W at 220 V and the other 40 W at 220 V are connected in parallel to the electric supply at 220 V.

(a) Draw a circuit diagram to show the connections.

(b) Calculate the current drawn from the electric supply.

(c) Calculate the total energy consumed by the two lamps together when they operate for one hour.

Ans.(a)
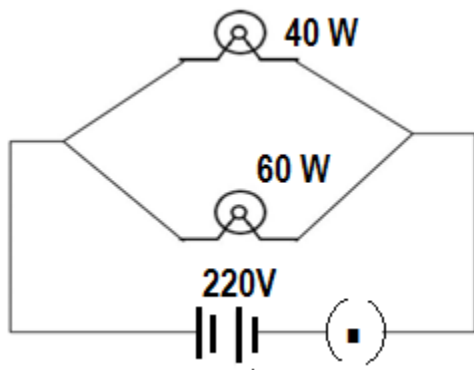
(b) Current drawn into the bulbs = Power/Voltage

Since both bulbs are connected in parallel to the electric supply of 220 V, therefore the voltage across them will be the same.

Current drawn into the bulb of 40 W = 40/220 =2/11 A

Current drawn into the bulb of 60 W = 60/220 =3/11 A

Total current drawn into the circuit = (2/11 +3/11)A=5/11 A

(c) Total energy consumed by the two lamps together = Heat energy(H) dissipated by the bulbs

H = Power × Time = (40+60)W×1 h=100 Wh

1 kWh =1000 Wh

H = 100/1000 =0.1 kWh

Q12.In the below circuit, if the current reading in the ammeter A is 2A, what would be the value of R₁ ?
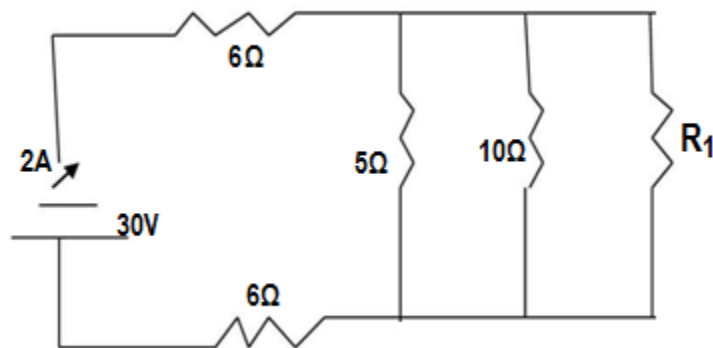
Ans. 5 Ω ,10Ω and R_1 are combined in parallel

Their equivalent resistance is

$1/R_p$ =1/5 +1/10 +1/R_1

$1/R_p$ = (2R_1+R_1+10)/10R_1

R_p = 10R_1 / (3R_1+10)

6Ω,6Ω are combined in series

There equivalent resistance is

$R_s = 6 + 6 = 12\Omega$

Net resistence of the circuit is

$R_{net} = R_p + R_s = 12 + 10R_1 / (3R_1 + 10)$

$V = IR_{net}$

$R_{net} = V/I = 30/2 = 15\Omega$

$12 + 10R_1 / (3R_1 + 10) = 15$

$10R_1 / (3R_1 + 10) = 3$

$9R_1 + 30 = 10R_1$

$R_1 = 30\Omega$

OR

A wire of given material having length L and area of cross-section A has a resistance of 4 ohms. What would be the resistance of another wire of the same material having length L/2 and area of cross-section is 2A.

Ans. Let the resistance of another wire is R'

The length of the wire is L and its area of cross-section is A

The relation between L(length), A(area of cross-section), and R (resistance) of a conductor is given as

$$R = \rho \frac{L}{A}$$

Where ρ is the resistivity of the material, $R = 4\Omega$

$$\rho \frac{L}{A} = 4 .... (i)$$

If the length of another wire of the same material is half of the length of the previous wire(L/2) and the area of cross-section is twice(2A)

$$\rho \frac{L/2}{2A} = 4$$

$$\rho\frac{L}{4A} = R' \dots (ii)$$

On dividing equation (i) by equation (ii) ,we get

4 = 4/R'

R' = 1

Hence the resistance of another wire is 1 Ω

Q13.Gas A, found in the upper layers of the atmosphere, is a deadly poison but is essential for all living beings.The amount of this gas started declining sharply in the 1980s.

a.Identify Gas A . How is it formed at higher levels of the atmosphere?

b.Why is it essential for all living beings? State the cause for the depletion of this gas.

Ans. Click here for answers of this question **Ozone Layer and How it is Getting deplteted.**

SECTION -C

This section has 02 case-based questions(14 and 15). Each case is followed by 03 sub-questions(a,b, and c).Parts a and b are compulsory. However, an internal choice has been provided in part c.

Q14.Ansari has observed colorful flowers in the garden and wants to know how a flower changes into fruit. He has observed their pollination. He has observed different parts of flowers. In gymnosperms, the ovule is not contained in a carpel but exposed on the surface of a dedicated support organ. Pollination is considered a very important process in angiosperms. Pollen grain has two layers intine and extine in which many changes occur after fertilization.

(a)What is self and cross-pollination?

Ans. When pollens are transferred from anther to the stigma of the same flower or genetically similar flower then it is known as self-pollination.

When pollens are transferred from anther of a flower to the stigma of another flower or genetically different flower then it is known as cross-pollination.

(b)Draw a labeled diagram showing germination of pollination on the stigma of a flower.

(c)Which part of the flower will give rise to seed and fruit.

Ans. Male gamete(pollens) reaches from anther to stigma then further transported through style to the ovary where male gametes meet eggs. Both male gamete (pollen)and female gamete(egg) fused together and form the zygote, zygote transforms into embryo and embryo changes into seeds, the ovary develops into the fruit.

OR

(c) What is double fertilization?

Ans. Double fertilization occurs generally in flowering plants when a male gamete fertilizes an egg and union of both fused to another sperm, in double fertilization one egg and sperm fused together form seeds and fusion of union of both with the secondary nucleus of another sperm resulting formation of fruit.

Q15.Substance through which charges cannot pass is called insulators. Glass, pure water, and all gases are insulators. Insulators are called dielectrics. In insulators, the electrons are strongly bound to their atoms and cannot get themselves freed. Thus, free electrons are absent in insulators. Insulators can easily be charged by friction. This is due to the reason that when an electric charge is given to an insulator, it is unable to move freely and remains localized. But this does not mean that conductors can't be charged by rubbing it with silk if it is held in a handle of glass or amber.

(a) Calculate the current in a wire if a 1500 C charge is passed through it in for 5 minutes.

Ans. The relation between charge(Q) and current(i) is

$i = Q/t$,where t is time

$Q = 1500$ C, $t = 5$ minutes $= 5 \times 60 = 300$ seconds

$i = 1500/300 = 5$

Hence current in the given wire is 5 A

(b)(i) Write practical application of the heating effect of current.

Ans. The household appliances like iron, heater, geyser, electric toaster, electric oven, etc are operated due to the application of the heating effect of current. The heating element of these appliances is made of material that has high resistivity and a high melting point.

An electric fuse is used to protect the electric appliances, the excess flow of current causes to heat the fuse wire which results to burn it, and the circuit is broken, The fuse wire is made of material that has high resistivity and a low melting point.

The filament of incandescent bulbs is made of material that has material of high resistivity and a high melting point, in this device non-reactive gases nitrogen and argon gases are flushed into it, the filament of the bulb is heated due to the flow of the current and emits light

(ii)Name the material that you would advise to use in the heater element of the electric heating device and why?

Ans. The material used in the heater element of the electric heating device should be an alloy like nichrome which have high resistivity and a high melting point.

(c)Define 1 ampere.

Ans. The relationship between electric current, charge, and time is Q= it, where Q is a charge, i is current and t is time

$Q = it$

Q=1 C ,t =1 s then i=1C/1s =1 A

Therefore 1 A current is defined as the flow of 1 C charge in 1 second.

OR

State ohm's law

Ans.
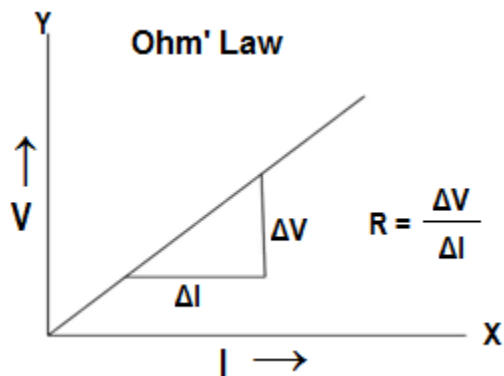
Potential difference (V)is directly proportional to the electric current (i)

V ∝ i

V =iR

Where R is the constant of proportionality known as the resistance of the circuit

Class 10 Science Question Paper CBSE Half Yearly Exam 2022-23 With Solutions

Section A

MCQ's

Q1.The main cause of variation among organisms during sexual reproduction is:

(a) Errors in copying DNA

(b)Errors in RNA

(c)Errors in both RNA and DNA

(d)Genetic drift

Solution:(a) Errors in copying DNA

Q2.The radius of curvature of a converging mirror is 30 cm. At what distance from the mirror should an object be placed so as to obtain a virtual image?

(a) Infinity

(b)30 cm

(c)Between 15 cm and 30 cm

(d)Between 0 cm and 15 cm

Solution:

(d)Between 0 cm and 15 cm

The virual image formed by a concave mirror(converging mirror) when the object is located between focal point and the pole of the mirror.

Therefore the distance of the object should be less than its focal length (f=30/2=15 cm)

Q3. The following reaction is used for preparation of oxygen gas in laboratory:

$$2KClO_3 \xrightarrow{Heat} 2KCl + 3O_2$$
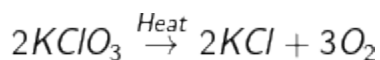
(a) It is decomposition and endothermic

(b) It is combination reaction

(c) It is decomposition reaction and heat is released

(d) It photochemical decomposition and exothermic in nature.

Solution:(a) It is decomposition and endothermic

Q4. Which of the following is correct sequence of events of sexual reproduction in a flower?

(a) Pollination, fertilisation, seeding, embryo

(b) Seeding, embryo, fertilisation, pollination

(c) Pollination, fertilisation, embryo, seeding

(d) Embryo, seeding, pollination, fertilisation

Solution:(c) Pollination, fertilisation, embryo, seeding

Q5. What happens when dilute hydrochloric acid is added to iron fillings?

(a) Hydrogen gas and iron chloride are formed

(b) Chlorine gas and iron hydroxide are formed

(c) No reaction takes place

(d) Iron salt and water are produced

Solution:(a) Hydrogen gas and iron chloride are formed

Q6. Two conducting wires of the same material and of equal lengths and equal diameters are first connected in series and then in parallel in a circuit across the same potential difference. The ratio of heat produced in series and parallel combination would be

(a) 1:2

(b) 2:1

(c) 1:4

(d) 4:1

Solution:(c) 1:4

Heat produced in the circuit = V^2t/R

Let resistance of a wire is R

Net resistance of two wires when connected in series =R+R =2R

Net resistance of two wires when connected in parallel =R/2

The ratio of heat produced in series and parallel combination

= $V^2t/2R$: $V^2t/R/2$

=1 :4

Q7. What happens when a solution of an acid is mixed with a solution of a base in a test tube?

(i) temperature increases

(ii) temperature decreases

(iii) temperature remains same

(iv) salt formation takes place

(a) (i) only

(b) (i) and (iii)

(c) (ii) and (iii)

(d) (i) and (iv)

Solution:(d) (i) and (iv)

Q8. The refractive index of medium A is 1.5 and that of medium B is 1.33. If the speed of light in air is 3×10^8 m/s, what is the speed of light in mediums A and B?

(a) 2×10^8 m/s, 1.33×10^8 m/s

(b) 1.33×10^8 m/s, 2×10^8 m/s

(c) 2.25×10^8 m/s, 2×10^8 m/s

(d) 2×10^8 m/s, 2.25×10^8 m/s

Solution:Let the speed of the light in medium A is V_A and in medium B is V_B

Refractive index of a given medium= Velocity of the light in air/Velocity of the light in the given midium

In case of first medium

$1.5 = 3\times10^8 /V_A$

$V_A = 3\times10^8$m/s

In case of second medium

$1.33 = 3\times10^8 /V_B$

$V_B = 2.25\times10^8$m/s

Q9. In the given food chain, suppose the amount of energy of fourth trophic level is 5 KJ, what will be the energy available at the producer level?

Grass $\rightarrow$ Grasshopper $\rightarrow$ Frog $\rightarrow$ Snake $\rightarrow$ Hawk

(a) 5 KJ

(B) 50 KJ

(C) 500 KJ

(D) 5000 KJ

Solution:(D) 5000 KJ

Let the energy available at the producer level is = x

The energy available at second trophic level is = 10x/100 = x/10

The energy available at third trophic level is = 10% of x/10 = x/100

The energy available at fourth trophic level is = 10% of x/100 = x/1000

Energy of fourth trophic level given is 5 KJ

x/1000 = 5 KJ

x = 5000 KJ

Q10. In a food chain, the third trophic level is always occupied by:

(a) Carnivores

(b) Herbivores

(c) Decomposers

(d) Producers

Solution:(a) Carnivores

Solution of the Science Question Paper of Class 10 half-yearly CBSE exam 2021-22 helpful for you in 2022-23 CBSE Board:see the video

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Section B

Read the assertion and reasons carefully and then mark the correct option:

(a) Both (A) and (R) are true and R is the correct explanation.

(b) Both (A) and (R) are true but R is not the correct explanation.

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

Q11.Assertion(A): Iron articles get rusted in moist air.

Reason(R) : Moisture and oxygen are required for rusting to form hydrated ferric oxide.

Solution:(a) Both (A) and (R) are true and R is the correct explanation.

Q12.Assertion(A): Silver articles turn black when exposed to air.

Reason(R) : Silver reacts with atmospheric oxygen.

(a) Both (A) and (R) are true and R is the correct explanation.

Q13.Assertion(A): Sodium hydroxide reacts with zinc to produce hydrogen gas.

Reason(R) : Acid reacts with active metals to produce hydrogen gas.

Solution:(b) Both (A) and (R) are true but R is not the correct explanation.

Q14.Assertion(A): Tomato contains oxalic acid,vinegar contains acetic acid

Reason(R) : Tamarind contains tartaric acid.

Solution:(b) Both (A) and (R) are true but R is not the correct explanation.

Q15.Assertion(A): In human heart, there is no mixing of oxegenated and deoxygenated blood

Reason(R) : Valves help in movement of blood in one direction.

Solution:(a) Both (A) and (R) are true and R is the correct explanation.

Q16.Assertion(A): Asexual reproduction is seen in small organisms.

Reason(R) : Budding is one type of asexual reproduction.

Solution:(b) Both (A) and (R) are true but R is not the correct explanation.

Q17.Assertion(A): The greater number of individuals are present in lower trophic level.

Reason(R) : The flow of energy is unidirectional.

Solution:(b) Both (A) and (R) are true but R is not the correct explanation.

Q18.Assertion(A): A fuse wire is always connected in parallel with the main line.

Reason(R) : If a current larger than specified value flows through the circuit,fuse wire melts.

(d) (A) is false but (R) is true.

Q19. The mirror which always forms erect and same size image is:

(a)Concave   (b)Convex   (c)Plane   (d)Any of these

Solution:(c)Plane

Q20.When an object is kept within the focus of a concave mirror,an enlarged image is formed behind the mirror.This image is:

(a)Real   (b)Inverted   (c)Virtual and inverted   (d)Virtual and erect

Solution: (d)Virtual and erect

Section C

Q21.Balance the following chemical equation:

$NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$
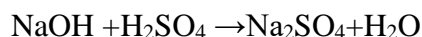
Solution:$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

Q22.A light ray travelling in air enters obliquely into kerosene oil.In what direction does the light bend and why?

Solution.A Light ray entering kerosene oil from the air will be bent towards the normal because a light ray is always bent towards the normal when it enters to a denser medium, in this case, kerosene is denser than air. The velocity of the light is slowed down when it enters to denser medium

Q23.Will current flow more easily through a thick wire or thin wire of aluminum when connected to a battery?

Solution. Current is inversely proportional to the resistance of the conductor, the resistance of the thin wire of the same metal is more than the resistance of the thick wire since resistance is inversely proportional to the area of the cross-section of the wire, therefore being lesser resistance of a thick wire the current flow more easily through it compared to thin wire of aluminum.

Q24.What would happen if mucus is not secreted by the gastric glands?

Solution. The walls of the stomach contain many gastric glands, these gastric glands secrete enzymes pepsin, mucus, and hydrochloride, mucus helps in protecting the inner lining of the stomach from the pepsin and hydrochloric acid if the mucus is not secreted by gastric glands pepsin and HCl may corrode the inner lining of the stomach which cause ulcer and acidity.

Q25.Two unequal resistances are connected in parallel.If you are not provided with any other parameters(e.g numerical values of l and R). What can be said about the voltage drop across the two resistors?

Solution. The voltage across all the unequal resistors are same if they are connected parallel to each other through a single battery or other sources of current, hence voltage drop across the two resistors is the same.

Q26.Why does the colour of copper sulphate solution change when an iron nail is dropped in it?

Solution. When iron nail is dropped in the copper sulphate solution(blue in colour),iron being more rective than copper displaces copper in the solution and forms iron sulphate (green in colour).

Fe +$CuSO_4$(blue) →$FeSO_4$(green)+Cu
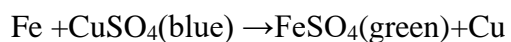
Or

Why is the temperature of scrotal sac 2°C less than the body temprature?

Solution. The sperms are killed in the higher temperatures of the body, so it is designed to be located bellow the abdomen so for the protection of the sperms from high temperatures the temperature of the scrotal sac is 2°C less than the body temperature.

Section D

Q27.How is bleaching powder prepared? Give its chemical equation and it uses.

Solution.The chlorine gas released in the chlor alkali process is utilized in manufacturing bleaching powder. Bleaching powder is produced by the action of chlorine on dry slaked lime [Ca(OH)2].

Ca(OH)2 + Cl2 → CaOCl2 + H2O

The reaction of Cl2 on Ca(OH)2 releases bleaching powder (CaOCl2)

Use of bleaching powder: Bleaching powder is used to bleach the fabrics of cotton and linen in the textile industry,it is used to bleach wood pulp in paper factories and also used to bleach washed cloth in laundry.

Bleaching powder also used as an oxidizing agent in many chemical industries and for disinfecting drinking water to make it free of germs.

Or

A white colored powder is used by doctor for supporting fractured bones.

(i)Write the chemical name and formula of the powder.

(ii)When this white powder is mixed with water a hard solid mass is obtained .Write balanced chemical equation for the change.

Solution.

(i) The powder used by doctors for supporting fractured bones is plaster of peris whose chemical name is calcium sulfate hemihydrate.

(ii)Plaster of paris is a white powder when mixes up with water,it changes into gypsum giving hard solid mass.

$$CaSO_4 . \frac{1}{2}H_2O + 1\frac{1}{2}H_2O \rightarrow CaSO_4 . 2H_2O$$
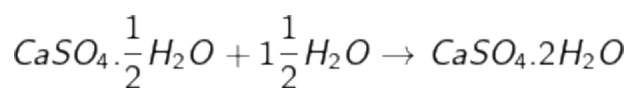
Q28.A 5 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 18 cm at a distance of 12 cm from it.Use lense formula to determine the position.size and nature of image formed.

Solution.The height of the object,h = 5 cm

Focal length of the lense,f = 18 cm

The distance of the object from the lense,u=-12 cm

Applying the lense formula

1/f = 1/v - 1/u,where v is the distance of the image from the lense

1/18 = 1/v - 1/-12

1/v = 1/18 -1/12

1/v =(2-3)/36

v = -36

Position of the image is 36 cm from the lense on the same side of the object

Magnificance of the lense = v/u =h'/h,where h' is size of the image

-36/-12 = h'/5

h' =(-36×5)/-12 =15

Size of the image is 15 cm

Nature of the image is virtual and errect since its direction of the image is same as the direction of the object and the size of the image is positive

Q29.Bile juice does not have any digestive engyme but still plays a significant role in the process of digestion.Justify the statement.

Solution.Bile juice makes the food acidic in the small intestine coming from the stomach which is alkaline in nature since pancreatic juices can act on the acidic medium for the digestion of carbohydrates and protein, more bile breaks down larger fat globules to smaller fat globules for the action of the enzymes, the action of bile is emulsification of the fat just as the action of soap on the dirt.

Or

In birds and mammals, the left and right side of the heart are separated. Give reasons.

Solution.The separation of left and right of the heart is to prevent mixing of oxygenated and dioxygenated blood,the separation is adapted to enhance amount of oxygen supply to the blood which is required to fulfill larg energy requirement of birds and mammals in functionng of their complex organ systems.

Q30.What will be the amount of energy available to the organisms of the secondary consumer trophic level of the food chain,if the energy available to the producer level is 10000 J.

Solution. According to the 10 percent law of transferring the energy from the lower traffic level to the next trophic level,if the energy available to the producer level is 10000J then its 10 percent(i.e 1000J) will be transferred to the primary consumer(grass eating animal,second trophic level) then 10 pecent of 1000J (i.e100J) will be transferred to secondary consumer(carnivores,third trophic level).

Name any two items which can be easily recycled but are generally thrown in the dustbin by us.

Solution. Although there are many items that are thrown to the dustbin by people and many of them can be recycled but paper and plastics are mostly thrown by people to the dustbin while of both of plastics and paper can be recycled.

Q31.Calculate the resistance of 1 cm long wire of copper of radius 1 mm. The resistivity of copper is 1.72×10^{-8} Ωm.

Solution.Applying the following formula

$R = \rho L/A$

Resistivity of copper,$\rho = 1.72 \times 10^{-8}$ Ωm and length,L of the wire=1cm =10^{-2}m

Radius,r of the copper wire= 1mm = 10^{-3}m

Area,A of the cross section = πr^2 = $(22/7) \times (10^{-3})^2 = 3.14 \times 10^{-6}$m²

The resistance of the wire,R is

R = $(1.72 \times 10^{-8}) \times 10^{-2}/(3.14 \times 10^{-6})$

R=$5.5 \times 10^{-4}\Omega$

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Section E

Q32.The figure below shows three cylindrical copper conductors along with their face areas and lengths. Compare the resistance and the resistivity of the three conductors. Justify your answer.
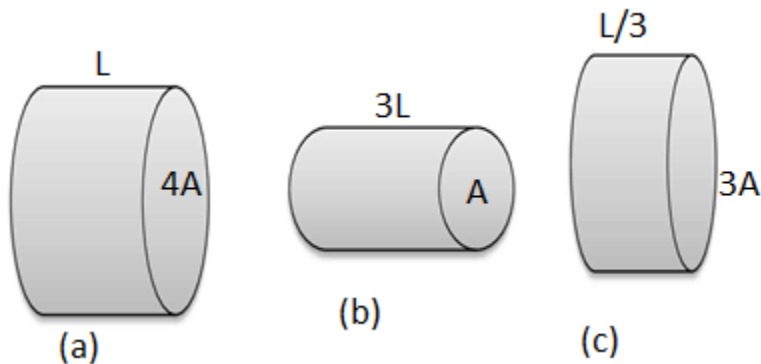
Solution.The relationship between resistance, length, and crosssectional area of a conductor is following

R= $\rho L/A$

Where R is the resistance,ρ is resistivity,L is length and A is area of cross-section of the conductor

In fig.(a) let the resistance of the wire is R_1

$R_1 = \rho L/4A$

In fig.(b) let the resistance of the wire is R_2

$R_2 = 3\rho L/A$

In fig.(c) let the resistance of the wire is R_3

$R_3 = \rho L/(3 \times 3A)$

$R_3 = \rho L/9A$

Resistivity of all of these threewire is same because all the wire are of the same metal copper.

The ratio between the resistances of the (a),(b) and (c)

$R_1:R_2:R_3 = \rho L/4A : 3\rho L/A : \rho L/9A$

$R_1:R_2:R_3 = \rho L/4A : 3\rho L/A : \rho L/9A$

$R_1:R_2:R_3 = 9:108:4$

Or

V-I graph for two wires 'A ' and 'B ' are shown in the figure.If both the wires are of the same length and are of same thickness, which of these two is made of material of higher resistivity? Give justification for your answer?
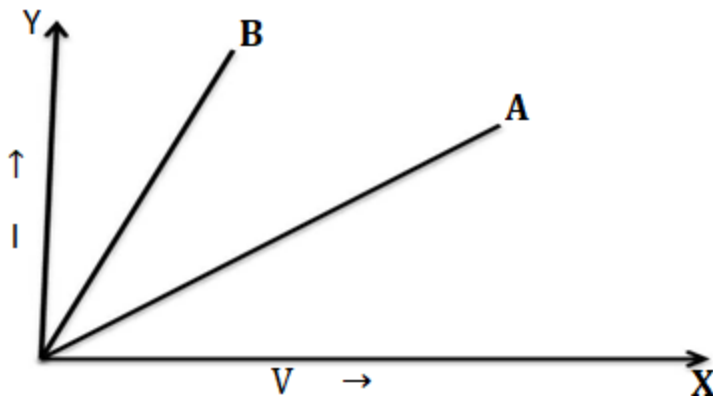
Solution.Let the resistivity of two wires 'A ' and 'B ' are ρ_1 and ρ_2 respectively and their resistances are R and R'

$\rho_1 = RA/l$

$\rho_2 = R'A/l$

$\rho_1 : \rho_2 = R:R'$

It is clear that resistivity of A and B is in the ratio of their resistances,the restance in the V-I graph is slope of the graph,the slope of B is more than the slope of A , the resistance of B is more than A therefore resistivity of B is more than A.

Q33.What is biological magnification? Why is it not desirable to suggest some methods to reduce it?

Solution. Human lies on the top level of any food chain. Several pesticides and chemicals are utilized in to protect the crop from diseases and pests. These chemicals are either washed down into the soil or into the water bodies. From the soil, these are absorbed by the plants, from the water body these are taken by fishes and other aquatic animals. These chemicals accumulated as the trophic level rises up and ultimately maximum consumption is taken place by humans,it is known as biological magnification.

It is not desirable because it can effect human health, its prolonged effect on humans may result in cancer, kidney disease, heart disease, and even birth defects.

Biological magnification can be reduced by avoiding the use of heavy metals like lead, mercury and arsenic, it can be reduced by imposing a restriction on the products which are harmful to the environment.

Or

(i) What is ozone and how is it essential for us?

(ii)What could be the consequences if non -biodegradable substances keep accumulating?

Solution.

(i)When sunlight reaches the stratosphere, the ultraviolet rays of sunlight split up oxygen molecule(O2) into its two atoms. The high reactivity of the oxygen atom forces it to combine with oxygen molecules resulting in the formation of ozone molecules.

$O2 \rightarrow O + O$

$O2 + O \rightarrow O3$

Ozone(O3) is a molecule formed by three atoms of oxygen. While O2.which we normally refer to as oxygen, is essential for all aerobic forms of life.Ozone performs an essential function. It shields the surface of the earth from ultraviolet(UV) radiation from the Sun. This radiation is highly damaging to organisms, for example,it is known to cause skin cancer and cataract in human beings, UV rays also has its harmful effects on plant life and marine life.

(ii)If non -biodegradable substances plastics,metalic products like cans,water bottles,e-waste and glass etc are keep accumulating around us then its consequences would be very dangerous for environment. The accumulation of non-biodegradable substance cause the death of cattles by the

ingestion of hazardous products,it will lead to biological magnification that will disorder ecological imbalance,it will lead low productivity of the crop.

Q34.1 g of copper powder is taken in a china dish and heated . What change takes place on heating? When hydrogen gas is passed over this heated substance,a visible change is seen in it. Give the chemical equations of reactions, the name, and colour of the products formed in each case.

Solution.

When 1 g of copper powder is taken in a china dish and heated, Cu is oxidized to copper oxide due to which its brown colour transforms to black

$$Cu(brown) + O_2 \overset{Heat}{\rightarrow} CuO(black)$$
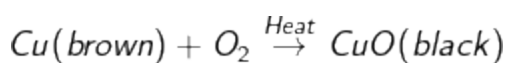
When hydrogen gas is passed over CuO then it is reduced to Cu and its colour again transforms to brown due to the formation of copper metal.

$$CuO(black) + H_2 \overset{Heat}{\rightarrow} Cu(brown) + H_2O$$
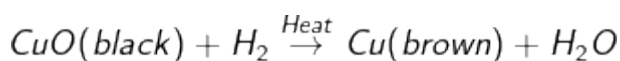
Q35.Define the term pollination. Differentiate between self-pollination and cross-pollination. What is the significance of pollination?

Solution.

Definition of Pollination: Pollination is a process of transfering pollens(male gametes) from the anther(male part) to the stigma(female part) , the pollination occurs in the flowers of the same species.

The difference between self-pollination and cross-pollination:

Self-pollination: When pollen grains are transferred from anther to stigma of the same flower then it is known as self-pollination.it occurs in bisexual flowers in in which the stigma and anther mature at the same time as an example peas, wheat, etc, for self-pollination no external medium is required.

 Cross-pollination: When pollen grains are transferred from anther to stigma of the another flower then it is known as cross-pollination.it occurs in bisexual flowers in which the stigma and anther mature at the same time as an example generally it occurs in garden plants like brinjal, tomato, lady finger, etc. for cross-pollination external medium is required.

Or

Draw a well labeled diagram of the humane respiratory system.

The Respiratory System
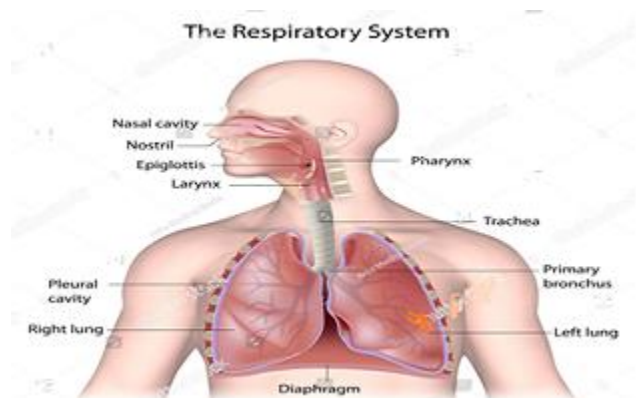
Section F

Q36.(i)Dry pallets of a base X when kept in open,,it absorbs moisture and turns sticky. The compound is also formed by chlor alkali process .Write chemical name and formula of X.Describe chlor alkali process with balance chemical equations.Name the type of chemical reaction which occurs when X is treated with HCl.Write the chemical equation.

(ii)While diluting the acid ,why is it recommended that acid should be added to water and not water to acid?

Solution.Dry pallets of a base X is sodium hydroxide, when it is kept in open it absorbs moisture and turns sticky,the compound NaOH is formed when electricity is passed through aqueous solution of sodium chloride.The reaction is known as chlor alkali process because the products formed are NaOH which is alkali and chlorine is shorted to chlor.

$NaCl(aq) +2H_2O(l) \rightarrow NaOH(aq)+Cl_2(g)+H_2(g)$
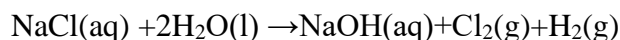
When NaOH is treated with HCl , sodium chloride(salt) and water is formed

$NaOH(aq) +HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$
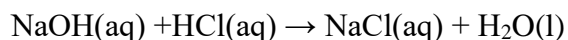
Or

(i)State the chemical properties on which the following uses of baking soda are based:

(a)as an antacid.

(b)as a soda acid fire extinguisher.

(c)to make bread and cake soft and spongy.

(ii)How washing soda is obtained from baking soda? Write a balanced chemical equation.

Solution.(a) Baking soda is the commercial name of sodium bicarbonate which is a base, when it reacts with HCl in the stomach it neutralizes the excess HCl, and acid reflux is relieved.

(b) Soda acid fire extinguisher contains baking soda and sulphuric acid in a different container in a cylinder when the lid of the cylinder is opened both sodium carbonate and sulphuric acid come out and reacts with each other releasing carbon dioxide and water which are responsible for extinguishing the fire.

(c) When baking soda is mixed with moisture and acid like yogurt or buttermilk a reaction takes place in which carbon dioxide is released, carbon dioxide gas expands the volume of dough of flour and creates tiny small wholes throughout it, when kept in the oven the rate of blowing carbon dioxide increases and the whole of the dough is baked up.

(ii)When baking soda (i.e sodium hydrogen carbonate) is heated, sodium carbonate, carbon dioxide, and water are formed. Sodium carbonate further reacts with water and gives the crystal of sodium hydrogen carbonate known as washing soda.

$2NaHCO_3$ (baking soda)$\rightarrow Na_2 CO_3 + CO_2 + H_2O$

$Na_2CO_3 + 10H_2O \rightarrow Na_2CO_3 .10H_2O$(washing soda)
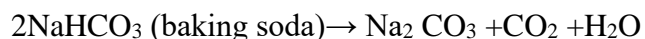
Q37.(i)What is meant by food chain?"The number of trophic levels in the food chain is limited" Give reason to justify the statement.

Solution. A food chain in an ecosystem defines that one organism depends on other organisms for its survival. In a food chain energy is transferred from one organism to another organism. A food chain starts with producer organisms (Plants). All food chains are processed in the presence of bacteria on the earth.

The number of trophic levels in the food chain is limited because at each trophic level the energy is utilized for the maintenance of the organism and heat is transferred to the surroundings, as a result, a lesser amount of the energy is passed on to the next trophic level so after few levels the energy transfer is neglected.

(ii)"The flow of energy in a food chain is unidirectional"Comment.

Solution. The energy transferred in a food chain from one trophic level to the next is 10%, as an example, the first trophic level is plants which get energy from the sun, plants utilize maximum energy for their maintenance and release heat to the surroundings so 10 % of the energy is transferred to second trophic level so the transfer of energy from second trophic level to the producer is impossible as well as plants energy can't transfer as a light energy transfer of energy can not be reverted the flow of energy in a food chain is unidirectional.

Q38.(i)Calculate the total resistance in the figure given below.
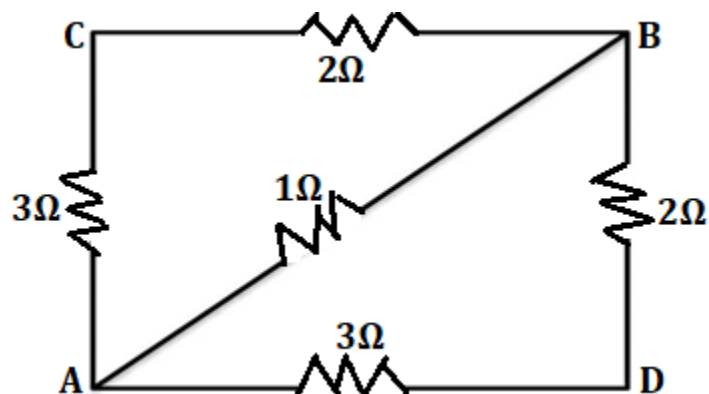
(ii)What are the advantages of parallel combination over series?

Solution.3Ω and 2Ω resistors are in series in ABD

The net resistance of (3Ω and 2Ω)in ABD = 3+2 = 5Ω

Also 3Ω and 2Ω resistors are in series in ABC

The net resistance of (3Ω and 2Ω) in ABC= 3+2 = 5Ω

Now 5Ω , 5Ω and 1Ω resistors are parallel

1/R = 1/5 +1/5 +1/1

1/R = (1+1+5)/5 =7/5

R = 5/7

Therefore the net resistance of the circuit is 5/7 Ω

(ii) The advantages of the parallel combination over series connection are

- Switching off one appliance does affect other appliance
- Overall resistance is less as compared to series connection
- Heat decay is less
- All the appliances get the full and the same voltage
- The current flows in each appliance depend only on its resistance
- In parallel combination, it is easy to connect or connect a particular appliance

Or

Figure below shows a 3Ω resistor and a 6 Ω resistor connected in parallel across a 1.5 V cell.

Calculate the current in:

(i)3Ω resistor   (ii)6Ω resitor   (iii)the cell

(iv)Calculate the resistance of the parallel combination.
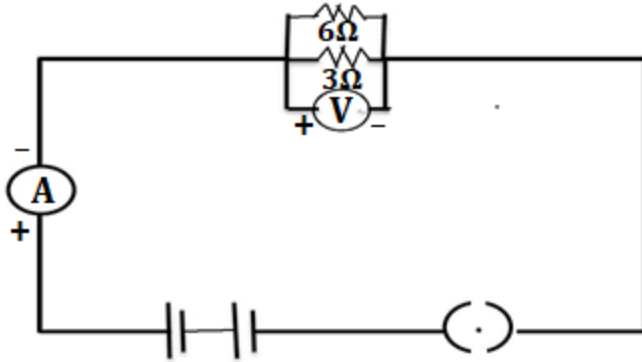
Solution.Let the current flows through 3Ω resistor is I_1 and through 6 Ω resistor is I_2 and current flow through the cell is I

3Ω resistor and a 6 Ω resistor are connected in parallel, their net resistance,R is

1/R = 1/3 +1/6 =3/6=1/2

R= 2Ω

The voltage,V = 1.5 V

According to the Ohm's law

Voltage = Current×Resistance

$1.5 = I_1 \times 3$

$I_1 = 0.5$ A

$1.5 = I_2 \times 6$

$I_2 = 0.25$ A

The current through the cell is

$1.5 = I \times 2$

I = 0.75A

Q39.(i)What is glycolysis ? With the help of flow chart explain how glucose is broken down in different organisms to produce energy.

(ii)Differentiate between aerobic and anaerobic respiration.

Solution.

(i) Glycolysis is the primary step for cellular respiration, in this process glucose is broken down to produce energy, the process is taken place in the cytoplasm of the cell and doesn't require oxygen because this process occurs in both aerobic and anaerobic respiration,in the process of glycolysis 2 molecules of pyruvate,ATP,NADH and water are formed.
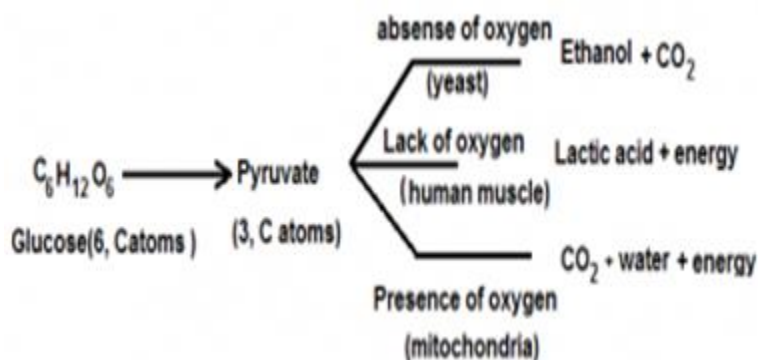
During the cellular respiration in all organism 6 C atoms molecule of glucose is broken down into 3 C atoms molecule of pyruvate. Thereafter further pyruvate is broken in different ways in case of different organisms.

(ii)

Aerobic respiration	Anaerobic respiration
It takes place in the presence of oxygen	It takes place in the absence of oxygen
It involves the exchange of gases between the organism and the environment	Exchange of gases between an organism and outside environment is absent
It occurs in cytoplasm and mitochondria	It occurs only in the cytoplasm
It always releases CO2 and H2O	The products formed depends on organisms
It yields 36 ATP's	It yields 2 ATP's

Section G

Q40. **Case Study**

Ohms law gives the relationship between current flowing through a conductor with potential difference across it provided the physical conditions and temprature remains constant.The electric current flowing in a circuit can be measured by an ammeter.

Potential difference is measured by a voltameter connected in parallel to the battery or cell.Resistance can reduce the current in the circuit.

(i)Graphs between electric current and potential difference acrosss two conductors A and B are shown in the figure.Which of the following conductors has more resistance?
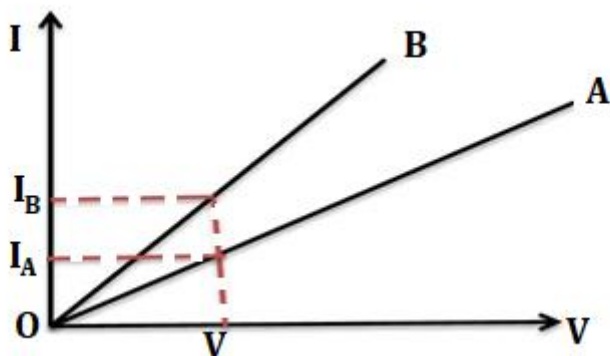
(a)B   (b)A   (c) A and B have equal resistance   (d)None of these

(ii)For metallic conductors voltage vs current graph is shown at two different temperature T_1 and T_2.From the graph it follows.
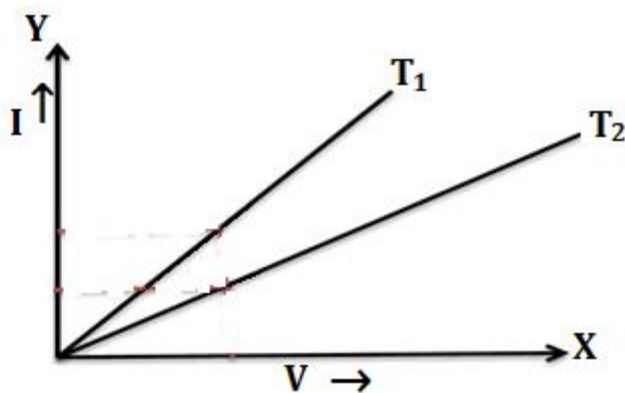
(a)$T_1 = T_2$ (b)$T_1 > T_2$ (c)$T_1 < T_2$ (d)None of these

(iii)Seven identical lamps of resistence 220Ω each are connected to a 220V line as shown in figure.What will be the reading of ammeter?

Solution.(i) The resistance of the conductor is given as

Resistance = Voltage /Current

The currents flow on same voltage in conductor A and B are I_A and I_B respectively

Resistance of the conductor B = V/I_B

Resistance of the conductor A = V/I_A

Since $I_B > I_A$

Resistance of the conductor A > Resistance of the conductor B

(ii) Resistance of the conductor at T_1 < is higher than at T_2 , therefore $T_1 < T_2$

Or

Two conductors A and B of resistance 5 Ω and 10Ω respectively can be arranged in parallel and later on in series.

In each arrangement, the total voltage applied is 120 V.In which arrangement will the voltage across A and B be the same in which case will the current flowing through A and B be the same?

Solution.The net resistance of 5 Ω and 10Ω when connected in series = 5+10 =15Ω

The net resistance of 5 Ω and 10Ω when connected in parallel =(10/3)Ω

The current flow is the same in both conductors A and B when connected in series since net current will flow through the both the conductors which is

Net current through the circuit when A and B are in series =120/(5+10) =8A

In case of parallel connection current flow through A and B is as per their individual resistances

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