SUPPORT MATERIAL

CLASS X

SCIENCE

SA-I (English)

LIST OF CONTRIBUTORS FOR PREPARATION/REVIEW OF SUPPORT MATERIAL IN SCIENCE

CLASS IX

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CONTENTS

QUESTION PAPER DESIGN FOR SCIENCE (CODE NO. 086/090)
CLASS-X (2016-17)

Time : 3 Hours **Max. Marks : 90**

S. No.	Typology of Questions	Very Short Answer (VSA) 1 Mark	Short Answer-I (SAI) 2 Marks	Short Answer-II (SAII) 3 Marks	Long Answer (LA) 5 Marks	Total Marks	% Wei.
1.	**Remembering** (Knowledge based simple recall questions, to know specific facts, terms, concepts, principles or theories, identify, define or recite, information)	3	-	1	1	11	15%
2.	**Understanding** (Comprehension to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase or interpret information)	-	1	4	1	19	25%
3.	**Application** (Use abstract information in concrete situation, to apply knowledge to new situations, use given content to interpret a situation, provide an example, or solve a problem)	-	-	4	1	17	23%
4.	**High Order Thinking Skills** (Analysis & Synthesis : Classify, compare, contrast or differentiate between different pieces of information, organize and/or integrate unique pieces of information from a variety of sources)	-	2	-	1	9	12%

5.	**Inferential and Evaluate** (Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	-	-	2 + 1*	2	19	25%
	Total (Theory Based Questions)	**3 × 1 = 3**	**3 × 2 = 6**	**12 × 3 = 36**	**6 × 5 = 30**	**75 (24)**	**100 %**
	Practical Based Questions (PBQs)	**9 × 1 = 9**	**3 × 2 = 6**	**-**	**-**	**15 (12)**	
	Total	**12 × 1 = 12**	**6 × 2 = 12**	**12 × 3 = 36**	**6 × 5 = 30**	**90 (36)**	

Note : The question paper of SA-II will include a section on Open Text Based Assessment (OTBA) of 10 marks. The case studies will be supplied in advance. This material is designed to test the analytical and higher order thinking skills of students.

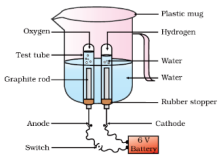
** One question of 3 marks will be included to assess the values inherent in the texts.*

WEIGHTAGE OF MARKS UNIT WISE

CLASS X

Second Term — Marks : 90

Unit No.	Unit	Marks
I	Matter – Its Nature & Behaviour	18
II	Organisation in Living World	26
III	Motion, Force and Work	36
V	Our Environment	10
	Total	**90**



Chapter - 1 Chemical Reactions And Equations

The process in which new substances with new properties are formed from one or more substances is called **Chemical Reaction.**

* The substances which take part in chemical reaction are called **Reactants.**
* The substances which are formed in a chemical reaction are called **Products.**

Examples :

(i) Digestion of food

(ii) Respiration

(iii) Rusting of iron

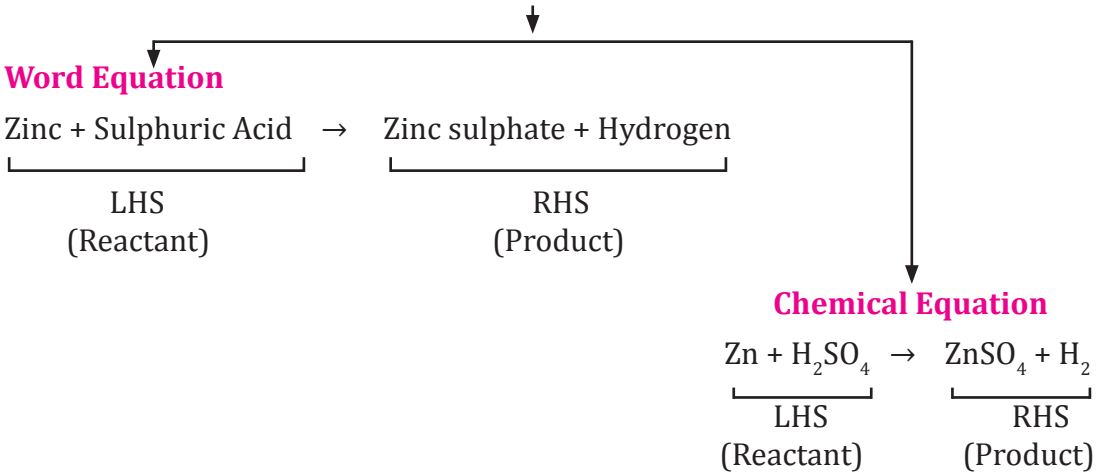
(iv) Burning of Magnesium ribbon

(v) Formation of curd

Chemical reaction involves :

- Change in state
- Change in colour
- Change in temperature
- Evolution of gas

Ways of Representing a Chemical Reaction



Chemical Equation

* A chemical reaction can be represented by chemical equation. It involves uses of symbol of elements or chemical formula of reactant and product with mention of physical state.
* The necessary conditions such as temperature, pressure or any catalyst should be written on arrow between reactant and products.

  e.g., Magnesium is burnt in air to form magnesium oxide.

$$Mg + O_2 \rightarrow MgO$$

Balancing Chemical Equation

* Law of conservation of Mass. Matter can neither be created nor destroyed in a chemical reaction.
* So number of elements involved in chemical reaction should remain same at reactant and product side.

STEPWISE BALANCING (Hit and Trial)

Step 1. Write a chemical equation and draw boxes around each formula.

$$Fe + H_2O \rightarrow Fe_3O_4 + H_2$$

* Do not change anything inside the box.

Step 2. Count the number of atoms of each element on both the sides of chemical equation.

	Element	No. of atoms at reactant side	No. of atoms at product side
1.	Fe	1	3
2.	H	2	2
3.	O	1	4

Step 3. Equalise the number of atoms of element which has maximum number by putting in front of it.

$$Fe + 4H_2O \rightarrow Fe_3O_4 + H_2$$

Step 4. Try to equalize all the atoms of elements on reactant and product side by adding coefficient in front of it.

$$3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$$

* Now all the atoms of elements are equal on both sides.

Step 5. Write the physical states of reactants and products.

$$3Fe\ (s) + 4H_2O\ (g) \rightarrow Fe_3O_4\ (s) + 4H_2\ (g)$$

Solid state = (s)

Liquid state = (*l*)

Gaseous state = (g)

Aqueous state = (aq)

Step 6. Write necessary conditions of temperature, pressure or catalyst on arrow above or below.

TYPES OF CHEMICAL REACTIONS

I. COMBINATION REACTION : The reaction in which two or more reactant combine to form a single product.

e.g. (i) Burning of coal

$C\ (s) + O_2\ (g) \rightarrow CO_2\ (g)$

(ii) Formation of water

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

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

Quick lime Slaked lime

Exothermic Reactions : Reaction in which heat is released along with formation of products.

e.g., (i) Burning of natural gas

$CH_4\ (g) + O_2\ (g) \rightarrow CO_2\ (g) + 2H_2O\ (g) + Heat$

(ii) Respiration is also an exothermic reaction.

$C_6H_{12}O_6\ (aq) + 6O_2\ (g) \rightarrow 6CO_2\ (aq) + 6H_2O\ (l) + energy$

II. DECOMPOSITION REACTION : The reaction in which a compound splits into two or more simple substances is called decomposition reaction.

$$A \rightarrow B + C$$

- **Thermal decomposition :** When decomposition is carried out by heating.

e.g., (i) $2FeSO_4\ (s) \xrightarrow{Heat} Fe_2O_3\ (s) + SO_2\ (g) + SO_3\ (g)$

(Ferrous sulphate) (Ferric oxide)

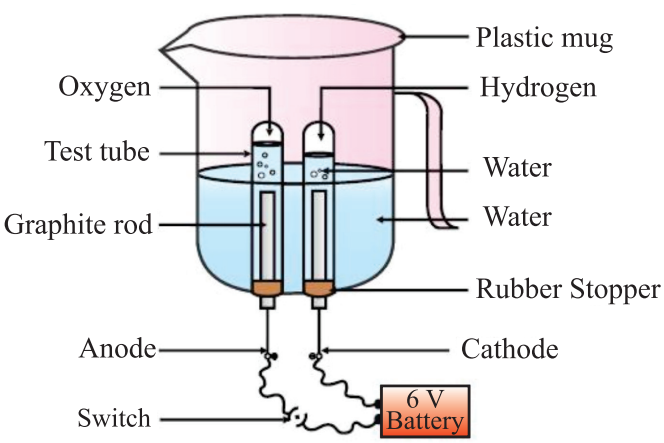
Green colour Red-brown colour

(ii) $CaCO_3\ (s) \xrightarrow{Heat} CaO\ (s) + CO_2\ (g)$

(Lime stone) (Quick lime)

- **Electrolytic Decomposition :** When decomposition is carried out by passing electricity.

e.g., $2H_2O \xrightarrow[current]{Electric} 2H_2 + O_2$



- **Photolytic Decomposition :** When decomposition is carried out in presence of sunlight.

e.g., $2AgCl\ (s) \xrightarrow{Sunlight} 2Ag\ (s) + Cl_2\ (g)$

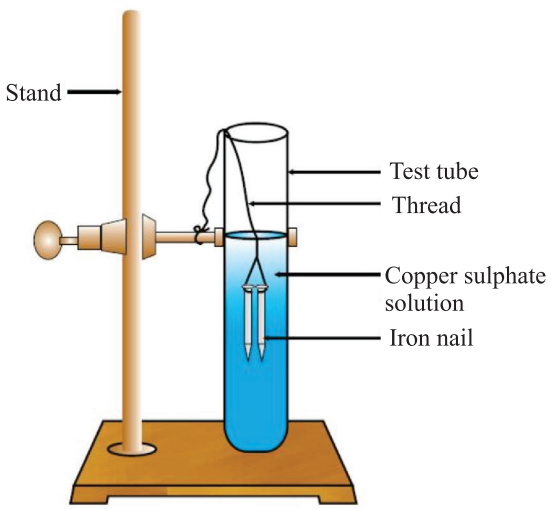
$2AgBr\ (s) \xrightarrow{Sunlight} 2Ag\ (s) + Br_2\ (g)$

* Above reaction is used in black & white photography.

- **Endothermic Reactions :** The reactions which require energy in the form of heat, light or electricity to break reactants are called endothermic reactions.

III. DISPLACEMENT REACTION : The chemical reaction in which more reactive element displaces less reactive element from its salt solution.

$$Fe\ (s) + CuSO_4\ (aq) \rightarrow FeSO_4\ (aq) + Cu\ (s)$$



The iron nail becomes brownish in colour by deposition of Cu and blue colour of $CuSO_4$ changes dirty green colour due to formation of $FeSO_4$.

$$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$$

Zn is more reactive than copper.

IV. DOUBLE DISPLACEMENT REACTION : A reaction in which new compounds are formed by mutual exchange of ions between two compounds.

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

(Sodium sulphate)	(Barium chloride)	(Barium sulphate)	(Sodium chloride)

White precipitate of $BaSO_4$ is formed, so it is also called precipitation reaction.

V. OXIDATION AND REDUCTION :

Oxidation : (i) The addition of oxygen to substance.

(ii) The removal of hydrogen from a substance.

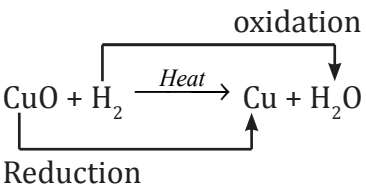
$$C + O_2 \rightarrow CO_2$$

$$2Cu + O_2 \xrightarrow{Heat} 2CuO$$

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

Reduction : (i) The addition of hydrogen to substance.

(ii) The removal of oxygen from a substance.



In this reaction CuO is reduced to Cu and H_2 is oxidized to H_2O. So, oxidation and reduction taking place together is redox reaction.

Effects of Oxidation in Daily Life

1) Corrosion

- When a metal is exposed to substances such as moisture, acid etc. for some time, a layer of hydrated oxide is formed which weakens the metal and hence metal is said to be corrode
- Rusting of iron, black coating on silver and green coating on copper are examples of corrosion.
- Corrosion can be prevented by galvanization, electroplating or painting.

2) Rancidity : The oxidation of fats and oils when exposed to air is known as rancidity. It leads to bad smell and bad taste of food.

Methods to Prevent Rancidity

(i) By adding antioxidants

(ii) Keeping food in air tight containers

(iii) Replacing air by nitrogen

(iv) Refrigeration

QUESTIONS

VERY SHORT QUESTIONS (1 Mark)

1. What changes do you observe in the iron nails and colour of copper sulphate solution, if iron nails are dipped in $CuSO_4$ solution for 15 minutes ?
2. Identify the chemical change :

   Melting of ice or conversion of milk into curd.
3. Why is respiration considered an exothermic reaction ?
4. Why do copper vessel lose shine when exposed to air ?
5. Potato chips manufacturers fill the packet of chips with nitrogen gas. Why ?
6. Why we store silver chloride in dark coloured bottles ?
7. Write a chemical equation of double displacement reaction.
8. $N_2 + 3H_2 \rightarrow 2NH_3$, name the type of reaction.
9. What happens when milk is left open at room temperature during summers ?
10. What happens when quick lime is added to water ?

SHORT TYPE QUESTIONS (2 Marks)

1. Define combination reaction. Give one example of combination reaction which is exothermic in nature.
2. What is decomposition reaction ? Explain with the help of an example.
3. Name and state the law which is kept in mind when we balance a chemical equation.
4. Give one example of each :

   (a) Chemical reaction showing evolution of gas.

   (b) Change in substance's colour during a chemical reaction.
5. What is rancidity ? Write two ways by which it can be prevented.
6. What are two conditions which promotes corrosion ?
7. A small amount of ferrous sulphate is heated in hard glass tube.

   (a) Write the chemical equation.

   (b) What type of reaction is taking place.

8. What happens when Zn strip is dipped in $CuSO_4$ solution ?

SHORT TYPE QUESTIONS (3 Marks)

1. What is redox reaction ? Write down a chemical reaction representing it.
2. In electrolysis of water :
   (a) Name the gas collected at cathode and anode.
   (b) Why is volume of one gas collected at one electrode is double of another ?
   (c) Why are few drops of dil. H_2SO_4 added to water ?
3. In the reaction

   $CuO\ (s) + H_2\ (g) \rightarrow Cu(s) + H_2O\ (g)$

   (a) Name the oxidized substance.
   (b) Name the reduced substance.
   (c) Name the oxidizing agent.
4. Give reasons :
   (a) White silver chloride turns grey in sunlight.
   (b) Brown coloured copper powder on heating in air turns into black coloured substance.
5. Compound 'X' decomposes to form compound 'Y' and CO_2 gas. Compound Y is used in manufacturing of cement.
   (a) Name the compounds 'X' and 'Y'.
   (b) Write the chemical equation for this reaction.
6. A metal salt MX when exposed to light splits upto to form metal M and gas X_2. Metal M is used to make ornaments whereas gas X_2 is used in making bleaching powder. The salt MX is used in black & white photography.
   (a) Identify the metal M and gas X_2.
   (b) Identify MX.
   (c) Write down the chemical reaction when salt MX is exposed to sunlight.
7. A metal strip X is dipped in blue coloured salt solution YSO_4. After some time a layer of metal 'Y' is formed on metal strip X. Metal X is used in galvanization whereas metal Y is used for making electric wires.

(a) What could be metal 'X' and 'Y' ?

(b) Name the metal salt YSO_4.

(c) What type of chemical reaction takes place between X and YSO_4 ? Write the balanced chemical equation.

LONG TYPE QUESTIONS (5 Marks)

1. White wash was being done at Mukesh's house. Mukesh saw that the painter added quick lime to drum having water. Mukesh touched outer surface of drum, it is unbelievably hot.

   (a) Write the chemical equation for above reaction.

   (b) What type of reaction is it ?

   (c) What is utility of this reaction ?

2. What types of reactions are represented by following :

   (a) $CaCO_3 \rightarrow CaO + CO_2$

   (b) $2Ca + O_2 \rightarrow 2CaO$

   (c) $Pb + CuCl_2 \rightarrow PbCl_2 + Cu$

   (d) $2FeSO_4 \rightarrow Fe_2O_3 + SO_2 + SO_3$

   (e) $Na_2SO_4 + BaCl_2 \rightarrow BaCl_2 + 2NaCl$

3. Balance the following equations :

   (a) $H_2 + O_2 \rightarrow H_2O$

   (b) $MnO_2 + HCl \rightarrow MnCl_2 + H_2O + Cl_2$

   (c) $Pb(NO_3) \rightarrow PbO + NO_2 + O_2$

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

   (e) $Ca(OH)_2 + HNO_3 \rightarrow Ca(NO_3)_2 + H_2O$

4. Write down the balanced chemical equation for the following :

   (a) Silver chloride is decomposed in presence of sunlight to give silver and chlorine gas.

   (b) Calcium oxide reacts with water to give lime water.

   (c) Sodium hydroxide reacts with hydrochloric acid to give sodium chloride and water.

(d) Die hydrochloric acid is added to copper oxide to give green coloured copper chloride and water.

(e) Solution of barium chloride and sodium sulphate in water reacts to give insoluble barium sulphate and solution of sodium chloride.

Hints to Long Answer Type Questions

2. (a) Decomposition reaction

   (b) Combination reaction

   (c) Displacement reaction

   (d) Decomposition reaction

   (e) Double displacement reaction

3. (a) $2H_2 + O_2 \rightarrow 2H_2O$

   (b) $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

   (c) $2Pb(NO_3) \rightarrow 2PbO + NO_2 + O_2$

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

   (e) $Ca(OH)_2 + 2HNO_3 \rightarrow Ca(NO_3)_2 + 2H_2O$

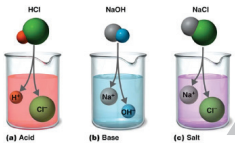
4. (a) $2AgCl \xrightarrow{Sunlight} 2Ag + Cl_2$

   (b) $CaO + H_2O \rightarrow Ca(OH)_2$

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

   (d) $CuO + 2HCl\ (dil.) \rightarrow CuCl_2 + H_2O$

   (e) $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$



Chapter - 2

Acid, Bases And Salts

ACIDS :

- These are the substances which have sour taste.
- They turn blue litmus solution red.
- They give H^+ ions in aqueous solution.
- The term 'acid' has been derived from the Latin word, acidus, which means sour.

Strong Acids : HCl, H_2SO_4, HNO_3

Weak Acids : CH_3COOH, Oxalic acid, Lactic acid

Concentrated Acid : Having more amount of acid + less amount of water

Dilute Acid : Having more amount of water + less amount of acid

BASES :

- These are the substances which are bitter in taste and soapy in touch.
- They turn red litmus solution blue.
- They give OH^- ions in aqueous solution.

Strong Bases : NaOH, KOH, $Ca(OH)_2$

Weak Bases : NH_4OH

Alkalis : These are bases which are soluble in water [NaOH, KOH, $Ca(OH)_2$].

SALTS :

These are the compounds formed from reaction of acid and base.

Example :

NaCl, KCl.

INDICATORS :

These are the substances which change their colour/smell in different types of substances.

TYPES OF INDICATORS

Natural indicators

— Found in nature in plants.

— Litmus, red cabbage leaves extract, flowers of hydrangea plant, turmeric

Synthetic indicators

— These are chemical substances.

— Methyl orange, phenolphthalein

Olfactory indicators

— These substances have different odour in acid and bases.

	S. No.	Indicator	Smell/Colour in acidic solution	Smell/Colour in basic solution
Natural Indicator	1.	Litmus	Red	Blue
	2.	Red cabbage leaf extract	Red	Green
	3.	Flower of hydrangea plant	Blue	Pink
	4.	Turmeric	No change	Red
Synthetic Indicator	1.	Phenolphthalein	Colourless	Pink
	2.	Methyl orange	Red	Yellow
Olfactory Indicator	1.	Onion	Characteristic smell	No smell
	2.	Vanilla essence	Retains smell	No smell
	3.	Clove oil	Retains smell	Loses smell

CHEMICAL PROPERTIES OF ACIDS AND BASES

Reaction of Metals with

Acids	Bases
Acid + Metal → Salt + Hydrogen gas	Base + Metal → Salt + Hydrogen gas
E.g., $2HCl + Zn \rightarrow ZnCl_2 + H_2$	*E.g.,* $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2\uparrow$ (Sodium zincate)

* Hydrogen gas released can be tested by bringing burning candle near gas bubbles, it burst with pop sound.

Reaction of Metal Carbonates/Metal Hydrogen Carbonates with

Acids	Bases
Acid + Metal Carbonate/→ Salt + $CO_2 + H_2O$	Base + Metal Carbonate/
Metal Hydrogen Carbonate	Metal Hydrogen Carbonate
E.g., $2HCl + Na_2CO_3 \rightarrow 2NaCl + CO_2 + H_2O$	→ No Reaction
$HCl + NaHCO_3 \rightarrow NaCl + CO_2 + H_2O$	

* CO_2 can be tested by passing it through lime water.

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

(Lime water turns milky.)

* When excess CO_2 is passed,

$CaCO_3 + CO_2 + H_2O \rightarrow Ca(HCO)_3$

(Milkiness disappears.)

Reaction of Acids and Bases With Each Other

Acid + Base → Salt + H_2O

Neutralisation Reaction : Reaction of acid with base is called as neutralization reaction.

E.g., $HCl + NaOH \rightarrow NaCl + H_2O$

IF :

Strong Acid + Weak Base → Acidic salt + H_2O

Weak Acid + Strong Base → Basic salt + H_2O

Strong Acid + Strong Base → Neutral salt + H_2O

Weak Acid + Weak Base → Neutral salt + H_2O

Reaction of Metallic Oxides with Acids

Metallic oxides are basic in nature.

E.g., CaO, MgO are basic oxides.

Metallic Oxide + Acid → Salt + H_2O

$CaO + 2HCl \rightarrow CaCl_2 + H_2O$

Reaction of Non-metallic Oxides with Bases

Non-metallic oxides are acidic in nature.

Non-metallic Oxide + Base → Salt + H_2O

$CO_2 + Ca(OH)_2 \rightarrow CaCO_3 + H_2O$

Reaction Of Acid

- + Metal Carbonate → Salt + CO_2 + Water
- + Metal → Salt + H_2
- + Metal Hydrogen Carbonate → Salt + CO_2 + H_2O
- + Metallic oxide → Salt + H_2O
- + Base → Salt + H_2O

Reaction Of Base

- + Metal → Salt + H_2
- + Metal Carbonate → No Reaction
- + Metal Hydrogen Carbonate → No Reaction
- + Acid → Salt + H_2O
- + Non Metallic oxide → Salt + H_2O

What do all Acids and Bases have in common

- All acids have H^+ ions in common.
- Acids produce H^+ ions in solution which are responsible for their acidic properties.
- All bases have OH^- (hydroxyl ions) in common.

All → Acids → H^+ ions; Bases → OH^- ions

Acid or Base in Water Solution

- Acids produce H^+ ions in presence of water.
- H^+ ions cannot exist alone, they exist as H_3O^+ (hydronium ions).

$$H^+ + H_2O \rightarrow H_3O^+$$

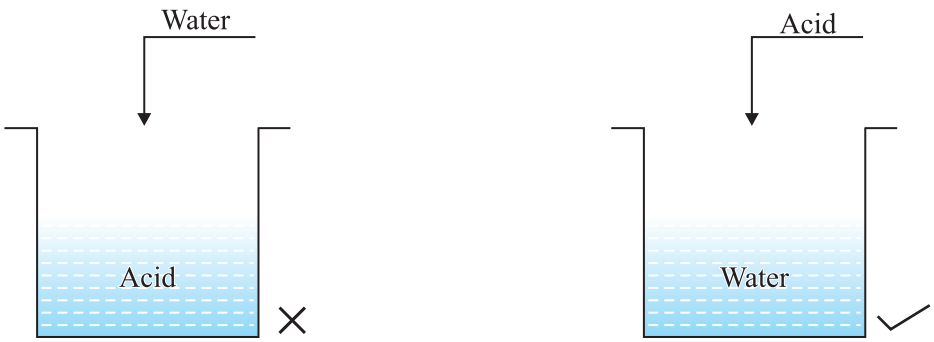
$$HCl + H_2O \rightarrow H_3O^+ + Cl^-$$

Bases when dissolved in water gives OH^- ions.

$$NaOH \xrightarrow{H_2O} Na^+ + OH^-$$

$$Mg(OH) \xrightarrow{H_2O} Mg^{2+} + 2OH^-$$

- Bases soluble in water are called alkali.
- While diluting acids, it is recommended that the acid should be added to water and not water to acid because the process of dissolving an acid or a base in water is highly exothermic.



If water is added to acid, the heat generated may cause the mixture to splash out and cause burns and the glass container may also break due to excessive local heating.

Adding water to acid may

Cause mixture to splash out

Break the glass container

Mixing an acid or a base with H_2O results in decrease of concentration of ions (H_3O^+/OH^-) per unit volume. Such a process is called as dilution.

Strength of Acid and Base

Strength of acid or base can be estimated using universal indicator.

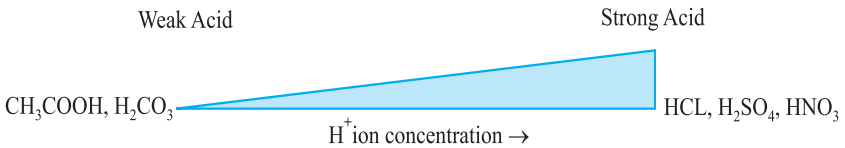
Universal indicator : is a mixture of several indicators. It shows different colours at different concentrations of H^+ ions in the solution.

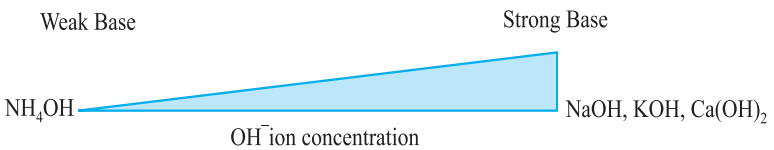
pH Scale : A scale for measuring H^+ ion concentration in a solution . p in pH stands for 'potenz' a German word which means power.

pH = 7 → neutral solution

pH less than 7 → acidic solution

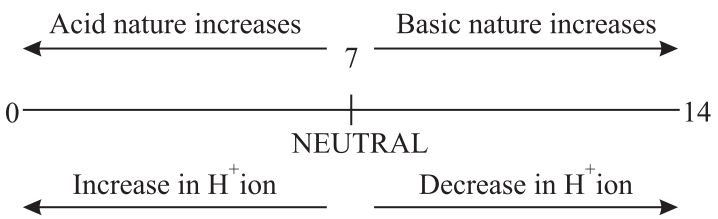
pH more than 7 → basic solution





On diluting an acid : pH increases ↑

On diluting a base : pH decreases ↓



Importance of pH in everyday life

1. Plants and animals are pH sensitive	• Our body works within the pH range of 7-7.8. • When pH of rain water is less than 5.6, it is called acid rain.
2. pH of the soil	• Plants require a specific pH range for their healthy growth.

3. pH in our digestive system	• Our stomach produces HCl acid which helps in digestion. • During indigestion, stomach produces more acid and cause pain and irritation. • To get rid of this pain, people uses antacid (mild base) like milk of magnesia [$Mg(OH)_2$] to neutralize excess acid.
4. pH change as cause of tooth decay	• Tooth decay starts when pH of mouth is lower than 5.5. • Tooth enamel made up of calcium phosphate (hardest substance in body) does not dissolve in water but corrodes when pH is lower than 5.5 due to acids produced by degradation of food particles by bacteria. • Using toothpaste (generally basic) tooth decay can be prevented.
5. Self defence by animals and plants through chemical warfare	(a) Bee sting leaves an acid which cause pain and irritation. Use of a mild base like baking soad on stung area gives relief. (b) Stinging hair of nettle leaves inject methanoic acid causing burning pain. Rubbing with leaf of dock plant give relief.

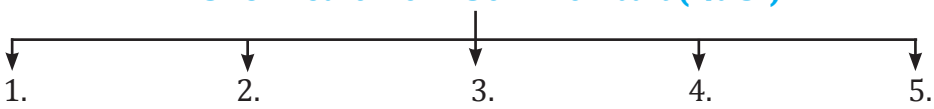
pH of Salts :

(i) Strong Acid + Strong Base → Neutral Salt : pH = 7

(ii) Salt of strong acid + Weak base → Acidic salt : pH < 7

(iii) Salt of strong base + Weak acid → Basic salt : pH > 7

Chemicals from Common Salt (NaCl)



1.	2.	3.	4.	5.
Sodium Hydroxide (NaOH)	Bleaching Powder ($CaOCl_2$)	Baking Soda ($NaHCO_3$)	Washing Soda ($Na_2CO_3.10H_2O$)	Plaster of Paris ($CaSO_4.½H_2O$)

1. Sodium Hydroxide (NaOH) : When electricity is passed through an aqueous solution of NaCl (brine), it decompose to form NaOH. (Chlor-alkali process)

$$2NaCl + 2H_2O \rightarrow 2NaOH + Cl_2 + H_2$$

At anode : Cl_2 gas

At cathode : H_2 gas

Near cathode : NaOH solution is formed.

Uses :

H_2 : Fuels, margarine

Cl_2 : Water treatment, PVC, CFC's

HCl : Cleaning steels, medicines

NaOH : Degreasing metals, soaps and paper making

Cl_2 + NaOH → Bleach : Household bleaches, bleaching fabrics

2. Bleaching Powder ($CaOCl_2$) : It is produced by the action of chlorine on dry slaked lime.

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

Uses :

(a) Bleaching cotton and linen in textile industry.

(b) Bleaching wood pulp in paper factories.

(c) Oxidizing agent in chemical industries.

(d) Disinfecting drinking water.

3. Baking Soda (Sodium Hydrogen Carbonate) ($NaHCO_3$) :

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

Baking soda

- It is mild non-corrosive base.
- When it is heated during cooking :

$$2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + H_2O + CO_2$$

Uses :

(a) For making baking powder (mixture of baking soda and tartaric acid). When baking powder is heated or mixed with water, CO_2 is produced which causes bread and cake to rise making them soft and spongy.

(b) An ingredient in antacid.

(c) Used in soda acids, fire extinguishers.

4. Washing Soda ($Na_2CO_3.10H_2O$) : Recrystallization of sodium carbonate gives washing soda. It is a basic salt.

$$Na_2CO_3 + 10H_2O \rightarrow Na_2CO_3.10H_2O$$

Uses :

(a) In glass, soap and paper industry.

(b) Manufacture of borax.

(c) Cleaning agent for domestic purposes.

(d) For removing permanent hardness of water.

5. Plaster of Paris (Calcium sulphate hemihydrates) ($CaSO_4.½H_2O$) : On heating gypsum ($CaSO_4.2H_2O$) at 373K, it loses water molecules and becomes Plaster of Paris (POP).

It is a white powder and on mixing with water it changes to gypsum.

$$CaSO_4.½H_2O + 1½H_2O \rightarrow CaSO_4.2H_2O$$

Uses :

(a) Doctors use POP for supporting fractured bones.

(b) For making toys, material for decoration.

(c) For making surfaces smooth.

Water of Crystallization : It is a fixed number of water molecules present in one formula unit of a salt.

E.g., $CuSO_4.5H_2O$ has 5 water molecules.

$Na_2CO_3.10H_2O$ has 10 water molecules.

$CaSO_4.2H_2O$ has 2 water molecules.

QUESTIONS

VERY SHORT QUESTIONS (1 Mark)

1. Name the acid present in ant sting.
2. What happens when egg shell is added to nitric acid ?
3. Name a salt which does not contain water of crystallization.
4. Name two constituents of baking powder.
5. What is the pH of gastric juices released during digestion ?
6. Which solution is used to dissolve gold ?
7. How will you test a gas which is liberated when HCl acid reacts with an active metal ?
8. Why does flow of acid rain water into a river make the survival of aquatic life in the river difficult ?
9. When conc. acid is added to water, whether the process is exothermic or endothermic ?
10. Which by-product of chlor-alkali process is used for manufacturing bleaching powder ?

SHORT TYPE QUESTIONS (2 Marks)

1. Why does bleaching powder smell strongly of chlorine and does not dissolve completely in water ?
2. Hold one moist and one dry strip of blue litmus paper over dry HCl acid gas. Which strip will turn red and why ?
3. What is Plaster of Paris ? How is it obtained from gypsum ?
4. What is the role of toothpastes in preventing cavities ?
5. Explain why sour substances are effective in cleaning copper vessels ?
6. A white powder is added while baking breads and cakes to make them soft and fluffy. What is the name of the powder ? What are its main ingredients ?

7. How washing soda is prepared from baking soda ?

8. Though the compounds such as glucose and alcohol have hydrogen atoms in their molecule, yet they are not categorized as acids. Why ?

9. What is the reaction called when an acid reacts with base to produce salt and water ? Give example also.

10. Why pickles and curd are not stored in copper and brass utensils ?

SHORT TYPE QUESTIONS (3 Marks)

1. On passing excess CO_2 through lime water, it first turns milky and then becomes colourless. Explain why ? Write chemical equations.

2. How are bases different from alkalis ? Are all bases alkalis ?

3. While constructing a house, a builder selects marble flooring and marble top for kitchen where vinegar and juices of lemon, tamarind etc. are more often used for cooking. Will you agree to this selection and why ?

4. Indicate with the help of a diagram the variation of pH with change in concentration of H^+ (aq) and OH^- (aq) ions.

5. Write the name and formulae of three hydrated salts.

6. What happens when calcium carbonate is made to react with hydrochloric acid ? Give the equation of reaction.

7. Why metallic oxides are called basic oxides and non-metallic oxides are called acidic oxides ?

8. What is pH scale ? What is pH value of salt formed by a

   (a) weak acid and strong base ?

   (b) strong acid and strong base ?

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. What is water of crystallization ? Write the common name and chemical formula of a commercially important compound which has ten water molecules. How is this compound obtained ? Write chemical equations also. List any two uses of this compound.

2. Identify the compound X on the basis of the reactions given below. Also, write the name and chemical formulae ofA, B and C.

$$X + Zn \longrightarrow A + H_2 (g)$$

$$X + HCl \longrightarrow B + H_2O$$

$$X + CH_3COOH \longrightarrow C + H_2O$$

3. An element P does not react with dil. H_2SO_4. If forms an oxide PO which turns red litmus into blue. Will you call P as a metal or a non-metal ? Give reason.

Hints to Long Answer Type Questions

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

   $Na_2CO_3 (s) + 10H_2O (l) \rightarrow Na_2CO_3.10H_2O (s)$

2. $2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$

(X)

(A)

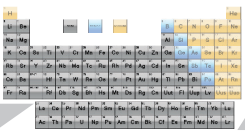
$NaOH + HCl \rightarrow NaCl + H_2O$

(B)

$NaOH + CH_3COOH \rightarrow CH_3COONa + H_2O$

(C)

3. 'P' is a metal.



Chapter - 3

Metals And Non-Metals

- Elements can be classified as metals and non-metals on the basis of their properties.
- Example of some metals are :
  Iron (Fe), Aluminium (Al), Silver (Ag), Copper (Cu)
- Examples of some non-metals are :
  Hydrogen (H), Nitrogen (N), Sulphur (S), Oxygen (O)

I. PHYSICAL PROPERTIES

PROPERTY	METALS	NON-METALS
1. Lustre	Metals have shining surface.	They do not have shining surface. • Except Iodine.
2. Hardness	They are generally hard. • Except Sodium, Lithium and Potassium which are soft and can be cut with knife.	Generally soft. • Except Diamond, a form of carbon which is the hardest natural substance.
3. State	Exist as solids. • Except Mercury.	Exist as solids or gaseous. • Except Bromine.
4. Malleability	Metals can be beaten into thin sheets. • Gold and Silver are the most malleable metals.	Non-metals are non-malleable.

5. Ductility	Metals can be drawn into thin wires.	They are non-ductile.
6. Conductor of heat & electricity	Metals are good conductors of heat and electricity. • Silver (Ag) and Copper (Cu) : Best conductors of heat. • Lead (Pb), Mercury (Hg) poor conductor of heat.	Non-metals are poor conductor of heat and electricity. • Except Graphite.
7. Density	Generally have high density and high melting point. • Except Sodium and Potassium.	Have low density and low melting point.
8. Sonorous	Metals produce a sound on striking a hard surface.	They are not sonorous.
9. Oxides	Metallic oxides are basic in nature.	Non-metallic oxides are acidic in nature.

II. CHEMICAL PROPERTIES OF METALS

(A) Reaction with Air :

Metals combine with oxygen to form metal oxide.

$$\text{Metal} + O_2 \rightarrow \text{Metal oxide}$$

Examples :

(i) $2Cu + O_2 \rightarrow 2CuO$

Copper oxide (black)

(ii) $4Al + 3O_2 \rightarrow 2Al_2O_3$

Aluminium oxide

(iii) $2Mg + O_2 \rightarrow 2MgO$

Different metals show different reactivities towards O_2.

- Na and K react so vigorously that they catch fire if kept in open so they are kept immersed in kerosene.
- Surfaces of Mg, Al, Zn, Pb are covered with a thin layer of oxide which prevent them from further oxidation.
- Fe does not burn on heating but iron fillings burn vigorously.
- Cu does not burn but is coated with black copper oxide.

- Au and Ag does not react with oxygen.

Amphoteric Oxides : Metal oxides which react with both acids as well as bases to produce salts and water are called amphoteric oxides.

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

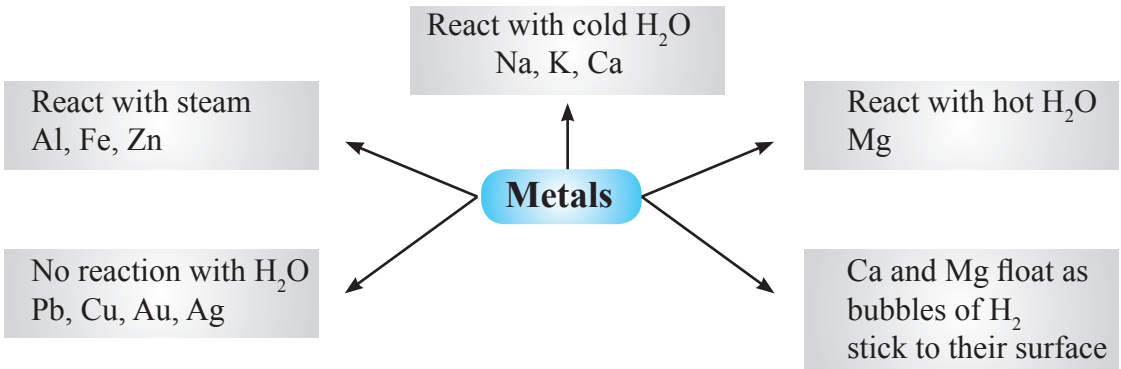
$Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$

Sodium Aluminate

(B) Reaction of Metals with Water :

Metal + Water $\rightarrow$ Metal oxide + Hydrogen

Metal oxide + Water $\rightarrow$ Metal hydroxide



Examples :

(i) $2Na + 2H_2O \rightarrow 2NaOH + H_2 + Heat$

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

(iii) $Mg + 2H_2O \rightarrow Mg(OH)_2 + H_2$

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

(v) $3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$

(C) Reaction of Metals with Acids (Dilute) :

Metal + Dilute acid $\rightarrow$ Salt + H_2

Cu, Ag, Hg do not react with dil. acids.

Examples :

(i) $Fe + 2HCl \rightarrow FeCl_2 + H_2$

(ii) $Mg + 2HCl \rightarrow MgCl_2 + H_2$

(iii) $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

(iv) $2Al + 6HCl \rightarrow 2AlCl_3 + 3H_2$

(D) Reaction of Metals with Solutions of other Metal Salts :

Metal A + Salt solution B → Salt solution A + Metal B

- Reactive metals can displace less reactive metals from their compounds in solution form.

$$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$$

REACTIVITY SERIES

The reactivity series is a list of metals arranged in the order of their decreasing activities.

K	Most reactive
Na	
Ca	
Mg	
Al	
Zn	Reactivity decreases
Fe	
Pb	
H	
Cu	
Hg	
Ag	
Au	Least reactive

Reaction of Metals with Non-metals

- Reactivity of elements is the tendency to attain a completely filled valence shell.
- Atoms of the metals lose electrons from their valence shell to form cation. Atom of the non-metals gain electrons in the valence shell to form anion.

E.g., Formation of NaCl

$Na \rightarrow Na^+ + e^-$

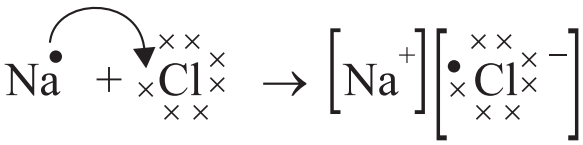
2, 8, 1 2, 8

Sodium cation

$Cl + e^- \rightarrow Cl^-$

2, 8, 7 2, 8, 8

Chloride anion



Ionic Compounds

The compounds formed by the transfer of electrons from a metal to a non-metal are called ionic compounds or electrovalent compounds.

Properties of Ionic Compounds

1. **Physical nature :** The are solid and hard, generally brittle.
2. **Melting and Boiling Point :** They have high melting and boiling point.
3. **Solubility :** Generally soluble in water and insoluble in solvents such as kerosene, petrol etc.
4. **Conduction of electricity :** Ionic compounds conduct electricity in molten and solution form but not in solid state.

Occurrence of Metals

Minerals : The elements or compounds which occur naturally in the earth's crust are called minerals.

Ores : Minerals that contain very high percentage of particular metal and the metal can be profitably extracted from it, such minerals are called ores.

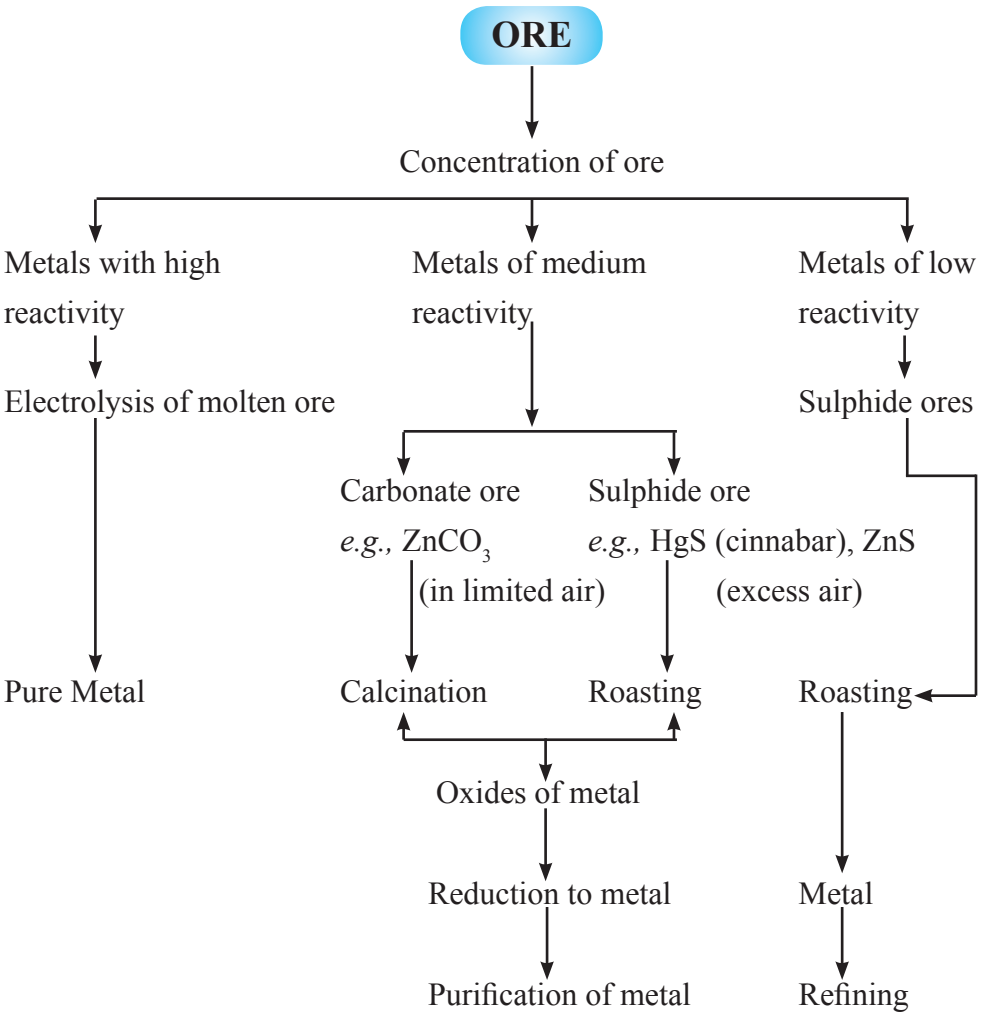
Very reactive metals	K, Na, Ca, Mg, Al	Not found in free state Extraction by electrolysis
Moderately reactive	Zn, Fe, Pb, Cu, Hg	Occur as sulphides, oxides, carbonates Reduction by using carbon
Least reactive	Ag, Au	Occur in native/free state

Extraction of Metals from Ores

Step 1. Enrichment of ores.

Step 2. Extraction of metals.

Step 3. Refining of metals.



Steps Involved in Extraction of Metals from Ores

Some Important Terms

(a) Gangue : Ores are usually contaminated with large amount of impurities such as soil, sand etc. called gangue.

(b) Roasting : The sulphide ores are converted into oxides by heating strongly in the

presence of excess air. This process is called roasting.

$$2ZnS + 3O_2 \xrightarrow{Heat} 2ZnO + 2SO_2$$

(c) Calcination : The carbonate ores are changed into oxides by heating strongly in limited air. This process is called calcination.

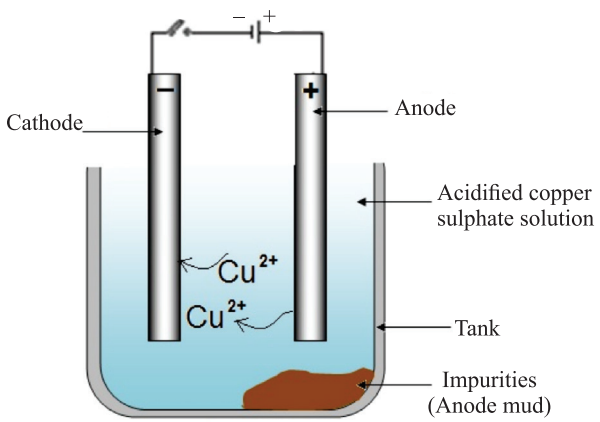
$$ZnCO_3 \xrightarrow{Heat} ZnO + CO_2$$

(d) Reduction : Metal oxides are reduced to corresponding metals by using reducing agent like carbon.

$$ZnO + C \rightarrow Zn + CO$$

Refining of Metals

The most widely used method for refining impure metal is electrolytic refining.



- Anode : Impure copper
- Cathode : Strip of pure copper
- Electrolyte : Solution of acidified copper sulphate

(a) On passing the current through electrolyte, the impure metal from anode dissolves into the electrolyte.

(b) An equivalent amount of pure metal from the electrolyte is deposited at the cathode.

(c) The insoluble impurities settle down at the bottom of the anode and is called anode mud.

Corrosion

The surface of some metals such as iron is corroded when they are exposed to moist air

for a long period of time. This is called corrosion.

(i) Silver becomes black when exposed to air as it reacts with air to form a coating of silver sulphide.

(ii) Copper reacts with moist carbon dioxide in the air and gains a green coat of copper carbonate.

(iii) Iron when exposed to moist air acquires a coating of a brown flaky substance called rust.

Prevention of Corrosion

The rusting of iron can be prevented by painting, oiling, greasing, galvanizing, chrome plating, anodizing or making alloys.

Galvanization : It is a method of protecting steel and iron from rusting by coating them with a thin layer of zinc.

Alloy : An alloy is a homogenous mixture of two or more metals or a metal and a non-metal.

Iron : Mixed with small amount of carbon becomes hard and strong.

Steel : Iron + Nickel and chromium

Brass : Copper + Zinc

Bronze : Copper + Tin (Sn)

Solder : Lead + tin

Amalgam : If one of the metal is mercury (Hg).

QUESTIONS

VERY SHORT QUESTIONS (1 Mark)

1. Name one lustrous non-metal.
2. Name two metals that are soft and can be cut with a knife.
3. Number of electrons gained or lost by an element is called its…….. .
4. What are minerals ?
5. What is the process of depositing zinc on iron called ?
6. Which metal do not react with water at all ?
7. Name the ion made by non-metals – cation/anion.
8. Bronze is an alloy made by the combination of……..and…….. .
9. Name two metals that are stored in kerosene oil.
10. Arrange copper, silver and aluminium in increasing order of reactivity.

SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. Give reasons :
   (a) Why is pure gold not suitable for making ornaments ?
   (b) Why calcium is found in the form of compound ?
   (c) Why electrical wires are coated with PVC (Poly Vinyl Chloride) ?
   (d) Why do we apply oil on iron tools kept in storage ?
   (e) Why sodium is stored in kerosene oil ?

SHORT ANSWER TYPE QUESTIONS (3 Marks)

1. Why caesium and gallium melt in our palm ?
2. Why magnesium ribbon starts floating in hot water ?
3. What are ionic compounds ?
4. Complete the following chemical reactions :
   (a) $3Fe + 4H_2O \rightarrow$
   (b) $Ca + H_2O \rightarrow$
   (c) $K + H_2O \rightarrow$
5. To obtain metal from their metal oxide, which chemical process is used ? Give the chemical equation as well.

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. What is the difference between a mineral and an ore ?
2. Differentiate between roasting and calcinations process in metallurgy.
3. What is an alloy ? Name the alloy which has iron, nickel and chromium as its constituent. What is the chief use of this alloy ?
4. Explain any two ways to prevent rusting of iron.
5. Explain briefly electrolytic refining method.

Hints to Long Answer Type Questions

1. **Mineral**
   Natural occurring chemical substances obtained by mining

   Ore
   An ore is a mineral from which metal is obtained.

2. **Roasting**
   (a) Ore is heated in the presence of air.
   (b) Convert

   Sulphide ore $\xrightarrow{Roasting}$ Oxide ore

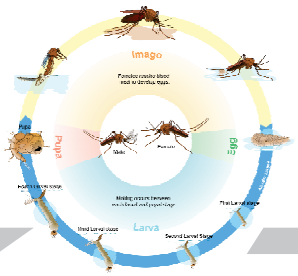
   Calcination
   (a) Ore is heated in absence of air.
   (b) Convert

   Carbonate ore $\xrightarrow{Calcination}$ Oxide ore

3. **Alloy :** It is a homogenous solid solution of one metal with one or more metals or non-metals.

   Stainless steel, used for making utensils, equipments.

4. (a) By coating the surface with a thin film of oil or grease.
   (b) By painting the surface.
   (c) By the process of galvanization.
5. Refer Page no. 52 of NCERT



Chapter - 4

Life Processes

All living things perform certain life processes like growth, excretion, respiration, circulation etc.

All the processes like respiration, digestion, which together keep the living organisms alive and perform the job of body maintenance are called life processes.

Examples :

Life Processes

Growth | **Digestion** | **Respiration** | **Circulation** | **Excretion**

I. Nutrition

(The whole process by which an organism obtain its food)

Nutrition in Plants

↓

Plants are autotrophs.

↓

Can make their own food.

Nutrition in Animals

↓

Animals are hetrotrophs.

↓

Depends on plants or other animals for their food.

Modes of Nutrition

Autrotrophic	Hetrotrophic
Kind of nutrition in which inorganic materials like CO_2, water etc. are utilized to prepare organic food by the process of photosynthesis. *E.g.,* Green plants.	Kind of nutrition in which organisms do not possess the ability to synthesize their own food. They depend on autotrophs for their food supply directly or indirectly. *E.g.,* Animals, fungi.

Autotrophic Nutrition :

The organisms which carry out autotrophic nutrition are called autotrophs (green plants).

Autotrophs $\xrightarrow{Use}$ Simple inorganic material $\xrightarrow{Convert\ ino}$ Complex high energy molecules

(Carbohydrates)

Autotrophic nutrition is fulfilled by the process by which autotrophs take in CO_2 and H_2O and convert these into carbohydrates in the presence of chlorophyll, sunlight is called **Photosynthesis.**

Equations : $6CO_2 + 12H_2O \xrightarrow[Chlorophyll]{Sunlight} C_6H_{12}O_6 + 6O_2 + 6H_2O$

Raw Materials for Photosynthesis :

- Sunlight
- Chlorophyll →Sunlight absorbed by chlorophyll
- CO_2 →Enters through stomata and oxygen (O_2) is released as by-product through stomata on leaf.
- Water →Water + dissolved minerals like nitrogen, phosphorus etc. are taken up by the roots of the soil.

Site of Photosynthesis :

Chloroplast in the leaf, chloroplast contain chlorophyll (green pigment).

Main Events of Photosynthesis :

- Absorption of light energy by chlorophyll

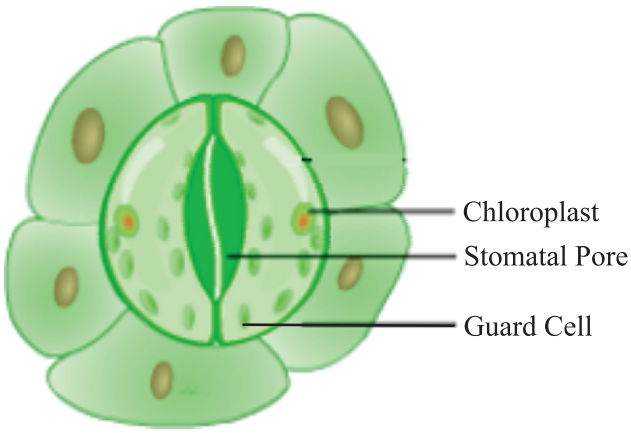
- Conversion of light energy into chemical energy + splitting (breaking) of water into hydrogen and oxygen
- Reduction of CO_2 to carbohydrates

Stomata : Tiny pores present on the surface of the leaves.

Functions :

(a) Exchange of gases O_2/CO_2.

(b) Loses large amount of water (water vapour) during transpiration.



Hetrotrophic Nutrition

Holozoic	Saprophytic	Parasitic
Animals take in solid food and breakdown inside the body. *E.g.,* Amoeba, animals.	Organisms feed on dead, decaying matter. *E.g.,* Fungi.	Parasites live inside or outside other organism (host) and derive nutrition from it. *E.g.,* Cuscuta (plant parasites), Ticks etc.

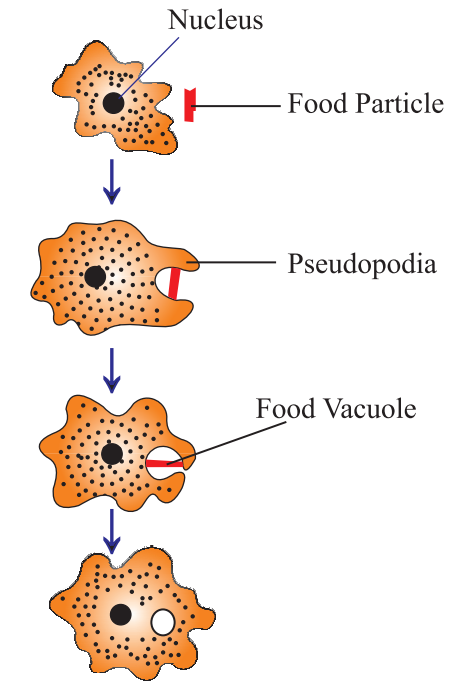
How do organisms obtain their food

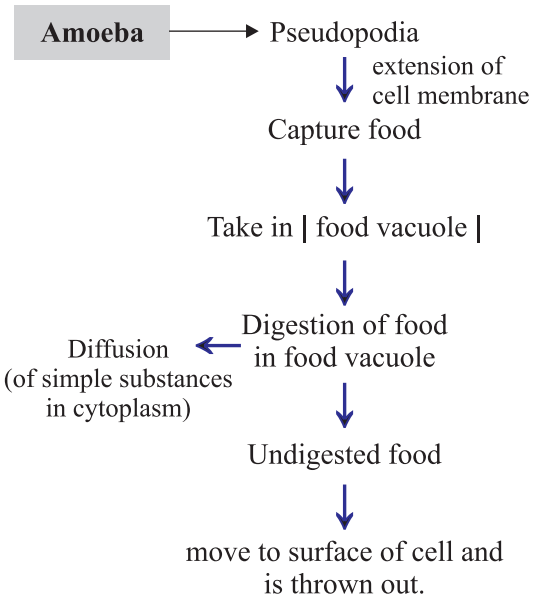
Unicellular/Single celled organisms : Food is taken up through entire surface.

Example : (i) Amoeba

(ii) Paramaecium

(i) Amoeba





Nutrition in Amoeba

(ii) Paramaecium

Paramaecium → Cilia (Present all over the body) → Take in food → At a specific spot

I. NUTRITION

NUTRITION

Ingestion (Intake of food) material into simple ones)	**Digestion** (Breakdown of complex food)	**Absorption** (Movement of digested	**Assimilation** (Utilisation of food) products)	**Egestion** (Removal of waste

Different organisms utilize different nutritional processes as it depends upon the source of carbon from where the food is taken.

Nutrition in Human Beings

Mouth → Intake of whole food.

→

Teeth → Chewing/grinding of food.

→

Tongue → Rolling of food +

→ Tasting of food +

Swallowing/Pushing down of the food.

Salivary Glands → Secrete saliva + Mucus

→ Starch $\xrightarrow[\text{amylase [Saliva]}]{\text{Salivay}}$ Sugar

Oesophagus → Taking food from mouth to stomach by

→ **Peristaltic movements.** [Contraction and expansion of muscles of the oesophagus

Stomach → Gastric glands $\xrightarrow{\text{Secrete}}$ Gastric juice

→

Gastric Juice

PEPSIN	**HCl**	**MUCUS**
(Enzyme that breaks down proteins)	(Makes medium acidic)	(Protects inner lining of the stomach)

Small Intestine → (a) **Intestinal enzyme**

→convert

Carbohydrate	**Fats**	**Proteins**
→	→	→
Glucose	Fatty acid + Glycerol	Amino acids

Small Intestine → (b) Villi (finger like projections) → Helps in absorption of food into the blood

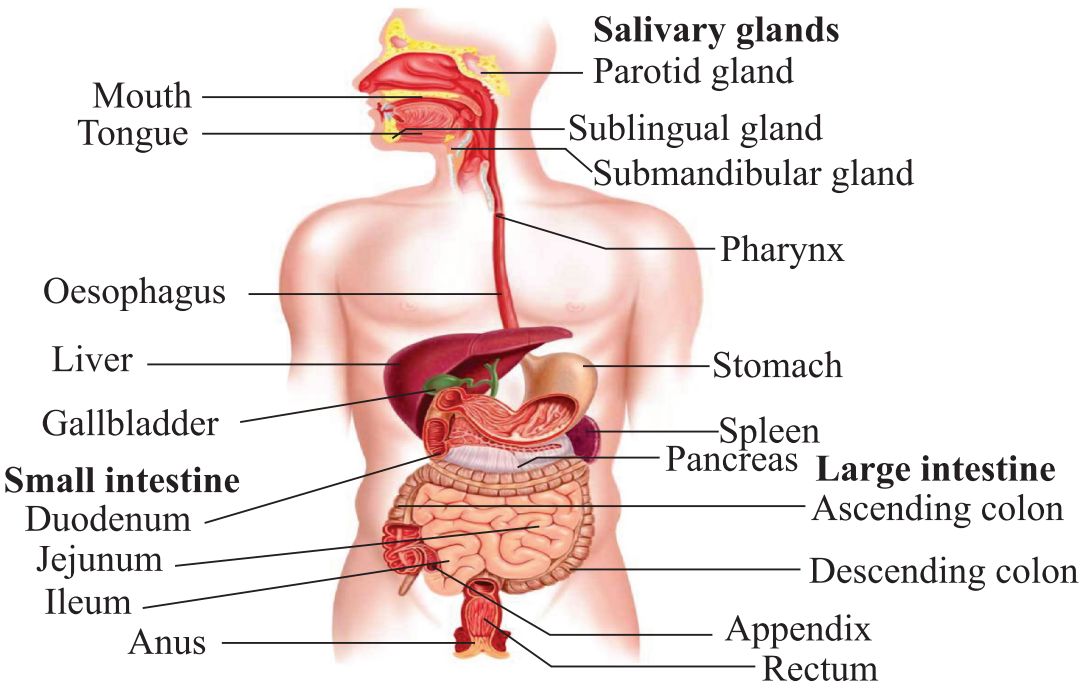
Small Intestine → (c) Receives secretion from

- Liver → Bile → Large fat Globules → Emulsifi cation → small globe
- Pancreas → Pancreatic juice
  - Trypsin → Proteins → Peptones
  - Lipase → Fats → Lip

→

Large Intestine → Absorb excess of water

→ The rest of the material is removed from the body via the anus.



Human Digestive System

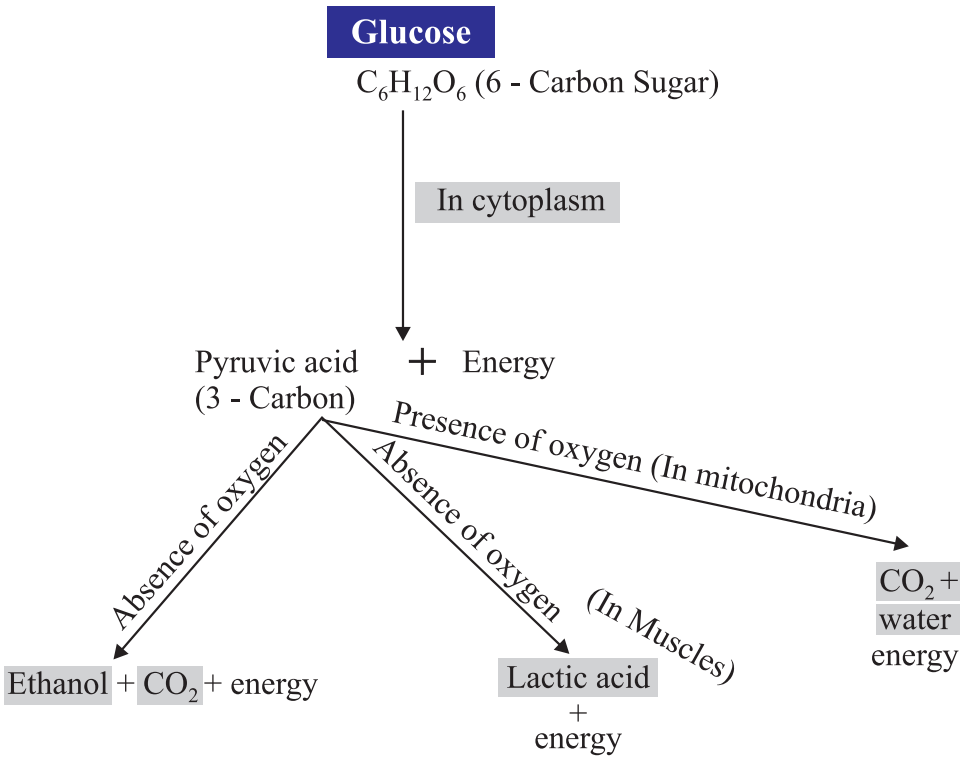
RESPIRATION

Respiration involves :

(i) Gaseous exchange : Intake of oxygen from the atmosphere and release of CO_2 →Breathing

(ii) Breakdown of simple food in order to release energy inside the cell →Cellular respiration

Breakdown of Glucose by Various Pathways



Respiration

Aerobic	Anaerobic
• Takes place in the presence of oxygen	• Takes place in the absence of oxygen
• Occurs in mitochondria	• Occurs in cytoplasm
• End products are CO_2 and H_2O	• End products are alcohol or lactic acid
• More amount of energy is released	• Less amount of energy is released

Human Respiratory System

Passage of air through the respiratory system :

Nostril

→

Nasal Passage

→

Nasal Cavity

→

Pharynx

→

Larynx

→

Trachea

→

Bronchi

→

Bronchioles

→

Alveoli

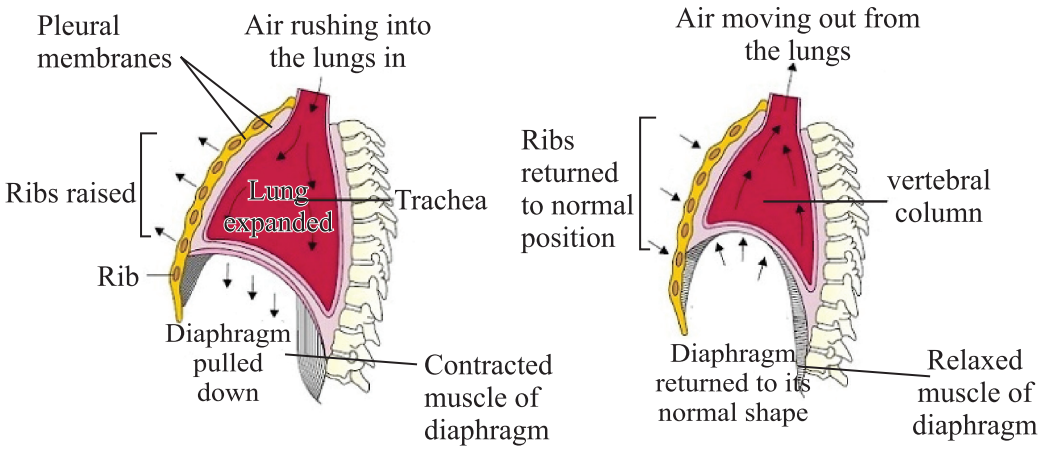
→

Blood capillaries

Lungs

Mechanism of Breathing

Inhalation	Exhalation
• During inhalation the thoracic cavity (chest cavity) expands.	• Thoracic cavity contracts.
• Ribs lift up.	• Ribs move downwards.
• Diaphragm become flat in shape.	• Diaphragm becomes dome shaped.
• Volume of lungs increases and air enters the lungs	• Volume of lungs decreases and air exits from the lungs.



(a) Inhalation **(b) Exhalation**

Exchange of gases between alveolus, blood and tissues

(i) Air (rich in O_2) →Blood →Binds with haemoglobin in RBC →O_2 is released in (in alveolus) (through blood vessels) tissues

(ii) CO_2 →Released in blood →Dissolved in blood →Blood vessels →Released in alveolar sac →Sent out through nostrils

(from tissue) (in alveoli)

Terrestial organisms : Use atmospheric oxygen for respiration

Aquatic organisms : Use dissolved oxygen for respiration

Respiration in plants

Respiration in plants is simpler than the respiration in animals. Gaseous exchange occur through :

(a) Stomata in leaves

(b) Lenticels in stems

(c) General surface of the root

Transportation

Human beings like other multicellular organism need regular supply of food, oxygen etc. This function is performed by circulatory system.

The circulatory system in human beings consists of

Heart	**Arteries and Veins**	**Blood and lymph**
(A pumping organ)	(Blood vessels)	(A circulatory medium)

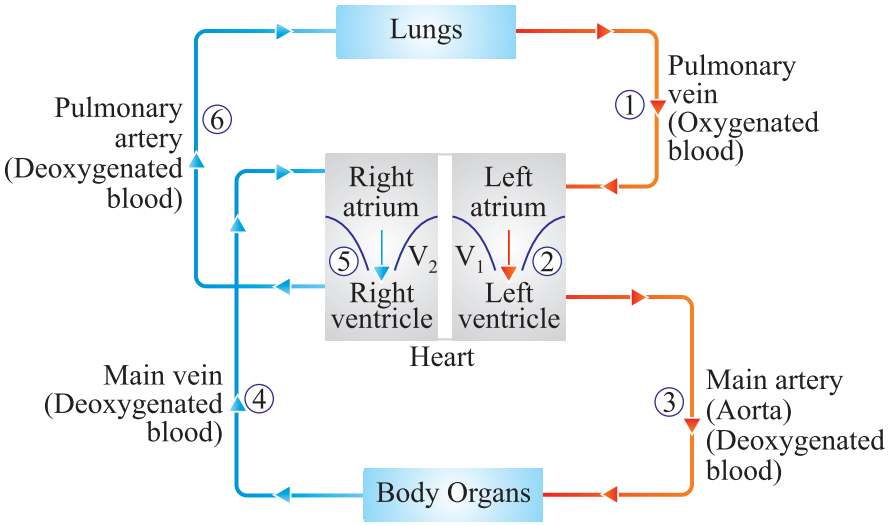
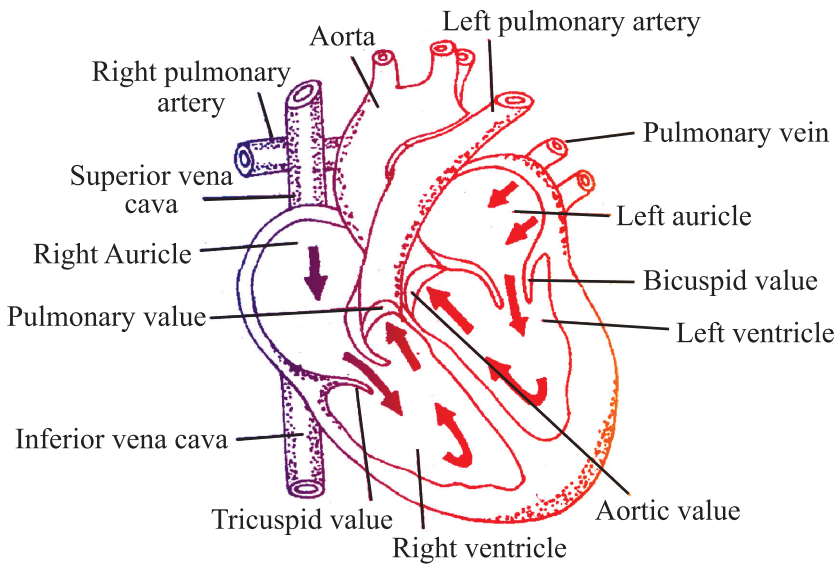


Diagram to show blood circulation in human body

Double circulation

Blood travels twice through the heart in one complete cycle of the body.



Direction of blood flow through human heart

- **Pulmonary Circulation :** Blood moves from the heart to the lungs and back to the heart.
- **Systemic Circulation :** Blood moves from the heart to rest of the body and back to the heart.

Blood

(A fluid connective tissue)

Solid Component — Blood Corpuscles

R. B. C.s	Blood Platelets	W. B. C.
• Carries respect gas (O_2, CO_2) • Contain Hb, impart red colour to the blood	helps in Blood Clotting	Provide body defence by engulfing the germs & producing antibodies

Liquid Component — Plasma

A yellow colour fluid contain 90% water & 10% organic substances like
- plasma, proteins viz. albumin, globulin,
inorganic - mineral ions.

Lymph : A yellowish fluid escapes from the blood capillaries into the intercellular spaces contain less proteins than blood. Lymph flows from the tissues to the heart assisting in transportation and destroying germs.

Blood Vessels

Arteries	Veins
1. Carry oxygenated blood from heart to body parts except pulmonary artery.	1. Carry deoxygenated blood from body parts to heart except pulmonary vein.
2. Also called distributing vessel.	2. Also called collecting vessel.
3. Thick and elastic.	3. Thin and less elastic.
4. Deepseated	4. Superficial as compared to arteries

Transportation in Plants

There are two main conducting pathways in a plant.

Xylem	Phloem
1. Carries water & minerals from the roots to other parts of the plant.	1. Carries product of photosynthesis from leaves to the other parts of the plant.
2. No energy is used.	2. Energy is used from ATP.

Transpiration is the process of loss of water as vapour from aerial parts of the plant.

Function :

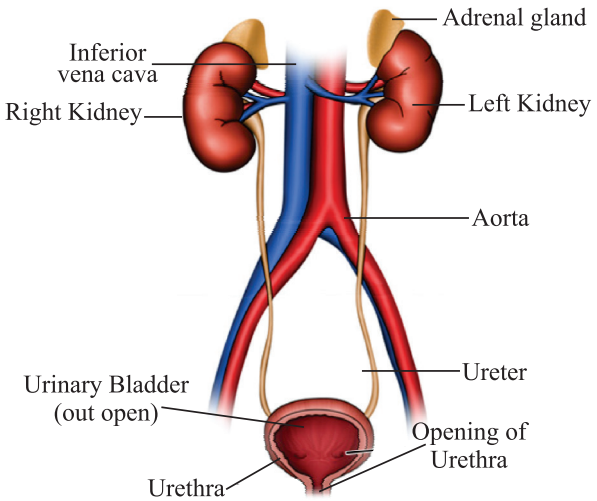
(a) Absorption and upward movement of water and minerals by creating PULL.
(b) Helps in temperature regulation in plant.

Transport of food from leaves (food factory) to different part of the plant is called **Translocation**.

EXCRETORY SYSTEM IN MAN

Excretory/urinary system consists of :

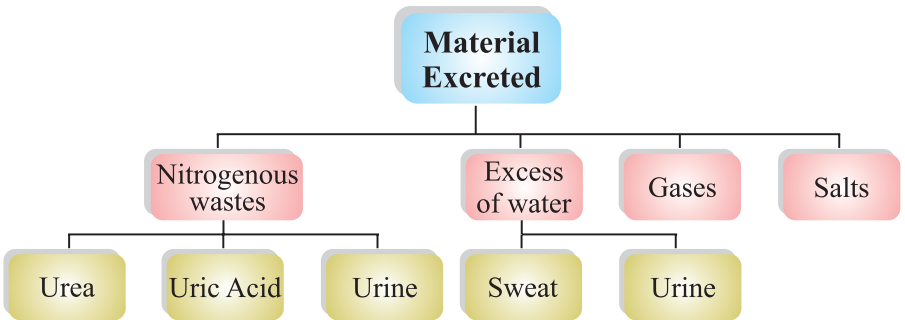
(1) The kidneys : The excretory organ
(2) The ureters : The ducts which drain out urine from the kidneys
(3) The urinary bladder : The urinary reservoir
(4) The urethra : The channel to the exterior



The human excretory system

EXCRETION

1. The metabolic activities in the body generates many kinds of wastes including nitrogenous wastes which are harmful for the body and hence needed to be removed. Excretion is a process by which these wastes are removed from our body.



2. Unicellular organisms remove these wastes by simple diffusion.

Human Excretory System

Formation of Urine

- Each kidney contains many filtration units called as nephrons.
- Nephrons are made up of a cluster of thin walled capillaries called glomerulus which is associated with a cup like structure called as Bowman's capsule and the long tube which terminates through this capsule.
- The renal artery brings oxygenated blood to the kidneys along with the nitrogenous wastes like urea and uric acid and many other substances.
- The blood gets filtered through the glomerulus and this filtrate enters the tubular part of nephron.
- As this filtrate moves down the tubular part, glucose, amino acids, salts and excess of water gets selectively reabsorbed by the blood vessels surrounding these tubules.
- The amount of water reabsorbed depends upon :
  - How much excess of water is there in the body and,
  - How much nitrogenous wastes need to be excreted out.
- So the fluid now flowing in the tubular part is urine which gets collected in collecting ducts of nephrons.
- These collecting ducts together leave the kidney at a common point by forming the ureter.
- Each ureter drains the urine in the urinary bladder where it is stored until the pressure of expanded bladder leads to an urge to pass it out through urethra.
- This bladder is a muscular structure which is under nervous control.
- 180 litres of filtrate is formed daily but only 2 litres is excreted out as urine so the rest is reabsorbed in the body.

Functions of Nephron

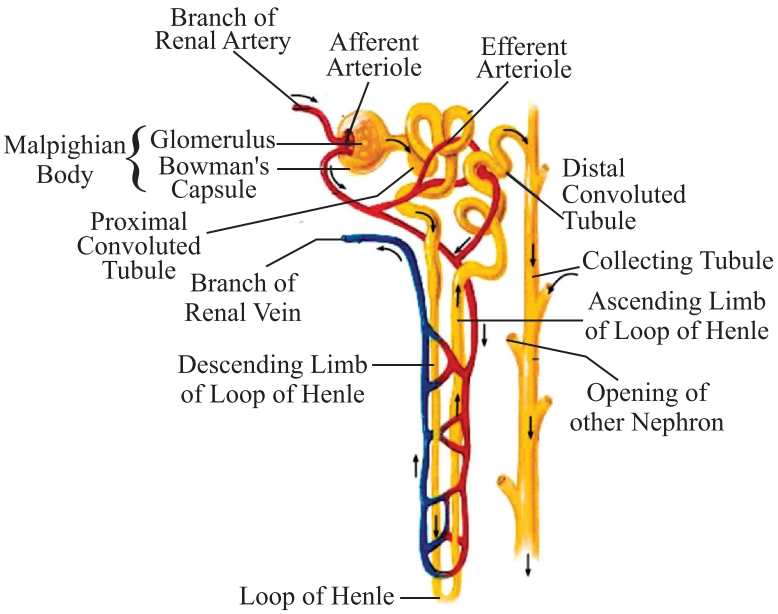
- Excretion of nitrogenous wastes.
- To maintain the water and ionic balance (osmic regulation).

Excretion in Plants

Plants use different strategies for excretion of different products :

- Oxygen and carbon dioxide is diffused through stomata.
- Excess water is removed by transpiration.

- Plants can even loose some of their old parts like old leaves and bark of tree.
- Other waste products like raisins and gums especially in old xylem cells which can also be lost by plants.
- Plants also secrete some waste substances into the soil around them.



Structure of a Nephron

The urine formation involves three steps :

1. **Glomerular filtration :** Nitrogenous wastes, glucose water, amino acid filter from the blood into Bowman Capsule of the nephron.
2. **Tubular reabsorption :** Now, useful substances from the filtrate are reabsorbed back by capillaries surrounding the nephron.
3. **Secretion :** Urea, extra water and salts are secreted into the tubule which open up into the collecting duct & then into the ureter.

Artificial Kidney

Haemodialysis : The process of purifying blood by an artificial kidney. It is meant for kidney failure patients.

QUESTIONS

VERY SHORT QUESTIONS (1 Mark)

1. State one difference between autotrophic and hetrotrophic mode of nutrition.
2. Define peristaltic movement.
3. What is the role of saliva in the digestion of food ?
4. Name the tissue that transports water and minerals in plants.
5. What is the role of acid in our stomach ?
6. What is emulsification ?
7. Name the cell organelle in which photosynthesis occur.
8. Name the largest artery in the human body.
9. Define transpiration.
10. What is the structural and functional unit of kidney called ?

SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. How is small intestine designed to absorb digested food ?
2. What are stomata ? Draw a labeled diagram of stomata.
3. Write the equation for the process of breakdown of glucose in a cell :
   (a) in the presence of oxygen.
   (b) in the absence of oxygen.
4. Write the differences between inhalation and exhalation.
5. List the three events which occur during photosynthesis.
6. How does transpiration help in upward transport of substances.
7. Write the functions of the components of blood.
8. Why is small intestine longer in herbivores than in carnivores ?
9. Explain the cause of cramps after excessive physical exercise.
10. Why is the rate of breathing in aquatic organisms much faster than that seen in terrestrial organisms.

SHORT ANSWER TYPE QUESTIONS (3 Marks)

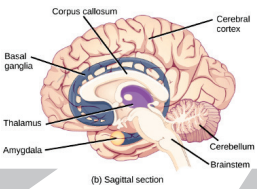
1. Describe the process of double circulation in human beings.
2. What are the methods used by plants to get rid of their waste products ?
3. Give reason for the following :
   (a) Arteries are thick walled blood vessels.
   (b) Veins are thin walled blood vessels.
   (c) Veins have valves in them.

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. If you chew chapatti for long, after some time it taste sweet ? Why is this so ?
2. What is the benefit of residual volume of air in the respiratory process ?
3. Why is the energy needs in plants is very less as compared to animals ? Explain.
4. Draw a well-labelled diagram of Nephron. Explain the process of formation of urine in the human kidney.
5. Draw a diagram showing Human Respiratory System. Label the following parts :
   (a) Alveolus (b) Trachea
   (c) Bronchus (d) Lungs

Hints to Long Answer Type Questions

1. Chapati will taste sweet as saliva breaks down starch which is a complex molecule to give sugar.
2. The lungs always contain a residual volume of air so that there is sufficient time for oxygen to be absorbed and for the carbon dioxide to be released.
3. Plant gets most of energy during photosynthesis.
4. See the given diagram.
5. See the given diagram.



Chapter - 5

Control And Coordination

- All the living organisms respond and react to changes in the environment around them.
- The changes in the environment to which the organisms respond and react are called stimuli such as light, heat, cold, sound, smell, touch etc.
- Both plants and animals respond to stimuli but in a different manner.

Control and Coordination in Animals

It is brought about in all animals with the help of two main systems :

(a) Nervous system

(b) Endocrine system

NERVOUS SYSTEM

- Control and coordination are provided by nervous and muscular tissues.
- Nervous tissue is made up of an organized network of nerve cells or neurons, and is specialized for conducting information via electrical impulses from one part of the body to another.

Receptors : Are specialized tips of some nerve cells that detect the information from the environment. These receptors are located in our sense organs.

(a) Ear :
- Phonoreceptors
- Hearing
- Balance of the body

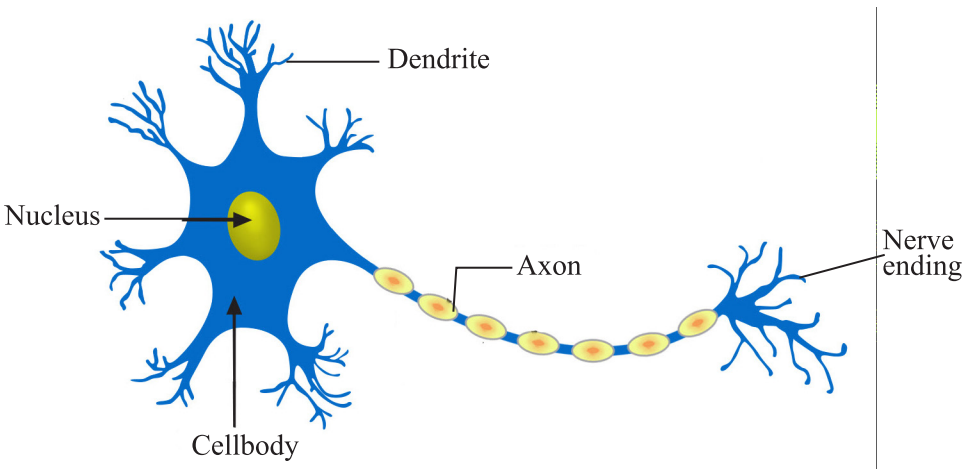
(b) Eyes :
- Photoreceptors
- Seeing

(c) Skin :
- Thermoreceptors
- Heat or cold
- Touch

(d) Nose :
- Olfactory receptors
- Smell detection

(e) Tongue :
- Gustatory receptors
- Taste detection

Neuron : It is the structural and functional unit of nervous system.



Parts of Neuron :

(a) Dendrite : Acquires information.

(b) Cell body : Acquired information travels as an electrical impulse.

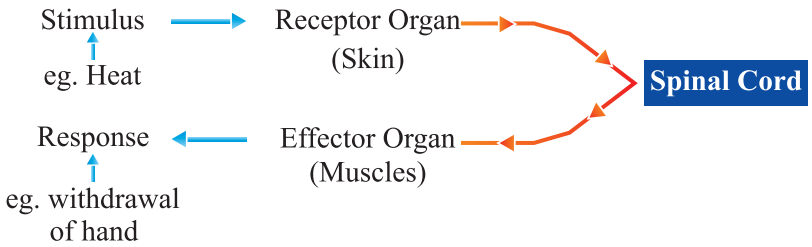
(c) Axon : Longest fibre on the cell body is called axon. It transmits electrical impulse from cell body to dendrite of next neuron.

Synapse : It is the gap between the nerve ending of one neuron and dendrite of the other neuron. Here electrical signal is converted into chemical signal for onward transmission.

REFLEX ACTION

Reflex action is quick, sudden and immediate response of the body to a stimulus. *E.g.,* Knee jerk, withdrawal of hand on touching hot object.

Reflex arc : The pathway through which nerve impulses pass during reflex action is called reflex arc.



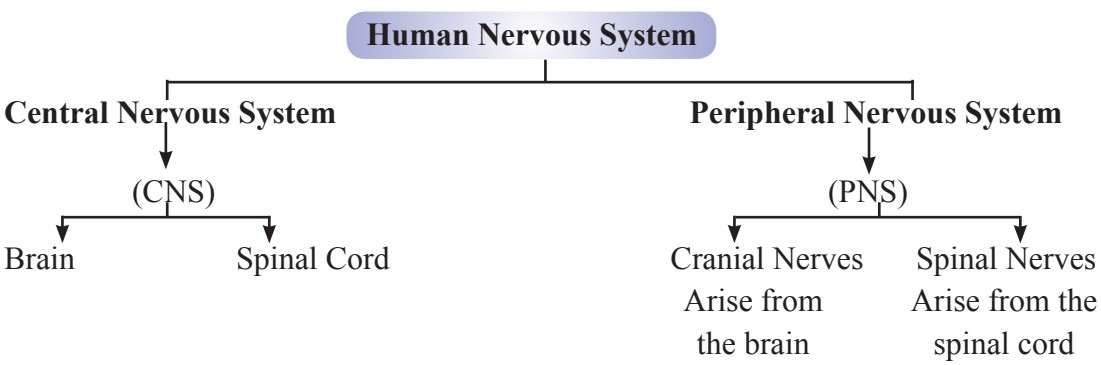
Response : Responses are of three main types :

(a) Voluntary : Controlled by fore brain. *E.g.,* talking, writing.

(b) Involuntary : Controlled by mid and hind brain. *E.g.,* heart beat, vomiting, respiration.

(c) Reflex action : Controlled by spinal cord. *E.g.,* withdrawal of hand on touching a hot object.

Need of Reflex Actions : In some situations such as touching a hot object, pinching etc. we need to act quickly, otherwise our body would be harmed. Here response is generated from spinal cord instead of brain.



HUMAN BRAIN

Brain is the main coordinating centre of the body. It has three major parts :

(a) Fore-brain (b) Mid-brain (c) Hind-brain

(a) Fore-brain : It is the most complex or specialized part of the brain. It consists of cerebrum.

Functions :

(i) Thinking part of the brain.

(ii) Control the voluntary actions.

(iii)Store information (Memory).

(iv)Receives sensory impulses from various parts of the body and integrate it.

(v) Centre associated with hunger.

(b) Mid-brain : Controls involuntary actions such as :

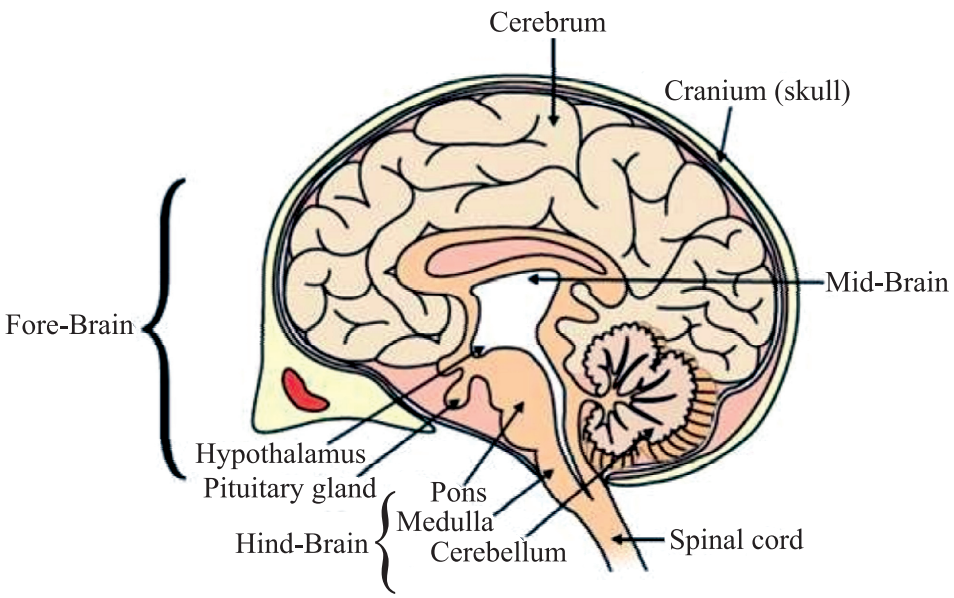
- Change in pupil size.
- Reflex movements of head, neck and trunk.

(c) Hind-brain : It has three parts :

(i) **Cerebellum:** Controls posture and balance. Precision of voluntary actions *e.g.,* picking pen.

(ii) **Medulla :** Controls involuntary actions *e.g.,* blood pressure, salivation, vomiting.

(iii) **Pons :** Involuntary actions, regulation of respiration.



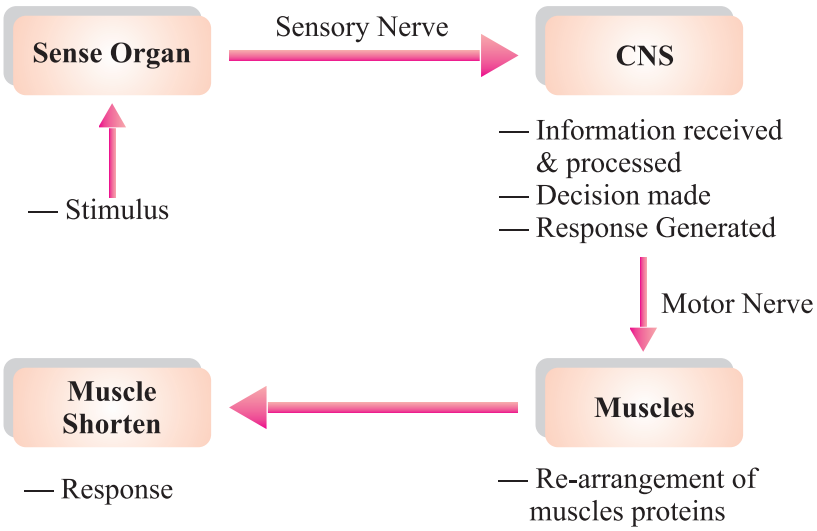
Human Brain

Protection of Brain and Spinal Cord

(a) Brain : Brain is protected by a fluid filled balloon which acts as shock absorber and is enclosed in cranium (skull or brain box).

(b) Spinal Cord : Spinal cord is enclosed in vertebral column.

Coordination between Nervous and Muscular Tissue



Limitations of Electric communication/Nervous system :

(a) Electric impulse will reach only to those cells that are connected by nervous tissue.

(b) After generation and transmission of an electrical impulse, the cell takes some time to reset its mechanism before transmitting another impulse. So cells cannot continually create and transmit impulse.

(c) Plants do not have any nervous system.

Chemical communication : To overcome the limitations of electric communication.

COORDINATION IN PLANTS

Movements in plants :

(i) Independent of growth

(ii) Dependent on growth

(i) Independent of growth : Immediate response to stimulus.

- Plants use electrical-chemical means to convey information from cell to cell.
- For movement to happen, cells change their shape by changing the amount of water in them, resulting in swelling or shrinking of cells.

E.g., Drooping of leaves of 'Touch-me-not' plant on touching it.

(ii) Dependent on growth : These movements are tropic movements i.e., directional

movements in response to stimulus.

- **Tendrils :** The part of tendril away from the object grows more rapidly as compared to the part near the object. This causes circulating of tendril around the object.
- **Phototropism :** Movement towards light.
- **Geotropism :** Movement towards/away from gravity.
- **Chemotropism :** Growth of pollen tube towards ovule.
- **Hydrotropism :** Movement towards water.

Plant Hormones : Are chemical compounds which help to coordinate growth, development and responses to the environment.

Main plant hormones are :

(a) Auxin :
- Synthesized at shoot tip
- Helps the cells to grow longer
- Involved in phototropism

(b) Gibberellin :
- Helps in the growth of the stem

(c) Cytokinins :
- Promotes cell division
- Present in greater concentration in fruits and seeds

(d) Abscisic Acid :
- Inhibits growth
- Cause wilting of leaves
- Stress hormone

Hormones in Animals :

Hormones : Hormones are the chemical substances which coordinate the activities of living organisms and also their growth.

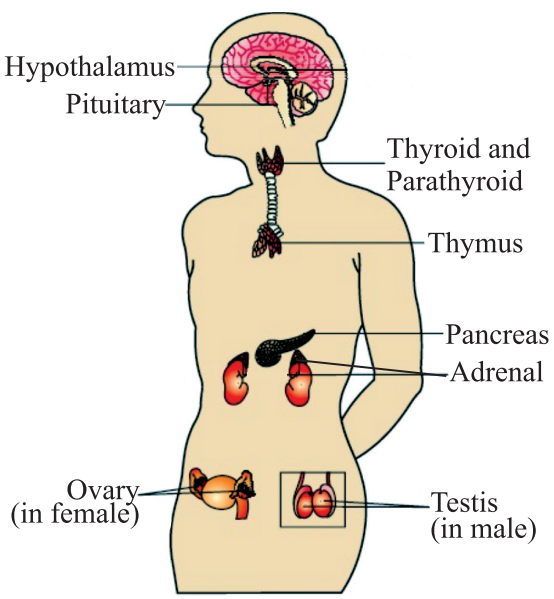
Endocrine glands : These glands secrete their product (hormone) into the blood.

Endocrine Gland, Hormones and their Functions

S. No.	Hormone	Endocrine Gland	Location	Functions
1.	Thyroxine	Thyroid	Neck/Throat region	Regulation of metabolism of carbohydrates, fats and proteins.

2.	Growth hormone	Pituitary (master gland)	Mid brain	Regulates growth and development.
3.	Adrenaline	Adrenal	Above both kidneys	Regulation (increasing) of blood pressure, heart beat, carbohydrate metabolism (during emergency)
4.	Insulin	Pancreas	Below stomach	Reduces and regulates blood sugar level
5. Sex Hormone	(a)Testosteron in males	Testis	Genital/lower abdomen area	Changes associated with puberty (Sexual maturity)
	(b)Estrogen in females	Ovaries		

Human Endocrine Glands



Iodised salt is necessary because iodine mineral is essential part of thyroxine hormone secreted by thyroid gland. Thyroxine regulates metabolism of carbohydrates, fats and proteins. So, we must consume iodised salt which is necessary for proper working of thyroid gland. It's deficiency causes a disease called goiter (Swollen neck).

Diabetes

Disease in which blood sugar level increase.

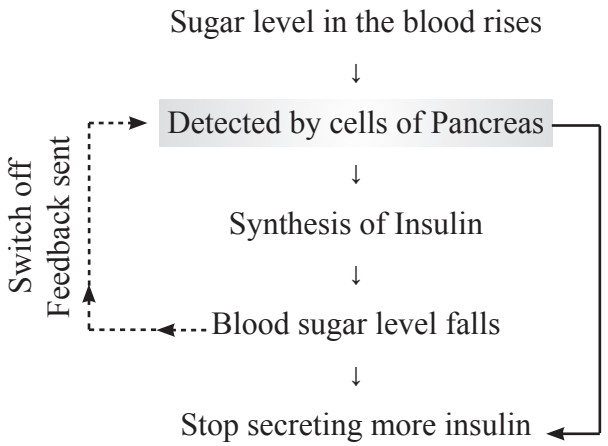
Cause : Due to the deficiency of insulin hormone secreted by pancreas that is responsible to control blood sugar levels.

Treatment : Injections of insulin hormone.

Feedback Mechanism

The excess or deficiency of hormones has a harmful effect on our body. Feedback mechanism makes sure that hormones should be secreted in precise quantity and at right time.

E.g., Feedback mechanism to control the sugar level in blood is as follows :



QUESTIONS

VERY SHORT QUESTIONS (1 Mark)

1. Where is auxin synthesized in plants ?
2. Which gland is known as master gland ?
3. Name the hormone that regulates blood sugar level.
4. What is synapse ?
5. What are tropic movements ?
6. Which part of the brain is responsible for maintaining posture and balance of our body ?
7. Which hormone has inhibiting effects on growth of plants ?
8. What is phototropism ?

9. What are the components of central nervous system ?
10. What happens at synapse between two neurons ?

SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. Draw a labelled diagram of neuron.
2. What is reflex arc ? Explain with the help of flow chart.
3. What is the cause of diabetes ? How it can be controlled ?
4. Why is it advisable to use iodised salt ?
5. What are sensory and motor neurons ? Write their functions.
6. Why is Abscisic acid called as stress hormone ?
7. What is the need for a system of control and coordination in an organization ?

SHORT ANSWER TYPE QUESTIONS (3 Marks)

1. What are plant hormones ? Name a plant hormone that promotes growth in plants.
2. What is the significance of tropic movements in plants ? Explain any two types of tropic movements.
3. Which hormone is known as emergency hormone in our body ? How it helps in coping during emergency ?
4. Where are different receptors present in our body ? What are their functions ?

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. Draw a labelled diagram of human brain and state the functions of its different parts.
2. What are hormones ? Give the name of associated gland and functions of different animal hormones.
3. What is feedback mechanism ? Explain its working with the help of one example.
4. (a) How brain and spinal cord are protected ?
   (b) What are the different parts of human nervous system ?
   (c) What are the limitations of nervous system ?

VALUE BASED QUESTION

Rahul's aunt is obese. She is very fond of eating sweets and junk food. She feels very thirsty and passes excess of urine. She got herself examined by the doctor. Doctor told her not to eat sweet things and exercise regularly. He prescribed some medicines also.

Rahul helped her to follow doctor's advice.

Now answer the following questions :

(a) Which disease is she suffering from ? Name the hormone responsible for this.

(b) What values are displayed by Rahul ?

Hints to Long Answer Type Questions

1. See the labelled diagram. Fore-brain, Mid-brain and Hind-brain.
2. **Hormones :** Secretion of endocrine glands.

	Gland	Hormone	Function
(a)	Thyroid	Thyroxine	Regulate the rate of growth and metabolism
(b)	Pancreas	Insulin	Regulate sugar metabolism

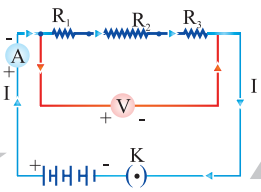
3. **Feedback mechanism :** Regulate the timing and amount of hormone released.

   Working : Sugar level in blood rises, detected by the cells of pancreas which respond by producing more insulin.

4. (a) Brain : Skull Spinal Cord : Vertebral column

   (b) Central Nervous System (CNS) → Brain + Spinal cord

   Peripheral Nervous System (PNS) → Cranial nerves + Spinal nerves



Chapter - 6

Electricity

- **Charge** is a fundamental particle in an atom. It may be positive or negative.
- Like charges repel each other.
- Unlike charges attract each other.

  Coulomb (C) : S. I. unit of charge

  1 Coulomb charge = Charge present on approx. 6×10^{18} electrons
- Charge on 1 electron = Negative charge of 1.6×10^{-19} C

$$Q = ne$$

Where Q = Charge (total)

n = No. of electrons

e = Charge on 1 electron

Current (I) : The rate of flow of charge is called current.

$$\text{Current} = \frac{\text{Charge}}{\text{Time}}$$

$$I = \frac{Q}{T}$$

S. I. unit of current = Ampere (A)

$$1 \text{ A} = 1 \text{ Cs}^{-1}$$

$$1 \text{ mA} = 10^{-3} \text{ A}$$

$$1 \mu\text{A} = 10^{-6} \text{ A}$$

Current is measured by Ammeter. Its symbol is 

Ammeter has low resistance and always connected in series.

Direction of current is taken opposite to flow of electrons as electrons were not known at the time when the phenomenon of electricity was discovered first and current was considered to be flow of positive charge.

Potential Difference (V) : Work done to move a unit charge from one point to another.

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

1 Volt : *When 1 joule work is done in carrying one Coulomb charge then potential difference is called 1 volt.*

S. I. unit of Potential difference = Volt (V)

$$1\ V = 1\ JC^{-1}$$

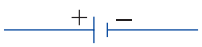
1 Volt : When 1 joule work is done in carrying one Coulomb charge then potential difference is called 1 volt.

Voltmeter : Instrument to measure potential difference.

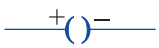
- It has high resistance and always connected in parallel. Symbol is 

- Cell is the simplest device to maintain potential difference.
- Current always flow from higher potential to lower potential.

Symbols of Some Commonly Used Components in Circuit :

Electric cell : 

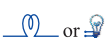
Battery : 

Key (open) : 

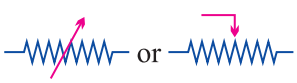
Key (closed) : 

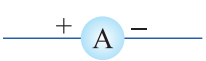
Wire joint : 

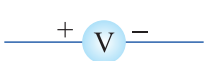
Wire Crossing (without join) : 

Electric bulb : 

Resistance : 

Rheostat : 

Ammeter : 

Voltmeter : 

Ohm's Law : Potential difference across the two points of a metallic conductor is directly proportional to current passing through the circuit provided that temperature remains constant.

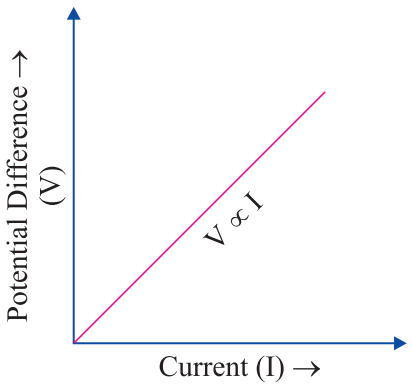
- Mathematical expression for Ohm's law :

$$V \quad I$$

$$V = IR$$

R is a constant called resistance for a given metal.

- V-I graph for Ohm's law :



Resistance (R) : It is the property of a conductor to resist the flow of charges through it.

- Ohm (Ω) : S. I. unit of resistance.
- $1 \text{ ohm} = \frac{1 \text{ volt}}{1 \text{ ampere}}$ *When potential difference is 1 V and current through the circuit is 1 A, then resistance is 1 ohm.*

Rheostat : Variable resistance is a component used to regulate current without changing the source of voltage.

Factors on which the Resistance of a Conductor depends :

Resistance of a uniform metallic conductor is

(i) directly proportional to the length of conductor,

(ii) inversely proportional to the area of cross-section,

(iii)directly proportional to the temperature and

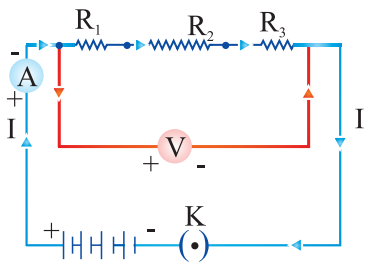
(iv)depend on nature of material.

Resistivity (P) : It is defined as the resistance offered by a cube of a material of side 1 m when current flows perpendicular to its opposite faces.

- Its S.I. unit is ohm-metre (Ωm).

- Resistivity does not change with change in length or area of cross-section but it changes with change in temperature.
- Range of resistivity of metals and alloys is 10^{-8} to 10^{-6} Ωm.
- Range of resistivity of insulators is 10^{12} to 10^{17} Ωm.
- Resistivity of alloy is generally higher than that of its constituent metals.
- Alloys do not oxidize (burn) readily at high temperature, so they are commonly used in electrical heating devices.
- Copper and aluminium are used for electrical transmission lines as they have low resistivity.

Resistors in Series :



When two or more resistors are connected end to end, the arrangement is called series combination.

- Total/resultant/overall/effective resistance in series

$$R_s = R_1 + R_2 + R_3$$

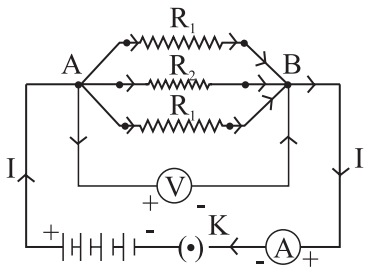
- Current through each resistor is same.
- Equivalent resistance is larger than the largest individual resistance.
- Total voltage = Sum of voltage drops

$$V = V_1 + V_2 + V_3$$

- Voltage across each resistor :

$$V_1 = IR_1$$
$$V_2 = IR_2 \qquad [V_1 + V_2 + V_3 = V]$$
$$V_3 = IR_3 \qquad V = IR$$
$$V = IR_1 + IR_2 + IR_3$$
$$IR = I(R_1 + R_2 + R_3)$$
$$R = R_1 + R_2 + R_3$$

Resistors in Parallel :



- Voltage across each resistor is same and equal to the applied voltage.
- Total current is equal to sum of currents through the individual reistances.

$$I = I_1 + I_2 + I_3$$

$$\frac{V}{R} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

- Reciprocal of equivalent resistance is equal to sum of reciprocals of individual resistances.

$$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

- Equivalent resistance is less than the value of the smallest individual resistance in the combination.

Advantages of Parallel Combination over Series Combination

(i) In series circuit, when one component fails, the circuit is broken and none of the component works.

(ii) Different appliances have different requirement of current. This cannot be satisfied in series as current remains same.

(iii)The total resistance in a parallel circuit is decreased.

Heating Effect of Electric Circuit

If an electric circuit is purely resistive, the source of energy continually get dissipated entirely in form of heat. This is known as heating effect of electric current.

As $E = P \times T$ VIt $\{E = H\}$

Heat produced, $H = VIt$ $\{V = IR\}$

Or Heat produced, $H = I^2Rt$

Joule's Law of Heating Effect of Electric Current

It states that the heat produced in a resistor is

(i) directly proportional to square of current, H I^2

(ii) directly proportional to resistance for a given current, H R

(iii)directly proportional to time for which current flows through the conductor, H *t*.

So, $H = I^2Rt$

- Heating effect is desirable in devices like electric heater, electric iron, electric bulb, electric fuse, etc.
- Heating effect is undesirable in devices like computers, computer monitors (CRT), TV, refrigerators etc.
- In electric bulb, most of the power consumed by the filament appears a heat and a small part of it is radiated in form of light.
- *Filament of electric bulb is made up of tungsten* as

  (i) it does not oxidise readily at high temperature.

  (ii) it has high melting point (3380º C).
- The bulbs are filled with chemically inactive gases like nitrogen and argon to prolong the life of filament.

Electric Fuse : It is a safety device that protects our electrical appliances in case of short circuit or overloading.

- Fuse is made up of pure tin or alloy of copper and tin.
- Fuse is always connected in series with live wire.
- Fuse has low melting point.
- Current capacity of fuse is slightly higher than that of the appliance.

Electric Power : The rate at which electric energy is consumed or dissipated in an electric circuit.

$$P = VI$$

$$P = I^2R = \frac{V^2}{R}$$

S.I. unit of power = Watt (W)

1 Watt = 1 volt × 1 ampere

- Commercial unit of electric energy = Kilo Watt hour (KWh)

$1\ KWh = 3.6 \times 10^6\ J$

1 KWh = 1 unit of electric energy

QUESTIONS

VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

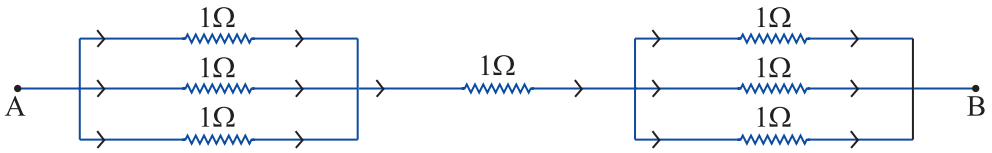
1. Define S.I. unit of :
   (a) Electric current
   (b) Potential difference
   (c) Resistance
   (d) Electric power
   (e) Electrical energy consumed
2. Define the term resistivity.
3. Device used for measuring the current is……. .
4. Name the element of filament of a bulb.
5. Write two types of resistors combination.

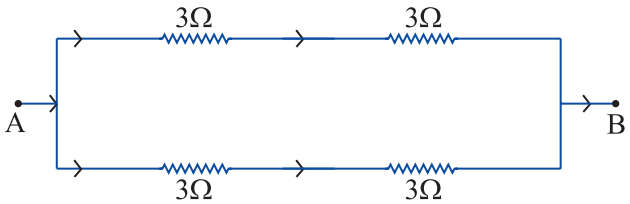
SHORT ANSWER TYPE QUESTIONS (2 Marks)

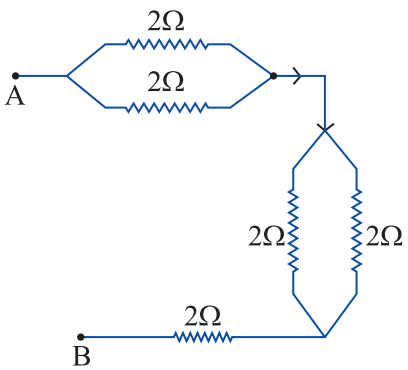
1. How the voltmeter and ammeter are connected in a circuit ?
2. Why the filament of bulb has high melting point ?
3. How does fuse wire protect electrical appliances ?
4. Find the number of joules in 1 KWh.
5. Find a relationship between P, I and V.
6. On what factors does resistance of a conductor depend ?

SHORT ANSWER TYPE QUESTIONS (3 Marks)

1. State Ohm's law. Derive relation between I, V and R. Draw the graph between V and I.
2. What is Joule's heating effect of current P ? Derive its expression.
3. What would be new resistance if length of conductor is doubled and thickness is halved ?
4. Find the effective resistance between A and B.



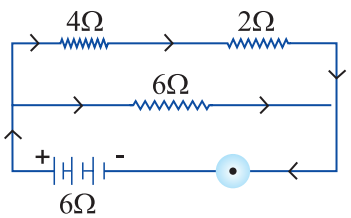




5. Which is the better way to connect lights and other appliances in domestic wiring and why ?

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. Explain the Joule's law of heating. How and on what factors does the heat produced in a conductor depends ?
2. In the circuit given below, calculate :



   (a) Total effective resistance.

   (b) Potential difference across 4Ω, 2Ω.

3. Three resistances of 2Ω, 3Ω and 5Ω are connected in electric circuit. Find :

(a) maximum effective resistance.

(b) minimum effective resistance.

4. On what factors, the resistance of a conductor depends ? Give the mathematical expression. Give the SI unit of resistivity.

VALUE BASED QUESTION

That right Vinay was preparing for his science exam. Suddenly light of his room went off. His cousin brother Vasu quickly with mobile phone torch found that fuse has blown. He checked and put a fuse wire. The light come to life again. Vinay thanked Vasu and continued his study.

(a) What was the values displayed by Vasu and Vinay ?

(b) What is electric fuse ?

(c) What characteristics you would prefer for a fuse wire ?

Hints to Long Answer Type Questions

1. $H = I^2RT$

   Factors : Current, Resistance, Time.

2. (a) Total effective resistance :

$$4\Omega + 2\Omega = 6\Omega$$

$$\frac{1}{R} = \frac{1}{6} + \frac{1}{6} = \frac{2}{6}\Omega = \frac{1}{3}\Omega$$

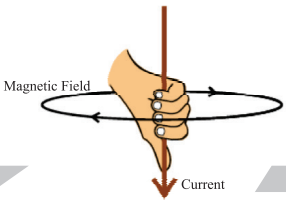
$$R = 3\Omega$$

   (b) V (across 4Ω) = IR = $1 \times 4 = 4$ V

   V (across 2Ω) = IR = $1 \times 2 = 2$ V

3. (a) $R = 10\Omega$

   (b) $R = \frac{30}{31}\Omega$



Chapter - 7

Magnetic Effects Of Electric Current

Magnet is any substance that attracts iron or iron-like substances.

Properties of Magnet

(i) Every magnet has two poles *i.e.,* North and South.

(ii) Like poles repel each other.

(iii) Unlike poles attract each other.

(iv) A freely suspended bar magnet aligns itself in nearly north-south direction, with its north pole towards north direction.

Magnetic Field : The area around a magnetic in which its magnetic force can be experienced.

- Its SI unit is Tesla (T).
- Magnetic field has both magnitude and direction.
- Magnetic field can be described with help of a magnetic compass.
- The needle of a magnetic compass is a freely suspended bar magnet.

Characteristics of Field Lines

(i) Field lines arise from North pole and end into South pole of the magnet.

(ii) Field lines are closed curves.

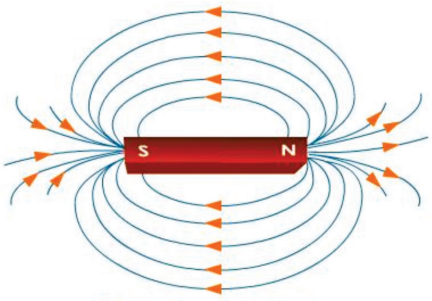
(iii) Field lines are closer in stronger magnetic field.

(iv) Field lines never intersect each other as for two lines to intersect, there must be two north directions at a point, which is not possible.

(v) Direction of field lines inside a magnet is from South to North.

(vi) The relative strength of magnetic field is shown by degree of closeness of field lines.

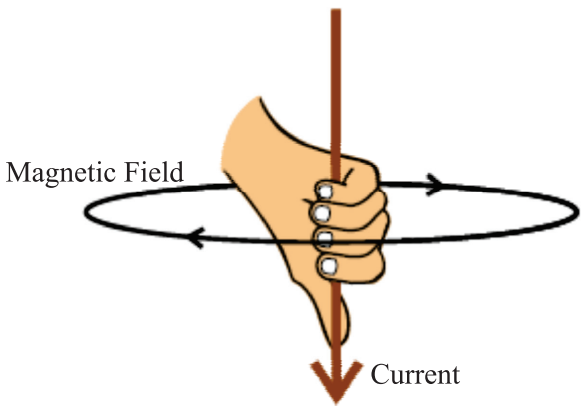
Magnetic Field of a Bar Magnet



- H. C. Oersted was the first person to state that electric current has magnetic field.

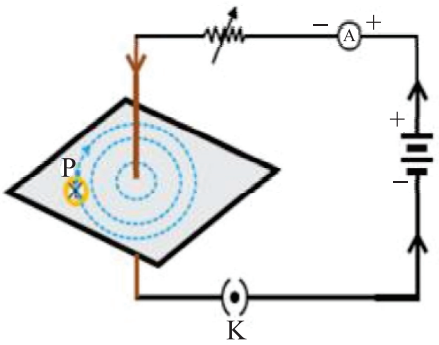
Right Hand Thumb Rule

Imagine you are holding a current carrying straight conductor in your right hand such that the thumb is pointing towards the direction of current. Then the fingers wrapped around the conductor give the direction of magnetic field.



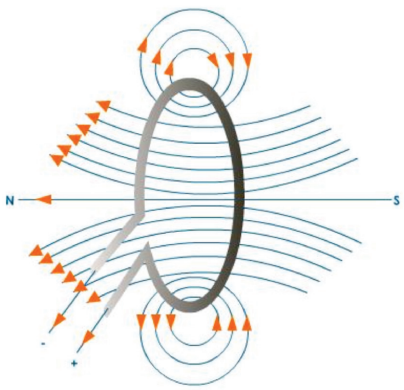
Magnetic Field Due to Current Through a Straight Conductor

- It can be represented by concentric circles at every point on conductor.
- Direction can be given by right hand thumb rule or compass.
- Circles are closer near the conductor.
- Magnetic field Strength of current
- $\text{Magnetic field} \propto \frac{1}{\text{Distance from conductor}}$



Magnetic Field Due to Current Through a Circular Loop

- It can be represented by concentric circle at every point.
- Circles become larger and larger as we move away.
- Every point on wire carrying current would give rise to magnetic field appearing as straight line at centre of the loop.
- The direction of magnetic field inside the loop is same.



Factors affecting magnetic field of a circular current carrying conductor

- Magnetic field Current passing through the conductor
- Magnetic field $\propto \frac{1}{\text{Distance from conductor}}$
- Magnetic field No. of turns in the coil

Magnetic field is additive in nature *i.e.,* magnetic field of one loop adds up to magnetic field of another loop. This is because the current in each circular turn has some direction.

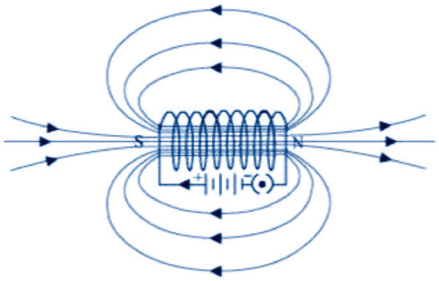
Solenoid

A coil of many circular turns of insulated copper wire wrapped closely in a cylindrical form.

- Magnetic field of a solenoid is similar to that of a bar magnet.
- Magnetic field is uniform inside the solenoid and represented by parallel field lines.
- Direction of magnetic field

  (i) Outside the solenoid : North to South

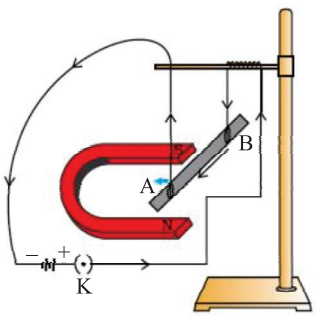
  (ii) Inside the solenoid : South to North
- Solenoid can be used to magnetise a magnetic material like soft iron.



Electromagnet	Permanent Magnet
1. It is a temporary magnet, so, can be easily demagnetised.	1. Cannot be easily demagnetised.
2. Strength can be varied.	2. Strength is fixed.
3. Polarity can be reversed.	3. Polarity cannot be reversed.
4. Generally strong magnet.	4. Generally weak magnet.

Force on a Current carrying Conductor in a Magnetic Field

Andre Marie Ampere suggested that the magnet also exerts an equal and opposite force on a current carrying conductor.

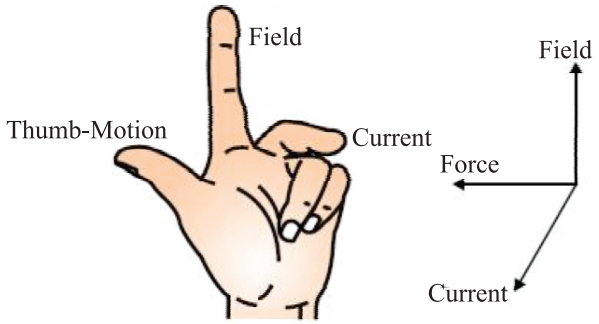


The displacement in the conductor is the maximum when the direction of current is at right angle to the direction of magnetic field.

Direction of force is reversed on reversing the direction of current.

Fleming's Left Hand Rule

Stretch the thumb, fore finger and middle finger of your left hand such that they are mutually perpendicular. If fore finger points in the direction of magnetic field, middle finger in the direction of current then thumb will point in the direction of motion or force.



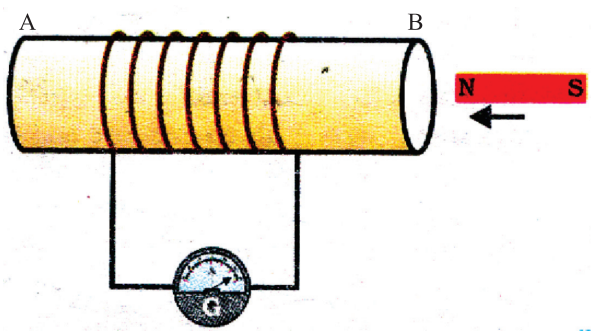
- Heart and brain in the human body have significant magnetic field.
- **MRI (Magnetic Resonance Imaging) :** Image of internal organs of body can be obtained using magnetic field of the organ.

Galvanometer : Instrument that can detect the presence of current in a circuit. It also detects the direction of current.

Electro Magnetic Induction

When a conductor is placed in a changing magnetic field, some current is induced in it. Such current is called induced current and the phenomenon is called electromagnetic induction.

Activity No. 1

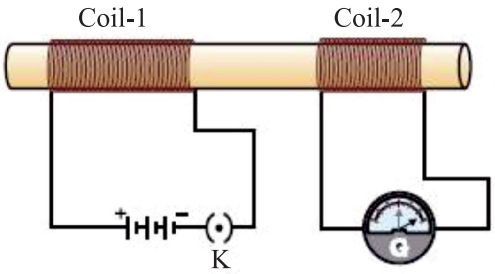


(i) **Magnet moved into the coil :** Momentary deflection in G indicating presence of current.

(ii) **Magnet kept stationary inside the coil :** No deflection.

(iii)**Magnet is withdrawn :** Momentary deflection in G but in opposite direction of first case.

Activity No. 2



Primary Coil **Secondary Coil**

(i) **Switched on :** Momentary deflection in G.

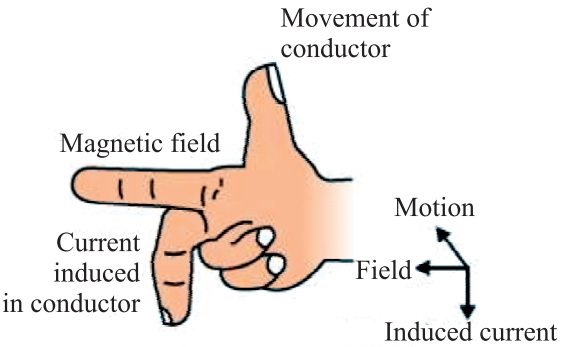
(ii) **Steady current :** No deflection.

(iii)**Switched off :** Momentary deflection in G but in opposite direction of the first case.

Fleming's Right Hand Rule

Hold the thumb, the fore finger and the middle finger of right hand at right angles to each other. If the fore finger is in the direction of magnetic field and the thumb points in the direction of motion of conductor, then the direction of induced current is indicated by middle finger.

- Working principle of electric generator.
- Used to find direction of induced current.



Alternate Current (A. C.) : The current which reverses its direction periodically.

- In India, A. C. reverses its direction in every $\frac{1}{100}$ second.

$$\text{Time period} = \frac{1}{100} + \frac{1}{100} = \frac{1}{50}\text{s}$$

$$\text{Frequency} = \frac{1}{\text{Time period}}$$

$$= \frac{1}{1/50} \qquad 50 \text{ Hz}$$

Advantage

- A. C. can be transmitted over long distance without much loss of energy.

Disadvantage

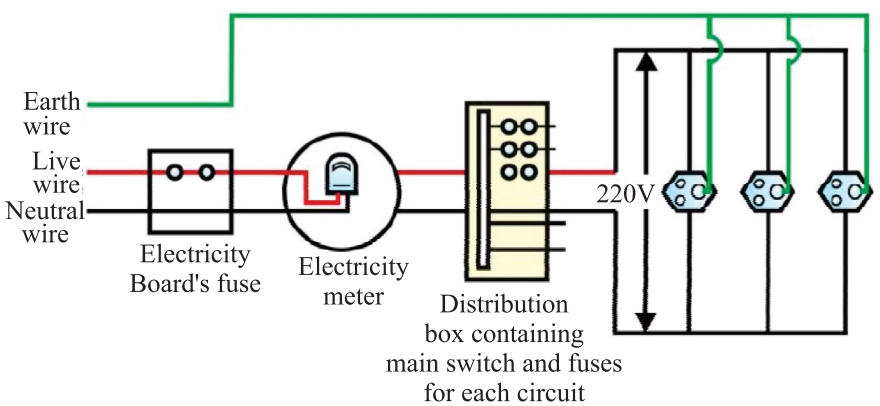
- A. C. cannot be stored.

Direct Current (D. C.) : The current which does not reverse its direction.

- D. C. can be stored.
- Loss of energy during transmission over long distance is high.
- Sources of D. C. : Cell, Battery, Storage cells.

Domestic Electric Circuits

- There are three kinds of wires used :
  (i) Live wire (positive) with red insulation cover.
  (ii) Neutral wire (negative) with black insulation cover.
  (iii)Earth wire with green insulation cover.
- The potential difference between live and neutral wire in India is 220 V.
- Pole Main supply Fuse Electricity meter Distribution box To separate circuits



Earth Wire : Protects us from electric shock in case of leakage of current especially in metallic body appliances. It provides a low resistance path for current in case of leakage of current.

Short Circuit : When live wire comes in direct contact with neutral wire accidently.

- Resistance of circuit becomes low.
- Can result in overloading.

Overloading : When current drawn is more than current carrying capacity of a conductor, it results in overloading.

Causes of overloading :

(i) Accidental hike in voltage supply.

(ii) Use of more than one appliance in a single socket.

Safety devices :

(i) Electric fuse

(ii) Earth wire

(iii)MCB (Miniature Circuit Breaker)

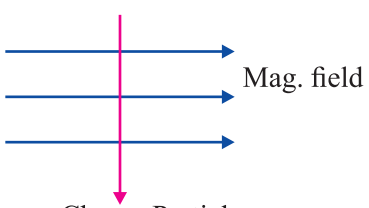
QUESTIONS

VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

1. Define magnetic field lines.
2. What is the frequency of a.c. in India ?
3. Who discovered the electromagnetic induction ?
4. What is short circuit ?
5. Why does two magnetic field lines not intersect ?

SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. A charged particle enters at right angle into a uniform magnetic field. What is the nature of charge particle if it experiences a force in a direction pointing vertically out of page.



Use Fleming's Left Hand Rule

2. When does short circuit occur ?
3. Write the three ways to produce magnetic field.

4. What is overloading ?
5. Write the use of safety device used in electric circuit.

SHORT ANSWER TYPE QUESTIONS (3 Marks)

1. What is solenoid ? Where the magnetic field is uniform in solenoid ?
2. Draw the pattern of magnetic field lines due to current carrying straight conductor.
3. What is earth wire ? How it works in our domestic circuit ?

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. What is electromagnetic induction ? Explain with an activity. Write its one application.
2. Draw the schematic diagram of domestic circuit. Write the colour and nature of neutral wire, live wire and earth wire.
3. What is an electromagnet ? What material are used to make electromagnet ? Can we use steel to make electromagnet ?

VALUE BASED QUESTION

In the birthday party of Bharat, his parents gave slinky to each friend as a return gift. The next day during the school, their teacher explained them about the production of magnetic fields using current carrying coils and also said that they can make permanent magnet using such coils by passing high current through them. Teacher also explained the uses of solenoid.

(a) What values did Bharat's parents exhibit towards his son ?

(b) What type of field is produced by solenoid ?

Hints to Long Answer Type Questions

1. The process by which a changing magnetic field in a conductor induces a current in another conductor is called electromagnetic induction.

   See Fig. 15.17 NCERT

2. Refer to given diagram
3. A strong magnetic field produced inside a solenoid can be used to magnetise a piece of magnetic material, like soft iron, when placed inside the coil. The magnet so formed is called an electromagnet.

   Yes, steel can be used to make electromagnet.

Chapter - 8

Sources Of Energy

- Energy comes in different forms and one form can be converted into another.
- A source of energy is one which provide adequate amount of energy in a convenient form over a long period of time.

Need of energy :

- For making food
- For lightning
- For transport
- For running machines
- For industrial activities and agricultural work

Qualities of a Good Source of Energy

(i) Which would do a large amount of work per unit mass.

(ii) Cheap and easily available.

(iii) Easy to store and transport.

(iv) Safe to handle and use.

(v) Does not cause environmental pollution.

Fuels : The materials which are burnt to produce heat energy are known as fuels. *E.g.,* wood, coal, LPG, kerosene.

Characteristics of a Good Fuel

- High calorific value (give more heat per unit mass).
- Burn without giving out any smoke or harmful gases.

- Proper ignition temperature.
- Cheap and easily available.
- Easy to handle, safe to transport.
- Convenient to store.
- Burn smoothly.

Sources of Energy

Conventional Sources of Energy	Non-conventional Sources of Energy
• Fossil fuels (Coal, Petroleum)	• Solar energy (*e.g.,* solar cooker, solar cell panel)
• Thermal power plant	• Energy from the sea (tidal wave, OT energy)
• Hydro power plants	• Biomass-biogas plant • Wind energy
• Geothermal energy	• Nuclear energy

CONVENTIONAL SOURCES OF ENERGY

Sources of energy which are known to most of the people. *E.g.,* fossil fuels, bio mass etc.

I. FOSSIL FUELS :

- Fuels developed from the fossils *e.g.,* coal, petroleum.
- Take millions of years to form.
- Available in very limited amount.
- These are non-renewable sources of energy.

India has about 6% share in the world reserved coal, that may last 250 years more at the present rate of consumption.

Pollution Caused by Fossil Fuels

- Released oxides of carbon, nitrogen and sulphur (acidic in nature) which causes acid rain that damages trees, plants, reduces fertility of soil.
- Produces large amount of CO_2 in the atmosphere which causes green house effect leading to excessive heating of the earth.

Controlling Pollution Caused by Fossil Fuels

- Increasing the efficiency of the combustion process.

- Using various techniques to reduce the escape of harmful gases and ashes into the surroundings.

II. THERMAL POWER PLANT :

A power plant which uses heat energy to generate electricity.

- Burning of fossil fuels produces steam to run turbines.
- Set up (power plants) near the coal and oil fields to minimize the cost of transportation and production.
- Transmission of electricity is more efficient.

III. HYDRO POWER PLANTS :

- Convert the potential energy of falling water into electricity.
- Hydro power plants are associated with Dams.

Around 25% of our country's energy requirement is met by Hydro Power plants.

Advantages :

(i) No environmental pollution.

(ii) Flowing water is a renewable source of electric energy.

(iii) Construction of dams prevents flooding of rivers, provide water for irrigation.

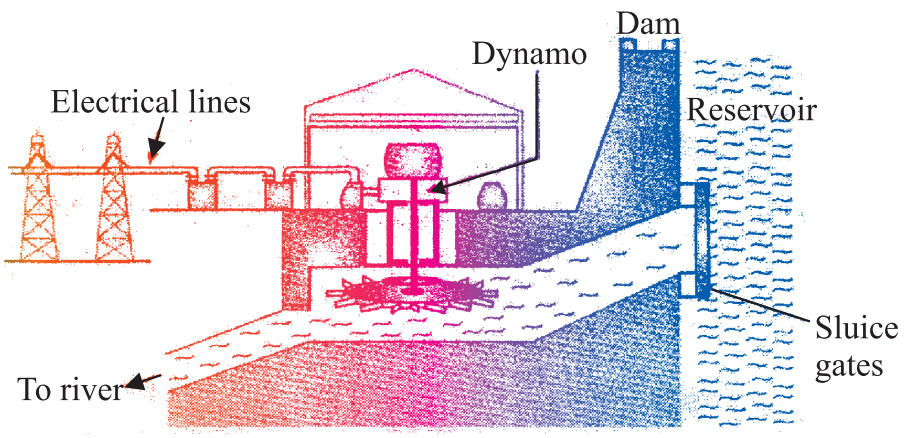
Disadvantages :

(i) Large areas of agricultural land, a vast variety of flora and fauna, human settlements get submerged in the water of reservoir formed by the dam.

(ii) Large ecosystems are destroyed.

(iii) Vegetation that submerged under water rots under anaerobic conditions and produces large amount of methane which is a green house gas.

(iv) Creates the problems of satisfactory rehabilitation of displaced people.



Production of hydroelectricity using water energy

Improvements in the Technology for Using Conventional Sources of Energy

I. BIOMASS :

The dead parts of plants and trees and the waste materials of animals and man are called **Biomass**.

(1) Wood : It is a biomass and used as a fuel for a long time.

Disadvantages :

- Produces a lot of smoke on burning.
- Do not produce much heat.
- Thus by improvement in technology we can improve the efficiency of traditional sources of energy.

For *e.g.,* wood can be converted into much better fuel called charcoal.

(2) Charcoal : When wood is burnt in limited supply of air, then water and other volatile materials gets removed and charcoal is formed.

$$\text{Wood} \xrightarrow{\text{Limited Supply of } O_2} \text{Charcoal}$$

Charcoal is better fuel than wood because :

(i) It has higher calorific value than wood.

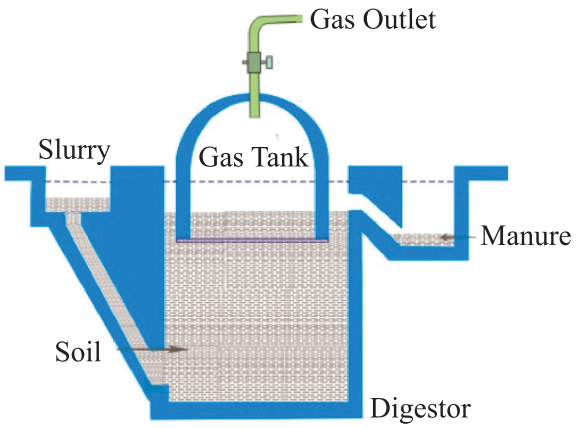
(ii) Does not produce smoke while burning.

(iii) It is a compact fuel, easy to handle and convenient to use.

(3) Cowdung : It is biomass but it is not good to burn cowdung directly as fuel because :

- produces lot of smoke.
- cowdung does not burn completely, produces lot of ash as residue.
- low calorific value.
- by making bio gas (or gobar gas) from cow dung, we get a smokeless fuel.

(4) Bio gas : It is produced in a biogas plant. Anaerobic micro organisms decomposes the complex compound of the cow dung + water slurry. It takes few day for the decomposition process and generate gases like methane, CO_2, hydrogen and hydrogen sulphide. Bio gas is stored in the gas tank above the digester from which they are drawn through pipes for use.



Bio gas Plant

Advantages of Bio gas :

(i) It is an excellent fuel as it contains upto 75% methane (CH_4).

(ii) It burns without smoke.

(iii) Leaves no residue like ash in wood & coal burning.

(iv) Heating capacity is high.

(v) It is also used for lighting.

(vi) Slurry left behind is used as excellent manure rich in nitrogen and phosphorus.

(vii) Safe and efficient method of waste disposal.

(5) Wind energy :

- Unequal heating of the landmass and water bodies by solar radiations generate air movement and causes wind to blow.
- Kinetic energy of the wind can be used :
  - * to generate electricity by turning the rotor of the turbine.
  - * to lift water from the well.
  - * to run the flour mills.
- But the output of a single wind mill is quite small so a number of windmills are erected over a large area called wind energy farm.
- The minimum wind speed for wind mill to serve as a source of energy is 15-20 KmPH.

Advantages :

(i) Eco-friendly.

(ii) Efficient source of renewable energy.

(iii) No recurring expenses for production of electricity.

Disadvantages :

(i) Wind energy farms need large area of land.

(ii) Difficulty in getting regular wind speed of 15-20 KmPH.

(iii) Initial cost of establishing wind energy farm is very high.

(iv) High level of maintenance of blades of wind mill.

- Denmark is called the 'Country of Winds'.
- India is ranked 5th in harnessing wind energy for the production of electricity.
- In India largest wind energy farm has been established near Kanyakumari in Tamil Nadu and it generates 380 MW of electricity.

Alternate or Non-conventional Sources of Energy

Day by day, our demand for energy increases, so there is a need for another source of energy.

Reasons for alternate sources of energy

(i) The fossil fuel reserves in the earth are limited which may get exhausted soon if we use them at the current rate.

(ii) Reduce the pressure on fossil fuels making them last for a much longer time.

(iii) To reduce the pollution level and to save the environment.

I. SOLAR ENERGY :

- Sun is the ultimate source of energy.
- Energy obtained from the sun is called solar energy.

$$\text{Solar constant} = 1.4 \text{ KJ/s/m}^2$$

Outer edge of the earth receives solar energy equal to 1.4 KJ/s/m^2 or 1.4 KW/m^2 [... 1 KJ/s = 1 KW]

Solar energy devices : Devices using solar energy are :

(i) Solar cooker

(ii) Solar water heater

(iii) Solar cells

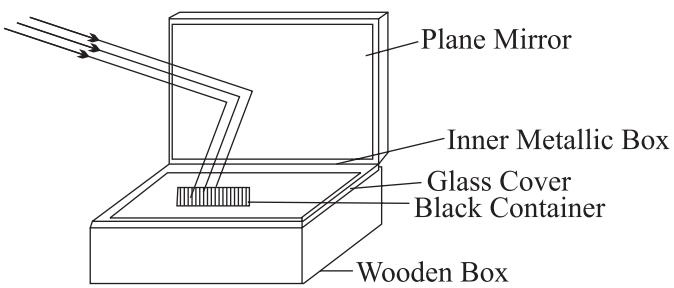
Solar heating devices :

- Use black painted surface because black surface absorbs more heat as compared to white or other surface.
- Use of glass plate because it allows infrared radiations to enter through it but does not allow the radiations to exit through it, causing more green house effect that result in increase in temperature.

(i) SOLAR COOKER

Box Type Solar Cooker : It consists of a rectangular box which is made up of wood or plastic which is painted dull black.

- Inner walls of the box are painted black to increase heat absorption.
- Solar cookers are covered with glass plate and have mirror to focus the rays of the sun and achieve higher temperature.
- Temperature inside the box increases 100ºC-140ºC in 2-3 hours.



Solar Cooker (Box Type)

Advantages :

(a) Save precious fuel like coal, LPG, kerosene.

(b) Does not produce smoke.

(c) Nutrients of food do not get destroyed while cooking.

(d) Upto four food items can be cooked at the same time.

Disadvantages :

(a) Solar cookers cannot be used during night.

(b) If the day sky is covered with clouds, even then solar cooker cannot be used.

(c) Direction of reflector of solar cooker changes from time to time to keep it facing the sun.

(d) Cannot be used for frying or baking purpose.

II. SOLAR CELL :

- Solar cells convert solar energy into electricity.
- A solar cell develops a voltage of 0.5-1 V and can produce about 0.7 W of electricity.
- A large number of solar cell are combined in an arrangement called solar cell panel

Advantages :

(a) Have no moving parts.

(b) Require little maintenance.

(c) Can work without any focusing device.

(d) Can be set up in remote and inacessible areas.

Disadvantages :

(a) Manufacturing is expensive.

(b) Availability of special grade silicon for making solar cells is limited.

(c) Silver wire for interconnection of cells is expensive.

Uses of Solar Cell :

(a) Artificial satellites and space probes use solar cells as the main source of energy.

(b) Radio, TV relay stations in remote locations use solar cell panels.

(c) Traffic signals, calculators and many toys are fitted with solar cells.

III. ENERGY FROM THE SEA

	Tidal Energy	Wave Energy	Ocean Thermal Energy
	Tidal Energy	**Wave Energy**	**Ocean Thermal Energy**
Working : (i)	The phenomenon of high and low tide give us tidal energy.	Kinetic energy of huge waves near sea shore is trapped to generate electricity.	The difference in the temperature of water at the surface and deeper section of ocean is used to obtain energy in ocean thermal energy conversion plants. (OTEC)

(ii)	It is harnessed by constructing a dam across the narrow opening of the sea.	Wave energy is used for rotation of turbine and production of electricity.	The warm surface water is used to boil volatile liquid ammonia. The vapours of the liquid are used to run the turbine of generator to produce electricity.
Disadvantage :	The location where such dams can be built are limited.	Wave energy is viable only where waves are very strong.	Efficient commercial exploitation is very difficult.

GEOTHERMAL ENERGY

- 'Geo' means 'earth' and 'thermal' means 'heat'.
- Geothermal energy is the heat energy from hot rocks present inside the earth.
- When underground water comes in contact with 'hot spot', steam is generated. Steam trapped in rocks is routed through pipes to a turbine and used to generate electricity.

Advantages :

(a) Economical to use geothermal energy.

(b) Does not cause any pollution.

Limitations :

(a) Geothermal energy is not available everywhere.

(b) Deep drilling in the earth to obtain geothermal energy is very difficult and expensive.

- In New Zealand and USA, there are no. of power plants based on geothermal energy are operational.

NUCLEAR ENERGY

- The energy released during a nuclear reaction is called nuclear energy.
- It can be obtained by two types of nuclear reactions :

(i) Nuclear fission

(ii) Nuclear fusion

(i) Nuclear Fission :

- 'Fission' means split up.

- The process in which the heavy nucleus of a radioactive atom (such as uranium, plutonium or thorium) split up into smaller nuclei when bombarded with low energy neutrons, is called nuclear fission.
- A tremendous amount of energy is produced.
- U-235 is used as a fuel in nuclear reactor in form of uranium rods.

Working : In a nuclear reactor self sustaining chain reaction releases energy at a controlled rate, which is used to produce steam and further generate electricity.

Major Nuclear Power Plants :

(a) Tarapur (Maharashtra)

(b) Rana Pratap Sagar (Rajasthan)

(c) Kalpakkam (Tamil Nadu)

(d) Narora (U. P.)

(e) Kakrapar (Gujrat)

(f) Kaiga (Karnataka)

(ii) Nuclear Fusion :

When two nuclei of light elements (like hydrogen) combine to form a heavy nucleus (like helium) and tremendous amount of energy is released is called nuclear fusion.

$$^{2}_{1}H \text{ (deuterium)} + {}^{2}_{1}H \xrightarrow{\text{fusion}} {}^{3}_{2}He + {}^{1}_{0}n + Heat$$

- Very-very high temperature and pressure is needed for fusion.
- Hydrogen bomb is based on this phenomenon.
- Nuclear fusion is the source of energy in the sun and other stars.

Advantage :

(a) Production of large amount of useful energy from a very small amount of nuclear fuel.

(b) Does not produce green house gases like CO_2.

Limitations :

(a) Environmental contamination due to improper nuclear waste storage and its disposal.

(b) Risk of accidental leakage of harmful radiations.

(c) High cost of installation.

(d) Limited availability of nuclear fuel.

Environmental Consequences

Exploiting any source of energy disturbs the environment in some way or the other. Thus, the source we would choose depends upon following the factors :

(a) Ease of extracting energy from the source.

(b) Cost of extracting energy from the source.

(c) Efficiency of technology available to extract energy.

(d) The environmental damage caused by using that source.

In other words, no source of energy is said to be pollution free. Some source are cleaner than the other.

For example, solar cells may be pollution free but the assembly of the device would have cause some environmental damage.

How long will an energy resource last us ?

Sources of Energy

Non-renewable Sources of Energy	**Renewable Sources of Energy**
Sources that will get depleted some day. For example : Fossil fuel	Energy sources that can be regenerated and that will last for ever. For example : Wind energy, water energy.

QUESTIONS

VERY SHORT ANSWER TYPE QUESTIONS (1 Mark)

1. Give two examples of fossil fuels.
2. Write two characteristics of good fuel.
3. What do you mean by nuclear energy ?
4. Which country is known as 'Country of Winds' ?
5. Write the full form of CNG and LPG.
6. Name the main component of solar cell.

7. What do you mean by fuel ?
8. How charcoal is different from wood ?
9. Biogas is also known as gobar gas. Justify.
10. Name a device which can be used for cooking so as to save fuel.

SHORT ANSWER TYPE QUESTIONS (2 Marks)

1. Write two disadvantages of using fossil fuels.
2. What are solar panels ? Write three uses of solar panels.
3. Name four gases mainly present in bio gas.
4. Define nuclear fusion.
5. Write two limitations of using wind energy.
6. Write name of four nuclear power reactors located in India.
7. Write two uses/advantages of geothermal energy.
8. Why we pay attention towards alternative or non-conventional sources of energy ?
9. Write two advantages and two limitations of dams for the production of hydro electricity.

SHORT ANSWER TYPE QUESTIONS (3 Marks)

1. Charcoal is a better fuel than wood. Why ?
2. What is bio mass ? How does bio gas plant help to reduce the problem of pollution?
3. Write three advantages and three limitations of using solar cooker.
4. Why it is not possible to make use of solar cells to meet all our needs ? State three reasons.

LONG ANSWER TYPE QUESTIONS (5 Marks)

1. Why tidal energy do not become the main source of energy ?
2. What is OTEC ? Which two main points are necessary for its working ?
3. Bio gas is a boom for farmer. Why ?
4. Draw a diagram of bio gas plant.

VALUE BASED QUESTION

A school organized a study tour for its students to observe how do people in village use energy resources for their living. They observed that in one of the villages, people use wood and cow dung as a fuel while in the nearby village they saw modern technology

was used by the villagers for better sanitation and management of their bio-waste and sewage materials by establishing bio gas plant.

(a) If you compare the situation of both the villages, which practice would you prefer to be the best and why ?

(b) What are the advantages of this practice ?

(c) State the associated values which you would get from this excursion tour.

Hints to Long Answer Type Questions

1. (a) Few sites for building dams.
   (b) Rise and fall of water during tides is not high enough.
2. **OTEC :** Device used to harness ocean thermal energy.
   (a) Temperature difference of 20ºC or more.
   (b) Warm surface boil ammonia and vapours are used to run the turbine.
   (c) Minimum depth of water – 2000 m.
3. Bio gas is a boom as it is a
   (a) Clean and safe fuel.
   (b) Slurry left behind is a good manure.
4. See the diagram in text.

MCQ BASED ON PRACTICALS

CHAPTER 1.

CHEMICAL REACTIONS AND EQUATIONS

1. Dil. HCl is added to solid sodium carbonate. It is observed that :

(a) no change takes place

(b) a loud sound is produced

(c) immediately brisk effervescences occur

(d) solution turns blue-black

2. A student added dil. HCl to test tube containing Zn granules and made the following observations :

I. The surface of Zn becomes black.

II. A gas is evolved which burns with pop sound.

III. The solution remains colourless.

The correct observations are :

(a) I and II (b) I and III

(c) II and III (d) I, II and III

3. When CO_2 is passed through lime water milkiness formed is due to :

(a) $CaCO_3$ (b) $Ca(OH)_2$

(c) $Ca(HCO_3)_2$ (d) none

4. When drops of blue litmus solutions are added to dil. HCl and aqueous NaOH taken in two different test tubes A and B respectively, what will be the colour changes occurring ?

(a) Blue to red in both A and B

(b) No change in both A and B

(c) Blue to red in A and no change in B

(d) Blue to red in B and no change in A

5. When HCl reacts with Zn metal, the gas produced is :

(a) Oxygen (b) Nitrogen

(c) Chlorine (d) Hydrogen

6. Four students studied reaction of Zn and sodium carbonate with dil. HCl and NaOH and presented their result. The (✓) represent evolution of gas whereas (×) no reaction.

A.

	Zn	Na_2CO_3
HCl	✓	✓
NaOH	✓	×

B.

	Zn	Na_2CO_3
HCl	✓	×
NaOH	✓	✓

C.

	Zn	Na_2CO_3
HCl	×	×
NaOH	✓	✓

D.

	Zn	Na_2CO_3
HCl	✓	✓
NaOH	×	×

The right set of observation is :

(a) A (b) B

(c) C (d) D

7. Rahul adds aqueous solution of barium chloride to aqueous solution of sodium sulphate. He would observe that :

(a) a pungent smelling gas is evolved

(b) the colour of solution turns red

(c) white precipitate is formed after sometime

(d) white precipitate is formed immediately

8. A student took solid quick lime in a china dish and added a small amount of water to it, he would hear :

(a) a pop sound (b) a crackling sound

(c) a hissing sound (d) no sound at all

9. Iron fillings were added to copper sulphate solution. After 10 minutes, it was observed that blue colour of solution has changed and a layer has deposited on iron fillings. Which of the following respond to change of colour of solution and to colour of coating on iron filling ?

(a) Yellow and green (b) Brown and blue

(c) Red and greenish blue (d) Light green and reddish brown

11. When crystals of $FeSO_4$ are strongly heated, the residue obtained is :

(a) red in colour (b) blue in colour

(c) green in colour (d) colourless

12. Vinegar solution has a pH of 2.4-3.4. When a universal pH paper is dipped into it, the colour of the paper will be :

(a) reddish orange (b) greenish blue

(c) dark red (d) greenish yello

13. A danger mark showing the corrosive nature should be pasted on the bottle of :

(a) conc. HCl (b) conc. NaOH solution

(c) conc. ethanoic acid (d) all

14. On adding a few drops of base to distilled water, the pH will become :

(a) less than 7 (b) more than 7

(c) remain 7 (d) pH does not change

15. When dil. HCl reacts with zinc metal, the gas liberated is :

(a) oxygen (b) nitrogen

(c) chlorine (d) hydrogen

16. Iron fillings were added to $CuSO_4$ solution taken in a beaker. Which one of the following will occur ?

(a) Iron fillings become reddish, solution becomes green

(b) Iron fillings become reddish, solution remains blue

(c) Iron fillings become grey, solution becomes green

(d) Iron fillings become grey, solution becomes blue

17. Copper sulphate solution should not be kept in :

(a) aluminium vessel (b) zinc vessel

(c) iron vessel (d) any of these

18. When a solution of barium chloride is added to solution of sodium sulphate, the following happens :

(a) a white precipitate is formed

(b) a red precipitate is formed

(c) colour of the solution turns blue

(d) a pungent smelling gas is evolved

19. When dil. HCl is added to granulated Zn, the observation made is :

(a) the surface of the metal turns shining

(b) the reaction mixture turns milky

(c) odour of chlorine is observed

(d) a colourless and odourless gas evolves with bubbles

20. When Zn metal reacts with dil. HCl the gas evolved :

(a) supports combustion (b) turns lime water milky

(c) burns with a pop sound (d) has a pungent odour

CHAPTER 6.

LIFE PROCESSES

1. In the experiment to show that CO_2 is released during respiration, the solution in the small test tube is chemically :

(a) NaOH (b) KOH

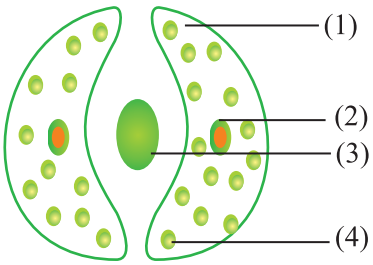
(c) NaCl (d) KCl

2. To obtain the peel of a leaf, which part of the leaf would you work with ?

(a) Veins (b) Petiole

(c) Mid rib (d) Lamina

3. From the diagram given below,



Identify the nucleus and chloroplast, from amongst 1, 2, 3 and 4 :

(a) 1 and 2 (b) 2 and 4

(c) 3 and 4 (d) 4 and 1

4. In the experiment 'To show that light is necessary for photosynthesis', presence of starch is tested by adding :

(a) sugar solution (b) lime solution

(c) iodine solution (d) saline water

5. In the experiment to show that germinating seed release CO_2 during respiration, which observation should be made to get correct results ?

(a) Check if CO_2 is coming into the delivery beaker

(b) Carefully observe if there is any change in the size of germinating seeds

(c) Check the change in the level of water present in the beaker

(d) See if the KOH in the test tube has absorbed CO_2 released by the germinating seeds

6. Before setting up the experiment to show the light is necessary for photosynthesis, the experimental plant is kept for 24 hours in :

(a) in the garden (b) in open area

(c) in a open field (d) in a dark room

7. In the experiment set 'To show CO_2 is released during respiration' the water level in the bent tube rises. The reason is that :

(a) due to presence of oxygen

(b) germinating seeds absorb water

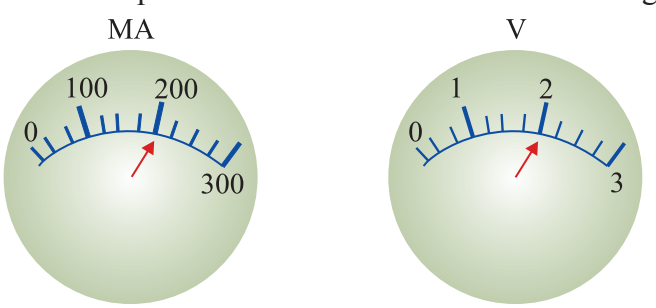
(c) CO_2 released by seeds is absorbed by KOH solution

(d) germinating seeds soak oxygen

CHAPTER 12.

ELECTRICITY

1. The current flowing through a resistor connected in an electric circuit and the potential difference developed across its ends are shown in the diagram :



The value of the resistance of the resistor in Ohm is :

(a) 25 (b) 20

(c) 15 (d) 10

2. A student has to connect 4 cells of 1.5 V each to form a battery of voltage 6 V :

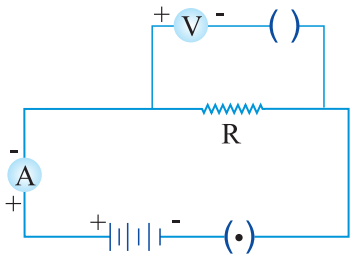
(a) (b) (c) (d)

The correct way of connecting these cells is shown in figure :

(a) A (b) B

(c) C (d) D

3. For the circuit arrangement shown alongside the student would observe :



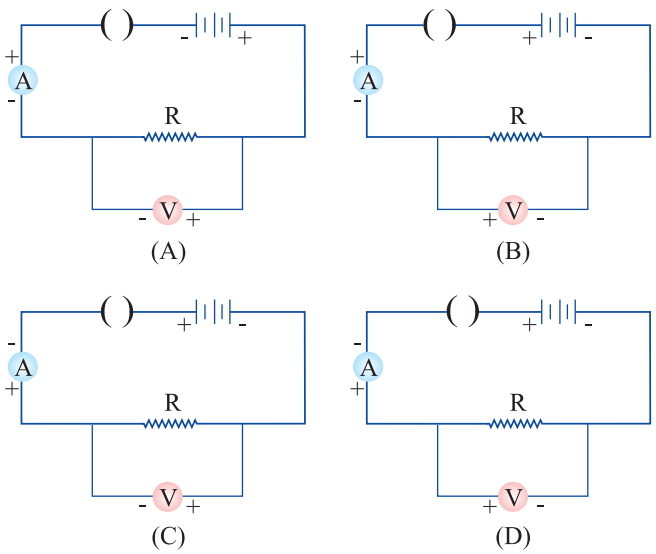
(a) some reading in both ammeter and voltmeter

(b) no reading in either the ammeter or the voltmeter

(c) some reading in both ammeter and voltmeter

(d) some reading in the voltmeter but no reading in the ammeter

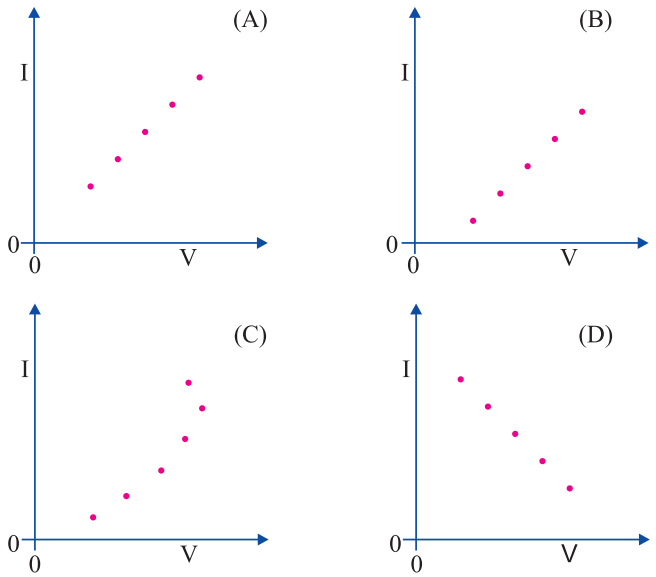
4. Out of the four circuits shown for studying the dependence of the current on the potential difference across a resistor, the correct circuit is :



(a) A (b) B

(c) C (d) D

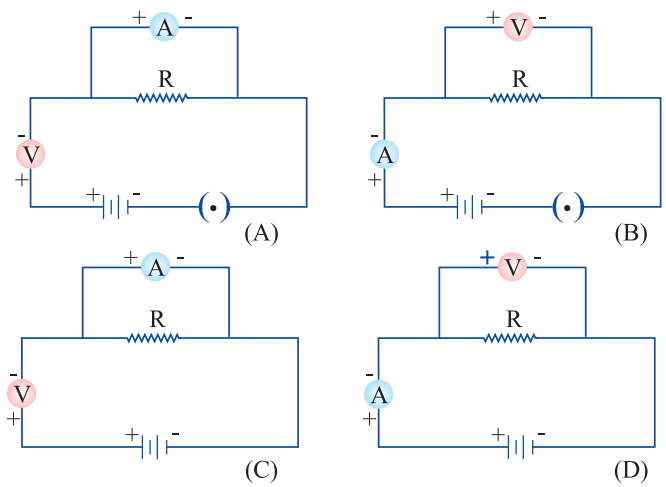
5. The plot correctly showing the dependence of current I on the potential V across a resistor R is :



(a) A (b) B

(c) C (d) D

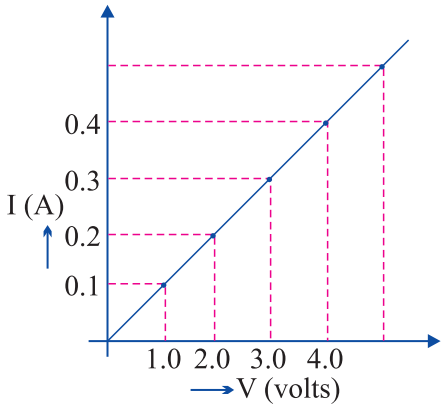
6. In the experiment to studying the dependence of current (I) on potential difference (V), four students set up their circuits as shown in below. The best set up is that of :



(a) student I (b) student II

(c) student III (d) student IV

7. In an experiment to study the dependence of current on potential difference across a resistor, a student obtained the graph as shown in the diagram :

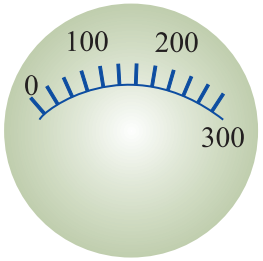


The value of resistance of its resistor is :

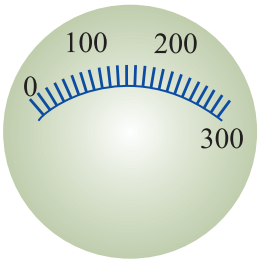
(a) 0.1 ohm (b) 1.0 ohm

(c) 10 ohm (d) 100 ohm

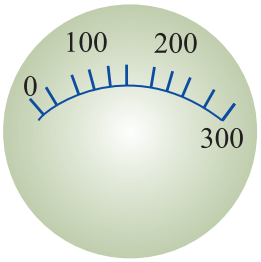
8. Which one of the given four milliammeters would you use for measurement of currents flowing in a circuit ?



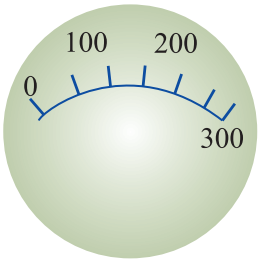
(A)



(B)



(C)

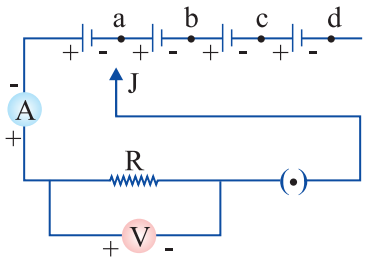


(D)

(a) I (b) II (c) III (d) IV

9. To study the dependence of current (I) on the potential difference (V), across a

resistor, a student used the set-up shown below. He kept the contact J in four different positions marked as (a), (b), (c) and (d) in the figure :



On calculating the value of the ratio V/I, for his four readings, he would find that the value of this ratio :

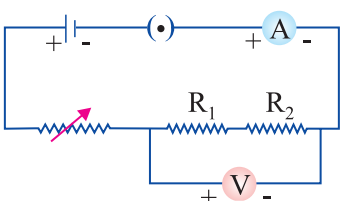
(a) for contact at point (a) is $1/4^{th}$ of that for contact at point (d)

(b) for contact at point (b) is $2/4^{th}$ of that for contact at point (d)

(c) for contact at point (c) is $3/4^{th}$ of that for contact at point (d)

(d) is the same for all the four readings

10. To determine the equivalent resistance of two resistors when connected in series, a student arranged the circuit components as shown in the diagram. But he did not succeed to achieve the objective.



Which of the following mistakes have been committed by him in setting up the experiment ?

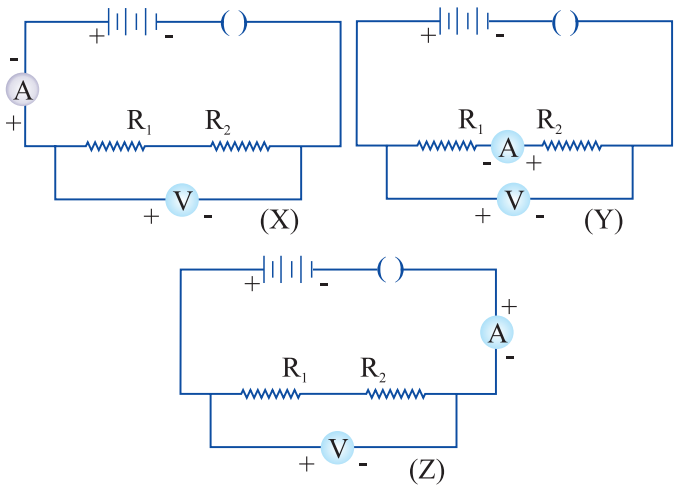
(a) Position of voltmeter is incorrect

(b) Position of ammeter is incorrect

(c) Terminals of voltmeter are wrongly connected

(d) Terminals of ammeter are wrongly connected

11. In their experiment on finding the value of equivalent resistance of two resistors connected in series, three students connected the ammeter, in their circuits, in three ways X, Y and Z as shown below :



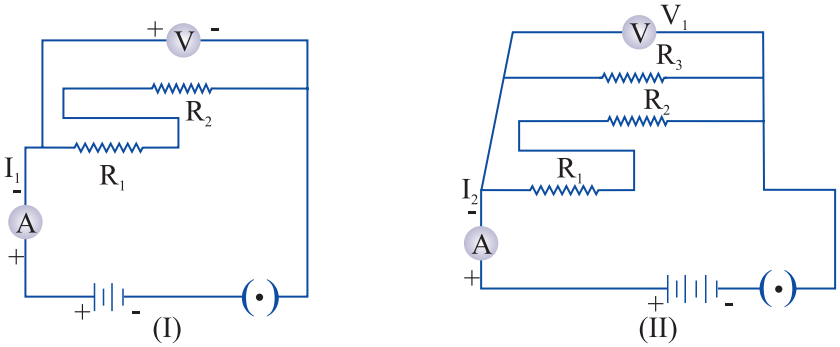
Assuming the ammeter to be ideal, the ammeter has been incorrectly connected in :

(a) case X only (b) case Y only

(c) case Z only (d) all the three cases

12. Circuit I : Ammeter reads current I_1 and voltmeter reads V_1.

Circuit II. Ammeter reads current I_2 and voltmeter reads V_2.



The relationship between the readings is :

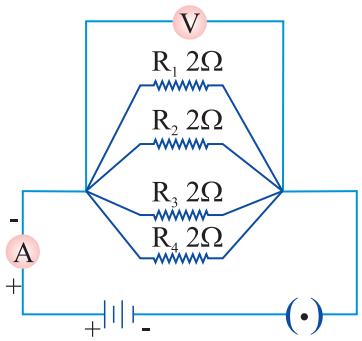
(a) $I_1 > I_2$; $V_1 = V_2$

(b) $I_1 < I_2$; $V_1 = V_2$

(c) $I_1 > I_2$; $V_1 \neq V_2$

(d) $I_1 < I_2$; $V_1 < V_2$

13. Four resistors are connected in parallel. Each have a resistance 2Ω. The effective resistance is :



(a) 8Ω (b) 4Ω

(c) 0.5Ω (d) 0.25Ω

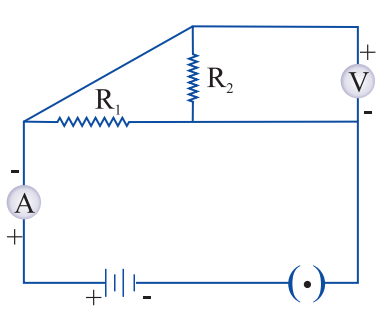
14. The resistors R_1 and R_2 are connected in :

(a) parallel in both circuits

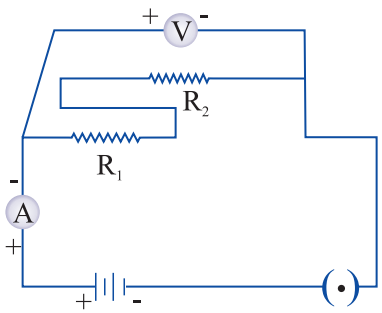
(b) series in both circuits

(c) parallel in circuit I and series in circuit II

(d) series in circuit I and parallel in circuit II

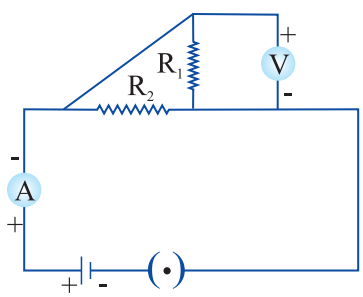


(X)



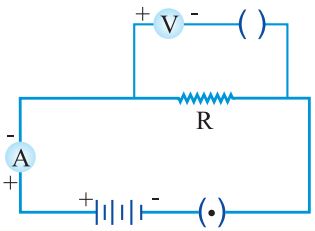
(Y)

15. Which of the circuit components in the circuit diagrams are connected in parallel ?



(a) R_1 and R_2 only (b) R_2 and V only

(c) R_1 and V only (d) R_1, R_2 and V



Unsolved Paper

FIkRST TERM (SA – I)

SCIENCE *(Theory)*

(For Practice)

CLASS X

[Time allowed : 3 Hours] *[Maximum Marks : 90]*

General Instructions :

(i) The question paper comprises of two sections, A and B. You are to attempt both the sections.

(ii) All questions are compulsory.

(iii) There is no overall choice.

(iv) All questions of Section A and all questions of Section B are to be attempted separately.

(v) Question numbers 1 to 3 in Section A are one mark questions. These are to be answered in one word or in one sentence.

(vi) Question numbers 4 to 6 in Section A are two marks questions. These are to be answered in about 30 words each.

(vii) Question numbers 7 to 18 in Section A are three marks questions. These are to be answered in about 50 words each.

(viii) Question numbers 19 to 24 in Section A are fIkve marks questions. These are to be answered in about 70 words each.

(ix) Question numbers 25 to 33 in Section B are multiple choice questions based on practical skills. Each question is a one mark question. You are to select one most appropriate response out of the four provided to you.

(x) Question numbers 34 to 36 in Section B are two marks questions based on practical skills. These are to be answered in about 30 words each.

SECTION A

1. Name the pigment which absorbs solar energy.

2. Mention the main purpose of using a plane mirror in solar cookers.

3. What are the conditions that promote corrosion ?

4. *n* electrons, each carrying a charge e^-, are fLkowing across a unit cross unit section of a metallic wire in unit time from east to west. Write an expression for electric current and also give its direction of fLkow. Give reason for your answer.

5. (a) DefIkne a redox reaction.

(b) When magnesium is burnt in air, it combines with oxygen to form a white ash. Write the chemical equation for the reaction and identify the substance oxidised in the reaction.

6. What is baking powder ? How does it make the cake soft and spongy ?

7. Write chemical equations for the reaction of aluminium with the following :

(a) H_2O (steam)

(b) O_2

(c) HCl

8. Write balanced chemical equations for the reaction of dil. HCl with :

(a) Zn metal

(b) Na_2CO_3

(c) NaOH

9. Silver is kept at the bottom of the 'reactivity series'. It does not react easily with air but it becomes blackish in presence of air. Name the gas responsible for the corrosion of silver. Identify the black coloured compound formed on the surface of silver and give equations for the reaction involved.

10. Giving one example of each, defIkne the following terms :

(a) Corrosion

(b) Rancidity

11. A nichrome wire has a resistance of 10 Ω. FIknd the resistance of another nichrome wire whose length is three times and area of cross-section four times the fIkrst wire.

12. Derive the relation for equivalent resistance when two resistances are connected in parallel.

13. An electric kettle of 2 kW works for 2 h daily. Calculate the (a) energy consumed in SI and commercial unit (b) cost of running it in the month of June at the rate of ₹ 3.00 per unit.

14. (a) An electric oven of 2 kW power rating is operated in a domestic electric circuit (220 V) that has a current rating of 5 A. What result do you expect ? Explain.

(b) What precaution should be taken to avoid the overloading of domestic electric circuits ?

15. (a) How brain and spinal cord are protected in human beings ?

(b) Name the master gland present in the brain.

16. Animals exhibit movement and locomotion, caused due to change in position of contractile proteins. How do you think movement will be brought about in leafLkets of *Mimosa pudica* which lacks such proteins ? Explain with the help of a diagram.

17. List in tabular form two distinguishing features, between newewable and non-renewable sources of energy. Give two examples of each.

18. (a) Describe how electric energy is generated in a hydropower plant.

(b) Construction of dams submerges large areas of forests. How does this contribute to the greenhouse effect ?

19. Carbon cannot reduce the oxide of sodium, magnesium, calcium etc., to the respective metals. Justify the statement giving appropriate reason. State the method used for obtaining their metals from their salts. For obtaining sodium by this method :

(a) name the salt of sodium used and the rod at which sodium metal is deposited.

(b) identify the gas produced during the process.

(c) show the chemical reactions taking place at both the electrodes.

(d) suggest two other metals which can be obtained from their compounds using same method.

20. Give reasons :

(a) Plaster of Paris is written as $CaSO_4.½H_2O$. How is it possible to have half water molecule attached to $CaSO_4$?

(b) Why is sodium hydrogencarbonate an essential ingredient in antacids ?

(c) When electricity is passed through an aqueous solution of sodium chloride, three products are obtained. List the products. Why is this process called chlor-alkali ?

21. Describe an activity to fIknd the combined resistance when three resistors R_1, R_2 and R_3 are connected in parallel and obtain the relation for it using Ohm's law. State two advantages of connecting household appliances in parallel arrangement.

22. What is a solenoid ? Draw the magnetic fIkeld pattern through and around a current-carrying solenoid.

What does the pattern of fIkeld lines inside the solenoid indicate ? How can this fIkeld be utilized to magnetise a piece of soft iron ?

23. (a) What are chemoautotrophs ?

(b) Explain the detailed mechanism of photosynthesis in higher green plants. Also, mention the site where it takes place.

24. What is double circulation ? Why is it found in birds and mammals and not in fIkshes ? How is oxygen and carbon dioxide transported in blood ?

SECTION B

25. On adding an aqueous solution of barium chloride to an aqueous solution of sodium sulphate, a white precipitate is formed :

(a) instantly (b) after 30 seconds

(c) after 20 seconds (d) after 15 seconds

26. The two colours seen at the extreme ends of the pH chart are :

(a) red and blue (b) red and green

(c) green and blue (d) orange and green

27. Which of the following will give a colourless gas that burns with pop sound, on reaction with dilute HCl ?

(a) Solid sodium carbonate (b) Zinc metal

(c) Sodium hydroxide (d) Sodium bicarbonate

28. Copper metal displaces the metal from the solution of

(a) $FeSO_4$ (b) $ZnSO_4$

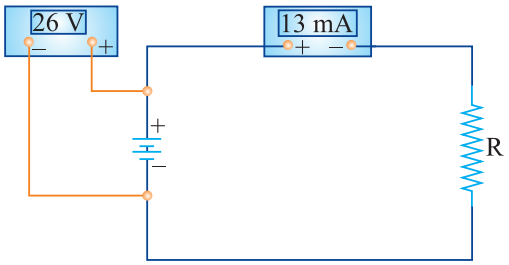
(c) $Al_2(SO_4)_3$ (d) None of the above

29. An ammeter has 20 divisions between mark 0 and mark 1.0 on its scale. The least count of the ammeter is :

(a) 0.02 A (b) 0.01 A

(c) 0.2 A (d) 0.05 A

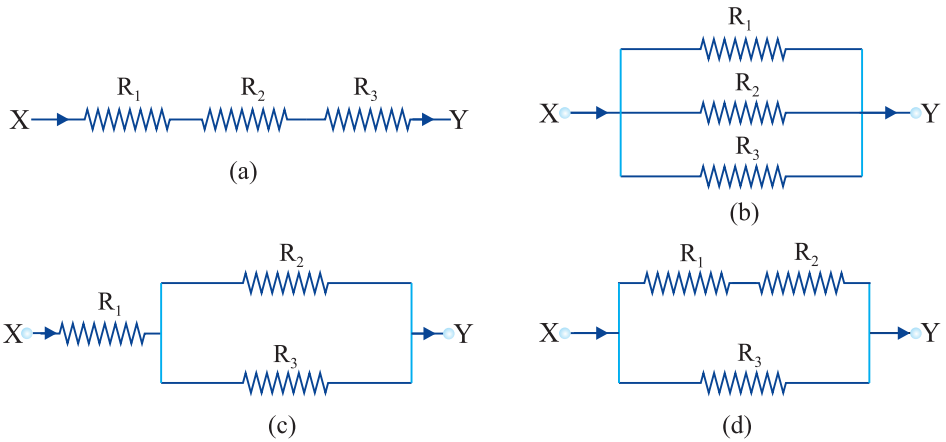
30. What is the resistor value in the given circuit ?



(a) 200 Ω (b) 1 kΩ

(c) 2 kΩ (d) 4 kΩ

31. To determine the equivalent resistance of three resistors R_1, R_2 and R_3 which are connected in parallel combination, four students, A, B, C and D connected the resistors as follows :

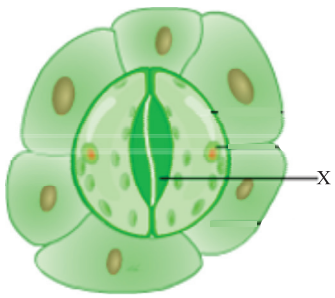


The correct arrangement of the resistors is that of student :

(a) A (b) B

(c) C (d) D

32. Which structure is represented by 'X' in the following diagram :



(a) Chloroplast (b) Nucleus

(c) Cytoplasm (d) Stomata

33. Compensation point occurs at :

(a) noon
(b) throughout the day
(c) sunset and sunrise
(d) anytime when light intensity is very low

34. To show that CO_2 is released during respiration by germinating seeds, Ishita set up an air tight apparatus. From where did the seeds obtained oxygen from ?

35. Draw the circuit diagram used to study the dependence of potential difference (V) across a resistor on the current (I) passing through it. Also plot a graph between V and I.

36. Solution of a substance (A) turns milky when a gas (B) is passed through it. This gas is produced by the reaction between sodium carbonate and hydrochloric acid. Identify (A) and (B). Give the reactions.

Summative Assessment-I, 2015-16

Subject : Science

Class : X

[Time : 3 Hours] **[Maximum Marks : 90]**

General Instructions :

(i) The question paper comprises of two sections, A and B. You are to attempt both the sections.

(ii) All questions are compulsory.

(iii) All questions of Section A and all questions of Section B are to be attempted separately.

(iv) Question numbers 1 to 3 in Section A are one mark questions. These are to be answered in one word or in one sentence.

(v) Question numbers 4 to 6 in Section A are two marks questions. These are to be answered in about 30 words each.

(vi) Question numbers 7 to 18 in Section A are three marks questions. These are to be answered in about 50 words each.

(vii) Question numbers 19 to 24 in Section A are fIkve marks questions. These are to be answered in about 70 words each.

(viii) Question numbers 25 to 33 in Section B are multiple choice questions based on practical skills. Each question is a one mark question. You are to select one most appropriate response out of the four provided to you.

(ix) Question numbers 34 to 36 in Section B are based on practical skills. Each question is a two marks questions.

सामान्य निर्देश :

(i) इस प्रश्न-पत्र को दो भागों, भाग-अ और भाग-ब में बाँटा गया है। आपको दोनों भागों के प्रश्नों के उत्तर लिखने हैं।

(ii) सभी प्रश्नों के उत्तर अनिवार्य हैं।

(iii) आपको भाग-अ और भाग-ब के सभी प्रश्नों के उत्तर पृथक्-पृथक् लिखने होंगे।

(iv) भाग-अ के प्रश्न संख्या 1 से 3 के प्रश्न एक-एक अंक के हैं। इनके उत्तर एक शब्द अथवा एक वाक्य में दें।

(v) भाग-अ के प्रश्न संख्या 4 से 6 के प्रश्न दो-दो अंकों के हैं। इनके उत्तर लगभग 30-30 शब्दों में दें।

(vi) भाग-अ के प्रश्न संख्या 7 से 18 के प्रश्न तीन-तीन अंकों के हैं। इनके उत्तर लगभग 50-50 शब्दों में दें।

(vii) भाग-अ के प्रश्न संख्या 19 से 24 के प्रश्न पाँच-पाँच अंकों के हैं। इनके उत्तर लगभग 70-70 शब्दों में दें।

(viii) भाग-ब के प्रश्न संख्या 25 से 33 के प्रश्न प्रयोगात्मक कौशल पर आधारित बहुविकल्पी प्रश्न हैं। प्रत्येक प्रश्न एक-एक अंक का है। दिए गए चार विकल्पों में से आपको केवल एक सबसे उपयुक्त विकल्प चुनना है।

(ix) भाग-ब के प्रश्न संख्या 34 से 36 के प्रश्न प्रयोगात्मक कौशल पर आधारित दो-दो अंकों के हैं।

SECTION A/भाग-अ

1. Why are we advised to use iodised salt in our diet ? 1

हमें अपने आहार में आयोडीन युक्त नमक को सम्मिलित करने की सलाह क्यों दी जाती है?

2. Mention the colour convention for live and earth wires. 1

विद्युन्मय और भूसम्पर्क तारों के लिए प्रयोग किये जाने वाला रंगों का कोड लिखिए।

3. Mention any one reason due to which most of the thermal power plants are set up near coal or oil fIkeld. 1

अधिकांश तापीय विद्युत संयंत्र (थर्मल पावर प्लांट) को कोयले अथवा तेल भण्डार क्षेत्रों के समीप स्थापित करने का एक कारण लिखिए।

4. Write one example each of : 2

(i) A metal which so soft that it can be cut with a knife and a non-metal which is the hardest substance.

(ii) A metal and a non-metal which exist as liquid at room temperature.

प्रत्येक का एक-एक उदाहरण दीजिए –

(i) एक धातु जो इतनी कोमल है कि उसे चाकू से काटा जा सकता है और एक अधातु जो सभी प्राकृतिक पदार्थों में सबसे कठोर है।

(ii) ऐसी धातु और अधातु जो कक्ष ताप पर द्रव के रूप में होती है।

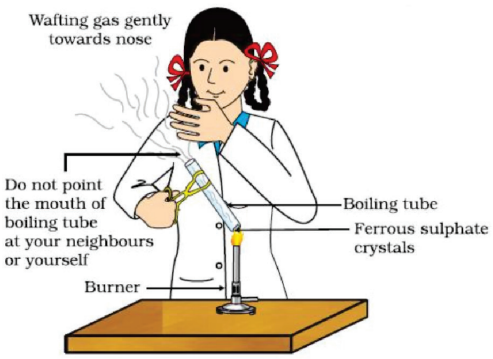
5. Explain why an aqueous solution of sodium sulphate is neutral while an aqueous solution of sodium carbonate is basic in nature. 2

व्याख्या कीजिए कि सोडियम सल्फेट का जलीय विलयन उदासीन क्यों होता है जबकि सोडियम कार्बोनेट का जलीय विलयन क्षारीय प्रकृति का होता है।

6. Mention the site of complete digestion in our body. Name the end products formed on complete digestion of carbohydrates, proteins and fats. 2

हमारे शरीर में पूर्ण पाचन के स्थल का उल्लेख कीजिए। कार्बोहाइड्रेट, प्रोटीन तथा वसा के पूर्ण पाचन पर प्राप्त होने वाले अंतिम उत्पादों के नाम लिखिए।

7. Look at the fIkgure given below and answer the following questions : 3



(i) What is the colour of ferrous sulphate crystals before and after heating ?

(ii) How do you identify the gases evolved on heating ?

(iii) What kind of reaction does it represent ? Write the balanced chemical equation also.

नीचे दिए गए चित्र को देखिए तथा निम्न प्रश्नों के उत्तर दीजिए –

(i) फेरस सल्फेट क्रिस्टलों का रंग गर्म करने से पूर्व तथा पश्चात् लिखिए।

(ii) गर्म करने पर उत्सर्जित गैसों को आप कैसे पहचानेंगे ?

(iii) यह किस प्रकार की अभिक्रिया दर्शाता है ? इसका संतुलित रासायनिक समीकरण भी लिखिए।

8. A compound 'X' is a constituent of baking powder. It is used as an antacid. When 'X' is heated it gives out a gas 'Y' which when passed through lime water turns it milky and a salt 'Z' is formed which is the main constituent of washing powder. Identify X, Y and Z. Write balanced chemical equations for the reactions involved. 3

एक यौगिक 'X' बेकिंग पाउडर का घटक है। इसका उपयोग एन्टैसिड के रूप में होता है। जब 'X' को गर्म किया जाता है एक गैस 'Y' उत्सर्जित करता है जो चूने के पानी में प्रवाहित होने पर उसे दूधिया करती है तथा एक लवण 'Z' बनता है जो सोडे का मुख्य घटक है। X, Y तथा Z की पहचान कीजिए। संलग्न सभी अभिक्रियाओं के रासायनिक समीकरण लिखिए।

9. (i) In the following reactions, name the reactants which undergo oxidation and reduction : 3

निम्न अभिक्रियाओं में उन अभिकारकों के नाम लिखिए जिनका उपचयन एवं अपचयन हो रहा है –

(a) $CuO_{(s)} + H_{2(s)} \rightarrow Cu_{(s)} + H_2O_{(g)}$

(b) $CuO_{(g)} + Zn_{(s)} \rightarrow ZnO_{(s)} + Cu$

(ii) State one industrial application of reduction.

अपचयन का एक औद्योगिक अनुप्रयोग व्यक्त कीजिए।

10. You are given samples of three metals – sodium, magnesium and copper. Suggest any two activities to arrange them in order of their decreasing reactivity. 3

आपको तीन धातुओं के नमूने दिए गए हैं – सोडियम, मैग्नीशियम तथा ताँबा। किन्हीं दो क्रियाकलापों के सुझाव दीजिए जिससे इन्हें अभिक्रियाशीलता के घटते क्रम में व्यवसिथत किया जा सके।

11. Mention three parts of hind brain and write one function of each. 3

पार्श्व मसितष्क के तीन भागों के नाम लिखिए और प्रत्येक का एक प्रकार्य लिखिए।

12. State three common features of respiratory organs of animals. 3

जन्तुओं के श्वसन अंगों की तीन उभयनिष्ठ विशेषताएँ लिखिए।

13. DefIkne excretion. Write two vital functions of kidney. 3

उत्सर्जन की परिभाषा लिखिए। वृक्क के दो प्रमुख प्रकार्य लिखिए।

14. Show four different ways in which three resistors of 'r' ohm each may be connected in a circuit. In which is the equivalent resistance of the combination : 3

(i) maximum ?

(ii) minimum ?

तीन प्रतिरोधकों, जिनमें प्रत्येक का प्रतिरोध 'r' ओम है, को परिपथ में संयोजित करने के चार विभिन्न ढंगों को दर्शाइए। किसमें प्रतिरोधकों के संयोजन का तुल्य प्रतिरोधक –

(i) अधिकतम होगा ?

(ii) न्यूनतम होगा ?

15. A coil of insulated wire is connected to a galvanometer. Explain what happens if a bar magnet with it pole towards one face of the coil is : 3

(i) moved quickly towards the coil

(ii) kept stationary inside the coil, and

(iii) moved quickly away from the coil.

रोधी तार से बनी किसी कुण्डली के सिरों से कोई गैल्वनोमीटर संयोजित किया गया है। व्याख्या कीजिए कि क्या होता है जब किसी छड़ चुम्बक के उत्तर ध्रुव को इस कुण्डली के –

(i) एक सिरे की ओर तेजी से लाया जाता है

(ii) भीतर सिथत रखा जाता है, और

(iii) इसी सिरे से तेजी से दूर ले जाया जाता है।

16. With the help of a diagram for the experimental set-up describe an activity to show that a current carrying conductor placed in a uniform magnetic fIkeld experiences a force. 3

प्रयोगिक व्यवस्था के आरेख की सहायता से यह दर्शाने के लिए एक क्रियाकलाप का वर्णन कीजिए कि एक समान चुम्बकीय क्षेत्र में सिथत धारावाही चालक किसी बल का अनुभव करता है।

17. Aditi made a solar cooker in science competition. She got a prize also in the competition. She wanted to help her mother in cooking at home with this solar cooker. She made her mother aware of the limitations of the solar cooker. 3

(i) What is the main limitation of using a solar cooker ?

(ii) Would you suggest Aditi to install a solar cooker at her home ? Give reason for your answer.

(iii) Which values of Aditi impress you ?

अदिति ने विज्ञान प्रतियोगिता में सौर कुकर का निर्माण किया। उसे प्रतियोगिता में पुरस्कार भी प्राप्त हुआ। वह उस सौर कुकर से अपनी माँ की घर में भोजन बनाने में भी सहायता करना चाहती थी। उसने अपनी माँ को सौर कुकर की सीमाओं से भी अवगत कराया।

(i) सौर कुकर के उपयोग की एक मुख्य सीमा क्या है?

(ii) क्या आप अदिति को अपने घर में सौर कुकर स्थापित करने का सुझाव देंगे? अपने उत्तर के लिए उचित कारण लिखिए।

(iii) अदिति के कौन-से गुण आपको प्रभावित करते हैं?

18. Mention any three factors on which the selection of a good source of energy depends. 3

अच्छे ऊर्जा स्रोत का चुनाव करने में महत्वपूर्ण तीन कारक लिखिए।

19. (i) DefIkne the term alloy. Write two advantages of making alloys. 5

(ii) A metal 'X' which is used in thermite process, when heated with oxygen gives an oxide 'Y' which is amphoteric in nature. Identify X and Y. Write down balanced chemical equations of the reactions of oxide Y with HCl and NaOH.

(i) मिश्रधातु पद की परिभाषा दीजिए। मिश्र धातुओं के निर्माण के दो लाभ लिखिए।

(ii) एक धातु 'X' जो थर्मिट प्रक्रिया में प्रयुक्त होती हे, जब ऑक्सीजन के साथ गर्म की जाती है तो ऑक्साइड उत्सर्जित होता है जो प्रकृति में उभयधर्मी है। X तथा Y की पहचान कीजिए। ऑक्साइड 'Y' की HCl तथा NaOH से अभिक्रियाओं के संतुलित रासायनिक समीकरण लिखिए।

20. Identify the type of chemical reactions in the following statements and defIkne each one of them : 5

(i) Digestion of food in our body

(ii) Rusting of iron

(iii) Heating of manganese dioxide with aluminium powder

(iv) Blue colour of copper sulphate solution disappears when iron fIkllings are added to it

(v) Dilute hydrochloric acid is added to sodium hydroxide solution to form sodium chloride amalgam.

निम्न कथनों में से अभिक्रिया के प्रकार पहचान कर प्रत्येक को परिभाषित कीजिए –

(i) हमारे शरीर में खाद्य पदार्थों का पचना।

(ii) लोहे को जंग लगना।

(iii) ऐलुमिनियम पाउडर के साथ मैंगनीज डाऑक्साइड का जलना।

(iv) लोहे की छीलन का कॉपर सल्फेट विलयन में डालने पर उसका नीला रंग गायब होना।

(v) सोडियम हाइड्रॉक्साइड विलयन में तनु हाइड्रोक्लोरिक अम्ल डालने पर सोडियम क्लोराइड तथा जल का

21. (i) DefIkne refLkex arc. Draw a fLkow chart showing the sequence of events which occur during sneezing.

(ii) List four plant hormones. Write one function of each. 5

(i) प्रतिवर्ती चाप की परिभाषा लिखिए। छींक आने पर होने वाली घटनाओं का सही प्रक्रम में प्रवाह चित्र बनाइए।

(ii) चार पादप हॉरमोनों की सूची बनाइए। प्रत्येक का एक प्रकार्य लिखिए।

22. Give reasons for the following : 5

(i) Electric bulbs are not fIklled with air but are fIklled with argon or nitrogen gas.

(ii) The fIklament type electric bulbs are not power effIkcient.

(iii) The coils of heating devices are made of alloys rather than pure metals.

(iv) Copper and aluminium wires are usually used for electricity transmission.

(v) The current that makes the heater element red hot only slightly warms the connecting wire leading the heater.

निम्नलिखित के लिए कारण दीजिए –

(i) विद्युत बल्बों में वायु के स्थान पर आर्गन अथवा नाइट्रोजन गैस भरी जाती है।

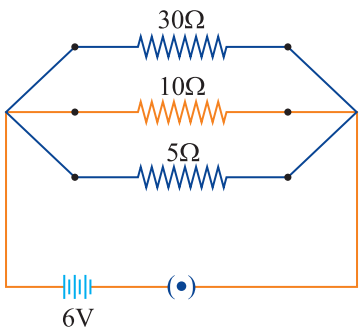
(ii) तन्तु युक्त बल्ब शक्ति-दक्ष नहीं होते हैं।

(iii) तापन युक्तियों की तापन कुण्डलियों के निर्माण में शुद्ध धातुओं के स्थान पर मिश्र धातुओं का उपयोग किया जाता है।

(iv) विद्युत संचारण में उपयोग होने वाले तारों के निर्माण में कॉपर अथवा ऐलुमिनियम का उपयोग किया जाता है।

(v) जिस विद्युत धारा को प्रवाहित करने पर तापन युक्तियों के तन्तु लाल तप्त हो जाते हैं उन युक्तियों तक धारा पहुँचाने वाले संयोगी तार केवल हल्के से गर्म होते हैं।

23. Two wires X and y are of equal length and have equal resistances. If the reactivity of X is more than that of Y, which wire is thicker and why ? For the electric circuit given below calculate : 5

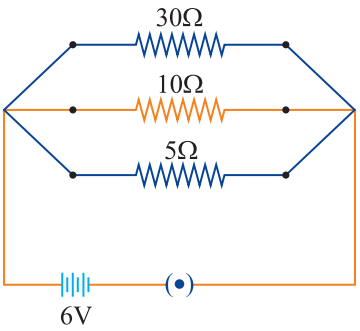


(i) current in each resistor,

(ii) total current drawn from the battery, and

(iii) equivalent resistance of the circuit.

दो तारों X तथा Y की लम्बाई और प्रतिरोध समान हैं। यदि X की प्रतिरोधकता Y की तुलना में अधिक है, तो इनमें से कौन-सा तार मोटा है और क्यों? नीचे दिए गए विद्युत परिपथ के लिए निम्नलिखित का परिकलन कीजिए –



(i) प्रत्येक प्रतिरोकध से प्रवाहित धारा,

(ii) बैटरी से ली गई कुल धारा, और

(iii) परिपथ का तुल्य प्रतिरोध।

24. State Ohm's law. Write the necessary condition for its validity. How is this law verifIked experimentally ? What will be the nature of graph between potential difference and current for a conductor ? Name the physical quantity that is determined from this graph. 5

ओम का नियम लिखिए। इस नियम की वैधता के लिए आवश्यक शर्त लिखिए। इस नियम का प्रायोगिक सत्यापन किस प्रकार किया जाता है? किसी चालक के लिए विभवान्तर और विद्युत धारा के बीच ग्राफ की प्रकृति क्या होगी? इस ग्राफ द्वारा जिस भौतिक राशि को ज्ञात किया जाता है, उसका नाम लिखिए।

SECTION – B/भाग - ब

25. To fIknd the pH of lemon juice in the laboratory, a student added two drops of universal indicator in the given sample in a test tube. The colour observed by him in the test tube will be : 1

(a) light orange (b) yellow

(c) green (d) blue

किसी छात्र ने प्रयोगशाला में नींबू के रस की pH ज्ञात करने के लिए परखनली में दिए गए उसके नमूने में सार्वत्रिक सूचक की दो बूँद डालीं। उसे परखनली में जो रंग दिखाई देगा, वह है –

(a) हल्का नारंगी (b) पीला

(c) हरा (d) नीला

26. In acidic solutions the pH paper detects the concentration of : 1

(a) H^- ion (b) H^+ ion

(c) OH^- ion (d) OH^+ ion

अम्लीय विलयन में pH पेपर सान्द्रता ज्ञात करता है –

(a) H^- आयन की (b) H^+ आयन की

(c) OH^- आयन की (d) OH^+ आयन की

27. A student while studying the properties of acids took a boiling tube, added zinc granules in it and dilute hydrochloric acid over them. The student then observed the bubbles of a gas which he identifIked with its sound. The gas and the sound respectively were : 1

(a) hydrogen, pop sound (b) hydrogen, crackling sound

(c) carbon dioxide, pop sound (d) carbon dioxide, crackling sound

एक छात्र ने अम्लों के गुणों के अध्ययन का प्रयोग करते हुए एक क्वथन नली में जिंक के दाने डाल कर उस पर तनु हाइड्रोक्लोरिक अम्ल डाला। उसे परखनली में किसी गैस के बुलबुले दिखे जिसे उसने पहचानने की पद्धति का उपयोग करके ध्वनि से पहचाना। वह गैस तथा ध्वनि क्रमशः थी –

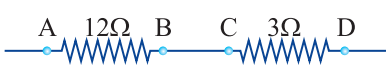
(a) हाइड्रोजन, पॉप ध्वनि (b) हाइड्रोजन, चटख ध्वनि

(c) कार्बन डाइऑक्साइड, पॉप ध्वनि (d) कार्बन डाइऑक्साइड, चटख ध्वनि

28. Identify the set –ups in which the chemical reaction will occur : 1

नीचे दिए गए चित्रों में से उन परखनलियों को पहचानिए जिनमें रासायनिक अभिक्रिया होगी –

(A) 

(B) 

(C) 

(a) II, III (b) III, IV

(c) IV, I (d) II, I

29. A student added aluminium pieces in ferrous sulphate solution taken in a test tube. She observed charnge in colour of solution from : 1

(a) colourless to pale green (b) pale green to colourless

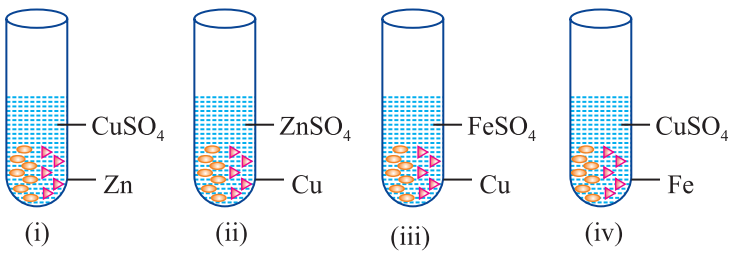
(c) pale green to dark green (d) colourless to dark green

किसी छात्रा ने ऐलुमिनियम के टुकड़े परखनली में लिए गए फैरस सल्फेट के विलयन में डाले। उसके द्वारा विलयन के रंग में नोट किया गया परिवर्तन है –

(a) रंगहीन से हल्का हरा (b) हल्के हरे से रंगहीन

(c) हल्के हरे से गहरा हरा (d) रंगहीन से गहरा हरा

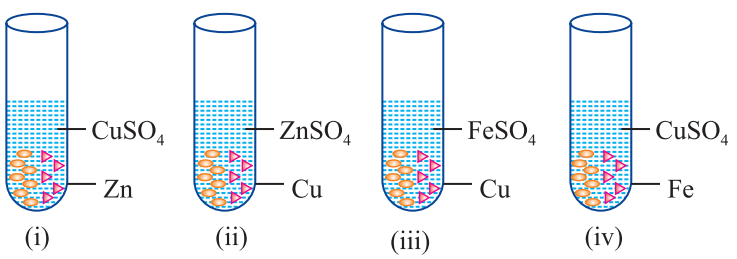
30. In the series combination of resistors shown below, the maximum equivalent resistance will be in the combination : 1



(a) A (b) B

(c) C (d) same in all the combinations

प्रतिरोधकों के श्रेणीक्रम संयोजन में नीचे दर्शाए गए अनुसार जिस संयोजन में अधिकतम तुल्य प्रतिरोध होगा, वह है –



(a) A (b) B

(c) C (d) सभी संयोजनों में एक समान

31. An ammeter and a voltmeter are joined in series to a cell. Their readings are A and

V respectively when resistance is now joined in parallel with the voltmeter : 1

(a) both A and V will increase (b) both A and V will decrease

(c) A will decrease, V will increase (d) A will increase, V will decrease

एक अमीटर और वोल्टमीटर को एक सैल के साथ श्रेणी क्रम में जोड़ा गया है। उनके पाठ्यांक क्रमशः A और V हैं। प्रतिरोध को वोल्टमीटर के साथ समान्तर क्रम में जोड़ दिया जाए तो –

(a) A और V दोनों का मान बढ़ जाएगा

(b) A और V दोनों का मान घट जाएगा

(c) A का मान कम हो जाएगा, V का मान बढ़ जाएगा

(d) A का मान बढ़ जाएगा, V का मान कम हो जाएगा

32. In an experiment on photosynthesis, students were instructed to cover a portion of a leaf of a de-starched potted plant with opaque paper.

"A" covered one of the leaves with red strip, "B" with green, "C" with blue and "D" with black. When the starch test was done on the leaves after 4 hours, the result showed no starch in :

(a) the portion covered with red, green and blue strips

(b) the portion covered with green strip

(c) the portion covered with black and blue strips

(d) any of the covered portions

प्रकाश संश्लेषण के प्रयोग में छात्रों को यह अनुदेश दिए गए हैं कि वे स्टार्च रहित किए गए गमले में लगे पौधे की पत्ती को अपारदर्शी कागज से ढकें। A ने पत्तियों को लाल सिट्रप से, B ने हरी से, C ने नीले से तथा D ने काली सिट्रप से ढका। जब 4 घण्टे के बाद स्टार्च का परीक्षण किया गया तो परिणाम प्राप्त हुआ कि जिन भागों में स्टार्च प्राप्त नहीं हुआ, वे थे –

(a) लाल, हरी और नीली सिट्रप से ढके हुए

(b) हरी सिट्रप से ढके हुए

(c) काली और नीली सिट्रप से ढके हुए

(d) कोई भी ढके हुए भाग

33. In the experiment set-up to show that 'CO_2 is released during respiration', Anand saw the water level rising in the bent glass tube. The possible reason could be :

(a) CO_2 pulls the water

(b) atmospheric pressure pushes the water

(c) vacuum is created due to the release of CO_2

(d) vacuum is created due to absorption of CO_2 by KOH

'श्वसन के दौरान CO_2 उत्सर्जित होती है' दर्शाने के प्रायोगिक सेटअप में आनन्द ने मुड़ी काँच की नली में जल के स्तर को ऊँचे उठते देखा। इसका सम्भावित कारण हो सकता है –

(a) CO_2 जल खींचती है

(b) वायुमण्डलीय दाब ने जल को धक्का दिया

(c) CO_2 के उत्सर्जन के कारण निर्वात उत्पन्न हुआ

(d) KOH द्वारा CO_2 का अवशोषण होने से निर्वात उत्पन्न हुआ

34. During an experiment a student obtains white precipitate of barium sulphate on mixing two aqueous solutions with each other. Name the two solutions he has mixed. Also state the type of reaction that has taken place with complete chemical equation. 2

किसी प्रयोग को करते समय कोई छात्र दो जलीय विलयनों को परस्पर मिलाने पर बेरियम सल्फेट का सफेद अवक्षेप प्राप्त करता है। उन दो विलयनों के नाम लिखिए जिन्हें उसने मिलाया है। इस प्रकरण में होने वाली अभिक्रिया के प्रकार का नाम पूर्ण रासायनिक समीकरण के साथ लिखिए।

35. While experimentally verifying Ohm's law a student observed that the pointer of the voltmeter coincide with 15th division when the voltmeter has a least count of 0.05 V. FIknd the observed reading of voltmeter. 2

ओम के नियम का प्रायोगिक सत्यापन करते समय किसी छात्र ने यह पाया कि वोल्टमीटर, जिसका 0.05 V अल्पतमांक है, का संकेतक 15 वें अंश के संपाती है। वोल्टमीटर का प्रेक्षित पाठ्यांक ज्ञात कीजिए।

36. In an experiment to prepare temporary mount of a leaf peel, staining of leaf peel is done before putting a drop of glycerine. Explain why. 2

पत्ती की झिल्ली का अस्थायी आरोहण तैयार करन के प्रयोग में, झिल्ली का अभिरंजन ग्लिसरीन की बूँद डालने से पूर्व किया जाता है। कारण लिखिए।

MARKING SCHEME

Summative Assessment-I, (2015-16)

Science (Class : X)

General Instructions :

(i) The Marking Scheme provides general guidelines to reduce subjectivity and maintain uniformity. The answers given in the marking scheme are the best suggested answers.

(ii) Marking be done as per the instructions provided in the marking scheme. (It should not be done according to one's own interpretation or any other consideration).

(iii) Alternative methods be accepted. Proportional marks be awarded.

(iv) If a question is attempted twice and the candidate has not crossed any answer, only fIkrst attempt be evaluated and 'EXTRA' be written with the second attempt.

(v) In case where no answers are given or answers are found wrong in this Marking Scheme, correct answers may be found and used for evaluation purpose.

SECTION A

1. Iodine is necessary for the thyroid gland to make thyroxin hormone. 1

2. Live wire : Red, Earth wire : Green 1

3. Transportation of electricity is more effIkcient than transporting coal or petroleum over same distance. 1

4. (i) Sodium, Diamond 1 + 1 = 2

(ii) Metal – Mercury, Non-metal – Bromine

5. Sodium sulphate is a neutral salt because it is made from strong acid and strong base, so its aqueous solution is neutral. Sodium carbonate is basic salt because it is made from strong base and weak acid, so its aqueous solution is basic in nature. 1 + 1 = 2

6. Small intestine ½ + 1½ = 2

Carbohydrates – Glucose

Protein – Amino acid

Fats – Fatty acids and glycerol

7. (i) Before heating – green, after heating – brown $1 \times 3 = 3$

(ii) Gases evolved have the smell of burning sulphur.

(iii) Thermal decomposition

$$2FeSO_{4(s)} \xrightarrow{Heat} Fe_2SO_{3(s)} + SO_{2(g)} + SO_{3(g)}$$

8. X – Sodium hydrogen carbonate $NaHCO_3$ $1 \times 3 = 3$

Y – Carbon dioxide CO_2

Z – Sodium carbonate Na_2CO_3

$$2NaHCO_3 \xrightarrow{Heat} Na_2CO_3 + H_2O + CO_2$$

Baking soda — Sodium carbonate — Water — Carbon dioxide

$$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$$

Lime water — Milky product

9. (i) (a) CuO is reduced to copper. $2 + 1 = 3$

Hydrogen is oxidized to water.

(b) CuO is reduced to copper.

Zinc is oxidized to zinc oxide.

(ii) To obtain pure metals from their ores by electrolytic reduction. E.g. sodium, aluminium.

10. Activity 1 3

Sodium reacts with cold water to form sodium hydroxide and hydrogen gas.

$$2Na_{(s)} + 2H_2O_{(l)} \rightarrow 2NaOH_{(aq)} + H_{2(g)}$$

Magnesium does not react with cold water but with hot water to form magnesium hydroxide and hydrogen gas.

$$Mg + 2H_2O \rightarrow Mg(OH)_2 + H_2$$ ...1 mark

Hence, sodium is more reactive than magnesium.

Activity 2

$$Mg + CuSO_4 \rightarrow MgSO_4 + Cu$$

$$Cu + MgSO_4 \rightarrow \text{No reaction}$$ ...1 mark

So, magnesium is more reactive than copper.

Concluding from activity 1 and activity 2, Na > Mg > Cu. ...1 mark

11. Pons – Regulate respiration ½ × 6 = 3

Medulla – Centre for swallowing, coughing, sneezing etc.

Cerebellum – Helps in coordination and maintaining the posture and balance of body.

12. (i) Should have large surface area to get enough oxygen. 1 × 3 = 3

(ii) Walls of respiratory organs should be thin.

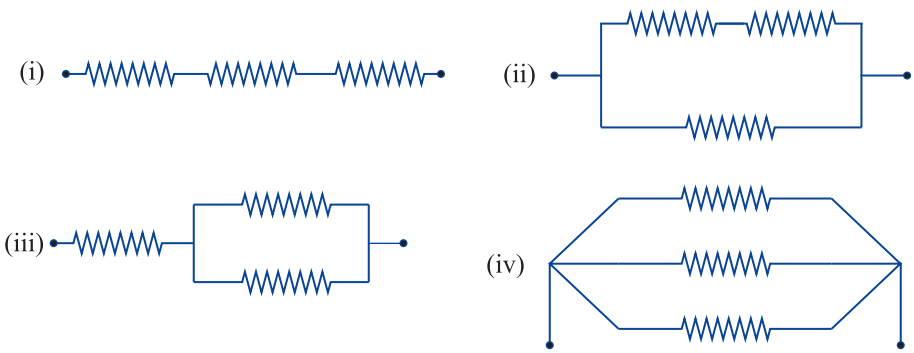
(iii) Should have rich supply of blood for transport of gases.

13. The biological process involved in the removal of the harmful metabolic wastes from the body. 1 + 2 = 3

(i) It removes the poisonous wastes such as urea, some salts and excess water from the blood and excretes them in the form of a yellowish liquid called urine.

(ii) It regulates the water balance of the body.

14. 2 + 1 = 3



(four combinations)

In case I resistance is maximum.

In case IV resistance is minimum.

15. (i) The increasing magnetic fIkeld induces current in the coil as a result of which galvanometer shows momentary defLkection (say towards right).

1 × 3 = 3

(ii) No change in magnetic fIkeld, no induced current defLkection zero.

(iii) Magnetic fIkeld decreases induced current is produced in the coil and the

galvanometer shows momentary defLkection in opposite direction (i.e., towards left).

16. Diagram (fIkg. 13.12, p. 230) 3

When plug is inserted the conductor moves towards the left. When current or fIkeld direction is reversed it moves towards the right.

17. (i) Solar cooker can be used only during day time. $1 \times 3 = 3$

(ii) Yes, as solar cooker is a renewable, non-polluting source of energy.

(iii) Courage to try new things, love for experiment.

18. • The ease and cost of extracting energy from the source. $1 \times 3 = 3$

• The effIkciency of technology available for using that source.

• The impact of using that source on the environment.

सQ