SAMPLE PAPER - 2   SOLUTIONS

SECTION-A

1.   (a) Modern periodic law: According to this law physical and chemical properties of the elements are periodic function of their atomic number.

   (b) 7 periods, 18 groups

2.   (a) Butane (C_4H_{10}), Pentane (C_5H_{12})

3.   (a) Emergent ray is parallel to incident ray but laterally displaced from incident ray.

   (b) Absolute R.I of glass = $\dfrac{C}{v_g}$

   $\Rightarrow$ 1.5 = $\dfrac{3 \times 10^8}{v_g}$ [$\because$ C = 3 × 10⁸ m/s]

   $\Rightarrow$ $v_g = \dfrac{3 \times 10^8}{1.5} = 2 \times 10^8 \ m/s$

   (c) It will return back and retrace its earlier path.

   (d) 'The law of refraction' is also known as 'Snell's Law'

4.   (a) Option 2

   (b) Ovary - fruit

   Ovule - seed

   (c) Option 1 Gametes → zygote → embryo → seedling

   (d) Transfer of pollen grain from anther to stigma of a flower is known as pollination.

5.   Option (1)

   When a point source of light is placed at the focus of a concave mirror [or convex lens], the light rays emerges out as a parallel beam after reflection [or refraction] through mirror (or lens).

<div align="center">**OR**</div>

   Option (4)

   Resistivity of metal wire depends upon its nature, not upon its dimensions

6.   Option (3)

7.   Option (3)

   Since Sun's rays are focused on a screen at 24 cm away from mirror and the screen is placed at the same side of mirror, the device is a concave mirror of focal length 24 cm.

8.   Option (3) Forest conservation   **OR**   Option (4) Recycle, Reduce, reuse

9.   Option (2) The extinction of organism has occurred thousands of years ago.

10.   Correct option (3)

   Explanation : This is a redox reaction.

11.   Correct option (3)

   Explanation : HCl acid is a strong acid, acetic acid is weak acid and water is neutral.

12.   Correct option (3)

   Explanation : Increasing atomic masses

13. Correct option (1)

Explanation : The mixing of water to an acid is highly exothermic in nature. if water is added to an acid it produces very large amount of heat which can break the container and some times even cause burnings. So, it is advised to add concentrated acid to water very slowly.
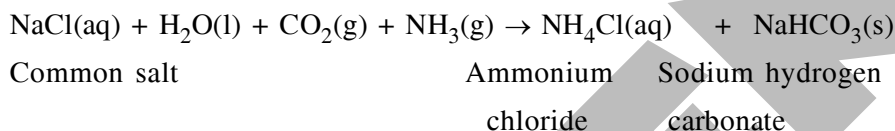
14. Option (1)

Refractive index of media (2) w.r.t. media (1)

$$= \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2}$$

SECTION-B

15. (a) Baking soda

Manufacture: In this method a solution of sodium chloride (called "brine") saturated with ammonia is allowed to react with CO_2, sodium hydrogen carbonate & ammonium chloride are formed.

$NaCl(aq) + H_2O(l) + CO_2(g) + NH_3(g) \rightarrow NH_4Cl(aq) + NaHCO_3(s)$
Common salt   Ammonium   Sodium hydrogen
                                 chloride   carbonate

(b) Effect of heat: The following reaction takes place when it is heated during cooking.

$2NaHCO_3(s) \xrightarrow{\text{Heat}} Na_2CO_3(s) + H_2O(\ell) + CO_2(g)$

16. (a) Aluminium oxide, Zinc oxide.

(b) Reduction by aluminium

The reaction of iron(III) oxide (Fe_2O_3) with aluminium, is used to weld railway tracks or cracked machine parts. This reaction is known as thermite reaction. The mixture of iron oxide and aluminium powder is called thermite.

$Fe_2O_3(s) + 2Al(s) \xrightarrow{\text{Heat}} 2Fe(\ell) + Al_2O_3(s) + Heat$
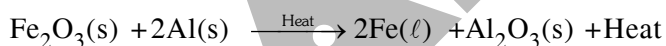
Application: This reaction is used to weld railway tracks or cracked machine parts.

OR

Sodium (Na) and potassium (K) react with cold water to form basic salt NaOH and KOH respectively. The molecular mass of NaOH is 40. So, X is Na and Y is NaOH. The gas liberated during the reaction is hydrogen (H_2). So Z is H_2.

$2Na + 2H_2O \longrightarrow 2NaOH + H_2 + Heat energy$

17. $2NaCl + H_2SO_4 \rightarrow Na_2SO_4 + 2HCl\uparrow$

HCl is a dry gas. It does'nt affect blue litmus paper but turn moist litmus paper to red.

Reason : In presence of water, present in moist litmus paper, HCl behaves as acid due to ioniosation.

18. (a) In double circulation, the blood passes twice through the heart to supply once to the body. It is an improvement over single circulation because in this type of circulation both the types of blood (oxygented and deoxygenated) are pumped forcefully. It is useful in animals with higher energy needs like birds and mammals.

(b) Differences between arteries and veins (any two)

S.No.	Features	Arteries	Veins
1	Direction of blood flow	Take the blood away from heart to different parts of body.	Bring the blood towards the heart from various body parts.
2	Kind of blood	Oxygenated blood except in pulmonary artery.	Deoxygenated blood except in pulmonary vein.
3	Blood pressure	Pressure is high.	Pressure is low.
4	Blood flow	Blood flows rapidly with jerks.	Blood flows smoothly without jerks.
5	Lumen	Narrow	Wide
6	Valves	Absent	Present
7	Location	Mostly deep seated.	Mostly superficial.

19. Feedback mechanism is a regulatory machanism in which presence of certain level of substance promotes or inhibits its further formation.

Hormone regulation is mostly done by feedback mechanism. A good example of negative feedback is the hormone insulin. Insulin is a hormone that is produced by the pancreas. It is released by the pancreas when the amount of glucose in the blood goes up. It stimulates the target cells to take glucose out of the blood, which is utilized in cell respiration or is stored as glycogen. When cells take up glucose from the blood this makes the glucose level normal. With fall in blood glucose level, insulin secretion decreases. This checks the further fall in blood glucose level. So the negative feedback work to keep the blood glucose level normal.

Feedback mechanism
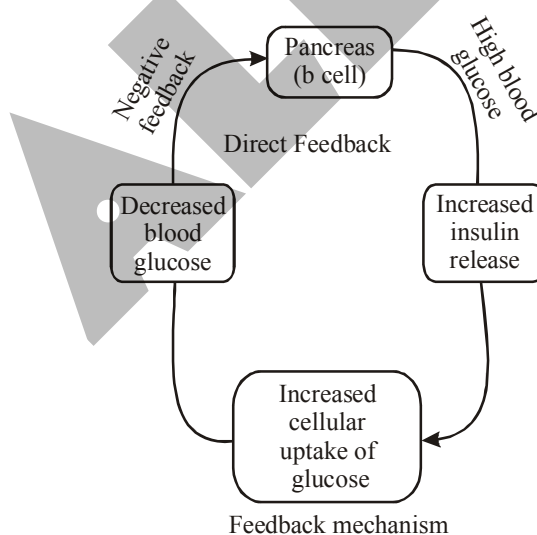
20. (a) Deer and rabbit belong to second trophic level. Frog, Fox, Eagle belong to third trophic level.

(b) This phenomenon is called Biomagnification. It involves progressive increase in concentration of harmful non-biodegradable chemical at different trophic levels in a food chain.

OR

An ecosystem is defined as a dynamic system of biotic and abiotic components and there is a continuous flow of energy between the different components.

Its two main components are :

(i) Biotic component/living organisms

(ii) Abiotic component/physical factors

An aquarium needs to be cleaned regularly because it is an artificial and incomplete ecosystem in which natural decomposers are absent and the water is stagnant. Thus, water is not cleaned by itself in an aquarium, it has to be done externally.

21. (a)

REFLEX ARC
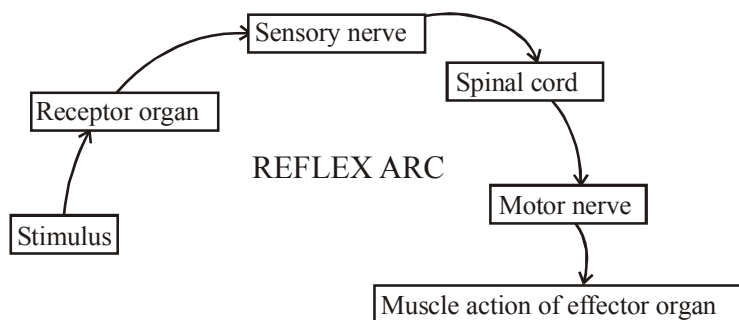
(b) (i) Dendrites   (ii) Axon

22. 'Dispersion of white light' takes place when a beam of white light is refracted through a glass prism. In this phenomena, the violet colour deviates most whereas the red colour deviates least.

If a second identical prism is placed in inverted position with respect to the first prism, the separated (dispersed) light rays fall on the second prism and recombines to emerge out as a white light beam.

This phenomena takes place because refractive index of prism material is different for light rays of different colours i.e., the speed of light rays of different colours is different from each other while passing through the prism.
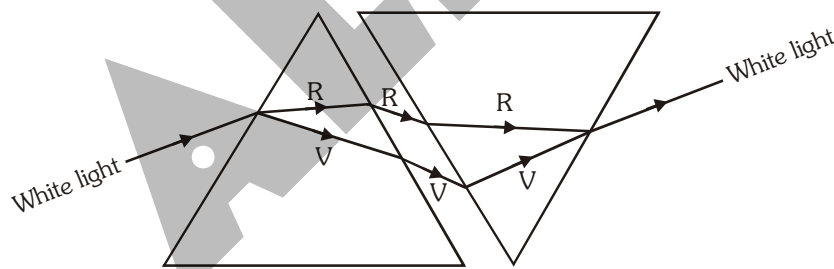
OR

(i) Defect in vision → Myopia [or Short sightedness]

(ii) Nature of lens used for correcting the vision → concave lens.

Focal length of corrective lens (in m) = $\dfrac{1}{\text{Power of lens (in D)}}$

$\Rightarrow$ f $= \dfrac{1}{-0.5} = -2m$ $\Rightarrow$ f = –200 cm

(iii) Causes of myopia

  (a) Power of eye lens becomes too great (i.e. focal length of eye lens becomes too less)

  (b) Excessive curvature of cornea or elongation of eye ball

23. (a) Resistance of Nichrome wire, R = 10 Ω

Where, $R = \rho \times \dfrac{\ell}{A}$ and $A = \pi r^2$

(i) When only length of wire is doubled, $R \propto \ell$

$\therefore \dfrac{R'}{R} = \dfrac{\ell'}{\ell}$ $\Rightarrow$ $R' = R\dfrac{\ell'}{\ell} = 10 \times \dfrac{2\ell}{\ell}$

R' = 20 Ω

(ii) When only diameter of wire is doubled

$R \propto \dfrac{1}{A} \propto \dfrac{1}{\pi r^2}$

$\Rightarrow R \propto \dfrac{1}{\pi \left(\dfrac{d}{2}\right)^2}$ [Where d = diameter of wire, r = radius of wire & $r = \dfrac{d}{2}$]

So, $\dfrac{R'}{R} = \dfrac{r^2}{(r')^2}$

$\because$ d' = 2d $\therefore$ r' = 2r

Therefore, $R' = R \times \left[\dfrac{r}{r'}\right]^2 = 10 \times \left[\dfrac{r}{2r}\right]^2 = \dfrac{10}{4}$

$\Rightarrow$ R' = 2.5 Ω

(b) Element of heating devices are made up of alloys because the resistivity [Hence, the resistance] of an alloy is greater than that of its constituent materials and greater resistance leads to more production of heat when electric current flows in the circuit.

24. The nature of lens is 'concave'

Ray diagram for image formation using concave lens :
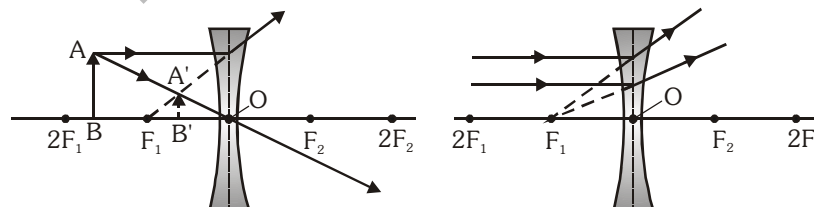
(a) Object placed at some finite distance
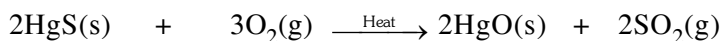
(b) Object at infinity

Power of concave lens = –10 D

$\therefore$ Focal length of lens, $f = -\dfrac{1}{10}$ m

$\Rightarrow$ f = –10 cm

SECTION-C

25. (a) Cinnebar HgS

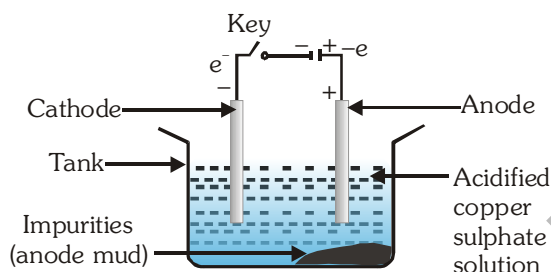(I) Roasting: Sulphide ores can be converted to oxide ores on heating in the presence of excess of air.

$$2HgS(s) \ + \ 3O_2(g) \ \xrightarrow{\text{Heat}} \ 2HgO(s) \ + \ 2SO_2(g)$$

Mercuric sulphide   Mercuric   Sulphur dioxide

(Cinnabar)   oxide

(II) This oxide can be reduced to metal by further heating alone.

$$2HgO \ \xrightarrow{\text{Heat}} \ 2Hg(\ell) \ + \ O_2(g)$$

Mercuric oxide   Mercury   Oxygen

(b) Electrolytic refining of copper:

Electrolytic refining of copper. The electrolyte is a solution of acidified copper sulphate. The anode is impure copper, whereas the cathode is a strip of pure copper. On passing electric current, pure copper is deposited on the cathode.

(c) By heating alone

OR

(a) Solid, Lustrous, Malleable, Ductile (any two)

(b) Iron, Aluminium, Zinc (any two)

(c) Carbon is strong reducing agent and it can easily break the bonding between moderative reactive metal and other elements present in ore. So metals can be extracted by heating their ores with carbon.

(d) Duralumin

Constituents :   95% Al   4% Cu   0.5% Mg   0.5% Mn
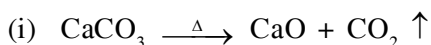
(e) Hydroges gas is evolved

$$Zn + 2HCl \longrightarrow ZnCl_2 + H_2$$

26. X is calcium carbonate ($CaCO_3$).

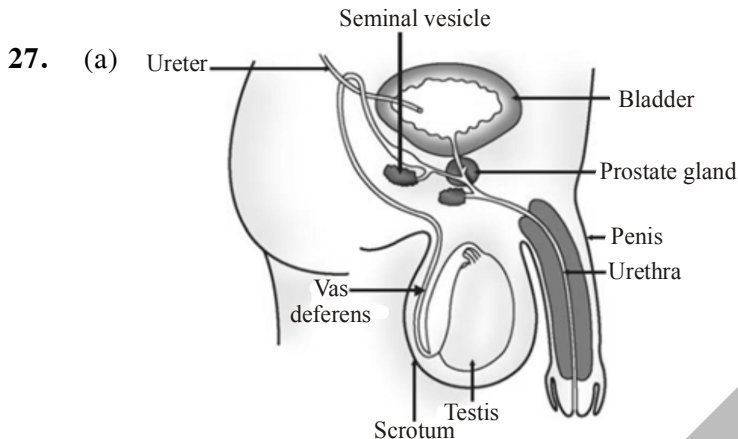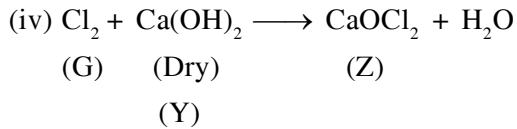Y is slaked lime [$Ca(OH)_2$].

G is chlorine (Cl_2) gas.

Z is bleaching powder ($CaOCl_2$).

The reactions involed are:

(i) $CaCO_3 \xrightarrow{\Delta} CaO + CO_2 \uparrow$

     (X)   (Acidic gas)

(ii) $CO_2 + Ca(OH)_2 \longrightarrow CaCO_3 + H_2O$
      (Y)   (X)

(iii) $2NaCl(aq) + 2H_2O(l) \xrightarrow{\text{electric current}} 2NaOH(aq) + Cl_2(g) + H_2(g)$
                                                                  (G)

(iv) $Cl_2 + Ca(OH)_2 \longrightarrow CaOCl_2 + H_2O$
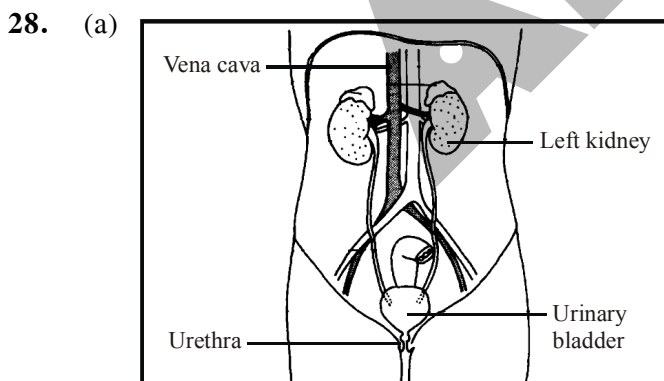   (G)   (Dry)   (Z)
             (Y)

27. (a)
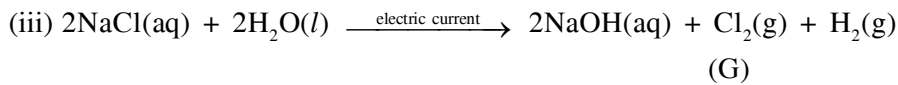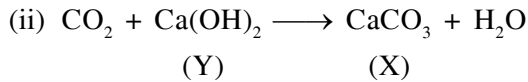
(b) Testes

Sperm : A sperm is a single celled male gamete with three parts :

(a) Head : Contains nucleus.

(b) Middle piece : contains numerous mitochondria.

(c) Long tail : helps in movement.

All the usual cell components are present in the sperm. The sperms are motile because of long tail.

28. (a)

(b) The purpose of making urine is to get rid of nitrogenous waste materials like urea, excess water and salts.

(c) Amino acids and glucose

OR

The various steps involved in holozoic nutrition are:

(i) Ingestion: Through the help of mouth human beings ingest food.

(ii) **Digestion:** The teeth helps in physical digestion of food. Salivary glands, secretes saliva in buccal cavity, in which salivary amylase enzyme is present which digest the starch present in food into maltose sugar, i.e., the digestion of carbohydrate starts from mouth itself. Mouth opens into a small funnel-shaped area called pharynx which leads to a long tube called oesophagus, whose wall is highly muscular. When the slightly digested food enters into oesophagus the contraction and expansion movement of its wall, takes place, which is known as peristaltic movement. This movement helps the food to move towards the stomach. Usually, in oesophagus there is no digestion of food. From the oesophagus the food enters into the stomach. In the stomach there is secretion of gastric juices which is a mixture of hydrochloric acid, pepsin (protein digesting enzyme) and mucus. Now, the partially digested food enters from stomach into duodenum. 'The duodenum, receives secretions from two glands, i.e. liver and pancreas. Liver secretes bile juice which emulsifies fat and pancreas secretes pancreatic juice which digestes the proteins, carbohydrates and emulsified fats. Here the digestive enzymes are amylase for digesting the carbohydrates, trypsin for proteins and lipase for fats. Wall of intestine itself also contain intestinal glands for complete digestion of food.

(iii) **Absorption:** After complete digestion nutrients get absorbed in small intestine which have millions of finger-like projections known as villi which increase the surface area for absorption of food.

(iv) **Assimilation:** The blood carries the digested and dissolved food to all parts of the body, where it is assimilated into the cells which is used for obtaining energy as well as for growth and repair of the body.

(v) **Egestion:** The undigested food enters into the large intestine, where water is absorbed from the undigested food. Now, this undigested food enters the last part of large intestine known as rectum where it gets stored temporarily and finally removed from the body via anus.

29. Combination of resistors in series

Let us consider three resistors having resistances R_1, R_2 and R_3 respectively joined in series. Let V_1, V_2, V_3 are voltages across resistors R_1, R_2, R_3 respectively. The current through resistors R_1, R_2 and R_3 are I_1, I_2 and I_3 respectively. Since the resistors are joined in series, thus, current through each resistor is same because current entering at one point (end) is equal to current leaving at the other point (end). (see fig.)

$I_1 = I_2 = I_3 = I$ (let) ...(1)

Potential difference 'V' between the point A and point B is the sum of the voltages across R_1, R_2 & R_3.

$V = V_1 + V_2 + V_3$ ...(2)

Let 'R_s' be the equivalent resistance of whole combination.

Equivalent resistance : The resistance of a single resistor that can replace a combination of resistors in any given circuit without any change in potential difference across the terminals and current through the circuit is called '**equivalent resistance**'.

$\therefore$ $V = I R_s$ .... (3)

From (2) & (3) we get, $I R_s = V_1 + V_2 + V_3$
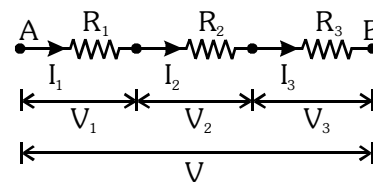
or $I R_s = I R_1 + I R_2 + I R_3$ [V = I R]

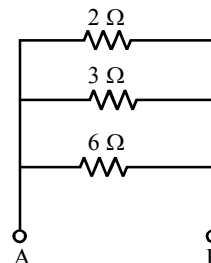or $I R_s = I (R_1 + R_2 + R_3)$ or $R_s = R_1 + R_2 + R_3$

General formula for 'n' resistors in series :

$R_s = R_1 + R_2 + R_3 + ... + R_n$

For the given combination of resistors (see fig.)

$$\frac{1}{R_{AB}} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6} = \frac{3+2+1}{6}$$

$$\Rightarrow R_{AB} = \frac{6}{6} = 1 \ \Omega$$

30. (i) **Fleming's left hand rule :**

The direction of force on a current-carrying conductor is given by Fleming's left-hand rule. According to this rule, 'stretch the thumb, forefinger and central finger of your left hand such that they are mutually perpendicular. If the fore finger points in the direction of magnetic field and the central finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.'
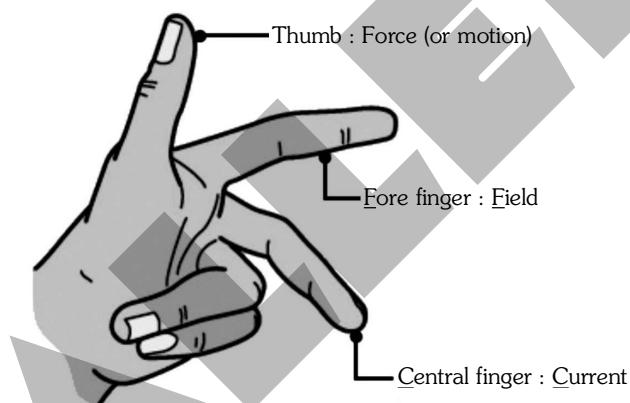
Fig. Fleming's left hand rule

(ii) **Principle of working of an electric motor :**

It is based on the fact that when a current-carrying coil is placed in an external magnetic field, it experiences equal and opposite forces on its edges which rotates it continuously.

(iii) **Function of parts of electric motor :**

(a) Armature : To transmit electric current across the magnetic field since it carry electric current flow. It is used to experience a magnetic force on it to rotate itself when it is placed in a magnetic field with carrying current through it. Thus electrical energy is converted into mechanical energy in an electric motor.

(b) Brushes : They maintain the electric contact between armature coil and main supply circuit for proper current flow.

(c) Split rings : They work as a mechanical rectifier i.e. split rings converts the direct current coming from external main circuit into the alternate current flowing through the armature coil, as it rotates. Overall, it reverses the direction of current through coil in each half rotation of the coil.

OR

(i) Magnetic field lines can never intersect each other because if they intersect at a point, magnetic field at that point will have two directions which is not possible. (If we put a magnetic needle at such a point, it will point in two directions, that is impossible)

(ii) <u>Right hand thumb rule</u>

'Imagine that you are holding a current-carrying straight conductor in your right hand and the thumb is stretched along the direction of current, then, your fingers will wrap around the conductor in the direction of the field lines of the magnetic field'.
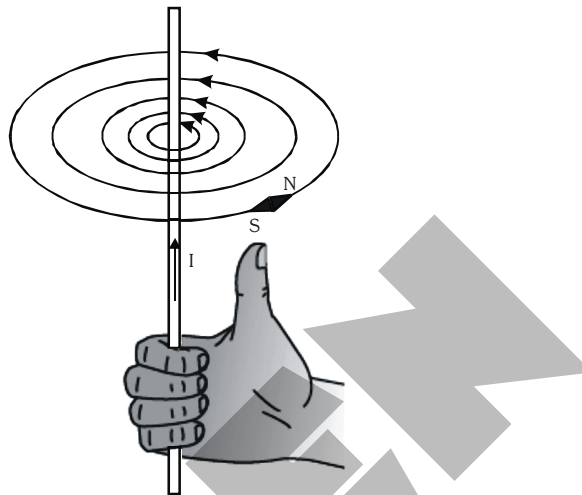
(iii) Magnetic field produced by a straight current carrying conductor depends upon

(a) Current : It is directly proportional to the current flowing through it.

(b) Distance from conductor : It is inversely proportional to the distance of the conductor.