CLASS X (2019-20)
SCIENCE (CODE 086)
SAMPLE PAPER-9

Time : 3 Hours **Maximum Marks : 80**

General Instructions :

(i) The question paper comprises of three sections-A, B and C. Attempt all the sections.
(ii) All questions are compulsory.
(iii) Internal choice is given in each sections.
(iv) All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.
(v) All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50-60 words each.
(vi) All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80-90 words each.
(vii) This question paper consists of a total of 30 questions.

Section A

1. Name the part of the human eye that helps in changing the focal length of the eye lens. [1]

Ans : Ciliary muscles.

2. Identify the type of reaction in the following example : [1]

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

Ans : Double displacement reaction.

3. Answer question numbers 3.1-3.4 on the basis of your understanding of the following paragraph and the related studied concepts.

Another traditional source of energy was the kinetic energy of flowing water or the potential energy of water at a height. Hydro-power plants convert the potential energy of falling water into electricity. Since there are very few waterfalls, which could be used as a source of potential energy, hydro-power plants are associated with dams. In the last century, a large number of dams were built all over the world. Hydro-power plants meet a quarter (25%) of our energy requirement in India.

In order to produce hydroelectricity, high-rise dams are constructed on the river to obstruct the flow of water and thereby collect water in larger reservoirs. The water level rises and in this process the kinetic energy of flowing water gets transformed into potential energy. The water from the high level in the dam is carried through pipes, to the turbine, at the bottom of the dam. Since the water in the reservoir would be refilled each time it rains (hydro power is a renewable source of energy) we would not have to worry about hydroelectricity sources getting used up the way fossil fuels would get finished on day. But, constructions of big dams have certain problems associated with it. The dams can be constructed only in a limited number of places, preferably in hilly terrains. Large areas of agricultural land and human habitation are to be sacrificed as they get submerged. Large eco-systems are destroyed when submerged under the water in dams. The vegetation which is submerged rots under anaerobic conditions and gives rise to large amounts of methane which is also a green-house gas. It creates the problem of satisfactory rehabilitation of displaced people. Opposition to the construction of Tehri Dam on the river Ganga and Sardar Sarovar project on the river Narmada are due to such problems.

3.1 What percentage of our energy requirements is met by hydroelectric power ? [1]

Ans : 25%

3.2 What sort of transformation in energy occurs in a hydroelectric plant ? [1]

Ans : The kinetic energy of running water is converted into electrical energy.

3.3 What problems are associated with construction of dams ? [1]

Ans : The dams can be constructed only in a limited number of places, preferably in hilly terrains. Large areas of agricultural land and human habitation are to be sacrificed as they get submerged. Large ecosystems are destroyed when submerged under the water in dams.

3.4 What type of energy is hydro power ? [1]

Ans : Renewable.

4. Answer question numbers 4.1-4.4 on the basis of your understanding of the following paragraph and the related studied concepts.

Is there a relationship between the radius of curvature R, and focal length f, of a spherical mirror ? For spherical mirrors of small apertures, the radius of curvature is found to be equal to twice the focal length. We put this as $R = 2f$. This implies that the principal focus of a spherical mirror lies midway between the pole and centre of curvature.

4.1 Write relation between radius of curvature and focal length. [1]

Ans : $R = 2f$

4.2 For which type of mirrors above relation is verified? [1]

Ans : Spherical

4.3 The size of the aperture should be? [1]

(a) small

(b) large
(c) neither small nor large
(d) None of these

Ans : (a) small

4.4 Principal focus of a spherical mirror is lies [1]
(a) midway between the pole and centre of curvature
(b) near the pole
(c) near the centre of curvature
(d) None of these

Ans : (a) midway between the pole and centre of curvature

5. Where should an object be placed in front of a convex lens to get a real image of the same size of the object ? [1]
(a) At the principal focus of the lens
(b) At twice the focal length
(c) At infinity
(d) Between the optical centre of the lens and its principal focus.

Ans : (b) At twice the focal length

6. What is the current through a 5.0 ohm resistor if the voltage across it is 10 V [1]
(a) zero (b) 0.5 A
(c) 2.0 A (d) 5.0 A

Ans : (c) 2.0 A

7. The image formed by a concave mirror is observed to be virtual, erect and larger than object. [1]
The position of the object should be
(a) between the principal focus and the centre of curvature
(b) at the centre of curvature
(c) beyond the centre of curvature
(d) between the pole of the mirror and its principal focus.

Ans : (d) between the pole of the mirror and its principal focus.

8. In the experiment to show that CO_2 is given out during respiration, the student uses : [1]
(a) lime water (b) alcohol
(c) KOH solution (d) iodine solution

Ans : (c) KOH solution

or

Samir observed that when he washed his clothes a sample of water, scum is formed. Those scum's are :[1]
(a) calcium salts of long chain of carboxylic acid
(b) magnesium salts of long chain of carboxylic acid
(c) lead salt of long chain of carboxylic acid
(d) either (a) or (b)

Ans : (d) either (a) or (b)

9. A student strongly heats hydrated ferrous sulphate salt in a dry test tube. He would observe a : [1]
(a) yellow residue (b) brown residue
(c) light green residue (d) white residue

Ans : (b) brown residue

10. To prepare a temporary mount of a leaf peel for observing stomata, the chemicals used for staining and mounting respectively are : [1]
(a) safranin and iodine
(b) safranin and glycerine
(c) iodine and safranin
(d) glycerine and iodine

Ans : (b) safranin and glycerine

11. A student observes binary fission in Amoeba. On the basis of his observation he may conclude that the binary fission in Amoeba starts with the : [1]
(a) constriction of its cell membrane
(b) elongation of its nucleus
(c) bulb like projection in the parent body
(d) two Amoeba coming closer to each other

Ans : (b) elongation of its nucleus

12. A salt reacts with ethanoic acid with a lot of effervescence and liberation of colourless gas which turns lime water milky. This salt could be : [1]
(a) sodium ethanoate
(b) sodium chloride
(c) sodium hydrogen carbonate
(d) sodium hydroxide

Ans : (c) sodium hydrogen carbonate

or

A thin plate of zinc metal is placed in a beaker containing aqueous ferrous sulphate solution. The zinc plate is taken out after 15 minutes. The colour of the solution changes to : [1]
(a) deep yellow (b) deep green
(c) light blue (d) colourless

Ans : (d) colourless

(Q.no 13 to 14)In each of the following questions, a statement of Assertion is given by the corresponding statement of Reason. Of the statements, mark the correct answer as.
(a) If assertion is true and reason is correct explanation of assertion.
(b) If assertion is true but reason is false.
(c) If assertion is false but reason is true.
(d) If both are false.

13. **Assertion :** A lemon kept in water in a glass tumbler appears to be bigger than its actual size.
Reason : When a ray of light passes from denser medium to rarer medium then it bends away from the normal. [1]

Ans : (a) If assertion is true and reason is correct explanation of assertion.

14. **Assertion :** Clear sky appears blue.
Reason : Blue colour of light has smaller wavelength, so it scatters more in upper layer of atmosphere in comparison to the other layers. [1]

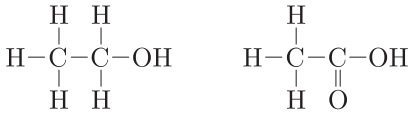
Ans : (b) If assertion is true but reason is false.

Section B

15. An organic compound 'A' is an essential constituent of wine and beer. Oxidation of 'A' yields an organic acid 'B' which is present in vinegar. Name the compounds 'A' and 'B' and write their structural formula. What happens when 'A' and 'B' react in the presence of an acid catalyst? Write the chemical equation for the reaction. [3]

Ans :

Ethyl alcohol is an essential constituent of wine and beer. Therefore, A is ethyl alcohol. Oxidation of ethyl alcohol gives acetic acid. Vinegar contains acetic acid. Therefore, B is acetic acid.



Ethyl alcohol (A) Acetic acid (B)

When A and B react in the presence of an acid catalyst, the ester, ethyl acetate is formed.

$$\underset{\text{ethyl alcohol}}{CH_3CH_2OH} + \underset{\text{acetic acid}}{CH_3COOH} \xrightarrow[H_2SO_4]{\text{conc.}} \underset{\text{ethyl acetate}}{CH_3COOC_2H_5} + H_2O$$

16. State the reactions, if any of the following metals react with lead nitrate solution. In case a reaction takes place, support it by a chemical equation.
(i) Silver (ii) Zinc, (iii) Copper, and (iv) Iron. [3]

Ans :

i. Silver does not react with lead nitrate solution.
ii. Zinc reacts with lead nitrate solution and displaces lead metal.

$$Pb(NO_3)_2(aq) + Zn(s) \longrightarrow Zn(NO_3)_2(aq) + Pb(s)$$

iii. Copper does not react with lead nitrate solution.
iv. Iron reacts with lead nitrate solution and displaces lead metal.

$$Pb(NO_3)_2(aq) + Fe(s) \longrightarrow Fe(NO_3)_2(aq) + Pb(s)$$

or

Write fully balanced equations for the following reactions.
i. Copper (II) oxide and dil. nitric acid
ii. Aluminium hydroxide and dil. sulphuric acid,
iii. Magnesium hydrogen carbonate and dil. hydrochloric acid. [3]

Ans :

i. $CuO(s) + 2HNO_3(aq) \longrightarrow Cu(NO_3)_2(aq) + H_2O(l)$

ii. $2Al(OH)_3(s) + 3H_2SO_4(aq) \longrightarrow Al_2(SO_4)_3(aq) + 6H_2O(l)$

iii. $Mg(HCO_3)_2(aq) + 2HCl(aq) \longrightarrow MgCl_2(aq) + 2H_2O(l) + 2CO_2(g)$

17. i. Distinguish between esterification and Saponification reactions of organic compounds.
ii. With a labelled diagram describe an activity to show the formation of an ester. [3]

Ans :

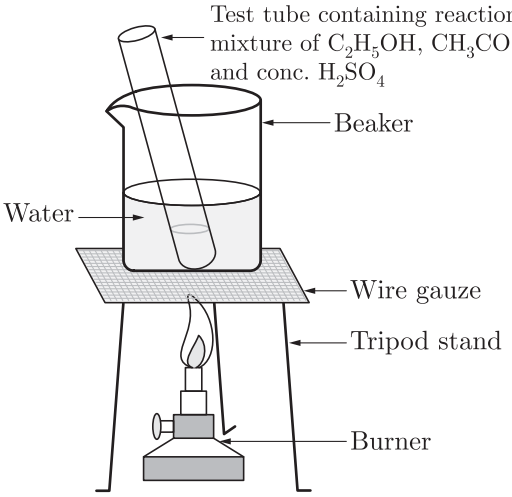
i. A chemical reaction in which an alcohol reacts with alkanoic acid to form a sweet smelling compound (ester) is called esterification.

$$\underset{\text{Ethanoic acid}}{CH_3COOH} + \underset{\text{Ethanol}}{C_2H_5OH} \xrightarrow[\text{Warming}]{\text{Conc. } H_2SO_4} \underset{\text{Ethyl ethanoate(ester)}}{CH_3COOC_2H_5} + H_2O$$

A chemical reaction in which an ester gets hydrolysed in the presence of sodium hydroxide to form the constituent alcohol and sodium salt of the alkanoic acid is called saponification.

$$\underset{\text{Ethyl ethanoate}}{CH_3COOC_2H_5} + \underset{\text{hydroxide}}{\overset{\text{Sodium}}{NaOH}} \longrightarrow \underset{\text{Sodium acetate}}{CH_3COONa} + \underset{\text{ethanol}}{C_2H_5OH}$$

ii.
(a) Pour 1 ml of ethanol (absolute alcohol in a test tube).
(b) Pour 1 ml of glacial acetic acid in the alcohol and then a few drops of conc. sulphuric acid.
(c) Warm the contents of the test tube in a hot water bath for 10 minutes.
(d) Pour the contents of the test tube in another beaker containing 20 ml of water.
(e) Smell the contents of the beaker. You will find a sweet fruity smell. This smell is due to the formation of the ester, ethyl ethanoate.



Formation of ester

18. List and describe in brief any three ways devised to avoid pregnancy [3]

Ans :

i. Foam tablets, jellies, creams and spermicides are common chemicals used by females. These are placed in vagina.
ii. Ovulation and fertilisation can be prevented by changing hormonal balance of the body. It can be done by taking oral pills.
iii. Intrauterine Contraceptive Device (IUCD) such as the loop or the copper-T are placed in the uterus to prevent pregnancy. The drawbacks with these devices are bleeding and discomfort.

or

What are sexually transmitted diseases ? Name four such diseases. Which one of them damages the immune system of human body ? [3]

Ans :

The diseases which are spread by sexual contact from an infected person to a healthy person, are called sexually transmitted diseases or STDs.
i. AIDS (Acquired Immune Deficiency Syndrome)
ii. Gonorrhoea
iii. Syphilis

iv. Genital herpes
'AIDS' – damages the immune system of human body.

19. What important properties of aluminium are responsible for its great demand in the industry? [3]

Ans :

i. It is a light weight metal which does not corrode in moist air.
ii. It can form light weight alloys which are as strong as steel.
iii. It is a very good conductor of heat and electricity.
iv. It is highly malleable and ductile.

20. Name the functions of some phytohormones. [3]

Ans :

Some of the plant functions regulated by phytohormones are -
i. growth of root, stem and leaf.
ii. movement of plants and plant parts in response to light, gravity, etc.
iii. flowering.
iv. ripening of fruits.
v. leaf and fruit fall.
vi. opening and closing of stomata.
vii. seed dormancy, etc.

21. Which is the main thinking part of the brain? State how it functions. [3]

Ans :

i. The fore-brain is the main thinking part of the brain having thinking tissues.
ii. It has regions which receive sensory impulses from various receptors such as skin, eyes, ear, tongue, nose.
iii. Separate areas of association where this sensory information is interpreted by putting it together with information from other receptors as well as with information that is already stored in the brain. Based on this, a decision is made about how to respond.

22. Resistivity of two elements A and B are $= 1.62 \times 10^{-8}\,\Omega$m and $520 \times 10^{-8}\,\Omega$m respectively. Out of these two, name the element that can be used to make: [3]
a. filament of electric bulb.
b. wires for electrical transmission lines. Justify your answer in each case.

Ans :

Given: $\rho_A = 1.62 \times 10^{-8}\,\Omega$m
$\rho_B = 520 \times 10^{-8}\,\Omega$m
a. For filament of electric bulb resistivity must be higher i.e. $520 \times 10^{-8}\,\Omega$m. So element B is used for filament.
b. For electric transmission resistivity must be lower which is of element A.

23. i. What is the function of an electric switch in an electric circuit ?
ii. Why is the switch placed in the live wire, which is connected to an appliance ?
iii. What consequences will follow, if the switch is placed in the neutral wire ? [3]

Ans :

i. The electric switch can close or open an electric circuit.
ii. When a switch is placed in the live wire, on opening the switch, the appliance is completely cut off from the live wire. Thus, if the appliance is touched with bare hands, there is no likelihood of getting an electric shock.
iii. In such a situation the appliance will not work in an open circuit, but it will remain connected with the live wire. Thus, if the appliance is touched with bare hands, one is likely to get a severe electric shock.

24. A 5.0 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 30 cm. By calculation determine (i) the position and (ii) the size of the image formed. [3]

Ans :

Given, $h_o = 5$ cm
$f = 20$ cm
$u = -30$ cm
$v =$? (To be calculated)
$h_i =$? (To be calculated)

(i) From lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{v} = \frac{1}{f} + \frac{1}{u}$$

$$\frac{1}{v} = \frac{1}{20} + \frac{1}{-30}$$

$$\frac{1}{v} = \frac{3-2}{60} = \frac{1}{60} \text{ or } v = 60 \text{ cm}$$

(ii) Applying, $\frac{h_i}{h_o} = \frac{v}{u} \Rightarrow \frac{h_i}{5} = \frac{60}{-30}$

$$h_i = \frac{-60 \times 5}{30} = -10 \text{ cm}$$

or

An object is 2 m away from a lens, which forms an erect image one-fourth the size of the object. Determine the focal length of the lens. What type of lens is this ? [3]

Ans :

Given, $u = -2$ m

$$m = \frac{v}{u} \Rightarrow \frac{1}{4} = \frac{v}{u}$$

$$v = \frac{u}{4} = -\frac{2}{4}\text{m} = -0.5 \text{ m}$$

As image is erect and also $\frac{1}{4}$th the size of the object, so, lens is concave lens.

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \Rightarrow \frac{1}{f} = \frac{1}{-0.5} - \frac{1}{-2}$$

$$\frac{1}{f} = \frac{-4+1}{2} = -\frac{3}{2}$$

Thus, focal length, $f = -\frac{2}{3}\text{m} = -0.67 \text{ m} = -67$ cm

Section C

25. State the limitations of a balanced chemical

equation. [5]

Ans :

i. It does not give information about the physical state of reactants and products.
ii. It does not tell whether a chemical reaction will come to completion or not.
iii. It does not tell about the speed of a chemical reaction .
iv. It does not tell about the physical conditions which bring about the chemical reaction, such as pressure, catalyst, etc.
v. It does not tell about the changes such as precipitation, change in colour, evolution of heat, light, sound, etc.

or

i. Distinguish between 'roasting' and 'calcination'. Which of these two is used for sulphide ores and why ?
ii. Write a chemical equation to illustrate the use of aluminium for joining cracked railway lines.
iii. Name the anode, the cathode and the electrolyte used in the electrolytic refining of impure copper. [5]

Ans :

i. Roasting is the heating of a metallic ore (generally sulphides) to about 1000°C in the presence of air. Calcination is the heating of a metallic ore (generally carbonates or oxides) to about 1000°C in the absence of air.
The sulphide ore is subjected to roasting. In doing so the sulphide ore is oxidised to the oxide ore. We convert sulphide ore to the oxide ore, because it is very easy to reduce metals from it by using conventional reducing agents such as coke, carbon monoxide, etc.

$$2ZnS + 3O_2 \longrightarrow 2ZnO + 2SO_2 \text{ (Roasting)}$$
$$ZnO + C \longrightarrow Zn + CO$$

ii. $Fe_2O_3 + 2Al \longrightarrow Al_2O_3 + 2Fe$
(Thermite reaction)

iii. **Anode :** Impure copper
Cathode : Thin rod or sheet of pure copper
Electrolyte : Copper sulphate solution acidified with sulphuric acid.

26. Atoms of seven elements A, B, C, D, E, F and G have a different number of electronic shells but have the same number of electrons in their outermost shells. The elements A and C combine with chlorine to form an acid and common salt respectively. The oxide of element A is a liquid at room temperature and is a neutral substance, while the oxides of the remaining six elements are basic in nature. Based on the above information answer the following questions.
i. What could the element A be ?
ii. Will elements A to G belong to the same period or same group of the periodic table ?
iii. Write the formula of the compound formed by the reaction of element A with oxygen.
iv. Show the formation of the compound by a combination of element C with chlorine with the help of an electronic structure.
v. What would be the ratio of the number of combining atoms in a compound formed by the combination of element A with carbon ?
vi. Which one of the given elements is likely to have the smallest atomic radius ? [5]

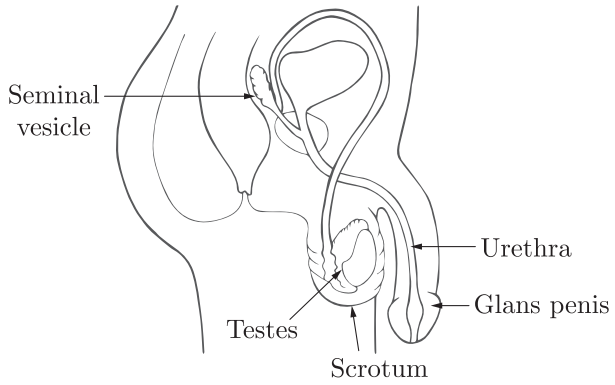
Ans :

i. Hydrogen
ii. Elements A to G belong to the same group of the periodic table since they contain the same number of electrons in their outermost shells.
iii. $2H_2 + O_2 \longrightarrow 2H_2O$ (Since A is hydrogen)
iv. $C^{\bullet} + {\times}\underset{\times\times}{\overset{\times\times}{Cl}}{\times} \longrightarrow C^+Cl^-$ or CCl
(2,8,7) (2,8,7)
v. Ratio = 4 : 1
vi. Hydrogen (represented by A) is likely to have the smallest atomic radius amongst all the elements in a group. This is because the atomic radius increases while moving down the group.

27. Draw a neat diagram of the human male reproductive system and label the parts performing the following functions :
i. Production of sperms
ii. Gland which provides fluid
iii. Provides low temperature for the formation of sperms
iv. Common passage for sperms and urine.
Name a sexually transmitted disease and a method to avoid it. [5]

Ans :

i. Testes
ii. Seminal vesicle
iii. Scrotum
iv. Urethra

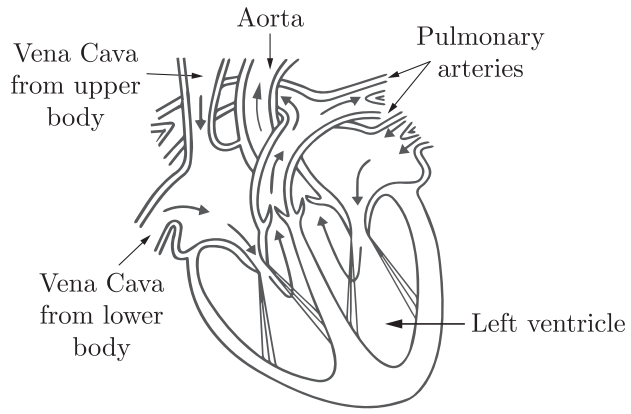


AIDS (Acquired Immuno Deficiency Syndrome) is a sexually transmitted disease. Using condom helps in preventing the transmission of these diseases (STDs).

28. i. Draw a sectional view of the human heart and label on it Aorta, Pulmonary arteries, Vena cava, Left ventricle.
ii. Why is double circulation of blood necessary in human beings ? [5]

Ans :

i.



ii. During double circulation, the blood flows twice through the heart. The circulation of blood from the right ventricle to the lungs, and from the lungs to the left auricle is called pulmonary circulation. The circulation of blood from the left ventricle to the body parts and from the body parts to the right auricle is called system circulation.

Double circulation of blood is necessary for constant and efficient supply of oxygen to the body which is needed for high energy needs of our body and to maintain the body temperature.

or

i. Explain the process of nutrition in Amoeba with suitable diagram.

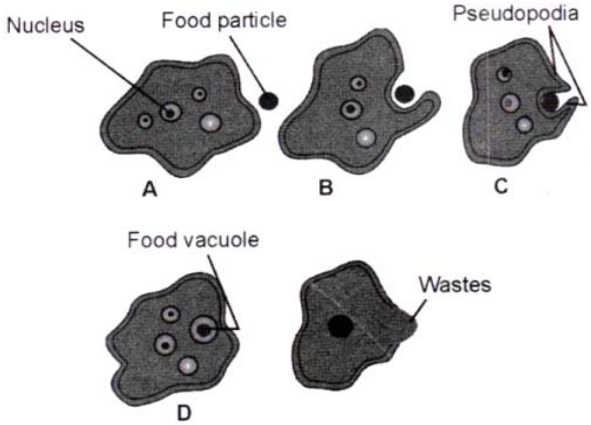
ii. During one cycle how many times blood goes to heart of fish and why ? [5]

Ans :

i. **Nutrition in Amoeba** (Holozoic nutrition)

(a) The entire body surface is capable of intake of food.

(b) It can form temporary finger-like extensions (Pseudopodia) of the cell surface which fuse over the food particle forming a food vacuole.



(c) The complex substances are broken down into simpler ones by using digestive enzymes inside the food vacuole. These substances then diffuse into the cytoplasm.

(d) The undigested material remaining in the food vacuole is moved to the cell surface and thrown out.

ii. Blood passes only once through the heart in the fish during one cycle of passage through the body. Fishes have two chambered heart, the blood pumped to the gills, is oxygenated there and passes directly to the rest of body.

29. i. Define 1 dioptre of power. Find the focal length of a lens of power – 2.0 D.

ii. Why does a lemon kept in water in a glass tumbler appear to be bigger than its actual size ?

iii. Study the table given below and state the medium in which light ray will travel fastest. Why ? [5]

Medium	A	B	C
Refractive Index	1.33	1.5	2.4

Ans :

i. One dioptre is the power of a lens of focal length 1 m.

$$\text{Focal length, } f = \frac{1}{P} = \frac{1}{-2.0} = -0.5 \text{ m}$$

$$= -50 \text{ cm}$$

ii. It is because of refraction from denser medium to rarer medium.

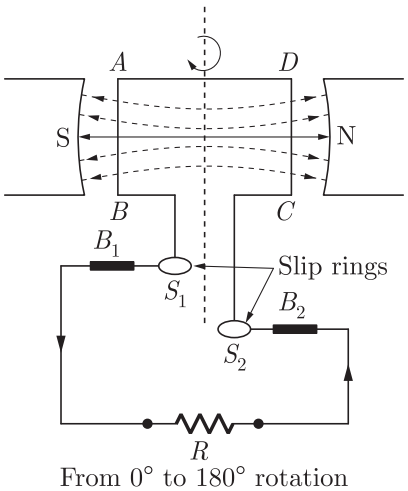
iii. Light ray will travel fastest in medium A due to its least refractive index.

30. Explain the underlying principle and working of an electric generator by drawing a labelled diagram. What is the function of brushes ? [5]

Ans :

i. Electric generator is based on the principle of electromagnetic induction, according to which when a closed coil is moved rapidly in a magnetic field, an induced current is produced in it.

ii. Working of AC Generator : Suppose the generator coil ABCD is in the horizontal position and the coil is rotated in the clockwise direction within the poles of a magnet.

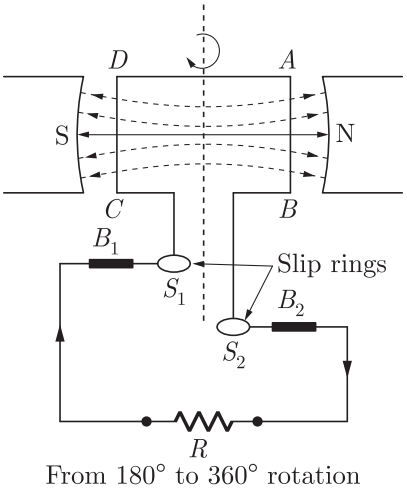


From 0° to 180° rotation

Figure-1

iii. As the coil rotates in the clockwise direction, the side AB of the coil moves up in the plane of paper and side CD moves down into the plane of paper. In doing so AB and CD cut the magnetic lines of force, due to which an induced current is produced in AB and CD. On applying Fleming right hand rule, we find that the direction of current in AB is from B to A and in CD from D to C respectively. The effective direction of current in the complete circuit is along DCRBA. Also, the direction of current in the external circuit is along B_1 RB_2, such that brush B_1 acts as positive and brush B_2 as negative.

iv. After half rotation, the sides AB and CD interchange their positions (Fig. 2). Now the side AB move down into the plane of paper and side CD moves upward out of the plane of paper. Thus, the current in AB flows from A to B and the current in CD flows from C to D. The effective direction of current in the complete circuit is along ABRCD.



From 180° to 360° rotation

Figure-2

This is exactly opposite of the direction of current in the first half of rotation. Also the direction of current in the external circuit is magnet along B_2 RB_1, such that brush B_1 acts as negative and brush B_2 as positive.

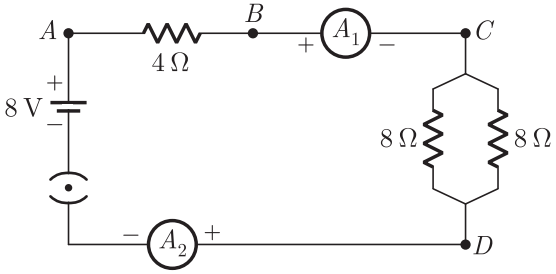
Thus, to sum up, in one complete rotation of the coil, the direction of the current changes twice.

v. Brushes continuously remove the induced current from the slip rings of the rotating coil and pass it in the external circuit.

or

Find out the following in the electric circuit given in Figure.

i. Effective resistance of two 8Ω resistors in the combination.
ii. Current flowing through 4Ω resistor.
iii. Potential difference across 4Ω resistor.
iv. Power dissipated in 4Ω resistor.
v. Difference in ammeter readings, if any. [5]



Ans :

i. Two 8Ω resistors are connected in parallel
Effective resistance of this combination

$$= \frac{8 \times 8}{8+8} = \frac{64}{16}$$

$$= 4\,\Omega$$

ii. Equivalent resistance of the circuit

$$= 4\Omega + 4\Omega = 8\Omega$$

Current flowing through the 4 Ω resistance,

$$I = \frac{V}{R} = \frac{8\,\text{V}}{8\,\Omega}$$

$$= 1\,\text{A}$$

iii. Potential difference across 4 Ω resistor,

$$V = IR = 1\text{A} \times 4\,\Omega$$

$$= 4\,\text{V}$$

iv. Power dissipated in 4 Ω resistor

$$= I^2R = (1)^2 \times 4$$

$$= 4\,\text{W}$$

v. Both ammeter has same reading. So there is no difference in ammeter readings.