Science

Time: 3 Hours **Max. Marks: 80**

S. No.	Typology of Question	Very Short Answer (VSA) 1 Mark	Short Answer– I (SA I) 2 Marks	Short Answer– II (SA II) 2 Marks	Long Answer (LA) 5 Marks	Total Marks	% Weightage
1.	**Remembering**	2	-	1	1	10	15%
2.	**Understanding**	-	1	4	2	24	35%
3.	**Application**	-	1	2	2	18	26%
4.	**High Order Thinking Skills**	-	-	1	1	8	12%
5.	**Inferential and Evaluative**	-	1	1 + 1**	-	8	12%
	Total (Theory Based Questions)	2 × 1 = 2	3 × 2 = 6	10 × 3 = 30	6 × 5 = 30	68(21)	100%
	Practical Based Questions		6 × 2 = 12	-	-	12(6)	
	Total	2 × 1 = 2	9 × 2 = 18	10 × 3 = 30	6 × 5 = 30	80(27)	

1. Question paper will consist of 27 questions

2. All questions would be compulsory. However, an internal choice will be provided in two questions of 3 marks each and one question of 5 marks.

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

SCIENCE

Time allowed: 3 hours **Maximum marks: 80**

General Instructions:

($\boldsymbol{i}$) The question paper comprises two sections, A and B. You are to attempt both the sections.
($\boldsymbol{ii}$) All questions are compulsory.
($\boldsymbol{iii}$) All questions of Section-A and B are to be attempted separately
($\boldsymbol{iv}$) There is an internal choice in three questions of three marks each, two questions of five marks each and one question of two marks each (practical skills).
($\boldsymbol{v}$) Question numbers 1 and 2 in Section-A are one-mark questions. They are to be answered in one word or in one sentence.
($\boldsymbol{vi}$) Question numbers 3 to 5 in Section-A are two marks questions. These are to be answered in 30 words each.
($\boldsymbol{vii}$) Question numbers 6 to 15 in Section-A are three marks questions. These are to be

answered in about 50 words each.
$(\boldsymbol{vii})$ Question numbers 16 to 21 in Section-A are five marks questions. These are to be answered in 70 words each.
$(\boldsymbol{ix})$ Question numbers 22 to 27 in Section-B are based on practical skills. Each question is a two marks question.

These are to be answered in brief.

SECTION – A

Q1. What is the function of pollen grains in flowers?

Q2. Which hormone controls the metabolism of calcium and phosphorus in human beings?

Q3. An element 'A' has atomic number 14. To which period does this element belong and how many elements are there in that period? Also identify the element $'A'$ and the group in which it is placed.

Q4. An object 5.0 cm in length is placed at a distance of 20 cm in front of a convex mirror of radius of curvature 30 cm. Find the position of the image, its nature and size.

Q5. Explain the working of hydroelectric power plant to produce electricity?

Q6. Draw a labelled diagram of an electric motor. Write its principle. What is the function of a split ring in an electric motor.

OR

Name two safety measures commonly used in electric circuits and appliances 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.

Q7. A schematic diagram of a circuit consists of a battery of three cells of 2 V each, a 5 Ω resistor, a and a 12 2 resistor, and a plug key all connected in series. An ammeter to measure the current through the resistors and a voltmeter to measure the potential difference across the 12 Ω resistor are also connected. Draw the required circuit. What would be the reading in the ammeter and the voltmeter?

Q8. Identify the oxidising agent (oxidant) in the following reaction:

(a) $Pb_30_4 + 8HC\dot{I} \rightarrow 3PbCl_2 + Cl_2 + 4H_20$

(b) $2Mg + O_2 \rightarrow 2Mgo$

(c) $CuSO_4 + Zn \rightarrow Cu + ZnSO_4$

Q9. Two elements 'A' and 'B' belong to group 1 and 2 respectively in the same period. Compare them with respect to (a) the number of valence electrons (b) valency (c) metallic character (d) Give reasons.

Q10. Explain digestion in the small intestine.

OR

(a) Name two different ways in which glucose is oxidised to provide energy in various organisms.
(b) Write any two difference between the two ways of oxidation of glucose in organisms.

Q11. Name two homologous structures in vertebrates. Why are they so called? How do such organs help in understanding an evolutionary relationship?

Q12. A 4.5 cm needle is placed 12 cm away from a concave lens of focal length 15 cm. Give the location of the image and the magnification. Describe what happens as the needle is moved farther from the lens.

Q13. You have four solutions A, B, C and D. The pH of solution A is 6, B is 9, C is 12 and D is 7.
(i) Identify the most acidic and most basic solution.
(ii) Arrange the above four solutions in the increasing order of H^+ ion concentration.
(iii) State the change in colour of pH paper on dipping it in solutions C and D.

OR

Baking soda is used in small amount in making bread and cakes. It helps to make these items soft and spongy. An aqueous solution of baking soda turns red litmus blue. It is also used in soda-acid fire extinguishers.

Based on this information answer the following questions:
(i) How does baking soda help to make bread and cakes soft and spongy?
(ii) How does it help in extinguishing fire?
(iii) What should be the pH value of aqueous solution of baking soda?

Q14. Give some uses and advantages of solar energy.

Q15. Rohan is in 7^{th} standard. He is very short in height as compared to his classmates. They always tease him because of his short height. One day when they were teasing him, their science teacher noticed and scolded his classmates for doing so. She explained them that it is not Rohan's mistake rather it is hormonal condition.

(a) What kind of value was shown by the teacher?
(b) Name the hormone which controls the height character
(c) Name the disease which occurs due to deficiency and excess of this hormone.

Q16. (a) Explain an activity to show that a current-carrying conductor experiences a force when placed in a magnetic field.
(b) State the rule which gives the direction of force acting on the conductor.

Q17. Give the structures and IUPAC names of straight chain alkanes with molecular formula

(i) C_4H_{10}
(ii) C_5H_{12}
(iii) C_6H_{14}

(b) How many structural isomers can you draw for pentane?

OR

Identify the compounds A to E in the following reactions:

(i) $CH_3CH_2OH \xrightarrow{KMnO_4,KOH} A$

(ii) $CH_3CH_2OH + A \xrightarrow{Conc.H_2SO_4}$

(iii) $B + NaOH \rightarrow C + CH_3CH_2OH$

(iv) $A + NaHCO_3 \rightarrow C + D + H_2$

(v) $CH_3CH_2OH + E \rightarrow CH_3CH_2ONa + H_2$

Q18. (a) Draw the structure of a nephron and label the following on it: glomerulus, Bowman's capsule, renal artery, collecting duct.

(b) What happens to glucose that enters the nephron along with filtrate?

Q19. Explain the refraction of light through a triangular glass prism using a labelled ray diagram. Hence define the angle of deviation.

Q20. Give answers for the following:

(i) The reaction of metal X with ferric oxide is highly exothermic. Metal X is obtained from its oxides b electrolytic reduction. Identify X and write its reaction with ferric oxide.

(ii) Give reason to justify that aluminium oxide is an amphoteric oxide. Also give another example of amphoteric oxide.

(iii) Mention constituent metals present in bronze.

Q21. What is the importance of ozone in the environment? Why is it depleting? What precautions are taken to preserve it?

OR

What is rainwater harvesting? How can it be done at local level? What are its benefits?

SECTION – B

Q22. A student added a piece of zinc metal to four test tubes I, II, III and IV which contain aqueous solutions of aluminium sulphate, zinc sulphate, ferrous sulphate and copper sulphate respectively. In which test tube the reaction will take place.

Q23. Bottle X contains oxalic acid and bottle Y contains sodium carbonate solution. When p each of the solutions, the colour seen in X and Y respectively will be?

OR

A student was given three samples containing ethanoic acid, sodium bicarbonate solution and water in test tubes A, B and C respectively. On dipping a pH paper in them, he observed that

the colour turned orange in A, blue in B and green in C. What would be the sequence of these bottles if arranged in the increasing order to their pH and why?

Q24. The rest position of the needles in a milliammeter and voltmeter not in use are as shown in figure (a). When a student uses these in his experiment, the needle are in the positions shown on figure (b). Determine the correct values of current and voltage in the equipment.

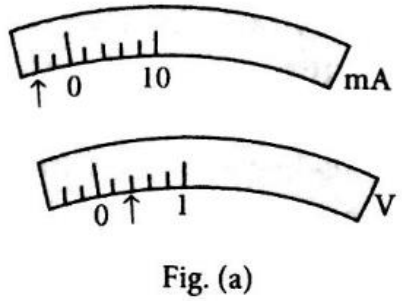


Fig. (a)

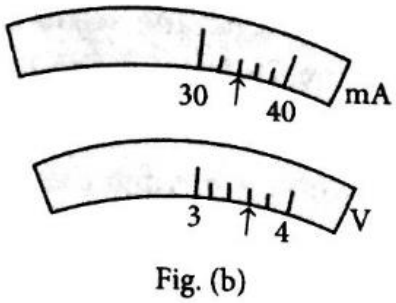
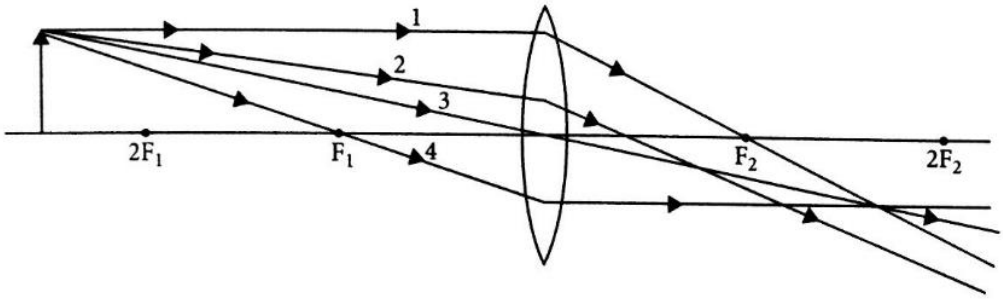


Fig. (b)

Q25. Consider the following diagram and select any two such incident rays, which are shown refracted as per the laws of refraction of light. Use these rays to show the image formation of an object placed at a distance of 25 cm on the principal axis of a convex lens of focal length 10 cm.



Q26. List the various steps of observing a slide under the microscope.

Q27. During respiration experiment, why is potassium hydroxide placed in a small test tube with flask containing germinating seeds?

SOLUTIONS

Ans 1. Pollen grains are the male gametes which fertilise the egg cell present in the ovule.

Ans 2. Parathyroid hormone (parathormone)

Ans 3. Electronic configuration of element 'A' is 2(K), 8(L), 4(M). As it has three shells, therefore, element 'A' belongs to the third period. Third period has 8 elements. Element 'A' is silicon (Si) and it belongs to group 14.

Ans 4.

$$f = \frac{R}{2} = \frac{30}{2} = 15 \text{ cm}$$

$f = +15$ cm, $u = -20$ cm, $h_1 = 5.0$ cm.

Using mirror formula,

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}, \quad \therefore \quad \frac{1}{v} = \frac{1}{f} - \frac{1}{u}$$

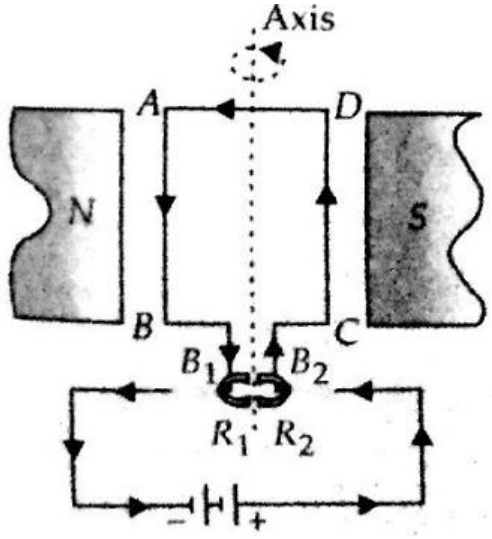
$$\frac{1}{v} = \frac{1}{15} + \frac{1}{20}; \quad \frac{1}{v} = \frac{7}{60} \quad \therefore \quad v = \frac{60}{7} \text{ cm}$$

Image is virtual, behind the mirror and erect.

$$m = \frac{-v}{u} = \frac{\frac{-60}{7}}{-20} = \frac{3}{7}$$

$$\text{Also, } m = \frac{h_2}{h_1}; \; h_2 = mh_1 = \frac{3}{7} \times 5 = \frac{15}{7} \text{ cm}$$

Ans 5. In order to produce hydroelectricity, high rise dams are constructed on the river to obstruct the flow of water and thereby collect water in very large reservoirs. The water from high level in the dam is carried through pipes, to the turbine, at the bottom of the dam. The turbines are connected to the generator. Rotation of the turbines makes the generator produce electricity. Water stored at a height in the dam has a large amount of potential energy which gets converted into the kinetic energy of flowing water when it is allowed to fall on the turbines it gets converted into mechanical energy of the turbine and finally gets converted into the electric energy by the generator.



Principle: Current carrying conductor when placed at right angle to a magnetic field, experiences a force due to a which we get motion. The direction of the force is given by Flemings left hand rule.

Split-ring in an electric motor takes the current from the battery and passes it on to the coil through the brushes after reversing its direction after every half revolution. The reversal of current in the coil reverses the direction of forces acting on the sides of the loop.

OR

The safety devices that are used in electric circuits and appliances are, (a) Fuse (b) Earthing. MCBs are also used as safety device in electrical circuits.

Rating of the oven = 2 kW

Line voltage = 220 V

Then

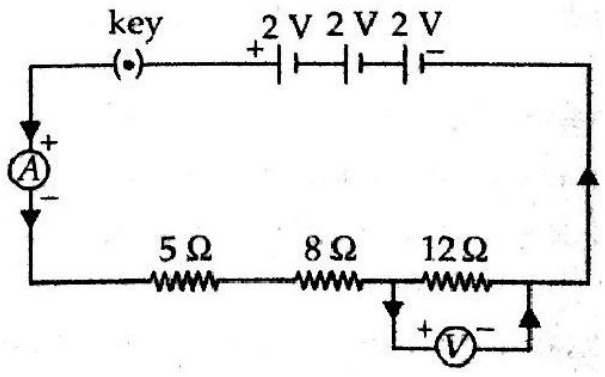
Current drawn by the oven = $\frac{\text{Power}}{\text{Voltage}}$

$$\frac{2\ kW}{220\ V} = \frac{2000}{220}\ \text{A} = 9.1\ \text{A}$$

Since the domestic circuit is rated for 5 A, and the oven draws a current of 9.1 A, the following result is expected.

(i) The fuse (if there) will blow off.
(ii) The wiring may burn out.

Ans 7. The completed circuit diagram is given below:



For the whole circuit,

Total resistance = 5 Ω + 8 Ω + 12 Ω-25 Ω

Total applied voltage = 2 V + 2 + 2 V = 6 V

current flowing through the resistors,

$$\text{I} = \frac{\text{V}}{\text{R}} = \frac{6\ \text{V}}{25\ \Omega} = 0.24\ \text{A}$$

So, the ammeter will show a reading of 0.24 A.

Voltage across the 12 Ω resistor – IR

= 0.24 A × 12 Ω = 2.88 V

So, the voltmeter will show a reading of 2.88 V.

Ans 8. (a) $\mathrm{Pb_3O_4 + 8HCL \rightarrow 3PbCl_2 + 4H_2O}$

$\mathrm{Pb_3O_4}$ is oxidising agent. It oxidises HCl to $\mathrm{Cl_2}$.

(b) $\mathrm{2Mg + O_2 \rightarrow 2MgO}$

(c) $\mathrm{CuSO_4 + Zn \rightarrow Cu + ZnSO_4}$

$\mathrm{CuSO_4}$ is oxidising agent. It oxidises Zn to $\mathrm{ZnSO_4}$.

Ans 9. (a) Number of valence electrons in $A = 1$ and $B = 2$.

(b) Valency of A is one while that of B is two.

(c) Element A is more metallic as compared to B. As we move across the period, metallic character decreases.

(d) B is smaller than A in size.
As we move across the period, metallic character decreases.

Ans 10. In the first part of the small intestine, the is erect and small in size of an object secretion of the liver called bile and the pancreatic juice are received. The bile salts break down the large globules of fat into smaller globules. This is called emulsification. The bile also makes the food alkaline so that the pancreatic enzymes can act. The pancreatic enzymes contain trypsin for digesting proteins and lipase for digesting fats. The walls of the small intestine secrete intestinal juices which finally digest as follows:

Proteins → amino acids
Fats → fatty acids and glycerol
Carbohydrates → glucose

OR

(a) The two different ways in which glucose is oxidised to provide energy in various organisms are as follows:

First set of breakdown of glucose (six carbon molecules) takes place in the cytoplasm of cells of all organisms. This process yields a three carbon molecule compound called pyruvate. Further breakdown of pyruvate takes place in different manners in different organisms.

(i) Anaerobic respiration which takes place in absence of oxygen, e.g., in yeast during fermentation. In this case, pyruvate is converted into ethanol and carbon dioxide.

(ii) Aerobic respiration, in which breakdown of pyruvate takes place in presence of oxygen to give rise to three molecules of carbon dioxide and water.

(b) The two differences between the two ways of oxidation of glucose in organisms are as follows:

	Aerobic respiration	Anaerobic respiration
(i)	When oxidation of food nutrients occurs in the presence of molecular oxygen, it is called aerobic respiration.	When oxidation of nutrients occurs without the utilization of molecular oxygen, it is called anaerobic respiration.
(ii)	More energy is produced as oxidation is complete.	Less amount of energy is produced as is not complete.

Ans 11. Two homologous structures in vertebrates are:

(i) limbs of birds and reptiles.
(ii) limbs of reptiles and amphibians
These are called so because the or organs have similar structure to perform different function in various vertebrates.

The homologous characteristics indicate common ancestry.

Ans 12. A concave lens always forms virtual image, which is erect and small in size of an object.

Focal length of concave lens f = -15 cm

Obiect distance u = - 12 cm

Using lens formula

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \Rightarrow \frac{1}{v} - \frac{1}{-12} = \frac{1}{-15}$$

$$\frac{1}{v} = \frac{-4-5}{60}$$

$$\therefore \quad v = -\frac{60}{9}\ cm = -6.66\ cm$$

Image is formed on the same side as the object.

$$m = \frac{v}{u}; m = \frac{9}{12} = 0.55$$

It shows the image is erect, small in size and virtual.

When the needle is moved farther from lens the image also moves farther and decreases in size.

As u approaches ∞, v approaches to focus but never beyond f.

Ans 13. (i) The most acidic solution is A (pH = 6). The most basic solution is C (pH = 12).

(ii) Lower the value of pH, higher will be the concentration is C < B < D < A.

(iii) The colour of pH paper on dipping in solution C will be dark purple and in solution D Will be green.

OR

(i) When Baking soda is heated, it releases CO_2 which makes bread and cakes soft and spongy.

(ii) When baking soda reacts with an acid brisk effervescence of CO_2 is released with pressure, which covers the fire and stops the supply of oxygen and consequently fire extinguishers.

(iii) Baking soda is basic in nature, its aqueous solution should have pH more than 7.

Ans 14. Uses:

(i) For cooking food in a solar cooker.
(ii) For heating water in solar geysers.
(iii) For generating electricity in space satellites, calculators, watches, etc, by solar cells.
(iv) For generating electricity on a large scale by a solar power plant.
(v) To melt metals in solar furnaces.

Advantages:

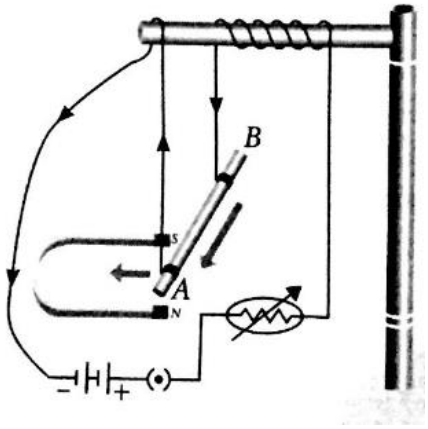
(i) It does not cause any pollution
(ii) It is a renewable source of energy.
(iii) It is free of cost.

Ans 15. (a) The teacher had shown the value of sense of responsibility, adequate knowledge on a subject and capability to use it when required.

(b) Growth hormone is the hormone secreted by pituitary gland which controls height.

(c) Growth hormone regulates growth and development of the body. When there is a deficiency of this hormone, it leads to dwarfism. When there is an excess of this hormone, it leads to gigantism.

Ans 16. (a) A small aluminium rod suspended horizontally from a stand using two connecting wires. Place a strong horseshoe magnet in such a way that the rod lies between the two poles with the magnetic field directed upwards. For this, put the north pole of the magnet vertically below and south pole vertically above the aluminium rod.

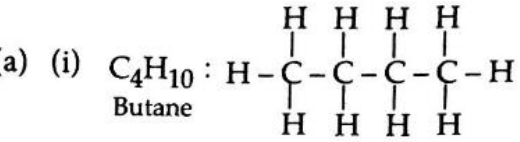


Connect the aluminium rod in series with a battery a key and a rheostat. Pass a current through the aluminium rod from one end to other (B to A). The rod is displaced towards left. When the direction of current through the rod is reversed, the displacement of rod will be towards right.

(b) Fleming's Left-hand rule: Stretch the thumb, forefinger and middle finer of your left hand such that they are mutually perpendicular to one another. If and forefinger points in the direction of magnetic field and the middle finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.

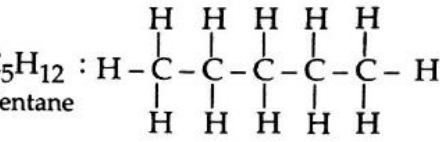
Ans 17.

(a) (i) C_4H_{10} : Butane



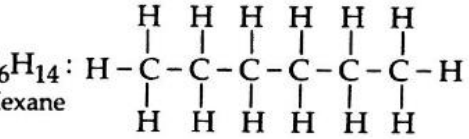
or $CH_3 - CH_2 - CH_2 - CH_3$

(ii) C_5H_{12} : Pentane



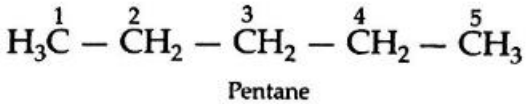
or $CH_3 - CH_2 - CH_2 - CH_2 - CH_3$

(iii) C_6H_{14} : Hexane

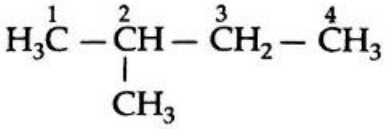


or $CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

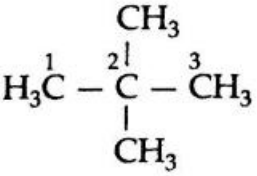
(b) Pentane (C_5H_{12}) has a skeleton of five carbon atoms. It can exist as one straight chain as well as two branched chain isomers.



Pentane



2-Methylbutane



2, 2-Dimethylpropane

OR

(i) A : CH3COOH (Acetic acid)

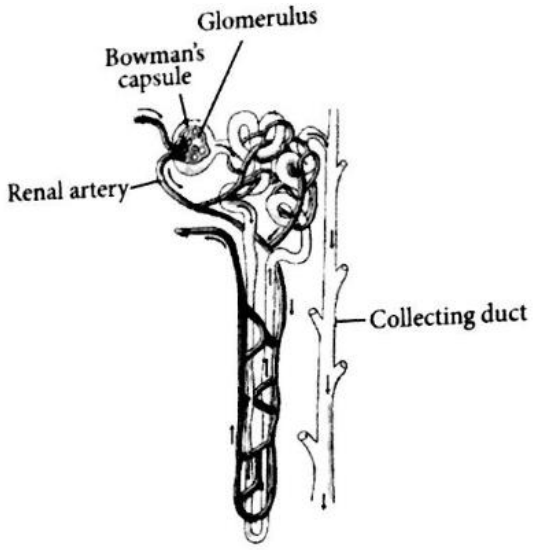
(ii) $B : CH_3-\overset{\overset{O}{\|}}{C}-OC_2H_5$ (Ethyl ethanoate)

(iii) C : CH_3COONa (Sodium ethanoate)

(iv) D : CO_3 (Carbon dioxide)

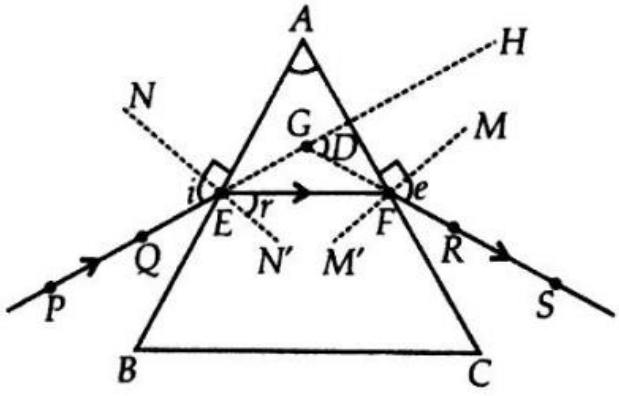
(v) E : Na (Sodium)

Ans 18. (a) The structure of a nephron is as follows:



(b) Glomerular filtrate present in Bowman's capsule contains glucose. This filtrate when enters proximal convoluted tubule of kidney then, much of it is reabsorbed back here (65%), Glucose is almost completely reabsorbed in the kidney tubule and is not excreted out.

Ans 19. A triangular glass prism has two triangular bases and three rectangular lateral surfaces. These surfaces are inclined to each other. The angle between its two lateral faces is called the angle of the prism.



Here *PE* is the incident ray. *EF* is the refracted ray and *FS* is the emergent ray. A ray of light is entering from air to glass at the first surface *AB*. The light ray on refraction has bent towards the normal. At the second surface *AC*, the light ray has entered from glass to air.Hence it has bent away from normal. The peculiar shape of the prism makes the emergent ray end at an angle to the direction of the incident ray. This angle is called the angle of deviation. In this case $\angle D$ is the angle of deviation.

Ans 20. (i) Metal *X* is aluminium.

$$\underset{\text{Aluminium}}{2\text{AI}} + \underset{\text{Ferric oxide}}{\text{Fe}_2\text{O}_3} \rightarrow \underset{\text{Aliminium oxide}}{\text{Al}_2\text{O}_3} + \underset{\text{Iron}}{2\text{Fe}}$$

(ii) Aluminium oxide (Al_1O_3) is an amphoteric oxide as it reacts with both acid and base to produce salt and water. Zinc oxide (ZnO) is also an amphoteric oxide

(iii) Bronze is an alloy of copper and tin.

Ans 21. Ozone is present in the stratosphere. It protects the earth from harmful ultraviolet radiations. UV ray causes diseases to organisms *e.g.*, skin cancer, cataract in human beings.

Ozone layer is depleting because of chlorides and fluorides. They act on ozone molecules and deplete it. Chlorides, fluorides are present in chlorofluorocarbon (CFC's) which are used in refrigerants and fire extinguishers.

The precautions taken to preserve the ozone layer is to ban the use of CFC’s.

OR

Rainwater harvesting is the indigenous water saving methods to capture every trickle of water that had fallen on land. For this, we need to dig small pits and lakes, build small earthen dams, construct dykes, sand and limestone reservoirs, set up roof top water collecting units. This will recharge ground water levels and bring rivers back to life.

Water harvesting techniques give people control over their local water resources, ensures, that the mismanagement and overexploitation of these resources is reduced/removed. The advantage of water stored in the ground are many. It does not evaporate, but spreads out to recharge wells and provide moisture for vegetation over a wide area. It does not provide breeding area for mosquitoes. It is also protected from contamination by human and animal waste.

Ans 22. The reaction will take place in test tubes III and IV. Zinc being more reactive than iron and copper, displaces these metals from their salt solutions.

$$\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$$

$$\text{Zn} + \text{FeSO}_4 \rightarrow \text{ZnSO}_4 + \text{Fe}$$

Ans 23. The colour of pH paper is orange in acidic medium (bottle X) while it is blue in basic medium (bottle Y).

OR

Ethanoic acid ‘A’ has the lowest pH (<7) and $NaHCO_3$ ‘B’ has the highest pH (>7) whereas the pH of water ‘C’ is 7.

Thus, the increasing order of pH values is A < C < B.

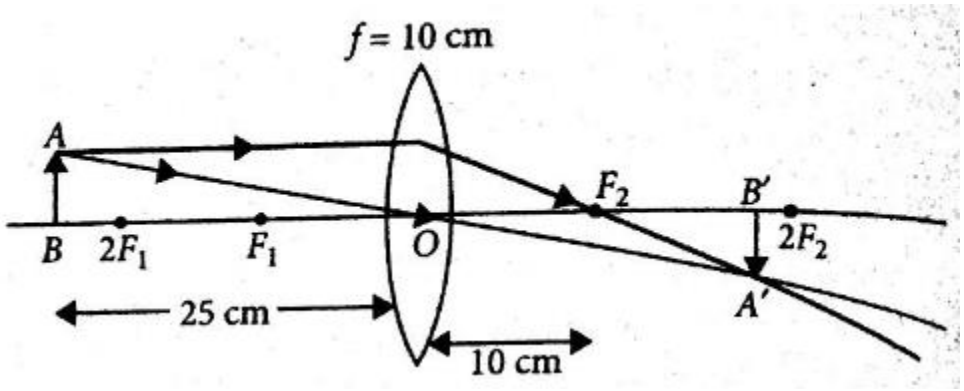
Ans 24. For milliammeter, 1 division = $\frac{10\ \text{mA}}{5} = 2\ \text{mA}$

Correct value of current = $34\ \text{mA} - (-4\text{mA}) = 38\ \text{mA}$

For voltmeter, 1 division $= \frac{1\ \text{V}}{5} = 0.2\ \text{v}$

Correct Value of voltage = $3.6\ \text{v} - (+0.4\text{v}) = 3.2\ \text{v}$

Ans 25. Rays numbers 1 and 3 or 1 and 4 are best suitable Rays diagram



Ans 26. The various steps of observing a slide under microscope are as follows:

(i) we took a clean prepared slide and clipped it on the stage.

(ii) By looking in the microscope we adjust the mirror to illuminate the slide.

(iii) Moved the coarse adjustment screw of microscope to focus the slide (object) under low power.

(iv) Moved the nosepiece and adjusted the high power of objective lens.

(v) We focus the slide (object) at high power by using fine adjustment screw.

Ans 27. Potassium hydroxide (KOH), placed in the test tube with flask containing germinating seeds, absorbs carbon dioxide produced by them and create partial vacuum in the flask. Due to this, water rises in the delivery tube proving that carbon dioxide is released during respiration.