CBSE Class 10 Science: Sample Paper 1: Marking Scheme and Solutions

Based on NCERT · the board's 2024 to 2026 pattern | Time: 3 hours · **Maximum marks: 80**

Section A (20 × 1 mark)

1. The image that the eye lens forms on the retina is [1]

(a) virtual and erect
(b) real and inverted
(c) real and erect
(d) virtual and inverted

Answer: (b) The eye lens forms an inverted, real image of the object on the retina.

2. A stage technician wants to dim a lamp smoothly without changing the battery. In series with the lamp he should connect [1]

(a) a voltmeter
(b) a rheostat
(c) an ammeter
(d) a second battery

Answer: (b) A rheostat changes the resistance in a circuit without changing the voltage source, so it changes the current through the lamp.

3. Which product is formed both when yeast breaks down pyruvate without oxygen and when pyruvate is broken down in the mitochondria using oxygen? [1]

(a) Ethanol
(b) Water
(c) Carbon dioxide
(d) Lactic acid

Answer: (c) In yeast pyruvate gives ethanol and carbon dioxide; in mitochondria it gives carbon dioxide and water. Only carbon dioxide is common. Lactic acid forms in muscle.

4. At a cable factory in Renukoot, copper rods are pulled through smaller and smaller holes until they become fine wires. The property of copper that makes this possible is [1]

(a) ductility
(b) malleability
(c) sonorousness
(d) lustre

Answer: (a) Drawing a metal into thin wires uses ductility. Malleability is beating into sheets; sonorousness and lustre are sound and shine.

5. The chemical name of baking soda is [1]

(a) sodium carbonate
(b) sodium chloride
(c) sodium hydroxide
(d) sodium hydrogencarbonate

Answer: (d) Baking soda is sodium hydrogencarbonate, $NaHCO_3$. Sodium carbonate is formed from it on heating, and sodium chloride is one of its raw materials.

6. Benzene and cyclohexane each contain a ring of six carbon atoms. Which statement is correct? [1]

(a) Both are saturated.
(b) Benzene, C_6H_6, is unsaturated; cyclohexane, C_6H_{12}, is saturated.
(c) Benzene is saturated; cyclohexane is unsaturated.
(d) Neither is a hydrocarbon.

Answer: (b) Cyclohexane is C_6H_{12} with single bonds only; benzene, C_6H_6, is a cyclic unsaturated hydrocarbon.

7. Assertion (A): Danger signal lights on railway tracks are red. Reason (R): Red light is scattered the least by fog or smoke. [1]

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Answer: (a) Both are true. Because red is scattered least by fog or smoke, it reaches a distant observer in the same colour, which is exactly why danger signals are red.

8. In the copper wire of a torch circuit, electrons drift from the negative terminal of the cell, through the bulb, towards the positive terminal. By convention, the electric current in that wire [1]

(a) flows only inside the cell
(b) flows the same way as the electrons
(c) flows from the positive terminal through the bulb to the negative terminal
(d) has no fixed direction

Answer: (c) Conventional current is taken opposite to the flow of electrons, so in the external circuit it is shown from the positive terminal to the negative terminal.

9. Assertion (A): Most of the power consumed by the filament of a lit bulb appears as heat, not light. Reason (R): Tungsten is used for filaments because it melts only at 3380 °C. [1]

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Answer: (b) Both statements are true. R explains why the filament survives the heat without melting; it does not explain why most of the power becomes heat.

10. Meenal wants to see the complete image of a tall building behind her in a small hand mirror. She should use [1]

(a) a plane mirror
(b) a concave mirror held at arm's length
(c) a concave mirror held close to her eye
(d) a convex mirror

Answer: (d) A convex mirror always forms an erect, diminished image, so a small one can show a full-length image of a large object such as a tall building; a plane or concave mirror of the same size cannot.

11. Assertion (A): A Hibiscus flower is bisexual. Reason (R): The stamen produces yellowish pollen grains. [1]

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Answer: (b) Both are true. Hibiscus is bisexual because it contains both stamens and pistil; that the stamen makes pollen does not explain why the flower has both parts.

12. In a farm food chain paddy → rat → snake → eagle, the tertiary consumer is the [1]

(a) eagle
(b) snake
(c) rat
(d) paddy

Answer: (a) Paddy is the producer, the rat the primary consumer, the snake the secondary consumer and the eagle, the larger carnivore at the fourth level, the tertiary consumer.

13. A flower grower wants thousands of disease-free plants of one prized ornamental variety, all from a single parent plant. The method best suited is [1]

(a) growing them from seeds
(b) cross-pollination
(c) tissue culture
(d) layering a single branch

Answer: (c) Tissue culture lets many plants be grown from one parent in disease-free conditions, and it is commonly used for ornamental plants.

14. Milk of magnesia, taken to relieve acidity, is [1]

(a) $Mg(OH)_2$
(b) MgO
(c) $MgCO_3$
(d) $MgSO_4$

Answer: (a) Milk of magnesia is magnesium hydroxide, $Mg(OH)_2$, a mild base that neutralises excess stomach acid.

15. In a single neuron, an electrical impulse travels in the order [1]

(a) axon → cell body → dendrite
(b) dendrite → axon → cell body
(c) cell body → dendrite → axon
(d) dendrite → cell body → axon

Answer: (d) Information picked up at the dendritic tip creates an impulse that travels from the dendrite to the cell body and then along the axon to its end.

16. Assertion (A): Baking soda is used as an antacid. Reason (R): Baking soda is produced using sodium chloride as one of its raw materials. [1]

(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Answer: (b) Both are true. Baking soda works as an antacid because it is a mild base that neutralises excess acid; the raw material used to make it does not explain that.

17. Propane, a fuel gas, burns in oxygen: $C_3H_8 + x\ O_2 \rightarrow 3CO_2 + 4H_2O$. For the equation to be balanced, x must be [1]

(a) 3
(b) 10
(c) 7
(d) 5

Answer: (d) Oxygen atoms on the right: $3 \times 2 + 4 \times 1 = 10$, so $10/2 = 5$ molecules of O_2. Option (b) gives the number of oxygen atoms, not O_2 molecules.

18. A compass needle is a small bar magnet. The end of the needle that settles pointing towards the north is called its [1]

(a) unmagnetised end
(b) south pole
(c) neutral point
(d) north-seeking or north pole

Answer: (d) The end that points towards the north is the north-seeking or north pole; the other end is the south pole.

19. A gardener lays a fleshy Bryophyllum leaf on moist soil. A few weeks later small plants appear. They grew from [1]

(a) buds in the notches along the leaf margin
(b) the leaf stalk
(c) seeds in the leaf
(d) spores on the leaf surface

Answer: (a) Buds produced in the notches along the leaf margin of Bryophyllum fall on the soil and develop into new plants.

20. Meena and Arjun have a son. The chromosome that made the child a boy came from [1]

(a) Meena, who gave an X (b) Arjun, who gave a Y

(c) Arjun, who gave an X (d) Meena, who gave a Y

Answer: (b) Every child gets an X from the mother, boy or girl. A boy is XY, so the deciding chromosome is the Y he received from his father.

Section B (6 × 2 marks)

21. A few millilitres of ethyl ethanoate are warmed with sodium hydroxide solution in a test tube. [2] After some time the fruity smell has gone. Explain this with an equation, and name the type of reaction.

Or *Name the products formed when an ester is heated with sodium hydroxide. Write the equation for this reaction taking ethyl ethanoate as the ester, and state the use of such a reaction in industry.*

The ester is converted back to the alcohol and the sodium salt of the acid, neither of which has the ester's sweet smell: $CH_3COOC_2H_5 + NaOH \rightarrow C_2H_5OH + CH_3COONa$. This is saponification.

- equation: $CH_3COOC_2H_5 + NaOH \rightarrow C_2H_5OH + CH_3COONa$, the ester being used up so the smell goes (1)
- the reaction is saponification (1)

Or:

An ester heated with sodium hydroxide gives the alcohol and the sodium salt of the carboxylic acid: $CH_3COOC_2H_5 + NaOH \rightarrow C_2H_5OH + CH_3COONa$. This saponification reaction is used to prepare soap.

- products: alcohol and sodium salt of the acid, with the balanced equation for ethyl ethanoate (1)
- saponification, used to prepare soap (1)

22. The leaf cells of a plant species have 20 chromosomes. How many chromosomes will (i) a male germ-cell of this plant and (ii) a zygote of the species carry? Give the reason for each. [2]

(i) 10: each germ-cell takes one chromosome from each of the 10 pairs. (ii) 20: the zygote forms by fusion of two germ-cells of 10 each, which restores the normal number.

- germ-cell 10, one from each pair (1)
- zygote 20, fusion restores the number (1)

23. To locate the image formed by a convex mirror, a student draws two rays from the top of the object. Name two such rays and state the path of each after reflection. [2]

Any two of: (i) a ray parallel to the principal axis, which after reflection appears to diverge from the principal focus behind the mirror; (ii) a ray directed towards the centre of curvature, which is reflected back along the same path; (iii) a ray directed towards the principal focus, which emerges parallel to the principal axis. The image lies where the reflected rays, produced backwards, meet.

- first ray and its path after reflection (1)
- second ray and its path after reflection (1)

24. Neha's flat has a plastic-bodied mixer, a table fan, a toaster and an LED bulb. (a) Which of these must have their bodies joined to the green wire, and why those? (b) Where does the green wire end outside the house? [2]

(a) The table fan and the toaster: they have metallic bodies, and earthing matters especially for appliances with a metallic body. (b) The green earth wire is connected to a metal plate buried deep in the earth near the house.

- table fan and toaster, because their bodies are metallic (1)
- a metal plate buried deep in the earth near the house (1)

25. A blacksmith finds that a rod of pure iron bends and stretches easily when hot. (a) What can be mixed with the iron to make it hard and strong? (b) Name the alloy used for kitchen sinks that does not rust, and its added metals. [2]

(a) A small amount of carbon, about 0.05%, which turns it into hard, strong steel. (b) Stainless steel, made by mixing iron with nickel and chromium; it is hard and does not rust.

- carbon, about 0.05% (1)
- stainless steel with nickel and chromium (1)

26. Name the instrument used to measure blood pressure. What causes high blood pressure (hypertension)? [2]

A sphygmomanometer. Hypertension is caused by the constriction of arterioles, which increases resistance to blood flow.

- sphygmomanometer (1)
- constriction of arterioles increasing resistance to blood flow (1)

Section C (7 × 3 marks)

27. A neurologist examines three patients after head injuries. P can think and speak clearly but sways while walking and can no longer ride a bicycle. Q cannot control his salivation and vomits often. R has healthy nasal passages but can no longer recognise smells. Name the part of the brain likely to be damaged in each, giving a reason. [3]

Or *Three patients are examined after head injuries. L can no longer pick up a pencil neatly or walk in a straight line. M's blood pressure swings without control. N's ears are healthy but sounds are no longer recognised. Name the part of the brain likely to be damaged in each, giving a reason.*

P: the cerebellum of the hind-brain, which gives precision of voluntary actions and maintains posture and balance. Q: the medulla of the hind-brain, which controls involuntary actions such as salivation and vomiting. R: the fore-brain, which has areas specialised for smell.

- P: cerebellum, for balance and precision of voluntary actions (1)
- Q: medulla, for involuntary actions such as salivation and vomiting (1)
- R: fore-brain, with an area specialised for smell (1)

Or:

L: the cerebellum, responsible for the precision of voluntary actions and for balance. M: the medulla, which controls blood pressure among involuntary actions. N: the fore-brain, which has areas specialised for hearing.

- L: cerebellum, precision of voluntary actions and balance (1)
- M: medulla, controls blood pressure (1)
- N: fore-brain, area specialised for hearing (1)

28. Two wires A and B are of the same material and the same length. A carries 0.25 A when 3.0 V is applied across it; B carries 1.5 A when 6.0 V is applied across it. (i) Describe the V–I graph of each wire (V plotted against I) and say which is steeper. (ii) Which wire is thicker, and how do their areas of cross-section compare? (iii) Find the current in each wire when 9 V is applied across it. [3]

(i) R(A) = 3.0/0.25 = 12 Ω, R(B) = 6.0/1.5 = 4 Ω. Each graph is a straight line through the origin, of slope V/I = R; A's line is steeper. (ii) Same material and length, so R is inversely proportional to the area. B has a third of A's resistance, so B is thicker, with three times the area of cross-section of A. (iii) I = V/R: A 9/12 = 0.75 A, B 9/4 = 2.25 A.

- straight lines through origin; A steeper (R = 12 Ω against 4 Ω) (1)
- B thicker, three times the area of A (1)
- 0.75 A in A, 2.25 A in B (1)

29. A jar of homemade mathri, fried in oil, is left open in a cupboard for a few weeks and begins to smell and taste unpleasant. (a) Name this condition and the chemical process behind it. (b) State two ways in which a manufacturer of packaged snacks can prevent it. [3]

(a) Rancidity, caused by oxidation of the fats and oils in the food. (b) Any two: adding antioxidants; packing in airtight containers; flushing the packet with an unreactive gas such as nitrogen.

- rancidity (1)
- oxidation of fats and oils (1)
- two methods of prevention (1)

30. A fish has only a two-chambered heart, yet oxygenated and de-oxygenated blood never mix in it. Explain why. How many times does blood pass through the heart in one cycle in a fish and in a human being? [3]

In a fish the heart pumps blood to the gills, where it is oxygenated, and the blood passes directly to the rest of the body, so the heart only receives blood returning from the body. Blood passes through a fish's heart once in each cycle and through a human heart twice (double circulation).

- heart pumps to the gills; oxygenated there (1)
- blood goes straight to the body, so the heart handles only blood from the body (1)
- fish once per cycle; human twice (double circulation) (1)

31. A tailor is prescribed spectacles of power +3.2 D for close work; with them he sees his stitching clearly at 25 cm. Find the focal length of the lens and the nearest distance at which he can see clearly without the spectacles, and name the lens. [3]

f = 1/P = 1/3.2 m = 0.3125 m = +31.25 cm. The lens forms the image of the cloth at 25 cm at his near point: u = −25 cm, 1/v = 1/f + 1/u = 1/31.25 − 1/25 = 8/250 − 10/250 = −2/250, so v = −125 cm. Without spectacles he sees clearly only from 125 cm (1.25 m). The power is positive, so the lens is convex; he has hypermetropia.

- f = 1/P = +31.25 cm (1)
- uses u = −25 cm in the lens formula to get v = −125 cm, near point 1.25 m (1)
- convex lens, because the power is positive (1)

32. Three gas jars hold ethane, ethene and ethyne. (a) Write the structural formula of each. (b) Which of the three is expected to burn in air with the cleanest flame, and why? (c) Write the name and structure of the compound formed when ethyne adds two molecules of hydrogen over a nickel catalyst. [3]

(a) Ethane $H_3C–CH_3$ (single bond), ethene $H_2C=CH_2$ (double bond), ethyne HC≡CH (triple bond). (b) Ethane: it is saturated, and saturated hydrocarbons generally give a clean flame, while unsaturated ones give a yellow, sooty flame. (c) $HC{\equiv}CH + 2H_2 \rightarrow H_3C–CH_3$, ethane.

- (a) the three structures with single, double and triple carbon-carbon bonds (1)
- (b) ethane, because it is saturated (1)
- (c) ethane, $H_3C–CH_3$ (1)

33. At a scrap yard in Delhi, old refrigerators are broken up and a gas escapes from their cooling pipes. (a) Name the class of chemical likely to be in old refrigerators, and one other use of it. (b) What change in the atmosphere has it been linked to? (c) Ozone is also present in the air the scrap-yard workers breathe. Why is that no benefit to them? [3]

(a) Chlorofluorocarbons (CFCs); also used in fire extinguishers. (b) The sharp fall in the amount of ozone in the atmosphere since the 1980s. (c) Ozone is a deadly poison to breathe; it is only at the higher levels of the atmosphere that it does its useful work of shielding the earth from the Sun's ultraviolet radiation.

- CFCs, also in fire extinguishers (1)
- fall in atmospheric ozone (1)
- ozone is a poison at ground level; its shielding is at the higher levels of the atmosphere (1)

Section D (3 × 5 marks)

34. A drop of lemon juice falls on Meera's tongue and she makes a face. (a) Which receptors detect the sourness, and where in a nerve cell are receptors found? (b) Describe how the information travels through the first neuron. (c) The sour taste lasts for minutes, yet a neuron cannot keep sending impulses without a pause. Why not, and what second means of communication does the body therefore also use? [5]

Or *The lunch bell rings and Sameer, sitting near the canteen, hears it and smells hot samosas at the same moment. (a) Where are the receptors for the bell's sound found, what are receptors, and which receptors pick up the samosas? (b) Describe how the information from the bell becomes an impulse and travels through the first neuron. (c) The bell rings for a full minute, yet a neuron cannot keep sending impulses without a pause. Why not, and what second means of communication does the body therefore also use?*

(a) Gustatory receptors detect taste; receptors are the specialised tips of some nerve cells, located in sense organs such as the tongue. (b) The information acquired at the dendritic tip sets off a chemical reaction that creates an electrical impulse. The impulse travels from the dendrite to the cell body and then along the axon to its end. (c) Once a cell has generated and transmitted an impulse it needs time to reset before it can send another, so it cannot fire continually. The body therefore also uses chemical communication: a released compound diffuses to surrounding cells, which recognise it with special molecules on their surfaces; it is slower but reaches all cells, steadily and persistently.

- (a) gustatory receptors, the specialised tips of nerve cells in the tongue (1)
- (b) chemical reaction at the dendritic tip creates an electrical impulse (1)
- (b) impulse runs dendrite → cell body → axon to its end (1)
- (c) a cell needs time to reset after each impulse, so cannot fire continually (1)
- (c) chemical communication: compounds reach all cells, slower but persistent (1)

Or:

(a) In the inner ear; receptors are the specialised tips of some nerve cells, located in sense organs; olfactory receptors in the nose detect the smell. (b) The information acquired at the dendritic tip sets off a chemical reaction that creates an electrical impulse, which travels from the dendrite to the cell body and then along the axon to its end. (c) After generating and transmitting an impulse a cell needs time to reset, so it cannot fire continually. The body therefore also uses chemical communication: a released compound diffuses to surrounding cells, which recognise it with special surface molecules; it is slower but reaches all cells, steadily and persistently.

- (a) inner ear; specialised tips of nerve cells; olfactory receptors for the smell (1)
- (b) chemical reaction at the dendritic tip creates an electrical impulse (1)
- (b) impulse runs dendrite → cell body → axon to its end (1)
- (c) a cell needs time to reset after each impulse, so cannot fire continually (1)
- (c) chemical communication: compounds reach all cells, slower but persistent (1)

35. At a science exhibition, a thick straight copper rod stands vertically through a hole in a horizontal glass sheet, and a steady current flows down the rod. (a) Describe the shape of the magnetic field lines on the glass sheet and the plane they lie in. (b) Seen from above, do the lines go clockwise or anticlockwise? Name the rule you use. (c) Compare the field at 3 cm and at 6 cm from the rod. (d) State the effect on the field at a point of increasing the current, and of reversing it. [5]

Or *A long straight wire is stretched horizontally across a laboratory and passes at right angles through a vertical sheet of card. Sunita stands facing the card, and the current in the wire flows towards her. (a) Describe the shape of the field lines on the card and where their centre lies. (b) To Sunita, do the lines go clockwise or anticlockwise? Name the rule. (c) A compass on the card is moved from 2 cm to 8 cm from the wire. How does the field at the compass change? (d) State the effect on the field at a point of halving the current, and of reversing it.*

(a) Concentric circles with their centre on the rod, lying in the horizontal plane of the sheet, perpendicular to the rod. (b) Right-hand thumb rule: thumb pointing down along the current, the fingers curl clockwise as seen from above. (c) The field is smaller at 6 cm, because the field decreases as the distance from the conductor increases; the circles there are farther apart. (d) Increasing the current increases the field at the point; reversing the current reverses the direction of the field, so the lines go anticlockwise.

- concentric circles centred on the rod (1)
- in a plane perpendicular to the rod (1)
- clockwise from above, by the right-hand thumb rule (1)
- smaller at 6 cm, field falls with distance (1)
- more current, stronger field; reversed current, reversed field (1)

Or:

(a) Concentric circles in the plane of the card, which is perpendicular to the wire, with their centre on the wire. (b) Right-hand thumb rule: thumb pointing towards Sunita along the current, the fingers curl anticlockwise as she sees them. (c) The field becomes smaller, since it decreases as the distance from the conductor increases. (d) Halving the current makes the field at the point smaller; reversing the current reverses its direction, so the lines go clockwise.

- concentric circles centred on the wire (1)
- in the plane of the card, perpendicular to the wire (1)
- anticlockwise, by the right-hand thumb rule (1)
- smaller at 8 cm, field falls with distance (1)
- less current, smaller field; reversed current, reversed field (1)

36. In a school lab Arjun uses an electrolysis kit with two platinum electrodes, each under a graduated tube filled with water to which a few drops of dilute sulphuric acid have been added. Electrode X is joined to the negative terminal of a battery and electrode Y to the positive terminal. (a) Write the balanced equation for the change, with the condition over the arrow, and state which tube, X or Y, collects hydrogen. Give a reason. (2) (b) Why did Arjun add a few drops of dilute sulphuric acid to the water? (1) (c) If 0.5 g of hydrogen is collected, what mass of oxygen is collected with it? (1) (d) Is this reaction exothermic or endothermic? Give a reason. (1) [5]

Or *Sana electrolyses acidulated water to make the two gases that water is built from. (a) Name the gas collected over the positive electrode, and write the balanced equation for the overall change with state symbols and the condition over the arrow. (2) (b) Sana first tried distilled water with nothing added and saw almost no bubbles. Explain. (1) (c) Sana says the two gases form in a 2 : 1 ratio by mass, just as they do by volume. Correct her, giving the mass ratio. (1) (d) Name the form of energy that brings about this decomposition, and state whether the reaction absorbs or releases energy. (1)*

(a) $2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$, with 'electricity' written over the arrow (H 4, O 2 on each side). Tube X: hydrogen is evolved at the cathode, the negative electrode, and X is joined to the negative terminal. (b) Pure water is a poor conductor; the acid provides ions so the current can pass. (c) Hydrogen : oxygen by mass is 1 : 8, so 0.5 × 8 = 4 g of oxygen. (d) Endothermic: the decomposition goes on only while electrical energy is supplied.

- $2H_2O \rightarrow 2H_2 + O_2$ with electricity over the arrow (1)
- tube X, hydrogen at the negative electrode (cathode) (1)
- acid provides ions for conduction (1)
- 4 g of oxygen (1)
- endothermic, energy supplied as electricity (1)

Or:

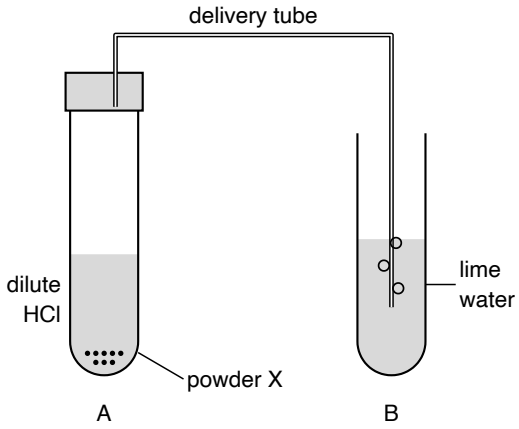
(a) Oxygen, which is evolved at the anode, the positive electrode. $2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$, with 'electricity' over the arrow (H 4, O 2 on each side). (b) Pure water is a poor conductor; without the acid there are too few ions to carry the current. (c) By mass hydrogen and oxygen form in the ratio 1 : 8; 2 : 1 is the ratio by volume. (d) Electrical energy; the reaction absorbs energy, so it is endothermic.

- oxygen over the positive electrode (1)
- $2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$ with electricity over the arrow (1)
- pure water a poor conductor; acid gives ions (1)
- mass ratio 1 : 8, not 2 : 1 (1)
- electricity; absorbs energy (endothermic) (1)

Section E (3 × 4 marks)

37. Read the passage and answer the questions that follow. [4]

Rohan sets up the apparatus shown. Test tube A holds a white powder X, to which he adds dilute hydrochloric acid. Brisk effervescence follows, and the gas formed is led through the delivery tube into the clear solution in test tube B. The solution in B soon turns milky. Rohan lets the gas bubble through B for several more minutes and finds that the milkiness slowly disappears.



(a) The gas that turns the solution in test tube B milky is [1]

(a) hydrogen (b) chlorine
(c) carbon dioxide (d) oxygen

Answer: (c) An acid with a metal carbonate or hydrogencarbonate gives carbon dioxide, which turns lime water milky.

(b) The milkiness disappears when the gas is passed for a long time because [1]

(a) the calcium carbonate dissolves as soluble calcium hydrogencarbonate (b) the calcium carbonate changes back to calcium hydroxide
(c) the gas carries the precipitate out of the tube (d) the lime water boils away

Answer: (a) Excess carbon dioxide converts the insoluble calcium carbonate into soluble calcium hydrogencarbonate, so the milkiness disappears.

(c) X is a sodium compound that is also used, with a mild edible acid, to make cakes rise. Identify X and write the balanced equation for its reaction with dilute hydrochloric acid. [2]

Or *Instead, X is marble, a naturally occurring form of a calcium compound, and the acid is dilute nitric acid. Identify X and write the balanced equation for the reaction.*

X is sodium hydrogencarbonate (baking soda), $NaHCO_3$. $NaHCO_3 + HCl \rightarrow NaCl + H_2O + CO_2$.

- X is sodium hydrogencarbonate, $NaHCO_3$ (1)
- balanced equation (1)

Or:

Marble is calcium carbonate, $CaCO_3$. $CaCO_3 + 2HNO_3 \rightarrow Ca(NO_3)_2 + H_2O + CO_2$.

- X is calcium carbonate, $CaCO_3$ (1)
- balanced equation (1)

38. Read the passage and answer the questions that follow. [4]

An auxiliary nurse midwife in a village in Odisha holds a counselling session for newly married couples. She shows a model with a small copper-T placed inside it, a packet of condoms, and a chart of the male and female reproductive tracts on which two tubes are marked with a cross. She explains that each method prevents pregnancy in a different way, that some methods have side effects, and that one of them also gives some protection against infections passed during sex.

(a) Of the methods shown, the one that also helps reduce the spread of sexually transmitted infections is the [1]

(a) copper-T (b) condom
(c) blocking of the vas deferens (d) blocking of the fallopian tube

Answer: (b) A condom on the penis creates a mechanical barrier and helps prevent transmission of many sexually transmitted infections to some extent; the other methods only prevent pregnancy.

(b) Where is the copper-T placed, and what side effect can it cause? [1]

It is placed in the uterus, and it can cause side effects through irritation of the uterus.

- placed in the uterus; may irritate the uterus (1)

(c) The two crossed tubes on the chart are the vas deferens and the fallopian tube. Explain how blocking each prevents pregnancy, and state the risk of the method. [2]

Or *Compare the condom and the copper-T: where each is used, and how the condom prevents pregnancy.*

Blocking the vas deferens prevents sperm transfer; blocking the fallopian tube stops the egg from reaching the uterus; in both cases fertilisation does not take place. Surgical methods are safe in the long run, but the surgery can cause infections and other problems if not performed properly.

- vas deferens block stops sperm; tube block stops the egg; no fertilisation (1)
- surgery can cause infection if not performed properly (1)

Or:

The condom is worn on the penis and forms a mechanical barrier so that sperm does not reach the egg. The copper-T is a device placed in the uterus to prevent pregnancy.

- condom on the penis: mechanical barrier, sperm does not reach the egg (1)
- copper-T is a device placed in the uterus (1)

39. Read the passage and answer the questions that follow. [4]

The Nair family in Thrissur want to understand their electricity bill. For one typical day they note the power rating of each appliance in their flat and how long it runs. The supply is 230 V, and the electricity board charges ₹6 for each unit of energy. Their brother says the iron must use the most energy because it has the highest rating; their mother thinks the fan, which runs most of the day, may use more.

Appliance	Power (W)	Use per day (h)
Ceiling fan	75	8
LED television	100	4
Mixer	500	0.4
Electric iron	1000	0.5

(a) Which appliance consumes the most electrical energy in a day? [1]

(a) ceiling fan (b) electric iron
(c) mixer (d) LED television

Answer: (a) Energy = power × time: fan 75 × 8 = 600 W h, iron 1000 × 0.5 = 500 W h, television 400 W h, mixer 200 W h. The fan uses the most though its rating is low.

(b) The total electrical energy consumed by the four appliances in a day is [1]

(a) 6.12 MJ (b) 1.7 MJ
(c) 0.47 MJ (d) 61.2 MJ

Answer: (a) 600 + 400 + 200 + 500 = 1700 W h = 1.7 kW h; $1.7 \times 3.6 \times 10^6$ J = 6.12×10^6 J = 6.12 MJ.

(c) Find the family's bill for these appliances for 30 such days. [2]

Or *Find the current drawn by the iron and choose its fuse from 2 A, 5 A and 10 A.*

1.7 kW h a day × 30 = 51 kW h = 51 units. Bill = 51 × ₹6 = ₹306.

- 51 units in 30 days (1)
- bill ₹306 (1)

Or:

I = P/V = 1000/230 ≈ 4.35 A. The fuse is the next rating above the working current: 5 A.

- I = P/V ≈ 4.35 A (1)
- 5 A fuse (1)