SCIENCE SQP (2024-25)
CLASS X
(Science 086)

Max. Marks: 80 **Time Allowed: 3 hours**

General Instructions:

1. All *questions would be compulsory. However, an internal choice of approximately 33% would be provided. 50% marks are to be allotted to competency-based questions.*
2. *Section A would have 16 simple/complex MCQs and 04 Assertion-Reasoning type questions carrying 1 mark each.*
3. *Section B would have 6 Short Answer (SA) type questions carrying 02 marks each.*
4. *Section C would have 7 Short Answer (SA) type questions carrying 03 marks each.*
5. *Section D would have 3 Long Answer (LA) type questions carrying 05 marks each.*
6. *Section E would have 3 source based/case based/passage based/integrated units of assessment (04 marks each) with sub-parts of the values of 1/2/3 marks.*

Section-A

Question 1 to 16 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

1 Identify ‘p’, ‘q’ and ‘r’ in the following balanced reaction — 1

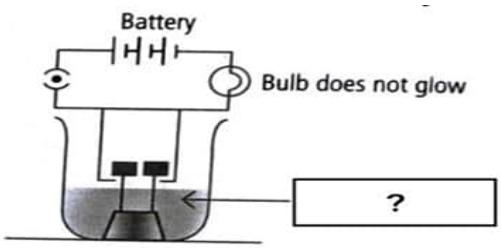
$$p\ Pb(NO_3)_{2(s)} \xrightarrow{Heat} q\ PbO_{(s)} + r\ NO_{2(g)} + O_{2(g)}$$

A. 2,2,4
B. 2,4,2
C. 2,4,4
D. 4,2,2

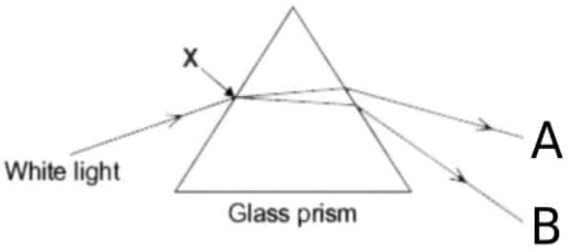
2 Match column I with column II and select the correct option using the given codes. — 1

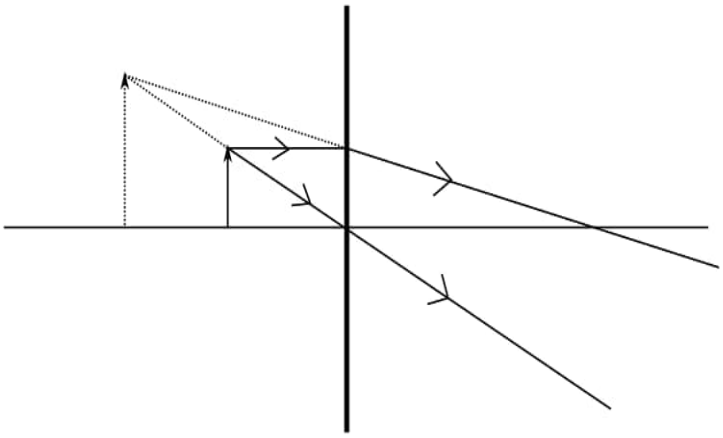
Column I	Column II
a. A metal that forms amphoteric oxides	(i) Ga
b. A metal which melts when kept on our palm	(ii) Au
c. A metal that reacts with nitric acid	(iii) Al
d. A metal which cannot displace hydrogen from acids	(iv) Mn

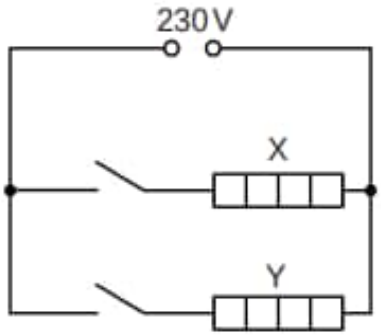
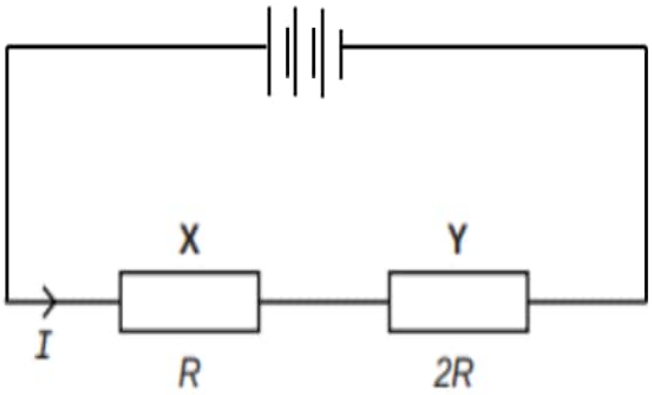
A. a – (ii), b – (i), c – (iii), d – (iv)
B. a – (iii), b – (i), c – (iv), d – (ii)
C. a – (iv), b – (ii), c – (iii), d – (i)
D. a – (iii), b – (ii), c – (i), d – (iv)

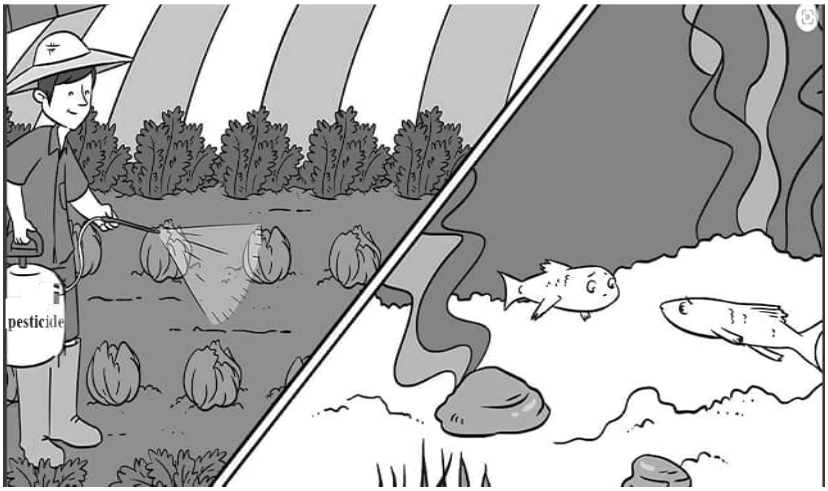
3	 The solution in the given figure is likely to be A. HNO_3 B. C_2H_5OH C. H_2SO_4 D. CO_2 in water - - - - - - - - - - - - - - *For Visual Impaired Students* Which among the following is considered as the strongest electrolyte? A. Dilute acid B. Dilute sugar solution C. Glucose solution D. Ethanol in water	1
4	An aqueous solution 'A' turns the phenolphthalein solution pink. On addition of an aqueous solution 'B' to 'A', the pink colour disappears. Which of the following statement is true for the solutions 'A' and 'B'. A. A is strongly basic and B is a weak base. B. A is strongly acidic and B is a weak acid. C. A has a pH greater than 7 and B has a pH less than 7. D. A has a pH less than 7 and B has a pH greater than 7.	1
5	When 50g of lead powder is added to 300 ml of blue copper sulphate solution, after a few hours, the solution becomes colourless. This is an example of A. Combination reaction B. Decomposition reaction C. Displacement reaction D. Double displacement reaction	1
6	The electronic configuration of three elements X, Y and Z are X- 2, 8, 7; Y- 2, 8, 2; and Z - 2, 8 A. Y and Z are metals B. Y and X are non-metals C. X is a non -metal and Y is a metal D. Y is a non-metal and Z is a metal	1
7	Which of the following is an endothermic reaction? A. Burning of candle. B. Cooking of food. C. Decomposition of Vegetable matter. D. Reaction of Sodium with air	1

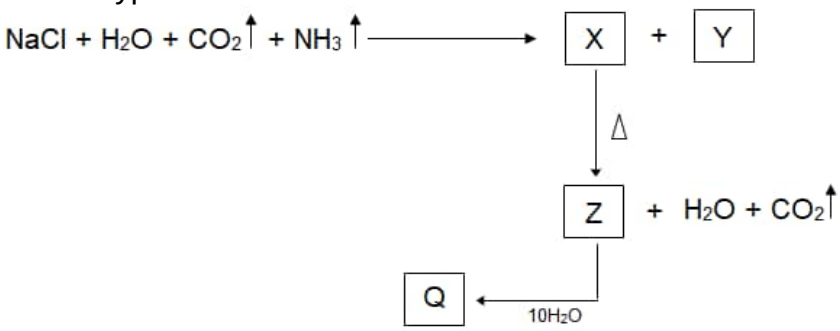
8	During cellular oxidation of Glucose, ATP is produced along with formation of other products in this reaction. Which of the following events is associated with production of maximum ATP molecules per molecule of Glucose during this process? Synthesis of A. ethanol in yeast B. lactic acid in muscle cells C. carbon dioxide in yeast cells D. carbon dioxide in human cells	1
9	During which of the following stages of the circulation of blood in a normal human being, the oxygenated blood is pumped to all parts of the body? A. contraction of the left atrium B. contraction of left ventricle C. relaxation of the right atrium D. relaxation of the right ventricle	1
10	Which of the following adaptations in herbivores helps in digestions of cellulose? A. Longer large intestine B. Smaller large intestine C. Smaller small intestine D. Longer small intestine	1
11	There was a cerebellar dysfunction in a patient. Which of the following activities will get disturbed in this patient as a result of this? A. Salivation B. Hunger control C. Posture and balance D. Regulation of blood pressure	1
12	In snails individuals can begin life as male and depending on environmental conditions they can become female as they grow. This is because A. male snails have dominant genetic makeup. B. female snails have dominant genetic makeup. C. expression of sex chromosomes can change in a snail's life time. D. sex is not genetically determined in snails.	1
13	In the following cases, a ray is incident on a concave mirror. In which case is the angle of incidence equal to zero? A. A ray parallel to the principal axis. B. A ray passing through the centre of curvature and incident obliquely. C. A ray passing through the principal focus and incident obliquely. D. A ray incident obliquely to the principal axis, at the pole of the mirror.	1

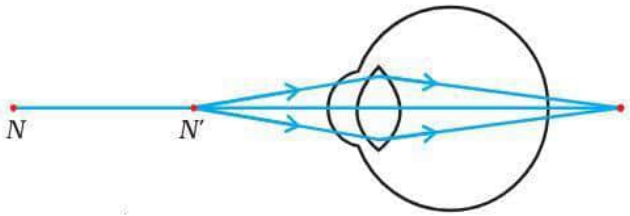
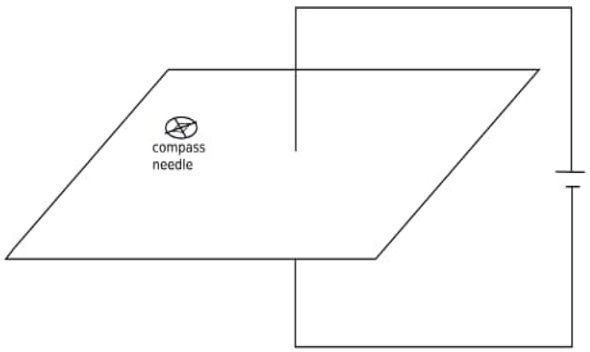
14	 Choose the correct option for the colour of rays for A and B. **Colour of Ray A** / **Colour of Ray B** A. Blue / Red B. Green / Yellow C. Red / Violet D. Violet / Indigo	1
15	Identify the incorrect statement 'The energy available to the producers is maximum' because: A. It is the first trophic level which absorbs1% of light energy directly from the source. B. It utilizes the most of the chemical energy for its own respiration, growth, reproduction, movement etc. C. It utilizes 10% of light energy and transfers the rest to the next trophic level. D. It transfers only 10% of light energy to the next trophic level.	1
16	Which of the following is not a role of decomposers in the ecosystem? A. Natural replenishment of soil. B. Enrichment of oxygen in atmosphere. C. Waste decomposition. D. Break-down of dead remains.	1
Question No. 17 to 20 consist of two statements – **Assertion** (A) and **Reason** (R). Answer these questions by selecting the appropriate option given below: A. Both A and R are true, and R is the correct explanation of A. B. Both A and R are true, and R is not the correct explanation of A. C. A is true but R is false. D. A is false but R is true		
17	**Assertion (A):** On adding dil. HCl to a test tube containing a substance 'X', a colourless gas is produced which gives a pop sound when a burning match stick is brought near it. **Reason (R):** In this reaction metal 'X' is displaced by Hydrogen.	1
18	**Assertion (A):** The number of chromosomes in a cell and in a germ cell is not the same in any species. **Reason (R):** When 2 germ cells combine they restore the normal number of chromosomes in a species.	1

<table>
<tr><td>19</td><td>Assertion (A): A convex mirror always forms an image behind it and the image formed is virtual.
Reason (R): According to the sign convention, the focal length of a convex mirror is positive.</td><td>1</td></tr>
<tr><td>20</td><td>Assertion (A): If the lions are removed from a food chain it will not affect the food chain, however if the plants are removed from a food chain it will disturb the ecosystem.
Reason (R): Plants are producers who can make food using sunlight, while lions are consumers.</td><td>1</td></tr>
<tr><td colspan="3">Section-B
Question No. 21 to 26 are very short answer questions</td></tr>
<tr><td>21</td><td>Identify the type of each of the following reactions stating the reason for your answers.
A. $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe + heat$
B. $Pb(NO_3)_2 + 2KI \rightarrow PbI_2(\downarrow) + 2KNO_3$</td><td>2</td></tr>
<tr><td>22</td><td>Differentiate between alveoli and nephron on the basis of the following points:
<table>
<tr><th>S. No.</th><th>Feature</th><th>Alveoli</th><th>Nephron</th></tr>
<tr><td>1</td><td>Structure and location</td><td></td><td></td></tr>
<tr><td>2</td><td>Function</td><td></td><td></td></tr>
</table></td><td>2</td></tr>
<tr><td>23</td><td><u>Attempt either option A or B.</u>
A. List the steps for the synthesis of glucose by the plants. What special feature is found in desert plants related to this process?
OR
B. Explain the role of the following enzymes in the process of digestion of food in humans:
(i) Salivary amylase
(ii) Pepsin
(iii) Trypsin
(iv) Lipase</td><td>2</td></tr>
<tr><td>24</td><td> 
The above figure shows the formation of an image by a lens shown by a thick line.</td><td>2</td></tr>
</table>

	Analyse the figure and answer the following questions. A. What is the type of lens used? B. What is the nature of the image? C. If the image is formed at a distance of 30 cm from the lens and the image is twice the size of the object, then where is the object placed? - - - - - - - - - - - - - - *For visually impaired students* A. What type of lens always forms a virtual erect and diminished image? B. List two uses of such a lens.	
25	*Attempt either option A or B.* A.  The electric circuit (above figure) in a clothes dryer contains two heaters X and Y in parallel. The above figure shows the circuit connected to a 230 V power supply. When both switches are closed, the current in X is 3.5 A. Analyse the circuit given above and answer the following questions. (i) Calculate the power developed in heater X. (ii) If the resistance of X is double that of Y calculate the current in heater Y. **OR** B.  The above figure shows two resistors X and Y connected in series to a battery. The power dissipated for this combination is P_1. When these resistors	2

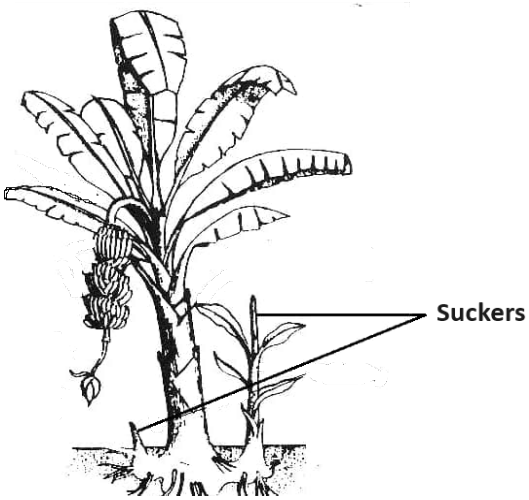
	are connected in parallel to the same battery then the power dissipated is given by P_2. Find out the ratio $\frac{P_1}{P_2}$. - - - - - - - - - - - - - - *For visually impaired students* A. We have four resistors A, B, C and D of resistance 3 Ω, 6 Ω ,9 Ω and 12 Ω respectively. Find out the lowest resistance which can be obtained by combining these four resistors. **OR** B. You are given 2 fuse wires A and B with current ratings 2A and 5A respectively. Justify with reason which of the two would you use with a 1000W, 220V room heater?	
26	The cartoon below addresses a growing concern:  main.jpg (1148×574) (frontiersin.org) What impact will the process shown in the image have on Humans if they occupy the last trophic level? Explain. - - - - - - - - - - - - - - *For visually impaired students* Create a food chain with more than 2 trophic levels that exists in the cabbage farm. If Humans occupy the last trophic level, then how would spraying pesticide affect the humans? Explain.	2
Section-C Question No. 27 to 33 are short answer questions		
27	A. Anirudh took two metal oxides; aluminium oxide and magnesium oxide as shown in the pictures given below. But he forgot to label them. How will you guide/ help Anirudh to identify the oxides and label them?	3

	  B. In an activity Aishu was given two substances; Copper Sulphide (Cu_2S) and Copper Oxide (Cu_2O) to obtain copper from these compounds. She was able to extract Copper successfully. Illustrate with the help of chemical equations how Aishu might have completed the activity. - - - - - - - - - - - - - - - *For visually impaired students* Give reasons for the following i. Certain metals are used for making cooking utensils. ii. Hydrogen gas does not evolve when certain metals except Mg & Mn react with nitric acid.	
28	*Attempt either option A or B.* A. (i) In the given series of reactions, name the compounds X and Z. (ii) Which type of reaction is X to Z?  (iii) You are given 3 unknown solutions A, B, and C with pH values of 6, 8 and 9.5 respectively. In which solution will the maximum number of hydronium ions be present? Arrange the given samples in the increasing order of H^+ ion concentration. **OR** B. Comment on the following statements: (i) Bee sting is treated with baking soda paste whereas wasp sting is treated with dilute vinegar. (ii) Farmers treat soil with quicklime when tilling. (iii) Ancient sculptures and marble structures are conserved by treating them with certain chemicals."	3
29	Water is used by the leaves of the plants for photosynthesis but rather than watering the leaves, we water the plant through the soil. How does this water reach the leaves of the plant?	3

30	A. In a family of four individuals, the father possessed long ears and the mother possessed short ears. If the parents had pure dominant and recessive traits respectively, then calculate the ratio of genetic makeup of F2 generation. Show a suitable cross. (2) B. If father had short ears and the mother had long ears, explain what effect it will have on the ratio of genetic makeup in F2 generation. (1)	3
31	A. What is the fundamental difference between hypermetropia and myopia in terms of the optical experience of a person? B. The diagram below shows a special case of an eye defect. (i) What is the defect that is shown in the figure? (ii) State one cause for such a defect? (iii) Explain with reason if a concave lens can be used to correct the defect.  - - - - - - - - - - - - - - *For visually impaired students* A. What is the fundamental difference between hypermetropia and myopia in terms of the optical experience of a person? B. What are the causes of myopia in the human eye?	3
32	A. State the relationship between the resistance R of a wire to its length l and cross sectional area A. Use the mathematical symbols to arrive at the final formula. B. Using the formula define the resistivity of a material.	3
33	 Mona was doing an experiment with a magnetic compass and a straight current-carrying wire. She observed that as she moved the compass away from the current-carrying wire, the deflection of the compass needle reduced. A. Explain why the deflection of the compass needle reduced as Mona moved away the compass needle from the current carrying wire. B. Mention one thing that could have changed in the circuit of the wire that could increase the deflection of the needle. C. Explain with reason what will be the direction of the magnetic field associated with the wire for the case described by the above figure.	3

Section-D

Question No. 34 to 36 are long answer questions.

34	*Attempt either option A or B.* A. (i) "Keerthi thinks that Substitution reaction occurs in saturated Hydrocarbons, on the contrary Krishi thinks, it occurs in unsaturated Hydrocarbons." Justify with valid reasoning whose thinking is correct. (ii) "Methane and Propane and their Isomers are used as fuels" Comment. Draw the electron dot structure of the immediate lower homologue of Propane. Give any two characteristics of homologues of a given homologous series. (iii) A mixture of oxygen and ethyne is burnt for welding. Can you predict why a mixture of ethyne and air is not used? **OR** B. (i) 'A' & 'B' are sodium salts of long-chain carboxylic acid and long chain Sulphonic acid respectively. Which one of A or B will you prefer as a cleansing agent while using underground water (hand pump water)? Give the reason for your answer. (ii) Elaborate on the process of cleansing action. Illustrate micelle with the help of labelled diagram. (iii) Write the chemical equation of the preparation of soap from an ester CH_3COOCH_3. What is the name of this process?	5
35	*Attempt either option A or B.* A. The image below shows a banana plant which is growing with the help of suckers. These suckers are small plant stem outgrowths which can be separated from the main plant and planted separately and they will grow into a new plant subsequently.  Fig.-1-Parts-of-Banana-plant-FAO-2021.png (623×609) (wp.com) (i) Give the name and type of reproduction that is shown in the image above. (1)	5

(ii) List two advantages the farmer will have on using the type of reproduction mentioned above. (2)

(iii) The above plant produces male flowers. Explain how this plant will be involved in the process of pollination. (1)

(iv) Why is the offspring of this banana plant not absolutely identical to its parent plant? (1)

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For visually impaired students

A. A banana plant is growing with the help of suckers. These suckers are small plant stem outgrowths which can be separated from the main plant and planted separately and they will grow into a new plant subsequently.

(i) Give the name and type of reproduction. (1)

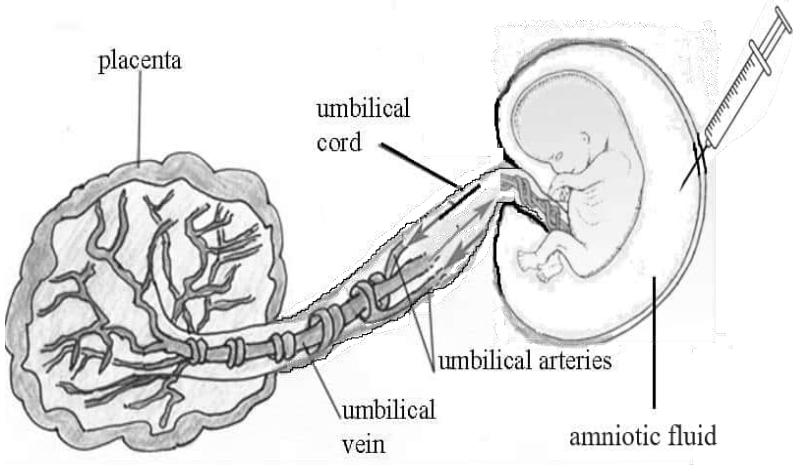
(ii) List two advantages the farmer will have on using the type of reproduction mentioned above. (2)

(iii) The above plant produces only male flower. Explain how this plant will be involved in the process of pollination. (1)

(iv) Why is the offspring of this banana plant not absolutely identical to its parent plant? (1)

OR

B. The image below shows a developing fetus in the mother's womb. The developing fetus is connected to the placenta by means of umbilical cord. The Umbilical vein and artery run inside the umbilical cord.



(i) Name two substance that moves through the blood vessels. (1)

(ii) If the placenta has less villi how will it affect the baby's growth? (1)

(iii) Name the region where the embryo develops inside the female body. Explain how this region is adapted for nourishing the baby. (1)

(iv) Some of the fetal cells fall off into the amniotic fluid and can be collected by careful procedure. The cells were screened and found to contain XY chromosome. (2)

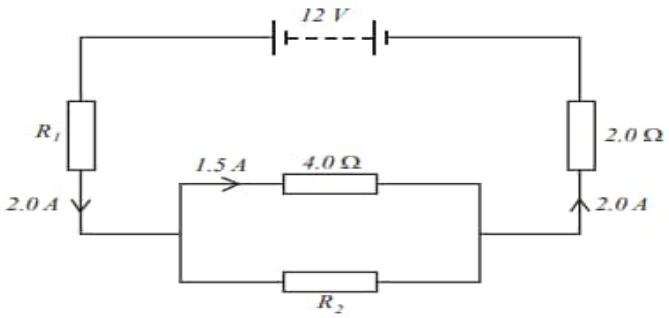
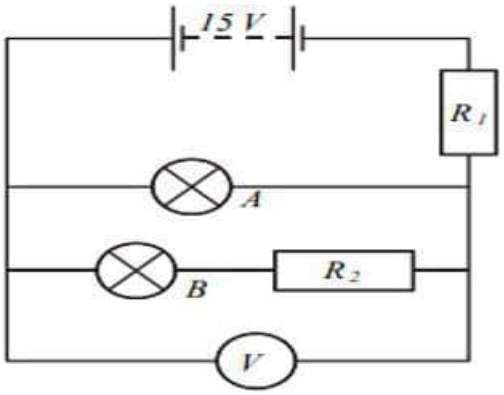
a) What is the sex of the foetus?

b) How is this prenatal sex determination misused?

- - - - - - - - - - - - - -

For visually impaired students

B. A developing fetus is connected to the placenta by means of umbilical cord. The Umbilical vein and artery run inside the umbilical cord.

	(i) Name two substance that moves through the blood vessels. (1) (ii) If the placenta has less villi how will it affect the baby's growth? (1) (iii) Name the region where the embryo develops inside the female body. Explain how this region is adapted for nourishing the baby. (1) (iv) Some of the fetal cells fall off into the amniotic fluid and can be collected by careful procedure. The cells were screened and found to contain XY chromosome. a) What is the sex of the foetus? b) How is this prenatal sex determination misused? (2)	
36	*Attempt either option A or B.* A.  The above circuit is a part of an electrical device. Use the information given in the question to calculate the following. (i) Potential Difference across R_2. (ii) Value of the resistance R_2. (iii) Value of resistance R_1 **OR** B.  As shown in the figure above A and B are two lamps. Lamp A is rated at 12 V, 24W. Lamp B is rated at 6.0 V. When lamp B operates at its rated voltage, the current in it is 3.0 A. The values of R_1 and R_2 are chosen so that both lamps operate at their rated voltages. Based on the information given, answer the following. (i) Calculate the current in Lamp A. (ii) State and give reason for the reading of the Voltmeter. (iii) Calculate the resistance of R_2. (iv) Find the value of the resistance R_1.	5

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For visually impaired students

A.

(i) State the law and write the formula connecting the electric current flowing through a conductor and voltage applied across it.

(ii) In a household five fans each of 100W are used for 4 hours and an electric press of 500W for 2 hours every day. Calculate the cost of using tube-lights and electric press for 60 days if the cost of 1 unit of electrical energy is Rs. 6.5.

OR

B.

(i) State Joules law of heating and write its mathematical expression.

(ii) Two resistors of resistances 2Ω and 4Ω are connected in

a) series

b) parallel

with a battery of given potential difference. Compute the ratio of total quantity of heat produced in the combination in the two cases if the total voltage and time are kept the same for both.

Section – E

Question No. 37 to 39 are case-based/data -based questions.

37 4

1. A + H_2O —ELECTROLYSIS→ X + Y↑ + Z↑
   X: CAUSTIC SODA; Y↑: ANODE; Z↑: CATHODE
2. A —ELECTROLYSIS→ M + Y↑
   A: MOLTEN; M: CATHODE; Y↑: ANODE
3. M + CH_3COOH → P + Z↑
4. CH_3COOH + Q —Conc. H_2SO_4→ R
5. R + X → P + Q

A. Derive the names of A, Y, Z, M, P & R

Attempt either subpart B or C.

B. Improvise an activity to test Z.

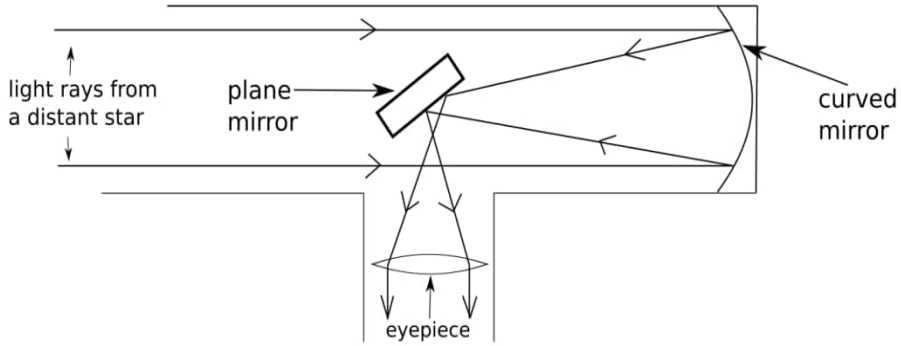
OR

C. Name the process in which compounds X, Y & Z are formed from A. Justify your response.

- - - - - - - - - - - - - -

For visually impaired students

	A. Distinguish between ethanol and ethanoic acid experimentally. *Attempt either subpart B or C.* B. Give the IUPAC name of the first member of Alkene which is formed by addition of conc. sulphuric acid to it. Illustrate the change with the help of a chemical equation. **OR** C. "All combustion reactions are oxidation but all oxidation reactions are not combustion." Justify.	
38	Mohan and Rohit observed that shoots of a plant growing in shade bend towards the sunlight. Whereas, leaves of 'Touch me not' plant fold and droop soon after touching. They were curious to know how these movements occur in plants.  A. Shoots of a plant bending towards light  B. Folding of leaves Touch me not plant In order to help them understand the movements in the plants, answer the following questions: *Attempt either subpart A or B.* A. What causes the bending of shoots in the plants as shown in figure A? **OR** B. What causes the folding of the leaves in 'Touch me not' plant as shown in figure B? (2) C. Compare the movement of growth of the pollen tube towards ovule with the movements shown in part A of the above figure. (1) D. Compare the movement shown in figure B with the movement of body parts in the animals. (1)	4

	- - - - - - - - - - - - - - *For visually impaired students* During a field trip, Mohan and Rohit observed that shoots of sunflower plants bend towards the sunlight. Whereas, leaves of 'Touch me not' plant begin to fold and droop soon after touching even during the day. They were curious to know how these movements occur in plants. *Attempt either subpart A or B.* A. What causes the bending of shoots in the sunflower plants towards sunlight? **OR** B. What causes the folding of the leaves in 'Touch me not' plants when touched by hand? (2) C. Compare the movement of growth of the pollen tube towards ovule with the bending of shoots of sunflower plant towards sunlight. (1) D. Compare the movement in folding of leaves of 'Touch me not' plants with the movement of body parts in the animals. (1)	
39	 The above image is that of a reflecting telescope. Reflecting telescopes revolutionised our ways of looking into the sky. They employ mirrors to gather and focus light, rather than relying solely on lenses as in their refracting counterparts. These telescopes utilise precisely shaped and polished mirrors to capture incoming light and reflect it to a focal point, where it forms an image for observation. A. What kind of image of the star is seen by the observer at the eyepiece? B. What kind of mirror is used in this reflecting telescope? *Attempt either subpart C or D.* C. Explain with reason what kind of optical device (type of lens or mirror) that is used at the eyepiece. **OR** D. What is the role of the plane mirror in the telescope? - - - - - - - - - - - - - - *For visually impaired students* Azim Taraporewala was a traveller and science enthusiast. During one of his	4

	travels he found himself on the edge of an island without any mode of communication. As he had read in many stories, he thought he would light a fire on the beach and travelling boats or ships could see that fire and come to give him a ride. He had run out of lighters and match-sticks but had a reading glass. Being a science enthusiast he knew some tricks and used that lens and a scrap of paper to light a fire, with the help of scorching rays from the sun. A. Which lens can be used by Azim to create the fire? B. What property of the lens helps Azim to create the fire? *Attempt either subpart C or D.* C. List two more uses of this kind of lens. **OR** D. Explain with reason the condition under which the lens can form both real as well as virtual images.	

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MARKING SCHEME
2024 -25
Class X Science (086)

Section-A		
1	A. 2,2,4	1
2	B. a – (iii), b – (i), c – (iv), d – (ii)	1
3	A. C_2H_5OH **Alternate question for VI** A. Dilute acid	1
4	C. A has a pH greater than 7 and B has a pH less than 7	1
5	C. Displacement reaction	1
6	C. X is a non-metal and Y is a metal.	1
7	B. Cooking of food	1
8	D. carbon dioxide in human cells	1
9	B. contraction of left ventricle.	1
10	D. Longer small intestine.	1
11	C. Posture and balance.	1
12	D. sex is not genetically determined in snails.	1
13	B. A ray passing through the centre of curvature and incident obliquely.	1
14	C. Red Violet	1
15	C. It utilizes 10% of light energy and transfers the rest to the next trophic level.	1
16	B. Enrichment of oxygen in the atmosphere.	1
17	A. A is true but R is false	1
18	B. Both A and R are true, and R is not the correct explanation of A	1
19	B. Both A and R are true, and R is not the correct explanation of A	1
20	D. A is false but R is true.	1

Section-B

21 — 2

A. Exothermic/Displacement reaction/Redox reaction. (0.5)
Heat is evolved or a More reactive element displaces a less reactive element or aluminium reduces iron (II) oxide to iron (0.5)

B. Double displacement / Precipitation reaction (0.5)
As there is an exchange of ions between reactants and products / (Yellow) precipitate (of Lead iodide) is formed (0.5)

22 — 2

S. No.	Feature	Alveoli	Nephron
1	Structure and location	Balloon like structures present at the terminal ends of bronchioles in lungs	Tubular structure present in kidneys
2	Function	Exchange of gases	Filtration of blood to form urine

23 — 2

Students to attempt either option A or B.

A. Steps of synthesis of glucose in plants:

- Absorption of light energy by chlorophyll
- Conversion of light energy to chemical energy and splitting of water molecules into hydrogen and oxygen
- Reduction of carbon dioxide into carbohydrates.
- Desert plants take up carbon dioxide at night and prepare an intermediate which is acted upon by the energy absorbed by the chlorophyll during the day. (0.5 x 4)

OR

B.

- Salivary amylase – breaks down starch which is a complex molecule to sugar.
- Pepsin – Helps to digest proteins in stomach.
- Trypsin – It helps in digesting proteins to amino acids.
- Lipase – Breaking down of emulsified fats to fatty acids and glycerol. (0.5 x 4)

24 — 2

A. The lens is a convex lens.
B. The image is virtual.
C. Magnification for lens = $\frac{v}{u} = \frac{h_i}{h_o}$ = 2.

$\frac{-30cm}{u}$ = 2

Hence u = -15 cm

- - - - - - - - - - - -

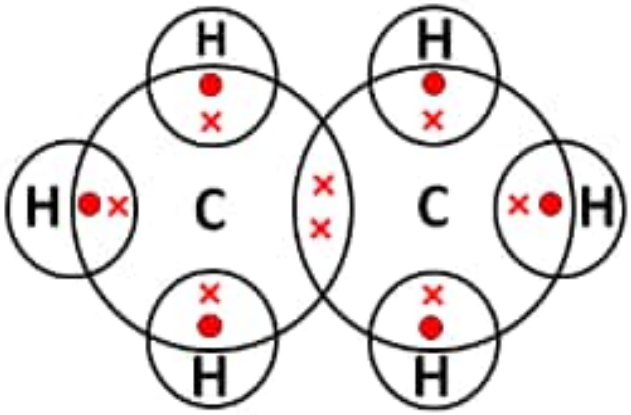
For visually impaired students

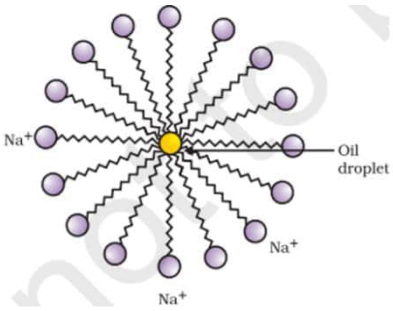
A. concave lens (1)
B. correction of myopia and peepholes of doors or any other correct alternative. (1)

25	*Student to attempt either A or B.* A. P = VI (1) = 230 × 3.5 = 805 W I $\propto \frac{1}{R}$, so half the resistance means double the current. Therefore, current in Y = 7.0 A. (1) **OR** B. For series total resistance is R+2R = 3R (0.5) $P_1 = \frac{V^2}{3R}$. (0.5) For parallel total Resistance is $\frac{2R}{3}$. (0.5) $P_2 = \frac{V^2}{2R/3} = \frac{3V^2}{2R}$. $\frac{P_1}{P_2} = \frac{2}{9}$. (0.5) - - - - - - - - - - - - *For visually impaired students* A. The resistance will be lowest/minimum if all the resistors are connected in parallel. The equivalent resistance in parallel combination is given by (0.5) $$\frac{1}{R_{eqv}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$$ (0.5) Substituting the values, we get $$\frac{1}{R_{eqv}} = \frac{1}{3} + \frac{1}{6} + \frac{1}{9} + \frac{1}{12}$$ (0.5) $$= \frac{12+6+4+2}{36} = \frac{24}{36} = \frac{2}{3}$$ $$R_{eqv} = \frac{3}{2} = 1.5\,\Omega$$ (0.5) **OR** B. $P = V \times I$ (0.5) $I = \frac{P}{V} = \frac{1000}{220} = 4.54\,A$ (0.5) We will be using fuse B with is rated as 5A. This is because it will be able to sustain the current (4.54 A) passing through it. Whereas fuse A will melt and break the circuit as the current exceeds its rating. (1)	2
26	Pesticides are non-biodegradable/ keep getting accumulated at each trophic level, / persist for longer time/ and thus last trophic level has highest concentration/ humans will have the highest concentration of pesticides/ leads to bio-magnification. (any 2 points) - - - - - - - - - - - - *For visually impaired students*	2

	Cabbage/plant-> rabbit-> snake-> owl (Any other relevant food chain) (1) Pesticides are non-biodegradable and persist for long. So when humans consume plants or any animal that consume this plant, the pesticide enters the food chain and keeps getting accumulated at each trophic level, thus the organism in the last trophic level-human being has the highest concentration of pesticide and this is called **biological magnification.** (1)	
Section-C		
27	A. Aqueous solution of magnesium oxide turns red litmus to blue. Aluminium oxide is amphoteric and insoluble in water. Thus, it does not change the colour of either blue or red litmus. **OR** Magnesium oxide reacts with acid only whereas Aluminium oxide reacts with acids and bases, which are amphoteric. (1) B. $2Cu_2S + 3O_2(g) \xrightarrow{Heat} 2Cu_2O(s) + 2SO_2(g)$ $2Cu_2O + Cu_2S \xrightarrow{Heat} 6Cu(s) + SO_2(g)$ (1+1) - - - - - - - - - - *For visually impaired students* A. Certain metals (like aluminium/ copper) are used for making cooking utensils as they are good conductors of heat and have high melting points. (0.5 + 0.5) B. Hydrogen gas is not evolved when a metal reacts with nitric acid. This is because HNO3 is a strong oxidising agent. It oxidises the H2 produced to water and itself gets reduced to any of the nitrogen oxides (N_2O, NO, NO_2). But magnesium (Mg) and manganese (Mn) react with very dilute HNO_3 to evolve H_2 gas. (1+1)	3
28	*Students to attempt either A or B.* A. (i) X = $NaHCO_3$; Z = Na_2CO_3 (0.5+0.5) (ii) Decomposition reaction (0.5) (iii) Solution A (0.5) (iv) Increasing order or H+ ions C<B<A (1) **OR** B. (i) As bee sting is acidic and wasp sting is basic. (1) (ii) To change the nature of soil to (neutral or basic). (1) (iii) To protect sculptures from the effects of certain gases present in environment and acid rain. (1)	3
29	• In plants, the water is absorbed by the plants from the soil through the roots. Xylem tissue of the roots, stems and leaves are interconnected to form a continuous system of water conducting channels. (1) • During the day, when stomata are open, the transpiration pull becomes	3

	the major driving force for the movement of water in the xylem. (1) ● Evaporation of water molecules from the stomata creates a suction which pulls water from the xylem cells of roots to the stem and then to the leaves. (1)	
30	(Any letter which clearly indicated dominant and recessive ears, example, L or E or any other) A. LL × ll F1= Ll Ll X Ll 1LL:2Ll:1ll. (2) B. No change in ratio/the ratio of F2 generation will still be 1LL:2Ll:1ll/ ratio will be the same. As the cross is still between a pure dominant and recessive allele/ genes/ traits/characters /as shown in the cross above. (1)	3
31	A. Hypermetropia is a defect that causes difficulty in focusing on near objects, with clearer vision observed for distant objects. In Myopia distant objects appear blurry while near objects are seen clearly. (1) B. (i) The image shows a case of hypermetropia. (0.5) (ii) shortening of the eyeball or focal length of the eye lens becomes too long. (0.5) (iii) No the concave lens would diverge the rays coming to the eyeball and will push the image even further, but a convex lens should be used which will help to converge the rays and create the image at the exact place on the retina. (1) - - - - - - - - - - - - *For visually impaired students* A. Hypermetropia is a defect that causes difficulty in focusing on near objects, with clearer vision observed for distant objects. In Myopia distant objects appear blurry while near objects are seen clearly. (1) B. High converging power of eye lens, elongation of eye-ball. (2)	3
32	A. $R \propto l$ $R \propto \frac{l}{A}$ $R = \rho \frac{l}{A}$. (1.5) B. $R = \rho \frac{l}{A}$ $\rho = R\frac{A}{l}$ for A =1m^2 and l =1m, we have ρ = R Hence resistivity is the resistance offered by a wire of length 1 m having a cross sectional area of 1 m^2. (1.5)	3
33	A. Magnetic field strength is inversely proportional to the distance from the	3

	current carrying wire. Hence when Mona moved the compass away from the current carrying wire, the magnetic effect was less on it and hence the deflection was less. (1) B. Magnetic field strength is directly proportional to the current in the wire. So, Mona could increase the current in the circuit to observe a greater deflection in the compass needle. (1) C. The battery suggests that the current is going from top of the plane to the bottom of the plane. Using the right hand thumb rule we can say that the magnetic field will be clockwise. (1)	
Section-D		
34	*Student to attempt either option A or B.* A. (i) Keerthi's thinking is correct as substitution reactions occur in saturated hydrocarbons, hydrogen atoms are replaced with heteroatoms in saturated hydrocarbons. Whereas in unsaturated hydrocarbons an addition reaction occurs, simple molecules are added across double and/or triple bonds. (1) (ii) Methane and propane undergo combustion reaction in presence of oxygen and produce large amount of energy. (1) The lower homologue of propane is ethane has the following electron dot structure:  (1) ANY TWO CHARACTERISTICS - Difference in -CH2- / 14u molecular mass of any two adjacent homologues. - Same general formula/ functional group - Similar chemical properties - Gradual change in physical properties (1) (iii) The mixture of ethyne and oxygen in sufficient amounts undergoes complete combustion to fire a clean blue flame. In pressure of insufficient supply of oxygen or in presence of air, ethyne does not undergo complete combustion and produces sooty flame. (1) **OR**	5

	B. (i) 'B' is preferred for cleansing action. The calcium and magnesium salts present in underground water are precipitated with carboxylic acids. The Ca^{++} and Mg^{++} salts of sulphonic acid are soluble in water. 'B' is a more effective cleansing agent in presence of Ca and Mg salts. (1) (ii) • Soaps are molecules in which the two ends have differing properties, one is hydrophilic, that is, it dissolves in water, while the other end is hydrophobic, that is, it dissolves in hydrocarbons. • The molecules of soap are sodium or potassium salts of long-chain carboxylic acids. The ionic end of soap dissolves in water while the carbon chain dissolves in oil. The soap molecules, thus form structures called micelles where one end of the molecules is towards the oil droplet while the ionic end faces outside. This forms an emulsion in water. The soap micelle thus helps in dissolving the dirt in water and we can wash our clothes clean  (Labelled fig - 1 + 2) (iii) CH_3COOCH_3+ NaOH → CH_3COONa+ CH_3OH The process is saponification. (0.5 + 0.5)	
35	*Students to attempt either option A or B.* A. (i) Vegetative propagation/ asexual reproduction. (0.5+0.5) (ii) More crops in same time interval, genetically identical, flower fruit faster, no need to depend on pollinators. (1+1) (iii) Cross pollination, the pollen from anther will be transferred the stigma of another banana plant using agents like wind, water, or insects etc. (0.5+0.5) (iv) There would be minor changes/some variation during the process of copying of the DNA. (1) - - - - - - - - - - - - *For visually impaired students* (i) Vegetative propagation/ asexual reproduction. (0.5+0.5) (ii) More crops in same time interval, genetically identical, flower fruit faster, no need to depend on pollinators. (1+1) (iii) Cross pollination, the pollen from anther will be transferred the stigma of another banana plant using agents like wind, water, or insects etc. (0.5+0.5)	5

	(iv) There would be minor changes/some variation during the process of copying of the DNA. (1) **OR** B. (i) Nutrients /glucose/oxygen/ waste. (any two) (1) (ii) less surface area for nutrients (glucose/oxygen) to pass from mother to embryo slow growth. (1) (iii) uterus; has thick lining with rich supply of blood to nourish the embryo. (1) (iv) a) male child b) misused as if the foetus is female, some people engage in aborting the child leading to female foeticide. (2) - - - - - - - - - - - - <u>*For visually impaired students*</u> A. (i) Nutrients /glucose/oxygen/ waste. (any two) (1) (ii) less surface area for nutrients (glucose/oxygen) to pass from mother to embryo slow growth. (1) (iii) uterus; has thick lining with rich supply of blood to nourish the embryo. (1) (iv) a) male child b) misused as if the foetus is female, some people engage in aborting the child leading to female foeticide. (2)	
36	<u>*Students to attempt either option A or B.*</u> A. (i) p.d. across 4 Ω resistor = p.d. Across R2 as both are in parallel. (0.5) 1.5 (A) × 4 (Ω) = 6 V (0.5) (ii) Total Current through 4 Ω and R_2 = 2.0 A (given). Current through 4 Ω = 1.5 A (given) (0.5) Hence current through R_2 = 2-1.5= 0.5 A Using Ohm's law for R_2 we get (0.5) 6 V= 0.5 A x R_2 Hence R_2 = 6/0.5 = 12 Ω (0.5) (iii) p.d. across R_1 = Total p.d. - (p.d. across R_2) - (p.d. across 2.0 Ω) (0.5) p.d. across 2.0 Ω = 2x2 = 4 V p.d. across R_2 = 6 V (calculated before) (0.5) Hence p.d. across R_1 = 12 − 6 − 4 = 2 V (0.5) Current through R_1 = 2A (0.5) Using Ohm's Law, we get R_1 = 2V/2A = 1Ω (0.5)	5

Alternative method

Total Resistance = R1 + $\frac{(4\ x\ 12)}{(4+12)}$ + 2 = 12V/2 A = 6Ω (0.5)

R1 = 6 – (3 + 2) = 1 Ω (0.5)

OR

B.

(i) Use of P = IV (0.5)

I = P ÷ V = 24 W ÷ 12V

Current in lamp A – 2 A (0.5)

(ii) Voltmeter reading = 12 V (0.5)

Lamp A and Lamp B are in parallel.

Hence p.d. across the arm containing A = p.d. across arm containing B

= 12 V (from a) (0.5)

(iii) p.d. across R_2 + p.d. across B = 12 V. (0.5)

p.d. across B = 6 V (given)

Hence p.d. across R_2 = 12 V - 6 V = 6V (0.5)

Current through R_2 = Current through B = 3A (given) (0.5)

Use of R = V/I

R_2 =6V/3A = 2Ω (0.5)

(iv) Current through R_1 = Total Current = 3A+2A = 5A (0.5)

p.d. across R_1 = 15V -12 V = 3V

R_1=3V/5A = 0.6 Ω (0.5)

- - - - - - - - - - - -

For visually impaired students

A.

(i) Ohm's Law is the law, which states that the electric current (I) flowing through a conductor is directly proportional to the voltage (V) applied across it and inversely proportional to the resistance (R) of the conductor. Mathematically, it can be represented as: (1)

$V \propto I$

$V = IR$ (1)

(ii) Let the energy consumed by the fans be E_f and the energy consumed by the electric press be E_p.

- $E_f = P \times t = \frac{100 \times 4}{1000} = 0.4\ kWh$
- $E_p = P \times t = \frac{500 \times 2}{1000} = 1\ kWh$ (1)
- Total energy consumed in 1 day = $E_p + E_f = 1.4\ kWh$

Total energy consumed in 60 days = $1.4 \times 60 = 84\ kWh.$

Total cost = $84 \times Rs.6.5 = Rs.546.00$ (2)

OR

B.

(i) Joule's Law of Heating states that the amount of heat produced in a conductor is directly proportional to the square of the electric current passing through it, the resistance of the conductor, and

the time for which the current flows. Mathematically, it can be expressed as

$$H = I^2Rt$$

- *H* is the heat produced (in joules),
- *I* is the electric current (in amperes),
- *R* is the resistance of the conductor (in ohms),
- *t* is the time for which the current flows (in seconds).

(ii) Let the equivalent resistance in series be denoted by R_s and that for parallel be denoted by R_p. Total voltage of the circuit is given by V in both cases and the time is denoted by t.

- $R_s = 2 + 4 = 6\Omega$
- $\frac{1}{R_p} = \frac{1}{2} + \frac{1}{4} = \frac{3}{4}, R_p = \frac{4}{3}$
- $H_s = \frac{V^2}{R_s}t, H_p = \frac{V^2}{R_p}t$
- $\frac{H_s}{H_p} = \frac{R_p}{R_s} = \frac{2}{9}$

SECTION – E

37

A. A - Sodium chloride
Y - Chlorine gas,
Z - Hydrogen gas,
M - Sodium metal,
P - Sodium ethanoate &
R - Ethyl ethanoate/ester (0.5 X 6 = 3)

4

Student to attempt either subpart B or C.

B. Any activity similar to the given figure (1)

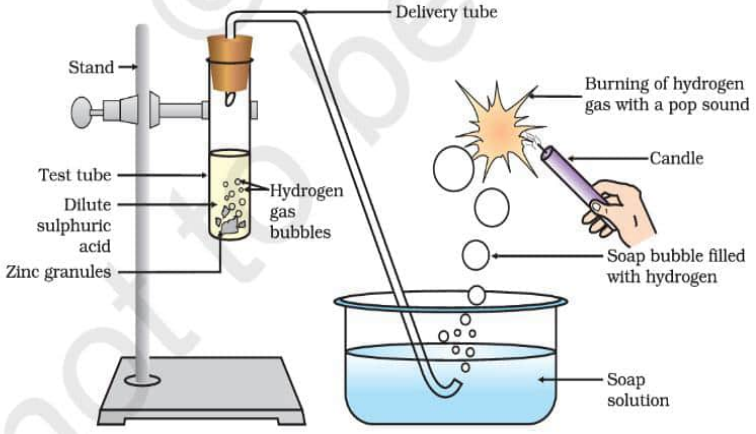


Figure 2.1 *Reaction of zinc granules with dilute sulphuric acid and testing hydrogen gas by burning*

OR

C. Chlor alkali process

The process is called the chlor-alkali process because of the products formed from chlorine and alkali for sodium hydroxide. (1)

	- - - - - - - - - - - - *For visually impaired students* A. <table><tr><td>ETHANOIC ACID</td><td>ETHANOL</td></tr><tr><td>Reaction with carbonates and hydrogen carbonates: Ethanoic acid reacts with carbonates and hydrogen carbonates to give rise to salt, carbon dioxide and water. The salt produced is commonly called sodium acetate. $2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + H_2O + CO_2$</td><td>No reaction</td></tr></table>(1+1) B. Ethene C_2H_5OH ------Hot Conc Sulphuric acid---→ $CH_2=CH_2 + H_2O$ (1) C. In combustion reactions oxygen is added hence all combustion reactions are oxidation, whereas in oxidation reactions, energy may or may not be released (along with the products), hence all oxidation reactions are not combustion reactions. (1)	
38	*Students to attempt either subpart A or B.* A. ● Bending of shoots of plants is a response to the stimulus and a directional, growth-related movement. ● When growing plants detect sunlight, a hormone called auxin, synthesized at shoot tip helps the cells to grow longer. ● When light is coming from one side of the plant, auxin diffuses to the shady side of the shoot. ● This concentration of auxin stimulates the cells of the shoot to grow longer on the side of the shoot which is away from the light. Thus, plant appears to bend towards light. (0.5 x 4 =2) **OR** B. ● Leaves of 'Touch me not' plant respond to the stimulus by showing growth independent movement. ● These plants use electrical–chemical means to convey the information from cell to cell. ● Movement happens at a point different from the point of touch. ● Plant cells change shape by changing the amount of water in them, resulting in swelling or shrinking, and therefore in changing shape. (0.5 x 4 =2) C. Growth of pollen tubes towards the ovule is an example of chemotropism whereas bending of shoots towards sunlight is an example of phototropism. (1)	4

	D. i) Although both plants and animals show electrical–chemical means to convey the information from cell to cell but unlike nerve cells in animals there is no specialized tissue in plants for conduction of information. (0.5) ii) In animal cells, change in shape occurs because of the specialized proteins found in muscle cells; plant cells change shape by changing the amount of water in them. (0.5) - - - - - - - - - - - - *For visually impaired students* *Students to attempt either subpart A or B.* A. ● Bending of shoots of plants is a response to the stimulus and a directional, growth-related movement. ● When growing plants detect sunlight, a hormone called auxin, synthesized at shoot tip helps the cells to grow longer. ● When light is coming from one side of the plant, auxin diffuses to the shady side of the shoot. ● This concentration of auxin stimulates the cells of the shoot to grow longer on the side of the shoot which is away from the light. Thus, plant appears to bend towards light. (0.5 x 4 =2) **OR** B. ● Leaves of 'Touch me not' plant respond to the stimulus by showing growth independent movement. ● These plants use electrical–chemical means to convey the information from cell to cell. ● Movement happens at a point different from the point of touch. ● Plant cells change shape by changing the amount of water in them, resulting in swelling or shrinking, and therefore in changing shape. (0.5 x 4 =2) C. Growth of pollen tubes towards the ovule is an example of chemotropism whereas bending of shoots towards sunlight is an example of phototropism. (1) D. i) Although both plants and animals show electrical–chemical means to convey the information from cell to cell but unlike nerve cells in animals there is no specialized tissue in plants for conduction of information. (0.5) ii) In animal cells, change in shape occurs because of the specialized proteins found in muscle cells; plant cells change shape by changing the amount of water in them. (0.5)	
39	A. Real Image (the final image is formed due to the lens at the eye-piece) (1)	4

	B. Concave Mirror (1) *Student to attempt either subpart C or D.* C. A converging lens is used at the eyepiece to collect the rays from the plane mirror and help the viewer to see a real erect image of the star. (2) **OR** D. The plane mirror laterally inverts the image formed by the curved mirror and its position helps to direct the rays towards the eye-piece. (2) - - - - - - - - - - - - *For visually impaired students* A. Convex lens. (1) B. Converging property. The lens can converge parallel rays to one point. (1) *Student to attempt either subpart C or D* C. To correct hypermetropia, lenses of telescopes, microscopes and slide projectors. (2) **OR** D. If the object is kept between the optical centre and the focus the image obtained is virtual, rest in all cases the image is real.	

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