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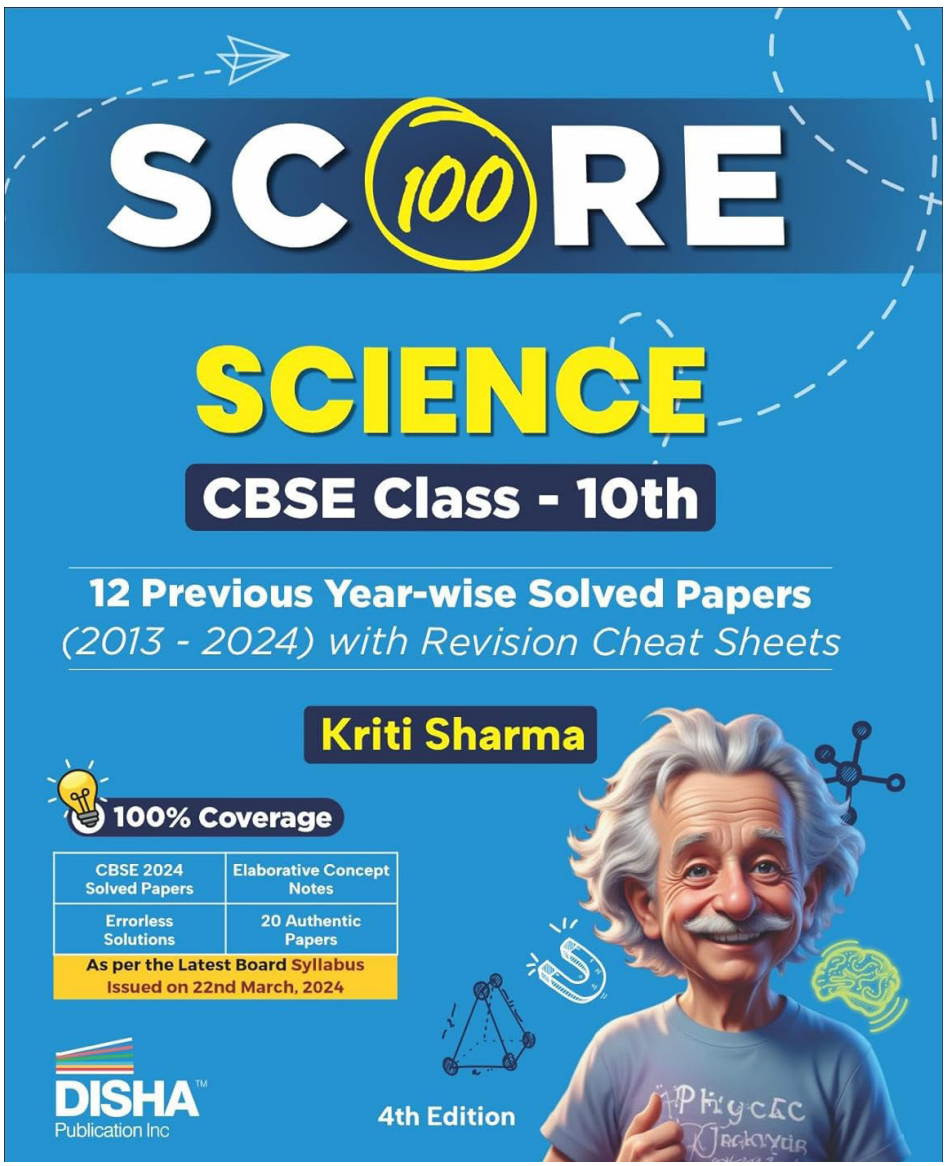
All India 2023 Solved Paper

This sample is taken from the **"Score 100 Science CBSE Class 10th 12 Previous Year-wise Solved Papers (2013 - 2024) with Revision Cheat Sheets 4th Edition"**



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All India 2023

CBSE Board Solved Paper

Time Allowed : 3 hrs. *Maximum Marks : 80*

General Instructions:

Read the following instructions very carefully and strictly follow them :

(i) This question paper consists of **39** questions. **All** questions are compulsory.
(ii) Question paper is divided into **FIVE** sections – **Section A, B, C, D** and **E**.
(iii) In **section A** – question number 1 to 20 are multiple choice questions (MCQs) carrying **1** mark each.
(iv) In **section B** – question number 21 to 26 are very short answer (VSA) type questions carrying **2** marks each. Answer to these questions should be in the range of 30 to 50 words.
(v) In **section C** – question number 27 to 33 are short answer (SA) type questions carrying **3** marks each. Answer to these questions should in the range of 50 to 80 words.
(vi) In **section D** – question number 34 to 36 are long answer (LA) type questions carrying **5** marks each. Answer to these questions should be in the range of 80 to 120 words.
(vii) In **section E** – question number 37 to 39 are of 3 **source based/case based units of assessment** carrying **4** marks each with sub-parts.
(viii) There is no overall choice. However, an internal choice has been provided in some sections.

SECTION - A

Select and write one most appropriate option out of the four options given for each of the questions 1 - 20:

1. Metal oxides generally react with acids, but few oxides of metal also react with bases. Such metallic oxides are: **1**

I. MgO II. ZnO
III. Al_2O_3 IV. CaO
(a) I and II (b) II and III
(c) III and IV (d) I and IV

2. Few drops of aqueous solution of ammonium chloride are put on a universal indicator paper. The paper turns pink. **1**

Study the following table and choose the correct option.

	Nature	Ammonium chloride is a salt of …..	Range of pH
(a)	acidic	weak acid and strong base	less than 7
(b)	basic	weak acid and strong base	more than 7
(c)	acidic	strong acid and weak base	less than 7
(d)	basic	strong acid and strong base	7

3. Select the appropriate state symbols of the products given as X and Y in the following chemical equation by choosing the correct option from table given below:

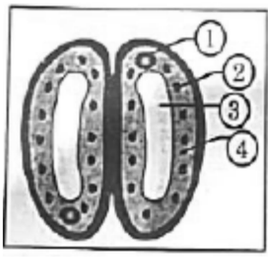
$$Zn_{(s)} + H_2SO_{4(l)} \longrightarrow ZnSO_{4(X)} + H_{2(Y)}$$ **1**

	(X)	(Y)
(a)	(s)	(l)
(b)	(aq)	(g)
(c)	(aq)	(s)
(d)	(g)	(aq)

4. Two salts 'X' and 'Y' are dissolved in water separately. When phenolphthalein is added to these two solutions, the solution 'X' turns pink and the solution 'Y' does not show any change in colour, therefore 'X' and 'Y' are **1**

	(X)	(Y)
(a)	Na_2CO_3	NH_4Cl
(b)	Na_2SO_4	$NaHCO_3$
(c)	NH_4Cl	Na_2SO_4
(d)	$NaNO_3$	Na_2SO_4

5. In the given diagram of a closed stomata: (1), (2), (3) and (4) respectively are: **1**



(a) nucleus, chloroplast, guard cell, vacuole

(b) nucleus, chloroplast, vacuole, guard cell

(c) chloroplast, nucleus, vacuole, guard cell

(d) vacuole, guard cell, nucleus, chloroplast

6. Walking in a straight line and riding a bicycle are the activities which are possible due to a part of the brain. Choose the correct location and name of this part from the given table: **1**

	Part of the Brain	**Name**
(a)	Fore brain	Cerebrum
(b)	Mid brain	Hypothalamus
(c)	Hind brain	Cerebellum
(d)	Hind brain	Medulla

7. A student wants to obtain an erect image of an object using a concave mirror of 10 cm focal length. What will be the distance of the object from mirror? **1**

(a) Less than 10 cm

(b) 10 cm

(c) between 10 cm and 20 cm

(d) more than 20 cm

8. Bronze is an alloy of **1**

(a) Copper and Zinc

(b) Aluminium and Tin

(c) Copper, Tin and Zinc

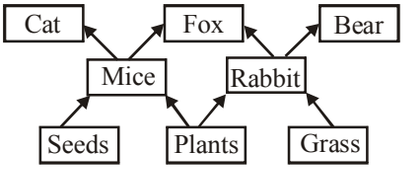
(d) Copper and Tin

9. In an experiment with pea plants, a pure tall plant (TT) is crossed with a pure short plant (tt). The ratio of pure tall plant to pure short plants in F_2 generation will be **1**

(a) 1 : 3 (b) 3 : 1

(c) 1 : 1 (d) 2 : 1

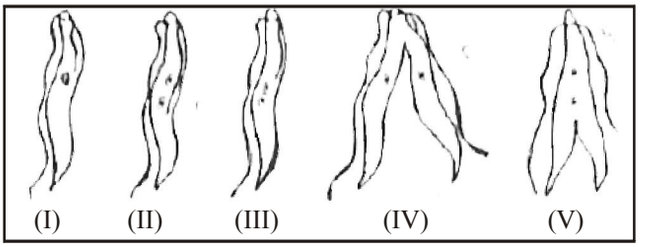
10. Study the given figure of a Food web and identify the primary consumer in the food web: **1**



(a) Mice and Bear (b) Rabbit and Cat

(c) Rabbit and Fox (d) Mice and Rabbit

11. Chooe the correct order of the stages of binary fission in Leishmania. **1**



(a) I, II, III, IV, V (b) I, III, II, V, IV

(c) I, III, V, II, IV (d) I, II, III, V, IV

12. Consider the following chemical equation I and II

I. $Mg + 2HCl \rightarrow MgCl_2 + H_2$

II. $NaOH + HCl \rightarrow NaCl + H_2O$

The correct statement about these equations is – **1**

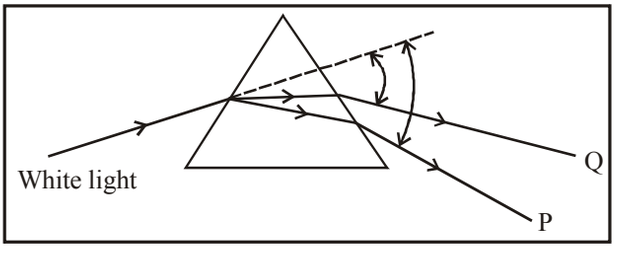
(a) 'I' is a displacement reaction and 'II' is a decomposition reaction.

(b) 'I' is a displacement reaction and 'II' is double displacement reaction.

(c) Both 'I' and 'II' are displacement reactions.

(d) Both 'I' and 'II' are double-displacement reactions.

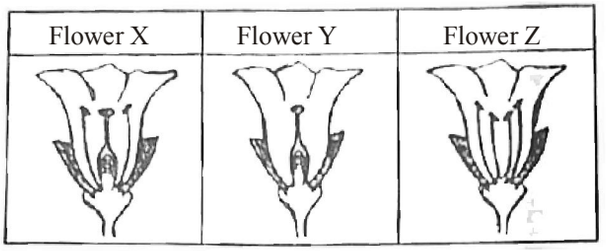
13. In the following diagram showing dispersion of white light by a glass prism, the colours 'P' and 'Q' respectively are- **1**



(a) Red and Violet (b) Violet and Red

(c) Red and Blue (d) Orange and Green

14. Consider the following three flowers namely X, Y and Z. Which flower(s) would develop into a fruit? **1**



(a) 'X' only (b) 'Z' only

(c) 'X' and 'Y' only (d) 'Y' and 'Z'

15. The magnetic field inside a long straight current carrying solenoid: **1**

(a) is zero

(b) decreases as we move towards its end.

(c) increases as we move towards its end.

(d) is same at all points.

16. In human eye the part which allows light to enter into the eye is –

(a) Retina (b) Pupil

(c) Eye lens (d) Cornea

For Questions 17-20 are Assertion – Reasoning based questions.

These consists of two statements - Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion(A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false, but Reason (R) is true.

17. **Assertion (A) :** It is advised that while diluting an acid one should add water to acid and not acid to water keeping the solution continuously stirred.

Reason (R) : The process of dissolving an acid into water is highly exothermic.

18. **Assertion (A) :** The energy which passes to the herbivores does not come back autotrophs.

Reason (R) : The flow of energy in a food chain is unidirectional.

19. **Assertion (A) :** Amoeba takes in food using finger like extensions of the cell surface.

Reason (R) : In all unicellular organisms, the food is taken in by the entire cell surface.

20. **Assertion (A) :** Melting point and boiling point of ethanol are lower than that of sodium chloride.

Reason (R) : The forces of attraction between the molecules of ionic compounds are very strong.

SECTION - B

Q. No. 21 to 26 are Very Short Answer Questions.

21. State whether the given chemical reaction is a redox reaction or not. Justify your answer. **2**

$MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

22. (a) List two difference between the movement of leaves of a sensitive plant and the movement of a shoot towards light. **2**

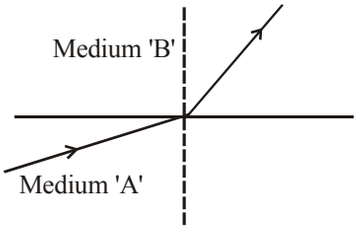
OR

(b) What happens at synapse between two neurons? State briefly. **2**

23. Give the name of the enzyme present in the fluid in our mouth cavity. State the gland which produces it. What would happen to the digestion process if this gland stops secreting this enzyme? **2**

24. Let the resistance of an electrical device remain constant, while the potential difference across its two ends decreases to one fourth of its initial value. What change will occur in the current through it? State the law which helps us in solving the above stated question. **2**

25. A light ray enters from medium A to medium B as shown in the figure. **2**



(a) Which one of the two media is denser w.r.t. other medium? Justify your answer. 1

(b) If the speed of light in medium A is v_a and in medium B is v_b, what is the refractive index of B with respect to A. 1

OR

(a) A ray of light starting from diamond is incident on the interface separating diamond and water. Draw a labelled ray diagram to show the refraction of light in this case. 1

(b) Absolute refractive indices of diamond and water are 2.42 and 1.33 respectively. Find the value of refractive index of water w.r.t. diamond. 1

26. State the rule to determine the direction of a (a) magnetic field produced around a straight conductor carrying current and (b) force experienced by a current carrying straight conductor placed in a magnetic field which is perpendicular to it. 2

SECTION - C

Q. No. 27 to 33 are Short Answer Questions.

27. Explain the process of transport of oxygenated and deoxygenated blood in a human body. 3

28. (a) A substance 'X' is used as a building material and is insoluble in water. When it reacts with dil. HCl, it produces a gas which turns lime water milky. 3

(i) Write the chemical name and formula of 'X'.

(ii) Write chemical equations for the chemical reactions involved in the above statements.

OR

(b) A metal 'M' on reacting with dilute acid liberates a gas 'G'. The same metal also liberates gas 'G' when reacts with a base.

(i) Write the name of gas 'G'.

(ii) How will you test the presence of this gas?

(iii) Write chemical equations for the reactions of the metal with (1) an acid and (2) a base. 3

29. (a) Name the gland and the hormone secreted by it in scary situations in human beings. List any two responses shown by our body when this hormone is secreted into the blood. 3

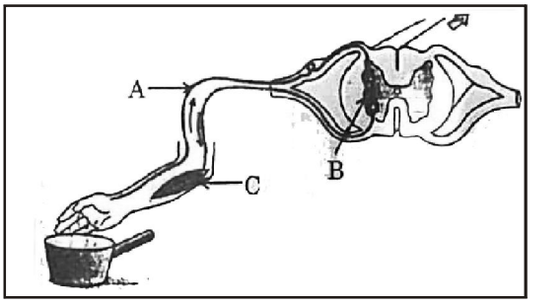
OR

(b) In the given diagram 3

(i) Name the parts labelled A, B, and C.

(ii) Write the functions of A and C.

(iii) Reflex arcs have evolved in animals? Why?



30. With the help of an appropriate example. Justify that some of the chemical reactions are determined by

(a) Change in temperature.

(b) Evolution of a gas, and

(c) Change in colour

Give chemical equation for the reaction involved in each case. 3

31. State reasons for Myopia. With the help of ray diagrams, show the 3

(a) image formation by a myopic eye, and

(b) correction of myopia using an appropriate lens.

32. What is a solenoid? When does a solenoid behave as a magnet? Draw the pattern of the magnetic field produced inside it showing the directions of the magnetic field lines. 3

33. (a) Write the percentage of (i) solar energy captured by the autotrophs and (ii) energy transferred from autotrophs to the next level in a food chain.

(b) What are trophic levels? Why do different food chains in an ecosystem not have more than four to five trophic levels? Give reason. 3

SECTION - D

Q. No. 34 to 36 are Long Answer Questions.

34. (a) (i) A compound 'A' with a molecular formula of $C_2H_4O_2$ reacts with a base to give salt and water. Identify 'A', state its nature and the name of the functional group it possesses. Write chemical equation for the reaction involved.

(ii) When the above stated compound 'A' reacts with another compound 'B' having molecular formula C_2H_6O in the presence of an acid, a sweet smelling compound 'C' is formed.

(1) Identify 'B' and 'C'.

(2) State the role of acid in this reaction. **5**

(3) Write chemical equation for the reaction involved.

OR

(b) (i) Name the compound formed when ethanol is heated at 443 K in the presence of conc. H_2SO_4 and draw its electron dot structure. State the role of conc. H_2SO_4 in this reaction.

(ii) What is hydrogenation? Explain it with the help of a chemical equation. State the role of this reaction in industry. **5**

35. Give reason for the following:

(a) During reproduction inheritance of different proteins will lead to altered body designs.

(b) Fertilization cannot take place in flowers if pollination does not occur.

(c) All multicellular organisms cannot give rise to new individuals through fragmentation or regeneration.

(d) Vegetative propagntion is practised for growing only some type of plants.

(e) The parents and off-springs of organisms reproducing sexually have the same number of chromosomes.

36. (a) (i) What is meant by resistance of a conductor? Defne its SI unit.

(ii) List two factors on which the resistance of a rectangular conductor depends.

(iii) How will the resistance of a wire be affeted if its

(1) length is doubled, and

(2) radius is also doubled?

Give justification for your answer.

OR

(b) In an electric circuit three bulbs of 100 W each are connected in series to a source. In another circuit set of three bulbs of the same wattage are connected in parallel to the same source.

(i) Will the bulb in the two circuits glow with the same brightness? Justify your answer.

(ii) Now, let one bulb in both the circuits get fused. Will the rest of the bulbs continue to glow in each circuit? Give reason for your answer. **5**

SECTION - E

Q. No. 37 to 39 are case based/data based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.

37. On the basis of reactivity metals are grouped into three categories-

(i) Metals of low reactivity

(ii) Metals of medium reactivity

(iii) Metals of high reactivity

Therefore metals ae extracted in pure form from their ores on the basis of their chemical properties.

Metals of high reactivity are extracted from their ores by electrolysis of the molten ore.

Metals of low reactivity are extracted from their sulphide ores, which are converted into their oxides. The oxides of these metals are reduced to metals by simple heating.

(a) Name the process of reduction used for a metal that gives vigorous reaction with air and water both.

(b) Carbon cannot be used as a reducing agent to obtain aluminium from its oxide? Why?

(c) Describe briefly the method to obtain mercury from cinnabar. Write the chemical equation for the reactions involved in the process.

OR

(c) Differentiate between roasting and calcination giving chemical equation for each.

38. All human chromosomes are not paired. Most human chromosomes have a maternal and a paternal copy, and we have 22 such pairs. But one pair called the sex chromosomes, is odd in not always being a perfect pair. Women have a perfect pair of sex chromosomes. But men have a mismatched pair in which one is normal sized while the other is a short one. **4**

(a) In humans, how many chromosomes are present in a Zygote and in each gamete?

(b) A few reptiles rely entirely on environmental cues for sex determination. Comment.

(c) "The sex of a child is a matter of chance and none of the parents are considered to be responsible for it." Justify it through flow chart only.

OR

(c) Why do all the gametes formed in human females have an X chromosome?

39. A student took three concave mirrors of different focal lengths and performed the experiment to see the image formation by placing an object at different distances with these mirrors as shown in the following table. **4**

Case No.	Object-distance	Focal length
I	45 cm	20 cm
II	30 cm	15 cm
III	20 cm	30 cm

Now answer the following questions:

(a) List two properties of the image formed in Case I.

(b) In which one of the cases given in the table, the mirror will form real image of same size and why?

(c) Name the type of mirror used by dentists. Give reason why do they use type of mirrors.

OR

(c) Look at the table and identify the situation (object distance and focal length) which resembles the situation in which concave mirrors are used as shaving mirrors? Draw a ray diagram to show the image formation in this case.

Solutions

1. **(b)** Amphoteric oxides react with both, acids and bases. ZnO and Al_2O_3 are amphoteric in nature. **(1 mark)**

Note

Amphoteric nature of ZnO and Al_2O_3:

$ZnO + 2HCl \longrightarrow ZnCl_2 + H_2O$

$ZnO + 2NaOH \longrightarrow Na_2ZnO_2 + H_2O$

$Al_2O_3 + 6HCl \longrightarrow 2AlCl_3 + 3H_2O$

$Al_2O_3 + 2NaOH \longrightarrow 2NaAlO_2 + H_2O$

2. **(c)** Ammonium chloride (NH_4Cl) is a salt of a strong acid HCl and a weak base NH_4OH.
Thus, there will be an excess of H^+ ions and the PH of the solution will be less than 7. **(1 mark)**

3. **(b)** The reaction between Zn and H_2SO_4 gives an ionic compound $ZnSO_4$ that remains in aqueous state along with the release of H_2 gas.
Thus, X = (aq.), Y = (q) **(1 mark)**

4. **(a)** Phenalphthalein is an indicator that turns pink in alkaline medium.
Therefore, solution 'X' must be an alkaline solution or a solution of a salt of a weak acid and strong base. Thus, 'X' must be Na_2CO_3 and 'Y' must be NH_4Cl. **(1 mark)**

Note

Phenolphthalein is a pH indicator that is colourless at pH between 0 to 8.3, has pink colour at pH between 8.3 and 10.0, and is again colourless at pH above 10.0

5. **(d)** 1- nucleus, 2- chloroplast, 3- vacuole, 4- guard cell **(1 mark)**

Note

Guard cells are pairs of epidermal cells that control gas diffusion by regulating the opening and closure of stomatal pores.

6. **(c)** Walking in a straight line and riding a bicycle are voluntary actions and are controlled by cerebellum. Cerebellum control voluntary actions such as body posture and balance of the body. Involuntary actions such as vomiting, blood pressure are under the control of medulla of hind brain. **(1 mark)**

7. **(a)** In concave mirror, image is erect only when object is between focus (F) and pole (P). So, distance of object from the mirror should be less than focal length i.e. less than 10 cm. **(1 mark)**

8. **(d)** Bronze is an alloy of Cu and Sn.
Brass is an alloy of Cu and Zn. **(1 mark)**

9. **(c)** In pea plants, a pure tall plant (TT) is crossed with a short plant (tt). The ratio of pure tall plant to short plants inF_2 is 1:1
Following combinations of genotype emerge is F_2 generation : TT (1), tt (1) and Tt (2).
This shows that ratio of pure tall (TT) to pure short (tt) is 1:1. **(1 mark)**

10. **(d)** Mice and rabbit are the primary consumers they are dependent on producers like seeds, plants and grass for food. **(1 mark)**

Note

Primary consumers are also known as herbivorous.

11. **(a)** Leishmania undergoes binary fission like Amoeba. Leishmania divides into two daughter cells longitudinally and such a type of binary fission is called longitudinal binary fission. In Leishmania, binary fission occurs in a definite orientation. Nuclear division is followed by the appearance of a constriction in the cell membrane. The membrane grows transversely inwards from the middle of the dividing cell. Cytoplasm separates into two equal parts having one nucleus each. **(1 mark)**

12. **(b)** 'I' is a displacement reaction as it involves displacement of H^+ ions from HCl and formation of $MgCl_2$.
'II' is a double displacement reaction as it involves exchange of ions between NaOH and HCl. **(1 mark)**

13. **(b)** Red colour bend and deviate the least, whereas violet colour bend and deviate the most. So 'P' is violet and 'Q' is red. **(1 mark)**

Note

Dispersion takes place because different colours of light travels with different speed in the prism.

14. **(c)** 'X' and 'Y' only
In the given diagram, flower "X" and "Y" contains female reproductive parts of the flower. Flower 'X' contains both male and female reproductive parts necessary for fertilisation to occur and will facilitate the development of fruit. The female elements are collectively called the pistil. The top of the pistil is called the stigma, which is a sticky surface receptive to pollen and flower 'Z' contains male reproductive parts of the flowers. The male parts of the flower are called the stamens and are made up of the anther at the top and the stalk or filament that supports the anther. The ovary is the part of the female reproductive structure of the flower, the pistil. Ovary bears ovules inside it. Fruit is a ripened ovary of the plant that develops after fertilization. Ovules in the ovary develop into seed. For flower 'Y' the female reproductive part is present if cross fertilisation occurs then fruit will develop. **(1 mark)**

15. **(d)** For an ideal long solenoid, magnetic field inside the solenoid is along the axis and is uniform, and outside the solenoid it is zero. **(1 mark)**

16. **(d)** The front part of eye is cornea and it allows light to enter into the eye. **(1 mark)**

17. **(d)** While diluting an acid, we should add the acid to water to initially make a dilute solution as the process of dissolution is highly exothermic. Thus, Assertion (A) is false but Reason (R) is true. **(1 mark)**

18. **(a)** The flow of energy in a food chain is unidirectional as food chain is a linear sequence of transfer of energy. The energy that is captured by the autotrophs cannot be returned to the sun and the energy which passes to the herbivores cannot be returne back to autotrophs. As it moves successively through the various trophic levels, it is no longer available to the last trophic level. **(1 mark)**

19. **(c)** Amoeba possesses finger- like projections called as pseudopodia which are involved in fetching and consumption of prey but the entire cell surface is not involved in this process. **(1 mark)**

Note

Amoeba are found in water bodies such as ponds, lakes and slow-moving rivers.

20. **(a)** Ethanol is a covalent compound that has weak attractive forces while NaCl is an ionic compound that has stronger electrostatic or coulombic forces of attraction. Therefore, the melting and boiling point of ethanol are lower than that of NaCl.
Thus, both, Assertion (A) and Reason (R) are correct and Reason (R) is a correct explanation of Assertion (A). **(1 mark)**

21. The given reaction involves conversion of MnO_2 into $MnCl_2$ in which the oxidation state of Mn changes from +4 to +2. Thus, it is reduced. **(1 mark)**
The oxidation state of Cl changes from –1 in HCl to 0 in Cl_2. Thus, it is oxidized. **(1 mark)**
Therefore, the given reaction is a Redox reaction.

22. (a) The movement of leaves may occur in response to touch. So the information that is touch is communicated by electrical chemical means transfer from cell to cell. The movement of shoot occurs due to phototropism that is the movement of shoot in direction of sunlight. **(2 marks)**

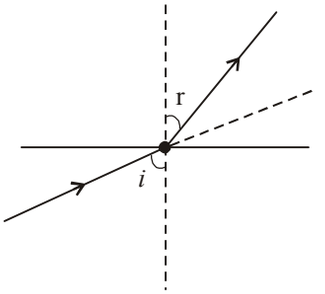
OR

(b) Transmission of nerve impulses occurs between two neurons via junction called the synapse. At the end of the axon, the electrical impulse sets releases some chemicals (neurotransmitters). These chemicals cross the gap or synapse and start a similar electrical impulse in the dendrite of the next neuron. **(2 marks)**

23. Enzyme present in the liquid of mouth cavity is salivary amylase. Gland which produces this enzyme is salivary gland this enzyme helps in digestion of starch in our mouth if this gland stop secreting this enzyme the digestion of starch will stop. **(2 marks)**

24. As R is constant, so by Ohm's law current through the conductor is directly proportional to potential difference across it. Therefore if potential difference is decreased to one-fourth of initial value, current will also decrease to one-fourth of initial value. **(2 marks)**

25. (a) As light is bending towards normal so ray is moving from rarer medium to denser medium. So medium 'B' is denser w.r.t. medium 'A'. **(1 mark)**



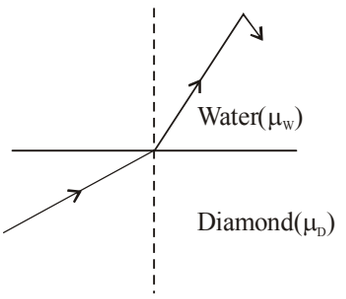
(b) Refractive index of 'B' w.r.t 'A' is given as

$$^{A}\mu_B = \frac{\mu_B}{\mu_A} = \frac{c}{\frac{v_B}{c}} = \frac{v_A}{v_B} = \frac{v_a}{v_b}$$
$$\frac{}{v_A}$$

$[\because v_A = v_a \text{ and } v_B = v_b]$ **(1 mark)**

OR

(a) As ray is moving from diamond (denser) to water (rarer), so ray will bend away from normal. **(1 mark)**



(b) Refractive index of water w.r.t diamond is given as

$$\frac{\mu_W}{\mu_D}$$

So, $\frac{\mu_W}{\mu_D} = \frac{1.33}{2.42} = \frac{133}{242}$ **(1 mark)**

26. (a) "Maxwell's Right- Hand Thumb Rule "can be used to determine the direction of magnetic field lines around a current-carrying straight conductor. **(1 mark)**

(b) "Fleming's Left Hand Rule" is used to find the direction of force acting on a current carrying conductor, placed in a magnetic field. **(1 mark)**

27. The heart is a muscular organ which is as big as our fist. Because both oxygen and carbon dioxide have to be transported by the blood, the heart has different chambers to prevent the oxygen-rich blood from mixing with the blood containing carbon dioxide. The carbon dioxide-rich blood has to reach the lungs for the carbon dioxide to be removed, and the oxygenated blood from the lungs has to be brought back to the heart. This oxygen-rich blood is then pumped to the rest of the body. We can follow this process step by step. Oxygen-rich blood from the lungs comes to the thin-walled upper chamber of the heart on the left, the left atrium. The left atrium relaxes when it is collecting this blood. It then contracts, while the next chamber, the left ventricle, relaxes, so that the blood is transferred to it. When the muscular left ventricle contracts in its turn, the blood is pumped out to the body. De-oxygenated blood comes from the body to the upper chamber on the right, the right atrium, as it relaxes. As the right atrium contracts, the corresponding lower chamber, the right ventricle, dilates. This transfers blood to the right ventricle, which in turn pumps it to the lungs for oxygenation. Since ventricles have to pump blood into various organs, they have thicker muscular walls than the atria do. Valves ensure that blood does not flow backwards when the atria or ventricles contract. **(3 marks)**

28. (a) (i) 'X' = Calcium carbonate, $CaCO_3$. **(1 mark)**

(ii) Equations:–

$$\underset{(S)}{CaCO_3} + 2HCl \longrightarrow CaCl_2 + H_2O + CO_2 \uparrow$$

$$\underset{\text{(lime water)}}{Ca(OH)_2} + CO_2 \longrightarrow \underset{\text{(milky solution)}}{CaCO_3} + H_2O$$

(2 marks)

OR

(b) (i) The gas evolved in both the cases in Hydrogen. 'G' = H_2. **(1 mark)**

(ii) The presence of H_2 gas can be checked by bringing a burning candle near the gas. **(1 mark)**
A popping sound indicates the presence of H_2 gas.

(iii) Reactions:-

(1) $Zn + 2HCl \longrightarrow ZnCl_2 + H_2 \uparrow$

(2) $Zn + 2NaOH \longrightarrow \underset{\text{(sodium zincate)}}{Na_2ZnO_2} + H_2 \uparrow$

(1 mark)

29. (a) Adrenaline (epinephrine) is a hormone adrenal glands make to help human being to prepare for stressful or dangerous situations. Adrenaline is secreted directly into the blood and carried to different parts of the body. The target organs or the specific tissues on which it acts include the heart. As a result, the heart beats faster, resulting in supply of more oxygen to our muscles. The blood to the digestive system and skin is reduced due to contraction of muscles around small arteries in these organs. **(3 marks)**

OR

(i) A- Sensory neuron, B- Relay neuron, C- Effector muscle in arm

(ii) A sensory neuron carries impulses from the receptor to the CNS (brain or spinal cord). C- Effectors are muscles or glands which respond when they receive impulses from motor neurones. Examples of effectors are the biceps and triceps muscles in the arm. When stimulated, muscles contract get shorter).

(iii) A basic reflex arc consist of sensory neurons, motor neuron and the muscle or gland cells.
Reflex arc, have evolved in animals, in order to perform quick responses against the external stimuli, as the thinking process of brain is not fast enough. **(3 marks)**

Note

The main difference between sensory and motor neuron is their function and structure.

30. (a) Chemical reaction detected by a change in temperature:-

$$\underset{\text{(Quick lime)}}{CaO} + H_2O \longrightarrow Ca(OH)_2 + \text{Heat}$$

This reaction involves release of heat (exothermic reaction) along with the formation of $Ca(OH)_2$.
Thus, the temperature of the system rises indicating a chemical change. **(1 mark)**

(b) Chemical Reaction detected by evolution of a gas:-

$$Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2 \uparrow$$

The H_2 gas produced here gives a popping sound upon burning, indicating a chemical change has taken place. **(1 mark)**

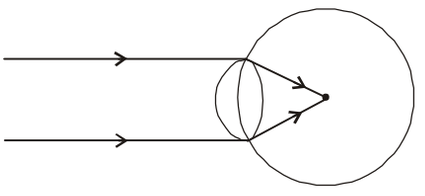
(c) Chemical reaction detected by a change in colour:-

$$\underset{\text{(Green)}}{FeSO_4} \xrightarrow{\text{Heat}} \underset{\text{(Brown–red)}}{Fe_2O_3} + SO_2 + SO_3$$

Here, the thermal decomposition of $FeSO_4$ causes it to give brown-reddish Fe_2O_3. **(1 mark)**

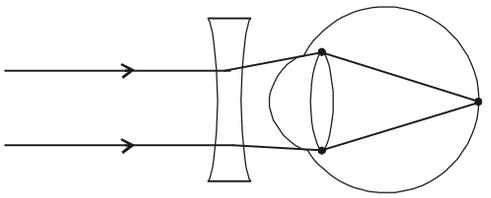
31. If the eyeball is too long or the eyelens is too spherical then final image is formed infront of retina and this condition is called myopia **(1 mark)**

(a) Image formation by myopic eye



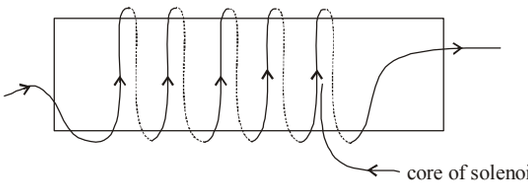
(1 marks)

(b) Correction of myopia by concave lens



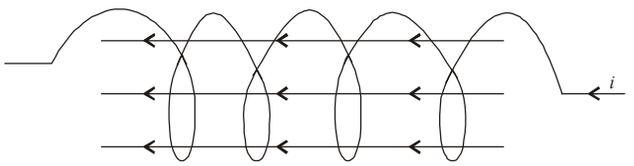
(1 mark)

32. A long coil of wire consisting of closely packed loop is called solenoid. **(1 mark)**



A solenoid acts as a magnet when current flows through it. **(1 mark)**

Pattern of magnetic field lines inside solenoid:-



33. (a) (i) The green plants in a terrestrial ecosystem capture about 1% of the energy of sunlight that falls on their leaves and convert it into food energy.

(ii) When green plants are eaten by primary consumers, a great deal of energy is lost as heat to the environment, some amount goes into digestion and in doing work and the rest goes towards growth and reproduction. An average of 10% of the food eaten is turned into its own body and made available for the next level of consumers. Therefore, 10% can be taken as the average value for the amount of organic matter that is present at each step and reaches the next level of consumers. **(1½ marks)**

(b) Each step or level of the food chain forms a trophic level. There is only 10% flow of energy from one trophic level to the next. The loss of energy at each step is consistent that very little usable energy is available after four or five trophic levels. Hence only 4 to 5 trophic levels are present in each food chain. **(1½ marks)**

34. **(a)** (i) since the compound gives a salt and water upon reaction with a base, it is an acidic compound. The molecular formula $C_2H_4O_2$ represents a molecule of ethanoic acid CH_3COOH.

'A' = CH_3COOH

Ethanoic acid is a low-melting and boiling compound with vinegar smell.

Functional Group present = – COOH (Carboxylic group) **(1 mark)**

Chemical equation for the reaction -

$$CH_3COOH + NaOH \longrightarrow \underset{\text{(Sodium ethanoate)}}{CH_3COONa} + H_2O$$ **(1 mark)**

(ii) Ethanoic acid (A) reacts with ethanol (CH_3CH_2OHB) to give a sweet smelling ester (c).

(1) 'B' = CH_3CH_2OH (ethanol)

'C'= $CH_3COOC_2H_5$(ester) **(1 mark)**

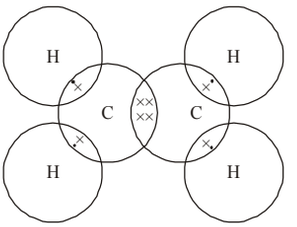
(2) The presence of an acid (H^+) in this reaction catalyses the esterification reaction. **(1 mark)**

(3) $CH_3COOH + CH_3 - CH_2OH \overset{H^+}{\rightleftharpoons} CH_3 - COOC_2H_5 + H_2O$ **(1 mark)**

OR

(b) (i) $\underset{\text{ethanol}}{CH_3 - CH_2 - OH} \xrightarrow[H_2SO_4,443K]{\text{Hot conc.}} \underset{\text{ethene}}{CH_2 = CH_2} + H_2O$ **(1 mark)**

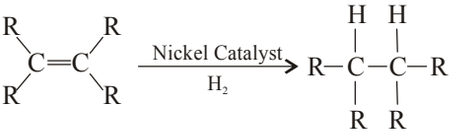
Electron-dot structure of ethene:-



(1 mark)

Role of H_2SO_4 = It is used as a dehydrating agent. **(1 mark)**

(ii) Hydrogenation is an addition reaction in which a hydrogen molecule is added usually to an unsaturated organic compound. **(1 mark)**



(1 mark)

Industrially, this reaction is used for the conversion of vegetable oils to saturated fats or ghee.

35. (a) Cellular DNA is the information source for making proteins in the cell. The DNA in the cell nucleus is the information source for making proteins. If the information is changed, different proteins will be made. Different proteins will eventually lead to altered body designs. Therefore, a basic event in reproduction is the creation of a DNA copy. **(1 mark)**

(b) Flower fertilization requires both male and female gametes. If pollination does not occur it means that the male gamete is not available, hence fertilization cannot take place. **(1 mark)**

(c) Complex multicellular organisms cannot give rise to new organism by using methods of reproduction like regeneration or fragmentation because the tissue and specialised cell make up the organs in the body. This is because of high degree of specialisation, multicellular organisms cannot reproduce by regeneration of a part of some tissue. **(1 mark)**

(d) The property of vegetative propagation is used in methods such as layering or grafting to grow many plants like sugarcane, roses, or grapes for agricultural purposes. Plants raised by vegetative propagation can bear flowers and fruits earlier than those produced from seeds. Such methods also make possible the propagation of plants such as banana, orange, rose and jasmine that have lost the capacity to produce seeds. **(1 mark)**

(e) Gametes of sexually-reproducing animals have half the number of chromosomes as that of the parents. Thus, during fertilization, when two gametes i.e. male and female gametes, fuse, the offspring produced will have the same amount of DNA or the same number of chromosomes as that of the parent. **(1 mark)**

36. (a)

(i) Resistance of a conductor is the opposition offered by it to flow of charge carriers (electron) inside it. Its SI unit is Ohm. **(1½ marks)**

(ii) Resistance depends on factors such as

(1) Nature of conductor

(2) Length of conductor

(3) Cross-sectional area of conductor **(1½ marks)**

(iii)

(1) As $R \propto l$

So if length is doubled, then resistance also get doubled.

(2) As $R \propto \frac{1}{A}$ i.e $R \propto \frac{1}{r^2}$ $\left[\because A = \pi r^2\right]$ **(1 mark)**

So if radius is doubled, then resistance becomes one-fourth. **(1 mark)**

OR

(b) (i) Let us assume that resistance of each bulb is R Case (1)

Current in each bulb $= \frac{V}{3R}$ **(1 mark)**

Case (2)

Net current $= \frac{V}{R/3} = \frac{3V}{R}$ **(1 mark)**

Current will get equally divided in three bulbs $= \frac{I}{3} = \frac{V}{R}$

Bulbs in case (2) will glow with great brightness because current $\propto$ Brightness. **(1 mark)**

(b) Now if one bulb gets fused, in case (1), rest of bulbs will not glow because in series voltage eruption in one appliance will affect other appliances. **(1 mark)**

But in case (b) all other bulbs will glow as voltage eruption in one bulb does not affect the voltage of other bulbs. **(1 mark)**

37. (a) Highly reactive metals like Na are obtained by 'Electrolytic reduction'. **(1 mark)**

The metal is deposited at cathode of the electrolytic cell.

(b) Carbon cannot be used as a reducing agent to obtain aluminium from its oxide because Al lies up in the reactivity series of metals and for such metals, electrolytic reduction is a suitable method. **(1 mark)**

(c) Cinnabar (HgS) is a sulphide ore of Hg.

Hg lies low in the reactivity series. First, HgS is heated to give HgO which upon further heating, gives Hg. **(1 mark)**

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

$$2HgO(s) \xrightarrow{Heat} 2Hg(l) + O_2(g)$$ **(1 mark)**

OR

(c) **Roasting:** It is the process of heating the sulphide ores in the excess of air to give corresponding metal oxides. **(½ mark)**

e.g: $2ZnS(s) + 3O_2(g) \xrightarrow{Heat} 2ZnO(s) + 2SO_2(g)$ **(½ mark)**

Calcination : It is the process of heating the ore in the absence of air to directly give the oxide of the metal. **(½ mark)**

e.g. $2ZnCO_3(s) \xrightarrow{Heat} ZnO(s) + CO_2(g)$ **(½ mark)**

38. (a) Zygote is formed due to the fusion of male and female gametes. Gametes are haploid cells. Thus fusion of two haploid cells results in the formation of a diploid cell. Therefore zygote is a diploid cell with 46 chromosomes. **(1 mark)**

(b) In few reptiles like crocodiles, alligators and turtles, the temperature of egg incubation has a significant influence on the sex determination of the developing embryos. **(1 mark)**

(c) Most human chromosomes have a maternal and a paternal copy, and we have 22 such pairs. But one pair, called the sex chromosomes, is odd in not always being a perfect pair. Women have a perfect pair of sex chromosomes, both called X. But men have a mismatched pair in which one is a normal-sized X while the other is a short one called Y. So women are XX, while men are XY. All children will inherit an X chromosome from their mother regardless of whether they are boys or girls. Thus, the sex of the children will be determined by what they inherit from their father. A child who inherits an X chromosome from her father will be a girl, and one who inherits a Y chromosome from him will be a boy. Thus, the sex of a child is a matter of chance and none of the parents are considered to be responsible for it. **(2 mark)**

OR

All children will inherit an X chromosome from their mother regardless of whether they are boys or girls. Thus, the sex of the children will be determined by what they inherit from their father. A child who inherits an X chromosome from her father will be a girl, and one who inherits a Y chromosome from him will be a boy. Thus, all the gametes formed in human females have an X chromosome. **(4 mark)**

39. (a) Here, $|u| = 45$ cm and $|f| = 20$cm

as $|u| > |2f|$ So image formed will be (i) real and inverted

(ii) Between f and 2f **(½ × 2 = 1 mark)**

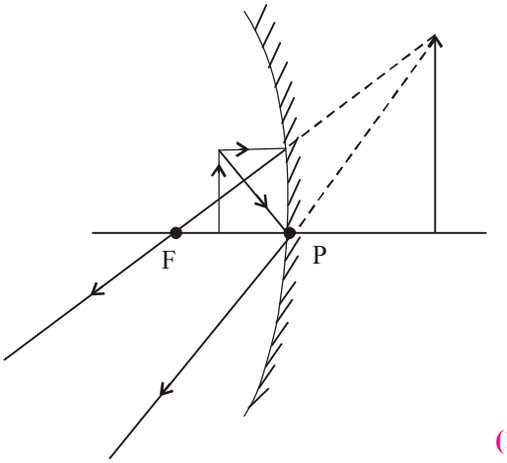
(iii) Smaller than size of object

(b) In case (II), image will be formed at centre of curvature and will be real and size same as that of object. **(1 mark)**

(c) Dentist use concave mirror because when teeth is in between focus (F) and pole (P) of concave mirror, we get enlarged and erect image behind the mirror. **(2 mark)**

OR

(c) Case (III) is used as shaving mirror, because when face is between focus (F) and pole (P) of concave mirror, we get enlarged and erect image behind the mirror as shown in fig. below. **(1 mark)**



(1 mark)