SAMPLE QUESTION PAPER-I

SCIENCE

Time allowed : 3 hours | Maximum Marks : 80

GENERAL INSTRUCTIONS:

Read the following instructions very carefully and strictly follow them :

(i) This question paper comprises 39 questions divided into three sections: Section A – Biology (Q.1–16), Section B – Chemistry (Q.17–29), and Section C – Physics (Q.30–39).

(ii) All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

(iii) Multiple Choice Questions (Q.1–9, Q.17–24, Q.30–32) carry 1 mark each.

(iv) Very Short Answer Type Questions (Q.10–12, Q.25, Q.33–34) carry 2 marks each. Answers to these questions should be in the range of 30 to 50 words.

(v) Short Answer Type Questions (Q.13–14, Q.26–27, Q.35–37) carry 3 marks each. Answers to these questions should be in the range of 50 to 80 words.

(vi) Source-based/Case-based Questions (Q.15, Q.28, Q.38) carry 4 marks each with sub-parts.

(vii) Long Answer Type Questions (Q.16, Q.29, Q.39) carry 5 marks each. Answers to these questions should be in the range of 80 to 120 words.

SECTION - A

1. Filtration unit of kidney is **1**

(*a*) Ureter (*b*) Urethra (*c*) Neuron (*d*) Nephron

2. During contraction, what prevents the backflow of blood inside the heart? **1**

(*a*) Valves in heart (*b*) Thick muscular walls of ventricles

(*c*) Thin walls of atria (*d*) Thick walls of atria

3. Identify the parts of the brain included in the hindbrain: **1**

(*a*) Cerebellum, medulla, pons (*b*) Cerebellum, hypothalamus, pons

(*c*) Medulla, cerebrum, pons (*d*) Medulla, hypothalamus, pons

4. Anita is studying the germination process in angiospermic flowers for her biology exam. Her teacher, Mr. Sharma, shows her several diagrams depicting different pathways of pollen tube growth and asks her to identify the correct one.
Which of the following shows the correct pathway of germination in the angiospermic flower? 1

(*a*) 

(*b*) 

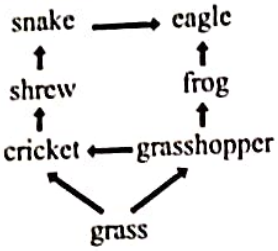
(*c*) 

(*d*) 

5. In his experiments, Mendel crossed tall pea plants with dwarf pea plants. The pea plants produced in F_1 generation were: 1

(a) All of them were tall
(b) All of them were of medium height
(c) Both tall and dwarf
(d) All of them were dwarf

6. In a classroom, a biology teacher explained food webs in ecosystems and drew four different food webs on the board as given in the question. She then asked Neha to select the food web that most accurately represents a natural ecosystem. Which of the following food webs is most likely to exist in nature? 1

(a)


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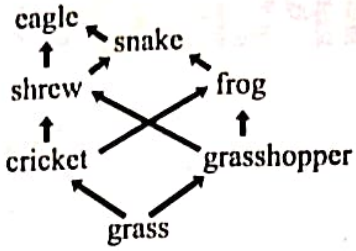

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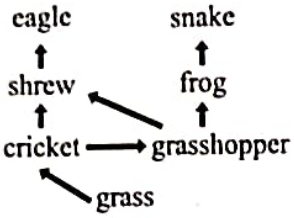
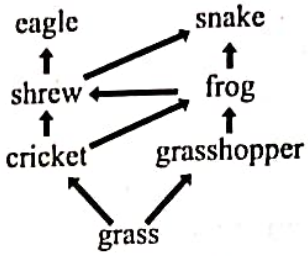
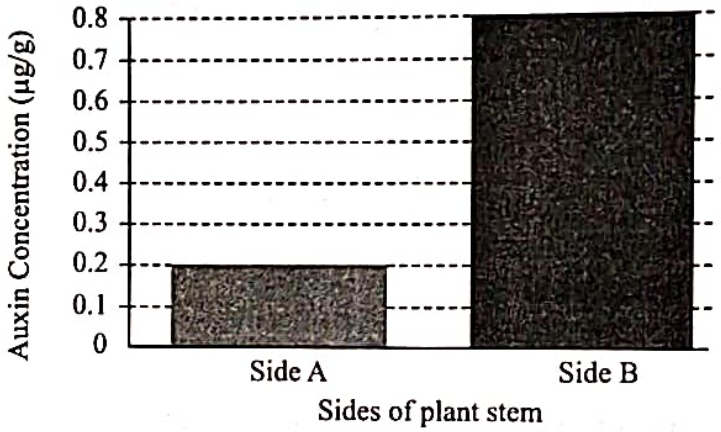


(d)


7. A study records the concentration of auxin in different sides of a plant stem. The auxin concentrations are represented in the graph below: 1



Based on the graph, what is the likely outcome of this auxin distribution on the plant's growth?

(a) The plant will grow uniformly
(b) The plant will bend towards Side A
(c) The plant will bend towards Side B
(d) The plant will stop growing

The following two questions 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.

8. **Assertion (A):** Ozone layer is getting depleted at upper atmosphere which is a cause of concern.
Reason (R): CFC reacts with ozone and breaks it. 1

9. **Assertion (A):** Hybrid is formed by cross between two organisms that are different in one or more than one traits.
Reason (R): Mendel crossed two plants differing in one trait to obtain F_1 plants which is monohybrid cross. 1

10. Dr. Suman is treating two patients: 2

Patient 1: Suffering from an endocrine disorder, affecting hormone secretion necessary for carbohydrate, protein, and fat metabolism.

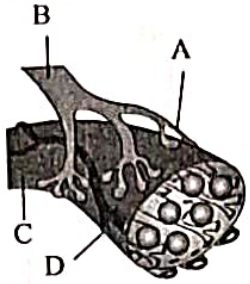
Patient 2: Suffering with anxiety issues.

Based on your understanding, answer the following question:

(*a*) Name the concerned gland in the case of Patient 1.

(*b*) Name the concerned gland in the case of Patient 2 and state one of its functions.

11. (A) Identify the given figure and label the following parts. 2



OR

(B) List two differences between the movement of leaves of a sensitive plant and the movement of a shoot towards light. 2

12. While Neha strolled through a colorful meadow on a sunny day, she saw some butterflies fluttering around the flowers. Can you share what this activity is all about? State any two abiotic agents of this activity apart from butterflies? 2

13. "Reproduction is one of the most important characteristics of living beings". Give three reasons in support of the statement. 3

14. (*a*) Jyoti is at a campsite in the mountains. After having a snack, she's left with an apple core and a plastic wrapper. Which item is biodegradable, and which one is non-biodegradable? Provide reasons for your choices.

(*b*) Explain how managing these types of waste is crucial in minimizing environmental pollution. 3

15. Aastha has a female labrador pet dog called Christie. Christie is a brown color labrador which is a recessive trait. In labrador black color fur is dominant to brown color. Aastha took Christie to the breeder. The breeder assures Aastha that Bruno will be the father of Christie's pups. After few months, Christie gives birth to 8 pups out of which 4 are black furred and 4 are brown furred. Based on this information, answer the following questions:

(*a*) What color was Bruno? 1

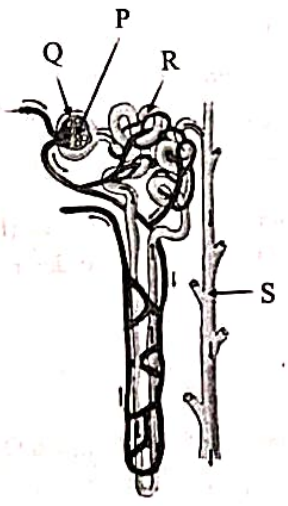
(*b*) What is the genotype of Bruno? State the reason for the answer. 2

(*c*) Write all the possible genotypes of Christie's pups. 1

OR

(*c*) If Christie were bred with another brown-furred dog, Max, what would be the expected fur color ratio of the pups? 1

16. (A) The diagram provided shows the structure of a nephron and its various parts labeled P, Q, R, and S. Based on the diagram answer the following questions: 5



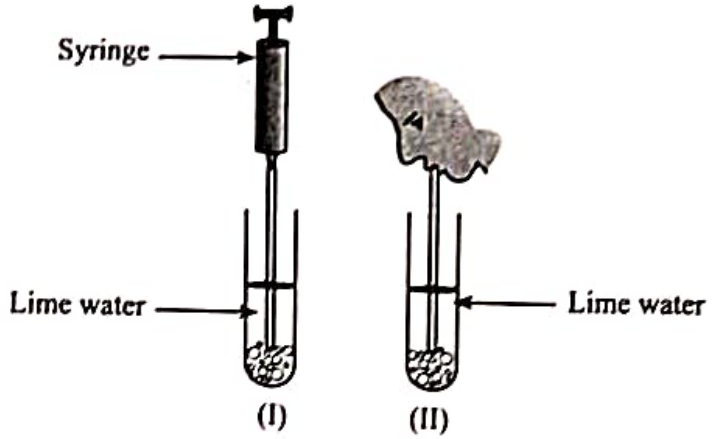
(a) Identify the parts labeled P, Q, R, and S in the diagram.

(b) Describe the process of filtration and reabsorption in the nephron, explaining the role of each labeled part (P, Q, R and S).

(c) Explain the importance of selective reabsorption in maintaining homeostasis in the body.

OR

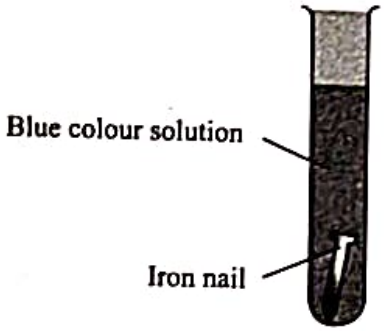
(B) (a) In the given experimental setup, diagram (I) uses atmospheric air passed into lime water, and diagram (II) uses exhaled air. Explain the difference in the time it takes for lime water to turn milky in both diagrams.



(b) Draw a diagram of an open stomatal pore and label (i) Guard cells and (ii) Chloroplasts. State two functions of stomata. 5

SECTION - B

17. Sheena took a piece of iron (Fe) nail and placed it in a blue solution. After some time, she noticed that the blue colour of the solution faded away, and a brown solid was observed on the iron nail. What can Sheena conclude from her experiment? 1



(a) Iron (Fe) is less reactive than copper (Cu).

(b) Iron (Fe) displaces copper (Cu) from its solution.

(c) Copper (Cu) is more reactive than iron (Fe).

(d) Copper (Cu) displaces iron (Fe) from its solution.

18. Imagine you are a chemist studying the decomposition of lead nitrate ($Pb(NO_3)_2$) when heated, which produces lead(II) oxide (PbO), nitrogen dioxide (NO_2), and oxygen (O_2). You need to determine the correct ratio of the products in the balanced chemical equation.

Given the unbalanced equation:

$Pb(NO_3)_2(s) \rightarrow PbO(s) + NO_2(g) + O_2(g)$

Determine the correct ratio (a : b : c) of the products PbO, NO_2, and O_2. 1

(a) a : b : c = 1 : 2 : 1 (b) a : b : c = 2 : 1 : 1 (c) a : b : c = 1 : 1 : 2 (d) a : b : c = 2 : 4 : 1

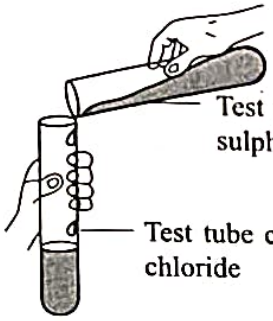
19. Rohit was in the midst of a home renovation project, and he turned to a knowledgeable friend in construction for advice. To ensure a smooth and long-lasting wall surface in his newly renovated room, which material should he select from the following options? **1**

(*a*) Calcium sulphate hexahydrate
(*b*) Calcium carbonate
(*c*) Calcium sulphate hemihydrate
(*d*) Calcium hydroxide

20. Which of the following represents the correct formula of sodium chloride? **1**

(*a*) $Na^+ \left[\cdot\underset{\cdot\cdot}{\overset{\cdot\cdot}{Cl}}\cdot\right]^-$ (*b*) $Na^+ 2 \left[\cdot\underset{\cdot\cdot\cdot}{\overset{\cdot\cdot\cdot}{Cl}}\cdot\right]^-$ (*c*) $2\,Na^+ \left[\cdot\underset{\cdot\cdot}{\overset{\cdot\cdot}{Cl}}\cdot\right]^-$ (*d*) $2\,Na^+ \left[\cdot\underset{\cdot\cdot}{\overset{\cdot\cdot}{Cl}}\cdot\right]^-$

21. **1**



Identify the solid product formed in this reaction.

(*a*) Barium chloride (*b*) Barium sulphate (*c*) Sodium chloride (*d*) Sodium sulphate

22. In tamarind and nettle sting, the name of acids present respectively are: **1**

(*a*) Citric acid and tartaric acid
(*b*) Tartaric acid and citric acid
(*c*) Tartaric acid and methanoic acid
(*d*) Methanoic acid and tartaric acid

23. You are conducting an experiment in a chemistry lab to identify the structure of different hydrocarbon compounds. Your instructor presents a scenario involving a three-carbon alkyne.
If the three-carbon skeleton is of a straight-chained alkyne, how many carbon atoms may NOT be bonded to any hydrogen atoms? **1**

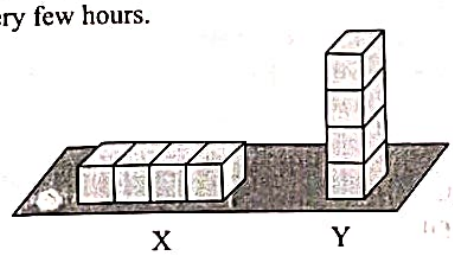
(*a*) 1 (*b*) 2 (*c*) 0 (*d*) 3

The following two questions 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.

24. **Assertion (A):** Formation of rust on iron is a chemical change.
Reason (R): Rust is formed when iron reacts with oxygen and water in the presence of air. The resulting iron oxide is chemically different from the original iron, making it a chemical change. **1**

25. Eight identical iron blocks are placed on the ground in the two arrangements X and Y as shown below. The block arrangement are kept moist by sprinkling water every few hours. **2**



Which of the arrangements is likely to gather more rust after ten days? Justify your answer.

26. (A) Some salt samples are given below. Find out their chemical formula, their solubility in water, check the action on blue litmus paper, and the name of the acids and bases used to form them.
Potassium nitrate, aluminium chloride, zinc sulphate 3

OR

(B) In a chemistry lab, students are exploring the properties and reactions of various substances used in everyday products. The instructor provides the students with three substances labelled X, Y, and Z, and gives them the following information:

- Substance X is a common ingredient used in antacids and is also used in the kitchen.
- When substance X is heated, it decomposes to give W, Y, and V
- W upon recrystallisation, forms substance Z.
- Substance Z is used in the manufacture of borax.
- When substance W reacts with an acid A, it produces a gas called V.

(*a*) Write your observations:

(*i*) if methyl orange is added to an aqueous solution of 'W'.

(*ii*) if a drop of red litmus solution is added to the aqueous solution of 'V'.

(*b*) Identify the substance 'Z'. 3

27. An ore on treatment with dil. HCl gives off the smell of rotten eggs. Name the type of this ore. How can the metal be obtained from its concentrated ore? 3

28. You are working as a metallurgist in a lab where you are tasked with studying the reactivity and extraction processes of various metals. During one of your experiments, you obtain a reddish-brown metal oxide (Y) along with two gases SO_2 and SO_3 from its anhydrous sulphate salt by heating. You then react this oxide with a metal (X), whose oxide is known to be amphoteric. The reaction results in the reduction of the metal oxide (Y) to metal (A).

(*a*) Based on the reactivity series of metals, identify the likely positions of metals X and A in the series (top, middle, or bottom). Provide a justification for your answer. 2

(*b*) (*i*) Which one is the correct chemical equation representing the reaction between metal oxide (Y) and metal (X), whose oxide is amphoteric?

(1) $CuO + Al \rightarrow Cu + Al_2O_3$

(2) $Fe_2O_3 + 2Al \rightarrow 2Fe + Al_2O_3 + heat$

(3) $PbO + Fe \rightarrow Pb + Fe_2O_3$

(4) $ZnO + Cu \rightarrow Zn + CuO$

(*ii*) Which of the following best explains the practical application of the reaction between Fe_2O_3 and Al in metallurgy?

(1) It is used to manufacture copper wires.

(2) It is an example of alloy formation.

(3) It is used in thermite welding to join railway tracks.

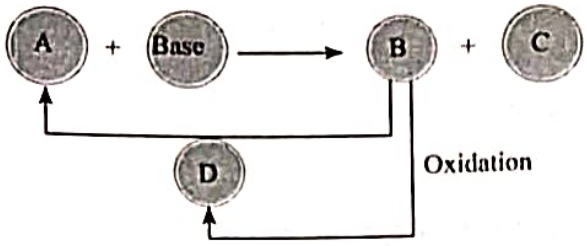
(4) It is used in electroplating of metals.

OR

(*b*) Describe the colour change you would expect to observe during the reaction between metal oxide (Y) and metal (X). Provide an explanation for the observed colour change. 2

29. (A) You are performing a series of chemical reactions in the laboratory:

1. When a base reacts with compound 'A', it produces two compounds, 'B' and 'C'.
2. When compound 'B' reacts with compound 'D', it reforms compound 'A'.
3. Additionally, the oxidation of compound 'B' produces compound 'D'.



(*a*) Identify compounds 'A', 'B', 'C', and 'D'.

(*b*) Identify and describe the reaction that occurs when the base reacts with compound 'A'. 5

OR

(B) A student performed a series of experiments in the laboratory:

1. In the first test tube, she added a small strip of zinc metal to a solution of dilute hydrochloric acid and noticed bubbles forming.
2. In the second test tube, she added sodium hydroxide to the same acid and observed the changes.
3. In a third test tube, a sweet-smelling liquid (compound Z) is formed from a carboxylic acid($C_2H_4O_2$) and an alcohol (C_2H_6O) in the presence of a few drops of concentrated sulphuric acid.

(*a*) (*i*) Identify the type of reaction between zinc and dilute hydrochloric acid.

(*ii*) Write the balanced chemical equation for this reaction.

(*b*) (*i*) Name the type of reaction between sodium hydroxide and hydrochloric acid.

(*ii*) Write the balanced chemical equation for this reaction.

(*c*) (*i*) Identify compound Z.

(*ii*) Write the names of the acid and the alcohol used to form Z.

(*iii*) Write the balanced equation for the formation of Z.

(*d*) Why is concentrated sulphuric acid used in the formation of compound Z?

SECTION - C

30. Sonu observes a ray which seems to be traveling through the focus of a convex mirror passes _____ after reflection 1

(*a*) parallel to the principle axis

(*b*) along the same path in opposite direction

(*c*) through F

(*d*) through C

31. Consider the following statements and choose the correct choice. 1

(A) In series connection, the same current flows through each element.

(B) In parallel connection, the same potential difference. gets applied across each element.

(*a*) Both (A) and (B) are correct

(*b*) (A) is correct but (B) is wrong

(*c*) (A) is wrong but (B) is correct

(*d*) Both (A) and (B) are wrong

The following two questions 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.

32. **Assertion (A):** A rainbow appears in the sky after a rain shower due to dispersion of sunlight by tiny water droplets in the atmosphere.
Reason (R): The water droplets act as small prisms, refracting and dispersing sunlight, which is then reflected internally and refracted again before reaching the observer's eye. 1

33. A light ray is incident on a concave mirror with a radius of curvature of 20 cm. If the object distance is 15 cm, calculate the image distance. 2

34. (A) Two wires of the same material have their lengths in the ratio of 1 : 2 and diameters in the ratio of 2 : 1. What is the ratio of their resistances? 2

OR

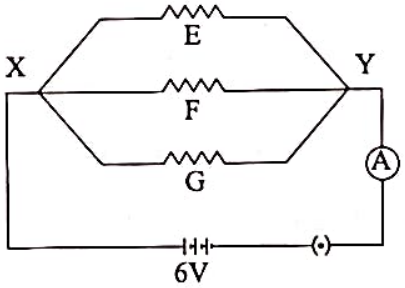
(B) A current of 2 A flows through a wire of resistance 10 Ω. Calculate the potential difference across the wire. 2

35. State the cause of dispersion of white light by a glass prism. How did Newton, using two identical glass prisms, explained that white light is made of seven colours? Draw a ray diagram to show the path of a narrow beam of white light, through a combination of two identical prisms arranged together in inverted position with respect to each other, when it is allowed to fall obliquely on one of the faces of the first prism of the combination. 3

36. You are working on a school project at home where you need to design a circuit with a specific resistance. You have five resistors, each with a resistance of ⅕ Ω.
What is the maximum and minimum resistance which can be made using five resistors each of ⅕ Ω? 3

37. Riya is assembling an electric lamp for her science fair project. She needs to choose a suitable material for the filament to ensure the lamp works efficiently and lasts a long time. After researching, she learns that a specific material is commonly used for this purpose.
Riya wants to know the name of the material and why this particular material is used almost exclusively for the filament of electric lamps. 3

38. Three resistors in a circuit are attached as shown here. The resistance of F and G are 10 ohm and 5 ohm respectively. The resistance of E is unknown. These resistors are connected to a battery with potential difference 6 V.

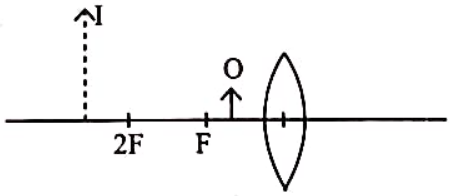


(*a*) What is the term used to describe such an arrangement of resistors? 1
(*b*) What is the resistance of E if 0.3 A current flows through it? 2
(*c*) What is the total current flowing in the circuit? 1

OR

(*c*) Should the resistance of an ammeter be low or high? 1

39. (A) Rakhi placed an object O in front of a lens and its image is I. Without actually drawing the ray diagram, Rakhi has to explain the following:



(*i*) Type of lens (Converging/Diverging)
(*ii*) Two optical instruments where such an image is obtained.
(*iii*) Three characteristics of the image formed if this lens is replaced by a concave mirror of focal length 'f' and an object is placed at a distance f/2 in front of the mirror. 5

OR

(B) A rod of length 10 cm lies along the principal axis of a concave mirror of focal length 10 cm in such a way that the end close to the pole is 20 cm away from it. Find the length of the image of the rod. 5