

**Series Z1XYW/4****SET~3**प्रश्न-पत्र कोड  
Q.P. Code**31/4/3**

रोल नं.

Roll No.

|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|



परीक्षार्थी प्रश्न-पत्र कोड को उत्तर-पुस्तिका के मुख-पृष्ठ पर अवश्य लिखें।

*Candidates must write the Q.P. Code on the title page of the answer-book.*

- कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 23 हैं।
- प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को छात्र उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें।
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में 39 प्रश्न हैं।
- कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में प्रश्न का क्रमांक अवश्य लिखें।
- इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है। प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा। 10.15 बजे से 10.30 बजे तक छात्र केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका में कोई उत्तर नहीं लिखेंगे।
- Please check that this question paper contains 23 printed pages.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 39 questions.
- Please write down the Serial Number of the question in the answer-book before attempting it.
- 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

## विज्ञान (सैद्धान्तिक)

### SCIENCE (Theory)

निर्धारित समय : 3 घण्टे

Time allowed : 3 hours

अधिकतम अंक : 80

Maximum Marks : 80

**GENERAL INSTRUCTIONS :**

**Read the following instructions very carefully and 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 be 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**  
**(Multiple Choice Questions)**

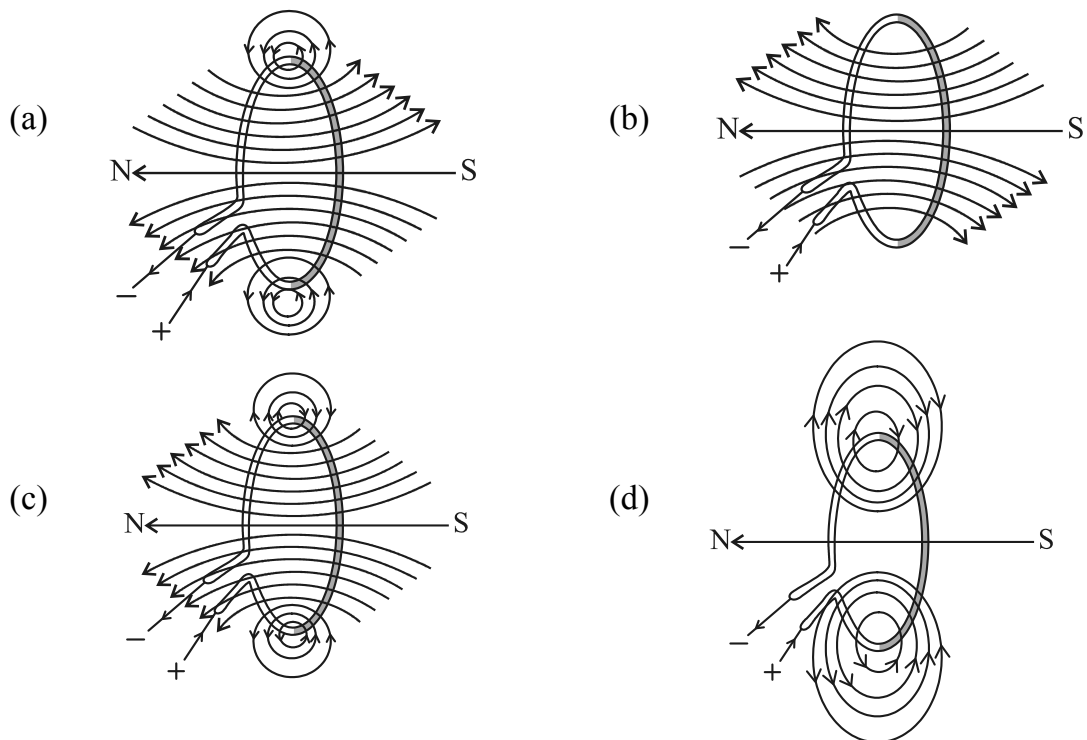
1. When aqueous solutions of potassium iodide and lead nitrate are mixed, an insoluble substance separates out. The chemical equation for the reaction involved is : **1**
  - (a)  $\text{KI} + \text{PbNO}_3 \longrightarrow \text{PbI} + \text{KNO}_3$
  - (b)  $2\text{KI} + \text{Pb}(\text{NO}_3)_2 \longrightarrow \text{PbI}_2 + 2\text{KNO}_3$
  - (c)  $\text{KI} + \text{Pb}(\text{NO}_3)_2 \longrightarrow \text{PbI} + \text{KNO}_3$
  - (d)  $\text{KI} + \text{PbNO}_3 \longrightarrow \text{PbI}_2 + \text{KNO}_3$
2. When Sodium bicarbonate reacts with dilute hydrochloric acid, the gas evolved is : **1**
  - (a) Hydrogen; it gives pop sound with burning match stick.
  - (b) Hydrogen; it turns lime water milky.
  - (c) Carbon dioxide; it turns lime water milky.
  - (d) Carbon dioxide; it blows off a burning match stick with a pop sound.
3. Acid present in tomato is : **1**
  - (a) Methanoic acid
  - (b) Acetic acid
  - (c) Lactic acid
  - (d) Oxalic acid
4. A metal ribbon 'X' burns in oxygen with a dazzling white flame forming a white ash 'Y'. The correct description of X, Y and the type of reaction is : **1**
  - (a)  $\text{X} = \text{Ca}$  ;  $\text{Y} = \text{CaO}$  ; Type of reaction = Decomposition
  - (b)  $\text{X} = \text{Mg}$  ;  $\text{Y} = \text{MgO}$  ; Type of reaction = Combination
  - (c)  $\text{X} = \text{Al}$  ;  $\text{Y} = \text{Al}_2\text{O}_3$  ; Type of reaction = Thermal decomposition
  - (d)  $\text{X} = \text{Zn}$  ;  $\text{Y} = \text{ZnO}$  ; Type of reaction = Endothermic



5. The name of the salt used to remove permanent hardness of water is : 1
- Sodium hydrogen carbonate ( $\text{NaHCO}_3$ )
  - Sodium chloride ( $\text{NaCl}$ )
  - Sodium carbonate decahydrate ( $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ )
  - Calcium sulphate hemihydrate ( $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ )
6. The electron dot structure of chlorine molecule is : 1
- Diagram (a) shows two chlorine atoms, each with the symbol 'Cl'. Each atom is surrounded by six 'x' marks representing valence electrons: two above, two below, and two to the side. The two atoms are placed side-by-side, but their valence electron shells do not overlap, and there are no shared electron pairs between them.
  - Diagram (b) shows two chlorine atoms, each with the symbol 'Cl'. Each atom is surrounded by six 'x' marks representing valence electrons: two above, two below, and two to the side. The two atoms are placed side-by-side, and their valence electron shells overlap. In the overlapping region, there are four 'x' marks, representing a shared pair of electrons. There are also two 'x' marks on the outer side of each atom, representing unshared electron pairs.
  - Diagram (c) shows two chlorine atoms, each with the symbol 'Cl'. Each atom is surrounded by six 'x' marks representing valence electrons: two above, two below, and two to the side. The two atoms are placed side-by-side, and their valence electron shells overlap. In the overlapping region, there are two 'x' marks, representing a shared pair of electrons. There are also four 'x' marks on the outer side of each atom, representing unshared electron pairs.
  - Diagram (d) shows two chlorine atoms, each with the symbol 'Cl'. Each atom is surrounded by six 'x' marks representing valence electrons: two above, two below, and two to the side. The two atoms are placed side-by-side, and their valence electron shells overlap. In the overlapping region, there are four 'x' marks, representing a shared pair of electrons. There are also two 'x' marks on the outer side of each atom, representing unshared electron pairs.
7. Sodium hydroxide is termed an alkali while Ferric hydroxide is not because : 1
- Sodium hydroxide is a strong base, while Ferric hydroxide is a weak base.
  - Sodium hydroxide is a base which is soluble in water while Ferric hydroxide is also a base but it is not soluble in water.
  - Sodium hydroxide is a strong base while Ferric hydroxide is a strong acid.
  - Sodium hydroxide and Ferric hydroxide both are strong base but the solubility of Sodium hydroxide in water is comparatively higher than that of Ferric hydroxide.
8. Opening and closing of stomata is due to : 1
- High pressure of gases inside the cells.
  - Movement of water in and out of the guard cells.
  - Stimulus of light in the guard cells.
  - Diffusion of  $\text{CO}_2$  in and out of the guard cells.
9. Water in the root enters due to : 1
- the function of the root to absorb water.
  - difference in the concentration of ions between the root and the soil.
  - excess water present in the soil.
  - diffusion of water in the roots.



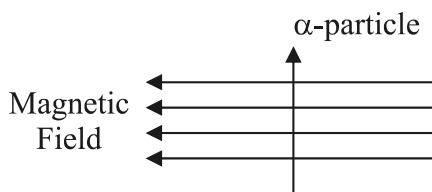
10. Which one of the given statements is incorrect : 1
- DNA has the complete information for a particular characteristic.
  - DNA is the molecule responsible for the inheritance of characters from parents to offsprings.
  - Change in information will produce a different protein.
  - Characteristics will remain the same even if protein changes.
11. Sensory nerve of a reflex arc carries information from the receptor cells to the : 1
- spinal cord
  - brain
  - muscles of the effector organ
  - bones of the receptor organ
12. A cross between pea plant with white flowers (vv) and pea plant with violet flowers (VV) resulted in  $F_2$  progeny in which ratio of violet (VV) and white (vv) flowers will be : 1
- 1 : 1
  - 2 : 1
  - 3 : 1
  - 1 : 3
13. The correct pattern of magnetic field lines of the field produced by a current carrying circular loop is : 1



14. Two LED bulbs of 12W and 6W are connected in series. If the current through 12W bulb is 0.06A the current through 6W bulb will be : 1
- (a) 0.04A (b) 0.06A (c) 0.08A (d) 0.12A

15. An alpha particle enters a uniform magnetic field as shown. The direction of motion of the alpha particle is : 1

- (a) towards right  
(b) towards left  
(c) into the page  
(d) out of the page



16. The resistance of a resistor is reduced to half of its initial value. If other parameters of the electrical circuit remain unaltered, the amount of heat produced in the resistor will become : 1
- (a) four times  
(b) two times  
(c) half  
(d) one fourth

**Q. No. 17 to 20 are Assertion – Reasoning based questions.**

**These consist of two statements – Assertion (A) and Reason (R). Answer these questions 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 but (R) is not the correct explanation of (A).  
(c) (A) is true but (R) is false.  
(d) (A) is false but (R) is true.

17. **Assertion (A) :** In humans, if gene (B) is responsible for black eyes and gene (b) is responsible for brown eyes, then the colour of eyes of the progeny having gene combination Bb, bb or BB will be black only.

**Reason (R) :** The black colour of the eyes is a dominant trait. 1

18. **Assertion (A) :** Reaction of Quicklime with water is an exothermic reaction.

**Reason (R) :** Quicklime reacts vigorously with water releasing a large amount of heat. 1



19. **Assertion (A) :** A current carrying straight conductor experiences a force when placed perpendicular to the direction of magnetic field.

**Reason (R) :** The net charge on a current carrying conductor is always zero.

1

20. **Assertion (A) :** The inner walls of the small intestine have finger like projections called villi which are rich in blood.

**Reason (R) :** These villi have a large surface area to help the small intestine in completing the digestion of food.

1

**SECTION – B**  
**(Very Short Answer Questions)**

21. Name a plant hormone responsible for bending of a shoot of a plant when it is exposed to unidirectional light. How does it promote phototropism ?

2

22. (A) A student took a small amount of copper oxide in a conical flask and added dilute hydrochloric acid to it with constant stirring. He observed a change in colour of the solution.

2

(i) Write the name of the compound formed and its colour.

(ii) Write a balanced chemical equation for the reaction involved.

**OR**

- (B) The industrial process used for the manufacture of caustic soda involves electrolysis of an aqueous solution of compound 'X'. In this process, two gases 'Y' and 'Z' are liberated. 'Y' is liberated at cathode and 'Z', which is liberated at anode, on treatment with dry slaked lime forms a compound 'B'. Name X, Y, Z and B.

2

23. Two green plants are kept separately in oxygen free containers, one in the dark and other in sunlight. It was observed that plant kept in dark could not survive longer. Give reason for this observation.

2

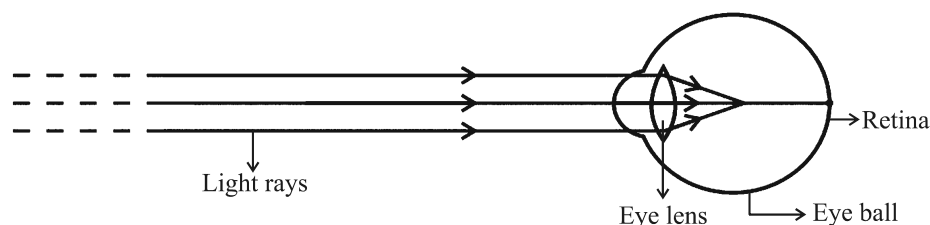
24. What is the other name of 'tissue fluid' ? Write its two functions.

2



25. “Although gardens are created by man but they are considered to be an ecosystem.” Justify this statement. 2

26. (A) Observe the following diagram and answer the questions following it : 2



- (i) Identify the defect of vision shown.
- (ii) List its two causes.
- (iii) Name the type of lens used for the correction of this defect.

**OR**

(B) The colour of clear sky from the earth appears blue but from the space it appears black. Why ? 2

### SECTION – C (Short Answer Questions)

27. Consider the following salts : 3

- (i)  $\text{YCl}$                       (ii)  $\text{NH}_4\text{X}$                       (iii)  $\text{ZCO}_3$
- (a) What would be the pH of the salt solution if in  $\text{YCl}$ , Y is sodium ? Give reason for your answer.
- (b) If in salt  $\text{NH}_4\text{X}$ , X is nitrate, then its solution will give what colour with universal indicator ? Why ?
- (c) What would be the change in colour in blue litmus solution if  $\text{ZCO}_3$  is added to it and Z is potassium ?

28. (i) While electrolysis of water before passing the current some drops of an acid are added. Why ? Name the gases liberated at cathode and anode. Write the relationship between the volume of gas collected at anode and the volume of gas collected at cathode. 3

(ii) What is observed when silver chloride is exposed to sunlight ? Give the type of reaction involved.



29. The magnification produced when an object is placed at a distance of 20 cm from a spherical mirror is  $+1/2$ . Where should the object be placed to reduce the magnification to  $+1/3$ . 3

30. (A) (i) How does Paramecium obtain its food ? 3

(ii) List the role of each of the following in our digestive system :

- (a) Hydrochloric acid
- (b) Trypsin
- (c) Muscular walls of stomach
- (d) Salivary amylase

**OR**

(B) (i) What is double circulation ? 3

(ii) Why is the separation of the right side and the left side of the heart useful ? How does it help birds and mammals ?

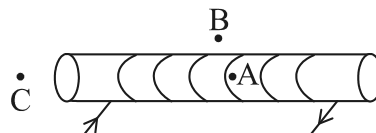
31. (A) (i) Why is an alternating current (A.C.) considered to be advantageous over direct current (D.C.) for the long distance transmission of electric power ? 3

(ii) How is the type of current used in household supply different from the one given by a battery of dry cells ?

(iii) How does an electric fuse prevent the electric circuit and the appliances from a possible damage due to short circuiting or overloading.

**OR**

(B) For the current carrying solenoid as shown, draw magnetic field lines and give reason to explain that out of the three points A, B and C, at which point the field strength is maximum and at which point it is minimum ? 3



32. Write one difference between biodegradable and non-biodegradable wastes. List two impacts of each type of the accumulated waste on environment if not disposed off properly. 3



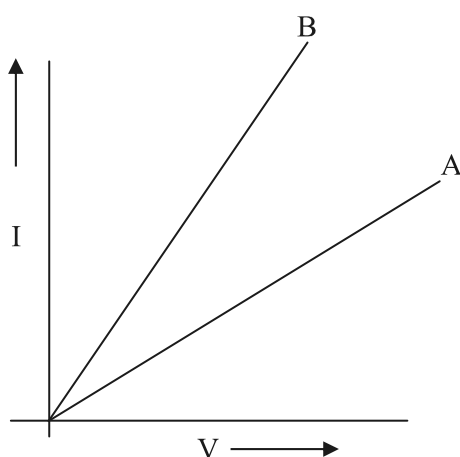
33. (A) Define the term dispersion of white light. State the colour which bends (i) the most, (ii) the least while passing through a glass prism. Draw a diagram to show the dispersion of white light. 3

OR

- (B) What is a rainbow ? Draw a labelled diagram to show its formation. 3

**SECTION – D**  
**(Long Answer Questions)**

34. (i) Name and explain the two modes of asexual reproduction observed in hydra. 5
- (ii) What is vegetative propagation ? List two advantages of using this technique.
35. (i) How is electric current related to the potential difference across the terminals of a conductor ? 5
- Draw a labelled circuit diagram to verify this relationship.
- (ii) Why should an ammeter have low resistance ?
- (iii) Two V - I graphs A and B for series and parallel combinations of two resistors are as shown. Giving reason state which graph shows (a) series, (b) parallel combination of the resistors.



36. (A) Write the chemical equation for the following : 5

- (i) Combustion of methane      (ii) Oxidation of ethanol  
(iii) Hydrogenation of ethene      (iv) Esterification Reaction  
(v) Saponification Reaction

OR

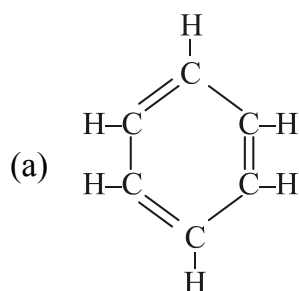
(B) (i) Draw two structural isomers of butane. 5

(ii) Draw the structures of propanol and propanone.

(iii) Name the third homologue of :

- (a) alcohols      (b) aldehydes

(iv) Name the following :



(b)  $\text{CH}_3\text{--CH}_2\text{CH}=\text{CH}_2$

(v) Show the covalent bond formation in nitrogen molecule.

**SECTION – E**  
**(Source Based/Case Based Questions)**

37. The most obvious outcome of the reproductive process is the generation of individuals of similar design, but in sexual reproduction they may not be exactly alike. The resemblances as well as differences are marked. The rules of heredity determine the process by which traits and characteristics are reliably inherited. Many experiments have been done to study the rules of inheritance. 4

- (i) Why an offspring of human being is not a true copy of his parents in sexual reproduction ? 1



- (ii) While performing experiments on inheritance in plants, what is the difference between  $F_1$  and  $F_2$  generation ? 1
- (iii) (A) Why do we say that variations are useful for the survival of a species over time ? 2

**OR**

- (iii) (B) Study Mendel's cross between two plants with a pair of contrasting characters. 2

|              |   |                |
|--------------|---|----------------|
| RRYY         | × | rryy           |
| Round Yellow |   | Wrinkled Green |

He observed 4 types of combinations in  $F_2$  generation. Which of these were new combinations ? Why do new features which are not present in the parents, appear in  $F_2$  generation ?

- 38.** The ability of a medium to refract light is expressed in terms of its optical density. Optical density has a definite connotation. It is not the same as mass density. On comparing two media, the one with the large refractive index is optically denser medium than the other. The other medium with a lower refractive index is optically rarer. Also the speed of light through a given medium is inversely proportional to its optical density. 4
- (i) Determine the speed of light in diamond if the refractive index of diamond with respect to vacuum is 2.42. Speed of light in vacuum is  $3 \times 10^8$  m/s. 1
- (ii) Refractive indices of glass, water and carbon disulphide are 1.5, 1.33 and 1.62 respectively. If a ray of light is incident in these media at the same angle (say  $\theta$ ), then write the increasing order of the angle of refraction in these media. 1
- (iii) (A) The speed of light in glass is  $2 \times 10^8$  m/s and in water is  $2.25 \times 10^8$  m/s. 2



- (a) Which one of the two is optically denser and why ?
- (b) A ray of light is incident normally at the water-glass interface when it enters a thick glass container filled with water. What will happen to the path of the ray after entering the glass ? Give reason.

**OR**

- (iii) (B) The absolute refractive indices of water and glass are  $\frac{4}{3}$  and  $\frac{3}{2}$  respectively. If the speed of light in glass is  $2 \times 10^8$  m/s, find the speed of light in (i) vacuum and (ii) water.

2

39. The melting points and boiling points of some ionic compounds are given below :

4

| Compound          | Melting Point (K) | Boiling Point (K) |
|-------------------|-------------------|-------------------|
| NaCl              | 1074              | 1686              |
| LiCl              | 887               | 1600              |
| CaCl <sub>2</sub> | 1045              | 1900              |
| CaO               | 2850              | 3120              |
| MgCl <sub>2</sub> | 981               | 1685              |

These compounds are termed ionic because they are formed by the transfer of electrons from a metal to a non-metal. The electron transfer in such compounds is controlled by the electronic configuration of the elements involved. Every element tends to attain a completely filled valence shell of its nearest noble gas or a stable octet.

- (i) Show the electron transfer in the formation of magnesium chloride.
- (ii) List two properties of ionic compounds other than their high melting and boiling points.
- (iii) (A) While forming an ionic compound say sodium chloride how does sodium atom attain its stable configuration ?

1

1

2

**OR**

- (iii) (B) **Give reasons :**

2

- (i) Why do ionic compounds in the solid state not conduct electricity ?
- (ii) What happens at the cathode when electricity is passed through an aqueous solution of sodium chloride ?



