

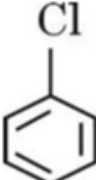
Class XII | Session 2026-27
Subject - Chemistry
Sample Question Paper - Set 8

General Instructions:

Read the following instructions carefully.

1. There are **33** questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 5 very short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. **All questions are compulsory.**
8. **Use of log tables and calculators is not allowed.**

Section A

1. Which of the following is most reactive towards nucleophilic substitution reaction? [1]
 - a) 
 - b) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-Cl}$
 - c) $\text{CH}_2=\text{CH-CH}_2\text{-Cl}$
 - d) $\text{CH}_2=\text{CH-C}$
2. The deficiency of which of the following vitamins causes Scurvy? [1]
 - a) Vitamin B₁₂
 - b) Vitamin C
 - c) Vitamin A
 - d) Vitamin B₆
3. Which of the following reagents can be used to oxidise primary alcohols to aldehydes? [1]
 - a) CrO₃ in an anhydrous medium.
 - b) Pyridinium chlorochromate.
 - c) All of these
 - d) Heat in the presence of Cu at 573K.
4. Which of the following compounds will give a ketone on oxidation with chromic anhydride (CrO₃)? [1]
 - a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
 - b) $(\text{CH}_3)_3\text{C-OH}$
 - c) $\text{CH}_3 - \text{CH}_2 - \underset{\text{OH}}{\text{CH}} - \text{CH}_3$
 - d) $(\text{CH}_3)_2\text{CH-CH}_2\text{OH}$
5. The half life of a substance in a first order reaction is 15 min. The rate constant is [1]

a) $4.62 \times 10^{-2} \text{ min}^{-1}$

b) $2.46 \times 10^2 \text{ min}^{-1}$

c) $7.18 \times 10^2 \text{ min}^{-1}$

d) $6.74 \times 10^{-2} \text{ min}^{-1}$

6. Match the items given in column I with that in column II.

[1]

Column I	Column II
(a) Molarity	(i) $\frac{\text{Mass of solute}}{\text{Mass of solution}} \times 10^6$
(b) Molality	(ii) Number of gram moles of a solute per litre of solution
(c) Normality	(iii) Number of gram moles of a solute per kg of solvent
(d) ppm	(iv) Number of gram equivalent of a solute per litre of solution

a) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

b) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)

c) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)

d) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

7. C - Cl bond in chlorobenzene in comparison to C - Cl bond in methyl chloride is:

[1]

a) longer and weaker

b) longer and stronger

c) shorter and stronger

d) shorter and weaker

8. Which of the following elements of 3d series of transition elements has the lowest $\Delta_a H^0$?

[1]

a) Zn

b) Cu

c) Sc

d) Cr

9. As temperature increases, the reaction rate:

[1]

a) Stays the same

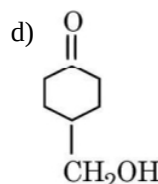
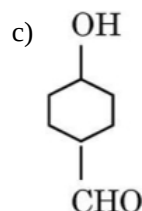
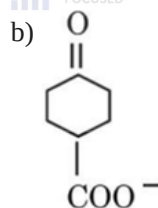
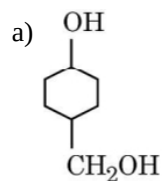
b) Increases

c) First decreases then increases

d) Decreases

10. The product (X) obtained in the following reaction is:

[1]



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11. Dehydration of tertiary alcohols with Cu at 573 K gives:

[1]

a) Ketone

b) Alkyne

c) Aldehyde

d) Alkene

12. The best reagent for converting, 2-phenylpropanamide into 1- phenylethanamine is _____.

[1]

a) Br_2/NaOH

b) LiAlH_4

c) excess H_2/Pt

d) $\text{NaBH}_4/\text{methanol}$

13. **Assertion (A):** The backbone of DNA and RNA molecules is a chain consisting of heterocyclic base, pentose sugar and phosphate group. [1]

Reason (R): Nucleotides and nucleosides mainly differ from each other in presence of phosphate group.

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

14. **Assertion (A):** Benzoic acid does not undergo Friedel - Crafts reaction. [1]

Reason (R): Carboxyl group is deactivating and the catalyst aluminium chloride gets bonded to the carboxyl group.

- 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.

15. **Assertion (A):** KCN reacts with methyl chloride to give methyl isocyanide. [1]

Reason (R): CN^- is an ambident nucleophile.

- 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.

16. **Assertion (A):** Last traces of moisture in ethanol can be removed by keeping it over sodium wire. [1]

Reason (R): Sodium reacts with water but not with ethanol to produce H_2 gas.

- 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) Both A and R are false.

Section B

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17. A 5% solution (by mass) of cane sugar in water has a freezing point of 271K. Calculate the freezing point of 5% glucose in water if the freezing point of pure water is 273.15 K. [2]

OR

Under what condition do non-ideal solutions show negative deviations?

18. i. What type of isomerism is shown by the complex $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$? [2]
ii. On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_o > P$.
iii. Write the hybridization and shape of $[\text{CoF}_6]^{3-}$. (Atomic number of Co = 27)

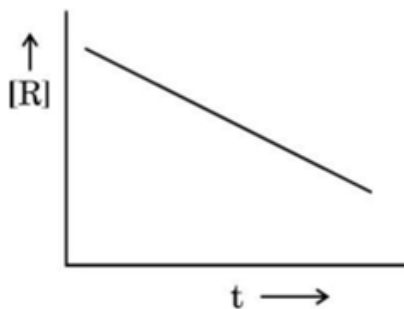
19. Answer the following: [2]

- a. What is the general electronic configuration of lanthanoids?
b. What are the common oxidation states of Cerium (At. no. 58)?
c. Why do actinoids show a wide range of oxidation states?

20. Answer the following: [2]

- (a) Consider the equation $2NO(g) + 2H_2(g) \rightarrow N_2(g) + 2H_2O(g)$. The rate law for this equation is first order with respect to H_2 and second order with respect to NO. write the rate law for this reaction. [1]

- (b) For a chemical reaction $R \rightarrow P$, the variation in the concentration $[R]$ vs time t plot is given as: [1]

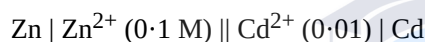


- a. Predict the order of the reaction and write the unit of rate constant (k) for this order of reaction.
b. What is the slope of the curve?

21. Write the equation involved in the Etard reaction. [2]

Section C

22. Write the Nernst equation and calculate the emf of the following cell at 298 K: [3]



Given : $E_{Zn^{2+}/Zn}^{\ominus} = -0.76 \text{ V}$

$E_{Cd^{2+}/Cd}^{\ominus} = -0.40 \text{ V}$

($\log 10 = 1$)

23. Hydrogen peroxide, $H_2O_2(aq)$ decomposes to H_2O and O_2 in a reaction which is first order in H_2O_2 and has a rate constant, $k = 1.06 \times 10^{-3} \text{ min}^{-1}$. Then: [3]

- How long will it take 15% of a sample of H_2O_2 to decompose?
- How long will it take 85% of a sample of H_2O_2 to decompose?

24. Draw the structure and name the product formed if the following alcohols are oxidized. Assume that an excess of oxidizing agent is used. [3]



OR

What is fermentation? How is ethanol obtained by fermentation of molecules giving chemical equations?

25. i. Which will undergo faster nucleophilic addition reaction? [3]

Acetaldehyde or Propanone

ii. What is the composition of Fehling's reagent?

iii. Draw structure of the semicarbazone of Ethanal.

26. Explain why electrolysis of aqueous solution of NaCl gives H_2 at cathode and Cl_2 at anode. Write overall reaction. [3]

$$\left(\begin{array}{l} E_{Na^+/Na}^0 = -2.71V; E_{H_2O/H_2}^0 = -0.83V \\ E_{Cl_2/2Cl^-}^0 = +1.36V; E_{H^++O_2/H_2O}^0 = 1.23V \end{array} \right)$$

27. Arrange the compounds of each set in order of reactivity towards S_N2 displacement: [3]

- i. 2-bromo-2-methyl butane, 1-bromopentane, 2-bromopentane.
- ii. 1-bromo-3-methylbutane, 2-bromo-2-methylbutane, 3-bromo-2-methylbutane.
- iii. 1-bromobutane, 1-bromo-2, 2-dimethylpropane, 1-bromo-2-methylbutane, 1-bromo-3-methylbutane.

28. a. Write the formulation for the galvanic cell in which the reaction $Cu(s) + 2Ag^+(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$ takes place. [3]
Identify the cathode and the anode reactions in it.
- b. Write Nernst equation and calculate the emf of the following cell: $Sn(s) | Sn^{2+}(0.04M) || H^+(0.02M) | H_2(g) | Pt(s)$
(Given $E^\ominus_{Sn^{2+}/Sn} = -0.14V$)

Section D

29. Read the following text carefully and answer the questions that follow: [4]

The f-block consists of elements in which 4f and 5f orbitals are progressively filled. They are placed in a separate panel at the bottom of the periodic table. The names transition metals and inner transition metals are often used to refer to the elements of d-and f-blocks respectively. The d-block occupies the large middle section of the periodic table flanked between s and p blocks in the periodic table. In general, the electronic configuration of the outer orbitals of these elements is $(n-1)d^{1-10}ns^{1-2}$. The electronic configurations of outer orbitals of Zn, Cd, Hg and Cn are represented by the general formula $(n-1)d^{10}ns^2$. The transition metals and their compounds also exhibit catalytic property and paramagnetic behaviour. Transition metal also forms an alloy. An alloy is a blend of metals prepared by mixing the components. Alloys may be homogeneous solid solutions in which the atoms of one metal are distributed randomly among the atoms of the other.

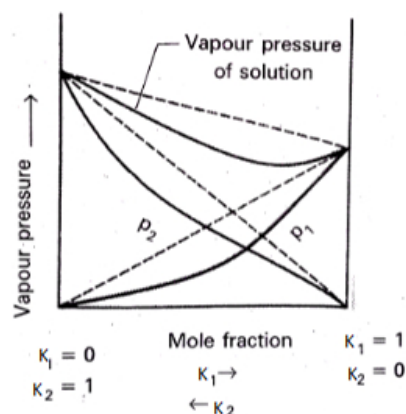
- i. Transition metals form alloys. Justify? (1)
- ii. Why do transition elements exhibit higher enthalpies of atomization? (1)
- iii. Transition metals and many of their compounds show paramagnetic behaviour. Give reason. (2)

OR

Transition metals and their many compounds act as good catalyst. Give reason. (2)

30. Read the following text carefully and answer the questions that follow: [4]

Raoult's law states that for a solution of volatile liquids, the partial vapour pressure of each component of the solution is directly proportional to its mole fraction present in solution. Dalton's law of partial pressure states that the total pressure (P_{total}) over the solution phase in the container will be the sum of the partial pressures of the components of the solution and is given as: $P_{\text{total}} = P_1 + P_2$



- i. Is the above-mentioned Raoult's law applicable for non-volatile liquids? (1)
- ii. What type of deviation from Raoult's law does the above graph represent? (1)

iii. Give an example of such system. (2)

OR

A solution of two liquids boils at a temperature more than the boiling point of either of them. What type of deviation will be shown by the solution formed in terms of Raoult's law? (2)

Section E

31. **Attempt any five of the following:** [5]

- (a) Define the following terms: [1]
- Essential amino acids
 - Nucleotide
- (b) Name the bases present in RNA. Which one of these is not present in DNA? [1]
- (c) What are nucleic acids? Why two strands in DNA are not identical but are complementary? [1]
- (d) Write the products obtained after hydrolysis of DNA. [1]
- (e) What is the structural feature characterising reducing sugars? [1]
- (f) What is the basic structural difference between starch and cellulose? [1]
- (g) a. How can you explain the absence of an aldehyde group in the pentaacetate of D-glucose? [1]
b. Name the bases present in RNA. Which one of these is not present in DNA?

32. a. i. For the complex $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$, write the hybridization magnetic character and spin of the complex. (At. number : Fe = 26). [5]

ii. Draw one of the geometrical isomers of the complex $[\text{Pt}(\text{en})_2\text{Cl}_2]^{2+}$ which is optically inactive.

b. i. Using crystal field theory, write the electronic configuration of iron ion in the following complex ion.

Also predict its magnetic behaviour: $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$

ii. Write the IUPAC name of the coordination complex: $[\text{CoCl}_2(\text{en})_2]\text{NO}_3$

OR

i. Define crystal field splitting energy. On the basis of crystal field theory, write the electronic configuration for d^4 ion if $\Delta_0 < P$.

ii. $[\text{Ni}(\text{CN})_4]^{2-}$ is colourless whereas $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ is green. Why? (At. no. of Ni = 28)

33. **Account for the following:** [5]

- Aniline is a weaker base compared to ethanamine.
- Aniline does not undergo Friedel-Crafts reaction.
- Only aliphatic primary amines can be prepared by Gabriel Phthalimide synthesis.

OR

An aromatic compound 'A' of molecular formula $\text{C}_7\text{H}_6\text{O}_2$ undergoes a series of reactions as shown below. Write the structures of A, B, C, D and E in the following reactions.

