

121530

Std. XII

PADMA SESHADRI BALA BHAVAN SENIOR SECONDARY SCHOOL, CHENNAI.
QUARTERLY EXAMINATION – 2025-2026

Date: 18.09.2025

Total no. of qns.: 33

CHEMISTRY

CODE - 1

Note:

Duration of Answering the Question Paper	: 3 hours
Reading and understanding the Question Paper	: 15 mins.
Total Duration	: 3¼ hours
Marks	: 70

GENERAL INSTRUCTIONS:

Read the following instructions carefully.

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

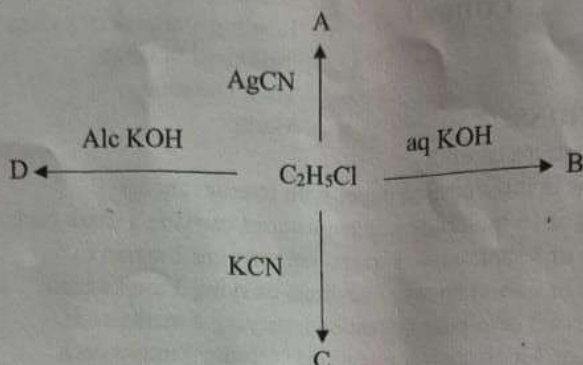
SECTION – A

(1 × 16 = 16)

The following questions are multiple-choice questions with one correct answer.
Each question carries 1 mark. There is no internal choice in this section.

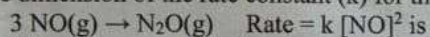
- SN2 mechanism proceeds through intervention of
a) Carbocation b) Transition state c) Free radical d) Carbanion
- The vapour pressure of a liquid in a closed container depends upon
(i) Quantity of the liquid
(ii) Surface area of the liquid
(iii) Temperature of the liquid
a) (i) only b) (iii) only c) (ii) and (iii) only d) (i), (ii) and (iii)
- Which of the following solutions will have the highest conductivity at 298 K?
a) 0.01 M HCl solution b) 0.01 M CH₃COOH solution
c) 0.1 M HCl solution d) 0.1 M CH₃COOH solution
- X molal solution of a compound in benzene has mole fraction of solute equal to 0.2. The value of X is
a) 14 b) 3.2 c) 1.4 d) 2
- Electronic configuration of a transition element X in +3 oxidation state is [Ar]3d⁵. What is its atomic number?
a) 25 b) 26 c) 27 d) 24
- An aromatic ether is not cleaved by HI even at 525 K. The compound is
a) C₆H₅OCH₃ b) C₆H₅OC₆H₅ c) C₆H₅OC₃H₇ d) C₆H₅OCH₂C₆H₅
- Which of the following is Chiral in nature?
a) 2-Bromobutane b) 1-Bromobutane c) 2-Bromopropane d) 2-Bromopropan-2-ol
- Which of the following compounds is oxidised to prepare methyl ethyl ketone?
a) Propan-2-ol b) Butanol c) Butan-2-ol d) t-Butyl alcohol
- Interstitial compounds are formed when small atoms are trapped inside the crystal lattice of metals. Which of the following is not the characteristic property of interstitial compounds?
a) They have high melting points in comparison to pure metals.
b) They are very hard.
c) They have no metallic conductivity.
d) They are chemically inert
- The rate of disappearance of Cr₂O₇²⁻ ion at any instant in the following reaction:
 $\text{Cr}_2\text{O}_7^{2-} + 6\text{I}^- + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 3\text{I}_2 + 7\text{H}_2\text{O}$ is $1.55 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$.
The rate of formation of iodine is
a) $9.3 \times 10^{-2} \text{ M s}^{-1}$ b) $4.65 \times 10^{-2} \text{ M s}^{-1}$ c) $5 \times 10^{-3} \text{ M s}^{-1}$ d) $2.5 \times 10^{-2} \text{ M s}^{-1}$

11. Identify A, B, C, D



- a) A = $\text{C}_2\text{H}_5\text{CN}$ B = $\text{C}_2\text{H}_5\text{OH}$ C = $\text{C}_2\text{H}_5\text{NC}$ D = C_2H_4
 b) A = $\text{C}_2\text{H}_5\text{Ag}$ B = $\text{C}_2\text{H}_5\text{OH}$ C = $\text{C}_2\text{H}_5\text{CN}$ D = $\text{C}_2\text{H}_5\text{OK}$
 c) A = $\text{C}_2\text{H}_5\text{NC}$ B = $\text{C}_2\text{H}_5\text{OH}$ C = $\text{C}_2\text{H}_5\text{CN}$ D = C_2H_4
 d) A = $\text{C}_2\text{H}_5\text{NC}$ B = $\text{C}_2\text{H}_5\text{OK}$ C = $\text{C}_2\text{H}_5\text{CN}$ D = C_2H_6

12. The dimension of the rate constant (k) for the following reaction



- a) s^{-1} b) $\text{mol L}^{-1} \text{s}^{-1}$ c) $\text{mol}^{-1} \text{L s}^{-1}$ d) $\text{mol}^{-1} \text{L}^2 \text{s}^{-1}$

Each of the following questions contains an assertion followed by a reason. Read them carefully and answer the questions on the basis of the following options.

13. **Assertion:** Nitration of Chlorobenzene leads to the formation of m-Nitrochlorobenzene.

Reason: Nitro group is meta-directing group.

Select the most appropriate answer from the options 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.

14. **Assertion:** Ortho and para nitrophenol can be separated by Steam distillation.

Reason: Para nitro phenol is steam volatile.

Select the most appropriate answer from the options 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.

15. **Assertion:** Cu cannot liberate hydrogen from acids.

Reason: Cu has positive electrode potential.

Select the most appropriate answer from the options 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.

16. **Assertion:** When ethyl alcohol is added to water, boiling point of water decreases.

Reason: When a volatile solute is added to a volatile solvent elevation in boiling point is observed.

Select the most appropriate answer from the options 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.

SECTION - B

(2 × 5 = 10)

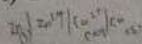
This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

17. i) What is the role of a salt bridge in an electrochemical cell?
 ii) Represent graphically the variation of molar conductivity with concentration for a strong electrolyte
18. Haloarenes are less reactive towards nucleophilic substitution reactions than haloalkanes. Explain.
19. Complete the equations
 (i) $\text{Cr}_2\text{O}_7^{2-}(\text{aq}) + \text{H}^+(\text{aq}) + \text{Sn}^{2+}(\text{aq}) \longrightarrow$
 (ii) $\text{MnO}_4^-(\text{aq}) + \text{Fe}^{2+}(\text{aq}) + \text{H}^+(\text{aq}) \longrightarrow$

(OR)

- Which element in 3d series has /is
 i) +1 oxidation state Zn ii) Lowest enthalpy of atomization Zn
 iii) highest oxidation state Mn iv) a strong reducing agent in +2 oxidation state Cr
20. Calculate the mass of a non-volatile solute (molecular mass 40 g mol^{-1}) that should be dissolved in 114 g of octane to reduce its pressure to 80%.
21. For the reaction
 $\text{Zn(s)} + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{Cu(s)}$ $E_{\text{cell}}^0 = 1.1 \text{ V}$ ($1 \text{ F} = 96500 \text{ C mol}^{-1}$).

i) Give the cell notation

ii) Calculate $\Delta_r G^0$ **SECTION - C**

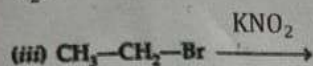
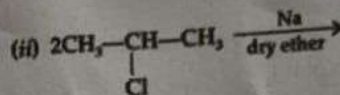
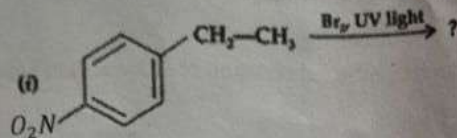
(3 × 7 = 21)

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. Determine the osmotic pressure of a solution prepared by dissolving 25 mg of K_2SO_4 in 2 litres of water at 25°C , assuming that it is completely dissociated ($\text{K}=39, \text{S}=32, \text{O}=16$) ($R = 0.0821 \text{ L atm K}^{-1} \text{ mol}^{-1}$)
23. i) State Kohlrausch law of independent migration of ions.
 ii) Calculate the mass of Ag deposited at cathode when a current of 2 amperes was passed through a solution of AgNO_3 for 15 minutes .
 [Molar mass of $\text{Ag} = 108 \text{ g mol}^{-1}$ $\text{F} = 96,500 \text{ C mol}^{-1}$]
24. Write the equations and give the IUPAC names of the products expected from the following reactions
 (a) Catalytic reduction of butanal.
 (b) Reaction of propanone with methyl magnesium bromide followed by hydrolysis
25. i) Write one similarity and one difference between the chemistry of lanthanoid and actinoid elements. (2)
 ii) Why transition metals form large number of complexes? (1)
26. a) Write the names of reagents and equations for the preparation of 2-Methoxy-2-methylpropane. (2)
 b) Write short notes on Reimer-Tiemann reaction. (1)
27. i) Account for the following:
 a) Allyl chloride is hydrolysed more readily than n-propyl chloride. Why?
 b) It is necessary to avoid even traces of moisture during the use of a Grignard reagent?
 ii) Draw the structure of neo-pentyl bromide

(OR)

Write the major product formed in the following reactions



28. For the reaction: $2\text{A} + \text{B} \rightarrow \text{A}_2\text{B}$ the rate $= k[\text{A}][\text{B}]^2$ with $k = 2.0 \times 10^{-6} \text{ mol}^{-2} \text{ L}^2 \text{ s}^{-1}$. Calculate the initial rate of the reaction when $[\text{A}] = 0.1 \text{ mol L}^{-1}$, $[\text{B}] = 0.2 \text{ mol L}^{-1}$. Calculate the rate of reaction after $[\text{A}]$ is reduced to 0.06 mol L^{-1} .

(4 × 2 = 8)

SECTION - D

The following questions are case-based questions. Each question has an internal choice and carries 4 marks each. Read the passage carefully and answer the questions that follow.

29. Electrochemistry plays a very important part in our daily life. A 38% solution of sulphuric acid is used in lead storage battery. Its density is 1.30 g mL^{-1} . The battery holds 3.5 L of the acid. During the discharge of the battery, the density of H_2SO_4 falls to 1.14 g mL^{-1} (20% solution by mass)

- (i) Write the chemical reaction taking place at anode when lead storage battery is in use.
 (ii) How much electricity in Faraday is required to carry out the reduction of one mole of PbO_2 ?
 (iii) Which cell is used in a) hearing aids b) clocks c) inverters d) Apollo space programme

(OR)

- (iii) Write the products of electrolysis when

- a) dilute sulphuric acid is electrolysed using platinum electrodes.
 b) Conc sulphuric acid is electrolysed using platinum electrodes.

30. Aspirin possesses analgesic, anti-inflammatory and antipyretic properties. The reaction with carboxylic acid and acid anhydride is carried out in the presence of a small amount of concentrated sulphuric acid. The reaction is reversible, and therefore, water is removed as soon as it is formed. The introduction of acetyl (CH_3CO) group in alcohols or phenols is known as acetylation. Acetylation of salicylic acid produces aspirin.

- (i) Give the structure of aspirin.
 (ii) Give a chemical test to distinguish Salicylic acid and Benzoic acid.
 (iii) Acetylation of phenol with acetyl chloride happens in the presence of pyridine. Justify

(OR)

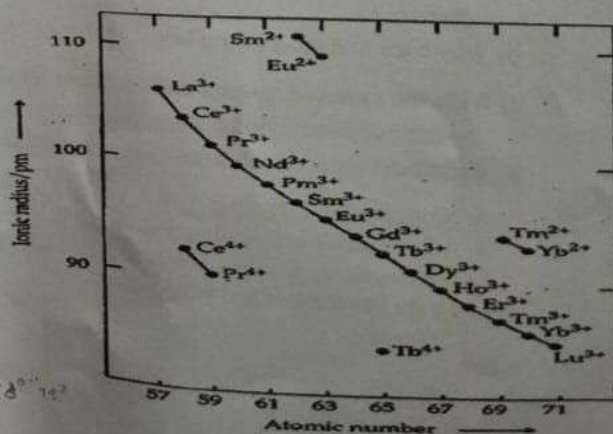
- (iii) Phenol is more acidic than alcohol. Justify.

SECTION - E

(5 × 3 = 15)

The following questions are long answer types and carry 5 marks each. All questions have an internal choice.

31. i) What is this unique phenomenon in the chemistry of lanthanoids referred to as? Explain it.
 ii) Mention any 2 consequences of the above phenomenon
 iii) Classify the following as oxidant / reductant
 a) Ce^{4+} b) Eu^{2+}
 iv) Give the general electronic configuration of Actinoids.



(1+1)

(1)

(1)

(1)

(OR)

When an oxide of manganese (A) is fused with KOH in the presence of an oxidising agent and dissolved in water, it gives a dark green solution of compound (B). Compound (B) disproportionates in neutral or acidic solution to give purple compound (C).

- Identify compounds A, B and C. Also explain the reactions involved.
- Mention the alloy of lanthanoids. What is it used for?

- What is the effect of temperature on the solubility of glucose in water? (1)
 - Ibrahim collected a 10mL each of fresh water and ocean water. He observed that one sample labeled "P" froze at 0°C while the other "Q" at -1.30°C . Ibrahim forgot which of the two, "P" or "Q" was ocean water. Help him identify which container contains ocean water, giving rationalization for your answer. (2)
 - Calculate Van't Hoff factor for an aqueous solution of $\text{Al}_2(\text{SO}_4)_3$ if the degree of dissociation is 0.852. What will be boiling point of this solution if its concentration is 1 molal? ($K_b = 0.52\text{Kkg/mol}$) (2)

(OR)

- What type of deviation from Raoult's Law is expected when phenol and aniline are mixed with each other? What change in the net volume of the mixture is expected? Graphically represent the deviation. (3)
 - The vapour pressure of pure liquids A and B are 450 mm Hg and 700 mm Hg respectively, at 350 K. Find out the composition of the liquid mixture if total vapour pressure is 600 mm Hg. Also find the composition of the vapour phase. (2)
- How are the following conversions carried out? (2)
 - Propene to Propan-2-ol
 - Toluene to Benzyl alcohol
 - Why is chloroform stored in closed dark coloured bottles upto the brim? (1)
 - Draw the structure of 1-bromo-4-sec-butyl-2-methylbenzene (1)
 - An optically active compound 'A' with molecular formula $\text{C}_4\text{H}_9\text{Br}$ is treated with aq KOH solution and the product formed has inversion of configuration. Identify A. (1)
- (OR)
- Write short notes on
 - Finkelstein reaction
 - Wurtz-Fittig reaction
 - Why is sulphuric acid not used during the reaction of alcohols with KI? (2)
 - A hydrocarbon C_5H_{10} does not react with chlorine in dark but gives a single monochloro compound $\text{C}_5\text{H}_9\text{Cl}$ in bright sunlight. Identify the hydrocarbon. (1)
 - Give the IUPAC name of
 $\text{ClCH}_2\text{C} \equiv \text{CCH}_2\text{Br}$ (1)
