

Class XII | Session 2026-27
Subject - Chemistry
Sample Question Paper - Set 4

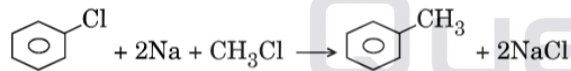
General Instructions:

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. The reaction given below: [1]



is called:

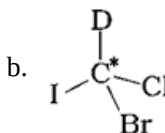
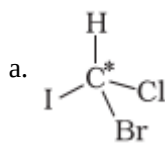
- | | |
|----------------------------|------------------------|
| a) Wurtz reaction | b) Gattermann reaction |
| c) Wurtz - Fittig reaction | d) Fittig reaction |
2. Which among the following is an example of pseudo first order reaction? [1]

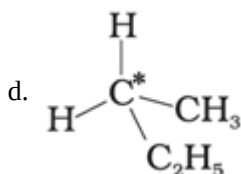
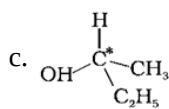
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|--|---|
| a) Decomposition of hydrogen peroxide | b) Dehydration of oxalic acid |
| c) Decomposition of nitrogen pentoxide | d) Acid catalysed hydrolysis of ethyl acetate |

3. Which of the following amines can be resolved into enantiomers? [1]

- | | |
|--------------------|---------------------------------|
| a) 2 – pentanamine | b) 3 – pentanamine |
| c) Trimethylamine | d) 4 – (dimethylamino) pyridine |

4. In which of the following molecules carbon atom marked with an asterisk (*) is asymmetric? [1]





a) (a), (b), (c), (d)

b) (b), (c), (d)

c) (a), (c), (d)

d) (a), (b), (c)

5. Alkenes react with water in the presence of acid as catalyst to form alcohols.

[1]

a) Deprotonation to form alcohol

b) nucleophilic attack of water on carbocation

c) Protonation of alkene and carbocation

d) All of these

6. Match the items of column I with appropriate entries of column II.

[1]

Column I	Column II
(a) K_b	(i) Elevation in boiling point
(b) K_f	(ii) Van't Hoff factor
(c) i	(iii) Cryoscopic constant
(d) ΔT_b	(iv) Ebullioscopic constant

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

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

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

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

7. How many alcohols with molecular formula $C_4H_{10}O$ are chiral in nature?

[1]

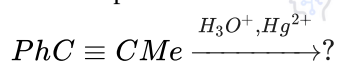
a) 1

b) 3

c) 2

d) 4

8. Give the products of the reaction



a) $PhCOCOME$

b) $PhCH_2COCH_3$

c) $PhCOCH_2CH_3$

d) $PhCH_2CH_2CHO$

9. On addition of small amount of $KMnO_4$ to concentrated H_2SO_4 , a green oily compound is obtained which is highly explosive in nature. Identify the compound from the following.

[1]

a) MnO_2

b) Mn_2O_7

c) Mn_2O_3

d) $MnSO_4$

10. The major component of starch is:

[1]

a) water

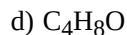
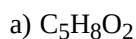
b) glucose

c) amylopectin

d) amylose

11. The molecular formula of ethyl acetate is:

[1]



12. Which among the following is an example of photochemistry used in our daily life? [1]

a) In inversion of cane sugar

b) In photography

c) In decomposition of hydrogen peroxide

d) All of these

13. **Assertion (A):** 2-Butanol on heating with H_2SO_4 gives 1-butene and 2-butene. [1]

Reason (R): Dehydration of 2-butanol follows Saytzeff's rule.

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 (A):** Boiling points of alkyl halides decrease in the order $R-I > R-Br > R-Cl > R-F$. [1]

Reason (R): Van der Waals forces decrease with an increase in the size of the halogen atom.

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):** Mg is not present in the enamel of human teeth. [1]

Reason (R): Mg is an essential element for the biological functions of humans.

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):** Benzaldehyde undergoes aldol condensation. [1]

Reason (R): Aldehydes that do not have α -hydrogen undergo aldol condensation.

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. Distinguish between homoleptic and heteroleptic ligands. [2]

18. Write the names of the reagents and equations in the conversion of [2]

i. phenol to salicylaldehyde.

ii. anisole to p-methoxyacetophenone.

19. **Answer the following:** [2]

(a) Write the slope value obtained in the plot of $\log \frac{[R_o]}{[R]}$ Vs. time for a first-order reaction. [1]

(b) For the homogeneous decomposition of N_2O_5 into NO_2 and O_2 ; $2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$ [1]

$$\text{Rate} = k [N_2O_5]$$

Find out the order of reaction with respect to N_2O_5 .

20. Describe giving reason [2]

i. Why Fe has higher melting point than Cu?

ii. Why Co^{2+} have higher magnetic moment than Ni^{2+} ?

21. What role does the molecular interaction play in a solution of alcohol and water? [2]
22. The vapour pressure of pure benzene at a certain temperature is 0.850 bar. A non-volatile, non-electrolyte solid weighing 0.5 g when added to 39.0 g of benzene (molar mass 78 g mol^{-1}). Vapour pressure of the solution, then, is 0.845 bar. What is the molar mass of the solid substance? [2]

Section C

23. For hydrolysis of ester in water follows a pseudo first order kinetics. The obtained results are as given below: [3]

t(in seconds)	0	30	60	90
[Ester] M	0.55	0.31	0.17	0.085

- i. Calculate the average rate of reaction between the time interval 30 to 60 s.
- ii. Calculate the pseudo first order rate constant for the hydrolysis of ester.
24. A strip of nickel metal is placed in a 1 molar solution of $\text{Ni}(\text{NO}_3)_2$ and a strip of silver metal is placed in a one molar solution of AgNO_3 . An electrochemical cell is created when the two solutions are connected by a salt bridge and the two strips are connected by wires to a voltmeter. [3]
- i. Write the balanced equations for the overall reaction occurring in the cell and calculate the cell potential.
- ii. Calculate the cell potential (E_{cell}) at 25°C for the cell, if the initial concentration of $\text{Ni}(\text{NO}_3)_2$ is 0.100 molar and the initial concentration of AgNO_3 is 1.00 molar.
- $[E^\circ_{\text{Ni}^{2+}/\text{Ni}} = -0.25 \text{ V}, E^\circ_{\text{Ag}^+/\text{Ag}} = 0.80 \text{ V}, \log 10^{-1} = -1]$.
25. Write the mechanism of hydration of ethene to yield ethanol. [3]

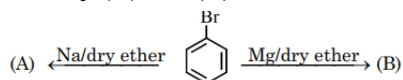
OR

How the following conversions can be carried out?

- i. 2-Chloropropane to 1-propanol
- ii. Isopropyl alcohol to iodoform
- iii. Chlorobenzene to p-nitrophenol
26. Write the chemical equation for all the steps involved in the rusting of iron. Give any one method to prevent rusting of iron. [3]
27. i. Write the structure of major alkene formed by β -elimination of 2, 2, 3-trimethyl-3-bromopentane with sodium ethoxide in ethanol. [3]
- ii. Which one of the compounds in the following pairs is chiral?



iii. Identify (A) and (B) in the following:



28. Two moles of compound (A) on treatment with a strong base gives two compounds (B) and (C). The compound (B) on dehydrogenation with Cu gives (A) while acidification of (C) gives carboxylic acid (D) having molecular formula CH_2O_2 . Identify (A) to (D). [3]
29. Depict the galvanic cell in which the reaction: [3]
- $$\text{Zn}(s) + 2\text{Ag}^+(aq) \rightarrow \text{Zn}^{2+}(aq) + 2\text{Ag}(s)$$
- takes place. Further show:

- i. Which of the electrodes is negatively charged?
- ii. The carries of current in the cell.
- iii. Individual reaction at each electrode.

Section D

30. Read the text carefully and answer the questions:

[4]

Vapour pressure of a liquid or a solution is the pressure exerted by the vapour in equilibrium with the liquid or solution at a particular temperature. It depends upon the nature of the liquid and temperature. The non-volatile solute in solution reduces the escaping tendency of the solvent molecules in the vapour phase because some of the solute particles occupy the positions of the solvent molecules on the liquid surface. The relative lowering of the vapour pressure of a solution containing a non-volatile solute is equal to the mole fraction of the solute in the solution. This is also known as Raoult's law. However, for solutions of volatile solutes, the vapour pressure of a component in a solution at a given temperature is equal to the mole fraction of that component in the solution multiplied by the vapour pressure of that pure component. The solutions in which each component obeys Raoult's law is called an ideal solution. For ideal solutions ΔH_{mixing} and ΔV_{mixing} are also zero. Practically no solution is ideal. A non-ideal solution is that solution in which solute and solvent molecules interact with one another with a different force than the forces of interaction between the molecules of the pure components. There are two types of non-ideal solutions, showing positive deviations and negative deviations from ideal behaviour. If for the two components A and B, the forces of interaction between A and B molecules are less than the A-A and B-B interactions, the non-ideal solutions have positive deviations. On the other hand, if the forces of interaction between A and B molecules are more than the A-A and B-B interactions, the non-ideal solutions have negative deviations.

- (a) What is the mole fraction of A in solution obeying Raoult's law if the vapour pressure of a pure liquid A is 40 mm of Hg at 300 K. The vapour pressure of this liquid in solution with liquid B is 32 mm of Hg?
- (b) Vapour pressure of a solution of heptane & octane is given by the equation:
 $P(\text{sol.})(\text{mm Hg}) = 35 + 65x$, where x is the mole fraction of heptane. Calculate the vapour pressure of pure octane.
- (c) What is the value of ΔV_{mixing} and ΔH_{mixing} for non-ideal solution showing negative deviation?



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Acetic acid + pyridine, the mixture is an example of which type of solution?

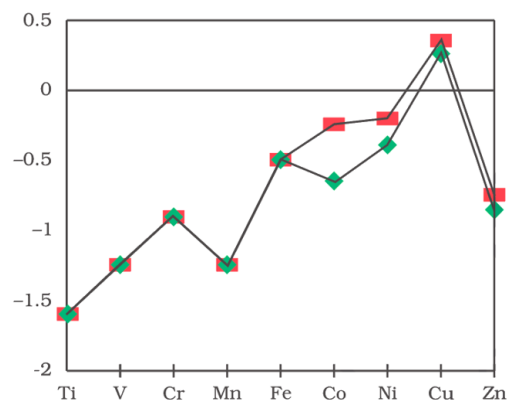
31. Read the text carefully and answer the questions:

[5]

The unique behaviour of Cu, having a positive E° accounts for its inability to liberate H_2 from acids. Only oxidising acids (nitric and hot concentrated sulphuric) react with Cu, the acids being reduced. The stability of the half-filled d sub-shell in Mn^{2+} and the completely filled d^{10} configuration in Zn^{2+} are related to their E° values, whereas E° for Ni is related to the highest negative $\Delta_{hyd}H^\circ$. An examination of the $E^\circ_{(M^{3+}/M^{2+})}$ values the low value for Sc reflects the stability of Sc^{3+} which has a noble gas configuration. The comparatively high value for Mn shows that $Mn^{2+}(d^5)$ is particularly stable, whereas a comparatively low value for Fe shows the extra

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stability of Fe^{3+} (d^5). The comparatively low value for V is related to the stability of V^{2+} (half-filled t_{2g} level).



- (a) Why Zn has high value for $\text{M}^{3+}/\text{M}^{2+}$ Standard Electrode Potentials?

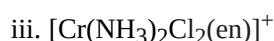
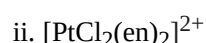
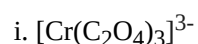
OR

Transition metals, despite high E° oxidation, are poor reducing agents. Justify.

- (b) Why is Cr^{2+} reducing and Mn^{3+} oxidising when both Cr and Mn have d^4 configuration?
 (c) Why Cu^{2+} is more stable than Cu^+ ?

Section E

32. Attempt any five of the following: [5]
- Which of the two components of starch is water soluble? [1]
 - What is the information given by primary structure of proteins? [1]
 - Name the deficiency disease resulting from lack of vitamin A and E in the diet. [1]
 - What are the hydrolysis products of sucrose? [1]
 - Name the sugar present in milk. How many monosaccharide units are present in it? What are such oligosaccharides called? [1]
 - What is the difference between a glycosidic linkage and a peptide linkage? [1]
 - Give one example of each- Monosaccharide, disaccharide and polysaccharide. [1]
33. Draw the structures of optical isomers of: [5]



OR

Explain on the basis of valence bond theory that $[\text{Ni}(\text{CN})_4]^{2-}$ ion with square planar structure is diamagnetic and the $[\text{NiCl}_4]^{2-}$ ion with tetrahedral geometry is paramagnetic.

34. A. For the following conversion reactions write the chemical equations: [5]
- Ethyl isocyanide to ethylamine
 - Aniline to N-phenylethanamide
- B. Two isomeric compounds A and B having molecular formula $\text{C}_4\text{H}_{11}\text{N}$, both lose N_2 on treatment with HNO_2 and gives compound C and D, respectively. C is resistant to oxidation but immediately responds to Lucas reagent, whereas 'D' responds to Lucas reagent after 5 minutes and gives a positive iodoform test. Identify A and B.

OR

a. Give reasons for the following :

- i. Acetylation of aniline reduces its activation effect.
- ii. CH_3NH_2 is more basic than $\text{C}_6\text{H}_5\text{NH}_2$.
- iii. Although $-\text{NH}_2$ is o/p-directing group, yet aniline on nitration gives a significant amount of m-nitroaniline.

b. Explain the following reactions:

- i. Coupling reaction
- ii. Gabriel phthalimide reaction



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