Sample Paper 02

Class XII 2025-26

Chemistry (043)

Time: 3 Hours **Max. Marks: 70**

General Instructions:

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

Directions (Q. Nos. 1-16) : The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. Which one of the following is the strongest base in aqueous solution?

(a) Methylamine (b) Trimethylamine

(c) Aniline (d) Dimethylamine

2. The reaction given below is known as $C_2H_5ONa + IC_2H_5 \rightarrow C_2H_5OC_2H_5 + NaI$

(a) Kolbe's synthesis (b) Wurtz' synthesis

(c) Williamson's synthesis (d) Grignard's synthesis

3. Match the following terms with their correct descriptions:

	Column A (Terms)		**Column B (Descriptions)**
A	Electrochemical Cell	1	Uses external electrical energy to drive a non-spontaneous reaction
B	Salt Bridge	2	Maintains electrical neutrality in an electrochemical cell
C	Electrolytic Cell	3	Converts chemical energy into electrical energy
D	Faraday's Constant	4	Charge of 1 mole of electrons, approximately 96,485 C/mol

(a) A - 2 B - 3 C - 4 D - 1 (b) A - 1 B - 2 C - 4 D - 3

(c) A - 2 B - 1 C - 3 D - 4 (d) A - 3 B - 2 C - 1 D - 4

4. The oxidation state of Cr in $K_2Cr_2O_7$ is:

(a) $+5$ (b) $+3$

(c) $+6$ (d) $+7$

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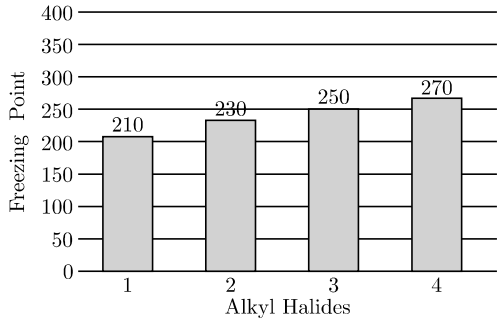
5. Study the graph showing the freezing points of alkyl halides and identify the compounds:



(a) 1 = Methyl chloride, 2 = Ethyl chloride, 3 = Propyl chloride, 4 = Butyl chloride
(b) 1 = Butyl chloride, 2 = Methyl chloride, 3 = Ethyl chloride, 4 = Propyl chloride
(c) 1 = Ethyl chloride, 2 = Butyl chloride, 3 = Methyl chloride, 4 = Propyl chloride
(d) 1 = Propyl chloride, 2 = Ethyl chloride, 3 = Butyl chloride, 4 = Methyl chloride

6. The coordination number of a central metal atom in a complex is determined by
(a) the number of ligands around a metal ionbonded by sigma and pi-bonds both
(b) the number of ligands around a metal ion bonded by pi-bonds
(c) the number of ligands around a metal ion bonded by sigma bonds
(d) the number of only anionic ligands bonded to the metal ion

7. Which of the following is non-electrolyte?
(a) NaCl (b) $CaCl_2$
(c) $C_{12}H_{22}O_{11}$ (d) CH_3COOH

8. Which is not colligative property?
(a) Freezing Point (b) Lowering of vapour pressure
(c) Depression of freezing point (d) Elevation of boiling point

9. Which of the following compounds is used as a refrigerant?
(a) Acetone (b) CCl_4
(c) CF_4 (d) CCl_4F_2

10. Fuel cells are preferred to other energy producing devices in space because of
(a) high efficiency (b) pollution free
(c) less weight (d) all of these

11. A catalyst is used
(a) only for increasing the velocity of the reaction
(b) for altering the velocity of the reaction
(c) Only for decreasing the velocity of the reaction
(d) All a, b and c are correct

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12. Which of the following is incorrect?
(a) $NaHSO_3$ is used in detection of carbonyl compound.
(b) $FeCl_3$ is used in detection of phenolic group.
(c) Tollen reagent is used in detection of unsaturation.
(d) Fehling solution is used in detection of glucose.

Directions (Q. Nos. 13-16) : Each of the following questions consists of two statements, one is Assertion and the other is Reason. Give answer :

13. **Assertion :** Nitrobenzene is used as a solvent in Friedel-Craft's reaction.
Reason : Fusion of nitrobenzene with solid KOH gives a low yield of a mixture of o-and p-nitrophenols.
(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
(c) Assertion is correct but Reason is incorrect.
(d) Both the Assertion and Reason are incorrect.

14. **Assertion :** Alcohols are easily protonated as compared to phenols.
Reason : Alcohols undergo intermolecular hydrogen bonding due to the presence of highly electronegative oxygen.
(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
(c) Assertion is correct but Reason is incorrect.
(d) Both the Assertion and Reason are incorrect.

15. **Assertion :** $p - O_2N \cdot C_6H_4 \cdot COCH_3$ is prepared by Freidel Craft's acylation of nitrobenzene.
Reason : Nitrobenzene easily undergoes electrophilic substitution reaction.
(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
(c) Assertion is correct but Reason is incorrect.
(d) Both the Assertion and Reason are incorrect.

16. **Assertion :** The $[Ni\ (en)_3]\ Cl_2$ (en = ethylene-diamine) has lower stability than $[Ni\ (NH_3)_6]Cl_2$.
Reason : In $[Ni\ (en)_3]Cl_2$, the geometry of Ni is trigonal bipyramidal.
(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.
(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.
(c) Assertion is correct but Reason is incorrect.
(d) Both the Assertion and Reason are incorrect.

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SECTION-B

Directions (Q. Nos. 17-21) : 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. Name the following compounds according to IUPAC system of nomenclature :

1. $CH_3CH(CH_3)CH_2CH_2CHO$ 2. $CH_3CH_2COCH(C_2H_5)CH_2CH_2Cl$
3. $CH_3CH = CHCHO$ 4. $CH_3COCH_2COCH_3$

OR

Write natural sources of formic acid, acetic acid and butyric acid.

18. Define ideal solution.

19. Name the two half-cell reactions that are taking place in the Daniel cell.

20. Predict the geometrical shapes of all following :

(a) sp^3 (b) d^2sp^3

21. What are symmetrical and unsymmetrical ether ?

SECTION-C

Directions (Q. Nos. 22-28) : This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. Identify the compounds A, B, C and D in the following sequence of reactions :

$$C_2H_5OH \xrightarrow[443\,K]{\text{conc. } H_2SO_4} A \xrightarrow{HBr} B \xrightarrow[443\,K]{KOH\,(aq)} C \xrightarrow{I_2,\,NaOH} D$$

23. How is a galvanic cell represented on paper as per IUPAC convention? Give one example.

24. Arrange the following compounds in increasing order of their reactivity toward HCN.
Acetaldehyde, Acetone, Di-tert-butyl ketone, Methyl tert-butyl ketone.

OR

Explain why is ortho-nitrophenol more acidic than ortho-methoxy phenol ?

25. Derive equilibrium constant from Nernst equation

26. (a) Give the IUPAC name of the complex salt $K_3[Fe(CN)_6]$.

(b) Calculate EAN (Effective Atomic Number) of Fe in this complex salt.

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27. Point out the difference between :
(i) Chirality and chiral centre.
(ii) Diastereoisomers and Enantiomers.

28. In a chemical reaction $A + 2B \rightarrow$ products, when concentration of A is doubled, rate of the reaction increases 4 times and when concentration of B alone is doubled rate continues to be the same. What is the order of the reaction ?

SECTION-D

Directions (Q. Nos. 29-30) : 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. Proteins are high molecular mass complex biomolecules of amino acids. The important proteins required for our body are enzymes, hormones, antibodies, transport proteins, structural proteins, contractile proteins etc. Except for glycine, all α-amino acids have chiral carbon atom and most of them have L -configuration. The amino acids exists as dipolar ion called zwitter ion, in which a proton goes from the carboxyl group to the amino group. A large number of α-amino acids are joined by peptide bonds forming polypeptides. The peptides having very large molecular mass (more than 10,000) are called proteins. The structure of proteins is described as primary structure giving sequence of linking of amino acids; secondary structure giving manner in which polypeptide chains are arranged and folded; tertiary structure giving folding, coiling or bonding polypeptide chains producing three dimensional structures and quaternary structure giving arrangement of sub-units in an aggregate protein molecule.
Answer the following questions :
(a) What do you mean by proteins ?
(b) What is Zwitter ion ?
(c) Which type of bond is present in polypeptide? Give example ?

OR

(d) Which type of bonding is present in α-helix and (β-pleated structure of proteins.

30. The solubility of gases increases with increase of pressure. William Henry made a systematic investigation of the solubility of a gas in a liquid. According to Henry's law "the mass of a gas dissolved per unit volume of the solvent at constant temperature is directly proportional to the pressure of the gas in equilibrium with the solution".
Dalton during the same period also concluded independently that the solubility of a gas in a liquid solution depends upon the partial pressure of the gas. If we use the mole fraction of gas in the solution as a measure of its solubility, then Henry's law can be modified as "the partial pressure of the gas in the vapour phase is directly proportional to the mole fraction of the gas in the solution."
Read the above passage and answer the following questions:
(a) What is the relation of K_H with temperature ?
(b) Write expression for Henry's law.
(c) Calculate solubility of methane in benzene at 298 K under 760 mm Hg. (Given Henry's constant $= 4.27 \times 10^5$ mm Hg) ?

OR

(d) The partial pressure of ethane over a saturated solution containing 6.56×10^{-2} g of ethane is 1 bar. If the solution contains 5.00×10^{-2} g of ethane then what will be the partial pressure (in bar) of the gas ?

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SECTION-E

Directions (Q. Nos. 31-33) : The following questions are long answer type and carry 5 marks each. All questions have an internal choice.

31. Define the following as related to proteins.

(i) Peptide linkage.

(ii) Primary structure.

(iii) Denaturation.

OR

What are vitamins? Give the list of some important vitamins, their sources and their deficiency diseases.

32. Define order of reaction and molecularity of reaction. Derive a general expression for specific rate constant of first order reaction.

OR

Explain the effect of temperature on rate of a reaction.

33. Explain giving reasons:

1. Transition metals and many of their compounds show paramagnetic behaviour.
2. The enthalpies of atomisation of the transition metals are high.
3. The transition metals generally form coloured compounds.
4. Transition metals and their many compounds act as good catalysts.

OR

Describe the preparation of potassium permanganate. How does the acidified permanganate solution react with (i) ion (II) ions (ii) SO_2 and (iii) oxalic acid? Write the ionic equations.

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