

Sample Paper 01

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.

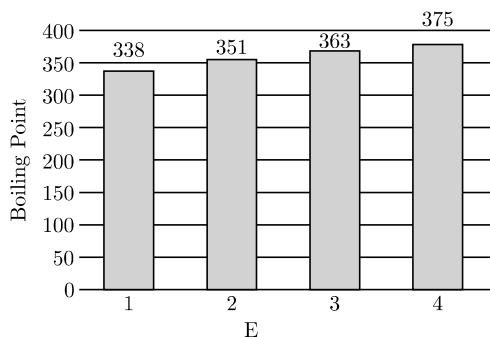
SECTION-A

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. Out of the following, the strongest base in aqueous solution is:
(a) Dimethylamine (b) Aniline
(c) Methylamine (d) Trimethylamine
2. Match the following terms in Column I with their definitions in Column II.

	Column I		Column II
(i)	Standard Electrode Potential	(A)	Directly related to the Gibbs free energy
(ii)	Conductance	(B)	Ability of ions to move in a solution
(iii)	Electrolysis	(C)	Chemical decomposition by electric current

- (a) (i)-(B), (ii)-(C), (iii)-(A) (b) (i)-(A), (ii)-(B), (iii)-(C)
(c) (i)-(C), (ii)-(A), (iii)-(B) (d) (i)-(B), (ii)-(A), (iii)-(C)
3. Study the graph showing the boiling points of alcohols and identify the compounds:



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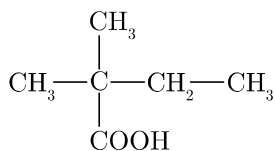


- (a) 1 = Methanol, 2 = Ethanol, 3 = Propanol, 4 = Butanol
 (b) 1 = Ethanol, 2 = Propanol, 3 = Methanol, 4 = Butanol
 (c) 1 = Butanol, 2 = Methanol, 3 = Ethanol, 4 = Propanol
 (d) 1 = Propanol, 2 = Methanol, 3 = Butanol, 4 = Ethanol
4. The compound obtained by the reaction of nitrous acid on aliphatic primary amine is:
 (a) alkyl nitrite (b) alcohol
 (c) nitroalkane (d) secondary amine
5. Alcohols show an increase in boiling points as the molecular weight increases due to stronger van der Waals forces. Methanol, being the smallest alcohol, has the lowest boiling point, followed by ethanol, propanol, and butanol. This pattern is reflected in the given boiling points. Which of the following compound will not undergo azo coupling reaction with benzene diazonium chloride ?
 (a) Phenol (b) Aniline
 (c) Nitrobenzene (d) Anisole
6. For the reaction, $2X + Y \longrightarrow X_2Y$
 What will be the expression for instantaneous rate of the reaction?
 (a) $+\frac{1}{2}\frac{d(Y)}{dt}$ (b) $-\frac{1}{2}\frac{d(X_2Y)}{dt}$
 (c) $-\frac{d(X)}{2dt}$ (d) None of these
7. In a chemical reaction, a catalyst plays a crucial role in influencing certain parameters without being consumed in the process. Which of the following aspects is directly altered by the presence of a catalyst in the reaction?
 (a) The enthalpy of the reaction (b) The Gibbs' free energy of the reaction
 (c) The equilibrium constant of the reaction (d) The activation energy of the reaction
8. Consider the following table of complexes of Cobalt (III) with ammonia:

Colour	Formula	Solution conductivity corresponds to
Yellow	$[\text{Co}(\text{NH}_3)_6]^{3+}3\text{Cl}^-$	Y
Violet	$[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}2\text{Cl}^-$	1:2 electrolyte
Green	X	1:1 electrolyte

'X' and 'Y' in the above table are:

- (a) $X = [\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+\text{Cl}^-$, $Y = 1:3$
 (b) $X = [\text{Co}(\text{NH}_3)_6]\text{Cl}_3$, $Y = 1:1$
 (c) $X = [\text{Co}(\text{NH}_3)_3\text{Cl}_3]^0$, $Y = 1:3$
 (d) $X = [\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$, $Y = 1:1$
9. What is the correct IUPAC name of the given compound ?



- (a) 2-carboxyl-2-methylpropanoic acid (b) 2-ethyl-2-methylpropanoic acid
(c) 3-methylbutanoic acid (d) 2, 2-dimethylbutanoic acid
10. For the reaction $2\text{H}_2\text{O}_2 \longrightarrow 2\text{H}_2\text{O} + \text{O}_2$, $r = k[\text{H}_2\text{O}_2]$. The reaction is of :
(a) First order (b) Second order
(c) Third order (d) Zero order
11. The value of K_H for Ar(g) , $\text{CO}_2(\text{g})$, HCHO(g) and $\text{CH}_4(\text{g})$ are 40.39, 1.67, 1.83×10^{-5} and 0.413 respectively. Arrange these gases in increasing order of solubility.
(a) $\text{Ar} < \text{CO}_2 < \text{CH}_4 < \text{HCHO}$ (b) $\text{Ar} < \text{CH}_4 < \text{CO}_2 < \text{HCHO}$
(c) $\text{HCHO} < \text{CH}_4 < \text{CO}_2 < \text{Ar}$ (d) $\text{HCHO} < \text{CO}_2 < \text{CH}_4 < \text{Ar}$
12. A graph was plotted between the molar conductivity Using valence bond theory, the complex $[\text{Cr}(\text{NH}_3)_6]^{3+}$ can be described as :
(a) $d^2 sp^3$, inner orbital complex, paramagnetic (b) $d^2 sp^3$, outer orbital complex, diamagnetic
(c) $sp^3 d^2$, outer orbital complex, paramagnetic (d) dsp^2 , inner orbital complex, diamagnetic

Directions (Q. No. 13-16) : Each of the following questions consists of two statements, one is Assertion and the other is Reason. Give answer :

13. **Assertion :** Vanadium had the ability to exhibit a wide range of oxidation states.
Reason : The standard potentials Vanadium are rather small, making a switch between oxidation states relatively easy.
(a) Both Assertion and Reason are true but Reason is not a correct explanation of Assertion.
(b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(c) Assertion is false but Reason is true.
(d) Assertion is true but Reason is false.
14. **Assertion :** DNA has a double strand helix structure.
Reason : The two strands in a DNA molecule are exactly similar.
(a) Both Assertion and Reason are true but Reason is not a correct explanation of Assertion.
(b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(c) Assertion is false but Reason is true.
(d) Assertion is true but Reason is false.
15. **Assertion :** Tertiary butylamine can be prepared by the action of NH_3 on tert-butylbromide.
Reason : Tertiary butyl bromide being 3° alkyl halide prefers to undergo elimination on the treatment with a base.
(a) Both Assertion and Reason are true but Reason is not a correct explanation of Assertion.
(b) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(c) Assertion is false but Reason is true.
(d) Assertion is true but Reason is false.

16. **Assertion :** IUPAC name of the compound
$$\begin{array}{c} \text{CH}_3 - \text{CH} - \text{O} - \text{CH}_2 - \text{CH}_2 - \text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$$
 is 2-Ethoxy-2-methylethane.

Reason : In IUPAC nomenclature, ether is regarded as hydrocarbon derivative in which a hydrogen atom replaced by $-\text{OR}$ or $-\text{OAr}$ group
[where R = alkyl group and Ar = aryl group]

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

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. Define Order of a reaction. Illustrate your answer with an example.
OR
What are complex reactions? Name one complex reaction.
- 18. What is salt bridge? What are its uses?
- 19. Why the properties of third transition series are very similar to second transition series?
- 20. How will you convert Phenol to benzene?
- 21. What are reducing and non reducing sugars?

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. Derive the structure of cyclohex-3-en-1-ol.
- 23. State colligative properties of dilute solution. Write down the different types of colligative properties.
- 24. Write the following reactions of Benzene diazonium chloride.
 - (i) Sandmeyer reaction
 - (ii) Gatterman reaction**OR**
What do you mean by invert sugar?
- 25. Explain magnetic behaviour of transition metals.
- 26. Draw the structure of all isomeric alcohols of molecular formula $C_4H_{10}O$ and give their IUPAC names.
- 27. What are the common types of secondary (2°) structure of proteins?
- 28. (i) Define the following terms:
 - (a) Enantiomers
 - (b) Racemic mixture(ii) Why is chlorobenzene resistant to nucleophilic substitution 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. A solution containing 30 g of non-volatile solute exactly in 90 g of water has a vapour pressure of 2.8 kPa at 298 K. Further 18 g of water is added to this solution. The new vapour pressure becomes 2.9 kPa at 298 K. When a non-volatile solute is added to a solvent, the surface has molecules of solute and solvent both. Thus, the number of molecules of solvent present in upper surface is less. The number of solvent molecules escaping from the surface is reduced.

Answer the following questions :

- Write down the expression for relative lowering of vapour pressure with the mole fraction of the solute.
- Calculate the vapour pressure of water at 298 K.
- Find out the molecular mass of solute?

OR

- Name two factors on which the vapour pressure of the liquid depends.

30. Carbohydrates are polyhydroxy aldehydes and ketones and those compounds which on hydrolysis give such compounds are also carbohydrates. The carbohydrates which are not hydrolysed are called monosaccharides. Monosaccharides with aldehydic group are called aldose and those which free ketonic groups are called ketose. Carbohydrates are optically active. Number of optical isomers = 2^n .

Where n = number of asymmetric carbons. Carbohydrates are mainly synthesised by plants during photosynthesis. The monosaccharides give the characteristic reactions of alcohols and carbonyl group (aldehydes and ketones). It has been found that these monosaccharides exist in the form of cyclic structures. In cyclization, the $-OH$ groups (generally C_5 or C_4 in aldohexoses and C_5 or C_6 in ketohexoses) combine with the aldehyde or keto group. As a result, cyclic structures of five or six membered rings containing one oxygen atom are formed, e.g., glucose forms a ring structure. Glucose contains one aldehyde group, one 1° alcoholic group and four 2° alcoholic groups in its open chain structure.

Answer the following questions :

- What is the name of the first member of ketose sugar?
- How many optical isomers are present in $CH_2OH(CHOH)_4CHO$?
- Write the reaction of glucose with hydroxylamine.

OR

- How many moles of acetic anhydride are needed for acetylation of glucose? What does it confirm?

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. Give two reactions that show the acidic nature of Phenol. Compare its acidity with that of ethanol.

OR

Write equations of the following reactions:

- Friedel-Craft's reaction-alkylation of anisole.
- Nitration of anisole.

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3. Bromination of anisole in ethanolic acid medium.
4. Friedel-Crafts acetylation of anisole.

32. (a) Differentiate between Osmosis and diffusion. How is osmotic pressure determined by Berkeley-Hartley method?
- (b) 18 g of glucose ($C_6H_{12}O_6$) was added to 1 kg water at 1.013 bar atmospheric pressure in a vessel. At which temperature will water boil? K_b For water is $0.52 \text{ K Kg mol}^{-1}$.

OR

- (a) What do you mean by the term 'elevation of boiling point'?
- (b) State Raoult's law. How is it useful in determining the molecular weight of non-electrolyte solute?

33. Arrange the compounds of each set in order of reactivity towards S_N2 displacement:

- (i) (a) 2-Bromo-2-methylbutane
(b) 1-Bromopentane
(c) 2-Bromopentane
- (ii) (a) 1-Bromobutane-3-methylbutane
(b) 2-Bromo-2-methylbutane
(c) 2-Bromo-3-methylbutane
- (iii) (a) Bromobutane
(b) 1-Bromo-2, 2-dimethylpropane
(c) 1-Bromo-2-methylbutane
(d) 1-Bromo-3-methylbutane.

OR

Write the structure of the major organic product in each of the following reaction :

1. $CH_3CH_2CH_2Cl + NaI \xrightarrow{\text{acetone, heat}}$
2. $(CH_3)_3CBr + KOH \xrightarrow{\text{ethanol heat}}$
3. $CH_3CH(Br)CH_2CH_3 + NaOH \xrightarrow{\text{Water}}$
4. $CH_3CH_2Br + KCN \xrightarrow{\text{aq ethanol}}$
5. $C_6H_5ONa + C_2H_5Cl \longrightarrow$
6. $CH_3CH_2CH_2OH + SOCl_2 \longrightarrow$
7. $CH_3CH_2CH=CH_2 + HBr \xrightarrow{\text{Peroxide}}$
8. $CH_3CH=C(CH_3)_2 + HBr \longrightarrow$

□□□□□□

