

Sample Paper 03

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.

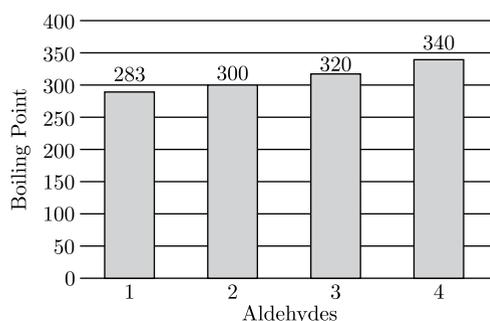
SECTION-A

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. In the Haber process for the manufacture of ammonia the following catalyst is used
(a) Platinized asbestos (b) Iron with molybdenum as promoter
(c) Copper oxide (d) Alumina
2. Match the following biomolecules with their corresponding characteristics or functions:

	Column A (Biomolecules)		Column B (Characteristics/Functions)
A	Glucose	1	A storage polysaccharide in animals
B	Cellulose	2	A polysaccharide providing structural support in plants
C	Glycogen	3	A monosaccharide involved in energy production
D	Insulin	4	A hormone that regulates blood sugar levels

- (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
3. Study the graph showing the boiling points of aldehydes and identify the compounds:



[CLICK HERE TO SEE ANSWERS](#)



- (a) 1 = Formaldehyde, 2 = Acetaldehyde, 3 = Propionaldehyde, 4 = Butyraldehyde
(b) 1 = Acetaldehyde, 2 = Propionaldehyde, 3 = Formaldehyde, 4 = Butyraldehyde
(c) 1 = Butyraldehyde, 2 = Formaldehyde, 3 = Acetaldehyde, 4 = Propionaldehyde
(d) 1 = Propionaldehyde, 2 = Butyraldehyde, 3 = Formaldehyde, 4 = Acetaldehyde
4. In test for primary amines, the amine is treated with CHCl_3 and KOH and a bad smelling compound is formed. If the primary amine used is ethylamine, identify the bad smelling compound formed?
(a) CH_3CN (b) CH_3CNO
(c) $\text{CH}_3\text{CH}_2\text{NC}$ (d) CH_3NCO
5. Faraday's law of electrolysis is related to :
(a) Atomic number of cation (b) Speed of cation
(c) Speed of anion (d) Equivalent weight of element
6. The green residue (B) has the formula :
(a) CrO_2 (b) Cr_2O_2
(c) Cr_2O_3 (d) CrO_5
7. The compound having tetrahedral geometry is –
(a) $[\text{NiCl}_4]^{2-}$ (b) $[\text{Ni}(\text{CN})_4]^{2-}$
(c) $[\text{PdCl}_4]^{2-}$ (d) $[\text{NiCl}_4]^{2-}$ and $[\text{PdCl}_4]^{2-}$ both
8. Which enzyme converts glucose and fructose both into ethanol ?
(a) Diastase (b) Invertase
(c) Zymase (d) Maltase
9. During osmosis, flow of water through a semi-permeable membrane is:
(a) from both sides of semi-permeable with equal flow rates
(b) from both sides of semi-permeable membrane with unequal flow rates
(c) from solution having lower concentration only
(d) from solution having higher concentration only
10. In a first-order reaction $A \longrightarrow B$, if k is the rate constant and initial concentration of the reactant A is 0.5 M, then the half-life is
(a) $\frac{\log 2}{k}$ (b) $\frac{\log 2}{k\sqrt{0.5}}$
(c) $\frac{\ln 2}{k}$ (d) $\frac{0.693}{0.5k}$
11. The number of chiral carbon in glucose is
(a) 4 (b) 5
(c) 3 (d) 1

Continue on next page.....

CLICK HERE TO INSTALL NODIA APP

12. Which of the following reactions is an example of nucleophilic substitution reaction ?

- (a) $2RX + 2Na \rightarrow R - R + 2NaX$
- (b) $RX + H_2 \rightarrow RH + HX$
- (c) $RX + Mg \rightarrow RH + HX$
- (d) $RX + KOH \rightarrow ROH + KX$

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 :** Proteins are made up of α -amino acids.

Reason : During denaturation, secondary and tertiary structures of proteins are destroyed.

- (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 :** Cyanide (CN^-) is a strong nucleophile.

Reason : Benzotriline is prepared by the reaction of chlorobenzene with potassium cyanide.

- (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 :** If the activation energy of a reaction is zero, temperature will have no effect on the rate constant.

Reason : Lower the activation energy, faster is the 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 :** Haemoglobin is an oxygen carrier.

Reason : Oxygen binds as O_2^- to Fe of haemoglobin.

- (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.

Continue on next page.....

CLICK HERE TO SEE ANSWERS



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. For the reaction $2\text{N}_2\text{O}_5(\text{g}) \longrightarrow 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$, the rate of formation of $\text{NO}_2(\text{g})$ is $2.8 \times 10^{-3} \text{ M s}^{-1}$. Calculate the rate of disappearance of $\text{N}_2\text{O}_5(\text{g})$.

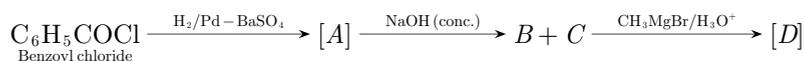
OR

What do you mean by rate of a reaction? For the reaction $\text{NO}_2(\text{g}) + \text{CO}(\text{g}) \longrightarrow \text{CO}_2(\text{g}) + \text{NO}(\text{g})$, the proposed mechanism is as follows :



What is the velocity (rate) of reaction?

18. Velocity (rate) of reaction = $k(\text{NO}_2)(\text{NO}_2) = k(\text{NO}_2)^2$ $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ are of different colours in dilute solutions. Why?
19. What is the effect of desaturation on the structure of proteins?
20. HgO decomposes on heating but MgO does not. Explain with reason.
21. Write the structures of *A*, *B*, *C* and *D* in the following reactions :



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. In a reaction $2\text{N}_2\text{O}_5(\text{g}) \longrightarrow 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$, the concentration of N_2O_5 decreases from 0.5 mol L^{-1} to 0.4 mol L^{-1} in 10 minutes, Calculate the average rate of this reaction and rate of production of NO_2 during this period.
23. Propose the mechanism of the reaction taking place when :
- (i) (-)-2-Bromooctane reacts with sodium hydroxide to form (+)-Octane-2-ol.
- (ii) 2-Bromopentane is heated with $\text{KOH}(\text{alc.})$ to form alkene.
24. The following compounds are given to you :
- 2-Bromopentane, 2-Bromo-2-methylbutane, 1- Bromopentane
- (i) Write the compound which is most reactive towards $\text{S}_{\text{N}}2$ reaction.
- (ii) Write the compound which is optically active.
- (iii) Write the compound which is most reactive towards β elimination reaction.

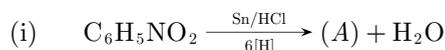
Continue on next page.....

CLICK HERE TO INSTALL NODIA APP

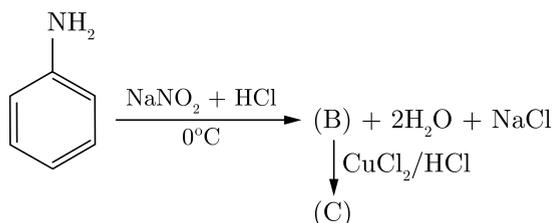


25. What happens when : (Any three)
- Formic acid reacts with conc. H_2SO_4 .
 - Acetic acid reacts with Cl_2 in the presence of red P ?
 - Calcium acetate is heated?
 - $\text{CH}_3 - \text{O} - \text{CH}_3$ is heated with HI .
26. (i) At low pressure and high temperature, water evaporates rapidly, why?
 (ii) Calculate the molality of a solution when 20 g NaOH is dissolved in 440 g of solvent.
27. How will you convert (Give only chemical equation):
- Propanamide to ethylamine
 - Ethyl amine to methane
 - Aniline to acetanilide.

OR

Identify A , B and C in the following equations :

(ii)



28. A solution of $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ is green but a solution of $[\text{Ni}(\text{CN})_4]^{2-}$ is colourless. Explain.

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. Amines constitute an important class of organic compounds derived by replacing one or more hydrogen atoms of ammonia molecule by alkyl/ aryl groups. Amines are usually formed from nitro compounds, halides, amides, etc. They exhibit hydrogen bonding which influences their physical properties. Alkyl amines are found to be stronger bases than ammonia. In aromatic amines, electron releasing and withdrawing groups, respectively increase and decrease their basic character. Reactions of amines are governed by availability of the unshared pair or electrons on nitrogen. Influence of the number of hydrogen atoms at nitrogen atom on the type of reactions and nature of products is responsible for identification and distinction between primary, secondary and tertiary amines. Reactivity of aromatic amines can be controlled by acylation process.

In the context of given passage, answer the following questions :

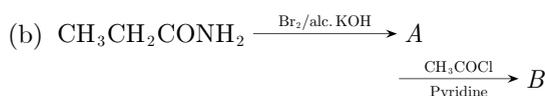
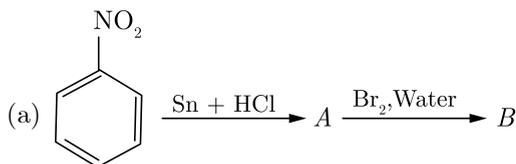
CLICK HERE TO SEE ANSWERS



- (i) Why does aniline not give Friedel-Crafts reaction?
- (ii) Arrange the following in the increasing order of their pK_b values :
 $C_6H_5NH_2$, NH_3 , $C_2H_5NH_2$, $(CH_3)_3N$
- (iii) How can you distinguish between $CH_3CH_2NH_2$ and $(CH_3CH_2)_2NH$ by Hinsberg test?

OR

- (iv) Write the structures of A and B in the following reactions:



30. Molar conductivity of a solution is the conductance of solution containing one mole of electrolyte, kept between two electrodes having unit length between them and large cross-sectional area, so as to contain the electrolyte. In other words, molar conductivity is the conductance of the electrolytic solution kept between the electrodes of a conductivity cell at unit distance but having area of cross-section large enough to accommodate sufficient volume of solution that contains one mole of the electrolyte. It is denoted by Λ_m .

The molar conductivity is related to conductivity as:

$$\begin{aligned} \Lambda_m &= k \times V = \frac{1000}{C} \times k \\ &= k \times \frac{1000}{\text{Molarity}} \end{aligned}$$

Unity of Λ_m (molar conductivity) shall be $\text{ohm}^{-1} \text{cm}^{-1} \text{mol}^{-1}$ or $\text{S cm}^2 \text{mol}^{-1}$.

Thus, knowing molar concentration (C) and conductivity (k), Λ_m can be calculated. Λ_m° is called molar conductivity at infinite dilution. The molar conductivity of strong electrolytes is found to vary with concentration according to the equation,

$$\Lambda_m^C = \Lambda_m^\circ - A\sqrt{C}$$

This equation is called Debye-Huckel Onsager equation.

Here, A is constant depending upon the type of electrolyte taken and nature of solvent and temperature. In the context of given passage, answer the following questions:

- (i) The molar conductivity of HCl increases with dilution. Can you suggest what may be the reason for this?
- (ii) Here are given the different molarities of NaCl. Which of them will exhibit the highest molar conductivity?
 0.005 M NaCl, 0.1 M NaCl, 0.5 M NaCl, 0.01 M NaCl.
- (iii) Molar conductivity of a solution is $1.26 \times 10^2 \Omega^{-1} \text{cm}^2 \text{mol}^{-1}$. Its molarity is 0.01. What will be its specific conductivity?

OR

- (iv) The conductivity of 0.00241 M acetic acid is $7.896 \times 10^{-5} \text{S cm}^{-1}$. What shall be the molar conductivity of the solution in $\text{S cm}^{-1} \text{mol}^{-1}$?

Continue on next page.....

CLICK HERE TO INSTALL NODIA APP



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. (i) 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. (Given : Molar mass of Ag = 108 g mol^{-1} , $1F = 96500 \text{ C mol}^{-1}$)
- (ii) What do you mean by fuel cell?
- (iii) Write Cu, Na, Mg and Ag in the decreasing order of electrochemical series with the help of the following reactions:
- $$\text{Cu} + 2\text{Ag}^+ \longrightarrow \text{Cu}^{2+} + 2\text{Ag}$$
- $$2\text{Na} + \text{Mg}^{2+} \longrightarrow 2\text{Na}^+ + \text{Mg}$$
- $$\text{Mg} + \text{Cu}^{2+} \longrightarrow \text{Mg}^{2+} + \text{Cu}$$

OR

What is the function of salt bridge in an electrochemical cell?

32. (i) Write the reaction involved in the following :
- (a) Etard reaction
(b) Stephan reduction
- (ii) How will you convert the following in not more than two steps :
- (a) Benzoic acid to Benzaldehyde
(b) Acetophenone to Benzoic acid
(c) Ethanoic acid to 2-hydroxyethanoic acid.

OR

- (i) An organic compound [A] with molecular formula $\text{C}_8\text{H}_{16}\text{O}_2$ was hydrolysed with dilute sulphuric acid to give a carboxylic acid [B] and an alcohol [C]. Oxidation of [C] with chromic acid produced [B]. The alcohol [C] on dehydration gave but-1-ene. Write equations for the reactions involved.
- (ii) How many asymmetric carbon atoms are created during the complete reduction of benzil (PhCOCOPh) with LiAlH_4 ? Also write the number of possible stereoisomers formed as the product.
33. (i) Account for the following :
- (a) Copper (I) compounds are white whereas Copper (II) compounds are coloured.
(b) Chromates change their colour when kept in an acidic solution.
(c) Zn, Cd, Hg are considered as *d*-block elements, but not as transition elements.

Continue on next page.....

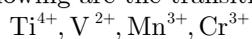
CLICK HERE TO SEE ANSWERS



- (ii) Calculate the spin-only moment of Co^{2+} ($Z = 27$) by writing the electronic configuration of Co and Co^{2+} .

OR

- (i) Following are the transition metal ions of 3d series :

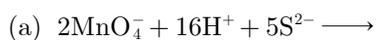


(Atomic numbers :



Answer the following :

- (a) Which ion is most stable in an aqueous solution and why?
(b) Which ion is a strong oxidising agent and why?
(c) Which ion is colourless and why?
- (ii) Complete the following equations :



□□□□□□

