



COMMON PRE-BOARD EXAMINATION
SUBJECT: CHEMISTRY (043)
CLASS XII-SESSION (2022-2023)



Time allowed : 3 hours

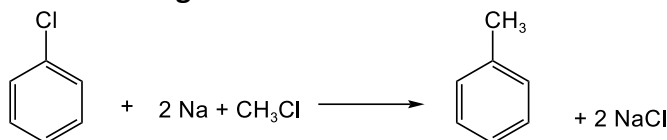
Maximum Marks: 70

General Instructions:

- (a) There are 35 questions in this question paper with internal choice.
- (b) Section A consists of 18 multiple-choice questions carrying 1 mark each.
- (c) Section B consists of 7 very short answer questions carrying 2 marks each.
- (d) Section C consists of short answer questions carrying 3 marks each.
- (e) Section D consists of case- based questions carrying 4 marks each.
- (f) Section E consists of 3 long answer questions carrying 5 marks each.
- (g) **All questions are compulsory.**
- (h) **Use of log tables and calculators is not permitted.**

Following questions are Multiple Choice Questions with one correct answer. Each question carries 1 mark each. There is no internal choice in this section.

1. The reaction given below is called:



- (a) Wurtz reaction
 - (b) Wurtz-Fittig reaction
 - (c) Fittig reaction
 - (d) None of the above
2. The quantity of charge required to obtain one mole of aluminium from Al_2O_3 is
- (a) 1F
 - (b) 2F
 - (c) 3F
 - (d) 4F
3. Identify the correct order of boiling points of the following compounds:

$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$	$\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$	$\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$
1	2	3

- (a) $1 > 2 > 3$
 - (b) $3 > 1 > 2$
 - (c) $1 > 3 > 2$
 - (d) $3 > 2 > 1$
4. The IUPAC name of
-
- CCN(CC)c1ccccc1
- (a) N-Ethyl-N-methylbenzamine
 - (b) N-Methyl-N-ethylbenzamine
 - (c) N, N-Ethyl methylbenzamine
 - (d) N, N-Methyl ethylbenzamine
5. If 75 % of the reaction is completed in 32 minutes, 50% of the same reaction would be completed in
- (a) 8 min
 - (b) 4 min
 - (c) 16 min
 - (d) 24 min

6. What type of organic compounds are prepared by Gatterman-Koch reaction?

- (a) Aliphatic aldehyde (b) Aromatic ketone
(c) Aliphatic ketone (d) Aromatic aldehyde

7. Compounds 'A' and 'B' react according to the following chemical equation: $A(g) + 2B(g) \rightarrow 2C(g)$. Concentration of either 'A' or 'B' were changed keeping the concentrations of one of the reactants constant and rates were measured as a function of initial concentration. Following results were obtained. Choose the correct option for the rate equations for this reaction.

Experiment	Initial concentration of [A]/mol L ⁻¹	Initial concentration of [B]/mol L ⁻¹	Initial concentration of [C]/mol L ⁻¹
1	0.30	0.30	0.10
2	0.30	0.60	0.40
3	0.60	0.30	0.20

- (a) Rate = $k[A]^2[B]$ (b) Rate = $k[A][B]^2$
(c) Rate = $k[A][B]$ (d) Rate = $k[A]^2[B]^0$

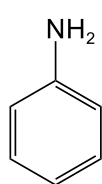
8. Identify the correct formula for potassium tetracyanonickelate (II).

- (a) $K[Ni(CN)_4]$ (b) $K[Ni(CN)_4]_2$
(c) $K_2[Ni(CN)_4]$ (d) $K_2[Ni(CN)_4]_2$

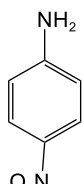
9. Among the following which has lowest pKa value?

- (a) HCOOH (b) CH₃COOH
(c) (CH₃)₂-CH-COOH (d) CH₃-CH₂-COOH

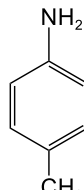
10. The correct increasing order of basic strength for the following compound is



(I)



(II)



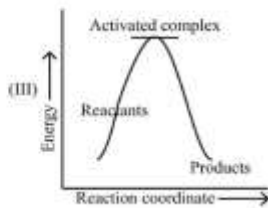
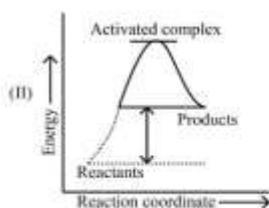
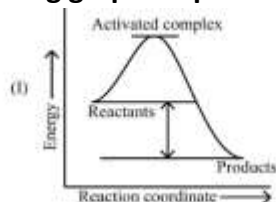
(III)

- (a) II < III < I (b) III < I < II
(c) III < II < I (d) II < I < III

11. Magnetic moment of 2.83 BM is given by which of the following ion?

- (a) Ti³⁺ (b) Ni²⁺
(c) Cr³⁺ (d) Mn²⁺

12. Which of the following graphs represents exothermic reaction?



- (a) (i) only (b) (ii) only
(c) (iii) only (d) (i) and (ii)

13. One mole of $\text{CoCl}_3 \cdot 6\text{H}_2\text{O}$ reacts with excess of $\text{AgNO}_3(\text{aq})$ to yield 2 moles of AgCl . The formula of the complex is

- (a) $[\text{Co}(\text{H}_2\text{O})_5\text{Cl}]\text{Cl}_2 \cdot \text{H}_2\text{O}$ (b) $[\text{Co}(\text{H}_2\text{O})_4\text{Cl}]\text{Cl}_2 \cdot 2\text{H}_2\text{O}$
(c) $[\text{Co}(\text{H}_2\text{O})_6]\text{Cl}_3$ (d) $[\text{Co}(\text{H}_2\text{O})_3\text{Cl}_3] \cdot 3\text{H}_2\text{O}$

14. Which of the following reagents may be used to distinguish between phenol and benzoic acid?

- (a) Neutral FeCl_3 (b) Aqueous NaOH
(c) Tollen's reagent (d) Molisch reagent

In the following questions (Q. No. 15 to 18) a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices:

- (a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion is wrong statement but reason is correct statement

15. **Assertion** : $(\text{CH}_3)_3\text{C}-\text{O}-\text{CH}_3$ gives $(\text{CH}_3)_3\text{C}-\text{I}$ and CH_3-OH on treatment with HI .

Reason : The reaction occurs by $\text{S}_{\text{N}}1$ mechanism.

16. **Assertion** : Uracil is present in DNA.

Reason : DNA undergoes replication.

17. **Assertion** : Transition metals have high melting point.

Reason : Transition metals have completely filled d-orbitals.

18. **Assertion** : Aniline does not undergo Friedel Crafts reaction.

Reason : Friedel Crafts reaction is an electrophilic substitution reaction.

SECTION – B

This section contains 7 questions with internal choice in two questions. The following questions are very short type and carry 2 marks each.

19. The rate constant of a first order reaction becomes 5 times when the temperature is raised from 350 K to 400 K. Calculate the activation energy of the reaction.
($R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$, $\log 5 = 0.6989$)

20. Answer the following:

- (a) Write a reaction which shows that all the carbon atoms in glucose are linked in a straight chain.
(b) What is the difference between a nucleoside and nucleotide?

OR

Define the following terms

- (a) Reducing sugars (b) Denaturation of proteins

21. Give reasons for the following:

- (a) Thionyl chloride is preferred for preparing alkyl chlorides from alcohols.
(b) Although chlorine is an electron withdrawing group, yet it is ortho, para directing in the electrophilic aromatic substitution reactions.

OR

What happens when

- (a) 2,4,6-Trinitrochlorobenzene is subjected to hydrolysis.
(b) methyl chloride is treated with AgCN ?

22. Complete the following equations:

- (a) $2 \text{MnO}_4^- + 5 \text{SO}_3^{2-} + 6 \text{H}^+ \longrightarrow$
(b) $2 \text{CrO}_4^{2-} + 2 \text{H}^+ \longrightarrow$

23. Write one chemical equation for each, to illustrate the following reaction:
 (a) Rosenmund reduction
 (b) Cannizaro reaction
24. Define order of the reaction. Write the condition under which a bimolecular reaction follows first order kinetics.
25. The specific conductance of saturated solution of AgCl at 298 K is found to be $1.386 \times 10^{-6} \text{ Scm}^2\text{mol}^{-1}$. Calculate its solubility. ($\lambda_{\text{Ag}^+}^0 = 62.0 \text{ Scm}^2\text{mol}^{-1}$ and $\lambda_{\text{Cl}^-}^0 = 76.3 \text{ Scm}^2\text{mol}^{-1}$)

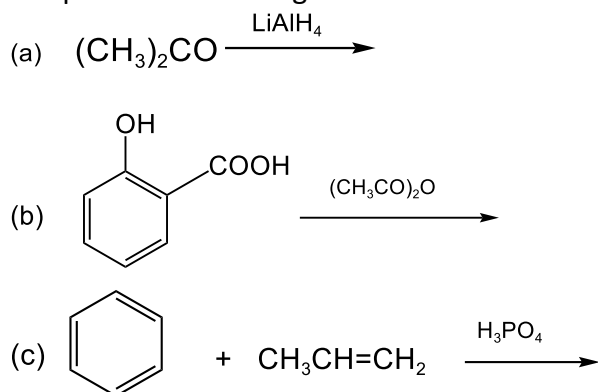
SECTION – C

This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

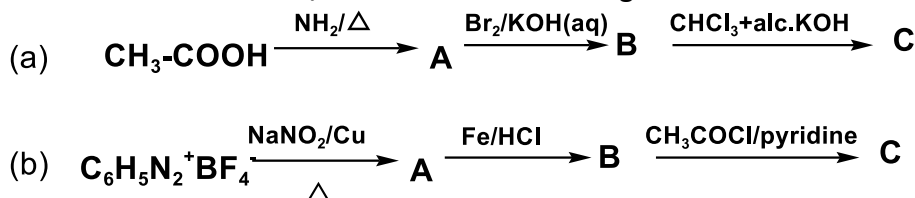
26. How would you account for the following?
 (a) Sc^{3+} is colourless in aqueous solution, whereas Ti^{3+} is coloured.
 (b) Cr^{3+} is reducing in nature while with the same d-orbital configuration (d^4), Mn^{2+} is an oxidizing agent.
 (c) Actinoid contraction is greater than lanthanoid contraction.
27. Following compounds are given to you:
 2- Bromopentane, 2-Bromo-2-methylbutane, 1- Bromopentane.
 (a) Write the compound which is most reactive towards S_{N}^2 reaction.
 (b) Write the compound which is optically active.
 (c) Write the compound which is most reactive towards β –elimination reactions.
28. Write the reactions and conditions for the following conversions:
 (a) Ethyl magnesium bromide to propan-1-ol
 (b) Phenol to toluene
 (c) Ethene to 1,1-dichloroethane

OR

Complete the following reactions



29. Give the structures of **A**, **B** and **C** in the following reactions:



OR

- (a) Aromatic primary amines be prepared by Gabriel phthalimide synthesis. Give reason.
 (b) Arrange the following compounds in the increasing order of solubility in water.
 $\text{C}_2\text{H}_5\text{NH}_2$, $\text{C}_6\text{H}_5\text{NH}_2$, $(\text{C}_2\text{H}_5)_2\text{NH}$
 (c) Give a chemical test to distinguish between aniline and N-methylaniline.

30. A solution contains 5.85 g NaCl (Molar mass = 58.5 g mol⁻¹) per litre of solution. It has an osmotic pressure of 4.75 atm at 27°C. Calculate the degree of dissociation of NaCl in this solution.
(Given: R = 0.082 L atm K⁻¹ mol⁻¹)

SECTION -D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

31. Some liquids on mixing, form azeotropes which are binary mixtures having the same composition in liquid and vapour phase and boil at a constant temperature. In such cases, it is not possible to separate the components by fractional distillation. There are two types of azeotropes, minimum boiling azeotrope and maximum boiling azeotrope. The solutions which show a large positive deviation from Raoult's law form minimum boiling azeotrope at a specific composition while the solution that show large negative deviation from Raoult's law form maximum boiling azeotrope at specific composition.

Answer the following questions:

- (a) What type of azeotrope is formed by negative deviation from Raoult's law?
- (b) Why pure ethanol cannot be obtained from rectified spirit even by fractional distillation?
- (c) Why is an increase in temperature is observed on mixing chloroform and acetone?

OR

On mixing liquid X and Y, volume of the resulting solution decreases. What type of deviation from Raoult's law is shown by the resulting solution? What change in temperature would you observe after mixing liquids X and Y?

32. The most abundant biomolecules of the living system are proteins. They are polymers of α –amino acids connected to each other by peptide linkage. Amino acids contain amino group (-NH₂) and carboxyl group (-COOH). Amino acids are classified as acidic, basic or neutral depending upon the relative number of amino and carboxyl groups in their molecule. They behave like salts rather than simple amines or carboxylic acids. In aqueous solution, the carboxyl group can lose a proton and amino group can accept a proton, giving rise to a dipolar ion known as Zwitter ion.

The amino acids which can be synthesized in the body, are known as non-essential amino acids. On the other hand, those which cannot be synthesized in the body and must be obtained through diet, are known as essential amino acids.

Answer the following questions:

- (a) Name the alpha amino acid which is optically active?
- (b) Name two essential amino acids?
- (c) The K_a and K_b values of α –amino acids are very low. Why?

OR

Draw the structure of Zwitter ion. Also show its amphoteric behaviour as it reacts with acids and bases.

SECTION – E

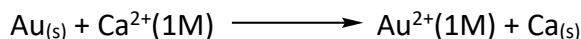
The following questions are Long Answer Type and carrying 5 marks each. Two questions have an internal choice.

33. a) An organic compound **A**, with molecular formula C₈H₆, on treatment with dilute H₂SO₄ containing mercuric sulphate gives a compound **B**. This compound **B** can also be obtained from a reaction of benzene with acetyl chloride in the presence of anhydrous AlCl₃. **B** on treatment with I₂ in aqueous KOH, yields **C** and a yellow compound **D**. Identify the compounds **A**, **B**, **C** and **D**. Write the reactions involved.
- (b) Give a simple test to distinguish between benzaldehyde and ethanal

OR

- (a) Write the reaction for cross aldol condensation of acetone and ethanal.
(b) How will you carry out the following conversions.
(i) Benzyl alcohol to phenyl ethanoic acid
(ii) Propanone to propene
(iii) Benzene to m-Nitroacetophenone

34.(a) Calculate the standard free energy for the following reaction at 25°C.

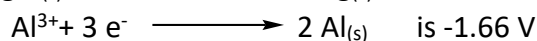
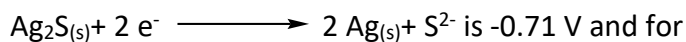


$$\text{Given } E^0_{\text{Au}^{3+}/\text{Au}} = +1.50 \text{ V}, E^0_{\text{Ca}^{2+}/\text{Ca}} = -2.87 \text{ V}$$

Predict whether the reaction will be spontaneous or not at 25°C. Which of the above two cells will act as an oxidizing agent and which one will be a reducing agent?

- (b) Tarnished silver contains Ag_2S . Can this tarnish be removed by placing the tarnished silver ware in an aluminium pan containing an inert electrolytic solution such as NaCl ?

The standard electrode potential for half reaction:



OR

- (a) Define molar conductivity.
(b) Write the Nernst equation and calculate emf of the following cells at 298K.



$$\text{Given } E^0_{\text{Mg}^{2+}/\text{Mg}} = -2.37 \text{ V}, E^0_{\text{Cu}^{2+}/\text{Cu}} = 0.34 \text{ V}$$

35. For the complex $[\text{Fe}(\text{en})_2\text{Cl}_2] \text{Cl}$, identify the following:

- (a) Hybrid orbitals and shape of the complex.
(b) Magnetic behaviour of the complex.
(c) Number of its geometrical isomers and their structures.
(d) Whether there may be optical isomers also.
(e) Name of the complex and oxidation number of iron.
(Atomic number of Fe = 26)