



BALVANTRAY MEHTA VIDYA BHAWAN (A.S.M.A.)  
MID TERM EXAMINATION (2024-25)  
CLASS: XII  
SUBJECT: CHEMISTRY (043)

Time: 3 Hours

Max. Marks: 70

Name: Richhima Kangjia

Roll Number: 35

General Instructions:

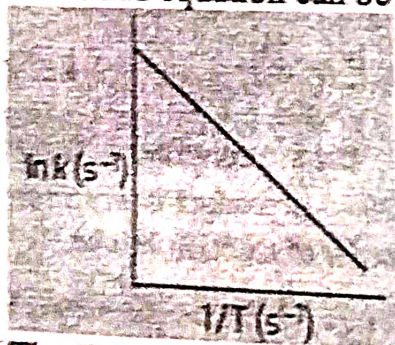
- There are 33 questions in this question paper with internal choice.
- Section A consists of 16 multiple-choice questions carrying 1 mark each.
- Section B consists of 5 short answer questions carrying 2 marks each.
- Section C consists of 7 short answer questions carrying 3 marks each.
- Section D consists of 2 case-based questions carrying 4 marks.
- Section E consists of 3 long answer type questions carrying 5 marks each.
- Wherever necessary, neat and properly labeled diagrams or examples should be provided.
- All questions are compulsory.
- Use of log tables and calculators is not allowed.

**Section A**

The following questions are multiple choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

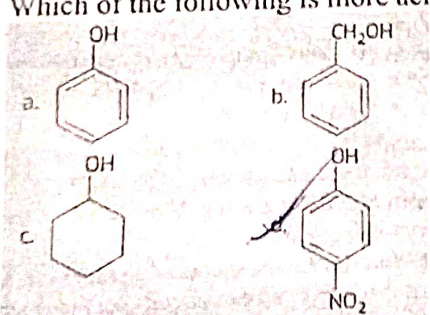
1. Mole fraction of glycerine  $C_3H_5(OH)_3$  in solution containing 36 g of water and 46 g of glycerine is:
- 0.20
  - 0.40
  - 0.46
  - 0.36

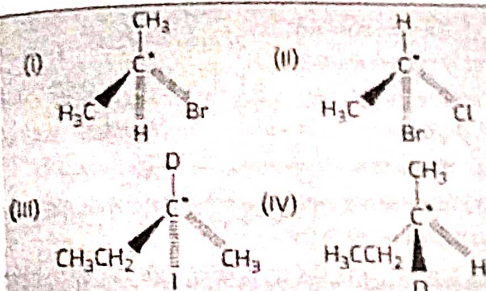
2. Arrhenius equation can be represented graphically as follows:



The (i) intercept and (ii) slope of the graph are:

- (i)  $\ln A$  (ii)  $E_a/R$
- (i)  $\ln A$  (ii)  $-E_a/R$

	c. (i) A (ii) -Ea d. (i) A (ii) Ea	
3.	Ti(H <sub>2</sub> O) <sub>6</sub> <sup>3+</sup> is paramagnetic in nature due to: a. 1 unpaired electron b. 2 unpaired electrons c. 3 unpaired electrons d. No unpaired electron	1
4.	Which of the following cell was used in hearing aid device? a. Mercury cell b. H <sub>2</sub> -O <sub>2</sub> cell c. Dry cell d. Ni- Cd cell	1
5.	A bidentate ligand in the following is: a. Oxalate ion b. NO <sub>3</sub> <sup>-</sup> c. NH <sub>3</sub> d. None of these	1
6.	Which of the following characteristics of transition metals is associated with their catalytic activity? a. Paramagnetic nature b. Variable oxidation states c. High enthalpy of atomization d. Colour of hydrated ions	1
7.	Value of Henry's constant K <sub>H</sub> : a. Increases with increase in temperature b. increases with decrease in temperature c. decreases with increase in temperature d. remains constant	1
8.	Which of the following is more acidic? 	1
9.	The standard E° <sub>red</sub> values of A, B and C are +0.68 V, -2.54 V and -0.50 V respectively. The order of their reducing power is: a. A>B>C b. A>C>B c. B>C>A d. C>B>A	1
10.	In which of the following molecules, C atom marked with asterisk is chiral?	1



- a. I, II, III                      b. II, III, IV  
 c. I, II, III, IV                  d. I, III, IV

11. A compound undergoes complete tetramerization in a given organic solvent. The van't Hoff factor 'i' is:  
 a. 4  
 b. 0.25  
 c. 0.125  
 d. 2.0
12. Reaction of 1-phenyl-2-chloropropane with alcoholic KOH gives mainly:  
 a. 1-phenylpropene  
 b. 3-phenylpropene  
 c. 1-phenylpropan-3-ol  
 d. 1-phenylpropan-2-ol

In Q13-Q16, there are two statements given-one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

- 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 and R is true.
13. A: Limiting molar conductivity ( $\Lambda_m^\circ$ ) is obtained by the extrapolation of the  $\Lambda_m$  versus  $C^{1/2}$  curve of strong electrolyte.  
 R:  $\Lambda_m^\circ$  for weak electrolytes is obtained by using Kohlrausch's law.
14. A: Ammonolysis of alkyl halides involves reaction between alkyl halides and alcoholic ammonia.  
 R: Ammonolysis of alkyl halides mainly produces secondary amines.
15. A: In transition metal series, the ionization enthalpy increases.  
 R: This is due to increase in nuclear charge corresponding to the filling of d electrons.
16. A: Order and molecularity of a reaction are always same.  
 R: Complex reaction takes place in different steps and the slowest step determines the rate of reaction.

Section B

This section contains 5 questions with internal choice in one question. The following questions are short answer type and carry 2 marks each.

17. A plot of  $\log t_{1/2}$  versus  $\log C_0$  is given below. What can be concluded from the graph given below?  
 Why rate of reaction does not remain constant throughout?

$$\frac{1.615}{dA} = 2.5 \times 10^{-4} \text{ J mol}^{-1}$$

	$\log t_{1/2}$ 	
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OR

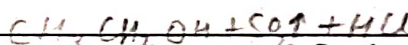
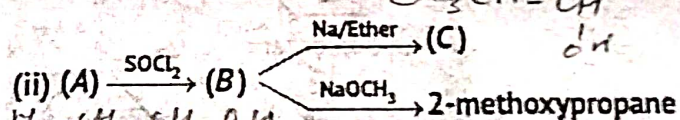
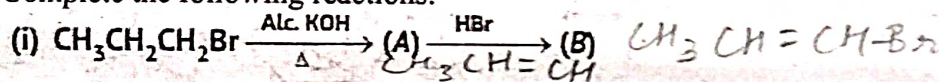
The decomposition of  $\text{NH}_3$  on the platinum surface is zero order reaction. What are the rates of production of  $\text{N}_2$  and  $\text{H}_2$  if  $k = 2.5 \times 10^{-4} \text{ mol}^{-1} \text{ L s}^{-1}$ ?

18. Write down the IUPAC name for each of the following complexes and indicate the oxidation state, electronic configuration and coordination number.
- $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$
  - $\text{K}[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2] \cdot 3\text{H}_2\text{O}$

19. How will you convert the following:
- Ethyl magnesium chloride to propanol
  - Benzene to phenol

20. Explain collision theory. Give examples and draw a diagram showing molecules having proper and improper orientation.

21. Complete the following reactions:



Section C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. a. If a reaction obeys the following equation:  


$$K = \frac{2.303}{t} \log \frac{a}{a-x}$$

What is the order of reaction?

- b. During nuclear explosion, one of the products is  $^{90}\text{Sr}$  with half-life of 28.1 years. If  $1 \mu\text{g}$  of  $^{90}\text{Sr}$  was absorbed in the bones of a newly born baby instead of calcium, how much of it will remain after 10 years and 60 years if it is not lost metabolically. [Antilog 0.8929 = 0.7814 and Antilog 1.3575 = 0.2278]

23. i. Account for the following:
- Elements of the first transition series possess many properties different from those of heavier transition elements.
  - Transition elements generally form coloured compounds.
- ii. What are the different oxidation states exhibited by lanthanoids.

24. a. Draw the graph between vapour pressure and temperature and explain the elevation in boiling point of a solvent in solution.

Sum  $\frac{1}{2}$  mol  


	b. Determine the osmotic pressure of a solution prepared by dissolving $2.5 \times 10^{-2}$ g of $K_2SO_4$ in 2 L of water at $25^\circ C$ assuming that it is completely dissociated. ( $R=0.0821$ L atm $K^{-1}$ mol $^{-1}$ , Molar mass of $K_2SO_4 = 174$ g mol $^{-1}$ )	
	<b>OR</b>	
	a. Explain Raoult's law. b. Calculate the mass of a non-volatile solute (molar mass $40$ g mol $^{-1}$ ) which should be dissolved in $114$ g octane to reduce its vapour pressure to $80\%$ .	3
25.	Write the chemical equations involved in: a. Kolbe's reaction      b. Williamson synthesis      c. Reimer-Tiemann reaction	3
26.	a. Calculate the mass of Ag deposited at cathode when a current of $2A$ was passed through a solution of $AgNO_3$ for $15$ min. (Given: Molar mass of Ag = $108$ g mol $^{-1}$ ) b. Briefly describe lead storage battery.	3
27.	a. Phenol is acidic while ethanol is neutral. Why? b. Give one chemical test to distinguish between the following: (i) Ethanol and dimethyl ether (ii) 1-propanol and 2-methyl-2-propanol.	3
28.	Give reasons for the following: a. The presence of $-NO_2$ group at ortho or para position increases the reactivity of haloarenes towards nucleophilic substitution reactions. b. p-dichlorobenzene has higher melting point than that of ortho or meta isomer. c. Thionyl chloride method is preferred for preparing alkyl chloride from alcohols.	3

*It is because due by product gas from  $SO_2$  and  $HX$  are excreted away*

**Section D**  
 Questions 29 and 30 are Case-Based questions. Read the passage carefully and answer questions that follows:

29.	Nernst equation relates the reduction potential of an electrochemical reaction to the standard potential and activities of the chemical species undergoing oxidation and reduction. The resulting potential difference across the cell is important in several processes such as transmission of nerve impulses and maintaining the ion balance. <b>Answer the following questions:</b> a. How much charge is required for the following reduction: $1$ mol of $MnO_4^-$ to $Mn^{2+}$ ? b. Arrange the following metals in the order in which they displace each other from the solution of their salts. Al, Cu, Fe, Mg and Zn. c. The conductivity of the $0.20$ M solution of KCl at $298$ K is $0.0248$ S $cm^{-1}$ . Calculate its molar conductivity.	4
30.	Coordination compounds are widely present in the minerals, plant and animal worlds and are known to play many important functions in the area of analytical chemistry, metallurgy, biological systems and medicine. Alfred Werner's theory postulated the use of two types of linkages (primary and secondary), by a metal atom/ ion in a coordination compound. He predicted the geometrical shapes of a large number of coordination entities using the property of isomerism. The Valence Bond Theory (VBT) explains the formation, magnetic behaviour and geometrical shapes of coordination compounds. It, however, fails to describe the optical properties of these compounds. The Crystal Field Theory (CFT) explains the effect of different crystal fields (provided by the ligands taken as point charges) on the degeneracy of d-orbital energies of the central metal	4

$$\begin{array}{r} 50 \\ \times 15 \\ \hline 300 \\ \times \end{array}$$

	atom/ion. <b>Answer the following questions:</b> a. What is the secondary valency of $[\text{Co}(\text{en})_3]^{3+}$ ? 3 b. Write the formula of Iron (III) Hex.acyanidoferrate (II). c. Give reasons: (i) Low spin tetrahedral complexes are not formed. (ii) $[\text{Co}(\text{NH}_3)_6]^{3+}$ is an inner orbital complex, whereas $[\text{Ni}(\text{NH}_3)_6]^{2+}$ is an outer orbital complex. [Atomic number: Co = 27, Ni = 28]	
<b>Section E</b>		
<b>This section contains 3 questions with internal choice in each question. The following questions are long answer type and carry 5 marks each.</b>		
31.	a. Define reversed osmosis. b. Why a mixture of $\text{CS}_2$ and acetone shows positive deviation from Raoult's law? What type of azeotrope is formed by this mixture? c. A 0.01 m aqueous solution of $\text{AlCl}_3$ freezes at $-0.068^\circ\text{C}$ . Calculate the percentage of dissociation. [Given: $K_f$ water = $1.86\text{K Kg/mol}$ ]	5
<b>OR</b>		
	a. What happens when we place the blood cell in saline water solution (hypertonic solution)? Give reason. b. 30 g of urea, $\text{H}_2\text{NCONH}_2$ ( $m = 60\text{ g mol}^{-1}$ ) is dissolved in 846 g of water. Calculate the vapour pressure of water for this solution if vapour pressure of pure water at 298 K is 23.8 mm Hg. c. The air is a mixture of a number of gases. The major components are oxygen and nitrogen with approximate proportion of 20% is to 79% by volume at 298 K. The water is in equilibrium with air at a pressure of 10 atm. At 298 K if the Henry's law constants for oxygen and nitrogen at 298 K are $3.30 \times 10^7\text{ mm}$ and $6.51 \times 10^7\text{ mm}$ respectively, calculate the composition of these gases in water.	
32.	a. Explain Standard Hydrogen Electrode OR Galvanic Cells. b. Calculate the maximum work and $\log K_c$ for the given reaction at 298 K: $\text{Ni}(\text{s}) + 2\text{Ag}^+(\text{aq}) \rightleftharpoons \text{Ni}^{2+}(\text{aq}) + 2\text{Ag}(\text{s})$ [Given $E^\circ_{(\text{Ni}^{2+}/\text{Ni})} = -0.25\text{V}$ , $E^\circ_{(\text{Ag}^+/\text{Ag})} = 0.80\text{V}$ ] c. Resistance of conductivity cell filled with 0.2 mol/L KCl solution is 200 ohm. If the resistance of the same cell when filled with 0.05 mol/L KCl solution is 620 ohm, calculate the conductivity and molar conductivity of 0.05 mol/L KCl solution. The conductivity of 0.2 mol/L KCl solution is 0.0248 S/cm	5
33.	a. Describe the oxidising action of potassium dichromate and write the ionic equations for its reaction with iodide. b. Indicate the steps for the preparation of $\text{K}_2\text{Cr}_2\text{O}_7$ from chromite ore. <b>Answer any one of the following questions:</b> c. Why is $\text{Cu}^+$ ion not stable in aqueous solution? d. Atomic radii of 4d and 5d series elements are nearly same. Give reason.	5

a)