

Marks : 50

Time : 8.30 am to 11.00 am

Instructions :

1. All sections are compulsory.
2. Marks :
Section A - 1 mark each, Section B: 2 marks each
Section C: 3 marks each, Section D: 4 marks each.
3. Use of calculator is not allowed.
4. Use of log tables is allowed.
5. Use of pencil only for diagrams.
6. Figures to the right indicate full marks.
7. Given data:
Avogadro's number $N_A = 6.022 \times 10^{23}$
Gas constant $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$

(7)

Q1. Select and write correct answer from given alternatives.

- Co-ordination number of atoms in simple cubic crystal lattice is _____.
a) 2 b) 4
c) 12 d) 6
- The unit of Henry's law constant is _____.
a) mol L⁻¹ bar⁻¹ b) mol⁻¹ L bar⁻¹
c) mol L⁻¹ bar d) mol⁻¹ L⁻¹ bar⁻¹
- In a particular reaction 2 kJ of heat is released by the system and 6 kJ of work is done on the system. The value of ΔU is _____.
a) -6 kJ b) +4 kJ
c) +8 kJ d) -2 kJ
- Relation between solubility product and its solubility for Al(OH)₃ is _____.
a) 4S³ b) S²
c) 27S⁴ d) 9S³

5. Which amine does not react with a Hinsberg reagent?
 - a) Ethanamine
 - b) N-Ethylethanamine
 - c) N,N-Diethylethanamine
 - d) 2-Methylpropan-2-amine
6. Glycerol has _____ number of hydroxyl group present in their structure.
 - a) 2
 - b) 4
 - c) 1
 - d) 3
7. Ketones react with hydroxyl amine and give _____.
 - a) hydrazone
 - b) ketal
 - c) oxime
 - d) cyanohydrin

Q2. Answer the following.

(7)

- i) What are benzylic halides?
- ii) Write the relation between van't Hoff factor and degree of dissociation of an electrolyte.
- iii) Write the name of the product obtained when vapours of tertiary alcohol passed over hot copper at 573K.
- iv) Define: Enantiomers
- v) Write the relation between radius (r) of the particle and edge length (a) for fcc unit cell.
- vi) Define : Osmosis
- vii) What is the pH of 0.001M HCl solution?

SECTION B

Attempt any eight of the following.

(16)

Q3. What is the action of following reagents on R - X.

- a) Alc.NH₃
- b) Alc.AgCN

Q4. What is the action of

- a) liquid bromine in acetic acid on anisole?
- b) soda-lime on sodium acetate?

Q5. How will you prepare amine from nitroalkane?

Q6. a) What is the action of LiAlH₄ on R-COOH?

- b) Write any two uses of alcohols.

- Q7.** Write the reaction for the preparation of
- acetaldehyde by Rosenmund reaction
 - benzaldehyde by Gatterman-Koch formylation.
- Q8.** Define Buffer solution. Write the Henderson Hasselbalch equation for acidic buffer.
- Q9.** Deduce the first law of thermodynamics for isochoric process.
- Q10.** Derive an expression for molar mass of solute from vapour pressure lowering.
- Q11.** What is substitutional impurity defect? Explain with suitable example.
- Q12.** Define.
- Extensive properties
 - Intensive properties
- Q13.** A solution of citric acid $C_6H_8O_7$ in 50g of acetic acid has a boiling point elevation of 1.76K. If K_b for acetic acid is $3.07 \text{ K kg mol}^{-1}$. What is the molality of solution.

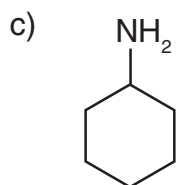
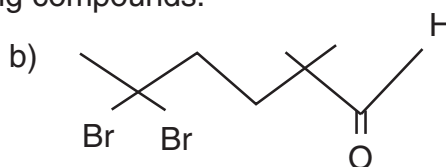
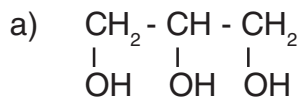
SECTION C

Attempt any four of the following.

(12)

Q14. Distinguish between SN^1 and SN^2 reaction. (any 6 points)

Q15. Write the IUPAC name of the following compounds.



Q16. a) Define simple ketones.

b) Explain cannizzaro reaction with the help of benzaldehyde.

Q17. Derive an expression for Ostwald's dilution law for weak acid HA.

Q18. Calculate the maximum work when 24g of O_2 are expanded isothermally and reversibly from the pressure of 1.6 bar to 1 bar at 298 K.

Q19. Explain the hydrolysis of salt of strong acid and weak base with suitable example.

SECTION - D

Attempt any two of the following.

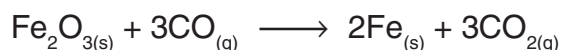
(8)

Q20. a) An element with molar mass 27 g/mol forms cubic unit cell with edge length of 405 pm. If density of the element is 2.7 g/cm³. Find the type of unit cell.

b) State Raoult's law.

Q 21.a) Define Entropy.

b) Calculate standard enthalpy of reaction,



from the following data.

$$\Delta_f H^\circ(\text{Fe}_2\text{O}_3) = -824 \text{ kJ/mol}$$

$$\Delta_f H^\circ(\text{CO}) = -110 \text{ kJ/mol}$$

$$\Delta_f H^\circ(\text{CO}_2) = -393 \text{ kJ/mol}$$

Q22. What are phenols?

Write the note on Dow process for the preparation of phenol.

Q23. Identify products A, B, C and D in following reactions.

