

Serial SSR/1

Code No. **56/1/1**

Roll No.

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Candidates must write the Code on the title page of the answer- book.

- Please check that this question paper contains **15** printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains **30** questions.
- **Please write down the Serial Number of the questions before attempting it.**

Chemistry (Theory)

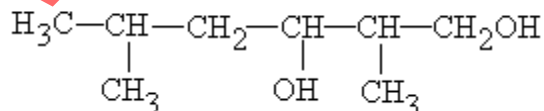
Time allowed: 3 hours]

[Maximum marks: 70

General Instructions:

- (i) All questions are compulsory.
- (ii) Question nos. 1 to 8 are very short answer questions and carry 1 mark each.
- (iii) Question nos. 9 to 18 are short answer questions and carry 2 marks each.
- (iv) Question nos. 19 to 27 are also short answer questions and carry 3 marks each.
- (v) Question nos. 28 to 30 are long answer questions and carry 5 marks each.
- (vi) Use log tables if necessary, use of calculators is not allowed

1. What is the coordination number of each type of ions in a rock-salt type crystal structure?
2. Define the term 'order of reaction' for chemical reactions.
3. What causes Brownian movement in a colloidal solution?
4. In which one of the two structures, NO_2^+ and NO_2^- , the bond angle has a higher value?
5. Write the IUPAC name of the following compound:



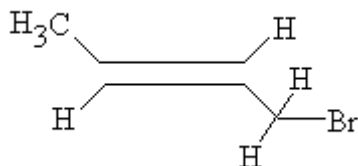
- Arrange the following compounds in an increasing order of their acid strengths:
 $(\text{CH}_3)_2\text{CHCOOH}$, $\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{COOH}$, $\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{COOH}$
- Write a chemical reaction in which the iodide ion replaces the diazonium group in a diazonium salt.
- Name a substance that can be used as an antiseptic as well as a disinfectant
- Explain as to why haloarenes are much less reactive than haloalkanes towards nucleophilic substitution reactions.

OR

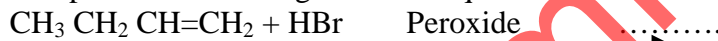
Which compound in each of the following pairs will react faster in $\text{S}_\text{N}2$ reaction with OH^- ? Why?

- CH_3Br or CH_3I
- $(\text{CH}_3)_3\text{CCl}$ or CH_3Cl

- (a) State the IUPAC name of the following compound:



- Complete the following chemical equations:



- State Henry's law correlating the pressure of a gas and its solubility in a solvent and mention two applications for the law.
- A first order decomposition reaction takes 40 minutes for 30% decomposition. Calculate its $t_{1/2}$ value.
- What is meant by the 'rate constant, k ' of a reaction? If the concentration be expressed in mol L^{-1} units and time in seconds, what would be the units for k (i) for a zero order reaction and (ii) for a first order reaction?
- Define the following terms in relation to proteins:
 - Peptide linkage
 - Denaturation
- List the reactions of glucose which cannot be explained by its open chain structure.
- Assign a reason for each of the following statements:
 - Ammonia is a stronger base than phosphine.
 - Sulphur in vapour state exhibits a paramagnetic behavior.
- Draw the structures of the following molecules:
 - SF_4
 - XeF_4
- What are biodegradable and non-biodegradable detergents? Give one example of each class.

19. What is semiconductor? Describe the two main types of semiconductors and explain mechanisms for their conduction.
20. Calculate the temperature at which a solution 54g of glucose, ($C_6H_{12}O_6$), in 250g of water will freeze. (K_f for water = $1.86 \text{ k mol}^{-1}\text{kg}$)
21. What are lyophilic and lyophobic sols? Give one example of each type. Which one of these two types of sols is easily coagulated and why?
22. State briefly the principles which serve as basis for the following operations in metallurgy:
- Froth floatation process
 - Zone refining
 - Reining by liquation
23. Write chemical equations for the following processes:
- Chlorine reacts with a hot concentrated solution of sodium hydroxide
 - Orthophosphorous acid is heated
 - PtF_6 and xenon are mixed together

OR

Complete the following chemical equations:

- $Ca_3P_2(s) + H_2O(l) \rightarrow \dots\dots$
- $Cu^{2+}(aq) + NH_2^-(aq) \rightarrow \dots\dots$
- $F_2(g) + H_2O(l) \rightarrow \dots\dots$

24. (a) What is a ligand? Give an example of a bidentate ligand.
(b) Explain as to how the two complexes of nickel, $[Ni(CN)_4]^{2-}$ and $Ni(CO)_4$, have different structures but do not differ in their magnetic behavior. ($Ni = 28$)
25. Name the reagents which are used in the following conversions:
- A primary alcohol to an aldehyde
 - Butan-2-one to butan-2-ol
 - Phenol to 2, 4, 6-tribromophenol
26. Account for the following observations:
- pK_b for aniline is more than that for methylamine.
 - Methylamine solution in water reacts with ferric chloride solution to give a precipitate of ferric hydroxide.
 - Aniline does not undergo Friedel-Crafts reaction.
27. Write the names and structures of the monomers of the following polymers:

- Buna-S
- Neoprene
- Nylon-6

28. Conductivity of $0.00241M$ acetic acid solution is $7.896 \times 10^{-5} \text{ Scm}^{-1}$. Calculate its molar conductivity in this solution. If \wedge_m^0 for acetic acid be $390.5 \text{ S cm}^2 \text{ mol}^{-1}$, what would be its dissociation constant?

OR

Three electrolytic cells A, B and C containing solutions of zinc sulphate, silver nitrate and copper sulphate, respectively are connected in series. A steady current of 1.5 ampere was passed through them until 1.45g of silver were deposited at the cathode of cell B. How long did the current flow? What mass of copper and what mass of zinc were deposited in the concerned cells? (Atomic masses of Ag = 108, Zn = 65.4, Cu = 63.5)

29. Assign reasons for the following:

- (i) The enthalpies of atomisation of transition elements are high.
- (ii) The transition metals and many of their compounds act as good catalyst.
- (iii) From element to element the actinoid contraction is greater than the lanthanoid contraction.

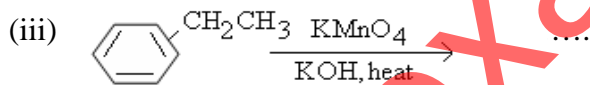
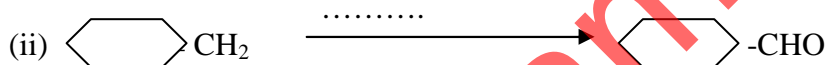
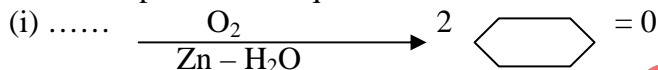
OR

(a) What may be the possible oxidation states of the transition metals with the following d electronic configuration in the ground state of their atoms:

$3d^3 4s^2$, $3d^5 4s^2$ and $3d^6 4s^2$. Indicate relative stability of oxidation states in each case.

(b) Write steps involved in the preparation of (i) Na_2CrO_4 from chromite ore and (ii) K_2MnO_4 from pyrolusite ore.

30. (a) Complete the following reaction statements by giving the missing starting material, reagent or product as required:



(b) Describe the following reactions:

- (i) Cannizaro reaction
- (ii) Cross aldol condensation

OR

(a) How would you account for the following:

- (i) Aldehydes are more reactive than ketones towards nucleophiles.
- (ii) The boiling points of aldehydes and ketones are lower than of the corresponding acids.
- (iii) The aldehydes and ketones undergo a number of addition reactions.

(b) Give chemical tests to distinguish between:

- (i) Acetaldehyde and benzaldehyde
- (ii) Propanone and propanol