

**2021  
CHEMISTRY**

Total marks : 70

Time : 3 hours

**General instructions:**

i) *Approximately 15 minutes is allotted to read the question paper and revise the answers.*

ii) *The question paper consists of 30 questions. All questions are compulsory.*

iii) *Marks are indicated against each question.*

iv) *Internal choice has been provided in some questions.*

**N.B:** *Check that all pages of the question paper is complete as indicated on the top left side.*

1. The appearances of colour in solid alkali metal halides is generally due to 1  
(a) Schottky defects (b) Frenkel defects  
(c) F-centre (d) interstitial defect.
2. The unit of rate constant for a zero order reaction is 1  
(a)  $\text{Mol L}^{-1}\text{S}^{-1}$  (b)  $\text{S}^{-1}$   
(c)  $\text{LMol}^{-1}\text{S}^{-1}$  (d)  $\text{L}^2\text{Mol}^2\text{S}^{-1}$ .
3. Which of the following compound shows the highest boiling point? 1  
(a)  $\text{CH}_3\text{Cl}$  (b)  $\text{CH}_3\text{Br}$   
(c)  $\text{CH}_3\text{F}$  (d)  $\text{CH}_3\text{I}$ .
4. Which of the following is most acidic? 1  
(a)  $\text{CH}_3\text{OH}$  (b)  $\text{CH}_3\text{CH}_2\text{OH}$   
(c)  $(\text{CH}_3)_2\text{CHOH}$  (d)  $(\text{CH}_3)_3\text{COH}$ .
5. Nucleic acids are polymers of 1  
(a) nucleosides (b) globulins  
(c) nucleons (d) nucleotides.
6. Define coordination number. 1
7. What is an ionic conductance? 1
8. What is dialysis? 1
9. Give the IUPAC name of  $\text{CH}_2=\text{CHCH}_2\text{Br}$ . 1
10. What is an ammonolysis? 1

11. a. Why does non-ideal solutions show positive deviations and negative deviations from Raoult's law? 2  
**Or**  
b. What is hypertonic solution and hypotonic solution?
12. A first order reaction is found to have a rate constant  $k = 5.5 \times 10^{-14} \text{S}^{-1}$ . Find the half life of the reaction. 2
13. a. Give reason why zinc, cadmium and mercury are not regarded as transition elements. 2  
**Or**  
b. Why do the transition elements exhibit higher enthalpies of atomization?
14. Write the preparation of ether by Williamson synthesis. 2
15. Complete the following reactions: 2  
(a)  $\text{CH}_3\text{COOH} + \text{PCl}_5 \rightarrow ?$   
(b)  $3\text{CH}_3\text{COOH} + \text{PCl}_3 \rightarrow ?$
16. a. Explain carbylamines reaction and write the reaction involved in it. 2  
**Or**  
b. What happens when  
(i) primary amines reacts with nitrous acid.  
(ii) aromatic amines reacts with nitrous acid.
17. Silver forms ccp lattice and X-ray studies of its crystals show that the edge length of its unit cell is 408.6 pm. Calculate the density of silver. (Atomic mass = 107.9u). 3
18. a. 45g of ethylene glycol ( $\text{C}_2\text{H}_6\text{O}_2$ ) is mixed with 600g of water. Calculate (a) the freezing point depression and (b) the freezing point of the solution. 3  
**Or**  
b. Calculate the molarity of each of the following solution:  
(a) 30g of  $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$  (Atomic mass  $291 \text{g mol}^{-1}$ ) in 4.3L of solution.  
(b) 30 ml of 0.5M  $\text{H}_2\text{SO}_4$  diluted in 500ml.
19. Derive the integrated rate equation for first order reaction. 3
20. a. Differentiate between dispersed phase and dispersed medium on the basis of interaction with an example. 3  
**Or**  
b. Explain the properties of colloidal solution by electrophoresis.

21. Write the preparation of ammonia by Haber process. Give one use. **3**
22. Name the element in the lanthanoids series which has +4 oxidation state. Why do transition metal form interstitial compounds? **3**
23. a. Explain the reasons why aryl halides are less reactive towards nucleophilic substitution reaction. **3**  
**Or**  
 b. Explain S<sub>N</sub>1 or substitution nucleophilic unimolecular reaction in haloalkanes.
24. Why are phenols more acidic than alcohol and water? **3**
25. Write Gabriel-phthalimide synthesis with the reaction involved in it. **3**
26. Explain the classification of proteins on the basis of their molecular shape. Give example. **3**
27. a. On the basis of valence bond theory, predict the shape, magnetic behaviour of [NiCl<sub>4</sub>]<sup>2-</sup>. **3**  
**Or**  
 b. Give the IUPAC name of K<sub>2</sub>[Cr(C<sub>2</sub>O<sub>4</sub>)<sub>3</sub>]. Predict the number of unpaired electrons in the square planar [Pt(CN)<sub>4</sub>]<sup>2-</sup> ion.
28. a. (i) Define molar conductivity.  
 (ii) The cell in which the following reaction occurs:  
 $2\text{Fe}^{3+}(\text{aq}) + 2\text{I}^{-}(\text{aq}) \rightarrow 2\text{Fe}^{2+}(\text{aq}) + \text{I}_2(\text{s})$  has  $E^{\circ}_{\text{cell}} = 0.236\text{V}$  at 298K. Calculate the standard Gibb's energy and the equilibrium constant of the cell reaction. (Anti log 7.98 =  $9.57 \times 10^{-7}$ ). **5**  
**Or**  
 b. (i) What is resistivity? Give the SI unit of resistance.  
 (ii) Represent the cell in which the following reaction takes place:  
 $\text{Mg}(\text{s}) + 2\text{Ag}^{+}(0.0001\text{M}) \rightarrow \text{Mg}^{2+}(0.130\text{M}) + 2\text{Ag}(\text{s})$ . Calculate its  $E_{\text{cell}}$  if  $E^{\circ}_{\text{cell}} = 3.17\text{V}$ .

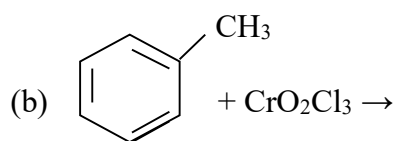
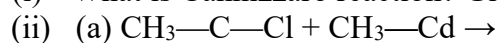
29. a. (i) Give reasons why  
 (a)  $\text{PH}_3$  is basic in nature.  
 (b) Bond angle in  $\text{PH}_4^+$  is higher than  $\text{PH}_3$ .  
 (ii) Explain the properties of oxidation state and ionisation enthalpy of group-16 elements.

Or

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- b. (i) What are interhalogen compounds? How are they prepared?  
 (ii) Draw the structure of  $\text{IF}_7$  and  $\text{BrF}_5$  and mention its type of hybridization.

30. a. (i) What is Cannizzaro reaction? Give the reaction.



Or

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- b. (i) Explain Clemmensen reduction with reaction.  
 (ii) Would benzaldehyde be more reactive or less reactive in nucleophilic addition reactions than propanol? Explain.

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