

2024
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 34 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 values of Van't Hoff factors for $KCl, NaCl, K_2SO_4$ respectively are 1
 - (a) 2, 2 and 2
 - (b) 2, 2 and 3
 - (c) 1, 1 and 2
 - (d) 1, 1 and 1

2. SI unit of conductance is 1
 - (a) Sm
 - (b) m^2
 - (c) Siemens
 - (d) Sm^{-1}

3. Identify the reaction order from the value of rate constant $K = 5 \times 10^{-3} mol^{-1} LS^{-1}$ 1
 - (a) 1st order
 - (b) zero order
 - (c) 2nd order
 - (d) 3rd order

4. Which of the following statement about transition element is not correct? 1
 - (a) They show variable oxidation states
 - (b) They exhibit diamagnetic and paramagnetic properties
 - (c) All ions are coloured
 - (d) They exhibit catalytic property.

5. Which of the following is π - acid ligand? 1
 - (a) NH_3
 - (b) CO
 - (c) F^-
 - (d) en

6. Full form of DDT is 1
 - (a) dichlorodiphenyltrichloroethane
 - (b) dichlorodiphenyltrichloromethane
 - (c) diphenyldichlorotrifluoroethane
 - (d) diphenyldifluorotrichloroethane

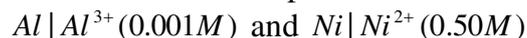
7. The IUPAC name of p-cresol is 1
 - (a) 4- methylphenol
 - (b) 3-methylphenol
 - (c) 3-chlorophenol
 - (d) methoxybenzene

8. Which one of the following is the strongest acid? 1
 (a) ICH_2COOH (b) ClCH_2COOH
 (c) FCH_2COOH (d) BrCH_2COOH
9. Treatment of phenol with benzene diazonium chloride in presence of base is known as 1
 (a) Gatterman reaction (b) Coupling reaction
 (c) Sulphonation reaction (d) Acylation reaction
10. Xerophthalmia is caused due to deficiency of 1
 (a) vitamin C (b) vitamin D
 (c) vitamin A (d) vitamin E
11. What is boiling point? 1
12. Write the IUPAC name of $[\text{Pt}(\text{NH}_3)_2(\text{H}_2\text{O})_2]^{2+}$ 1
13. Why is tert-butylbromide more reactive towards $\text{S}_{\text{N}}1$ reaction? 1
14. Draw the structures of the possible enantiomers of 3-methylpent-1-ene. 1
15. What is the name of the reagent used in Friedel-Craft alkylation of anisole? 1
16. Arrange the following in order of increasing order of their boiling points: 1
 CH_3CHO , $\text{CH}_3\text{CH}_2\text{OH}$, $\text{CH}_3\text{-CH}_2\text{-CH}_3$
17. Differentiate between solution showing positive and negative deviation from Raoult's law. 2
18. Write the rate equation for the reaction $\text{A}_2 + 3\text{B}_2 \rightarrow 3\text{C}$, if the overall order of the reaction is zero. 2
19. Cresol is a weaker acid than phenol. Explain. 2
20. Convert benzene to benzaldehyde. 2
21. a. Identify A and B in the reaction. 2

$$\text{CH}_3\text{CH}_2\text{Cl} \xrightarrow{\text{NaCN}} \text{A} \xrightarrow[\text{Ni/H}_2]{\text{Reduction}} \text{B}$$
- Or**
- b. Complete the reaction: $\text{C}_6\text{H}_5\text{NO}_2 \xrightarrow{\text{Fe/HCl}} \text{A} \xrightarrow[0-5^\circ\text{C}]{\text{NaNO}_2+\text{HCl}} \text{B}$

22. a. Why vitamin C cannot be stored in our body? 2
Or
- b. What are the products of the hydrolysis of sucrose?
23. a. Determine the osmotic pressure of a solution prepared by dissolving 25 mg of K_2SO_4 in 2L of water at $25^\circ C$ assuming that is completely dissociated. [Given $R=0.0821 \text{ L atm K}^{-1} \text{ mol}^{-1}$]. 3
Or
- b. Calculate the boiling point of solution when 2g of Na_2SO_4 (Molar mass= 142 gmol^{-1}) was dissolved in 50g of water, assuming Na_2SO_4 undergoes complete ionization. [K_b for water= $0.52 \text{ K Kg mol}^{-1}$].
24. What type of battery is lead storage battery? Write the anode and cathode reaction, also the overall cell reaction occurring in the operation of a lead storage battery. 3
25. a. The rate of reaction, $2NO + Cl_2 \rightarrow 2NOCl$ is doubled when concentration of Cl_2 is doubled and it becomes eight times when concentration of both NO and Cl_2 are doubled. Write the order of the reaction. 3
Or
- b. The decomposition of Cl_2O_7 at 400K in the gas phase to Cl_2 and O_2 is of 1st order reaction. After 55 seconds at 400K the pressure of Cl_2O_7 falls from 0.602 atm to 0.301 atm. Calculate the rate constant.
26. Why do transition elements show variable oxidation state? How is the variability in oxidation state of d-block differ from p-block elements? 3
27. $[Cr(NH_3)_6]^{3+}$ is paramagnetic while $[Ni(CN_4)]^{2-}$ is diamagnetic. Explain. 3
28. What is Fittig reaction? Write suitable reaction. 3
29. a. Write the mechanism of acid catalyzed dehydration of ethanol to yield ethene. 3
Or
- b. How can primary, secondary and tertiary alcohols be prepared from Grignard reagent?
30. Explain Gabriel phthalimide synthesis with proper reaction. 3
31. Draw the pyranose structure of glucose. 3

32. a. A voltaic cell is set up at 25°C with the following half cells:



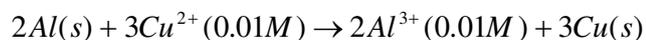
Calculate E_{cell} . [Given, $E^{\circ}_{\text{Ni}^{2+}|\text{Ni}} = -0.25\text{V}$

$$E^{\circ}_{\text{Al}^{3+}|\text{Al}} = -1.66\text{V}]$$

Or

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- b. Calculate E°_{cell} for the reaction at 298K .



Given, $E_{\text{cell}} = 1.98\text{V}$.

33. i. What are inner transitional elements?
 ii. Write the general electronic configuration of lanthanides and actinides.
 iii. Why do TiCl_3 act as good reducing agent?

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34. a. i. Write the IUPAC name of $\text{CH}_3\text{-CH=CH-CHO}$.
 ii. What happens when ethanal reacts with Tollen's reagent ?
 Write a complete reaction.
 iii. Chloroacetic acid is more acidic than acetic acid. Why?

Or

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- b. Give reasons for the following;

- i. Ethanal is more reactive than acetone towards nucleophilic addition reaction.
 ii. $(\text{CH}_3)_3\text{C-CHO}$ does not undergo aldol condensation.
 iii. Carboxylic acids have higher boiling point than alcohols.
