

**2022**  
**CHEMISTRY**

Total marks : 70

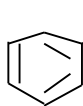
Time : 3 hours

**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 to ensure that all pages of the question paper is complete as indicated on the top left side.

1. Rust is a mixture of 1  
(a) FeO and Fe(OH)<sub>3</sub> (b) FeO and Fe(OH)<sub>2</sub>  
(c) Fe<sub>2</sub>O<sub>3</sub> and Fe(OH)<sub>3</sub> (d) Fe<sub>3</sub>O<sub>4</sub> and Fe(OH)<sub>2</sub>.
2. Colloidal solution in air is called 1  
(a) hydrosols (b) aerosol  
(c) alcosols (d) aquasols.
3. Zone refining is used for obtaining ultra pure sample of 1  
(a) copper (b) sodium  
(c) germanium (d) zinc.
4. Phenol on distillation with zinc dust gives 1  
(a) benzene (b) benzaldehyde  
(c) benzoic acid (d) benzophenone.
5. Deficiency of vitamin D leads to disease 1  
(a) rickets (b) beri-beri  
(c) scurvy (d) night-blindness.
6. What is interstitial defect? 1
7. a. Define order of a reaction. 1  
**Or**  
b. What is activation energy?
8. a. Write the IUPAC name of  $\text{CH}_3\text{-CH}_2\text{-CH=CH-C-H}$  1  
 $\begin{array}{c} \parallel \\ \text{O} \end{array}$   
**Or**  
b. What is Tollen's reagent?

9. What is diazotisation? 1
10. Why do soaps not work in hard water? 1
11. a. What is Van't Hoff factor? Under what condition Van't Hoff factor "i" is equal to unity? 2  
**Or**
- b. Calculate molality of 2.5g of ethanoic acid (CH<sub>3</sub>COOH) in 75g of benzene. 2
12. a. Differentiate between calcination and roasting. 2  
**Or**
- b. Explain the electrolysis of aluminium by Hall-Heroult process. 2
13. a. Explain why do the transition metals generally formed coloured compounds? 2  
**Or**
- b. Why does transition metals act as a good catalyst? 2
14. a. Complete the following reaction:
- (i)  $\text{H}_3\text{C}-\text{Br} + \text{AgF} \rightarrow$
- (ii)   $\text{CH}_2-\text{CH}=\text{CH}_2 + \text{HBr} \rightarrow$
- Or** 2
- b. What is DDT? Draw the structure of DDT. 2
15. a. Why are antioxidants added in the food? 2  
**Or**
- b. What are narcotic analgesics and non-narcotic analgesics? 2
16. a. What is Fittig reaction? Give reaction. 2  
**Or**
- b. Explain chirality with an example. 2
17. a. Niobium crystallises in body-centered cubic structure, if its density is 8.55gcm<sup>-3</sup>. Calculate the atomic radius of Niobium using its atomic mass 93u. 3  
**Or**
- b. Calculate the packing efficiency in hexagonal closed packing. 3

18. a.  $200\text{cm}^3$  of an aqueous solution of a protein contains 1.26g of the protein. The osmotic pressure of such a solution at 300K is found to be  $2.57 \times 10^{-3}$  bar. Calculate the molar mass of the protein. ( $R = 0.083\text{Lbar mol}^{-1}\text{K}^{-1}$ ). 3
- Or**
- b. The boiling point of benzene is 353.23K when 1.80g of a non-volatile solute was dissolved in 90g of benzene, the boiling point is raised to 354.11K. Calculate the molar mass of the solute.  $K_b$  for benzene is  $2.53\text{K kg mol}^{-1}$ .
19. a. Show that in a first order reaction, time required for the completion of 99.9 is 10 times of half-life ( $t_{1/2}$ ) of the reaction. 3
- Or**
- b. The rate constants of a reaction at 500K and 700K are  $0.02\text{S}^{-1}$  and  $0.07\text{S}^{-1}$  respectively. Calculate the values of  $E_a$ . (Given  $R = 8.314\text{JK}^{-1}\text{mol}^{-1}$ ,  $\log 0.02 = -1.698$ ,  $\log 0.07 = -1.1549$ ).
20. a. Write the comparison between physisorption and chemisorption. 3
- Or**
- b. What is peptisation? Explain Schulze and Hardy rule with an example.
21. a. Write the preparation of  $\text{H}_2\text{SO}_4$  by Contact process. Give one of its uses. 3
- Or**
- b. Give reasons why:  
i)  $\text{H}_2\text{S}$  is less acidic than  $\text{H}_2\text{Te}$ .  
ii) Noble gases have very low boiling points.
22. a. How is potassium permanganate prepared from pyrolusite ore? Give one of its uses. 3
- Or**
- b.  $\text{La}(\text{OH})_3$  is more basic than  $\text{Lu}(\text{OH})_3$ . Give reason.
23. a. Explain the structural isomerism of coordination compounds. 3
- Or**
- b. Draw the figure to show the crystal field splitting of d-orbital in tetrahedral coordination. Write the IUPAC name of  $\text{K}_3[\text{Cr}(\text{C}_2\text{O}_4)_3]$ .
24. a. How do primary, secondary and tertiary alcohol differ towards oxidation reaction. 3
- Or**
- b. What is Reimer-Tiemann reaction? Write the reaction involved in it.

25. a. Why is aniline less basic than ethylamine? 3  
**Or**
- b. What is meant by Hoffmann bromamide degradation reaction?
26. a. Differentiate between DNA and RNA. 3  
**Or**
- b. Explain the terms:  
i) Zwitter ion  
ii) Glycosidic linkage.
27. a. How is Nylon-6,6 prepared? Give one of its uses. 3  
**Or**
- b. Explain the two types of polythene.
28. a. State Kohlrausch law. Write its application.  $\lambda_m^\circ$  for NaCl, HCl and NaAc are 126.4, 425.9 and 91.0 S cm<sup>2</sup> mol<sup>-1</sup> respectively. Calculate  $\lambda^\circ$  for HAc. 5  
**Or**
- b. State Faraday's law of electrolysis. The conductivity of 0.001028 mol L<sup>-1</sup> acetic acid is  $4.95 \times 10^{-5}$  S cm<sup>-1</sup>. Calculate its dissociation constant if  $\lambda_m^\circ$  for acetic acid is 390.5 S cm<sup>2</sup> mol<sup>-1</sup>.
29. a. (i) Give the oxidation state and structure of any three oxoacids of phosphorus.  
(ii) Which form of sulphur shows paramagnetic behavior? 5  
**Or**
- b. (i) Write the preparation and structure of PCl<sub>5</sub>.  
(ii) Explain the ionization enthalpy, electronegativity and oxidation state of group-17.
30. a. (i) Explain Wolf-Kishner reduction with reaction.  
(ii) Why is the boiling point of carboxylic acid higher than the corresponding alcohols? 5  
**Or**
- b. Explain the following reactions and give the reaction involved in it:  
(i) Gatterman-Koch reaction  
(ii) Decarboxylation  
(iii) Hell-Volhard Zelinsky reaction.

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