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 $Fe(OH)_3$ (b)   FeO and $Fe(OH)_2$
      (c) Fe_2O_3 and $Fe(OH)_3$ (d) Fe_3O_4 and $Fe(OH)_2$.

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.
                              Or   **1**
      b.   What is activation energy?

8.   **a.**   Write the IUPAC name of $CH_3-CH_2-CH=CH-\overset{\displaystyle \|}{\underset{\displaystyle O}{C}}-H$

                              Or   **1**
      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?
                                    Or   **2**
     b.   Calculate molality of 2.5g of ethanoic acid (CH_3COOH) in 75g of
              benzene.

12. **a.**   Differentiate between calcination and roasting.
                                    Or   **2**
     b.   Explain the electrolysis of aluminium by Hall-Heroult process.

13. **a.**   Explain why do the transition metals generally formed coloured
              compounds?
                                    Or   **2**
     b.   Why does transition metals act as a good catalyst?

14. **a.**   Complete the following reaction:

     (i) $H_3C-Br + AgF \rightarrow$
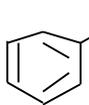
     (ii) $\begin{array}{c}\text{benzene ring}\end{array}$ $CH_2-CH=CH_2 + HBr \rightarrow$

                                    Or   **2**
     b.   What is DDT? Draw the structure of DDT.

15. **a.**   Why are antioxidants added in the food?
                                    Or   **2**
     b.   What are narcotic analgesics and non-narcotic analgesics?

16. **a.**   What is Fittig reaction? Give reaction.
                                    Or   **2**
     b.   Explain chirality with an example.

17. **a.**   Niobium crystalises in body-centered cubic structure, if its density
              is 8.55gcm^{-3}. Calculate the atomic radius of Niobium using its atomic
              mass 93u.
                                    Or   **3**
     b.   Calculate the packing efficiency in hexagonal closed packing.

18. **a.** $200cm^3$ 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 2.57×10^{-3} bar. Calculate the molar mass of the protein. (R= 0.083Lbar $mol^{-1}K^{-1}$).

Or   **3**

    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 2.53K 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.

Or   **3**

    b. The rate constants of a reaction at 500K and 700K are $0.02S^{-1}$ and $0.07S^{-1}$ respectively. Calculate the values of E_a. (Given R=8.314 $JK^{-1}mol^{-1}$, log 0.02= -1.698, log 0.07= -1.1549).

20. **a.** Write the comparison between physisorption and chemisorption.

Or   **3**

    b. What is peptisation? Explain Schulze and Hardy rule with an example.

21. **a.** Write the preparation of H_2SO_4 by Contact process. Give one of its uses.

Or   **3**

    b. Give reasons why:
i) H_2S is less acidic than H_2Te.
ii) Noble gases have very low boiling points.

22. **a.** How is potassium permanganate prepared from pyrolusite ore? Give one of its uses.

Or   **3**

    b. $La(OH)_3$ is more basic than $Lu(OH)_3$. Give reason.

23. **a.** Explain the structural isomerism of coordination compounds.

Or   **3**

    b. Draw the figure to show the crystal field splitting of d-orbital in tetrahedral coordination. Write the IUPAC name of $K_3[Cr(C_2O_4)_3]$.

24. **a.** How do primary, secondary and tertiary alcohol differ towards oxidation reaction.

Or   **3**

    b. What is Reimer-Tiemann reaction? Write the reaction involved in it.

25. **a.** Why is aniline less basic than ethylamine?

                        Or   **3**

     b. What is meant by Hoffmann bromamide degradation reaction?

26. **a.** Differentiate between DNA and RNA.

                        Or   **3**

     b.   Explain the terms:
             i) Zwitter ion
             ii) Glycosidic linkage.

27. **a.** How is Nylon-6,6 prepared? Give one of its uses.

                        Or   **3**

     b. Explain the two types of polythene.

28. **a.** State Kohlrauch law. Write its application. $\lambda°_m$ for NaCl, HCl and
             NaAc are 126.4, 425.9 and 91.0 S cm^2 mol^{-1} respectively.
             Calculate $\lambda°$ for HAc.

                        Or   **5**

     b. State Faraday's law of electrolysis. The conductivity of 0.001028
             mol L^{-1} acetic acid is 4.95×10^{-5} S cm^{-1}. Calculate its dissociation
             constant if $\lambda°_m$ for acetic acid is 390.5 S cm^2 mol^{-1}.

29. **a.** (i) Give the oxidation state and structure of any three oxoacids
                 of phosphorus.
             (ii) Which form of sulphur shows paramagnetic behavior?

                        Or   **5**

     b. (i) Write the preparation and structure of PCl$_5$.
             (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?

                        Or   **5**

     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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