2018

CHEMISTRY

(Theory)

Full Marks : 70

Pass Marks : 21

Time : Three hours

All the questions are compulsory.

The figures in the right margin indicate full marks for the questions.

(Question Nos. 1–10 are Very Short Answer (VSA) type of 1 mark each.)

1. What is rate law ?   1

2. Ferric hydroxide solution is coagulated by the addition of Na_3PO_4 solution. Which ion is responsible for this ?   1

3. Sulphide ores are concentrated by froth floatation process only. Why ?   1

4. Write the IUPAC name of the coordination compound, $\left[Co(NH_3)_4 \, (NO_2) \, Cl \right] NO_3$.   1

5. Which one of C_6H_5Cl and $C_6H_5CH_2Cl$ will react easily with aqueous KOH ?   1

6. Salicylaldehyde is a product obtained by the action of $CHCl_3$ on C_6H_5OH in presence of aq. KOH. What is the name of the reaction ? 1

7. Why is C_2H_5OH miscible with water ? 1

8. If one strand of a DNA has the sequence of bases TATCTACCTGGA. Write the sequence of bases on the complementary strand. 1

9. What happens when D-glucose is heated with red phosphorus and HI ? 1

10. When an egg is boiled, what happens to the soluble globular protien present in it ? 1

Question Nos. 11–14 are Objective type carrying 1 mark each. Choose and rewrite the best answer out of the given alternatives.

11. For the reaction, $2A + B \longrightarrow 3C + D$, which of the following does $\overline{NOT}$ express the reaction rate ? 1

   A. $\dfrac{-d[A]}{2\,dt}$

   B. $\dfrac{-d[B]}{dt}$

   C. $\dfrac{-d[C]}{3\,dt}$

   D. $\dfrac{-d[D]}{3\,dt}$

12. The catalyst used in the hydrogenation of oil is   1

     A.   Fe

     B.   Ni

     C.   Mo

     D.   Sn

13. Oxygen exhibits +2 oxidation state in the compound   1

     A. H_2O

     B. Na_2O

     C. OF_2

     D. MgO

14. In Clemmensen reduction carbonyl compound is treated with   1

     A.   Zinc amalgam + HCl

     B.   Sodium amalgam + HCl

     C.   Zinc amalgam + HNO_3

     D.   Sodium amalgam + HNO_3

15.   What are rectifiers and transistors ? How are they made ?   2

16.   Aluminium metal crystallises in a cubic structure in which the edge of the unit cell is 405 pm. Determine the type of unit cell if the density of Al is $2.7 \, g \, cm^{-3}$.   2

17.   Calculate the molality and mole fraction of a solution containing $2.5g$ ethanoic acid (CH_3COOH) in 75g of benzene.   2

18.   Giving examples, define (i) homogeneous and (ii) hetrogeneous catalysis.   2

19.   Describe the principles of (i) Liquation and (ii) Cupellation used for purification of metals.   2

20.   Explain the following :   2

      (i)   Tailing of mercury

      (ii)   Strong reducing character of H_3PO_3

21.   Define transition elements. Zinc, Cadmium and Mercury belong to d-block of the periodic table. But they are not considered as transition elements. Why ?

                                                                                                          2

22.   Using the V.B.T. predict the shape and magnetic character of $\left[Ni(CO)_4 \right]$.   2

23. Why are vitamins essential to us ? Name the disease caused due to lack of Vitamin-D. 2

24. Give *one* important use for each of the following in pharmacy. 2

    (i)   Equanil

    (ii) Morphine

Question Nos. 25–31 are Short Answer (SA-I) type of 3 marks each.

25. What is an ideal solution ? What are the necessary conditions for a solution to be ideal ? 3

26. For a reaction, the rate law, is Rate, $K = [X]^{\frac{1}{2}} [Y]$. Can this reaction be an elementary reaction ? 3

27. Write the step-wise process for the preparation of $K_2Cr_2O_7$ from chromite ore. 3

28. Convert 2-chlorobutane to : 3

    (i)   sec-butyl ethyl ether

    (ii) 2-Butanol

    (iii) 2-Butene

29. Draw the resonating structures of phenol and predict whether OH group is meta directing or ortho and para directing towards electrophilic ring substitution reactions. 3

30. Write the structures of A, B and C in the following :

$$CH_3Cl \xrightarrow{KCN} A \xrightarrow{LiAlH_4} B \xrightarrow[H^+]{CH_3CHO} C \qquad 3$$
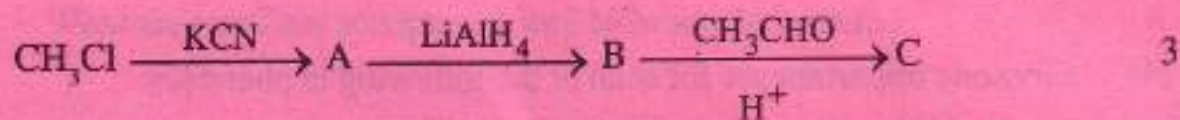
31. Explain, with examples, classification of polymers based upon strucutres.　3

Question Nos. 32 – 34 are Essay (E) type of 5 marks each.

32. (i) The resistivity of a 0·8 M solution of an electrolyte is 5×10^{-3} ohm cm. Calculate its molar conductivity.

   (ii) Calculate the mass of hydrogen evolved by passing a current of 0·5 ampere for 40 minutes through acidified water.

   (iii) Write the Nernst equation and calculate e.m.f. of the cell,

   $Mg(s)|Mg^{2+}(0·001M)||Cu^{2+}(0·0001M)|Cu(s)$
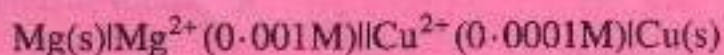
   at 298K. Given $E°cell = 2·71$ volt.　1+2+2=5

33. (a) On adding conc. H_2SO_4 to sugar a black mass is obtained. Identify the black mass.

   (b) What is ring test ? Write the chemical reaction involved in the ring test.

   (c) Nitrogen is a gas whereas phosphorus is solid. Explain.　1+2+2=5

34. (a) Describe the following reactions.

      (i) H.V.Z. reaction

      (ii) Cannizzaro reaction

      (iii) Rosenmund's reaction

    (b) An organic compound C_2H_4O gives red precipitate when warmed with Fehling's solution. Give the IUPAC name of the compound and write the chemical equation for the reaction.   3+2=5

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