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 superconductivity ?   1

2. If the radius of octahedral void is r and radius of the atom in close packing is R. Write the relation between r and R.   1

3. State Kohlrausch's law.   1

4. Why are lyophillic sols more stable than lyophobic sols ?   1

5. Transition elements have high melting points. Why ?   1

6. What is power alcohol ? 1

7. Arrange the following compounds in order of increasing acidic strength : 1

   $ClCH_2COOH$, $BrCH_2COOH$, CH_3COOH.

8. What are reducing sugars ? 1

9. What is meant by 66 in Nylon-66 ? 1

10. Name an artificial sweetner which is derivative of sucrose ? 1

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

11. Which of the followings is correct while charging the lead storage battery ? 1

   A. $PbSO_4$ cathode is reduced to Pb.

   B. $PbSO_4$ cathode is oxidised to Pb.

   C. $PbSO_4$ anode is oxidised to PbO_2.

   D. $PbSO_4$ anode is reduced to Pb.

12. Basicity of orthophosphoric acid is – 1

    A. two

    B. three

    C. four

    D. five

13. Which of the following statement about the interstitial compound is
INCORRECT? 1

    A. They retain metallic conductivity.

    B. They are chemically reactive.

    C. They are much harder than the pure metal.

    D. They have higher melting points than the pure metal.

14. Which of the following configuration of ions has zero crystal filed splitting
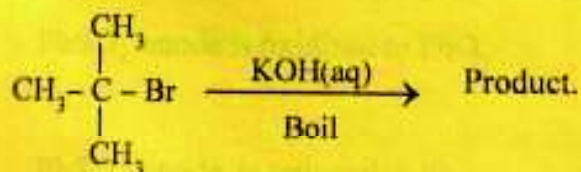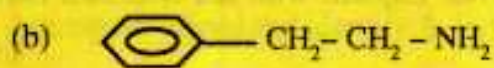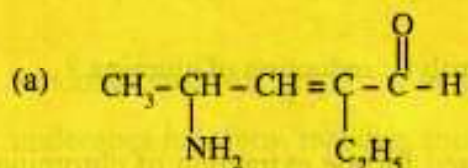energy (CFSE) in both strong and weak ligand field? 1

    A. d^{10}

    B. d^{8}

    C. d^{6}

    D. d^{4}

15. Why is Frenkel defect not shown by alkali metal halides? Name the ionic compound which can show this type of defect.   2

16. For the first order reaction the rate constant is $4.62 \times 10^{-2} \, s^{-1}$. What will be the time required for the initial concentration 1.5 mol of the reactant to be reduced to 0.75 mol ? [log 2 = 0.3010]   2

17. Write one method of preparation of sulphurdioxide. Explain bleaching action of SO_2.   2

18. Give the co-ordination isomer of   2

$$\left[Co(NH_3)_6 \right] \left[Cr(CN)_6 \right]$$

Give the IUPAC name of the isomer.

19. Write a brief account of the following with one suitable example of each.   2

   (a)   Wurtz Fittig reaction.

   (b)   Ullmann reaction.

20. Give the product and draw the mechanism for the following rection   2

$$CH_3 - \overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}} - Br \xrightarrow[\text{Boil}]{\text{KOH(aq)}} \text{Product.}$$

21. Write the IUPAC name of the following organic compounds.   2

(a)

$$CH_3 - \underset{\underset{NH_2}{|}}{CH} - CH = \underset{\underset{C_2H_5}{|}}{C} - \overset{\overset{O}{\|}}{C} - H$$

(b) ⬡ $- CH_2 - CH_2 - NH_2$

22. How does methylamine reacts with carbonyl chloride ? What is the name of the insecticide prepared by using this product ?   1+1=2

23. Name the polymer which is used in making the contact lenses. How is this polymer prepared ?   1+1=2

24. What are the advantages of synthetic detergents over soaps. (any two points.)   2

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

25. Calculate the E.M.F. of the cell   3

$$Mg(s)\left| Mg^{2+} (0 \times 1M) \right|\right| Ag^+ \left(1 \times 10^{-4} M\right) \left| Ag(s) \right.$$
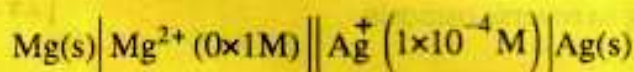
$$E^\circ_{Ag^+|Ag} = +0.8V, \quad E^\circ_{Mg^{2+}|Mg} = -2.37V$$

26. (a) Define order of a reaction.

    (b) State one condition under which a bimolecular reaction may kinetically be of first order reaction citing a suitable example.

    (c) Give the unit of rate constant for zero order reaction.   1+1+1=3

22 Chm (T) 17/18 (I)   5   P.T.O.

27. Physical and chemical adsorptions respond differently to a rise in temperature. What is the difference and why is it so ?   1+2=3

28. (a) Why is cryolite used in the electrolytic reduction of alumina ?

    (b) Aluminum metal is generally used for the extraction of chromium and manganese from their oxide ores. Explain with the chemical reactions involved.   1+2=3

29. What is lanthanoid contraction and what are the consequences of it ?   1+2=3

30. How does Lucas reagent help in the distinction of primary, secondary and tertiary alcohols.   3

31. What is the monomeric unit of protein ? Give two examples of monomers, one of which contain sulphur. Give the Zwitterionic forms of them ?   3

    Question from 32-34 are Essay (E) type of 5 marks each.

32. Define osmotic pressure and derive van't Hoff equation for dilute solutions. State the condition leading to reverse osmosis.   1+3+1=5

33. (a) Explain the following observations for group 15 elements down the group.

    (i) Stability of oxidation state +3 increases.

    (ii) Metalic character increases.

    (iii) Basic character of hydrides of these elements decreases.

(b) How does dinitrogen reacts with active metals and non metals separately. Write one relevant equatioh of each. $3+2=5$

34. A Compound $A(C_2H_4O)$ on oxidation gives $B(C_2H_4O_2)$. The compound A undergoes haloform reaction and reacts with dilute NaOH to yield C. C on subsequent heating gives D and D on catalytic hydrogenation gives E. Write the reaction involved and identify A, B, C, D and E. 5