Set 2

Std. 12
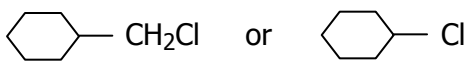05-01-2018

Max. Marks : 70
Time : 3 hrs.

General instructions :
i)   Question numbers 1 - 5 carry 1 mark each.
ii)   Question numbers 6 - 10 carry 2 marks each.
iii)   Question numbers 11 - 22 carry 3 marks each.
iv)   Question number 23 carry 4 marks.
v)   Question numbers 24 - 26 carry 5 marks each.

1. Write the structure and IUPAC name of alkyl iodide which is obtained when
    tert-butyl ethyl ether is treated with HI.   (1)

2. Which would undergo SN^2 reaction faster in the following pair and why?   (1)

    ⬡— CH_2Cl or   ⬡— Cl

3. Explain why the dipole moment of chlorobenzene is lower than that of cyclohexyl chloride?   (1)

4. Describe with an example the role of coordination compounds in analytical chemistry.   (1)

5. Why is the complex $[Co(en)_3]^{3+}$ is more stable than $[CoF_6]^{3-}$.   (1)

6. a)   Based on the nature intermolecular forces, classify the following solids
              Benzene,   silver
    b)   What type of semiconductor is formed when Ge is doped with Al?   (2)

7. Define the following terms: (2)
    i)   Azeotropes   ii)   Isotonic solutions

8. Draw the structure of the following: (2)
    i) $XeOF_4$ ii) $H_2S_2O_8$

9. Explain the preparation of potassium permanganate from pyrosulite ore.   (2)

10. How do anticeptics differ from disinfectants? Name a substance which can be used as
    an anticeptic as well as a disinfectant.   (2)

11. Chromium crystallises in bcc structure. If its atomic diameter is 245pm find its density.
    Atomic mass of Cr = 52u, N_A = 6.02 x 10^{23}.   (3)

12. a)   Why is an increase in temperature observed on mixing chloroform and acetone?
    b)   A 0.561 m solution of an unknown electrolyte depresses the freezing point of water
         by $2.93^\circ C$. What is vant Hoff factor for this electrolyte? The freezing point depression
         constant for water is $1.86^\circ C$ Kg mol^{-1}.
                                   (OR)
    A solution is prepared by dissolving 5g of non-volatile solute in 95g of water. It has a vapour
    pressure of 23.375mm Hg at 25^0C. Calculate the molar mass of the solute.
    (Vapour pressure of pure water at 25^0C is 23.75 mm of Hg, molar mass of water =18 $gmol^{-1}$)   (3)

13. a) What is shape selective catalysis?
    b) What is the difference between multimolecular and macromolecular colloids?
   Give one example of each. (3)

14. a) Name the method of refining which is based on adsorption.
    b) What is the role of limestone in the extraction of iron from its oxide?
    c) Write the reactions involved in the refining of zirconium by van Arkel method. (3)

15. Give the reasons for the following:
    a) NH_3 has a higher boiling point than PH_3
    b) Sulphur in the vapour state exhibits paramagnetism.
    c) PCl_5 is known but NCl_5 is not known. (3)

16. a) What is lanthanoid contraction? What are the consequences of lanthanoid contraction?
    b) Complete the following reactions:
       i) $MnO_4^- + C_2O_4^{2-} + H^+ \rightarrow$

       ii) $Cr_2O_7^{2-} + Fe^{2+} + H^+ \rightarrow$ (3)

17. a) What type of isomerism exhibited by the following complexes?
       i) $[Co(en)_3]^{3+}$

       ii) $[Co(NH_3)_6] [Cr(CN)_6]$

    b) Describe the type of hybridization, shape and magnetic property of $[Fe(H_2O)_6]^{2+}$
       At. No. Fe = 26 (3)

18. Illustrate the following reactions: (3)
    a) Wurts reaction
    b) Williamson's synthesis
    c) Reimer-Tiemann reaction

19. Give simple chemical tests to distinguish between following pairs of compounds (3)
    a) Phenol and cyclohexanol
    b) Benzaldehyde and acetophenone
    c) Ethylamine and aniline

20. How are the following conversions carried out? (3)
    a) Aniline to fluorobenzene
    b) Benzaldehyde to benzophenone
    c) Toluene to benzyl alcohol

21. a) Explain the mechanism of the following reactions:
       i) Addition of Grignard's reagent to the carbonyl group of a compound forming
          an adduct followed by hydrolysis.
       ii) Acid catalysed hydration of alkene forming an alcohol.
    b) The conversion of primary aromatic amines into diazonium salts is known as _____ (3)

22. a) Define the following related to proteins:
       i) peptide linkage   ii) denaturation
    b) Write the product obtained when D-glucose is treated with Br_2 water. (3)

23. After the ban on plastic bags, students of one school decided to make the people aware of the harmful effects of plastic bags on environment and Yamuna river. To make the awareness more impactful they organized a rally by joining hands with other schools and distributed paper bags to vegetable vendors, shopkeepers and departmental stores. All students pledged not to use polythene bags in future.
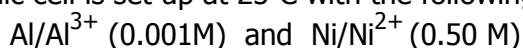   After reading the above passage, answer the following questions:
    i)   What values are shown by the students?
    ii)   What are biodegradable polymers? Give one example.
    iii)   Is polythene a condensation or addition polymer?   (4)

24. a)   What type of a battery is lead storage battery? Write the anode and cathode reactions and the overall cell reaction occurring in the operation of lead storage battery.
    b)   What is the quantity of charge required for the reduction of one mole of $Cr_2O_7^{2-}$ ions?
    c)   Calculate equilibrium constant for the reaction:
    $$Cd^{2+} + Zn \rightarrow Zn^{2+} + Cd$$
    $E^{\circ}_{Cd^{2+}/Cd} = -0.403$ V, $E^{\circ}_{Zn^{2+}/Zn} = -0.763$V
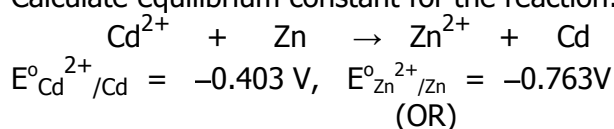
    (OR)
    a)   Define limiting molar conductivity. Why conductivity of an electrolyte solution decreases with the decrease in concentration?
    b)   Conductivity of 2.5×10^{-4} M methanoic acid is 5.25×10^{-5} S cm^{-1}. Calculate its molar conductivity and degree of dissociation.
    $\Lambda^{\circ}(H^+) = 349.5$ S cm^{2}mol^{-1} , $\Lambda^{\circ}(HCOO^-) = 50.5$ Scm^{2}mol^{-1}

    c)   A voltaic cell is set up at 25°C with the following half cells
          Al/Al^{3+} (0.001M) and Ni/Ni^{2+} (0.50 M)
    Write an equation for the reaction that occurs when the cell generates an electric current and determine the cell potential
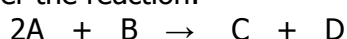 $E^{\circ}_{Ni^{2+}/Ni} = -0.25$ V, $E^{\circ}_{Al^{3+}/Al} = -1.66$ V.   (5)

25. a)   What do you understand by the order of a reaction? Identify the reaction order from each of the following units of reaction rate constant.
    i) L^{-1}mol S^{-1} ii)   Lmol^{-1}S^{-1}
    b)   A first order reaction takes 40 minutes for 30% decomposition. Calculate $t_{1/2}$ for this reaction.
    c)   For the reaction A→B the rate of reaction becomes twenty seven times when the concentration of A is increased three times. What is the order of the reaction?
    d)   The rate constant of a first order reaction increases from 2×10^{-2} to 4×10^{-2} when the temperature changes from 300K to 310K. Calculate energy of activation.
    $R = 8.314$ J K^{-1} mol^{-1}

    (OR)
    a)   Define the following terms:
    i)   Threshold energy   ii)   Elementary reaction
    b)   Explain the effect of catalyst on the rate of a chemical reaction
    c)   Consider the reaction:
          $$2A + B \rightarrow C + D$$
    Following results were obtained in experiments designed to study the rate of reaction

Experiment	[A]o	[B]o	Initial rate of reaction
1	0.30	0.30	0.096

| 2	0.60	0.30	0.384
3	0.30	0.60	0.192
4	0.60	0.60	0.768

    a)   Write the rate law of the reaction.

    b)   Calculate the value of rate constant for the reaction.   (5)
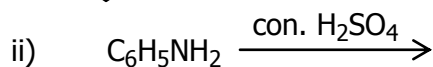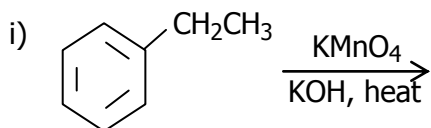
26.   a)   Account for the following:

          i)   The C-Cl bond length in chlorobenzene is shorter than that in CH_3-Cl.

          ii)   Phenols are more acidic than alcohols.

     b)   Arrange the following in the increasing order of property as indicated

        2-Bromo-2-methylbutane, 1-Bromopentane, 2-Bromopentane (Reactivity towards SN^2 displacement)

     c)   Write the structures of A, B and C in the following reactions:

$$C_6H_5COCl \xrightarrow[\text{Pd-BaSO}_4]{H_2} A \xrightarrow{\text{con.NaOH}} B + C$$

$$A \downarrow CH_3MgBr/H_3{}^+O$$

$$D$$
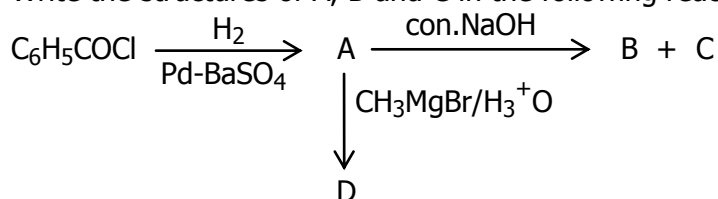
                           (OR)

     a)   An aromatic compound 'A' on treatment with aqueous ammonia and heating forms compound 'B' which on heating with Br_2 and KOH forms a compound 'C' of molecular formula C_6H_7N . Write the structures of A, B and C, and give chemical equations for the reactions involved.

     b)   Complete the following reactions:

          i)

          ii) $C_6H_5NH_2 \xrightarrow{\text{con. } H_2SO_4}$ (5)

                        -x-x-x-x-x-x-