Set 1

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 IUPAC name of the following compound.   (1)
              $CH_3 \, NH \, CH(CH_3)_2$

2.   Why is Butan -2-ol optically active?   (1)

3.   Of the two bromo derivatives $C_6H_5CH(CH_3)Br$ and $C_6H_5CH(C_6H_5)Br$ which one is more
        reactive towards SN^1 reaction and why?   (1)

4.   Name the method used for refining zirconium.   (1)

5.   Describe with an example the role of coordination compounds in biological systems.   (1)

6.   Give reason:
        i)   Silicon on doping with phosphorous forms n-type semiconductor.
        ii)   Ferrimagnetic substances show better magnetism than antiferromagnetic substances. (2)

7.   Derive the relationship between relative lowering of vapour pressure and mole fraction
        of the volatile liquid.
                                                  (OR)
        Define vapour pressure. Why does the addition of a non-volatile solute to a volatile solvent
        lowers its vapour pressure?   (2)

8.   Draw the structure of the following:
        i) H_3PO_2 ii) XeF_4 (2)

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

10.   Define the following:
        i)   Broad spectrum antibiotics   ii)   Anionic detergents   (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°C. What is vant Hoff factor for this electrolyte? The freezing point depression
                constant for water is 1.86°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)   Define peptization.
     b)   Name the two groups into which phenomenon of catalysis can be divided?
          Give an example of each group with the chemical equation involved.   (3)

14. a)   Name the method of refining to obtain low boiling metal like mercury.
     b)   Name the principal ore of aluminium.
     c)   What is the role of graphite in the extraction of aluminium?   (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:
     i)   Kolbe's reaction.
     ii)   Coupling reaction.
     iii) Hell –Volhard Zelinsky reaction.   (3)

19. How are the following conversions can be carried out?
     i)   Methylamine to ethylamine.
     ii)   Aniline to 1, 3, 5-tribromobenzene.
     iii) Ethanoic acid to propanoic acid.   (3)

20. Give simple chemical tests to distinguish between following pairs of compounds:
     i)   Propan-1-ol and 2-methyl propan -2-ol.
     ii)   Pentan -2-one and pentan-3-one.
     iii) Methylamine and dimethylamine.   (3)

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)   Write the name of the linkage joining two amino acids.
     b)   What happens when D-glucose is treated with HI?
     c)   Give points to differentiate between fibrous proteins and globular proteins.   (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 $cm^2 mol^{-1}$, $\Lambda^\circ(HCOO^-) = 50.5$ S$cm^2 mol^{-1}$
   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.
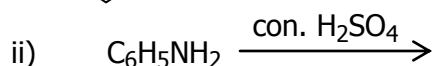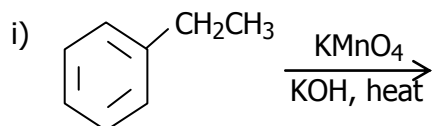b) Calculate the value of rate constant for the reaction. (5)

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:

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

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

$$D$$
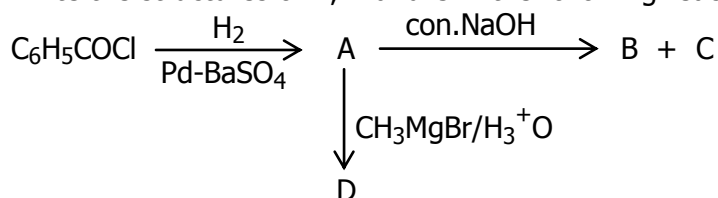
(OR)

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)

   $$\text{(ring)} \underset{\text{CH}_2\text{CH}_3}{} \xrightarrow[\text{KOH, heat}]{\text{KMnO}_4}$$

   ii) $C_6H_5NH_2 \xrightarrow{\text{con. H}_2\text{SO}_4}$ (5)

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