BOARD QUESTION PAPER : MARCH 2016
CHEMISTRY

Time: 3 Hours	Total Marks: 70

Note:
i.   All questions are compulsory.
ii.   Answers to the two sections are to be written in the same answer book.
iii.   Figures to the right hand side indicate full marks.
iv.   Write balanced chemical equations and draw neat and labelled diagrams, wherever necessary.
v.   Use of logarithmic table is allowed.
vi.   Answer to every question must be started on a new page.

SECTION – I

Q.1. Answer any SIX of the following: [12]
  i.   What is ferromagnetism? Iron (Z = 26) is strongly ferromagnetic. Explain.
  ii.   Define boiling point. Write the formula to determine molar mass of a solute using freezing point depression method.
  iii.   Write mathematical equations of first law of thermodynamics for the following processes:
      a.   Adiabatic process
      b.   Isochoric process
  iv.   Explain graphical method to determine activation energy of a reaction.
  v.   Write the names and chemical formulae of any one of iron and zinc each.
  vi.   What is the action of
      a.   Sodium on arsenic?
      b.   Magnesium on bismuth?
  vii.   Define enthalpy of sublimation. How is it related to enthalpy of fusion and enthalpy of vaporization?
  viii. What are Ellingham diagrams? Write any two features of it.

Q.2. Answer any THREE of the following: [9]
  i.   Silver crystallises in fcc structure. If density of silver is 10.51 g cm^{-3}, calculate the volume of unit cell.
         [Atomic mass of silver (Ag) = 108 g mol^{-1}]
  ii.   The vapour pressure of pure benzene is 640 mm of Hg. 2.175×10^{-3} kg of non-volatile solute is added to 39 g of benzene, the vapour pressure of solution is 600 mm of Hg. Calculate molar mass of solute (C = 12, H = 1).
  iii.   Calculate C–Cl bond enthalpy from the following reaction:
         $CH_3Cl_{(g)} + Cl_{2(g)} \longrightarrow CH_2Cl_{2(g)} + HCl_{(g)}$; $\Delta H° = - 104$ kJ
         If C–H, Cl–Cl and H–Cl bond enthalpies are 414, 243 and 431 kJ mol^{-1} respectively.
  iv.   Define cell constant. Draw a neat and well labelled diagram of primary reference electrode.

Q.3. Answer any ONE of the following: [7]
  i.   Write four points of differences between properties of nitrogen and other elements of group 15.
         Explain the structure of ClF_3.
         Conductivity of a solution is 6.23×10^{-5} $\Omega^{-1}cm^{-1}$ and its resistance is 13710 Ω. If the electrodes are 0.7 cm apart, calculate the cross-sectional area of the electrode.
         Why is molality of a solution independent of the temperature?

ii. What are neutral oxides? Explain the nature of zinc oxide with the help of the reactions.

Define 'molar conductivity' and 'zero order reaction'.

In a first order reaction x → y, 40% of the given sample of compound remains unreacted in 45 minutes. Calculate rate constant of the reaction.

Q.4. **Select and write the most appropriate answer from the given alternatives for each sub-question:** [7]

i. The molecular formula $H_2S_2O_2$ represents which oxoacid among the following?
   (A) Hydrosulphurous acid   (B) Thiosulphurous acid
   (C) Sulphuric acid   (D) Pyrosulphurous acid

ii. Iodine exists as _____.
   (A) polar molecular solid   (B) ionic solid
   (C) non-polar molecular solid   (D) hydrogen bonded molecular solid

iii. Absolute entropies of solids, liquids and gases can be determined by _____.
   (A) measuring heat capacity of substance at various temperatures
   (B) subtracting standard entropy of reactants from products
   (C) measuring vibrational motion of molecules
   (D) using formula $\Delta S° = S_T° - S_0°$

iv. The determination of molar mass from elevation in boiling point is called as _____.
   (A) cryoscopy   (B) colorimetry
   (C) ebullioscopy   (D) spectroscopy

v. The process of leaching alumina, using sodium carbonate is called _____.
   (A) Baeyer's process   (B) decomposition
   (C) cyanide process   (D) Hall's process

vi. On calculating the strength of current in amperes if a charge of 840 C (coulomb) passes through an electrolyte in 7 minutes, it will be _____.
   (A) 1   (B) 2
   (C) 3   (D) 4

vii. A → B is a first order reaction with rate 6.6×10^{-5} M s^{-1}. When [A] is 0.6 M, rate constant of the reaction is _____.
   (A) 1.1×10^{-5} s^{-1} (B) 1.1×10^{-4} s^{-1}
   (C) 9×10^{-5} s^{-1} (D) 9×10^{-4} s^{-1}

SECTION – II

Q.5. **Answer any SIX of the following:** [12]
i. Why is Sc^{3+} colourless while Ti^{3+} coloured? (Atomic number Sc = 21, Ti = 22)
ii. Illustrate with example, the difference between a double salt and a coordination compound.
iii. How is chlorobenzene prepared from aniline? How is chlorobenzene converted into diphenyl?
iv. What is metamerism? Explain metamerism with suitable examples of ethers.
v. What are ketones? How are ketones classified?
vi. How are
   a. 1-nitropropane   and   b. 2-nitropropane
   prepared from suitable oxime?
vii. Define antioxidants. Draw structure of BHT.
viii. What are carbohydrates? Write the reaction for the preparation of nylon-6.

Q.6. Answer any THREE of the following: [9]
   i.   What are f-block elements? Distinguish between lanthanoids and actinoids.
   ii.   Explain the terms
        a.   Optical activity
        b.   Ligand
        c.   Interstitial compounds
   iii.   Write the formula of Tetraamminedichloroplatinum(IV) chloride. How is propene converted into 1-bromopropane and 2-bromopropane?
   iv.   What are broad-spectrum antibiotics?
         How are polythene and neoprene prepared?

Q.7. Answer any ONE of the following: [7]
   i.   Explain the mechanism of esterification. Write the reactions involved in dehydration of 1°, 2° and 3° alcohols.
   ii.   What are vitamins? Name any two diseases caused by deficiency of vitamin A. Write the structures of:
        a.   nucleoside   b.   nucleotide
         How are 1-nitropropane, 2-nitropropane and 2-methyl-2-nitropropane are distinguished from each other using nitrous acid?

Q.8. Select and write the most appropriate answers from the given alternatives: [7]
   i.   The preparation of alkyl fluoride from alkyl chloride, in presence of metallic fluorides is known as _____.
        (A)   Williamson's reaction   (B)   Finkelstein reaction
        (C)   Swarts reaction   (D)   Wurtz reaction

   ii.   Identify the weakest acidic compound amongst the following:
        (A)   p-Nitrophenol   (B)   p-Chlorophenol
        (C)   p-Cresol   (D)   p-Aminophenol

   iii.   On acid hydrolysis, propanenitrile gives _____.
        (A)   propanal   (B)   acetic acid
        (C)   propionamide   (D)   propanoic acid

   iv.   Which of the following amines yield foul smelling product with haloform and alcoholic KOH?
        (A)   Ethylamine   (B)   Diethylamine
        (C)   Triethylamine   (D)   Ethylmethylamine

   v.   Which of the following is NOT present in DNA?
        (A)   Adenine   (B)   Guanine
        (C)   Thymine   (D)   Uracil

   vi.   Amongst the following, identify a copolymer.
        (A)   Orlon   (B)   PVC
        (C)   PHBV   (D)   Teflon

   vii.   Phenelzine is used as an _____.
        (A)   analgesic   (B)   antiseptic
        (C)   antipyretic   (D)   antidepressant