Board Question Paper: October 2014
Chemistry

Time: 3 Hours
Total Marks: 70

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

SECTION – I

Q.1. Select and write the most appropriate answer from the given alternatives for each sub-question: [7]
i. The Arrhenius equation is _______.
   (A) \( K = Ae^{\frac{RT}{E_a}} \)          (B) \( A = Ke^{\frac{-E_a}{RT}} \)
   (C) \( K = Ae^{\frac{-RT}{E_a}} \)          (D) \( A = K\cdot e^{\frac{E_a}{RT}} \)

ii. If the enthalpy of vaporisation of water at 100 °C is 186.5 J mol\(^{-1}\), the entropy of vaporization will be _______.
   (A) 4.0 J K\(^{-1}\) mol\(^{-1}\)          (B) 3.0 J K\(^{-1}\) mol\(^{-1}\)
   (C) 1.5 J K\(^{-1}\) mol\(^{-1}\)          (D) 0.5 J K\(^{-1}\) mol\(^{-1}\)

iii. The atomicity of sulphur in orthorhombic sulphur is _______.
   (A) 8          (B) 6
   (C) 4          (D) 2

iv. The major binding force in diamond is _______.
   (A) covalent bond          (B) ionic bond
   (C) metallic bond          (D) co-ordinate covalent bond

v. The boiling point of water at high altitude is low, because _______.
   (A) the temperature is low
   (B) the atmospheric pressure is low
   (C) the temperature is high
   (D) the atmospheric pressure is high

vi. The molar conductivity of cation and anion of salt BA are 180 and 220 mhos respectively. The molar conductivity of salt BA at infinite dilution is _______.
   (A) 90 mhos cm\(^2\) mol\(^{-1}\)          (B) 110 mhos cm\(^2\) mol\(^{-1}\)
   (C) 200 mhos cm\(^2\) mol\(^{-1}\)          (D) 400 mhos cm\(^2\) mol\(^{-1}\)

vii. What is the process in which concentrated ore is reduced to the corresponding metal by heating at high temperature with a reducing agent?
   (A) Polling          (B) Pyrometallurgy
   (C) Hydrometallurgy          (D) Calcination
Q.2. Answer any THREE of the following:

i. Describe anomalous behaviour of oxygen as compared with other elements of group 16 with reference to:
   a. magnetic property
   b. oxidation state
   c. hydrides

ii. What is the value of $\Delta S_{\text{surr.}}$ for the following reaction at 298 K?

\[
6\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}(\text{l}) \rightarrow \text{C}_6\text{H}_{12}\text{O}_6(\text{s}) + 6\text{O}_2(\text{g})
\]

Given that: $\Delta G^\circ = 2879 \text{ kJ mol}^{-1}$
\[\Delta S = -210 \text{ J K}^{-1} \text{ mol}^{-1}\]

iii. Sucrose decomposes in acid solution to give glucose and fructose according to the first order rate law. The half life of the reaction is 3 hours. Calculate fraction of sucrose which will remain after 8 hours.

iv. A solution containing 0.73 g of camphor (molar mass 152 g mol$^{-1}$) in 36.8 g of acetone (boiling point 56.3 °C) boils at 56.55 °C. A solution of 0.564 g of unknown compound in the same weight of acetone boils at 56.46 °C. Calculate the molar mass of the unknown compound.

Q.3. Answer any SIX of the following:

i. Describe triclinic crystal lattice with the help of a diagram.

ii. Write any four applications of electrochemical series.

iii. State and explain Hess’s law of constant heat summation.

iv. Distinguish between:
   Order and Molecularity of reaction.

v. With the help of the equation $\Delta G^\circ = -nFE^\circ_{\text{cell}}$ explain that cell potential is an intensive property.

vi. Describe the laboratory method of preparation of ammonia.

vii. Define van’t Hoff factor. How is it related to the degree of dissociation?

viii. Write chemical formulae of the following ores:
   a. Calamine
   b. Haematite
   c. Magnetite
   d. Corundum

Q.4. Answer any ONE of the following:

i. Write the reactions involved in extraction of silver from its ore by leaching process.

Derive the equation: $W = -P_{\text{ext}} \Delta V$

A unit cell of iron crystal has edge length 288 pm and density 7.86 g cm$^{-3}$. Find the number of atoms per unit cell and type of the crystal lattice.

Given: Molar mass of iron = 56 g mol$^{-1}$
\[\text{Avogadro’s number } N_A = 6.022 \times 10^{23}\]

ii. Define: Cryoscopic constant.

What is the action of hot/concentrated nitric acid on:
   a. Arsenic
   b. Antimony
Draw the structure of:

a. Orthophosphoric acid
b. Pyrophosphoric acid

How much electricity in terms of Faraday is required to produce:

a. 20 g of Ca from molten CaCl$_2$

b. 40 g of Al from molten Al$_2$O$_3$

(Given: Molar mass of calcium and aluminium are 40 g mol$^{-1}$ and 27 g mol$^{-1}$ respectively.)

SECTION – II

Q.5. Select and write the most appropriate answers from the given alternatives for each sub-question: [7]

i. Which of the following is a trihydric alcohol?
   (A) n-Propyl alcohol
   (B) Glycerol
   (C) Glycol
   (D) Glycine

ii. Alkyl halides are _______.
    (A) monohalogen derivatives of alkanes
    (B) dihalogen derivatives of alkanes
    (C) trihalogen derivatives of alkanes
    (D) tetrahalogen derivatives of alkanes

iii. Mohr’s salt is _______.
     (A) ferrous ammonium sulphate  (B) ferrous sulphate
     (C) ammonium sulphate          (D) ferric sulphate

iv. Which of the following is polyamide?
    (A) Teflon                        (B) Nylon-6,6
    (C) Terylene                     (D) Bakelite

v. Vitamin ‘C’ belongs to the class of _______.
   (A) vitamins of aliphatic series
   (B) vitamins of alicyclic series
   (C) vitamins of aromatic series
   (D) vitamins of heterocyclic series

vi. What is the IUPAC name of
    
    (A) $\alpha$-Aminobutanoic acid
    (B) 2-Aminobutyric acid
    (C) $\alpha$-Aminobutyric acid
    (D) 2-Aminobutanoic acid

vii. Which among the following molecular formulae represents urotropine?
    (A) $C_6H_{12}N_4$
    (B) $C_6H_{24}N_4$
    (C) $C_6H_{12}N_4O_2$
    (D) $C_6H_{24}N_4O_2$
Q.6. Answer any THREE of the following: [9]
   i. Write the structures of:
      a. 3-Chloro-3-ethylhex-1-ene  b. 1-Iodo-2,3-dimethylbutane
      c. 1,3,5-Tribromobenzene
   ii. What is the action of acidified potassium dichromate on:
       a. SO₂  b. KI
       Draw structure of dichromate ion.
   iii. Describe laboratory method for preparation of glucose.
       Write the reaction that indicates the presence of –CHO group in glucose.
   iv. What will be the action of the mixture of sodium nitrite and dilute hydrochloric acid on:
       a. ethylamine  b. aniline
       c. triethylamine

Q.7. Answer any SIX of the following: [12]
   i. What are chemical twins? Write ‘two’ examples.
   ii. Explain the terms:
       a. Antiseptics  b. Analgesics
   iii. Draw the simple Fischer projection formulae of:
       D – (+) – glucose and D – (–) – fructose.
   iv. Classify the following ligands into monodentate and polydentate:
       a. Ammonia  b. Carbon monoxide
       c. Ethylene diamine  d. Ethylene diamine tetra acetate ion
   v. State and explain Markownikoff’s rule with suitable example.
   vi. How are propan-1-amine and propan-2-amine prepared from oxime?
   vii. Identify ‘A’ and ‘B’ in the following reaction:
        \[ \text{C}_6\text{H}_5\text{MgBr} + \text{CO}_2 \overset{\text{Dry ether}}{\rightarrow} \text{‘A’} \overset{\text{PCl}_5}{\rightarrow} \text{‘B’} \]
   viii. What is the action of the following reagents on phenol:
        a. Bromine in CS₂ at low temperature
        b. Conc. H₂SO₄ at room temperature

Q.8. Answer any ONE of the following: [7]
   i. Write the structure and IUPAC names of all the metamers represented by formula C₄H₁₀O.
      Write balanced chemical equations for action of ammonia on:
      a. formaldehyde  b. acetaldehyde  c. acetone
   ii. Write four characteristics of co-ordinate complex ion.
      How is Nylon-6,6 prepared?
      Write any ‘two’ uses of terylene.
      Write four physical methods of preserving food materials.