BOARD QUESTION PAPER : OCTOBER 2015
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. **Select and write the most appropriate answer from the given alternatives for each sub-question:**   **[7]**

i.   The hybridisation of phosphorus in phosphorus pentachloride is _____.
       (A) dsp^3 (B) sp^3d
       (C) d^2sp^3 (D) sp^3d^2

ii.   The rate constant for a first order reaction is $100\ s^{-1}$. The time required for completion of 50% of reaction is _____.
       (A) 0.0693 milliseconds   (B) 0.693 milliseconds
       (C) 6.93 milliseconds   (D) 69.3 milliseconds

iii.   Silica is added to roasted copper ore during smelting process to remove _____.
       (A) ferrous sulphide   (B) ferrous oxide
       (C) cuprous sulphide   (D) cuprous oxide

iv.   96500 coulombs correspond to the charge on how many electrons?
       (A) 1.6×10^{19} (B) 6.022×10^{20}
       (C) 6.022×10^{23} (D) 6.022×10^{24}

v.   For the reaction: $Cl_{2(g)} \longrightarrow 2Cl_{(g)}$, _____.
       (A) ΔH is positive, ΔS is positive   (B) ΔH is positive, ΔS is negative
       (C) ΔH is negative, ΔS is negative   (D) ΔH is negative, ΔS is positive

vi.   The substance 'X', when dissolved in solvent water gave molar mass corresponding to the molecular formula 'X_3'. The van't Hoff factor (i) is _____.
       (A) 3   (B) 0.33
       (C) 1.3   (D) 1

vii.   The relation $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma \neq 90°$ represents which crystal system?
       (A) Orthorhombic   (B) Tetragonal
       (C) Triclinic   (D) Monoclinic

Q.2. **Answer any SIX of the following:**   **[12]**
i.   Define ebullioscopic constant. Write its unit.
ii.   State:
       a.   Second law of thermodynamics in terms of entropy.
       b.   Third law of thermodynamics.
iii.   What is the hybridisation of carbon atom in diamond and graphite?
       0.1 mole of Buckminster fullerene contains how many kg of carbon?
       [Atomic mass of carbon = 12]

iv. Draw structures of:
   a. Chlorine trifluoride   b. Chlorine pentafluoride
v. Derive an expression for maximum work in isothermal reversible expansion of two moles of an ideal gas.
vi. Can copper sulphate solution be stored in an iron vessel? Explain.
vii. Define:
   a. Average rate of reaction.   b. Instantaneous rate of reaction.
viii. Define:
   a. Hydrometallurgy   b. Electrometallurgy

Q.3. Answer any THREE of the following: **[9]**
   i. What is the action of dioxygen on:
      a. Calcium   b. Iron   c. Carbon disulphide?
   ii. A solution of glucose in water is labelled as 10% (W/W).
      Calculate:
      a. Molality
      b. Molarity of the solution.
      [Given: Density of solution is 1.20 g mL^{-1} and molar mass of glucose is 180 g mol^{-1}]
   iii. Resistance of conductivity cell filled with 0.1 M KCl solution is 100 ohms. If the resistance of the same cell when filled with 0.02 M KCl solution is 520 ohms, calculate the conductivity and molar conductivity of 0.02 M KCl solution. [Given: Conductivity of 0.1 M KCl solution is 1.29 S m^{-1}.]
   iv. Ammonia and oxygen react at high temperature as:
      $4NH_{3(g)} + 5O_{2(g)} \longrightarrow 4NO_{(g)} + 6H_2O_{(g)}$
      In an experiment, rate of formation of $NO_{(g)}$ is 3.6×10^{-3} mol L^{-1} s^{-1}.
      Calculate:
      a. Rate of disappearance of ammonia.
      b. Rate of formation of water.

Q.4. Answer any ONE of the following: **[7]**
   i. What is the effect of temperature on solubility of a gas in a liquid?
      Explain refining of nickel by Mond process.
      State Kohlrausch's law of independent migration of ions.
      Silver crystallises in F.C.C. (face-centred cubic crystal) structure. The edge length of the unit cell is found to be 408.7 pm. Calculate density of the unit cell.
      [Given: Molar mass of silver is 108 g mol^{-1}]

   ii. Write 'four' uses of hydrochloric acid.
      Write chemical formula of the following oxoacids of chlorine:
      a. Hypochlorous acid   b. Chlorous acid
      c. Chloric acid   d. Perchloric acid
      The equilibrium constant K$_p$ for the reaction,
      $H_{2(g)} + I_{2(g)}$ $2HI_{(g)}$ is 130 at 510 K.
      Calculate $\Delta G°$ for the following reaction at the same temperature:
      $2HI_{(g)}$ $H_{2(g)} + I_{2(g)}$
      [Given: R = 8.314 J K^{-1} mol^{-1}]

SECTION – II

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

i. Which among the following reducing agents is NOT used to reduce acetaldehyde to ethyl alcohol?
    (A) Na-Hg and water
    (B) Zn-Hg and conc. HCl
    (C) H_2-Raney Ni
    (D) $LiAlH_4/H^+$

ii. Acetaldehyde, when treated with which among the following reagents does NOT undergo addition reaction?
    (A) Ammonia
    (B) Hydroxylamine
    (C) Ammoniacal silver nitrate
    (D) Semicarbazide

iii. What is natural rubber?
    (A) Cis-1,4-polyisoprene
    (B) Neoprene
    (C) Trans-1,4-polyisoprene
    (D) Butyl rubber

iv. What is salvarsan?
    (A) An antiseptic
    (B) An antibiotic
    (C) An antifertility drug
    (D) An analgesic

v. Which among the following vitamins is also known as riboflavin?
    (A) B_1
    (B) B_2
    (C) B_6
    (D) B_{12}

vi. The amine which reacts with nitrous acid to give yellow oily compound is _____.
    (A) ethylamine
    (B) isopropylamine
    (C) secondary butylamine
    (D) dimethylamine

vii. What is the molecular formula of chromyl chloride?
    (A) CrO_2Cl_2
    (B) $CrOCl_2$
    (C) $CrCl_3$
    (D) Cr_2OCl_2

Q.6. Answer any SIX of the following: **[12]**

i. Identify 'A' and 'B' in the following reaction :
$$CH_3 - CH = CH_2 \xrightarrow{\text{HBr}} \text{'A'} \xrightarrow{\text{alc.KOH}} \text{'B'}$$

ii. Distinguish between lanthanoids and actinoids.

iii. How are the following compounds prepared?
    a. Benzyl alcohol from benzyl chloride.
    b. Propan-1-ol from propanal

iv. What is the action of acetic anhydride on:
    a. ethylamine?
    b. diethylamine?

v. What are monosaccharides? Draw ring structure of α-D-(+)-glucopyranose.

vi. Explain the following terms:
    a. Cationic detergents
    b. Tranquilizers

vii. What is Stephen reaction?

viii. Explain Sidgwick's electronic theory with suitable example.

Q.7. Answer any THREE of the following: [9]

    i.   What is the action of nitrous acid on:

          a.   primary nitroalkane?

          b.   secondary nitroalkane?

          c.   tertiary nitroalkane?

    ii.   What is peptide linkage? How is tripeptide formed?

    iii.   Write the reactions involved in the preparation of:

          a.   Teflon   b.   Orlon   c.   PVC

    iv.   What is the position of iron ($Z = 26$) in periodic table? Explain why is Fe^{3+} more stable than Fe^{2+}?

Q.8. Answer any ONE of the following: [7]

    i.   Discuss the mechanism of alkaline hydrolysis of bromomethane.

        How is carbolic acid prepared from chlorobenzene?

        What is the action of bromine water on carbolic acid?

        Write chemical test to distinguish between carbolic acid and alcohol.

    ii.   Explain cationic complexes and anionic complexes of coordination compounds.

        Write the structure and IUPAC names of isomeric aldehydes having molecular formula $C_5H_{10}O$.

        Draw the structure of aspirin.