

Board Question Paper: October 2014

Chemistry

Time: 3 Hours

Total Marks: 70

Note:

- All questions are compulsory.
- Answers to both sections should be written in the same answer book.
- Figure to the right hand side indicate full marks.
- Draw neat, labelled diagrams and write balanced equations wherever necessary.
- Use of logarithmic table is allowed.
- 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]

- The Arrhenius equation is _____.
(A) $K = Ae^{\frac{RT}{E_a}}$ (B) $A = Ke^{\frac{-E_a}{RT}}$
(C) $K = A \cdot e^{\frac{-RT}{E_a}}$ (D) $A = K \cdot e^{\frac{E_a}{RT}}$
- 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
- The atomicity of sulphur in orthorhombic sulphur is _____.
(A) 8 (B) 6
(C) 4 (D) 2
- The major binding force in diamond is _____.
(A) covalent bond (B) ionic bond
(C) metallic bond (D) co-ordinate covalent bond
- 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
- 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 cm² mol⁻¹ (B) 110 mhos cm² mol⁻¹
(C) 200 mhos cm² mol⁻¹ (D) 400 mhos cm² mol⁻¹
- 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:

[9]

- 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?
$$6\text{CO}_{2(g)} + 6\text{H}_2\text{O}_{(l)} \longrightarrow \text{C}_6\text{H}_{12}\text{O}_{6(s)} + 6\text{O}_{2(g)}$$
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:

[12]

- 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 $\Delta G^\circ = -nFE_{\text{cell}}^\circ$ 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:

[7]

- i. Write the reactions involved in extraction of silver from its ore by leaching process.
Derive the equation : $W = -P_{\text{ext}} \cdot \Delta V$
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}
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:

- Orthophosphoric acid
- Pyrophosphoric acid

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

- 20 g of Ca from molten CaCl_2
- 40 g of Al from molten Al_2O_3

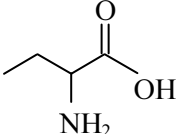
(Given : Molar mass of calcium and aluminium are 40 g mol^{-1} and 27 g mol^{-1} respectively.)

SECTION – II

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

[7]

- Which of the following is a trihydric alcohol?
(A) n-Propyl alcohol
(B) Glycerol
(C) Glycol
(D) Glycine
- Alkyl halides are _____.
(A) monohalogen derivatives of alkanes
(B) dihalogen derivatives of alkanes
(C) trihalogen derivatives of alkanes
(D) tetrahalogen derivatives of alkanes
- Mohr's salt is _____.
(A) ferrous ammonium sulphate
(B) ferrous sulphate
(C) ammonium sulphate
(D) ferric sulphate
- Which of the following is polyamide?
(A) Teflon
(B) Nylon-6,6
(C) Terylene
(D) Bakelite
- 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 

- α -Aminobutanoic acid
 - 2-Aminobutyric acid
 - α -Aminobutyric acid
 - 2-Aminobutanoic acid
- vii. Which among the following molecular formulae represents urotropine?
- $\text{C}_6\text{H}_{12}\text{N}_4$
 - $\text{C}_6\text{H}_{24}\text{H}_4$
 - $\text{C}_6\text{H}_{12}\text{N}_4\text{O}_2$
 - $\text{C}_6\text{H}_{24}\text{N}_4\text{O}_2$

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. SO_2
 - b. KIDraw structure of dichromate ion.
- iii. Describe laboratory method for preparation of glucose.
Write the reaction that indicates the presence of $-\text{CHO}$ 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:
$$\text{C}_6\text{H}_5\text{MgBr} + \text{CO}_2 \xrightarrow[\text{H}^+/\text{H}_2\text{O}]{\text{Dry ether}} \text{'A'} \xrightarrow{\text{PCl}_5} \text{'B'}$$
- viii. What is the action of the following reagents on phenol:
 - a. Bromine in CS_2 at low temperature
 - b. Conc. H_2SO_4 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 $\text{C}_4\text{H}_{10}\text{O}$.
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.