

BOARD QUESTION PAPER : MARCH 2018

Note:

- All questions are compulsory.
- Answers of both the sections should be written in same answer book.
- Draw well labelled diagrams and write balanced equations wherever necessary.
- Figures to the right indicate full marks.
- Use of logarithmic table is allowed.
- 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 process in which the value of $\Delta U = 0$ is _____.
(A) adiabatic (B) isothermal
(C) isobaric (D) isochoric
- An ionic crystal lattice has $\frac{r^+}{r^-}$ radius ratio of 0.320, its coordination number is _____.
(A) 3 (B) 4
(C) 6 (D) 8
- In hydrogen-oxygen fuel cell, the carbon rods are immersed in hot aqueous solution of _____.
(A) KCl (B) KOH
(C) H_2SO_4 (D) NH_4Cl
- The chemical formula of willemite is _____.
(A) ZnS (B) ZnCO_3
(C) ZnO (D) Zn_2SiO_4
- The oxidation state of nitrogen in dinitrogen trioxide is _____.
(A) +1 (B) +2
(C) +3 (D) +4
- Which of the following 0.1 M aqueous solutions will exert highest osmotic pressure?
(A) $\text{Al}_2(\text{SO}_4)_3$ (B) Na_2SO_4
(C) MgCl_2 (D) KCl
- The half-life period of zero order reaction $\text{A} \rightarrow \text{product}$ is given by _____.
(A) $\frac{[\text{A}]_0}{k}$ (B) $\frac{0.693}{k}$
(C) $\frac{[\text{A}]_0}{2k}$ (D) $\frac{2[\text{A}]_0}{k}$

Q.2. Answer any SIX of the following:

[12]

- Derive the relation between elevation of boiling point and molar mass of solute.
- State third law of thermodynamics. Give 'two' uses.
- Draw a neat and labelled diagram of lead storage battery.
- Ionic solids are hard and brittle. Explain.

- v. A certain reaction occurs in the following steps:
- $\text{Cl}_{(g)} + \text{O}_{3(g)} \rightarrow \text{ClO}_{(g)} + \text{O}_{2(g)}$
 - $\text{ClO}_{(g)} + \text{O}_{(g)} \rightarrow \text{Cl}_{(g)} + \text{O}_{2(g)}$
 - What is the molecularity of each of the elementary steps?
 - Identify the reaction intermediate and write the chemical equation for overall reaction.
- vi. Define: a. Semipermeable membrane
b. Reference electrode
- vii. What is the action of chlorine on: a. CS_2
b. Excess NH_3
- viii. Write the chemical equations involved in van Arkel method for refining zirconium metal.

Q.3. Answer any THREE of the following:

[9]

- Write balanced chemical equations for the following:
 - Phosphorus reacts with magnesium.
 - Flowers of sulphur boiled with calcium hydroxide.
 - Action of ozone on hydrogen peroxide.
- The density of iron crystal is $8.54 \text{ gram cm}^{-3}$. If the edge length of unit cell is 2.8 \AA and atomic mass is 56 gram mol^{-1} , find the number of atoms in the unit cell.
(Given: Avogadro's number = 6.022×10^{23} , $1 \text{ \AA} = 1 \times 10^{-8} \text{ cm}$)
- How many faradays of electricity are required to produce 13 gram of aluminium from aluminium chloride solution?
(Given: Molar mass of Al = $27.0 \text{ gram mol}^{-1}$)
- Calculate the internal energy at 298 K for the formation of one mole of ammonia, if the enthalpy change at constant pressure is $-42.0 \text{ kJ mol}^{-1}$.
(Given : $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

Q.4. Answer any ONE of the following:

[7]

- Define:
 - Enthalpy of atomization
 - Enthalpy of vaporization
- Draw the structure of IF_7 . Write its geometry and the type of hybridization.
- State Henry's law.
 - 22.22 gram of urea was dissolved in 300 grams of water. Calculate the number of moles of urea and molality of the urea solution.
(Given: Molar mass of urea = 60 gram mol^{-1})

OR

- What is the action of carbon on the following metal oxides:
 - Fe_2O_3 in blast furnace
 - ZnO in vertical retort furnace
- Write the molecular and structural formulae of:
 - Thiosulphuric acid
 - Dithionous acid
- The reaction $\text{A} + \text{B} \rightarrow \text{products}$ is first order in each of the reactants.
 - How does the rate of reaction change if the concentration of A is increased by factor 3?
 - What is the change in the rate of reaction if the concentration of A is halved and concentration of B is doubled?

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SECTION – II

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

[7]

- i. A polymer used in paints is _____.
(A) nomex (B) thiokol
(C) saran (D) glyptal
- ii. The number of primary and secondary hydroxyl groups in ribose are _____ respectively.
(A) 1, 3 (B) 2, 3
(C) 3, 1 (D) 3, 2
- iii. The ligand diethylenetriamine is _____.
(A) monodentate (B) bidentate
(C) tridentate (D) tetradentate
- iv. Propene on oxidation with diborane in presence of alkaline hydrogen peroxide gives _____.
(A) propan-1-ol (B) propan-2-ol
(C) allyl alcohol (D) propan-1,2-diol
- v. Baeyer's reagent is _____.
(A) acidified potassium dichromate
(B) alkaline potassium dichromate
(C) alkaline potassium permanganate
(D) acidified potassium permanganate
- vi. Identify 'A' in the following reaction:
$$A + 2Na \xrightarrow[\text{ether}]{\text{Dry}} 2,2,5,5\text{-Tetramethylhexane} + 2NaBr$$

(A) 2-Bromo-2-methylbutane
(B) 1-Bromo-2,2-dimethylpropane
(C) 1-Bromo-3-methylbutane
(D) 1-Bromo-2-methylpropane
- vii. An antifertility drug is _____.
(A) novestrol (B) histamine
(C) veronal (D) equanil

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

- i. Write balanced chemical equations for the conversion of CrO_4^{2-} to $\text{Cr}_2\text{O}_7^{2-}$ in acidic medium and $\text{Cr}_2\text{O}_7^{2-}$ to CrO_4^{2-} in basic medium.
- ii. Explain the geometry of $[\text{Co}(\text{NH}_3)_6]^{3+}$ on the basis of hybridisation. (Z of Co = 27)
- iii. Why ethanol has higher boiling point than ethane?
- iv. Write only reactions for the preparation of benzophenone from benzonitrile.
- v. What is the action of p-toluenesulphonylchloride on ethylamine and diethylamine?
- vi. What are amino acids? Write the correct reaction for formation of peptide bond between amino acids.
- vii. Define:
 - a. Antiseptics
 - b. Antioxidants
- viii. Explain only reaction mechanism for alkaline hydrolysis of tert-butylbromide.

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

- i. Complete and rewrite the balanced chemical equations:
 - a. Chlorobenzene $\xrightarrow[473\text{K, pressure}]{\text{NaCN} + \text{CuCN}}$?
 - b. Isobutyraldehyde $\xrightarrow{50\% \text{KOH}}$?
 - c. Butanone + 2,4-dinitrophenyl hydrazine $\xrightarrow{\text{H}^+}$?
- ii. Prepare carboic acid from benzene sulphonic acid.
Write a chemical equation for the action of neutral ferric chloride on phenol.
- iii. Explain the preparation and uses of nylon-2-nylon-6.
- iv. How glucose is prepared from cane sugar?
Write the formula of the complex: copper (II) hexacyanoferrate (II).

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

- i. What is lanthanide contraction?
- ii. Explain the cause of lanthanide contraction.
- iii. Draw the structures of chloroxylenol and adenine.
- iv. How are ethylamine and ethylmethanamine distinguished by using nitrous acid?

OR

- i. What is the action of the following reagents on ethanoic acid?
 - a. $\text{LiAlH}_4 / \text{H}_3\text{O}^+$
 - b. PCl_3 , heat
 - c. P_2O_5 , heat
- ii. Identify 'A' and 'B' in the following reaction and rewrite the complete reaction:
 $\text{CH}_3 - \text{CH}_2 - \text{Br} + \text{AgCN} \xrightarrow{\Delta} \text{A} \xrightarrow{\text{Na/C}_2\text{H}_5\text{OH}} \text{B}$
- iii. Explain Hoffmann bromamide degradation reaction.