BOARD QUESTION PAPER : MARCH 2018

Note:

i. All questions are compulsory.
ii. Answers of both the sections should be written in same answer book.
iii. Draw well labelled diagrams and write balanced equations wherever necessary.
iv. Figures to the right indicate full marks.
v. Use of logarithmic table is allowed.
vi. 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 process in which the value of $\Delta U = 0$ is _____.
(A) adiabatic (B) isothermal
(C) isobaric (D) isochoric

ii. 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

iii. 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

iv. The chemical formula of willemite is _____.
(A) ZnS (B) $ZnCO_3$
(C) ZnO (D) Zn_2SiO_4

v. The oxidation state of nitrogen in dinitrogen trioxide is _____.
(A) +1 (B) +2
(C) +3 (D) +4

vi. Which of the following 0.1 M aqueous solutions will exert highest osmotic pressure?
(A) $Al_2(SO_4)_3$ (B) Na_2SO_4
(C) $MgCl_2$ (D) KCl

vii. The half-life period of zero order reaction A $\rightarrow$ product is given by _____.
(A) $\frac{[A]_0}{k}$ (B) $\frac{0.693}{k}$
(C) $\frac{[A]_0}{2k}$ (D) $\frac{2[A]_0}{k}$

Q.2. Answer any SIX of the following: **[12]**

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

v. A certain reaction occurs in the following steps:
   a. $Cl_{(g)} + O_{3(g)} \rightarrow ClO_{(g)} + O_{2(g)}$
   b. $ClO_{(g)} + O_{(g)} \rightarrow Cl_{(g)} + O_{2(g)}$
   1. What is the molecularity of each of the elementary steps?
   2. 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]**

i. Write balanced chemical equations for the following:
   a. Phosphorus reacts with magnesium.
   b. Flowers of sulphur boiled with calcium hydroxide.
   c. Action of ozone on hydrogen peroxide.

ii. The density of iron crystal is 8.54 gram cm^{-3}. If the edge length of unit cell is 2.8 Å 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 Å = 1×10^{-8} cm)

iii. How many faradays of electricity are required to produce 13 gram of aluminium from aluminium chloride solution?
   (Given: Molar mass of Al = 27.0 gram mol^{-1})

iv. 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 kJ mol^{-1}.
   (Given : R = 8.314 J K^{-1} mol^{-1})

Q.4. Answer any ONE of the following: **[7]**

i. Define:
   a. Enthalpy of atomization b. Enthalpy of vaporization

ii. Draw the structure of IF_7. Write its geometry and the type of hybridization.

iii. a. State Henry's law.
   b. 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

i. What is the action of carbon on the following metal oxides:
   a. Fe_2O_3 in blast furnace
   b. ZnO in vertical retort furnace

ii. Write the molecular and structural formulae of:
   a. Thiosulphuric acid
   b. Dithionous acid

iii. The reaction A + B → products is first order in each of the reactants.
   a. How does the rate of reaction change if the concentration of A is increased by factor 3?
   b. 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:

$$A + 2Na \xrightarrow[ether]{Dry} 2,2,5,5\text{-Tetramethylhexane} + 2NaBr$$

(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 $Cr_2O_7^{2-}$ in acidic medium and $Cr_2O_7^{2-}$ to CrO_4^{2-} in basic medium.

ii. Explain the geometry of $\left[Co(NH_3)_6\right]^{3+}$ 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 $\xrightarrow[473\,K,\,pressure]{NaCN + CuCN}$?

b. Isobutyraldehyde $\xrightarrow{50\%\,KOH}$?

c. Butanone + 2,4-dinitrophenyl hydrazine $\xrightarrow{H^+}$?

ii. Prepare carbolic 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 ethylmethylamine distinguished by using nitrous acid?

OR

i. What is the action of the following reagents on ethanoic acid?

a. $LiAlH_4$ / H_3O^+

b. PCl_3, heat

c. P_2O_5, heat

ii. Identify 'A' and 'B' in the following reaction and rewrite the complete reaction:
$CH_3 - CH_2 - Br + AgCN \xrightarrow{\Delta} A \xrightarrow{Na/C_2H_5OH} B$

iii. Explain Hoffmann bromamide degradation reaction.