BOARD QUESTION PAPER : JULY 2017

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. Which of the following is a basic oxide?

(A) SiO_2 (B) P_4O_{10}
(C) MgO (D) Al_2O_3

ii. In the representation of galvanic cell, the ions in the same phase are separated by a _____.

(A) single vertical line (B) comma
(C) double vertical line (D) semicolon

iii. An ionic crystal lattice has limiting value of radius ratio as 0.414 to 0.732; the co-ordination number of its cation is _____.

(A) 6 (B) 4
(C) 3 (D) 12

iv. The unit of rate constant for zero order reaction is _____.

(A) t^{-1} (B) $mol\ dm^{-3}\ t^{-1}$
(C) $mol^{-1}\ dm^3\ t^{-1}$ (D) $mol^{-2}\ dm^6\ t^{-1}$

v. Calcium carbonate used in the extraction of iron acts as _____.

(A) oxidising agent (B) reducing agent
(C) gangue (D) flux

vi. 10.0 grams of caustic soda when dissolved in 250 cm^3 of water, the resultant gram molarity of solution is _____.

(A) 0.25 M (B) 0.5 M
(C) 1.0 M (D) 0.1 M

vii. 55 L atm of work is obtained when 1.0 mole of an ideal gas is compressed isothermally from a volume of 28.5 L to 18.5 L, the constant external pressure is _____.

(A) 5.05 atm (B) 5.5 atm
(C) 0.05 atm (D) 0.55 atm

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

i. State Henry's Law.

How does solubility of a gas in water varies with temperature?

ii. How is nitric acid prepared by Ostwald's process?

iii. Classify the following solids into different types:

a. Ammonium phosphate b. Brass

c. S_8 molecule d. Diamond

iv. Construct a labelled diagram for the following cell:

$Zn\left|Zn^{2+}(1M)\right|\left|H^{+}(1M)\right|H_{2(g,1atm)}\left|Pt\right.$

v. Explain with chemical reactions, why is zinc oxide amphoteric in nature?

vi. Write the names and chemical formulae of any 'two' minerals of aluminium.

vii. The rate law for the reaction

$2H_{2(g)} + 2NO_{(g)} \longrightarrow N_{2(g)} + 2H_2O_{(g)}$

is given by rate = $k[H_2][NO]^2$.

The reaction occurs in the following two steps:

a. $H_{2(g)} + 2NO_{(g)} \longrightarrow N_2O_{(g)} + H_2O_{(g)}$

b. $N_2O_{(g)} + H_{2(g)} \longrightarrow N_{2(g)} + H_2O_{(g)}$

What is the role of N_2O in the mechanism? What is the molecularity of each of the elementary steps?

viii. Write the mathematical expression of the First Law of Thermodynamics for the following processes:

a. Isothermal b. Adiabatic

c. Isochoric d. Isobaric

Q.3. Answer any THREE of the following: **[9]**

i. From the following data for the liquid phase reaction A → B, determine the order of reaction and calculate its rate constant:

t/s	0	600	1200	1800
[A] / mol L^{-1}	0.624	0.446	0.318	0.226

ii. Calculate the standard enthalpy of combustion of $CH_3COOH_{(l)}$ from the following data:

$\Delta_f H°\ (CO_2) = -393.3$ kJ mol^{-1}

$\Delta_f H°\ (H_2O) = -285.8$ kJ mol^{-1}

$\Delta_f H°\ (CH_3COOH) = -483.2$ kJ mol^{-1}

iii. Write the cell representation and calculate equilibrium constant for the following redox reaction:

$Ni_{(s)} + 2\ Ag^{+}_{(aq)}\ (1M) \longrightarrow\ Ni^{2+}_{(aq)}\ (1M) + 2Ag_{(s)}$ at 25°C

$E^{\circ}_{Ni} = -0.25$ V and $E^{\circ}_{Ag} = 0.799$ V

iv. What is the action of concentrated sulphuric acid on the following:

a. phosphorous pentachloride

b. copper

c. potassium chlorate?

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

i. Define:

a. Molality b. Osmotic pressure

Write any 'two' advantages of calomel electrode.

A metal crystallises into two cubic faces namely face centered (FCC) and body centered (BCC), whose unit cell edge lengths are 3.5 Å and 3.0 Å respectively. Find the ratio of the densities of FCC and BCC.

Arrange the following oxyacids of chlorine – $HClO$, $HClO_2$, $HClO_3$ and $HClO_4$ with respect to:

a. Increasing order of thermal stability.

b. Increasing order of oxidising power.

ii. An organic substance (M = 169 gram mol^{-1}) is dissolved in 2000 cm^3 of water. Its osmotic pressure at 12°C was found to be 0.54 atm. If R = 0.0821 L atm K^{-1} mol^{-1}, calculate the mass of the solute.

Calculate the number of atoms in a unit cell of a metal crystallising in face centered cubic structure.

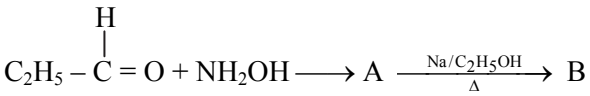
Distinguish between isothermal process and adiabatic process.

Mention the names of various steps involved in the extraction of pure metals from their ores.

SECTION – II

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

i. In the following



The compound 'B' is _____.

(A) Propan–1–amine (B) Propan–2–amine

(C) Isopropylamine (D) Dimethylamine

ii. The stability order for carbocation is _____.

(A) 2° > 3° > 1° (B) 3° > 2° > 1°

(C) 3° > 1° > 2° (D) 1° > 3° > 2°

iii. Effective atomic number rule is used to find _____.

(A) geometry of complex

(B) stability of complex

(C) number of isomers of complex

(D) number of possible ligands around metal ion in complex

iv. Which one of the following ions is coloured?

(A) Sc^{3+} (B) Zn^{2+}

(C) Ti^{4+} (D) V^{2+}

v. When phenol is heated with conc. HNO_3 in presence of conc. H_2SO_4 it yields _____.

(A) o-nitrophenol (B) p-nitrophenol

(C) 2,4,6-trinitrophenol (D) m-nitrophenol

vi. The secondary structure of protein is determined by _____.

(A) co-ordinate bond (B) ionic bond

(C) hydrogen bond (D) covalent bond

vii. Ethylidene dichloride when boiled with aqueous solution of NaOH yields _____.

(A) formaldehyde (B) acetaldehyde

(C) acetone (D) ethyl methyl ketone

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

i. How is phenol prepared from cumene?

ii. Write a note on self oxidation-reduction reaction of aldehyde with suitable example.

iii. Explain basic nature of amines.

iv. What are antiseptics? Give any 'two' examples.

v. What happens when glucose is treated with

a. hydroxylamine? b. hydrogen cyanide?

vi. Draw the structures of chromate and dichromate ions.

vii. How is terylene prepared?

viii. Identify A and B in the following reaction:

$$CH_3 - Br + Mg \xrightarrow{\text{dry ether}} A + CO_2 \xrightarrow[H^+ / H_2O]{\text{dry ether}} B + Mg(Br)\,OH$$

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

i. How ligands are classified? Explain with suitable examples.

ii. What is lanthanoid contraction?

Explain, why lanthanum (Z = 57) forms La^{3+} ion, while cerium (Z = 58) forms Ce^{4+} ion?

iii. What is the action of the following reagents on propanone?

a. Phenyl hydrazine

b. Zn – Hg / conc.HCl

c. Sodium bisulphite

iv. Define enzymes.

How is peptide linkage formed?

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

i. How is nitroethane converted into:

a. ethylamine,

b. N-ethylhydroxylamine,

c. acetic acid?

Write names and chemical formulae of monomers used in preparing Buna-N.

What are soaps? How are they prepared?

ii. How will you prepare ethanol, propan-2-ol and 2-methylpropan-2-ol from Grignard's reagent?

Define optical activity.

Explain optical activity of lactic acid.