

Board Question Paper: March 2014

Chemistry

Time: 3 Hours

Total Marks: 70

Note:

- All questions are compulsory.
- Answer to the two sections are to be written in the same answer book.
- Figure to the right hand side indicate full marks.
- Write balanced chemical equations and draw neat and labelled diagrams wherever necessary.
- Every new question must be started on a new page.
- Use of logarithmic table is allowed

SECTION – I

Q.1. Answer any ONE of the following:

[7]

- What is 'boiling point'?
Derive a relation between ΔH and ΔU for a chemical reaction.
Draw neat labelled diagram of calomel electrode.
Resistance and conductivity of a cell containing 0.001 M KCl solution at 298 K are 1500Ω and $1.46 \times 10^{-4} \text{ S. cm}^{-1}$ respectively. What is the cell constant?
- Write molecularity of the following reaction:
$$2\text{NO}_{(g)} + \text{O}_{2(g)} \longrightarrow 2\text{NO}_{2(g)}$$

What is 'calcination'? How does it differ from 'roasting'?
Write resonating structures of ozone.
The decomposition of $\text{N}_2\text{O}_{5(g)}$ at 320 K according to the following equation follows first order reaction:
$$\text{N}_2\text{O}_{5(g)} \rightarrow 2\text{NO}_{2(g)} + \frac{1}{2} \text{O}_{2(g)}$$

The initial concentration of $\text{N}_2\text{O}_{5(g)}$ is $1.24 \times 10^{-2} \text{ mol. L}^{-1}$ and after 60 minutes, $0.20 \times 10^{-2} \text{ mol. L}^{-1}$. Calculate the rate constant of the reaction at 320 K.

Q.2. Answer any THREE of the following:

[9]

- One mole of a gas expands by 3 L against a constant pressure of 3 atmosphere. Calculate the work done in:
 - L. atmosphere
 - Joules
 - Calories
- Calculate the amount of CaCl_2 (van't Hoff factor $i = 2.47$) dissolved in 2.5 L solution so that its osmotic pressure at 300 K is 0.75 atmosphere.
Given: Molar mass of CaCl_2 is 111 g. mol^{-1} .
 $R = 0.082 \text{ L. atm. K}^{-1} \text{ mol}^{-1}$
- Describe anomalous behaviour of fluorine with the other elements of group 17 with reference to:
 - Hydrogen bonding
 - Oxidation state
 - Polyhalide ions

- iv. Face centred cubic crystal lattice of copper has density of 8.966 g. cm^{-3} . Calculate the volume of the unit cell.
Given: Molar mass of copper is 63.5 g. mol^{-1} and Avogadro number N_A is $6.022 \times 10^{23} \text{ mol}^{-1}$.

Q.3. Answer any SIX of the following:

[12]

- What is the action of the following reagents on ammonia:
 - Nessler's reagent
 - Sodium metal
- State the first and second law of electrolysis.
- Draw neat and labelled diagram of Bessemer converter used in the extraction of copper.
- Derive the relation between half-life period and rate constant for first order reaction.
- Derive the relation between ΔG° and equilibrium constant (K) for the reaction,
 $aA + bB \rightleftharpoons cC + dD$.
- Explain brown ring test with the help of chemical equation.
- Explain, why do aquatic animals prefer to stay at lower level of water during summer?
- Distinguish between:
Crystalline solids and Amorphous solids.

Q.4. Select and write the most appropriate answer from the alternatives given below each sub-question:

[7]

- To prepare n-type semiconductor, the impurity to be added to silicon should have the following number of valence electrons _____.
(A) 2 (B) 3
(C) 4 (D) 5
- Number of faradays of electricity required to liberate 12 g of hydrogen is _____.
(A) 1 (B) 8
(C) 12 (D) 16
- What is molecular formula of oleum?
(A) H_2SO_3 (B) H_2SO_4
(C) $\text{H}_2\text{S}_2\text{O}_7$ (D) $\text{H}_2\text{S}_2\text{O}_8$
- Purification of aluminium by electrolytic refining is carried out by _____.
(A) Hoop process (B) Hall Process
(C) Baeyer process (D) Serperck process
- The rate of reaction for certain reaction is expressed as:
$$\frac{1}{3} \frac{d[A]}{dt} = -\frac{1}{2} \frac{d[B]}{dt} = -\frac{d[C]}{dt}$$

The reaction is _____.
(A) $3A \longrightarrow 2B + C$ (B) $2B \longrightarrow 3A + C$
(C) $2B + C \longrightarrow 3A$ (D) $3A + 2B \longrightarrow C$
- A system absorbs 640 J heat and does work of 260 J, the change in internal energy of the system will be _____.
(A) +380 J (B) -380 J
(C) +900 J (D) -900 J
- Which of the following is 'not' a colligative property?
(A) Vapour pressure (B) Depression in freezing point
(C) Elevation in boiling point (D) Osmotic pressure

SECTION – II

Q.5. Answer any ONE:

[7]

- i. Write the structural formula and IUPAC names of all possible isomers of the compound with molecular formula C_3H_8O .
Write 'two' uses of phenol.
What happens when glucose is treated with:
 - a. Bromine water
 - b. Dilute nitric acid
 - c. Hydrogen cyanide (HCN)
- ii. Write the molecular formula and structural formula of BHA and BHT.
What are thermoplastic polymers?
Write a note on aldol condensation.

Q.6. Answer any THREE:

[9]

- i. What is the action of the following reagents on aniline?
 - a. Bromine water
 - b. Acetic anhydride
 - c. Hot and conc. sulphuric acid
- ii. Discuss the optical activity of lactic acid.
- iii. Write balanced chemical equations for action of potassium permanganate on:
 - a. Hydrogen
 - b. Warm conc. sulphuric acidExplain why Mn^{2+} ion is more stable than Mn^{3+} ?
(Given: $Mn \rightarrow Z = 25$)
- iv. What is effective atomic number (EAN)?
Calculate EAN of cobalt ($Z = 27$) in $[Co(NH_3)_6]^{+3}$ and of zinc ($Z = 30$) in $[Zn(NH_3)_4]SO_4$.

Q.7. Answer any SIX:

[12]

- i. What is a 'soap'? How is it prepared?
- ii. Identify the compounds 'A' and 'B' in the following equation:
$$CH_3 - CH_3 + HNO_3 \xrightarrow{423-600K} 'A' \xrightarrow{Sn/conc.HCl} 'B' + H_2O$$
- iii. Write a note on self oxidation-reduction reaction of aldehyde with suitable example.
- iv. Write names and chemical formulae of monomers used in preparing Buna-S.
- v. Define complex lipids. Mention 'two' functions of lipids.
- vi. Distinguish between S_N^1 and S_N^2 mechanisms.
- vii. What are lanthanoids? What is the position of actinoids in periodic table?
- viii. How is methoxyethane prepared from:
 - a. Methyl iodide
 - b. Diazomethane

