

board question paper: march 2013

Chemistry

Time: 3 Hours

Total Marks: 70

Note:

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

SECTION – I

Q.1. Select and write the most appropriate answer from the given alternatives for each sub-question:

[7]

- i. In body centred cubic structure, the space occupied is about _____.
 (A) 68 % (B) 53 %
 (C) 38 % (D) 32 %
- ii. For a gaseous reaction, the unit of rate of reaction is _____.
 (A) L atm s^{-1} (B) $\text{atm mol}^{-1} \text{s}^{-1}$
 (C) atm s^{-1} (D) mol s^{-1}
- iii. Which of the following compounds contains S = O as well as S = S bonds?
 (A) Sulphuric acid (B) Thiosulphuric acid
 (C) Sulphurous acid (D) Thiosulphurous acid
- iv. Which of the following solutions shows maximum depression in freezing point?
 (A) 0.5 M Li_2SO_4 (B) 1 M NaCl
 (C) 0.5 M $\text{Al}_2(\text{SO}_4)_3$ (D) 0.5 M BaCl_2
- v. For a chemical reaction, $\Delta S = -0.035 \text{ kJ/K}$ and $\Delta H = -20 \text{ kJ}$. At what temperature does the reaction turn non-spontaneous?
 (A) 5.14 K (B) 57.14 K
 (C) 571.4 K (D) 5714.0 K
- vi. The standard e.m.f of the following cell is 0.463 V
 $\text{Cu} | \text{Cu}^{++} (1 \text{ M}) || \text{Ag}^+ (1 \text{ M}) | \text{Ag}$. If $E_{\text{Ag}}^\circ = 0.800 \text{ V}$,
 What is the standard potential of Cu electrode?
 (A) 1.137 V (B) 0.337 V
 (C) 0.463 V (D) -0.463 V
- vii. Fe_2O_3 is reduced to spongy iron near the top of blast furnace by _____.
 (A) H_2 (B) CaO
 (C) SiO_2 (D) CO

Q. 2. Answer any SIX of the following:

[12]

- i. Distinguish between crystalline solid and amorphous solid.
- ii. State Kohlrausch Law and write mathematical expression of molar conductivity of the given solution at infinite dilution.
- iii. Write cell reactions in lead storage battery during discharge.

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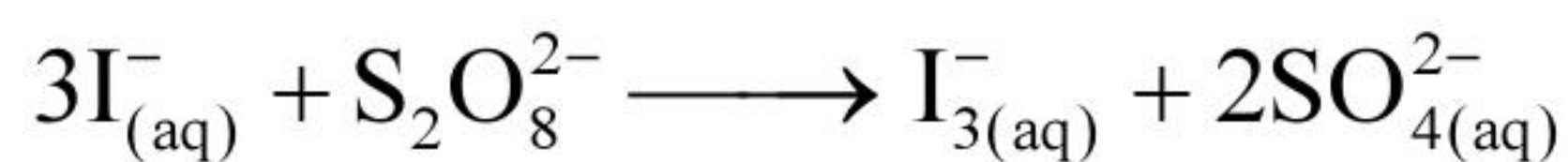
- iv. Draw structures and write geometry of PCl_3 and PCl_5 .
- v. Prove that $\Delta H = \Delta U + \Delta nRT$. What is the condition under which $\Delta U = \Delta H$?
- vi. Mention names and formulae of two ores of aluminium.
- vii. Derive the relationship between relative lowering of vapour pressure and molar mass of non-volatile solute.
- viii. What is pseudo first order reaction? Give one example of it.

Q.3. Answer any THREE of the following:

[9]

- i. Calculate the mole fraction and molality of HNO_3 in a solution containing 12.2 % HNO_3 .
(Given – atomic masses : H = 1, N = 14, O = 16)

- ii. Consider the reaction,



At particular time t , $\frac{d[\text{SO}_4^{2-}]}{dt} = 2.2 \times 10^{-2} \text{ M/s}$.

What are the values of the following at the same time?

a. $-\frac{d[\text{I}_3^-]}{dt}$ b. $-\frac{d[\text{S}_2\text{O}_8^{2-}]}{dt}$ c. $-\frac{d[\text{I}_3^-]}{dt}$

- iii. 300 M mol of perfect gas occupies 13 L at 320 K. Calculate the work done in joules when the gas expands –
 - a. isothermally against a constant external pressure of 0.20 atm.
 - b. isothermal and reversible process.
 - c. into vacuum until the volume of gas is increased by 3 L. ($R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$)
- iv. What is the action of the following reagents on ammonia?
 - a. Excess of air
 - b. Excess of chlorine
 - c. Na metal

Q. 4. Answer any ONE of the following:

[7]

- i. a. Explain with reason sign conventions of ΔS in the following reactions :
 1. $\text{N}_{2(\text{g})} + 3\text{H}_{2(\text{g})} \longrightarrow 2\text{NH}_{3(\text{g})}$
 2. $\text{CO}_{2(\text{g})} \longrightarrow \text{CO}_{2(\text{s})}$
- b. Explain the following terms:
 1. Smelting
 2. Flux
- c. Gold occurs as face centred cube and has a density of 19.30 kg dm^{-3} . Calculate atomic radius of gold. (Molar mass of Au = 197)
- ii. a. Explain the trends in the following properties with reference to group 16:
 1. Atomic radii and ionic radii
 2. Density
 3. ionisation enthalpy
 4. Electronegativity
- b. In the electrolysis of AgNO_3 solution 0.7g of Ag is deposited after a certain period of time. Calculate the quantity of electricity required in coulomb.
(Molar mass of Ag is 107.9 g mol^{-1}).
- c. Define Osmosis.

SECTION – II

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

[7]

i. In which of the following pairs, highest oxidation states of transition metals are found?

- (A) nitriles and chlorides (B) fluorides and chlorides
(C) fluorides and oxides (D) nitriles and oxides

ii. Which of the following carbocations is least stable?

- (A) $\text{CH}_3 - \text{CH}_2 - \overset{\oplus}{\text{C}} \begin{array}{c} \text{CH}_2 - \text{CH}_3 \\ | \\ \text{CH}_2 - \text{CH}_3 \end{array}$ (B) $\text{CH}_3 - \text{CH}_2 - \overset{\oplus}{\text{C}}\text{H} - \text{CH}_2 - \text{CH}_3$
(C) $\text{CH}_3 - \text{CH}_2 - \overset{\oplus}{\text{C}}\text{H}_2$ (D) $\text{CH}_3 - \text{CH}_2 - \overset{\oplus}{\text{C}}\text{H} - \overset{\text{H}}{\underset{\text{CH}_3}{\text{C}}} - \text{CH}_3$

iii. Compound having general formula $\begin{array}{c} \text{R} \quad \text{OR} \\ \diagdown \quad / \\ \text{C} \\ / \quad \diagdown \\ \text{H} \quad \text{OR} \end{array}$ is called _____.

- (A) diester (B) acid anhydride
(C) hemiacetal (D) acetal

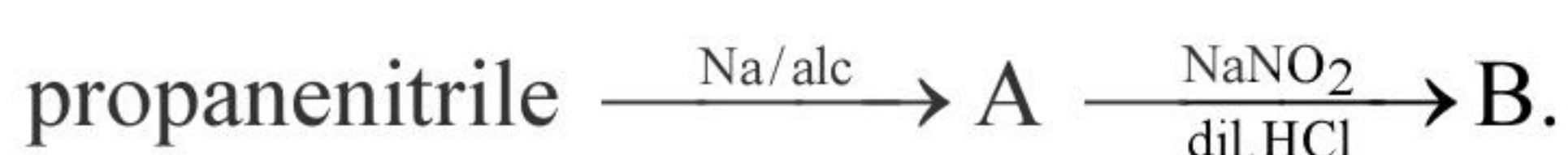
iv. The complex ion $[\text{Co}(\text{H}_2\text{O})_5(\text{ONO})]^{2+}$ and $[\text{Co}(\text{H}_2\text{O})_5\text{NO}_2]^{2+}$ are called _____.

- (A) linkage isomer (B) ionisation isomer
(C) co-ordination isomer (D) geometrical isomer

v. Inflammation of tongue is due to the deficiency of _____.

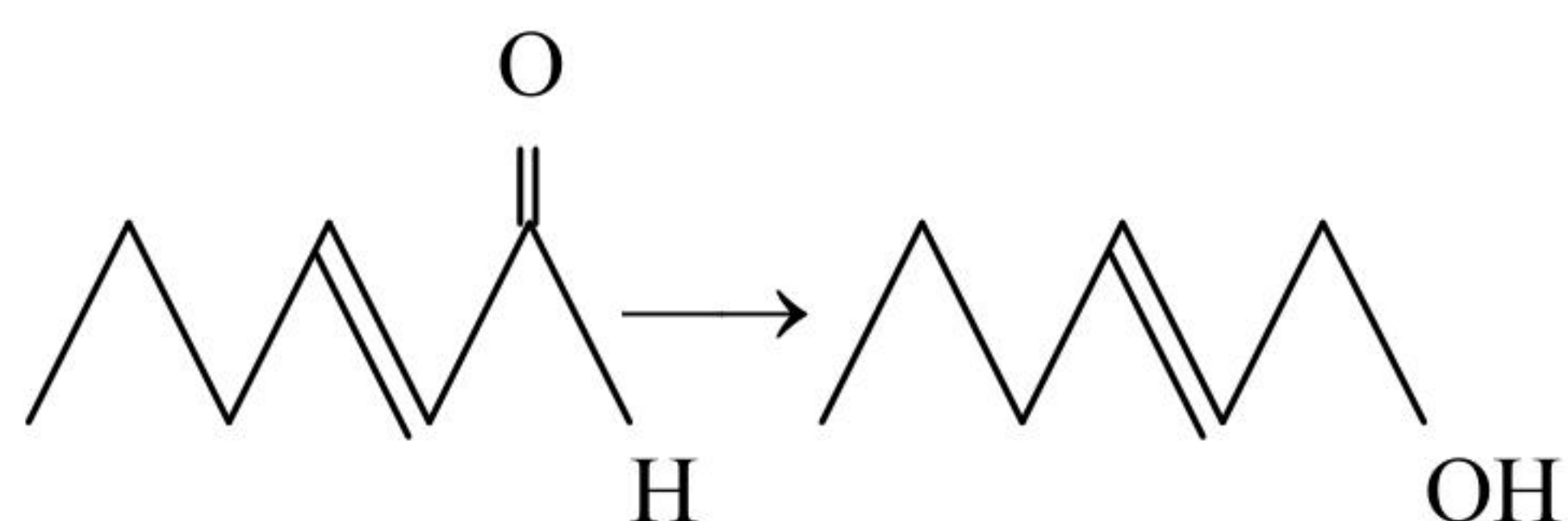
- (A) vitamin B₁ (B) vitamin B₂
(C) vitamin B₅ (D) vitamin B₆

vi. Identify the compound 'B' in the following series of reaction:



- (A) n-propyl chloride (B) Propanamine
(C) n-propyl alcohol (D) Isopropyl alcohol

vii. Which of the following reagents is best for the following conversion?



- (A) LiAlH_4 (B) H_3O^+
(C) $\text{H}_2/\text{Ni}, 453 \text{ K}$ (D) $\text{Zn} - \text{Hg} + \text{HCl}_{(\text{con})}$

Q.6. Answer any SIX of the following :

[12]

- i. Calculate magnetic moment of $\text{Fe}_{(\text{aq})}^{2+}$ ion ($Z = 26$).
- ii. How is ethanol prepared from methanal by using Grignard reagent?
- iii. Write the chemical reaction to prepare novolac polymer.
- iv. Why does p-nitrochlorobenzene undergo displacement reactions readily with attack of nucleophilic HO^{\ominus} ion?
- v. What is the action of bromine in alkaline medium on
 - a. $\text{CH}_3\text{CH}_2\text{NO}_2$
 - b. $\text{CH}_3 - \underset{\text{CH}_3}{\text{CH}} - \text{NO}_2$
- vi. Define antioxidants and mention two examples.
- vii. How is 4-methylpent-3-en-2-one obtained from propan-2-one?
- viii. What are hormones? Write the structure of simple triglycerides.

Q.7. Answer any THREE of the following:

[9]

- i. Write the different oxidation states of manganese. Why +2 oxidation state of manganese is more stable?
- ii. How are the following compounds prepared?
 - a. benzaldehyde from benzene
 - b. acetophenone from benzene
 - c. benzaldehyde from benzoyl chloride
- iii. Define complex lipids and write the structures of nucleotide and nucleoside.
- iv. Write the formulae of the following compounds:
 - a. Sodium hexanitrito – N – cobaltate (III)
 - b. Tetraaquodichlorochromium (III) chloride
 - c. Potassium tetracyanoaurate (III) ion

Q.8. Answer any ONE of the following:

[7]

- i.
 - a. Explain the following terms:
 1. Homopolymers
 2. Elastomers
 - b. Explain the mechanism of cleansing action of soaps.
 - c. Write balanced chemical equations for the action of
 1. phosphorus trichloride on propan-2-ol
 2. hydrogen bromide on styrene in the presence of a peroxide
 3. methyl bromide on silver propanoate
- ii.
 - a. Write a short note on Hoffmann bromamide degradation.
 - b. Explain the mechanism of action of hydroiodic acid on 3-methylbutan-2-ol.
 - c. Mention 'two' uses of propan-2-one.