RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

SECOND YEAR B.A./B.SC. FOURTH SEMESTER (January – June) 2014 Mid-Semester Examination, March 2014

Date : 24/03/2014

Time : 11 am – 12 noon

CHEMISTRY (General)

Paper : IV

Full Marks : 25

[1]

[1]

[2]

[2]

[2]

[2]

CH.

[Use a separate Answer Book for each group]

<u>Group – A</u>

(Answer <u>any one</u> of the following)

1. a) A Carnot engine operates between 600K and 300K with 10 moles of an ideal mono-atomic gas as the thermodynamic substance. The gas absorbs 5 Kcal amount of heat. Calculate (i) the magnitude of work involved in isothermal reversible expansion and (ii) the quantity of heat released. [2]

[Given that C_v of a mono-atomic gas $\frac{3}{2}$ R]

- b) What do you mean by the term "free energy"? For a reaction at 127°C, $\Delta G = -12$ Kcal and $\Delta H = -17.5$ Kcal. Find out ΔS . Also suggest if this reaction is spontaneous. [2]
- c) Why do the solvent molecules flow from the solvent side to the solutions in the osmosis phenomenon? Explain. [1]
- d) Define van't Hoff factor.
- A solution contains 1gm of Urea per litre and the osmotic pressure is 304 mm of mercury at 15°C. Calculate the molecular wt of the Urea. [2]
- 2. a) State and explain Le Chatelier's principle.
 - b) In the reaction $N_2 + 3H_2 \rightleftharpoons 2NH_3$, $\Delta H = -3000J$, indicate whether the forward or backward reaction shall be favoured, (i) When the temperature is increased, (ii) when pressure is increased. [1]
 - c) Calculate the pressure in atmosphere necessary to obtain a 50% dissociation of PCl₅ at 250°C. The equilibrium for the reaction $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ is given as $K_P = 1.8$. [2]
 - d) Normally, the freezing point of a solution is depressed and the boiling point of a solution is elevated with respect to solvent. True or false. Explain with a qualitative plot. [2]
 - e) What weight of Glycerol (Mol. wt. = 92) is to be added to 1000 gms of water in order to lower its freezing point by 10° ? (K_f of water = 1.86] [2]

<u>Group – B</u>

(Answer <u>any one</u> of the following)

3. a) Prepare $C_6H_5CH_2CO_2H$ from an alkyl halide.

b)	Explain why highly branched carboxylic acids such a	$(CH_3)_3C - CH_2 - C - CO_2H$ are	less acidic
		$U(U\Pi_2)_2$	

than unbranched acids.

- c) Write short note on : Mutarotation.
- d) How can you separate : Methylamine and dimethylamine.
- 4. a) Write mechanism for the reaction $H_3C COOC_2H_5$ with aqueous OH⁻. [2]
 - b) Write structures of the organic products for the following reactions
 - i) (R)-CH₃COOCH(CH₃)CH₂CH₃+H₃O⁺ \rightarrow

- ii) $PhCOOC_2H_5 + LiAlH_4 \rightarrow$
- c) Predict the products (A) to (C) of the following reactions. Give mechanism of transformation from (A) to (B).

$$\begin{array}{c}
\stackrel{\text{NO}_2}{\longrightarrow} & \xrightarrow{\text{Sn/HCl}} (A) \xrightarrow{\text{NaNO}_2} (B) \xrightarrow{\text{alkaline}} (C) \\
\stackrel{\text{Me}}{\longrightarrow} & \underbrace{\text{Group} - C}
\end{array}$$
[4]

[2+2]

[11/2]

- How does silver occur in nature? Write down the chemical equations (reactions) for the extraction 5. a) of silver from its source. [1+2]
 - Briefly explain the anodizing phenomenon. b)

Or,

- a) Describe the principle and isolation of nickel by Mond process. [3]
- What do you mean by electroplating? Explain with an example. [11/2] b)

What are Metal Indicators. Name any two metal indicators. [2] 6. a)

b) What do you mean by Masking and Demasking process. Give suitable examples of masking and demasking actions. $[2\frac{1}{2}]$

Or,

- Write down the requirements of gravimetric estimation. How chloride ion can be estimated a) gravimetrically? $[2\frac{1}{2}]$ [2]
- b) Write down the conditions for precipitation.

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