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(Residential Autonomous College affiliated to University of Calcutta)

B.A./B.Sc. FOURTH SEMESTER EXAMINATION, SEPTEMBER 2020

SECOND YEAR (BATCH 2018-21)

Date : 29/09/2020 **CHEMISTRY (General)**

Time : 11.00 am – 3.00 pm **Paper : IV** Full Marks : 40

[Attempt <u>any eight</u> questions of the following] [8×5]

1. a) Give chemical test to distinguish the following pair [2×1]

   i) ethylamine and aniline
   ii) methylamine and dimethylamine

   b) Write down the use of Grignard reagents for preparation of 1^{o}, 2^{o} and 3^{o} alcohols. [3]

2. a) Identify A, B and C in the following [2]

$$C_6H_5CN \xrightarrow{Ni/H_2} A \xrightarrow[HCl]{NaNO_2} B \xrightarrow{C_2H_5OH} C$$

   b) Write down the following chemical reactions with examples: [1.5×2]

   i) Sandmeyer's reaction

   ii) hydrolysis of esters by $A_{AC}2$ mechanism

3. a) Define the following terms with examples of each: [2×2]

   i) Glycosylation reaction
   ii) Mutarotation

   b) Write the reaction which shows that the D-glucose can exist in open chain structure. [1]

4. a) Write down short notes on: [2×2]

   i) Ruff's method in aldoses
   ii) Heinsberg's method of amine separation

   b) Arrange the following molecules with increasing order of acidity: Formic acid, acetic acid, benzoic acid [1]

5. a) Auride ion is very common but the cuprites ion is not commonly formed, explain. [2]

   b) Comment on the stable oxidation state of Cu, Ag and Au. [3]

6. a) Give a comparative study for the stability of Zn_2^{2+}, Cd_2^{2+} and Hg_2^{2+}. [2.5]

   b) Give a brief introduction on Nessler's reagent. [2.5]

7. a) Write down Clausius Inequality. [2]

   b) From Clausius inequality prove that the condition for spontaneity at constant T, P ,

   $dG < 0$ [3]

8. a) Write down the expression for efficiency of a Carnot engine in terms of temperatures of the source (T_h) and sink (T_l). [1]

   b) State Carnot's theorem. [2]

   c) With the help of (a) and (b) explain what would be the maximum possible efficiency of an engine working between T_h and T_l. [2]

9. a) An aqueous solution is made by dissolving 10 g of glucose ($C_6H_{12}O_{16}$ MW-180 g mol^{-1}) in 90 g of water at 300 K. If the vapor pressure of pure water at 300 K is 32.8 mm Hg, what would be the vapor pressure of the solution? [2]

   b) At what temperature will a solution containing 5.60 g of glucose ($C_6H_{12}O_{16}$) per kg of water will boil? Given the latent enthalpy of vaporization of water is 40.585 kJ/mol. [3]

10.a) Why $MgCl_2$ is a better coagulant than NaCl for As_2S_3 colloid? [2]

   b) How are the gold number and protective power of a colloid related? [2]

   c) Arrange the following solutions in increasing order of their boiling point - 0.001 M NaCl, 0.001 M glucose, 0.001 M $MgCl_2$. [1]

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