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University of Information Technology & Sciences (UITS)

School of Science and Engineering

Department of Computer Science and Engineering

Program: B.Sc. in CSE

Term Final Examination, Autumn-2022

Course Title: Engineering Chemistry

Course Code: CHE 175

Marks: 50 **Time: 3*(three)* hours**

*[Answer any **five (05)** out of following **seven (07)** questions. Assume necessary data/values if missing]*

1. a) State the postulates of Bohr's atom model. Derive an equation for calculating the radius of orbits in a hydrogen atom. [05]

   b) Define Isotopes and Isobars. What are importance if Isotopes? Choose isotopes and isobars from the following list: [03]
   $^{12}{}_{6}C$; $^{12}{}_{5}B$; $^{14}{}_{7}N$; $^{16}{}_{8}O$; $^{14}{}_{8}O$; $^{13}{}_{6}C$; $^{13}{}_{7}N$

   c) Describe AUFBAU Principle and Pauli Exclusion Principle. [02]

2. a) What is an ideal solution? Give the characteristic of an ideal solution and colligative Properties. [03]

   b) Derive a mathematical expression relating the molecular weight of a non-electrolyte solute with the elevation of boiling point of its solution. [04]

   c) Acetone (CH_3-CO-CH_3) boils at 56.38 o C and a solution of 1.41gm of an organic solute in 20gm of acetone boils at 56.88 o C. If K b value is 16.7, calculate molecular weight (MW) of the organic solute. [03]

3. a) Define and explain with examples the Heat of Formation and Heat of solution. [03]

   b) State Henry's law and derive the mathematical relationship between solubility and temperature during dissolution of gases in liquid. [04]

   c) What is solubility of solids in liquid? Draw the graphs showing the dependency of temperature and solubility. [03]

4. a) Define quantum numbers. What do they signify? Show the relationship between the quantum numbers. [04]

   b) What is dual nature of electron? Derive De Broglie's equation. [03]

   c) Explain with diagram what you understand by osmosis, osmotic pressure and reverse osmosis. What is the importance of reverse osmosis in modern time? [03]

5. a) Derive the integrated rate equation for a first order reaction 2A → P and prove that the half-life for a second order reaction is not independent of initial concentration. [04]

   b) Discuss the isolation and differential methods to find the order of a reaction. [03]