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Daffodil International University

Department of Electrical and Electronic Engineering

Faculty of Engineering

Final Examination, Fall – 2024

Course Code: 0531-111 | Course Title: Chemistry

Section: A, B, C, D, E, F | Level-Term: L1-T1 | Teacher's Initial: AAA

Full Marks: 40 | Exam Date: December 24, 2024 | Time: 2 Hours

[Answer All the Questions]

Q1. (a) **Define** Reversible & Irreversible reactions with example. CO-1 (C1) [2+2+4=8]

(b) **What** is chemical equilibrium? Visualize this with graphical presentation.

(c) $N_2+3H_2 \Leftrightarrow 3NH_3 + 92KJ$

Describe the effect of changing temperature and pressure of the above reaction at equilibrium.

Q2. (a) **What** is the difference between Molarity & Molality? CO-2 (C1) [2+4+2=8]

(b) **Determine** the number of molecules in 50g of barium hydroxide and 100g of MnO_2. [Ba=137g, Mn=95g]

(c) **What** is the mass percentage of Glucose in a solution prepared by dissolving 20g of glucose in 250g of water?

Q3. (a) **Differentiate** between Homogeneous Mixture & Heterogeneous Mixture. CO-2 C2) [2]

(b) **Calculate** the mole fraction of HCl in a solution of Hydrochloric acid in water containing 30% HCl by weight. CO-2 (C3) [3+3=6]

(c) **Calculate** the weight of HCl present in 180 ml of a 0.3M solution.

Q4. (a) **What** do you know about The Arrhenius Theory? Write down its limitations. CO-2 (C1) [2.5+2.5+3=8]

(b) **What** is a buffer solution? Describe the mechanism of acidic buffer with a diagram.

(c) **What** is the pH of a buffer 0.25 moles acetic acid and 0.200 moles acetate ion and the total volume is 2L when you add 0.5 moles HCl? [Ka= $1.9x10^{-5}$]

Or

CO-2 (C1) [2.5+1.5+4=8]

(a) **State** the Phase Rule and write down the merits and demerits of phase rule.

(b) **Explain** Phase, component and degree of freedom in brief.

(c) **Describe** the water system with a suitable phase diagram.

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Q5. (a) **What** are amines? **Discuss** about the types of amines? CO-3 (C1) [2]

(b) **How** would you prepare toluene and phenol? **Write** down the reactions. [3+3=6]

(c)**Write** down the mechanisms of S_N1 and S_N2 reactions.

Or

CO-3 (C1) [1+4+3=8]

(a)**Find** out the rate and order of the following reaction

$2NO\,(g) + Cl_2\,(g) \rightarrow 2NOCl\,(g)$

(b) **Establish** the relation between Kp & Kc with the help of the law of mass action.

(c) Some nitrogen and hydrogen gases are pumped into an empty five-litre glass bulb at 500°C. When equilibrium is established, 3 moles of N_2, 2.1 moles of H_2 and 0.298 moles of NH_3 are found to be present. **Find** the value of Kc for the reaction.

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