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# Daffodil International University

Department of Electrical and Electronic Engineering
Faculty of Engineering
**Final Examination, Spring – 2025**

Course Code: 0531-111 | Course Title: Chemistry
Section: A, B, C, D, E | Level-Term: L1-T1 | Teacher's Initial: AAA
Full Marks: 40 | Exam Date: June 26, 2025 | Time: 2 Hours

**[Answer All the Questions, you must maintain the order while answering]**

Q1. (a) **Define** Exothermic & Endothermic reactions with example. CO-1 (C1) [2+2+4=8]
(b) **Describe** Chemical Equilibrium with graphical presentation.
(c) $2SO_2+O_2 \Leftrightarrow 2SO_3 + 45.2Kcal$
**Highlight** 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 pH and pOH for the following entities.
0.5% $Na_2CO_3$, 0.2% $CH_3COOH$.
(c) **What** is the molarity of a solution prepared by dissolving 75.5 g of pure KOH in 660ml of solution?

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 23.5% HCl by weight. CO-2 (C3) [3+3=6]
(c) **Calculate** the molality of a solution prepared by dissolving 10g of Toluene ($C_6H_5CH_3$) in 250g of Benzene ($C_6H_6$).

Q4. (a) **What** are Acids and Bases according to Bronsted-Lowry theory? Write down its limitations. CO-2 (C1) [2+3+3=8]
(b) **What** is a buffer solution? Write down the process of calculating pH of a basic buffer with Henderson's Hasselbalch Equation.
(c) **What** is the pH of a buffer 0.35 moles ethanoic acid and 0.400 moles acetate ion and the total volume is 3.5L when you add 0.125 moles HCl? [$Ka= 1.75x10^{-5}$]

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Q5. (a) **What** are alcohols? **Catagorize** about the classification of alcohols? CO-3 (C4) [2]

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

(c) **Illustrate** the mechanisms of $S_N1$ and $S_N2$ reactions.

**Or**

CO-3 (C4) [2+3+3=8]

(a) **Outline** the Common Ion effect.

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

(c) At a certain temperature 0.1 mole of $H_2$ and 0.1 mole of $I_2$ were placed in a one litre flask. The purple color of Iodine vapour was used to monitor the reaction. After a time, the equilibrium,

$$H_2 + I_2 \Leftrightarrow 2HI$$

Was established and it was found that the concentration of $I_2$ decreased to 0.025 mole/L. **Estimate** the value of Kc for the reaction.