Daffodil International University

Department of Electrical and Electronic Engineering

Faculty of Engineering

Final Examination, Fall – 2025

Course Code: 0531-111 | Course Title: Chemistry
Section: A, B, C, D, E, F, G, H | Level-Term: L1-T1 | Teacher's Initial: AAA, SRA
Full Marks: 40 | Exam Date: December 22, 2025 | Time: 2 Hours

[Answer Any 5 Questions, you must maintain the order while answering]

Q1. **Define** Exothermic & Endothermic reactions with example. **CO-1 C(1)** **[2+6]**
Describe the effect of changing temperature and pressure at equilibrium for the following reaction.

$$N_2 + 3\,H_2 \Rightarrow 2\,NH_3 \quad \Delta H = -98\ KJ$$

Q2. **What** is the difference between Molarity & Molality? **CO-1 C(1)** **[2+2+4]**
What is the mole fraction of HCl in a solution of Hydrochloric acid in water containing 12% HCl by weight?
Determine the pH of a buffer composed of 0.1M acetic acid (CH_3COOH) and 0.6M acetate (CH_3COO-) knowing that the acid dissociation constant Ka is 1.8×10^{-5}.

Q3. **Differentiate** between Homogeneous Mixture & Heterogeneous Mixture. **CO-2 C(2)** **[3+3+2]**
Calculate the molality of a solution prepared by dissolving 10g of Toluene ($C_6H_5CH_3$) in 250g of Benzene (C_6H_6).
Calculate the mass percentage of glucose in a solution prepared by dissolving 10g of glucose into 100g of water.

Q4. **What** are Acids and Bases according to Arhcnious theory? **Write** down its limitations. **CO-2 C(1)** **[3+3+2]**
Determine the pH and pOH for the following entities.
0.5% H_2SO_4, 0.2% CH_3COOH.
Describe why $Ca(OH)_2$ is weaker base than KOH.

Q5. **Establish** the relation between Kp & Kc with the help of the law of mass action. **CO-3 C(4)** **[4+4]**
Some nitrogen and hydrogen gases are pumped into an empty five-litre glass bulb at 500°C. When equilibrium is established, 3.00 moles of N_2, 2.10 moles of H_2 and 0.298 mole of NH_3 are found to be present.

Estimate the value of Kc for the reaction.

Q6. **Explain** hydrocarbons with examples. **CO-3** **[1+3+4]**
Illustrate the preparation of toluene by Friedel- Craft alkylation. **C(4)**
Illustrate the mechanism of S_N1 reaction.