



Daffodil International University

Department of Nutrition and Food Engineering

Faculty of Health and Life Sciences

B.Sc. in Nutrition and Food Engineering

Final Examination Summer 2026

Course Code: 0531-1103

Level and Term: L-1, T-1

Time: 2 Hours

Section: 262 All

Course Title: Physical, Inorganic and Analytical Chemistry

Course Teacher Initials: DNU, DAMR, DFR, SKP

Total Marks: 40

"Maintaining the order of the questions is highly encouraged"

			Marks
1	(a) Draw the conjugate acid base pair between HNO_3 and H_2O .	[CLO3,PLO1, C1]	2
	(b) Illustrate the mechanism of acid buffer and basic buffer solution.	[CLO3,PLO1, C2]	3
	(c) Calculate the pOH of a 0.03 M $\text{Ca}(\text{OH})_2$ solution.	[CLO3,PLO1, C3]	3
2	(a) What are the characteristics of chemical equilibrium.	[CLO3, PLO1, C2]	2
	(b) What will be the effect of applying temperature and pressure on the following reactions:	[CLO3, PLO1, C3]	3
	(i) $\text{SO}_2 + \text{O}_2 \rightleftharpoons \text{SO}_3$		
	(ii) $\text{N}_2 + \text{H}_2 \rightleftharpoons \text{NH}_3$		
	(iii) $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$		
	(c) The value of K_p at 25°C for the reaction $2\text{NO}(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons 2\text{NOCl}(\text{g})$ is $1.9 \times 10^3 \text{ atm}^{-1}$. Calculate the value of K_c at the same temperature.	[CLO3,PLO1, C3]	3
3	(a) What is the hydrogen ion concentration of a solution of pH 13.5?	[CLO3, PLO1, C1]	2
	(b) Calculate the pH of a buffer solution containing 0.20 M CH_3COONa and 0.15 M CH_3COOH . K_a for acetic acid is 1.8×10^{-5} .	[CLO3, PLO1, C3]	3
	(c) Derive the relationship $K_p = K_c(\text{RT})^{\Delta n}$ for a reversible gaseous reaction.	[CLO3,PLO1, C4]	3
4	(a) The rate constant of a first-order reaction is $1.25 \times 10^{-3} \text{ s}^{-1}$. Calculate the half-life of the reaction.	[CLO4,PLO1,C2]	2
	(b) Derive the equation: $k = \frac{2.303}{t} \log \frac{a}{a-x}$ for the first order reaction.	[CLO4,PLO1,C4]	3
	(c) The half-life of a substance in a first order reaction is 15 minutes. Calculate the rate constant.	[CLO4,PLO1,C3]	3
5	(a) Write about dispersed phase and dispersion medium used in the preparation of emulsion and foam with example.	[CLO4,PLO1,C1]	2
	(b) Compare the Lyophilic and Lyophobic sols.	[CLO4,PLO1,C2]	3
	(c) Explain the process of dialysis used for the purification of colloidal sols.	[CLO4,PLO1,C1]	3