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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 **Course Title:** Physical, Inorganic and Analytical Chemistry
Level and Term: L-1, T-1 **Section:** 262 All **Course Teacher Initials:** DNU, DAMR, DFR, SKP
Time: 2 Hours **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 $Ca(OH)_2$ 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: (i) $SO_2 + O_2 \leftrightharpoons SO_3$ (ii) $N_2 + H_2 \leftrightharpoons NH_3$ (iii) $PCl_5 \leftrightharpoons PCl_3 + Cl_2$	[CLO3, PLO1, C3]	3
	(c)	The value of K_p at 25°C for the reaction $2NO\ (g) + Cl_2\ (g) \leftrightharpoons 2NOCl\ (g)$ is 1.9×10^3 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 $K_p = K_c(RT)^{\Delta n}$ for a reversible gaseous reaction.	[CLO3,PLO1, C4]	3
4				
	(a)	The rate constant of a first-order reaction is $1.25 \times 10^{-3} s^{-1}$. 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