CRAWFORD UNIVERSITY

COLLLEGE OF NATURAL AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL AND EARTH SCIENCES

RAIN EXAMINATION 2017/2018

COURSE CODE: ICH 204

COURSE TITLE: PHYSICAL CHEMISTRY II **UNITS: 2**

TIME ALLOWED: 2HRS

DATE: 2018

INSTRUCTIONS: ANSWER ANY FOUR (4) QUESTIONS.

1(a) Differentiate between chemisorption and physisorption. (6 marks)

(b) Death is likely if the pH range of blood changes by ±0.4 from normal value of 7.4. What is the approximate range of molar concentration of hydrogen ions for which life can be sustained? (6 marks)

(c) What is an amphiprotic system? (3 marks)

2(a) Derive expressions for pKa, pKb & pKw from $H_3O^+ + A^- \rightleftharpoons HA + H_2O$ (10 marks)

b) Calculate pKb, if pKa=10.56 for the conjugate acid $CH_3NH_3^+$ in the reaction

$H_3O^+ + CH_3NH_3^+ \rightleftharpoons CH_3 + H_3O^+$. (5 marks)

3(a) Estimate the pH and fraction of CH_3COOH molecules deprotonated in 0.15M CH_3COOH. $K_a=1.8 \times 10^{-5}$ (7 marks)

(b) What is a polyprotic acid? (4 marks)

(c) Give two examples of polyprotic acids. (4 marks)

4a) The conjugate acid for the base quinolone has pKa=4.88. Estimate the pH and fraction of molecules protonated in 0.01M aqueous solution. (7 marks)

(b) Highlight two factors that influence resistivity (4 marks)

(c) Give the equations for resistivity and conductivity. (4 marks)

5a) What are the conditions for developing an adsorption isotherm. (8 marks)

b) How is the extent of adsorption determined? (3 marks)

(c) Highlight two major adsorption isotherms. (2 marks)

(d) Define acids and bases according to the Bronsted-Lowry theory. (2 marks)

6a) List three techniques used in determining the chemical composition of a solid surface. (6 marks)

(b) When one drop of blood ($0.2cm^3$) of 1M HCl is added to $25cm^3$ of an acetate buffer solution, that is, 0.04M CH3COONa and 0.08M CH3COOH, what will be the change in pH when pKa=4.75. (9 marks)