CRAWFORD UNIVERSITY

COLLLEGE OF NATURAL AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL AND EARTH SCIENCES

RAIN EXAMINATION 2017/2018

COURSE CODE: ICH 202
COURSE TITLE: ANALYTICAL CHEMISTRY **UNITS: 2**
TIME ALLOWED: 2HRS
DATE: 2018
INSTRUCTIONS: ANSWER QUESTION 1 AND ANY OTHER THREE (3).

1(a) Define analytical chemistry. (3 marks)

(b) Draw the UV-vis spectrum using the data below:

Wavelength	Absorbance								
250	0.99	360	0.96	470	0.34	580	0.23	690	0.02
255	0.93	365	0.90	475	0.35	585	0.15	695	0.02
260	0.89	370	0.83	480	0.39	590	0.12	700	0.01
265	0.87	375	0.77	485	0.45	595	0.1		
270	0.87	380	0.71	490	0.48	600	0.09		
275	0.89	385	0.65	495	0.50	605	0.08		
280	0.93	390	0.59	500	0.58	610	0.08		
285	1.00	395	0.54	505	0.66	615	0.07		
290	1.08	400	0.50	510	0.66	620	0.06		
295	1.17	405	0.46	515	0.66	625	0.07		
300	1.24	410	0.43	520	0.76	630	0.06		
305	1.29	415	0.40	525	0.83	635	0.06		
310	1.31	420	0.38	530	0.77	640	0.06		
315	1.28	425	0.36	535	0.69	645	0.05		
320	1.26	430	0.34	540	0.72	650	0.05		
325	1.22	435	0.32	545	0.78	655	0.04		
330	1.17	440	0.31	550	0.71	660	0.04		
335	1.15	445	0.30	555	0.56	665	0.04		
340	1.12	450	0.3	560	0.46	670	0.03		
345	1.09	455	0.30	565	0.45	675	0.03		
350	1.06	460	0.30	570	0.43	680	0.03		
355	1.03	465	0.32	575	0.35	685	0.02		

(14 marks)

(c) If the absorbance of the first band reduces from 1.31 amu to 1.26 amu, calculate the new concentration if the initial concentration is 0.02mg/ml and the cuvette width is 1cm? (7 marks)

2(a) Define the following terms: i- Lot ii-Lot dimensionality iii-Sample (6 marks)

(b) Differentiate between constitutional heterogeneity and distributional heterogeneity. (2 marks)

(c) Write short notes on Gy's sampling theorem. (4 marks)

3(a) Define the following terms: i- Accuracy ii-Analyte iii-Assay (3 marks)

(b) Write short notes on: i-Titrimetry ii-Gravimetry. (6 marks)

(c) List three apparatus used for titrimetric analysis. (3 marks)

4 (a) Show the structural transformation of phenolphthalein from acidic to basic medium. (6 marks)

(b) Highlight the colour changes observed from basic to acidic medium for 3 indicators. (3 marks)

(c) List three types of chromatographic techniques. (3 marks)

5 (a) Write short notes on Fourier Transform Infra Red (FTIR) spectroscopy (3 marks)

(b) Give characteristic frequency values for the following:

(i) –OH stretching (ii) C-H stretching (iii) C=O stretching (3 marks)

(c) Calculate Kmy for Mg^{2+} at pH 5 to pH 10. What pH would be ideal for the titration of magnesium. α_4 at pH 5=3.5 x 10^{-7} and α_4 at pH 10=3.5 x 10^{-1}. Kmy (Mg^{2+})= 4.9 x 10^8. (6 marks)

6(a) The atmospheric data for Mars and ancient earth is as shown below:

	Mars	Ancient Earth
CO_2	95.7%	0.04%
N_2	1.89%	78.09%
Ar	1.93%	0.93%
O_2	0.146%	20.9%
CO	0.057%	-
He	-	0.005%
Water vapour	-	0.001%

(i) Based on the data above, do you think that life on Mars could exist? If so, which of the Mars atmospheric molecules or conditions would be important for creating the necessary molecules for life? If not, what additional molecules or conditions would be required to make life possible? Explain your reasoning. (8 marks)

(b) Which of the following is most suited for the following purposes? Explain the reason for your choice.

(i) Weighing 10mg of sugar- Top loading or analytical balance (2 marks)

(ii) Separating 25ml of liquid from a stock solution- Pipette or measuring cylinder. (2 marks)