National Open University of Nigeria
Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi - Abuja
Faculty of Sciences
2021_1 EXAMINATION 1234

COURSE CODE: CHM413
COURSE TITLE: Analytical Chemistry II
CREDIT: 2 Units
TIME ALLOWED: 2 Hours
INSTRUCTION: Answer Question ONE (1) and any other Three (3) Questions

Question 1

a. List two commonly used instrument for making potential measurement (3 marks)

b. Explain the term confident intervals of the mean (2 ½ marks)

c) Outline two Applications of Kohlrausch Law (3 marks)
d) Justify with suitable reasons why several acid-base titrations are quite difficult to realize ordinarily by the use of visual indicators. (4 ½ marks)
e) Distinguish between equivalent and molar conductivity (6 marks)
f) What advantage has helium over hydrogen as carrier gas (mobile phase) for chromatography? (6 marks)

Q1 ======== 25 MARKS

Question 2

Eleven measurements of cadmium concentrations in some selected solid waste disposal sites are as follows: 4.06, 3.75, 2.84, 3.94, 3.47, 2.19, 4.20, 3.62, 2.87, 3.69, and 3.20.

(V a l u e s of t for confidence intervals are presented in table 1 below.)

Calculate
i) Mean **2 marks**
ii) Median **1 marks**
iii) Standard deviation **9 marks**
iv) The 95% confidence limit for the experiment value. **3 marks**

Table 1. V a l u e s of t for confidence intervals

Degrees of freedom	Values of t for confidence interval of				
	80%	90%	95%	99%	99.9%
1	3.08	6.31	12.7	63.7	637
2	1.89	2.92	4.30	9.92	31.6
3	1.64	2.35	3.18	5.84	12.9
4	1.53	2.13	2.78	4.60	8.60
5	1.48	2.02	2.57	4.03	6.86
6	1.44	1.94	2.45	3.71	5.96
7	1.42	1.90	2.36	3.50	5.40
8	1.40	1.86	2.31	3.36	5.04
9	1.38	1.83	2.26	3.25	4.78
10	1.37	1.81	2.23	3.17	4.59

Question 3

a) What is Analytical chemistry and why is it described as a quantitative science? (5 marks)

b) i) What is the significance of Dixon's Q-test? **(3 marks)**

ii) Outline the null hypothesis associated with Q-test **(3 marks)**

c. The following replicate observations were obtained during a measurement and they are arranged in ascending order: 6.85, 8.18, 8.28, 8.49, 8.69

Can we reject observation 6.85 as an outlier at a 95% confidence level? **(4 marks)**

Question 4

a) What are the considerations that should be made when selecting a column material for the separation of a specific substance? (**4 ½ marks)**

b) Outline the two physical properties that governed the choice of detectors, and hence highlight three detector systems used in HPLC **(6 ½ marks)**

c) State four (4) specific applications of **HPLC** **(4 marks)**

Question 5

5a. Write short notes on the following:

i) specific conductance **(4.5 marks)**

ii) cell constant **(3 marks)**

5b. With the aid of Schematic *diagram of an ionization detector, describe the working principle of* gas ionization detectors.