



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES
DEPARTMENT OF PURE & APPLIED SCIENCES
JANUARY 2018 EXAMINATION QUESTIONS

CHM413: ANALYTICAL CHEMISTRY II

CREDIT : 2

TIME: 2 HOURS

INSTRUCTION: ANSWER QUESTION ONE & ANY OTHER THREE QUESTIONS.

QUESTION ONE

- a) An analyst performs a titrimetric experiment three times and obtains values of 31.29, 31.16 and 33.29ml.
 - i) Identify one of the titre value that should be rejected (1 mark)
 - ii) Calculate the mean of the results of the titrimetric experiment. (2 marks)
- b) Define the term "error". (2 marks)
- c) Briefly discuss the various types of error. (10 marks)
- d) What is the main difference between accuracy and precision (2 marks)
- e) What is meant by an "Outlier" (1 mark)
- f) The following replicate values were obtained during an experiment:
 5.86, 8.14, 8.34, 8.67, 8.71
 Can the value 5.86 be rejected as an outlier at a 95% confidence level? (7 mark)

Table 1: Critical value of Q

N	Q _{crit} (CL 90%)	Q _{crit} (CL 95%)	Q _{crit} (CL 99%)
3	0.941	0.970	0.994
4	0.765	0.829	0.926
5	0.642	0.710	0.821
6	0.560	0.625	0.740
7	0.507	0.568	0.680
8	0.468	0.526	0.634
9	0.437	0.493	0.598
10	0.412	0.466	0.568

QUESTION TWO

- a) Twelve measurements of the concentration of a certain metal in ground water samples gave the following results:

25.19, 24.98, 25.01, 24.70, 23.98, 24.75, 24.65, 25.23, 23.92, 24.52, 24.86, 25.00

Calculate:

- i) Mean 2marks
- ii) Median 2Marks
- iii) Standard deviation 7 mark
- ii) The 95% confidence limits for the experimental values 4 marks

TABLE 2: Values of t for confidence intervals

Degrees of freedom	Values of t for confidence interval of Mean				
	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
11	1.36	1.80	2.20	3.11	4.44
12	1.36	1.78	2.18	3.06	4.32

QUESTION THREE

- a) Describe the principle of voltammetry. (10 marks)
- b) Write short notes on these analytical techniques cathodic stripping voltammetry and anodic stripping voltammetry.

(5 marks)

QUESTION FOUR

- a) Write short notes on the followings:
- i) Chromatography ii) Chromatogram iii) Retention time, iv) Stationary phase. (4 marks)
- b) List any four uses of affinity chromatography. (4 marks)
- c) Describe the basic principle of ion-exchange chromatography. (7 marks)

Question 5

- a) Briefly explain briefly five applications of the differential scanning calorimeter. (5 marks)
- b) Discuss the basic principle of a liquid membrane electrode. (10 marks)