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NATIONAL OPEN UNVERSITY 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

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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) Stationery 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)