

**National Open University of Nigeria**

**Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi - Abuja**

**Faculty of Science**

**NOVEMBER, 2018 EXAMINATIONS**

**COURSE CODE: CHM413**

**COURSE TITLE: ANALYTICAL CHEMISTRY**

**CREDIT: 2 Units**

**TIME ALLOWED: 2 Hours**

**INSTRUCTION:** **Answer Question ONE (1) and any other THREE (3) Questions**

**QUESTION ONE**

1. A project student performs a volumetric experiment three times and obtains values of 37.29, 38.16 and 43.29ml.
2. Identify one of the titre value that should be rejected (1 mark)
3. Calculate the mean titre for the volumetric experiment. ( 2 marks)
4. Define the term “experimental error”. (2 marks)
5. Explain the various types of error. (10 marks)
6. What is meant by an outlier? (1 mark)
7. List any four uses of affinity chromatography (4 marks)
8. The following replicate values were obtained during an experiment:

10.21, 21.01, 21.65, 21.80, 21.20, 21.35 (5 marks)

Can we reject observation 10.21 as an outlier at a 95% confidence level?

Table 1: Critical value of Q

|  |  |  |  |
| --- | --- | --- | --- |
| N | Qcrit (CL 90%) | Qcrit (CL 95%) | Qcrit (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**

**Question 2**

**2 a)** List any two instrument used for making potential measurement (2 marks)

b) Mention the two types of glass membrane electrode (1 mark)

c) Given that the standard potential of the calomel electrode is 0.268 V and that the Hg/Hg2 2+ electrode is 0.789V, calculate Ksp for calomel (Hg2Cl2). (8 marks)

d) Write short notes on the following chromatography terms: (i) retention time (2 marks),

(ii) Chromatography (2 marks)

**QUESTION THREE**

a) Draw and explain the major components of a pH –meter (5 marks)

b) List and explain the factors that affect the conductivity of an electrolyte solution. (10 marks)

**QUESTION FOUR**

1. Ten measurements of the concentration of magnesium in ground water samples gave the

Following results:

19.34, 20.98, 24.46, 22.16, 21.56, 27.77, 30.11, 23.90, 26.55, 25.56

Calculate:

i) Mean (2 marks)

ii) Median (1 mark)

iii) Standard deviation (8 marks)

IV) The 95% confidence limits for the experimental values (4 marks)

**QUESTION FIVE**

***a)* Explain the basic principle of solvent extraction (**4 marks)

**b) State four applications of affinity chromatography. (**4 marks)

**c) Mention five advantages of Size-exclusion chromatography. (**5 marks)

d) list any two Applications of Radioanalytical Chemistry **(2 marks)**