



THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

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MAIN EXAMINATION

MAY – JULY 2015 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF CHEMISTRY

CHEM 308:ANALYTICAL CHEMISTRY I

SCHOOL FOCUSED PROGRAMME

Date: JULY 2015

Duration: 2 Hours

INSTRUCTIONS: Answer Question ONE and ANY OTHER TWO Questions

- Q1. a) Analytical chemistry is a multidisciplinary discipline that involves analytical chemists, with aspect to this statement;
- Define the term interdisciplinary
 - Give THREE examples to show that analytical chemistry is multidisciplinary.
 - State one duty of an analytical chemistry. **(10 marks)**
- b) Analysis has FIVE major steps which may incur errors;
- List the FIVE steps of analysis.
 - State at which step of analysis you would perform during a sample.
 - Define an error in analysis.
 - State TWO ways of expressing relative errors in analysis(use mathematical expression) **(10 marks)**
- c) State TWO for each one of the following;
- Advantages of digesting a precipitate
 - Ways of expressing precision.
 - Advantages of batch extraction.
 - Qualities of a primary standard. **(10 marks)**

Q2. The results of two experiments were as follows;

Experiment 1: Standard deviation = 0.30

$$n = 5$$

$$\text{Mean} = 20.4$$

Experiment 2: Variance = 0.38

$$n - 1 = 5$$

$$\text{Mean} = 18.0$$

- i State the null hypothesis. **(2 marks)**
- ii Which tests would you employ to test the null hypotheses given? **(4 marks)**
- iii Hence carry out the tests for accuracy and precision comparison. **(9 marks)**
- iv What would be the tabulated value at 99% CI for injection /intervention of any suspect value in results of experiment 2 Give your reason. **(2 marks)**
- v Evaluate the relative standard deviation for experiment 1. **(3 marks)**

Q3. Solvent extraction is a separation process where an analyte is extracted in the extracting solvent but may be partially extracted in the non-extracting solvent.

- i Why are separations important? **(2 marks)**
- ii Define the term analyte. **(2 marks)**
- iii List any TWO steps of solvent extraction and briefly describe the process involved. **(6 marks)**
- iv State the property of the solvents used in solvent extraction that would enable separation. **(2 marks)**
- v List TWO application of solvent extraction. **(2 marks)**

- vi Hence calculate the percent extraction when 30ml of 4.3×10^{-2} M of an aqueous solvent is shaken with two successive 15.0ml portion of an organic solvent. **(6 marks)**

Q4. a) In replicate analysis, the confidence limit determines the range which the true value can be found. For two sets of replicate analysis, the accuracy can be compared using the paired t-test.

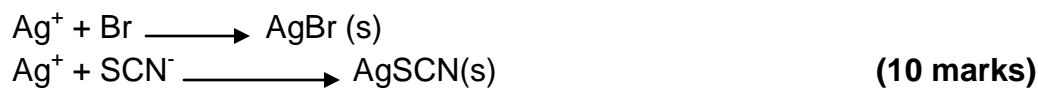
- i List the steps involved in carrying out the paired t-test.
ii Define the term (syonbots) employed in the equation of the confidence limits of the mean. **(10 marks)**

b) State an advantage of the following

- i Masking
ii Washing a precipitate
iii Pooling data sets
iv Acidifying water samples during sampling.
v Classical methods of analysis. **(10 marks)**

Q5. a) A sample weighing 0.6 contains sieves (FW = 108) a solution containing chloride ions (FW = 35) was used in determining the amount of silver in an ion. What is the percentage of silver in the coin if the precipitate weighed 4g? **(10 marks)**

b) Consider the equation below for a back titration. Study the equation and use arbitracry figures to determine the concentration of bromide.



END