



## GARISSA UNIVERSITY

UNIVERSITY EXAMINATION **2017/2018** ACADEMIC YEAR **TWO**  
**FIRST** SEMESTER EXAMINATION

SCHOOL OF EDUCATION, ARTS AND SOCIAL SCIENCES

FOR THE DEGREE OF BACHELOR OF EDUCATION (ARTS)

COURSE CODE: CHE 211

COURSE TITLE: BASIC ANALYTICAL CHEMISTRY

EXAMINATION DURATION: 3 HOURS

**DATE: 01/12/17**

**TIME: 09.00-12.00 PM**

---

### INSTRUCTION TO CANDIDATES

- The examination has SIX (6) questions
- Question ONE (1) is COMPULSORY
- Choose any other THREE (3) questions from the remaining FIVE (5) questions
- Use sketch diagrams to illustrate your answer whenever necessary
- Do not carry mobile phones or any other written materials in examination room
- Do not write on this paper

This paper consists of FOUR (4) printed pages

*please turn over*



**QUESTION ONE (COMPULSORY)**

- (a) State and Explain briefly **Four** fields of applications of Analytical Chemistry [8 marks]
- (b) What is the primary ionization technique in the following Analytical instruments [6 marks]
- i. GC-MS
  - ii. LC-MS
  - iii. ICP-MS
- (c) State any three electrochemical analytical techniques [3 marks]
- (d) 25 cm<sup>3</sup> of a solution of sodium hydroxide reacts with 15 cm<sup>3</sup> of 0.1 mol/dm<sup>3</sup> HCl. What is the molar concentration of the sodium hydroxide solution [6 marks]
- (e) Differentiate between Determinate (systematic) and indeterminate (random) errors in analytical analysis [2 marks]

**QUESTION TWO**

- (a) Describe the following terms and state their acceptable values in a set of analytical analysis data [3 marks]
- i. LOD
  - ii. LOQ
- (b) Describe the basic steps to be followed in a chemical analysis in Analytical Chemistry [3 marks]
- (c) Which technique can be used to separate a soluble solid from the liquid it is dissolved in [1 mark]
- (d) State four desirable properties of standard solutions for Chemical Analysis [2 marks]
- (f) Define the following terms as used in analytical chemistry [2 marks]
- i. Precision
  - ii. Accuracy
- (g) State the three types of chromatography and give their main features [4 marks]

**QUESTION THREE**

- (a) Name two extraction techniques of liquid- liquid mixtures [1 mark]
- (b) Differentiate between [4 marks]
- i. Qualitative analysis
  - ii. Quantitative analysis
- (c) What is the most commonly used stationary phase in reversed phase (RP) HPLC? Give the specific name [2 marks]
- (d) What is the most commonly used stationary phase in gas-liquid chromatography GLC? Specify name [2 marks]
- (e) Which technique can be used to separate an insoluble solid from a liquid [2 marks]
- (f) Name 4 Important requirements expected of primary standards [4 marks]

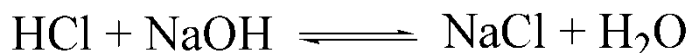


### QUESTION FOUR

- (a) Describe the following terms as used in statistical management of analytical data **[3 marks]**
- Average
  - Standard deviation and Variance
  - Relative standard deviation
- (b) Five measurements of fasting serum glucose concentration were made on the same sample taken from a diabetic patient. The values obtained were 2.3, 2.5, 2.2, 2.6 and 2.5 mM Calculate the following from the data set
- Mode **[1 mark]**
  - Median **[1 mark]**
  - Mean **[1 mark]**
  - standard Deviation **[3 marks]**
  - Variance **[2 marks]**
- (c) Calculate the confidence Interval at 68.3%, 95.5% and 99.7% confidence levels of fasting serum glucose concentration given in question (4,b) above (4 marks )

### QUESTION FIVE

- (a) Two students titrated a 100.00 mL sample of HCl with an unknown concentration with a standardized 0.1339 M NaOH sample.



The students obtained the following results:

Student A: 23.17 mL, 22.69 mL, 23.25 mL, 22.97 mL

Student B: 25.25 mL, 25.19 mL, 25.23 mL, 25.23 mL

- Determine the average (mean) and standard deviation for each student's data set **[5 marks]**
- Which student was more precise? Explain **[2 marks]**
- If the unknown HCl sample has a concentration of 0.0030 M, which student is more accurate **[2 marks]**
- Are the results (titration volumes) obtained by the two students significantly different at the 95% confidence level (Given:  $S_{\text{pooled}} = 0.18$ ) **[3 marks]**
- Using the Q test, decide if the second measurement (22.69 mL) for student A should be discarded **[3 marks]**



### QUESTION SIX

The aluminum (Mol. Wt =26.98 g/mole) in a 1.200g sample of impure ammonium aluminum sulfate was precipitated with aqueous ammonia as the hydrous  $\text{Al}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ . The precipitate was filtered and ignited at  $1000^\circ\text{C}$  to give anhydrous  $\text{Al}_2\text{O}_3$  (Mol. Wt =101.96 g/mole) which weighed 0.1798g. Calculate the percentage of aluminum in the sample. **[15 marks]**

