



**ALUPE UNIVERSITY**  
**COLLEGE**

*... Bastion of Knowledge ...*

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OFFICE OF THE DEPUTY PRINCIPAL  
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

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# UNIVERSITY EXAMINATIONS

## 2020 /2021 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER REGULAR EXAMINATION

**FOR THE DEGREE OF BACHELOR OF  
EDUCATION SCIENCE**

**COURSE CODE: CHE 112**

**COURSE TITLE: INTRODUCTION TO  
ANALYTICAL CHEMISTRY**

**DATE: 24<sup>TH</sup> FEBRUARY 2021**

**TIME: 0900 – 1200 HRS**

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### INSTRUCTION TO CANDIDATES

- SEE INSIDE

THIS PAPER CONSISTS OF 3 PRINTED PAGES

PLEASE TURN OVER

**CHE 112: INTRODUCTION TO ANALYTICAL CHEMISTRY****STREAM: BED (Science)****DURATION: 3 Hours**

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**INSTRUCTIONS TO CANDIDATES**

- i. Answer *ALL* questions.
- ii. Diagrams may be used whenever they serve to illustrate the answer

**Question One**

- a) Briefly discuss the term quantitative analysis. (2 Marks)
- b) Using examples differentiate between chemical and physical methods of quantitative analysis. (4 Marks)
- c) Highlight four steps involved in analysis process. (4 Marks)
- d) Calculate the analytical and equilibrium molar concentrations of the solute species in an aqueous solution that contains 285 mg of trichloroacetic acid (HA),  $\text{Cl}_3\text{CCOOH}$  (163.4 g/mol) in 10.0 ml. Trichloroacetic acid (HA) is 73% ionized in water. (6 Marks)
- e) For an analysis to be complete, it requires a combination of two methods. Explain. (2 Marks)

**Question Two**

- a) The methods of quantitative analysis are subdivided into three. Discuss. (6 Marks)
- b) Analysis of a sample of iron ore gave the following percentage values for the Iron content: 7.08, 7.21, 7.12, 7.09, 7.16, 7.14, 7.07, 7.14, 7.18, and 7.11. Calculate the mean, standard deviation and coefficient of variation for the values. (5 Marks)
- c) Highlight five methods used to reduce systematic errors. (2.5 Marks)
- d) Write short notes on the following
  - i. random and systematic errors (2 Marks)
  - ii. precision and accuracy (2 Marks)

**Question Three**

- a) The following values were obtained for the determination of cadmium in a sample of dust: 4.3, 4.1, 4.0, 3.2, 4.2, 3.9, 4.0  $\mu\text{g/g}$ . Should the value 3.2 be rejected? (Q-critical is 0.570) (3.5 Marks)
- b) Outline four advantages of gravimetric analysis. (4 Marks)
- c) Discuss three factors that determine a successful analysis by precipitation. (6 Marks)
- d) Discuss the four types of water that precipitates may contain. (4 Marks)

**Question Four**

- a) State three purposes that solvent extraction may serve in analytical applications. (3 Marks)
- b) Briefly discuss the three basic methods of liquid-liquid extraction generally utilized in the analytical laboratory. (6 Marks)
- c) State four conditions a reaction must fulfill during titrimetric analysis. (4 Marks)
- d) Separation techniques can be considered to fall into two main groupings. Discuss (2 Marks)
- e) Discuss the three factors influencing the extraction efficiency. (3 Marks)

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