



MOI UNIVERSITY

OFFICE OF THE DEPUTY VICE CHANCELLOR
(ACADEMICS, RESEARCH & EXTENSION)

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER EXAMINATION

FOR THE DEGREE OF

BACHELOR OF EDUCATION (SCIENCE)

COURSE CODE: CHE 112

COURSE TITLE: INTRODUCTION TO ANALYTICAL CHEMISTRY

DATE: 15TH FEBRUARY, 2018 **TIME:** 8.00 A.M. – 11.00 A.M.

INSTRUCTION TO CANDIDATES

- SEE INSIDE.

MOI UNIVERSITY

SCHOOL OF EDUCATION

END OF SEMESTER EXAM

DEPARTMENT: CENTRE FOR TEACHER EDUCATION

COURSE TITLE: INTRODUCTION TO ANALYTICAL CHEMISTRY

COURSE CODE: CHE 112

YEAR OF STUDY: 1

SEMESTER: I

SESSION: SEPT- FEB, 2017/2018

DEGREE PROGRAMME: BACHELOR OF EDUCATION SCIENCE

Time: 3 hours

SECTION A

Instructions: Answer all questions

1. a) Describe the following terms as used in analytical chemistry (6 mks)
- Selective reaction
 - Specific reaction
 - Accuracy
 - Analyte
 - Precision
 - Sample
- b) The results of a certain analysis are 32.98g compared with the accepted value 34.06g. What is the relative error in parts per thousand (3 mks)
- c) The following replicate weighings were obtained 29.8, 30.2, 28.6 and 29.7 mg. Calculate the standard deviation of the individual values and standard deviation of the mean and variance. Express this as absolute units of measurement and relative value (11 mks).
- d) A soda ash sample is analysed in the analytical chemistry laboratory by titration with standard hydrochloric acid. The analysis was prepared in replicate with the following results 93.50, 93.58 and 93.43% Na_2CO_3 . Within what range are you 95% confident that the true value lies given that $t = 4.3.3$ and the calculated standard deviation is 0.075% Na_2CO_3 (5 mks).
- e) State

$$(23 \times 2) + 2 + 16 \times 3 = 106 \checkmark$$

- i. Two properties of an ideal precipitating agent (2 mks)
- ii. Three properties of an ideal precipitate (3 mks)

SECTION B

Instructions: Answer any Four Questions

2. Describe the process of a successful gravimetric analysis (10 mks) ✓

3. a) Define the following terms as used in titrimetry (5 mks)

- i. Standard Solution
- ii. Titrant
- iii. Titrand
- iv. Equivalence Point
- v. End Point

b) Calculate the pOH and pH of a 5×10^{-2} M solution of sodium hydroxide (5 mks)

4. Describe stages of an analytical process (10 mks) ✓

5. a) State four properties of a good primary standard (4 mks) ✓

b) The Aluminium (FW=26.98g/mole) in a 1.200g sample of impure ammonium aluminium sulphate was precipitated with aqueous ammonia as the hydrous aluminium sulphate. The precipitate was filtered and ignited at 1000°C to give anhydrous Al_2O_3 (FW= 101.96 g/mole) which weighed 0.1798g. Calculate the percentage of aluminium in the sample (6 mks).

6. a) Distinguish between inclusion and occlusion co-precipitation (2 mks)

b) Discuss the following separation techniques giving their industrial applications

- i. Gas Chromatography (4 mks)
- ii. Liquid-liquid Extraction (4 mks)