



MURANG'A UNIVERSITY OF TECHNOLOGY
SCHOOL OF PURE, APPLIED AND HEALTH SCIENCES
DEPARTMENT OF HEALTH SCIENCES

TVET EXAMINATION

2023/2024 ACADEMIC YEAR

**FIRST YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN
SCIENCE LABORATORY TECHNOLOGY**

SLT-CU-SL-CR-03-6-A - CHEMISTRY TECHNIQUES

DURATION: 3 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Answer question one and any other three questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (40 MARKS)

- a) Differentiate between back titration and displacement titration. (4 marks)
- b) The % w/w of I in a 0.6712g sample was determined by a volhard titration. After adding 50.00ml of 0.05619m AgNo₃ and allowing the precipitate to form, the remaining silver was back titrated with 0.05322m KSCN, requiring 35.14ml to reach the end point. Calculate the % w/w of I in the sample. (7 marks)
Molar mass of I = 126.9
- c) Differentiate between simple and fractional distillation. (2 marks)
- d) Using a diagram, explain how sublimation is used to separate samples. (5 marks)
- e) Differentiate between separation and extracting techniques. (4 marks)
- f) Explain how recrystallization is used to separate a mixture of solid benzoic acid and solid naphthalene. (5 marks)
- g) A concentrated solution of ammonia is 28.0% w/w NH₃ and has a density of 0.899g/ml. What is the molar concentration of NH₃ in the solution? (5 marks)
- h) Differentiate between homogenous and heterogeneous solution. (4 marks)
- i) State two techniques used to purify samples in the laboratory. (2 marks)
- j) Explain why it is not advisable to use a universal indicator in a titration. (2 marks)

SECTION B – ANSWER ANY THREE QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

- a) Differentiate between liquid chromatography and gas chromatography. (10 marks)
- b) State two application of HPLC in pharmaceuticals companies. (2 marks)
- c) Explain how centrifuge is used to separate samples. (8 marks)

QUESTION THREE (20 MARKS)

- a) Explain how soxhlet extractor is used to extract samples. (10 marks)
- b) State three importance of extraction in chemistry. (3 marks)
- c) Calculate the amount of pure calcium nitrate required to prepare one litre of 250mpm nitrate ions solution, (Ca(NO₃)₂) =64 (7 marks)
N = 14
O = 16

QUESTION FOUR (20 MARKS)

- a) The concentration of Cl in a 100.00ml sample of water drawn from a fresh water aquifer suffering from encroachment of sea water, was determined by titrating with 0.0516M Hg(NO₃)₂. The sample was acidified and titrated to the diphenylcarbazone end point, requiring 6.18ml of the titrant – calculate the concentration of Cl in ppm. (6 marks)

- b) Differentiate between accuracy and precision. (4 marks)
- c) Explain three methods used to determine sample purity in the lab. (10 marks)

QUESTION FIVE (20 MARKS)

- a) An ore containing magnetic, Fe_3O_4 was analysed by dissolving a 1.5419(g) sample in concentrated HCL, giving a mixture of Fe^{2+} and Fe^{3+} . After adding HNO_3 to oxidise any Fe^{3+} precipitation as $\text{Fe}(\text{OH})_3$ by adding NH_3 . After filtering and rinsing the residue was ignited, giving 0.8525(g) of pure Fe_2O_3 . Calculate the % w/w Fe_3O_4 in the sample. $\text{Fe}_3\text{O}_3 = 159.69$, $\text{Fe}_3\text{O}_4 = 231.34$. (7 marks)
- b) Explain how analytical balance is used in laboratory giving its adaptability features. (7 marks)
- c) Explain three importance of sample preparation. (6 marks)