



MAASAI MARA UNIVERSITY

**REGULAR UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR
FOURTH YEAR FIRST SEMESTER**

**SCHOOL OF PURE, APPLIED AND HEALTH
SCIENCES (SPAHS)**

BACHELOR OF SCIENCE IN CHEMISTRY

COURSE CODE: CHE 4134-1

COURSE TITLE: ANALYTICAL CHEMISTRY IV

DATE: 14/12/ 2023

TIME: 1430-1630 HRS

INSTRUCTIONS TO CANDIDATES

1. Answer Question **ONE** and any other **ONE** questions in section **B**
2. No writing on the Question paper
3. Use of mobile phone in the exam room is prohibited

QUESTION ONE

[20 MARKS]

- A. Define the following terms;
- i. Polarography (1 mark)
 - ii. Voltammetry (1 mark)
 - iii. Chromatography (1 mark)
 - iv. Electro-analysis (1 mark)
- B. Using a well-labeled diagram, explain the working principles of a;
- i. Amperometry (3 marks)
 - ii. Conductometry (3 marks)
- C. Describe the four types of currents observed during polarography citing their sources (3 marks)
- D. Why is a dropping mercury electrode used in polarography? (1 mark)
- E. Discern between;
- i. Anodic stripping and cathodic stripping (1 marks)
 - ii. Staircase and differential scanning voltammetry (1 marks)
- F. Write the Ilkovic equation explaining all variables used (2 marks)
- G. Describe any three types of electrodes as used in amperometry (3 marks)
- H. Using appropriate diagrams, illustrate three types of conductometric titrations (4 marks)

QUESTION TWO

[15 MARKS]

Using a well-labeled diagram, explain the working principles of a;

- a) Polarography [3 marks]
 - b) Cyclic voltammetry [3 marks]
- a) Briefly describe the following types of current experienced during polarography;
- i. Limiting current [1 mark]
 - ii. Residual current [1 mark]
 - iii. Diffusion current [1 mark]
 - iv. Migration current [1 mark]
- b) Draw the working set-up used during amperometry briefly describing the role of all the electrodes used [3 marks]
- c) Use relevant examples and graphs to illustrate the ONE main types of conductometric titrations [2 marks]

QUESTION THREE

[15 MARKS]

- a) What is the major working principle of any chromatographic method? [1 marks]
- b) State any three types of detectors used in liquid chromatography [2 marks]
- c) Explain the working mechanisms of the following voltametric methods using voltammograms;
 - i. Linear sweep voltammetry [3 marks]
 - ii. Square wave voltammetry [3 marks]
 - iii. Anodic stripping voltammetry [3 marks]
 - iv. Cyclic voltammetry [3 marks]

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