



MACHAKOS UNIVERSITY

University Examinations 2023/2024

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

FIRST YEAR FIRST SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE

(PUBLIC HEALTH)

HPH 103: LABORATORY METHODS FOR PUBLIC HEALTH

DATE:

TIME:

INSTRUCTIONS:

- The paper consists of **two** sections.
- Section **A** is **compulsory** (30 marks).
- Answer any **two** questions from section **B** (each 20 marks).

SECTION A

QUESTION ONE (30 MARKS)

- a) Define the following terms
- i. pH (3 marks)
 - ii. Buffer. Give an example of a natural buffer and state its significance (3 marks)
 - iii. A standard solution (3 marks)
- b) State four major safety requirements in a chemistry laboratory (4 marks)
- c) After completing an experiment, explain where all chemical wastes should be kept (3 marks)
- d) Explain if someone accidentally spills a small amount of acid on the lab bench what should be done. (2 marks)
- e) Explain the procedure of cleaning a new glassware by use of 1% HCl (2 marks)
- f) Describe the preparation of 2.0 L of 0.05 M AgNO_3 (169.87 g/mol) from the primary-standard-grade solid. (5 marks)

- g) A 50.00 mL portion of an HCl solution required 29.71 mL of 0.01963 M Ba(OH)₂ to reach an end point with bromocresol green indicator. Calculate the molarity of the HCl. (5 marks)

SECTION B

QUESTION TWO (20 MARKS)

- a) Describe the following laboratory apparatus providing their uses
- i. Crucible: (2 marks)
 - ii. Volumetric Flasks: (2 marks)
 - iii. Dropper: (2 marks)
- b) Explain why eye protection devices are worn in the laboratory. (2 marks)
- c) In the event one doesn't understand a direction or part of a laboratory procedure, explain what one should do (3 marks)
- d) Distinguish between the precision and accuracy when doing an experiment. (4 marks)
- e) Titration of 0.2121 g of pure Na₂C₂O₄ (134.00 g/mol) required 43.31 mL of KMnO₄. Write a balanced chemical reaction equation and determine the molarity of the KMnO₄ solution. (5 marks)

QUESTION THREE (20 MARKS)

- a) Explain how soap interfere with titration results if the glassware is not well rinsed (3 marks)
- b) Explain with examples the difference between a strong acid and a weak acid (4 marks)
- c) Which of the acids above have a strong conductivity. Provide a reason for your choice. (2 marks)
- d) List six analytical chemistry steps followed in chemical analysis (6 marks)
- e) Determine the number of grams of NaOH required to make 250 cm³ solution of 0.025 M NaOH solution? (5 marks)

QUESTION FOUR (20 MARKS)

- a) Define an error in measurement and state its consequence. (2 marks)
- b) When estimating the area covered by an object:
- i. What type of error might you make (2 marks)
 - ii. What sources might cause the error (2 marks)

- iii. Explain what you can do to reduce the amount of error that might occur
(4 marks)
- c) Calculate the pH of a 0.5 M solution of acetic acid, if the K_a of acetic acid is 2×10^{-5}
(4 marks)
- d) Define acids and bases under the following theories: Arrhenius, Brønsted–Lowry and Lewis giving example in each case
(6 marks)

QUESTION FIVE (20 MARKS)

- a) Define a standard solution and state two characteristics of a primary standard solution
(4 marks)
- b) Discuss five uses of acids and bases
(5 marks)
- c) Define a mixture and give an example
(3 marks)
- d) Discuss the characteristics of a mixture giving examples
(4 marks)
- e) Calculate the hydronium and hydroxide ion concentrations in a 3×10^{-2} M NaOH solution
(4 marks)