



MACHAKOS UNIVERSITY

University Examinations for 2020/2021 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

FIRST YEAR FIRST SEMESTER EXAMINATION FOR
BACHELOR OF SCIENCE (FOOD NUTRITION AND DIETETICS)
BACHELOR OF SCIENCE TELECOMMUNICATION AND INFORMATION
TECHNOLOGY
BACHELOR OF EDUCATION (SPECIAL NEEDS)
BACHELOR OF SCIENCE (MATHEMATICS)
BACHELOR OF EDUCATION (SCIENCE)

SCH 100/HFN 142: FUNDAMENTALS OF INORGANIC CHEMISTRY

DATE: /12/2022

TIME: 8:30-10:30 AM

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: COMPULSARY

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) i. What are isotopes? (2 marks)
ii. List two examples of Isotopes (2 marks)
- b) i. State the Pauli Exclusion Principle (1 mark)
ii. Briefly explain the Pauli Exclusion Principle (2 marks)
iii. Illustrate the arrangement of two electrons in the 1S orbital (1 mark)

- c) Define the following terms according to Brønsted and Lowry theory
- i. Acid (1 mark)
 - ii. Base (1 mark)
- d) State Plank's quantum theory (2 marks)
- e) i. State three concepts of John Dalton that form the basis of chemistry (3 marks)
- ii. State the major limitation of in the John Daltons concept of an atom (1 mark)
- f) Workout the molecular mass of the following molecules;
- i. NBr_3 (Given $\text{N}=14.007 \text{ u}$; $\text{Br}=79.904 \text{ u}$). (3 marks)
 - ii. Dinitrogen trioxide, N_2O_3 (Given $\text{N}=14.007 \text{ u}$; $\text{O}=15.999 \text{ u}$). (3 marks)
- g) State the four assumptions made by Niels Bohr to explain hydrogen spectra (4 marks)
- h) i. What is chemical bonding? (2 marks)
- iii. Describe the major types of chemical bonds (2 marks)

QUESTION TWO (20 MARKS)

- a) Distinguish between a strong acid and a weak acid giving specific examples (3 marks)
- b) Determine the pH of $10^{-1} \text{ mol dm}^{-3} \text{ HCl}$ (0.1 M HCl)? (4 marks)
- c) Determine the pH of $10^{-3} \text{ mol dm}^{-3} \text{ H}_2\text{SO}_4$ (0.001 M H_2SO_4)? (3 marks)
- d) The pH of 0.01 mol dm^{-3} of ethanoic acid (acetic acid), CH_3COOH is 3.40 at 25°C . Determine the dissociation constant of ethanoic acid at this temperature? (10 marks)

QUESTION THREE (20 MARKS)

- a) Elements X and Y (not their actual symbols) have atomic number 13 and 82 respectively. To which period and groups do they belong? Show your working. (6 marks)
- b) Discuss the following historical atomic theories and models
- i. J. J. Thomson (4 marks)
 - ii. Ernest Rutherford (5 marks)
 - iii. Niels Bohr (5 marks)

QUESTION FOUR (20 MARKS)

- a) Illustrate the Balmer series of atomic hydrogen excited by electric discharge. (10 marks)
- b) Illustrate the various series in hydrogen spectrum (10 marks)

QUESTION FIVE (20 MARKS)

- a) State two laboratory tests for cation identification (2 marks)
- b) Explain the importance of rules in a qualitative laboratory, especially for identification of cations and anions (1 mark)
- c) State four basic rules in a qualitative laboratory for identification of cations and anions in solution (4 marks)
- d) Briefly describe the test for the following;
- i. Sulphates (3 marks)
 - ii. Halides (6 marks)
 - iii. Carbonates (4 marks)