



MACHAKOS UNIVERSITY

University Examinations for 2022/2023 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

FIRST YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (ELECTRICAL AND ELECTRICAL ENGINEERING)

BACHELOR OF SCIENCE (MECHANICAL ENGINEERING)

BACHELOR SCIENCE (CIVIL ENGINEERING)

ECU 100/ECU 113: CHEMISTRY FOR ENGINEERS I

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).

QUESTION ONE (COMPULSORY) (30 MARKS)

- a) Define the following terms and give specific example for each;
- Functional group (2 marks)
 - Hydrocarbons (2 marks)
- b) How many Neutrons are in iron as shown below? (1 mark)
- $${}_{26}^{56}\text{Fe}$$
- c) Distinguish between Nuclear fission and Nuclear fusion (2 marks)
- d) Identify the four lines in the Balmer series of hydrogen (4 marks)
- e) Other than Balmer series found in the visible region of electromagnetic radiation of hydrogen, give other four series found in the other parts of the spectrum (4 marks)
- f) State the three gas laws (6 marks)
- g) Relate the tendency of atoms to gain or lose electrons to the types of bonds they form. (3 marks)

- h) What is the wavelength, in nanometres, of green light having a frequency of $6.67 \times 10^{14} \text{ s}^{-1}$? (Given: $C = 3.0 \times 10^8 \text{ m/s}$) (6 marks)

QUESTION TWO (20 MARKS)

- a) Discuss the following historical atomic theories and models
- i. Ernest Rutherford (5 marks)
 - ii. Niels Bohr (5 marks)
- b) Calculate the number of moles, and number of atoms of H, S, and O in 5 moles of H_2SO_4 (Given Avogadro's number as 6.022×10^{23}) (10 marks)

QUESTION THREE (20 MARKS)


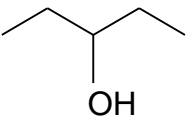
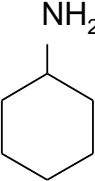
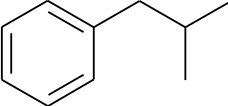
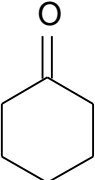
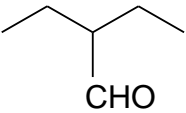
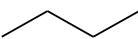
- a) Calculate the wavelengths of the radiations by a hydrogen atom when an electron makes the following transition: $n_2 = 4$ to $n_1 = 2$ (6 marks)
- b) Give the Schrödinger equation and explain what it represents (4 marks)
- c) State the symbols and names of the four set of quantum numbers that are used to uniquely define atomic orbitals (8 marks)
- d) Boron atom has a total of five electrons. Work out its electronic configuration (2 marks)

QUESTION FOUR (20 MARKS)

- a) i. State the three types of nuclear radiations (3 marks)
ii. Describe the properties of the above nuclear radiations in Qn 4i (12 marks)
- b) Illustrate the five d-orbitals in two dimensional drawings (5 marks)

QUESTION FIVE (20 MARKS)

- a) Compare the atomic and ionic radius of each of the following;
- i. Calcium atom and calcium ion (4 marks)
 - ii. Chlorine atom and chloride ion (4 marks)
- b) Elements in the periodic table are classified into blocs
- i. Identify four blocks in the periodic table (4 marks)
 - ii. Identify the criteria for naming these blocs (1 mark)
- c) Identify the functional group in the following organic molecules

Structure	Functional group
	i.....
	ii.....
	iii.....
	iv.....
	v.....
	vi.....
	vii.....

(7 marks)