



KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR**

**FIRST YEAR FIRST SEMESTER
SPECIAL/SUPPLEMENTARY EXAMINATIONS**

**FOR THE DEGREE OF BSC CHEMISTRY, BACHELOR OF
AGRICULTURAL ECONOMICS AND RESOURCE MANAGEMENT AND
BSC AGRICULTURE AND BIOTECHNOLOGY**

COURSE CODE: SCH 111

COURSE TITLE: INTRODUCTION TO INORGANIC CHEMISTRY

DATE: 29/09/2021

TIME: 11:00-1:00PM

INSTRUCTIONS TO CANDIDATES:

- Answer **Question ONE (Compulsory)** and any other **TWO (2)** questions
- Indicate answered questions on the front cover of your answer booklet
- Start each question on a new page and make sure the question's number is written on each page

TIME: 2 Hours

Constants: 1 mole = 6.02×10^{23} particles

This paper consists of 4 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

Question 1 [30 Marks]

- a. State the Aufbau Principle [2 Marks]
- b. Identify the isotope of Chromium with the same number of neutrons as Zn-65 [5 Marks]
- c. Determine the volume of 4.55×10^6 atoms of Nickel (density 8.908 g/cm^3) [5 Marks]
- d. Describe the four principles of Bohr's atomic theory [8 Marks]
- e. Determine the numbers of the following atoms in 12 g of $\text{Fe}(\text{MnO}_4)_3$
- i. Oxygen [4 Marks]
 - ii. Manganese [3 Marks]
- f. Describe covalent and ionic bonds giving an example for each [3 Marks]

Question 2 [20 Marks]

- a. Draw each of the following orbitals and indicate the maximum number of electrons they can hold [9 Marks]
- i. 1s
 - ii. 2p
 - iii. 3d
- b. List all the sets of 4 quantum numbers used to describe the electrons in a 4f orbital [6 Marks]
- c. Draw the Lewis electron structure for the species below. [5 Marks]
- i. NCl_3
 - ii. NOCl

Question 3 [20 Marks]

- a. For each of the following ions, indicate the; chemical formula and charge, the chemical formula for the compound each anion would form with K^+ and with Ca^{2+} . [4 Marks]
- i. sulfate
 - ii. acetate
 - iii. nitrate
 - iv. chloride
 - v. carbonate

Question 4 [20 Marks]

- a. Describe four trends observed in periods and groups of the periodic table and describe the reasons for each [8 Marks]
- b. Study the table below and answer the questions

Element	X	Y	Z
Mass Number	20	53	35
No. of neutrons	13	28	19

- i. Determine the atomic number of each element [3 Marks]
- ii. Draw the electron filling diagram for each element e.g He $\begin{array}{|c|} \hline \uparrow\downarrow \\ \hline \end{array}$ _{1s} [6 Marks]
- iii. Indicate the group and period to which each element belongs [3 Marks]

Question 5 [20 Marks]

A solution of alcohol based sanitizer consists of 75% v/v isopropanol. Given the density of isopropanol as 0.785 g/mL, determine;

- a. The total number of water and isopropanol molecules in 500 ml of the solution [14 Marks]
- b. The number of carbon, hydrogen and oxygen atoms in the solution [6 Marks]

