



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS (MAIN PAPER)
2023/2024 ACADEMIC YEAR**

FIRST YEAR FIRST SEMESTER EXAMINATIONS

**FOR THE DIPLOMA
IN
MEDICAL BIOTECHNOLOGY & MEDICAL LABORATORY
SCIENCES**

COURSE CODE: DMB/DML 114.

COURSE TITLE: INORGANIC AND PHYSICAL CHEMISTRY

DATE: 6TH DECEMBER 2023

TIME: 2.00-4.00PM

INSTRUCTIONS TO CANDIDATES

This paper is divided into three sections, **A B** and **C**, carrying respectively: Multiple Choice Questions (**MCQs**), Short Answer Questions (**SAQs**) and Long Answer Questions (**LAQs**). Answer all questions. **DO NOT WRITE ON THE QUESTION PAPER**

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 5 Printed Pages. Please Turn Over.

SECTION A: Multiple Choice Questions (20 Marks)

1. What does the position of an element in the periodic table primarily depend on?
 - A. Atomic mass
 - B. Atomic number
 - C. Number of valence electrons
 - D. Ionization energy
2. Which trend increases from left to right across a period in the periodic table?
 - A. Atomic radius
 - B. Ionization energy
 - C. Electronegativity
 - D. Metallic character
3. Which category of elements is typically located on the right side of the periodic table?
 - A. Metals
 - B. Metalloids
 - C. Nonmetals
 - D. Noble gases
4. Spherical shaped orbitals that can hold up to a maximum of 2 electrons are known as?
 - A. p orbitals
 - B. s orbitals
 - C. d orbitals
 - D. f orbitals
5. The direction of spin of an electron is denoted by the symbol _____
 - A. n
 - B. ml
 - C. ms
 - D. l
6. What is the property that decreases from top to bottom within a group on the periodic table?
 - A. Atomic radius
 - B. Electronegativity
 - C. Ionization energy
 - D. Metallic character
7. Which chemical symbol represents the element with the atomic number 26?
 - A. Fe
 - B. Zn
 - C. Co
 - D. Ni
8. Where are the lanthanides and actinides positioned in the periodic table?
 - A. Row 7
 - B. Between group 2 and group 13
 - C. Row 6
 - D. Bottom two rows at the bottom of the periodic table
9. The Hund's rule states that _____
 - A. Electrons fill the lowest energy levels first before moving to higher energy levels
 - B. No two electrons in an atom have the same quantum numbers
 - C. Electrons tend to occupy different orbitals within the same energy level
 - D. Energy levels can hold a maximum of two electrons with opposite spins

10. The concept of infinite variety was first described by _____
- A. Andrew Bohr
 - B. Democritus
 - C. John Dalton
 - D. Joseph Thompson
11. The element with the highest atomic radius in a period is generally found _____
- A. At the beginning of the period
 - B. At the middle of the period
 - C. At the end of the period
 - D. Anywhere in the period
12. The Gold foil experiment led to _____
- A. Discovery of the atom
 - B. Development of the plum pudding model
 - C. Discovery of the Nucleus
 - D. Discovery of the electron
13. Which group of elements is known for their high reactivity and tendency to form ionic compounds?
- A. Alkali metals
 - B. Alkaline earth metals
 - C. Halogens
 - D. Noble gases
14. Which among the following is not a characteristic of metals?
- A. Their delocalized electrons move freely
 - B. They are good conductors of electricity
 - C. Their atoms share a sea of electrons
 - D. They lack malleability
15. The property conferred to a molecule based on arrangement of its atoms is known as?
- A. Hybridization energy
 - B. Molecular geometry
 - C. Resonance
 - D. Radioactivity
16. The formula that represents the actual number of each type of atom in a molecule is _____
- A. Atomic formula
 - B. Chemical formula
 - C. Molecular formula
 - D. Empirical formula
17. Which of the following categories of elements is a semiconductor?
- A. Metals
 - B. Nonmetals
 - C. Metalloids
 - D. Noble gases
18. Which category of elements has properties intermediate between metals and nonmetals?
- A. Alkali metals
 - B. Alkaline earth metals
 - C. Metalloids
 - D. Halogens

19. Which element has the highest ionization energy?
- Oxygen
 - Fluorine
 - Lithium
 - Neon
20. The number of protons in an atom is the same as the _____
- Atomic mass number
 - Atomic number
 - Mass number
 - Neutron number

SECTION B: Short Answer Questions (40 Marks)

- Element A has an atomic mass of 23 and 12 neutrons and element B has atomic mass of 7 and 4 neutrons
 - Draw the electron configuration of both elements (4 marks)
 - Which element has higher ionization energy? Explain (4 marks)
- Element M has two isotopes M_1 with a relative atomic mass of 62.93 and an abundance of 69.09 and M_2 with a relative atomic mass of 64.93 and an abundance of 30.91. Calculate the relative atomic mass of element M (4 marks)
- Distinguish between a covalent bond and a co-ordinate bond (4 marks)
 - Draw a diagram showing bonding in an ammonium ion ($N=7, H=1$) (2 marks)
- An element X has an atomic number of 12 and a relative atomic mass of 24.3, it consists of three isotopes of mass numbers 24, 25 and 26
 - What is the mass number of the most abundant isotope (2 marks)
 - How many neutrons does the nucleus of the isotope with a mass number of 26 contain (2 marks)
 - What is the oxidation number of the ion formed by X (2 marks)
- Write a balanced chemical equation for the following;
 - Formation of sodium peroxide (4 marks)
 - Reaction of sodium peroxide with water (4 marks)
- Write the chemical formula for the following
 - Copper sulphate pentahydrate (2 mark)
 - Aluminum chloride (2 mark)
- Calculate the formula weight of the following compounds
 - $Al_2(SO_4)_3 \cdot 18H_2O$ (2 mark)
 - $Fe_2(SO_4)_3$ (2 mark)

SECTION C: Long Answer Questions (60 Marks)

- Describe the process of preparing a 1 molar solution of hydrochloric acid and a 1 Molar solution of Sodium hydroxide (20 marks)
- Discuss various types of bonds stating their examples and illustrating their structures (20 marks)
- Discuss the modern atomic theory and contributions of various scientists to its development (20 marks)