



MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

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University Examinations 2022/2023

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF TECHNOLOGY IN CIVIL ENGINEERING

SCS 3111: PHYSICAL INORGANIC CHEMISTRY

DATE: APRIL 2023

TIME: 2 HOURS

INSTRUCTIONS: *answer question one and any other two questions*

QUESTION ONE (30 MARKS)

- a) Write the electronic configuration of the following atoms using spdf notations (3 marks)
- Na = 11
Cl = 17
C = 6
- b) Differentiate between frequency and wavelength (2 marks)
- c) Differentiate between family and group in reference to elements in the periodic table (2 marks)
- d) Define the following forms (4 marks)
- i) Atomic radius
ii) Ionization energy
- e) Illustrate hydrogen bonding using methanol molecule as an example (3 marks)
- f) Define the following terms (3 Marks)
- i) Radioactivity
ii) Isotopes
iii) Nucleons

- g) What is half-life ($t_{1/2}$) of a radioactive substance? (2 marks)
- h) Define the following terms (3 marks)
- (i) pH
 - (ii) Acid
 - (iii) Base
- i) Define chemical equilibrium (2 marks)
- j) Define the term thermochemistry (2 marks)
- k) Differentiate between exothermic and endothermic reactions. Give an example
- l) Define the following terms (4 marks)
- (i) Bond energy
 - (ii) Potential energy

QUESTION TWO (20 MARKS)

- a) Discuss uses and applications of radioactivity (10 marks)
- b) Discuss covalent bonding (10 marks)

QUESTION THREE (20 MARKS)

- a) Discuss the factors that affect chemical equilibrium using the following equation (10 marks)
- $$\text{SO}_{2(g)} + \frac{1}{2}\text{O}_2 \rightleftharpoons \text{SO}_{3(g)} \quad (10 \text{ marks})$$
- b) The solubility product for PbI_2 is 8.49×10^{-9} (298K). calculate the solubility of PbI_2 in grams per 100g of water (10 marks)

QUESTION FOUR (20 MARKS)

- a) Discuss the following trends down a group and across a period in the periodic table (8 marks)
- i) Atomic radius
 - ii) Ionization energy
 - iii) Electronegativity
 - iv) Electron affinity
- b) Discuss industrial application of electrolysis (12 marks)