OFFICE OF THE DEPUTY VICE CHANCELLOR
ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2023/2024 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER REGULAR EXAMINATION

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: CHE 210

COURSE TITLE: ATOMIC STRUCTURE AND BONDING

DATE: 20TH DECEMBER 2023 **TIME:** 2.00PM – 5.00PM

INSTRUCTION TO CANDIDATES

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CHE 210

REGULAR – MAIN EXAM

CHE 210: ATOMIC STRUCTURE AND BONDING

STREAM: BED (Sci) **DURATION: 3 Hours**

INSTRUCTIONS TO CANDIDATES

i. *Answer ALL questions.*

ii. *Diagrams may be used whenever they serve to illustrate the answer.*

Question One (14 Marks)

a) Explain any two assumptions of Bohr model of the atom. (4 Marks)

b) Explain the aspects of the Bohr theory that is considered unsatisfactory as a result of the Heisenberg uncertainty principle. (3 Marks)

c) State three principles of Aufbau principle for filling electron configurations. (3 Marks)

d) Give possible Lewis structures for XeO_3, an explosive compound of xenon. Which Lewis structure or structures are most appropriate according to the formal charges? (Xe = 54, O = 8) (4 Marks)

Question Two (14 Marks)

a) State Pauli's exclusive principle. (2 Marks)

b) Draw the Lewis structure for ammonium ion. (2 Marks)

c) Define the term resonance (2 Marks)

d) Draw the resonance structure of NO_3^- (N = 7, O = 8) (3 Marks)

e) Write the electron configuration for

i. Potassium. (19) (2 Marks)

ii. Aluminium.(13) (2 Marks)

f) State the hybridization type present in the following molecules (2 Marks)

Question Three (14 Marks)

a) Explain the difference between electron affinity and electronegativity (4 Marks)

b) Identify any two elements that deviate from the octet rule and in each case draw the structure of the molecule and state the number of electrons in the central atom (4 Marks)

c) Explain the reason why H_2S is a gas at room temperature with a boiling point of -101°C while H_2O is a liquid with a boiling point of 100°Cat sea level. (3 Marks)

d) Explain the relationship between the number of lone pairs of electrons in a molecule and bond angles of the molecule in question. (3 Marks)

Question Four (14 Marks)

a) State the significance of the following

i. Radial distribution function. (2 Marks)

ii. Angular wave function. (2 Marks)

b) Clearly explain the four quantum numbers necessary to describe the behavour of an electron in an atom and state the significance of each. (8 Marks)

c) Explain the main postulate of the VSEPR model. (2 Marks)

Question Five (14 Marks)

a) State three properties of compounds with giant covalent structure (3 Marks)

b) What are fundamental particles? (1 Mark)

c) State any 4 fundamental particles found in the standard model of particle physics (4 Marks)

d) Draw the Lewis structure for the following molecules. (6 Marks)

i. CN^- (C = 6, N = 7)

ii. $BeCl_2$ (Be = 4, Cl = 17)

iii. Water (H = 1, O = 8)

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