CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DIPLOMA

CHEM 0102: BASIC CHEMISTRY

STREAMS: DIPLOMA   **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 08/04/2020   **11.30 A.M. – 1.30 P.M.**

INSTRUCTIONS:
- **Answer all questions in section A and any other two in section B.**
- **Do not write anything on the question paper.**
- **Electronic calculators may be used.**

SECTION A
QUESTION ONE (30 MARKS)

(a)   Define the following terms.

    (i)   Isotopes   (2 marks)

    (ii)   Mas number   (1 mark)

    (iii)   Atomic number   (1 mark)

(b)   Write the ground state electronic configuration of the following elements. (3 marks)

    (i)   Na
    (ii)   B
    (iii)   C

(c)   Draw the Lewis structures of the following

    (i) PCl_5 (2 marks)
    (ii) BF_3 (2 marks)
    (iii) CH_4 (2 marks)

(d)   Discuss three types of intermolecular forces.   (6 marks)

(e)   State the applications of radioisotopes and controlled radiation in agriculture. (3 marks)

(f)   Discuss the factors that affect the rate of reaction.   (8 marks)

SECTION B

QUESTION TWO (20 MARKS)

(a)   Distinguish between constitutional isomers and stereoisomers.   (4 marks)

(b)   Name the following compounds.   (8 marks)

(c)   State the solvent properties of water.   (3 marks)

(d)   Calculate the P^H of $10^{-12}H_3O^+$ solutions.   (2 marks)

(e)   Boron (z=5) has two naturally occurring isotopes. Find the percentage abundance of ^{10}B and ^{11}B. Given these data: atomic mass of $B = 10.81$amu and isotopic mass of $^{10}B = 10.0129$ amu and isotopic mass of $^{11}B = 11.0093$ amu.   (3 marks)

QUESTION THREE

(a)   Define the following terms.   (3 marks)

        (i)   Aliphatic compound

        (ii)   Hydro carbons

(b)   State the Pauli's exclusion principle.   (2 marks)

(c)   Describe the methods of preparation of colloids.   (8 marks)

(d)   Atoms of the element silicon consists of 92.2% silicon – 28, 4.7% silicon – 29 and 3.1% silicon 30. Calculate the relative atomic mass of silicon.

(e)   Distinguish between lyophilic colloids and lyophobic colloids.   (4 marks)

QUESTION FOUR (20 MARKS)

(a)   State the collision theory.   (2 marks)

(b)   Describe the trends in periodic table with respect to

      (i)   Atomic radius

      (ii)   Electronegativity

      (iii)   Electron affinity

(c)   Discuss the contributions of isotopes and radiation techniques towards strengthening national capabilities in terms of expertise and training.

      (i)   Plant nutrition   (3 marks)

      (ii)   Insect control   (3 marks)

      (iii)   Food preservation   (3 marks)

(d)   A research chemist adds a measured amount of HCI gas to pure water at $25^0\ C$ and obtains a solution with $[H_3O^+] = 3.0 \times 10^{-4}M$. Calculate $[OH^-]$, is the solution neutral, acidic or basic? (kw at $25^0C \times 10^{-14}$)   (3 marks)