CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF CERTIFICATE IN

CHEM 00102: BASIC CHEMISTRY

STREAMS: CERT. **TIME: 2 HOURS**

DAY/DATE: MONDAY 29/03/2021 **2.30 P.M. – 4.30 P.M.**

INSTRUCTIONS:

- Answer all questions in section A and any other two in section B.

SECTION A

QUESTION ONE (30 MARKS)

a) Define the following terms.

(i) Atomic number (1 mark)

(ii) Isotopes (1 mark)

(iii) Mass number (1 mark)

(iv) Hydrocarbons (1 mark)

b) Draw the Lewis structures of the following

(i) CH_4 (3 marks)

(ii) BF_3 (3 marks)

(iii) NH_4 (3marks)

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

d) State the applications of radioisotopes and controlled radiation in agriculture.(4 marks)

e) Discuss factors that affect rate of reaction (8 marks)

f) Distinguish between lyophobic and lyophilic colloids (2 marks)

SECTION B

QUESTION TWO (20 MARKS)

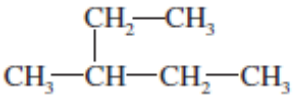
a) Discuss the trends in the periodic table (6 marks)

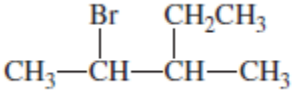
(i) Atomic radius

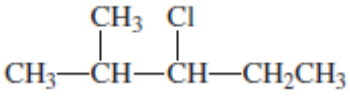
(ii) Electron affinity

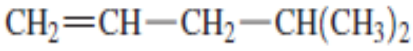
(iii) Electronegativity

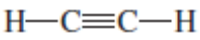
b) Name the following compounds (7 marks)

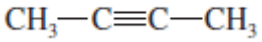
i) 

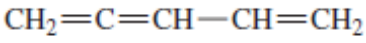
ii) 

iii) 

iv) 

v) 

vi) 

vii) 

c) State three applications of emulsions (3 marks)

d) Boron (B; $Z = 5$) has two naturally occurring isotopes. Find the percent abundances of ^{10}B and ^{11}B given these data: relative atomic mass of **B** = 10.81 amu, isotopic mass of ^{10}**B** = 10.0129 amu and isotopic mass of ^{11}B = 11.0093 amu. (4 marks)

QUESTION THREE (20 MARKS)

a) Calculate the number of protons and neutrons in the following elements

(i) $^{35}_{17}Cl$ (1 mark)

(ii) $^{14}_{6}C$ (1 mark)

b) Discuss the following types of bonding (6 marks)

(i) Ionic bonding

(ii) Covalent bonding

(iii) Metallic bonding

c) Calculate the pH of 10^{-12} *M* H_3O^+ solution. (2 marks)

d) Distinguish between constitutional and stereoisomers and draw two constitutional isomers of butane and name them. (6 marks)

e) A research chemist adds a measured amount of HCl gas to pure water at 25^0C and obtains a solution with $[H_3O^+] = 3.0 \times 10^{-4}\, M$. Calculate $[OH^-]$ and state whether it's a neutral, acidic or basic solution. (4 marks)

QUESTION FOUR (20 MARKS)

a) Bromine (RAM=79.90 amu) consists of two isotopes Br-79(78.92amu) and Br-81(80.92amu). Determine the abundance of each isotope. (5 marks)

b) Differentiate between homogeneous and heterogeneous catalysts (4 marks)

c) Discuss the contributions of isotopes and radiation techniques towards strengthening national capabilities in terms of expertise and training. (9 marks)

(i) Plant nutrition

(ii) Insect control

(iii) Food preservation

(d) An atom is electrically neutral, justify. (2 marks)
