CHEM 00102

CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF CERTIFICATE IN ANIMAL HEALTH AND PRODUCTION

CHEM 00102: BASIC CHEMISTRY

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

DAY/DATE: MONDAY 12/07/2021   **8.30 A.M. – 10.30 A.M.**

INSTRUCTIONS:

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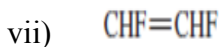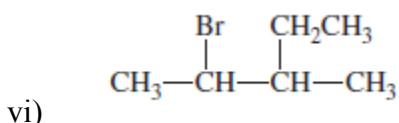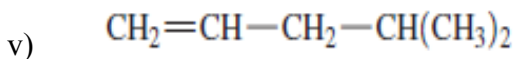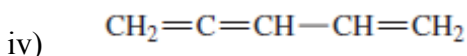
SECTION A

QUESTION ONE (30 MARKS)

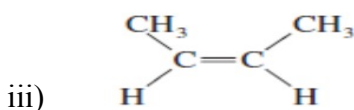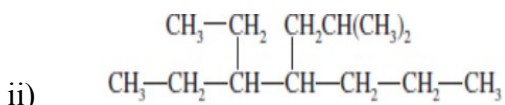   **a)** Define the following terms.

(i)	Atomic number	(1 mark)
(ii)	Isotopes	(1 mark)
(iii)	Mass number	(1 mark)
(iv)	Hydrocarbons	(1 mark)

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

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

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

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

   (i)   Atomic radius

   (ii)   Electron affinity

   (iii)   Electronegativity.   (9 marks)

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

SECTION B

QUESTION TWO (20 MARKS)

a) Name the following compounds   (7 marks)

i)
$$CH_3-\underset{\underset{F}{|}}{C}H-CH_2F$$

ii)
$$CH_3-CH_2-\underset{\underset{CH_3-CH_2}{|}}{C}H-\underset{\underset{CH_2CH(CH_3)_2}{|}}{C}H-CH_2-CH_2-CH_3$$

iii)
$$\underset{H}{\overset{CH_3}{\diagdown}}C=C\underset{H}{\overset{CH_3}{\diagup}}$$

iv)
$$CH_2=C=CH-CH=CH_2$$

v)
$$CH_2=CH-CH_2-CH(CH_3)_2$$

vi)
$$CH_3-\underset{\underset{Br}{|}}{C}H-\underset{\underset{CH_2CH_3}{|}}{C}H-CH_3$$

vii)
$$CHF=CHF$$
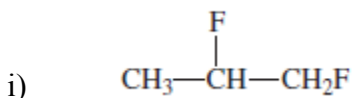
b) Discuss the classification of colloids.   (6 marks)

c) 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)

d) State the bonds that exist between the following.   (3 marks)

    i.   LiCl

    ii. O_2

    iii. H_2O

QUESTION THREE (20 MARKS)

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

    (i) $^{37}_{17}Cl$ (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) Distinguish between constitutional and stereoisomers and draw two stereoisomers isomers of but-2-ene and name them.   (6 marks)

d) 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)

e) i) Balance the following equation and express the rate in terms of the change in concentration with time for each substance.

$$NO_{(g)} + O_2(g) \rightarrow N_2O_3(g)$$

ii) How fast is [O₂] decreasing when [NO] is decreasing at a rate of $1.0 \times 10^{-4} mol/L$?

                                                                        (2 marks)

QUESTION FOUR (20 MARKS)

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

       (i)   Animal production and health

       (ii)   mutation

       (iii)   insect control

b) Bromine (RAM=79.90 amu) consists of two isotopes Br-79(78.92amu) and Br-81(80.92amu). Determine the abundance of each isotope.   (4 marks)

c) Distinguish between the dispersed phase and dispersion medium.   (2 marks)

d) State the factors that contributes to the polar nature of water.   (3 marks)

e) State two applications of colloidal solutions.   (2 marks)