CHUKA UNIVERSITY

Knowledge is Wealth (*Sapientia divitia est*)

Telephones: 020 2310512/18
Email: info@chuka.ac.ke

P. O. Box 109-60400, Chuka
Website: www.chuka.ac.ke

DEPARTMENT OF PHYSICAL SCIENCES

EXAMINATION FOR THE AWARD OF DIPLOMA IN ANIMAL HEALTH AND PRODUCTION

CHEM 0102: BASIC CHEMISTRY (2019/2020)

INSTRUCTIONS:

Answer question ONE and any other TWO questions

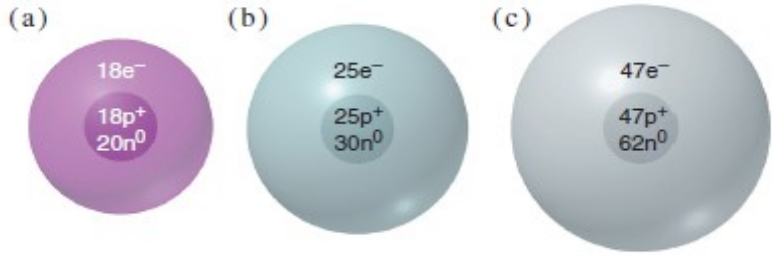
Do not write on the question paper

QUESTION ONE

a) Boron (B; $Z = 5$) has two naturally occurring isotopes. Find the percent abundances of ^{10}B and ^{11}B given these data: **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)

b) Describe the two major types of mixtures. (2 marks)

c) Write the $^{A}_{z}X$ notation for each atomic depiction: (3 marks)



d) Define the term cracking and explain the two ways of cracking. (3 marks)

e) What is the pH of a urine sample whose $[H^+] = 3.010^{-8}$ M (1 mark)

f) Explain the polar nature of water. (3 marks)

g) Draw Lewis structures for the following compounds. (5 marks)

i. Ammonia, NH_3

ii. Hydronium ion, H_3O^+

iii. Propane, C_3H_8

iv. Methylamine, CH_3NH_2

v. Water, H_2O

h) Classify colloidal solutions based on the interactions between phases. (2 marks)

i) Giving examples, define acids and bases according to Brønsted-Lowry acid-base definition.

(2 marks)

j) State 3 uses of alkanes. (3 marks)

k) List each set of compounds in order of increasing boiling point. (2 marks)

   i. octane, hexane, and decane.

   ii. octane, $(CH_3)_3C\text{-}C(CH_3)_3$, and $CH_3CH_2C(CH_3)_2CH_2CH_2CH_3$.

QUESTION TWO

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

b) In an art restoration project, a conservator prepares copper-plate etching solutions by diluting concentrated HNO_3 to 2.0 *M*, 0.30 *M*, and 0.0063 *M* HNO_3. Calculate **$[H_3O^+]$**, **pH**, **$[OH^-]$**, and **pOH** of the three solutions at 25°C; $\boldsymbol{K_w}$ at 25°C=1.0×10^{-4}. Briefly describe the trend of the results. (12 marks)

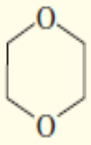
QUESTION THREE

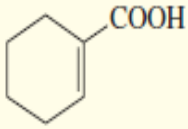
a) Discuss (5) applications of isotopes and radiation (radioisotopes) in Agriculture.

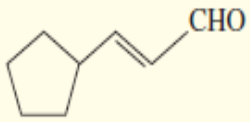
(5 marks)

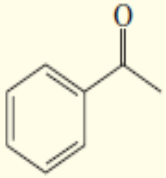
b) Describe the (3) major mass laws in chemistry. (6 marks)

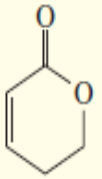
c) Circle the functional groups in the following structures. State to which class (or classes) of compounds the structure belongs. (9 marks)

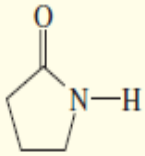
(a) 

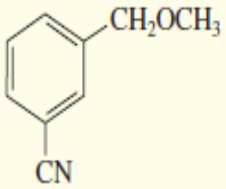
(b) 

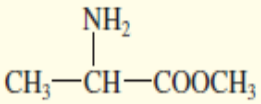
(c) 

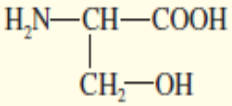
(d) 

(e) 

(f) 

(g) 

(h) 

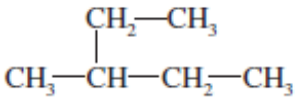
(i) 

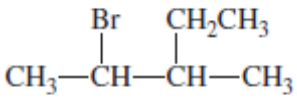
QUESTION FOUR

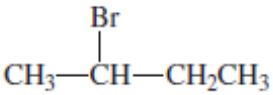
a) Colloids play a very important role in our daily life. Describe (4) applications of colloids. (4 marks)

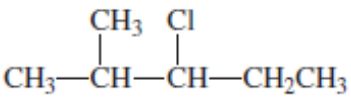
b) Describe the (6) main nonbonding (intermolecular) forces. (6 marks)

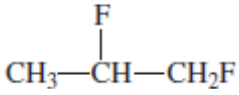
c) Give the **IUPAC** names of the following compounds. (10 marks)

i. 

ii. 

iii. 

iv. 

v. 

vi. $CH_2=CH-CH_2-CH(CH_3)_2$

vii. $CH_2=C=CH-CH=CH_2$

viii. $CH_2=CH-CH_2-CH=CH_2$

ix. $CH_3-C\equiv C-CH_3$

x. $H-C\equiv C-H$