OCTOBER 2023
EBS 115
GENERAL CHEMISTRY THEORY I
1 HOUR 20 MINUTES

Candidate's Index Number
Signature:

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
SCHOOL OF EDUCATIONAL DEVELOPMENT AND OUTREACH
INSTITUTE OF EDUCATION

COLLEGES OF EDUCATION
FOUR-YEAR BACHELOR OF EDUCATION (B.ED)
FIRST YEAR, END-OF-SECOND SEMESTER EXAMINATION, SEPTEMBER/OCTOBER 2023

5TH OCTOBER 2023 **GENERAL CHEMISTRY THEORY I** **12:40 PM – 2:00 PM**

SECTION B
(30 MARKS)

Answer any TWO questions in this Section.
Please, note that if you answer more than two questions, only the first two will be marked.

1.

a. Calculate the percentage by weight of each element present in magnesium trioxocarbonate (IV) ($MgCO_3$). **(4 marks)**
[Mg=24.0, C=12.0, O= 16.0]

b. Using the argon core electron figuration write the electronic configuration of each of the following species. **(3 marks)**
   i. $_{25}Mn^{2+}$
   ii. $_{27}Co$
   iii. $_{30}Zn$

c. Write the IUPAC names for the following compounds: **(8 marks)**
   i. $FeCO_3$
   ii. $(NH_4)_3PO_4$
   iii. $CH_3CH(CH_3)CCCH_3$
   iv. $CH_3CH_2CHCHCH_3$

2.

a. A 25.07 mL sample of vinegar (ethanoic acid) is titrated with 37.31 mL of 0.5119 M $Mg(OH)_2$. **(10 marks)**
   i. Write a balanced chemical equation for the reaction.
   ii. What is the IUPAC name given to the salt that was produced after the reaction?
   iii. Determine the molarity of the ethanoic acid in vinegar?

b. Copy and complete the table below: **(3 marks)**

	Electronegativity Difference	Bond Type
i.	< 0.4	
ii.	Between 0.4 and 1.8	
iii.	> 1.8	

c. Draw the Lewis dot structure for the species: **(2 marks)**

i. SF_6

ii. CCl_4

3.

a. A sample of the poisonous compound nicotine, extracted from cigarette smoke was found to contain **74.3%** carbon. **8.65%** hydrogen and **17.3%** nitrogen.
What is the empirical formula of nicotine? **[C = 12.0, H = 1.0, N= 14].** **(6 marks)**

b. Classify the following species in their aqueous states as acids, bases or neutral.
CO_3^{2-}, KCl, HF, Fe^{3+}, O^{2-} **(5 marks)**

c. Determine the IUPAC names of the following species: **(4 marks)**

i. $SO4^{2-}$

ii. $CH_3CH_2C(CH_3)_3$

4.

a. Explain the following terms: **(4 marks)**

i. Core electrons

ii. Electrovalency

b.

i. Explain why H_2O has higher boiling point than HF even though the H-bonds in HF are stronger and its molar mass (20.01 g mol^{-1}) is greater than that of H_2O (18 g mol^{-1}). **(4 marks)**

ii. Advance **two** points against Rutherford's model of the atom. **(4 marks)**

c. Predict the shape of the following molecules: **(3 marks)**

i. CH_4

ii. NH_3

iii. H_20