FACULTY: BASIC AND APPLIED SCIENCES

DEPARTMENT: PHYSICAL AND CHEMICAL SCIENCES

FIRST SEMESTER EXAMINATIONS 2017/2018 ACADEMIC SESSION

COURSE CODE: CHM 101

COURSE TITLE: GENERAL CHEMISTRY I

DURATION: 2 hours

HOD's SIGNATURE

TOTAL MARKS: 60

INSTRUCTION: There are three sections: A, B and C. Answer <u>one</u> (1) question only from each section.

SECTION A

Question One

a. what is Periodicity? [**1mark**]
b. Mention any two chemical properties commonly exhibited by group 1 elements [**2marks**]
c. Differentiate between Nucleons and Nuclide [**2marks**]
d. Provide the following information about the electrons in the 3rd energy level of an atom, n=3
    i.   Different types of orbitals that can possibly accommodate electrons at this energy level [**3marks**]
    ii. Maximum population of electrons in the atom [**I mark**]
e. Write the mathematical expression to show the relationship between atomic number and mass number of an element (**1mark**]
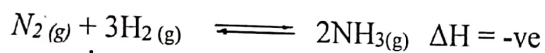
Question Two

a. i What is a Chemical Bond? [**1 mark**]
   ii. List any three types of chemical bonds, [**3marks**]
b. Why does atomic radius increase down the group? [**3marks**]
c. Mention any of the rules that govern the determination of ground state electronic configuration of an element [**1mark**]
d. Use the following data to predict the relative atomic number of Chlorine [**2marks**]

Isotope	Rel. isotopic mass	Fractional abundance
▸ $^{35}_{17}Cl$	34.97	0.7553
▸ $^{37}_{17}Cl$	36.95	0.2447

Question One

a. Distinguish between each pair of the following:
   i. Reaction Rate and Reaction Mechanism [**2marks**]
   ii. Order of Reaction and Molecularity of Reaction [**2marks**]
b. State Equilibrium law [**2marks**]
c. Predict the effects of the following on the position of equilibrium in the chemical reactions below:

$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)} \quad \Delta H = \text{-ve}$$

   i. Increase in temperature **[1 mark]**
   ii. Increase in pressure [**1 mark**]
   iii. Removal of H_2 [**1 mark**]
   iv. Addition of Pt as a catalyst [**1 mark**]

Question Two

a. State Faraday's first law of electrolysis **[2 marks]**

b. A direct current of 10 mA flows for 3.5 hrs through three cells in series. They contain solutions of potassium chloride, calcium sulphate and aluminum trioxonitrate (V). Calculate the mass of metal deposited in each cell [K = 39.0; Ca= 40.0; Al = 27.0 g / mol] **[8 marks]**

SECTION C

Question One

A. A solution contains 18.0 mg insulin in 7.00 ml develops an osmotic pressure of 10.5 mm Hg at 26.85 ^{0}C. Determine the molar mass of the insulin. **[5 Marks]**

B. Classify the element listed below as metal, non-metal or metalloid **[5 Marks]**
   i. Arsenic
   ii. Helium
   iii. Magnesium
   iv. Lead
   v. Calcium

Question Two

A. Write short note on the following **[4 Marks]**
   i. Dilute acid
   ii. Strong acid
   iii. Weak acid
   iv. Concentrated acid
B. State Raoult's law **[2 Marks]**

C. A 15.6 gram sample of C_6H_6 was mixed with excess HNO_3. We isolated 18.0 grams of $C_6H_5NO_2$. What is the percent yield of $C_6H_5NO_2$ in this reaction? **[4 Marks]**