BISHOP ROGAN COLLEGE MINOR SEMINARY SOPPO-BUEA CHEMISTRY TEST 1 – LOWER SIXTH. OCTOBER 2014

Instruction: answer all questions in the spaces provided

Time allowed: 90 minutes

**Section A: General and physical chemistry**

1. a) Define the following:

i) Relative atomic mass

_____

_____

_____

ii) Molar solution

_____

_____

iii) Avogadro's constant

_____

_____

iv) Molar gas volume

_____

_____

(4 marks)

b) A solution was made by dissolving 9.0g of hydrated aluminium sulphate ($Al_2(SO_4)_3.6H_2O$) in 250$cm^3$ of solution (RMM: Al = 27, S= 32, O = 16, H = 1, Avogadro's constant = 6.02 x $10^{23}$)

i. What type of solution is this?

_____

ii. List four main equipment's that can be used to prepare this solution.

_____

_____

Calculate

iii. The number of moles of hydrated aluminium sulphate in the solution.

_____

_____

_____

_____

iv. The number of moles of sulphate ions in this solution.

_____

_____

_____

v. The number of sulphate ions in this solution.

_____

_____

vi. The concentration ($moldm^{-3}$) of the hydrated aluminium sulphate

_____

_____

_____

vii. What is a mole?

_____

_____

(8 marks)

c) i) What is a primary standard substance?

_____

ii) State two examples of primary standard acid?

_____

(2 marks)

d) if $20cm^3$ of a solution of sodium hydroxide was neutralized by $22.5cm^3$ of a $0.05mol/dm^3$ sulphuric acid solution. Calculate the concentration of the solution in (i) $moldm^{-3}$ and (ii) $g/dm^3$.

_____

_____

_____

_____

_____

_____

(3 marks)

e) A volatile liquid upon vapourisation occupied a volume of $450cm^3$ at $21^0C$ and a pressure of 0.98 atm. If the mass of the liquid was 0.76g, calculate the relative molecular mass of the volatile liquid. ($R = 0.082dm^3$ atm $mol^{-1}$ $k^{-1}$) (3 marks)

_____

_____

_____

_____

_____

(3 marks)

(Total = 20 marks)

**Section B: Inorganic Chemistry**

1. (a). i) State the modern periodic law.

_____

ii) what are the four most important characteristics and properties of the elements shown by the periodic table .

_____

_____

(3 marks)

(b) The table below shows the melting temperature of the period 3 elements (Na - Ar)

| Element | Na | Mg | Al | Si | P | S | Cl | Ar |
|---|---|---|---|---|---|---|---|---|
| Temp/K | 371 | 923 | 933 | 1680 | 317 | 392 | 172 | 84 |

Explain the following in terms of the structure and bonding.

i) Magnesium has a higher melting temperature than Sodium.

_____

_____

ii) Silicon has a very high melting temperature than Aluminum.

_____

_____

(4 marks)

(c) (i) Define the first ionization energy?

_____

_____

(ii) Why is there a general increase in the first ionization energy from lithium to Neon?

_____

_____

(iii) Why are the first ionization energies of Boron (B) and Oxygen (O) lower than those of Berylium (Be) and Nitrogen (N) respectively?

_____

_____

_____

(5 marks)

(d) (i) How does the atomic radius vary across the period?

_____

(ii) Give an explanation for your results?

_____

_____

(2 marks)

(e) (i) The second electron affinity of Oxygen and sulphur are endothermic but that of Oxygen is greater than that of sulphur. Explain.

_____

_____

_____

(ii) Distinguish between electron affinity and electronegativity

_____

_____

(iii) The ionic radii of negative ions are greater than that of positive ions? Explain.

_____

_____

_____

(6 marks)

Total = 20 marks

## SECTION C: ORGANIC CHEMISTRY

1. (a) What is organic chemistry?

_____

_____

(1 mark)

(b) List four characteristics property unique to carbon.

_____

_____

_____

_____

_____

(2 marks)

(c) Define the following terms (4 marks)

(i) Catenation

_____

_____

(ii) Homologous series

_____

_____

(iii) Functional group

_____

_____

(iv) Hybridisation

_____

_____

(4 marks)

2. (a) State and identify any five functional groups you know.

_____

_____

_____

_____

_____

(3 marks)

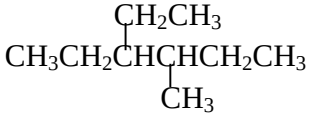
(b) Under each homologous series give five examples each and name them.

_____

_____

(2 marks)

c) Give the IUPAC nomenclature of the following compounds

i. 

_____

ii. $CH_3CHClCH_2CH(OH)CH_3$

_____

iii. $CH_3CH_2CH{=}CHCH_2CH{=}CHCH_3$

_____

(3 marks)

(b) Give the structure of each of the following compounds

i. 2.3-dimethylbutan-2-ol

_____

_____

ii. 3-ethyl-3-methyl hexane

_____

_____

(2 marks)

3. Determine the shape and bond angle of the following compounds (3 marks)

i. Methane ($CH_4$)

_____

ii. Ethanal ($CH_3CHO$)

_____

iii. Ethyne ($C_2H_2$)

_____

(3 marks)