OUR LADY OF MOUNT CARMEL COLLEGE: MUEA-BUEA CHEMISTRY TEST 1 – LOWER SIXTH. OCTOBER 2016

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) Avogadro's constant

_____

_____

iii) Molar solution

_____

_____

(3 marks)

b) A solution was made by dissolving 9.8g of hydrated ammonium iron(II)sulphate [$(NH_4)_2Fe(SO_4)_2$. $6H_2O$)] in 250 cm^3 of solution[RAM: S=32, O=16, Fe=56, N=14, H=1, avogadro's constant= $6.02x10^{23}$].

i. What type of solution is this?

_____

ii. List four main instruments used in preparing this solution.

_____

_____

iii. Calculate the number of moles of hydrated ammonium iron(II) sulphate.

_____

_____

iv. Calculate the concentration ($moldm^{-3}$) of the hydrated ammonium iron(II) sulphate.

_____

_____

v. Calculate the number of sulphate ions in this solutions

_____

_____

_____

(7 marks)

c)

i. What is a primary standard substance?

_____

_____

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ii. State two examples of primary standard acid?

_____

(2 marks)

d) If $20cm^3$ of a solution of potassium hydroxide was used to neutralize $22.5cm^3$ of a $0.05mol/dm^3$sulphuric acid solution in a titration experiment.

(i) Write a balanced equation for the reaction.

_____

_____

(ii)Calculate the concentration of the solution in $moldm^{-3}$ and g/dm^3.

_____

_____

_____

_____

_____

_____

(iii) How many moles are present in the $20cm^3$ solution of the base?

_____

_____

(5 marks)

e) (i) What is an ideal gas?

_____

(ii) A volatile liquid upon vapourisation occupied a volume of $30.6cm^3$ at 470 ^oC and a pressure of 100 atm. If the mass of the liquid was 4.3g, calculate the relative molecular mass of the volatile liquid. ($R = 8.314\ Jmol^{-1}\ k^{-1}$, $1\ atm = 1.0 \times 10^5 Nm^{-2}$)

_____

_____

_____

_____

(3 marks)

(Total = 20 marks)

SECTION B: INORGANIC CHEMISTRY

2. This question concerns elements in period 2 (Na to Ar) of the periodic table.

a). Define the term first ionization energy and first electron affinity in each case illustrating your answer with an equation

i) First ionization energy

_____

_____

_____

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ii) Electron affinity

_____
_____
_____

(4 marks)

b).

i). Sketch a graph of first ionization energies for the elements Na to Ar against their atomic numbers

_____
_____
_____
_____
_____
_____
_____

ii) Explain the shape of the curve

_____
_____
_____

(5 marks)

c). Use the information in the table below to explain the statements that follow.

	Na	Mg	Al	Si	P	S	Cl
Atomic radius/nm	0.156	0.136	0.125	0.117	0.110	0.104	0.099
Ionic radius/nm	0.095	0.065	0.50		0.0212	0.184	0.181

i) The atomic radius decreases across the period from Na to Cl

_____
_____
_____

ii) The ionic radii of Na^{+} and Al^{3+} are less than their respective atomic radii; where as the ionic radii of Cl^{-} and S^{2-} are greater than their respective atomic radii.

_____
_____
_____

(3 marks)

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d) (i) Sketch a graph of melting points of the elements Li to Ar against their atomic numbers

ii) Why do the boiling points rise from Na to Si? Explain the trend in terms of the structures of the elements.

iii) why are the boiling points of the elements (P to Ar) much lower than those of Li to Carbon

(5 marks)

e) Explain why:

i) The atomic volume of phosphorus is larger than silicon

ii) The boiling points of metals are higher than their corresponding melting points and the boiling points of non-metals are lower than their melting points.

iii) Moving from Na to Mg to Al bonding gradually gets stronger

(3 marks)

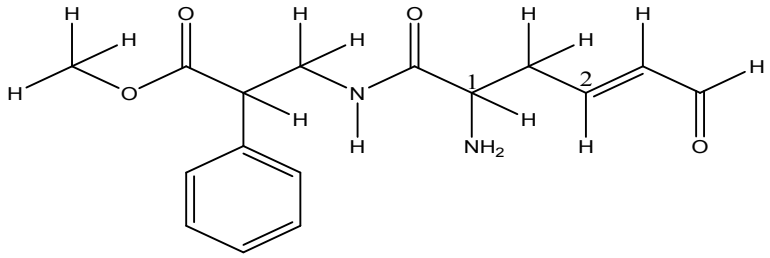
(Total = 20 marks)

SECTION C: ORGANIC CHEMISTRY

1. (i) What is a functional group?

(1 mark)

(ii) Label using A, B, C, D etc and name four functional groups in the following compound?



_____

_____

_____

_____

(iii) Indicate the hybridization of the carbons atoms numbered 1 and 2, and predict the bond angles.

_____

_____

(iv.) What is atomic hybridization?

_____

_____

_____

(10 marks)

(b) Consider the following compounds A: C_2H_6 B: C_2H_4

(i) What are the compounds A and B collectively called?

_____

(ii) B is unsaturated. Explain the term?

_____

_____

(iii) Identify the homologous series to which each belongs.

A_____ B _____

(4 marks)

(d) State two properties which are generally characteristic of an organic compound?

_____

_____

(2 marks)

ii) Catenation_____

_____

iii) State two properties that an element must possess in order to Catenate.

_____

_____

(3 marks)

(Total = 20 marks)

STOP!

GO BACK AND CHECK YOUR WORK.

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