1(a). What is meant by the term pH

(b). A solution of magnesium hydroxide contains 0.0002 moles per litre of magnesium ions.

(i). Calculate the number of moles of hydroxide ions present in the solution (ii).

The pH of the solution. ($Kw = 1.0 \times 10^{-14}$)

2. Define the term boiling point elevation constant.

(b) Describe an experiment to show how molecular mass of urea can be determined using ebulyoscopy.

(c) Acetone boils at 56.38^0C and a solution of 1.41g of an organic solid in 20g of a cetone boils at 56.88^0C. Calculate the mass of one mole of the organic solid (kb for a cetone per 100g is 16.7)

(d) (i) Explain why freezing point depression and boiling point elevation method are not suitable for determination of molar mass of polymers

3.(a) Define the term pH

(b) Find out the pH of 0.002M acetic acid solution if it is 2.3% Ionised in dilute solution

(c) (i) Explain the meaning of the word "Buffer solution"

(ii) Explain the mechanism of action of a basic buffer.

(d) (i) The P^H of a solution containing 0.15Mol per litre ethanoic acid and a certain mass of sodium ethanoate is found to be 4.8697. Calculate the mass of sodium ethanoate in the solution (ka for ethanoic acid is 1.8×10^{-5})

(ii) Calculate the PH change that would occur when $1cm^3$ if 1M HCl is added to the above solution.

(e) A chemist needs a buffered solution of propanoic acid and sodium propanoate.

Calculate the ratio of (CH_3CH_2COOH)/CH_3CH_2COONa) required to yield a p^H of 4.3 (Ka for propanoic acid is 1.3×10^{-5})

4. Explain four applications of butter solutions. (a) Define the following terms

(i) Atomic radius

(ii) Ionization energy

(iii) Electron affinity

(iv) Electronegativity

(b) Explain the variation of the following periodic properties across and down the group.

(i) Ionisation energy (iii) Electrode potential

(ii) Electro positively (iv) Melting point

(c) Explain each of the following observations.

(i) The first ionization energy of Aluminium is abnormally lower than that of Magnesium

(ii) The third abnormally higher than the second.

5. The first three successive ionization energies of element Y are 549, 1064 and 4226 kj/mol

(a) Explain the trend in the variation of the ionization energies of Y.
(b) State the group in the periodic Table to which Y belongs.
(01mark)

6. 2.0 g of phosphorous raises the boiling point of 37.4 g of carbon disulphide by 1.003^0C, whereas the boiling point of 100 g of carbon disulphide by 0.42^0C. Calculate the

(i) Boiling point constant of carbon disulphide.(Molar mass of Sulphur is 256)

(ii) Molar mass of Phosphorous in phosphorous in carbon disulphide.

7(a) 1.86 g of compound X contains carbon, hydrogen and nitrogen. On combustion liberated 5.28g of carbon dioxide and 224 cm^3 of Nitrogen gas at s.t.p

When vaporized 0.2 g of X occupied 81 cm^3 at 184.1^0C and 101.325 KPa. Determine the molecular formular of X.

(b). A compound Z contains 2.4g of carbon and 0.4 g of hydrogen.

(i) Determine the empirical formular of compound Z.

(ii) Determine the molecular formular of Z, If its vapour density is 29.

(iii) Write and name two isomers of Z.

8. (a) Define the term atomic radius.

(b) The table below shows the atomic radii of elements of group (ii) in the periodic table.

Element	Be	Mg	Ca	Sr	Ba
Atomic radius (nm)	0.112	0.160	0.197	0.215	0.221

(i) State how atomic radii of the elements vary in the group.

(ii) Explain your answer in (a)(i) above.

9. (a) Write the structural formula of the following compounds.

(i) 2,4-Dimethylpentane

(ii) 2,2,3-Trimethylhexane

(iii) 1-Bromo-2-chloropentane

(iv) Chlorocyclopropane

10. Define the following terms as applied to organic chemistry.

(i) Catenation.

(ii) Functional group

(iii) Homolytic Fission

(iv) Heterolytic fission.

(v) Inductive effect.

END

SENIOR FIVE