

NAME.....COMB.....

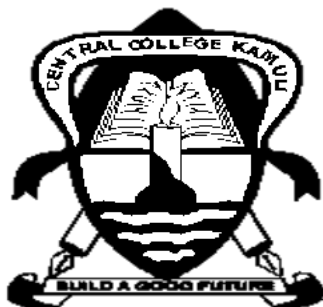
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P525/2

JUL/AUG 2019

CHEMISTRY

2 ½ HOURS



UGANDA ADVANCED CERTIFICATE OF EDUCATION

END OF TERM TWO EXAMINATIONS

CHEMISTRY

(Principal subject)

Paper Two

2 Hours 30 minutes.

INSTRUCTION TO CANDIDATES:

- Answer any five questions including any **three** from **section A** and any **two** from **section B**
- Additional questions answered will not be marked
- Write the answers in the booklet /sheet provided.
- Begin each question on a fresh page.
- Mathematical tables and graph papers are provided.
- Non programmable, silent scientific electronic calculators may be used.
- Illustrate your answer with equations where applicable

SECTION A

Answer three questions from this section

1. (a) explain the following observations

- (i) Bromine water reacts with propene to form 1-bromopropan-2-ol as the major product rather than 1,2-dibromopropane (**5 ½ marks**)
- (ii) When 2-methylpropene is reacted with hydrogenbromide, the major product is 2-bromo-2-methylpropane rather than 1-bromo-2-methylpropane (**5 marks**)

(b) (i) what is the name given to the reaction between fuming sulphuric acid and benzene (**½ marks**)

(ii) Write the mechanism for the reaction in b (i) above. (**2 ½ marks**)

(iii) Show how the product in b(i) can be converted to phenol (**2marks**)

(c) Phenol reacts with bromomethane in presence of an alkali to form ether. write equations for the reaction and outline the mechanism for the reaction. (**4 ½ marks**)

2. (a) The first ionisation energies of some group II metals of the periodic table and the melting points of their chlorides are given in the table below.

Metal	Mg	Ca	Sr	Ba
First ionisation energy	738	590	549	505
Melting point °C	708	772	873	967

Explain;

(i) Why the ionisation energy decreases with increasing atomic

number(3marks)

(ii) Why the melting point of the chlorides of the metals increases with increase in atomic number(3marks)

(b) Describe the trend in reactivity of the elements with cold water down the group. (8marks)

(c) Compare the solubility and basicity of hydroxides of group II elements with the hydroxides of group I.(3marks)

(d) Beryllium and aluminium show diagonal relationship. Write equations to show how beryllium and aluminium react with concentrated sodium hydroxide solution.(3marks)

3. A gaseous alkene Y diffuses 0.57735 times faster than nitrogen gas.

(a) Determine the molecular formula of Y. (3marks)

(b) on ozonolysis, followed by hydrolysis, Y produced propanal and propanone as the major organic products, Identify Y.(1mark)

(c) write the equation and suggest a mechanism for the reaction between

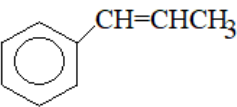
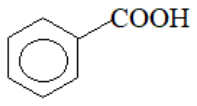
(i) Y and benzene in presence of an acid (4marks)

(ii) Y and bromine water (4marks)

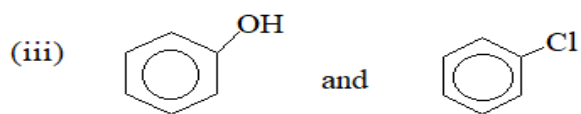
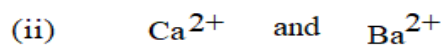
(iii) Propanal and phenyl hydrazine in acidic medium (4marks)

(d) Using equations only show how Y can be synthesised from propyne (4marks)

4. (a) complete the following equations and outline accepted mechanism for the reaction

- (i)  $\xrightarrow{\text{Fuming H}_2\text{SO}_4}$ 3marks
- (ii)  $\xrightarrow{\text{HBr}}$ 2 1/2 marks
- (iii)  $\xrightarrow{\text{Cl}_2/\text{Fe}}$ 3marks
- (iv) $\text{CH}_3\text{CH}_2\text{Cl} \xrightarrow[\text{warm}]{-\text{OH}}$ 2 1/2 marks

(b) Distinguish between the following pair of compounds using suitable reagents and state the observation in each case. (3marks @)



SECTION B

Answer two questions from this section

5. (a) define the following terms (4marks)

(i) Electron affinity

(ii) Second ionisation energy

(iii) Electro positivity

(iv) Atomic radius

(b) Describe and explain the trend of atomic radius in the following series

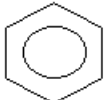
(i) Group II elements (**4marks**)

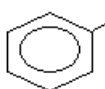
(ii) Period 3 elements (**4marks**)

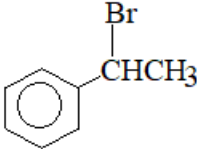
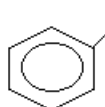
(v) Transition metal elements (**4marks**)

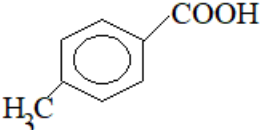
(c) Explain the trend of electro negativity across a period (**4marks**)

6. Show how the following compounds can be synthesised

(a) $\text{CH}_3\text{CH}_2\text{OH}$ to  (3.5 marks)

(b) $\text{BrCH}_2\text{CH}_2\text{Br}$ to  (2.5marks)

(c)  to  (4marks)

(d) CaC_2 to  (4marks)

(e)  from benzene (2.5 marks)

(f) Propan-2-ol to propanal (3.5 marks)

7.. (a) state Hess' law of heat summation (**1mark**)

(b) (i) the standard enthalpy of formation of SiCl_4 is -610 kJmol^{-1} . The standard enthalpy

change of atomisation of Si and Cl are $+338$ and $+122 \text{ kJmol}^{-1}$ respectively. Use the values to construct a Born-Haber cycle for the formation of SiCl_4 from its elements and indicate the energy changes involved. **(4marks)**

(ii) Calculate the average bond energy of the Si-Cl bond **(3marks)**

(c) What is meant by the following terms **(2marks)**

(i) Bond energy

(ii) Standard enthalpy of combustion

(b) Describe the experiment to determine the enthalpy of combustion of ethanol **(6marks)**

(e) Calculate the enthalpy of formation of methane from the following thermochemical data

Enthalpy of combustion of carbon = -393 kJmol^{-1}

Enthalpy of combustion of hydrogen = -286 kJmol^{-1}

Enthalpy of combustion of methane = -890 kJmol^{-1} **(4marks)**

8. (a). Define a colligative property **(2marks)**

(b). state any three examples of colligative properties **(1 ½ marks)**

(c). the vapour pressure of CS_2 at a certain temperature is 53330 Pa , at the same temperature, a solution of 5g of sulphur in 63cm^3 of carbon disulphide has a vapour pressure of 52340 Pa . The density of CS_2 at this temperature is 1.27gcm^{-3} . Calculate;

(i) RFM of sulphur **(3marks)**

(ii) Molecular formula of sulphur in CS_2 **(2marks)**

(d). explain the effect of dissociation on a colligative property of solutions **(3marks)**

(e). when 2.150g of $\text{Ca}(\text{NO}_3)_2$ in 100g of water forms a solution that freezes at -0.62°C . Find the apparent degree of dissociation given that $k_f = 1.86^\circ\text{Cmol}^{-1}\text{kg}^{-1}$ **(6 ½ marks)**

(f) Determination of RMM of substance by depression of boiling point is better than by

elevation in boiling point; explain (2marks)

END

"An intelligent student is motivated by the desire to achieve his/ her goal not by the desire to beat others"