P525/2
CHEMISTRY
Paper 2
August, 2022
2 ½ hrs

UNNASE MOCK EXAMINATIONS

Uganda Advanced Certificate Of Education

MOCK EXAMINATIONS

CHEMISTRY

Paper 2

2hours 30minutes

INSTRUCTIONS TO CANDIDATES

- *Attempt **five** questions including **three** from section **A** and any **two** questions from section **B**.*
- *Answers to the question must on the answer sheets provided*
- ***Begin each question on a fresh page.***
- ***Extra questions attempt will not be marked.***
- *Mathematical tables and graph papers are provided.*
- *Non- programmable scientific electronic calculators may be used.*
- *Use equations where necessary to illustrate your answers.*

[H= 1 , C= 12 , O = 16 , F= 19.0]

SECTION A

*Answer **three** questions from this section*

1. a) (i) Distinguish between d- block element and transition element. *(02marks)*

(ii) Explain why zinc is **not** considered as a typical transition element. *(02marks)*

b) One of the characteristics of transition elements is complex ion formation

(i) What is meant by the term complex ion. *(01mark)*

(ii) State **three** factors that favour formation of complexes. *(1½marks)*

c) Chromium(III) chloride hexahydrate , $CrCl_3.6H_2O$ exists in isomeric forms. Write the possible isomers of the compound. *(02marks)*

d) A mixture of manganese(IV) oxide and potassium hydroxide was fused in the presence of excess air.

(i) State what was observed *(01mark)*

(ii) Write equation for the reaction that took place. *(1½marks)*

e) The product in (d) was dissolved in water and the resultant solution acidified with dilute sulphuric acid.

(i) State what was observed. *(1½marks)*

(ii) Explain your observation *(2½marks)*

f) Name the reagent that cab used to distinguish between the following pairs of ions . State what would be observed when each ion of the pair is treated with the reagent.

(i) Fe^{2+} and Sn^{2+} *(2½marks)*

(ii) Co^{2+} and Cu^{2+} *(2½marks)*

2. a) **1** mole of an organic compound **Q** , $C_xH_yO_z$ reacts completely with **7** moles of oxygen to form **6** moles of carbon dioxide and **3** moles of water. Determine the molecular formula of **Q**. *(3½marks)*

b) **Q** burns with a sooty flame. Identify **Q**. *(0½mark)*

c) Write equation and suggest a mechanism for the reaction between an alkaline solution of **Q** and

(i) bromoethane *(03marks)*

(ii) propanoyl chloride (CH_3CH_2COCl) *(04marks)*

d) State what would be observed , write equation for the reaction and name the main organic product when bromine water was added to **Q**. *(02marks)*

e) Using equations only show how **Q** can be
   (i) converted to phenylmethanol *(3½marks)*
   (ii) synthesized from nitrobenzene *(3½marks)*

3. a) What is meant by the following terms?
   (i) base ionisation constant *(01mark)*
   (ii) solubility product constant *(01mark)*
   (iii) common ion effect *(01mark)*

b) When 0.68g of ammonia (NH_3) and 0.68g of silver chromate (Ag_2CrO_4) were separately shaken with 1 dm^3 of distilled water until equilibrium is attained at 25°C, 2.087% of the ammonia had ionized and 3.36% of silver chromate had dissociated into its ions.
Calculate
   (i) the base ionisation constant, Kb for ammonia at 25°C. *(2½marks)*
   (ii) the solubility product for silver chromate at 25°C. *(3½marks)*
   (H = 1, N = 14 , O = 16 , Cr = 52 , Ag = 108)

c) Describe an experiment that can be used to determine the solubility product of silver chromate in the laboratory. *(06marks)*

d) State and explain how the solubility of silver chromate would be affected when the following were added to its saturated solution.
   (i) silver nitrate. *(02marks)*
   (ii) ammonia solution *(02marks)*

e) Explain briefly how solubility product is applied in purification of common salt. *(02marks)*

4. a) What is meant by the term ideal solution? *(03marks)*

b) Ethanol and butanol are liquids that form an ideal solution. The data below shows the mole fraction butanol in the liquid and vapour phases varying with temperature for ethanol – butanol system

Boiling point (°C)		117	110	100	90	85	78.5
Mole fraction of butanol (%)	liquid	100	90	66	40	22	0
	vapour	100	70	40	18	10	0

(i) On the same axes plot a graph of boiling point against percentage of butanol in both liquid and vapour phases and label your graph completely. *(05marks)*

(ii) Explain the shape of the graph. *(04marks)*

(iii) Describe how a liquid mixture containing 45% ethanol is fractionally distilled. *(04marks)*

c) (i) State Raoult's Law as applied to miscible. *(01mark)*

(ii) Explain why some liquid mixtures don not obey Raoult's law. *(03marks)*

SECTION B

*Answer any **two** questions from this Section.*

5. Using equations only show how the following organic compounds can be synthesized.

a) Propanone from propanoic acid *(4½marks)*

b) methylbenzoate from benzene *(04marks)*

c) 2-hydroxypropanoic acid from but-2-ene *(4½marks)*

d) 2,2-dichloro propane from propene *(04marks)*

e) chlorobenzene from aminobenzene *(03marks)*

6. a) What is meant by the terms

(i) electrolytivc conductivity *(01mark)*

(ii) molar conductivity. *(01mark)*

b) Sketch graphs for

(i) molar conductivity potassium chloride with dilution. *(02marks)*

(ii) conductimetric titration of ethanoic acid with ammonia *(02marks)*

c) Explain the shapes of the graphs in (b). *(08marks)*

d) The molar ionic conductivities at infinite dilution of some ionic species are shown in the table below.

ion	λ_0 $(\Omega^{-1}cm^2mol^{-1})$
Na^+	50.1
OH^-	198.6
H^+	349.8
Cl^-	76.4

(i) Calculate the electrolytic conductivity of a solution made by mixing $35cm^3$ of 0.01M sodium hydroxide and $45cm^3$ of 0.02M hydrochloric acid. *(04marks)*

(ii) Would you expect the molar conductivity of lithium ion(Li^+) to be less or greater than that of sodium ion (Na^+). Explain your answer. *(02marks)*

7. Explain the following observations.

a) When iron filings were added to copper(II) sulphate solution , the pale blue solution turns to pale green and brown solid formed. *(03marks)*

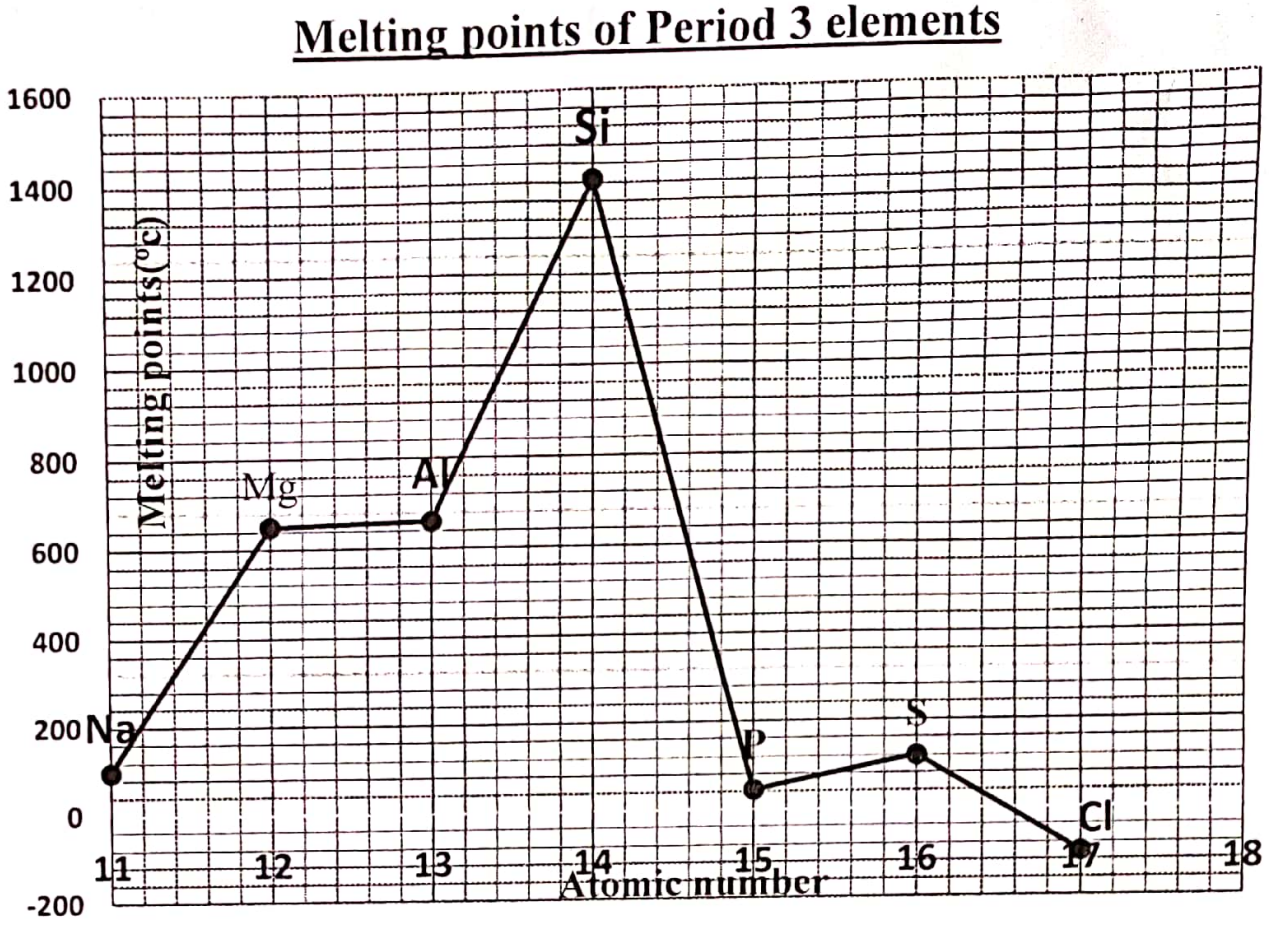
b) When sodium hydroxide solution was added to chromium(III) sulphate solution drop-wise until in excess, green precipitate dissolved in excess alkali to form a green solution which turned yellow on warming with hydrogen peroxide solution. *(05marks)*

c) When concentrated hydrochloric acid was added to an aqueous solution cobalt(II) sulphate , a pink solution turned to blue which on dilution with water the blue solution turned to pink again. *(04marks)*

d) When hydrogen sulphide gas was bubbled through acidified potassium dichromate solution , orange solution turned green and yellow precipitate formed. *(03marks)*

e) When warm dilute nitric acid was added to trileadtetraoxide , a red powder turned to dark brown solid which dissolved to form a bright yellow liquid when treated with excess cold concentrated hydrochloric acid . *(05marks)*

8. a) The graph below shows the melting points of period 3 elements



Explain why;

(i) there is a drastic increase in melting point from sodium to magnesium however there is slight increase in melting point from magnesium to aluminium. *(03marks)*

(ii) silicon has the highest melting point while chlorine has the lowest melting point. *(03marks)*

(iii) there was a general decrease in melting point from silicon to chlorine. *(03marks)*

b) Describe the reaction of

(i) aluminium , silicon , phosphorus and chlorine with sodium hydroxide. *(08marks)*

(ii) sodium chloride and sodium bromide with concentrated sulphuric acid. *(03marks)*

END