CANDIDATE NAME.: _____

NANJIRIRI CLUSTER EXAMINATIONS

2022 MALAWI SCHOOL CERTIFICATE OF EDUCATION MOCK EXAMINATIONS

CHEMISTRY

Subject Number: M038/I

TUESDAY, 31ST May

Time Allowed: 2 hours
2:00 -:400 pm

PAPER I

THEORY (100 MARKS)

Instructions:

1. **This paper contains 13 pages. Please check.**
2. This paper has three sections **A** and B. In section **A**, there are ten short answer questions while in section **B**, there are **three** restricted Essay questions.
3. Answer all **13** questions in the spaces provided. Marks are indicated against each question.
4. Use of electronic calculators is allowed.
5. Write your **name** at the top of your question paper in the spaces provided.
6. Hand in your question paper to the invigilator when time is called to stop writing.
7. In the table provided on this page, **tick** against the question number you have answered.

Question Number	Tick if Answered	Do not write in these columns	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			

 Turn over…..

NAME.:_____

2022 **M038/I**

SECTION A (70 MARKS)

Answer all questions in this section

1. a) State one difference between strong acid and weak acid.

_____

(1 mark)

b) Ethanoic acid (CH_3COOH) reacts with water (H_2O) according to following equation

$$\boldsymbol{CH_3COOH_{(l)} + H_2O_{(l)} \rightarrow CH_3COO^-_{(aq)} + H_3O^+_{(aq)}}$$

(i) Identify two conjugate acids – base pairs.

_____

_____

(2 marks)

(ii) Explain how H_3O^+ ion is formed.

_____

_____

_____

(2 marks)

c) Explain why propane is used in preparation of a simple acid – base indicators

_____

_____

(2 marks)

2. a) State three uses of phosphorus

_____

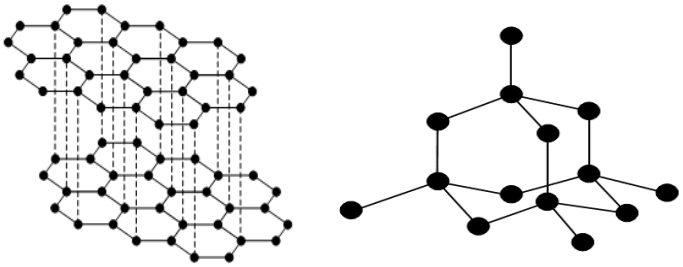
_____

_____

(3 marks)

b) Figure 1 shows the structures of two elements that are allotropes of carbon, X and Y. Use them to answer questions that follows;

Structure X **Structure Y**



(i) Define the term "Allotrope"

_____

(1 mark)

(ii) Name the element having the structure **Y.**

_____

(1 mark)

(iii) Which of the two elements having the structures **X** and **Y** conduct electricity.

_____

(1 mark)

(iv) Explain the reason for the answer in **2b(iii)**

_____

_____

_____

(2marks)

3. a) Define the term "Enthalpy change"

_____

(1mark)

b) Table 1 below shows bond energies of some elements. Use it to answer the questions that follows;

Bond	**Energies kj/mol**
C – H	413
O = O	498
O – H	464
C = H	805

Methane reacts with oxygen to produce carbon dioxide and water according the equation below;

$$\boldsymbol{CH_{4\,(g)} + O_{2(g)} \rightarrow CO_{2(g)} + H_2O_{(l)}}$$

(i) Balance the equation above.

(2 marks)

(ii) Use the table of bond energies and the balanced equation to calculate bond energy making and breaking.

(4 marks)

(iii) Identify the type of the reaction.

_____

(1mark)

4. Figure 2 below shows energy level diagram for dissolving of sodium hydroxide (NaOH) in water.

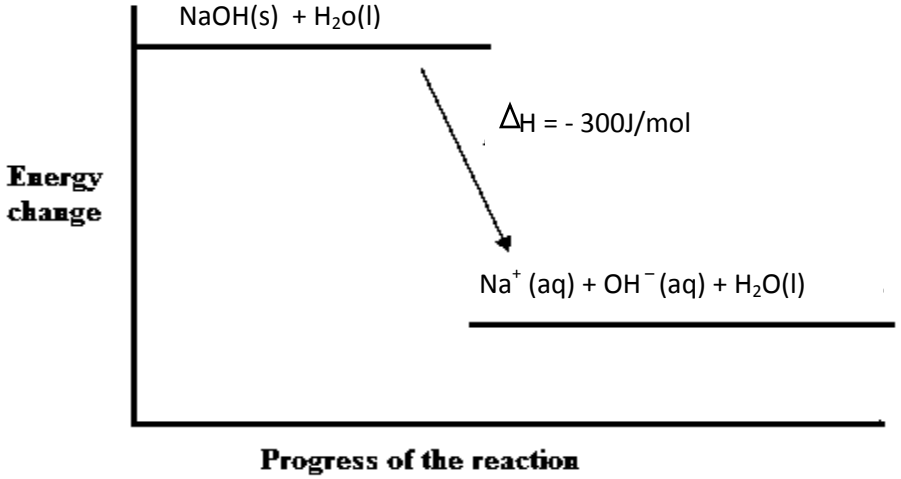


Figure 2

(i) what type of change is shown by the energy level diagram in figure **figure 2** above?

_____

(1mark)

(ii) Give a reason for your answer in 3c(i)

_____

(1mark)

5. The electro – motive force of a cell involving zinc and copper is shown by line notation as illustrated below;

$$Zn_{(s)} \mid Zn^{2+}_{(aq)} \mid\mid Cu^{2+}_{(aq)} \mid Cu_{(s)}$$

a) Draw the electrochemical cell for the line notation above.

(4marks)

b) Calculates the **E.M.F** of the cell given the electrode potential for Zinc = − 0.76 and Copper = +0,34.

(2marks)

c) Explain how each of the following prevent rusting.

(i) Galvanizing

_____

_____

_____

(3marks)

(ii) Sacrificial protection

_____

_____

_____

(3marks)

6.a) The following is part of an activity series.

(i) State whether copper (Cu) will react with a solution of magnesium sulphate **($MgSO_4$)**

_____

_____

(1mark)

(ii) Explain the answer to **5.a.(i).**

_____

_____

(2marks)

(iii) Which element is the most electropositive in the activity series?

_____

(1mark)

(iv) Give a reason for the answer to **5.a.(iii).**

_____

_____

(2marks)

b) (i) Write half equations for the reaction between silver nitrate **($AgNO_3$)** and Sodium **(Na).**

_____

_____

(2marks)

(ii) Name the reducing and oxidizing agents in **5.b.(i).**

_____

_____

(2marks)

7. Calculate the molecular formulas of a compound if its empirical formula is $\boldsymbol{CH_2O}$ and has molar mass of **180g.(RAM: C = 12, H = 1, O = 16)**

(4 marks)

8 a) Define the term "water of crystallization"

_____

_____

(1 marks)

b) A hydrated salt contains **55.9%** of water of crystallization. The relative formula mass of anhydrous salt is **142g**. Find the number of molecules of water of crystallization. (RAM: H = 1, O = 16)

(4marks)

9.a) Differentiate between limiting reagent and excess reagent.

_____

_____

(1marks)

b) Calcium and Chlorine react according to the following equation.

$$Ca_{(s)} + Cl_{2\,(g)} \rightarrow CaCl_{2\,(s)}$$

If **20g** of calcium and **20g** of chlorine are available for reaction, determine;

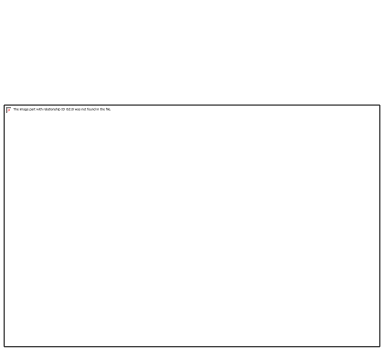
(i) Limiting reagent for the reaction**. (RAM: Ca = 40, Cl = 35.5)**

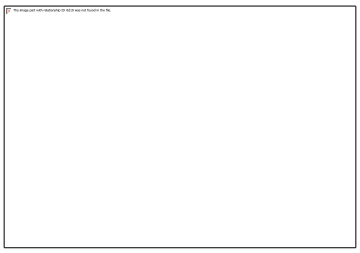
(4marks)

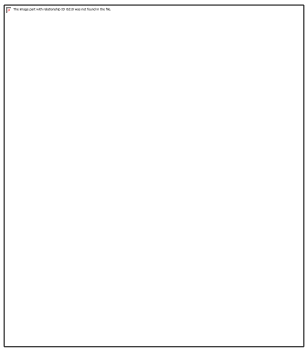
(ii) The mass of $CaCl_2$ formed.

(2marks)

10.a) Figure 3 below shows three structures of alkanols. Use it to answer the questions that follows;







(i) Which classes of alkanols do **P** and **Q** belong?

P_____

(1 mark)

Q _____

(1 mark)

(ii) which of the three alkanols is used in the preparation of alkanals?

_____

(1mark)

(iii) Write the condensed formula of structure R.

(2 marks)

b) Draw two isomers of butane.

(2marks)

SECTION B (30 marks)

Answer all the questions in this section

11.a) Describe how CFCs Contribute to the depletion of ozone layer

_____

_____

_____

_____

_____

_____

_____

_____

(4marks).

b) With the aid of flow diagram, describe how ammonium nitrate fertilizer is manufactured.

_____

_____

_____

_____

_____

_____

_____

(6marks)

12.a) Describe how nitate ion **(NO_3^-)** can be identified.

(5marks)

b) Explain why thermalsetting plastics can be heated and moulded only once.

(5 marks)

13. Explain five benefits of recycling metals and plastics.

(10 marks)

END OF QUESTION PAPER

N.B: This paper contains 13 printed pages.