**233/2**

NAME…………………………………………………. INDEX NUMBER……….….………..

CANDIDATE'S SIGNATURE…………………..…….. DATE…………..……………..……..

# ASUMBI GIRLS HIGH SCHOOL

# POST -MOCK 1

# AUGUST/SEPTEMBER

# 2022

## AUGUST / SEPTEMBER - 2022

### CHEMISTRY PAPER 2

### 2 HOURS

*Instructions to candidates*

*(a) Write your name and class number in each of the foolscaps answer sheets.*

*(b) Sign and write the date of examination in each of the foolscap answer sheets.*

*(c) Answer **all** the questions in this paper on one side of each foolscap.*

For Examiner's Use Only

| Question Number | Maximum score | Candidate's score |
|:---:|:---:|:---:|
| 1 | 13 | |
| 2 | 12 | |
| 3 | 9 | |
| 4 | 10 | |
| 5 | 11 | |

| 6 | 12 | |
|---|---|---|
| 7 | 13 | |
| **TOTAL** | **80** | |

1. The diagram shows part of the Periodic Table. The letters are not the actual symbols of the elements.



(a) Compare the reactivity between elements Q and T.                                    (2 marks)

(b) Explain the electrical conductivity of the chloride of element T.                    (2 marks)

(c) Compare the melting and boiling points of elements R and S.                          (2 marks)

(d) Write an equation for the second ionization energy of element Q.                     (1mark)

(e) How does the atomic and ionic radius of each of the following elements compare?

(i) Element T.                                                                           (1½ marks)

(ii)Element P                                                                              (1½ marks)

(f) Compare atomic radius of elements R and Q.                                             (1½ marks)

(g) Explain the difference in the melting points of the oxides of element Q and the oxide of element R.
                                                                                           (1½ marks)
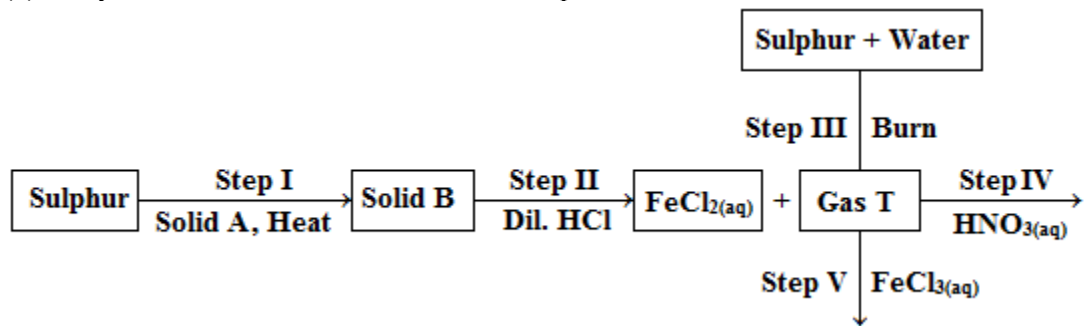
2 (a) The diagram below shows the structure of an allotrope of sulphur



(i) What are allotropes?                                                                   (1mark)

(ii) Identify the allotrope shown in the diagram above.                                    (1mark)

(iii) State **two** properties of the allotrope above.                                     (2 marks)

(b) Study the flow chart below and answer the questions that follow.

Sulphur + Water

Step III | Burn

Sulphur → Step I / Solid A, Heat → Solid B → Step II / Dil. HCl → $FeCl_{2(aq)}$ + Gas T → Step IV / $HNO_{3(aq)}$ →

Step V | $FeCl_{3(aq)}$

(i) Write the equation for the reactions in:

I. step I. (1mark)

II. Step II. (1mark)

(ii) State **two** observations made in step II. (2 marks)

(iii) Explain the observations made in:

I. Step IV. (1½ marks)

II. Step V. (1½ marks)

(iv) State **one** use of gas T. (1mark)

4

3. Next to each letter, **A** to **F**, in the table below is the molecular formula of an organic compound.

| A | $C_2H_5Br$ | B | $C_2H_4$ |
|---|---|---|---|
| C | $C_4H_{10}$ | D | $C_2H_6O$ |
| E | $C_3H_6O$ | F | $C_3H_6O_2$ |

(a) Choose a molecular formula above that represents an organic compound below. Write down only the letter (A to F) next to the question numbers

(i) A haloalkane                                                                                    (½ mark)

(ii) An alcohol                                                                                     (½ mark)

(iii) An unsaturated hydrocarbon                                                          (½ mark)

(iv) A product of thermal cracking of compound C.                               (½ mark)

(b) If compound F is a carboxylic acid, write down the following:

(i) The structural formula of a functional isomer (an isomer with a different functional group) of F.

(1mark)

(ii) The IUPAC name of a functional isomer of F.                                   (1mark)

(c) Compound B is a monomer used to make a polymer. Write down the:

(i) Definition of a polymer.                                                                   (1mark)

(ii) IUPAC name of the polymer.                                                (1mark)

(iii) Balanced equation for the polymerisation reaction                        (1mark)

(d) Compound A is used as a reactant in the production of compound D.
(i) Name the type of reaction that takes place.                                 (1mark)

(ii) State two changes that can be made to the reaction conditions in (d) (i) to obtain compound B, instead of D, as product.                                                                   (2 marks)

4. The flow chart below summarizes the extraction of Zinc, study it and answer the questions that follow.
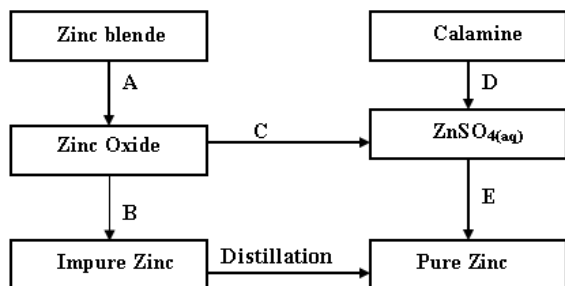


(a) Name the process represented by A and B
A……………………………………….                                        (2 marks)

B ……………………………………….

(b) Identify the reagents required for process B, C and D                       (3 marks)

B …………………………………………………….

C …………………………………………………….

D …………………………………………………….

(c) Write a chemical equation of the reaction that occurs in process B          (1mark)

(d) With an aid of a diagram, explain how you would obtain a pure sample of Zinc by process E.   (2 marks)

(e) State two uses of Zinc metal                                                                (2 marks)

5 (a) The table below gives some values of standard enthalpies of formation ($\Delta H_f^{\ominus}$).

| Substance | $F_{2(g)}$ | $CF_{4(g)}$ | $HF_{(g)}$ |
|---|---|---|---|
| $\Delta H_f^{\ominus}$ (kJmole$^{-1}$) | 0 | $-680$ | $-269$ |

The enthalpy change for the reaction $C_2H_{6(g)} + 7F_{2(g)} \rightarrow 2CF_{4(g)} + 6HF_{(g)}$ is $-2889$ kJ mol$^{-1}$.
Use this value and the standard enthalpies of formation in **Table 2** to calculate the standard enthalpy of formation
of $C_2H_{6(g)}$.                                                                               (3 marks)

(b) In an experiment to determine the enthalpy of solution of concentrated sulphuric (VI) acid (specific gravity =
1.84gcm$^{-3}$) the following procedure was used:
- A clean 250.0 cm$^3$ glass or plastic beaker is wrapped with a newspaper leaf.
- About 50.0 cm$^3$ of tap water is measured into the beaker and the steady temperature noted.

- The beaker is held in a tilted position and 2.0 cm$^3$ of and sulphuric acid added into the water

(i) Why was the beaker wrapped with newspaper leaf?                                              (1mark)

(ii) Why was the acid added into water and not vice versa?                                       (1mark)

(iii) Explain the reason for tilting the beaker during addition of the acid into water.          (2 marks)

(iv) Calculate the molar enthalpy of solution of concentrated sulphuric (VI) acid given that $\Delta T$ for the reaction = $1°C$. (Density of water = $1gcm^{-3}$; specific heat capacity of water = $4.2kJkg^{-1}K^{-1}$).                    (4 marks)

6 (a) Consider the electrochemical cell represented by the cell notation below, where X is an unknown metal:

$Pt_{(s)} \mid Fe^{2+}{}_{(aq)}, Fe^{3+}{}_{(aq)} \parallel X^{+}{}_{(aq)} \mid X_{(s)}$
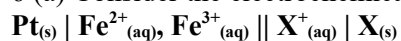
(The cell potential of this cell was found to be 0.03 V.

(i) Write down the type of electrochemical cell illustrated above.                    (1mark)

(ii) What does the single line (|) in the above cell notation represent?                    (1mark)

(iii) Write down the half-reaction that takes place at the anode in the above cell.                    (1mark)

(iv) Given that:

| Half reaction | $E^{\Theta}$ (volts) |
|---|---|
| $Fe^{3+}{}_{(aq)} + e \rightarrow Fe^{2+}{}_{(aq)}$ | + 0.77 |
| $Ag^{+}{}_{(aq)} + e \rightarrow Ag_{(s)}$ | + 0.80 |
| $Na^{+}{}_{(aq)} + e \rightarrow Na_{(s)}$ | − 2.87 |
| $K^{+}{}_{(aq)} + e \rightarrow K_{(s)}$ | − 2.92 |

Identify X with the aid of a calculation.                    (2 marks)

(b) The diagram below shows the apparatus that can be used to electrolyse dilute Sulphuric acid. Study it to answer the questions that follow.

Gas H

Gas G
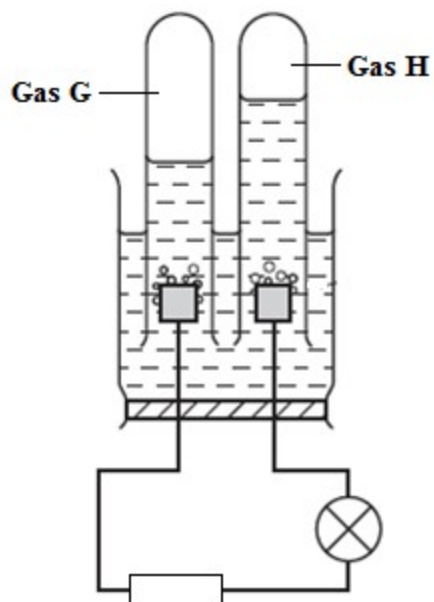
(i) Identify the gases H and G

I. H                                                                                    (1mark)

II. G                                                                                   (1mark)

(ii) What happens to the concentration of the Sulphuric acid during the process with time? Explain
                                                                                        (2
marks)

(iii) During the electrolysis a current of 0.72A was passed through the electrolyte for 15 minutes. Calculate the volume of gas H produced. (1 Faraday = 96,500C, molar gas volume = 24 dm$^3$ at r.t.p).                (3 marks)

7 (a) (i) What is a salt?                                                               (1mark)

(ii) Write the formula of any **two** double salts.                                     (1mark)

(b) A student has found that her sample of potassium nitrate is contaminated with small amounts of a green solid. She picks out a small piece of the green solid and finds that it is insoluble in water.

(i) Describe how you would make a pure sample of potassium nitrate from the impure mixture.     (3 marks)

(ii) The student believes that the green solid is copper (II) carbonate. Describe a series of 3 tests that the student could use to confirm this.                                                                                    (6 marks)

| Test | Procedure | Observations | Conclusion |
|------|-----------|--------------|------------|
| 1 | | | |
| 2 | | | |
| 3 | | | |

(c) In an experiment 50g of a saturated solution of a salt X was heated to dryness in an evaporating dish. The mass of crystals when weighed gave a reading of 2.7g. Determine the solubility of the salt.                 (2 marks)