**TRIAL EXAMINATIONS 2021**

**Kenya Certificate of Secondary Education (KCSE)**

**232/1 - CHEMISTRY - Paper 1**

**(Theory)**

**Nov/Dec. 2021 – 2 Hours**

**Name: …………………………………..… Index No: ……….………...Stream ……..**

**Candidate’s** **Signature**: ..……………………………………………. **Date**:…………

**INSTRUCTIONS TO CANDIDATES**

1. *Write your name and index number in the spaces provided.*
2. *Answer* ***all*** *questions in the spaces provided*
3. *KNEC mathematical tables and silent electronic calculators* ***may*** *be used for calculations.*
4. *All workings* ***must*** *be clearly shown where necessary.*
5. *Candidates should check the question paper to ascertain all the pages are printed as indicated and no questions are missing.*
6. *This paper consists of 12 printed pages*
7. *Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing*
8. *Candidates should answer all the questions in English.*

**For Examiners Use Only**

|  |  |  |
| --- | --- | --- |
| **Questions** | **Maximum Score** | **Students Score** |
| 1 – 28 | 80 |  |

1. State the observations made when a piece of sodium metal is dropped into a beaker containing water. (2 marks)

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………........................................

1. During a class experiment, students passed **gas X** over heated copper metal, the metal changed its colour to black.
2. Identify **gas X**. (1 mark) ………………………………………………………………………………………………
3. Name the black substance formed. (1 mark) ………………………………………………………………………………………………
4. Write the chemical equation for the reaction (1 mark)

………………………………………………………………………………………………

1. Name the process which takes place when; (3 marks)
2. Solid carbon (IV) Oxide changes to gas ………………………………………………………………………………………………
3. Red litmus paper turns white when dropped in chlorine water ………………………………………………………………………………………………
4. Propene gas molecules converted into giant molecules ………………………………………………………………………………………………
5. A student added 50cm3  of 1.0M aqueous Sulphuric (VI) acid to 50cm3 of 2.0M Potassium Hydroxide and the temperature of the resulting solution rose by 40 C.
6. Define the term Molar heat of neutralization. (1 mark) ………………………………………………………………………………………………………………………………………………………………………………………………
7. Calculate the molar heat of neutralization (2 marks)

(C = 4.2 kJkg-1 K-1, Density of solution = 1g/cm3) ………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Use the table below to answer the question that follow:

|  |  |
| --- | --- |
| **Element** | **Atomic number** |
| A | 11 |
| B | 13 |
| C | 14 |
| D | 17 |
| E | 19 |

1. Write an equation for the reaction between **element A** and water. (1 mark) ………………………………………………………………………………………………………………………………………………………………………………………………
2. Explain the trend of atomic radii between elements **A** and **D**. (2 marks) ……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………....
3. Define the term allotropy (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………

1. In terms of structure and bonding, explain why graphite is used as a lubricant. (2 marks)

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………….……...

2. State the Boyles Law. (1 mark) ………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………
3. A given mass of the gas occupies 20cm3 at 250 C and 670mmHg pressure. Find the volume it will occupy at 100 C and 335mmHg. (2 marks) ………………………………………………………………………………………………..……………………………………………………………………………………………………………………………………………………………………………………………........................................................................................................................................................................
4. Study the flow chart below and answer the questions that follow.

White precipitate insoluble on boiling tube

Colourless solution

Black solid

Mixture M

Step 1

Add water and filter

Add

Add water and filter

Add Barium Nitrate solution

Colourless solution

Pale blue solution

Step 4

Add dilute nitric (V) Acid

Step 3

Add ammonia solution in excess

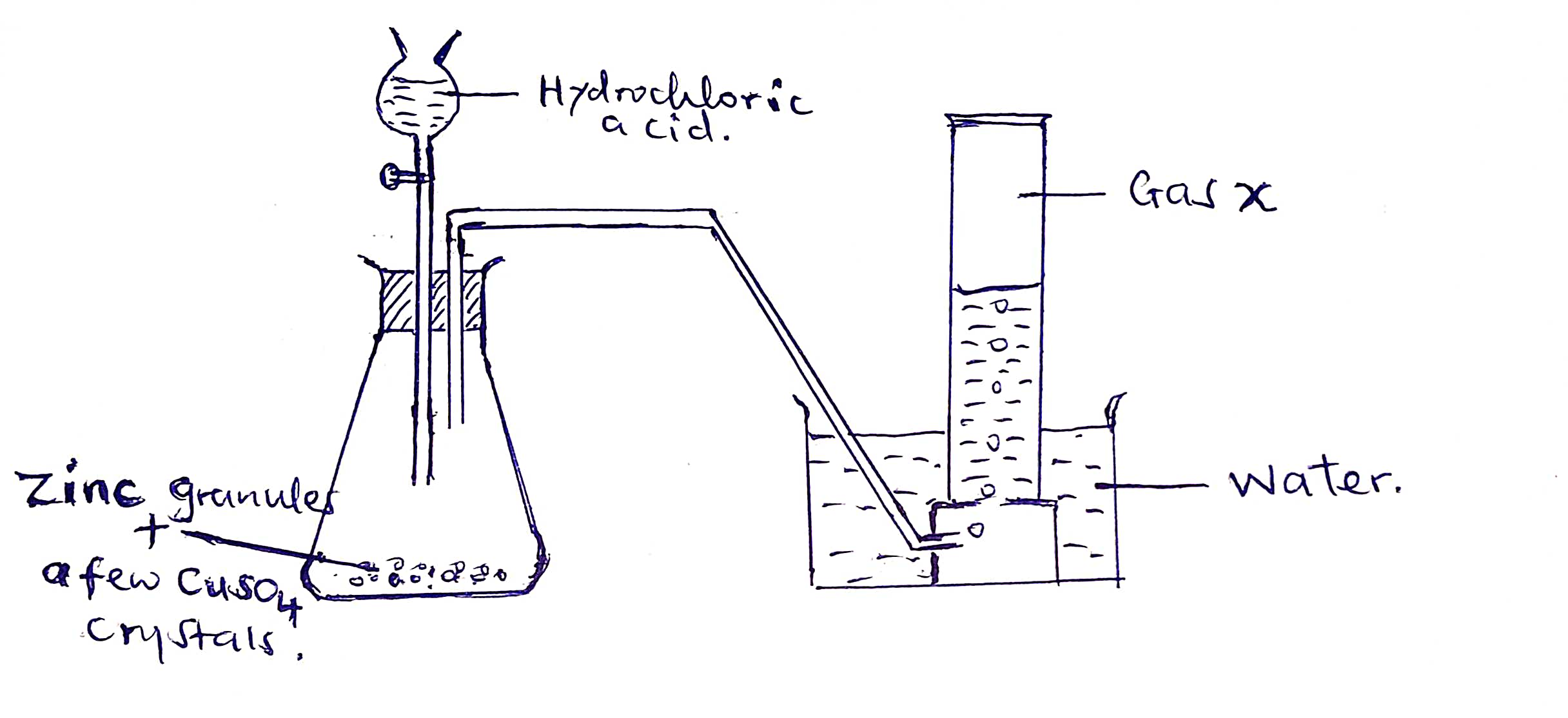
Step 2

1. Name

(i) Cations present in **mixture M**. (1 mark) ……………………………………………………………………………………………………………………………………………………………………………………………………

(ii) Anion present in the colourless solution. (1 mark) ………………………………………………………………………………………………..…………………………………………………………………………………………………..…

1. Write an equation to show how the white precipitate in step 3 dissolves. (1 mark) ………………………………………………………………………………………………..…
2. The solubility of potassium nitrate is 85g/100g of water at 500 C and 32g/100g of water at 250 C.
3. Define the term solubility. (1 mark) ……………………………………………………………………………………………………………………………………………………………………………………………………
4. Calculate the mass of the crystals formed if a saturated solution of potassium nitrate in 50g of water at 500C is cooled to 250C. (2 marks) ………………………………………………………………………………………………..…………………………………………………………………………………………………..…………………………………………………………………………………………..................
5. Magnesium Chloride dissolves in water to form a neutral solution while iron (III) chloride forms an acidic solution. Explain. (3 marks) ……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………........................................
6. The diagram below is a set up to prepare a certain **gas X**. Study it and use it to answer the questions that follow.



1. Identify **gas X**. (1 mark)

…………………………………………………………………………………………………..

1. Why is the gas collected over water? (1 mark) ………………………………………………………………………………………………..…
2. Why are Copper (II) Sulphate crystals added to the flask where the reaction takes place? (1 mark) …………………………………………………………………………………………………..

…………………………………………………………………………………………………..

1. Give the systematic names of the following organic compounds. (2 marks)
2. CH3CH2CH2CH2OH ………………………………………………………………………………………………
3. CH3CH2COOCH2CH3 ………………………………………………………………………………………………
4. Explain why an organic compound with the formula C4H8burns with a more soot flame than C4H10. (1 marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………

1. When solid Zinc Carbonate was added to a solution of Hydrogen Chloride in methylbenzene there was no observable change. On addition of some water to the mixture there was effervescence. Explain the observation. (2 marks)

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………........................................

1. In titration experiment, 25.0 cm3 of sodium hydroxide containing 8.0 g per litre was required for complete neutralization of 0.245 g of a dibasic acid. Calculate the relative molecular mass of the acid. (3 marks)

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………........................................

1. Describe how you would obtain solid sample of each of the following components of solid mixture containing lead (II) chloride, Ammonium Chloride and Copper (II) oxide (3 marks)

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………....………………………………………………………………………………………………………………………………

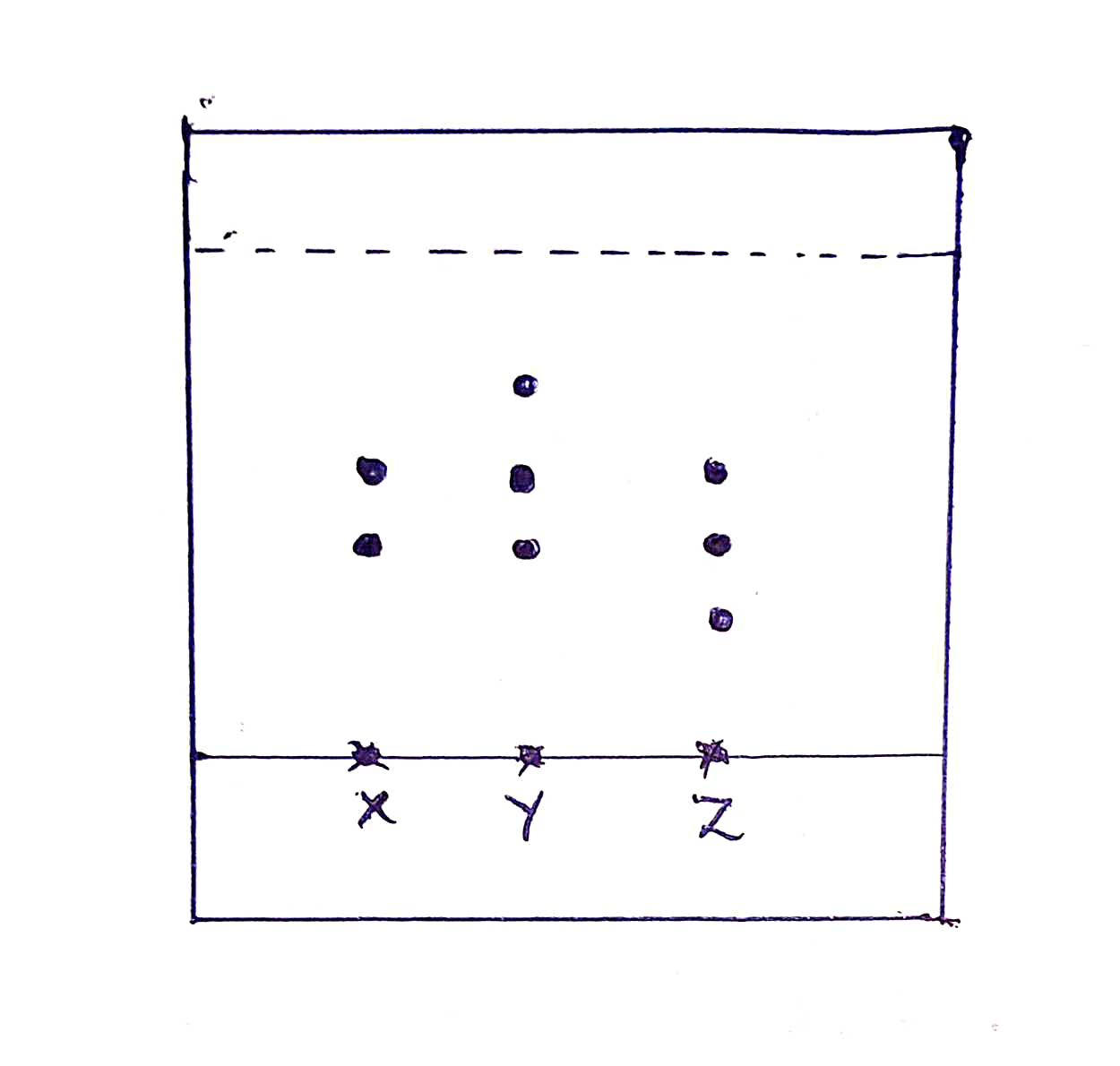
1. Define ionization energy. ` (1 marks)

………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Explain why the second ionization energy of Magnesium is higher than the first ionization energy. (2 marks)

………………………………………………………………………………………………………..……………………………………………………………………………………………………..

1. The diagram below represents a paper chromatography for three brands of juice suspected to contain unwanted food additives.



From the results, it was found that unwanted additives are present in **Y** and **Z** only. On the chromatogram:

1. Circle the spots which show unwanted food additives. (1 mark)
2. Name the solvent commonly used in paper chromatography. (1 mark)

……………………………………………………………………………………………….…

1. State **one** application of chromatography. (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………

1. Show bonding in Aluminum (III) Oxide. (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..................

1. Identify the type of bonds represented by **p** and **q** in the substances below.

H

H

H

H

O

p

q

O

O

H

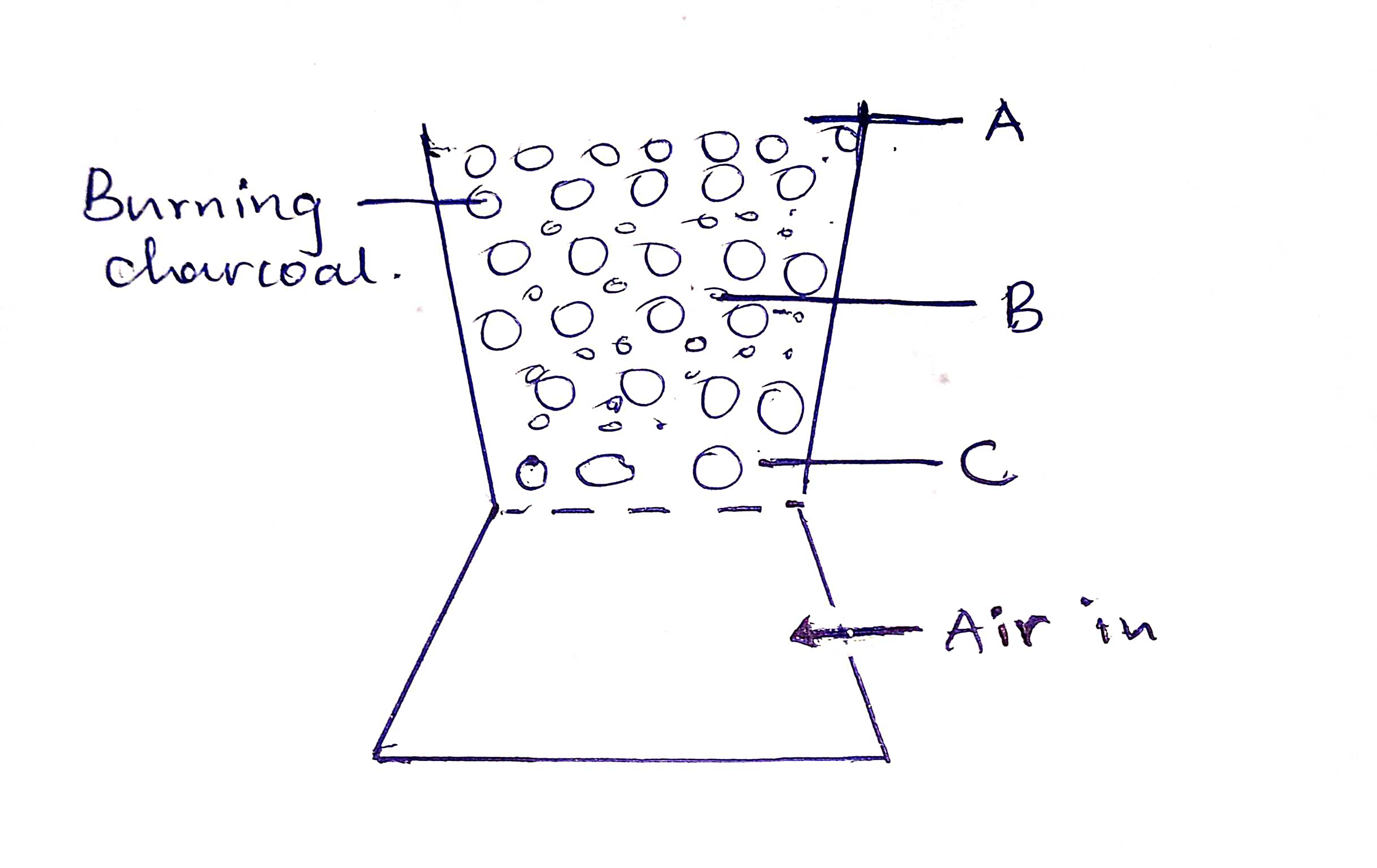
H

**q**

**p** ………………………………………………………………………...……....(1 mark)

**q** ………………………………………………………………………………….(1 mark)

1. The following diagram represents a charcoal burner. Study it and answer the questions that follow:



Write the equations for the reactions at regions A, B and C. (3 marks)

**A -**…………….……………………………………………………………………………………

**B –**…………………………………………………………………………………………………

**C -**……………………………………….…………………………………………………………

1. Use the scheme below to answer the question that follow.

Solid H

Carbon (IV) oxide

Solid J

(Yellow when cold)

1. Identify **process N**. (1 mark)

…………………..………………………………………………………………………………

1. Identify the solids (2 marks)

**H-** ………………………………………………………………………………………………

**J-** ………………………………………………………………………………………………

1. Ammonia gas is prepared by Haber process according to the equation below:

**N2(g)+3H2(g) 🡪 2NH3(g) +Heat**

State and explain the effect on equilibrium when the following conditions are applied.

1. Pressure increased. (1 mark)

………..………………………………………………………………………………………………..……………………………………………………………………………………………

1. Temperature increased. (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………

1. State Le Chatelier’s principle. (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………

1. You are given the following half equations.

I2(s) +2e- 2I (aq) EѲ=+0.54V

Br2(l) +2e- 2Br - (aq) EѲ=+1.09V

1. Write an overall equation for the cell reaction. (1 mark)

……………………………………………………………………………………………………….……………………………………………………………………………………………

1. Calculate the EѲ value of the cell. (1 mark)

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

1. Name the oxidizing agent. (1 mark)

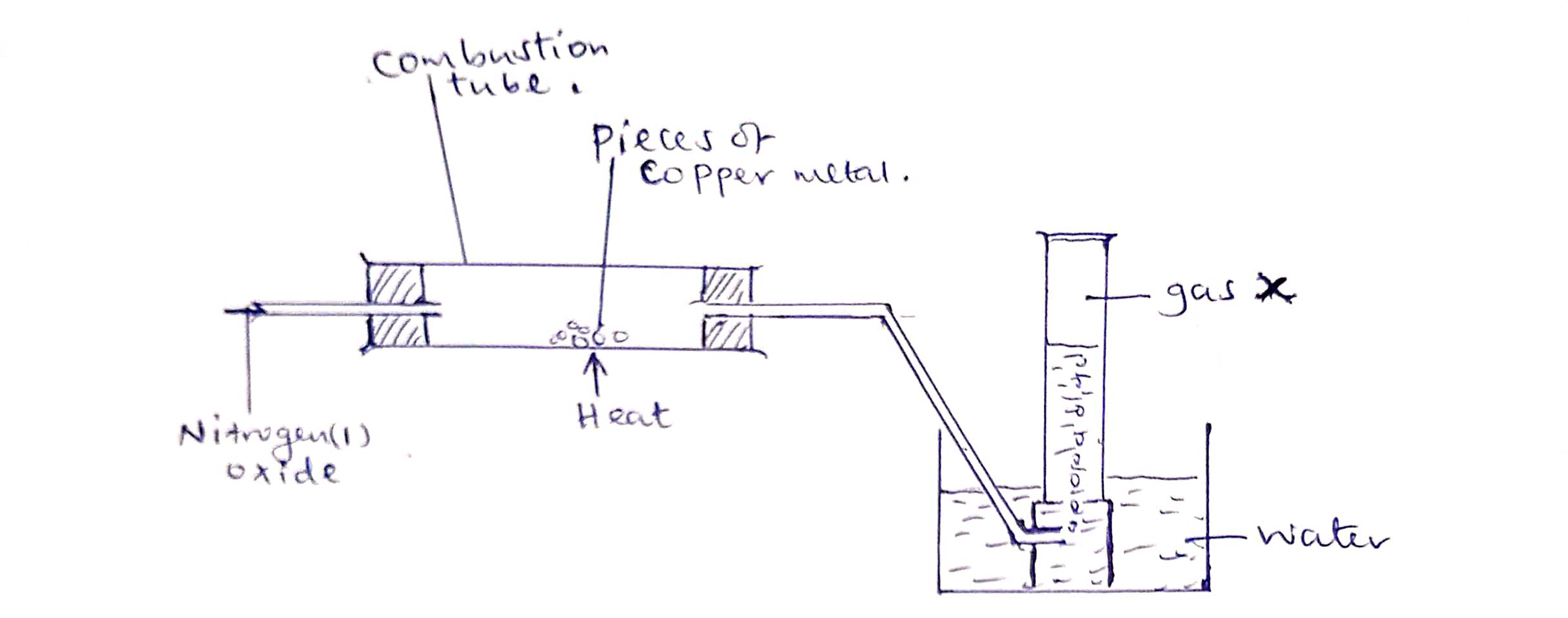
…………………………………………………………………………………………………..

1. When a current of 0.8Ampheres was passed for 44 minutes and 20 seconds through fused iodide of **metal Z**, 0.7167g of **Z** was deposited. Determine the charge of the ion of **metal Z**. (3 marks)

(1 Faraday=96500C, RAM of Z=65)

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………....

1. The set up below shows how small pieces of copper are heated in nitrogen (I) Oxide.



1. Write an equation for the reaction which occurs in the glass jar. (1 mark)

…………………………………………………………………………………..………………

1. Give **two** uses of the Nitrogen (I) Oxide. (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………

1. State what would be observed if concentrated Sulphuric (VI) Acid is added to:
2. Sugar crystals. (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………

1. Hydrated Copper (II) Sulphate crystals. (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………

1. What type of reaction has taken place above? (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………

1. Complete the table below. (2 marks)

|  |  |  |
| --- | --- | --- |
| **Solution** | **pH** | **Nature of Solution** |
| H | 1.0 |  |
| I |  | Neutral |
| J |  | Weak acid |
| K | 13.0 |  |

1. A farmer intended to plant cabbages in his farm. he first tested the PH of the soil and found it to be 3.0.If cabbages do well in alkaline soils, explain the advice that would be given to the farmer in order to realize a high yield. (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………

1. Name an appropriate apparatus:
2. That is used to prepare standard solutions in the laboratory. (1 mark)

……………………………………………………………………………………………………….……………………………………………………………………………………………

1. That is used in heating solid substances strongly. (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………

1. That can be used to separate two immiscible liquids. (1 mark)

……………………………………………………………………………………………………………………………………………………………………………………………………