NAME**.. ADM NO: ....**

STREAM...SCHOOL: ....

233/1
CHEMISTRY PAPER 1
October 2022
Time: 2 Hours

NYAHOKAKIRA CLUSTER THREE EXAMINATION 2022
Kenya Certificate of Secondary Education (*KCSE*)

Instructions to Candidates

  a) Write your name, admission number, index number in the spaces provided above.
  b) Write the name of school and stream in the spaces provided above.
  c) Answer all questions in the spaces provided in this question paper.
  d) All your answers must be written in the spaces provided after every question.

FOR EXAMINER'S USE ONLY

1	2	3	4	5	6	7	8	10	11	12	13	14	15	16	17	18	19	20	21

22	23	24	25	26	27	28	29

GRAND TOTAL

This paper consists of 12 printed pages. Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing

1. Aluminium metal is a good conductor and is used for overhead cables. State any other two properties that make aluminium suitable for this purpose. (2 marks)

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2. Starting with copper metal describe how a sample of pure copper (II) chloride crystals can be prepared. (3 marks)

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3. A piece of cover slip was weighted before and after a student made a mark on it using a pencil like of pure graphite. The masses were as shown below.

Mass of cover slip before the mark = 1.804g

Mass of cover slip after the mark was made = 1.9053g

Determine the number of carbon atoms used to draw the circle. (C = 12, L = 6.02 x 10^{23})

(3 marks)

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4. 5.04g of a mixture of anhydrous sodium carbonate and sodium hydrogen carbonate when heated to a constant mass, gave 4.11g of residue.

(a) Write an equation for the reaction that takes place when the mixture is heated .(1 mark)

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(b) Calculate the percentage of anhydrous sodium carbonate in the mixture. (2 marks)

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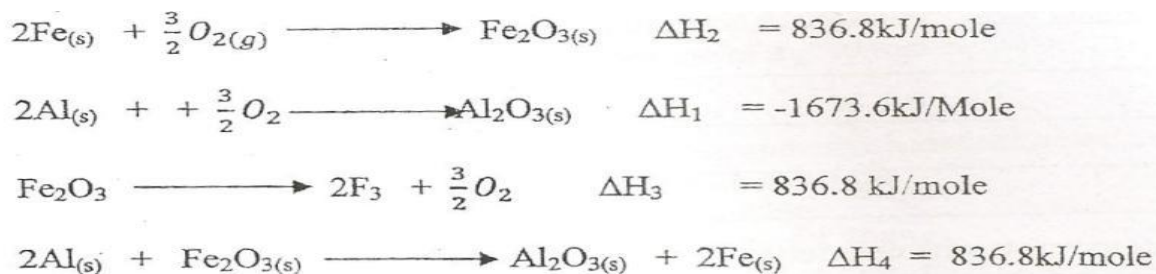
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5. State and explain what would happen if a dry red litmus paper was dropped in a gas jar of dry chlorine. (2 marks)

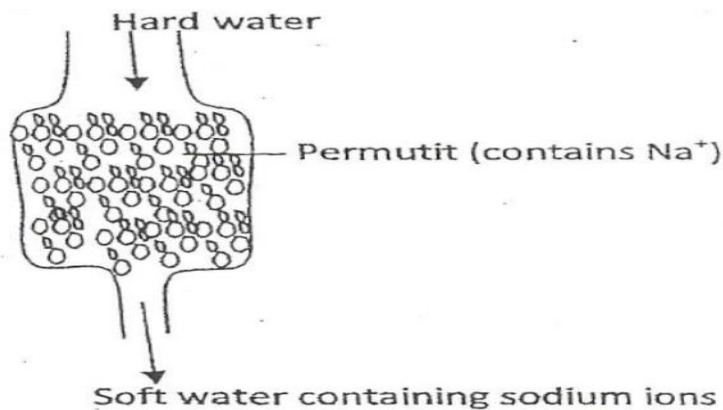………

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6.   Use the following equations to determine the heat evolved when aluminium metal is reacted with Iron (III) oxide. (3 marks)

$$2Fe_{(s)} + \frac{3}{2}O_{2(g)} \longrightarrow Fe_2O_{3(s)} \quad \Delta H_2 = 836.8kJ/mole$$

$$2Al_{(s)} + + \frac{3}{2}O_2 \longrightarrow Al_2O_{3(s)} \quad \Delta H_1 = -1673.6kJ/Mole$$

$$Fe_2O_3 \longrightarrow 2F_3 + \frac{3}{2}O_2 \quad \Delta H_3 = 836.8 \ kJ/mole$$

$$2Al_{(s)} + Fe_2O_{3(s)} \longrightarrow Al_2O_{3(s)} + 2Fe_{(s)} \quad \Delta H_4 = 836.8kJ/mole$$

7. (a) The column below was used to soften hard water.

Hard water

Permutit (contains Na⁺)

Soft water containing sodium ions

(i)   Explain how the hard water was softened as it passed through the column (1 mark)

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(ii)   After sometime the material in the column is not able to soften hard water. How can the material be reactivated? (1 mark)
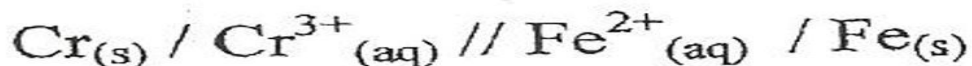
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(b) Give one advantage of using hard water foe domestic purposes. (1 mark)

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8.   Use the cell represented below to answer the questions that follow.

$$Cr_{(s)} / Cr^{3+}_{(aq)} // Fe^{2+}_{(aq)} / Fe_{(s)}$$

   (a) Write the equation for the cell reaction.   (1 mark)

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(b) If the e.m.f. of the cell is 0.30 volts and the E^o value for $Cr^{3+}_{(aq)} / Cr^{(s)}$ (2 marks)

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9 .   (a) Distinguish between nuclear fission and nuclear fusion.   (1 mark)

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(b) State two uses of radioisotopes in health   (2mks)

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10. When a piece of sodium metal is place in cold water in a beaker it melts producing a hissing
   sound, as it moves on the surface of the water. Explain these observations.   (2 marks)

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11. The table below shows information of four elements **A**, **B**, **C** and **D**. Study it and answer the
   questions that follow. The letters do not represent the actual symbols of the elements.

Element	Electronic arrangement	Atomic radius	Ionic radius
A	2.8.2	0.136	0.065
B	2.8.7	0.99	0.181
C	2.8.8.1	0.203	0.133
D	2.8.8.2	0.174	0.099

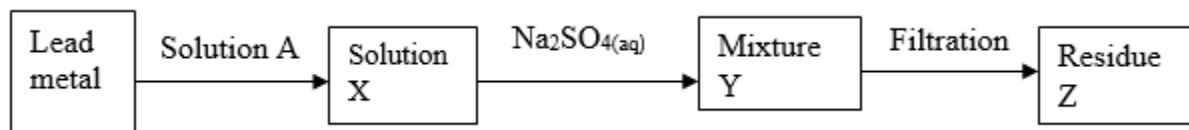4

(a) Which two elements have similar properties? (1 mark)

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(b) Explain why **B** ionic radius is larger than its atomic radius. (2 marks)

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12. The reaction below refers to the preparation of lead (II) sulphate starting with lead metal.

| Lead metal | Solution A → | Solution X | Na₂SO₄(aq) → | Mixture Y | Filtration → | Residue Z |

(a) Name solution A…………………………………………………………………….. (1 mark)

(b) Write an ionic equation for the reaction in (a) above. (1 mark)

(c) Explain why it is not possible to prepare residue Z using lead metal and dilute sulphuric acid. (1 mark)

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13. The set-up below was used to prepare a hydrocarbon. Study it and answer the questions that follow.
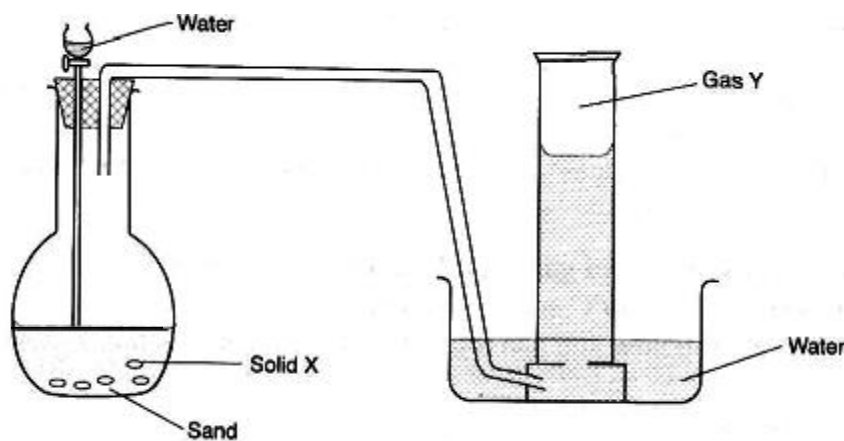
(a) Identify solid X and gas Y.

Solid X……………………………………………………………………………..... (1 mark)

Gas Y…………………………………………………………………….... (1 mark)

(b) Write a chemical equation for the complete reaction between gas Y and bromine

vapour. (1 mark)

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14. The set up below can be used for the laboratory preparation of product **W**.
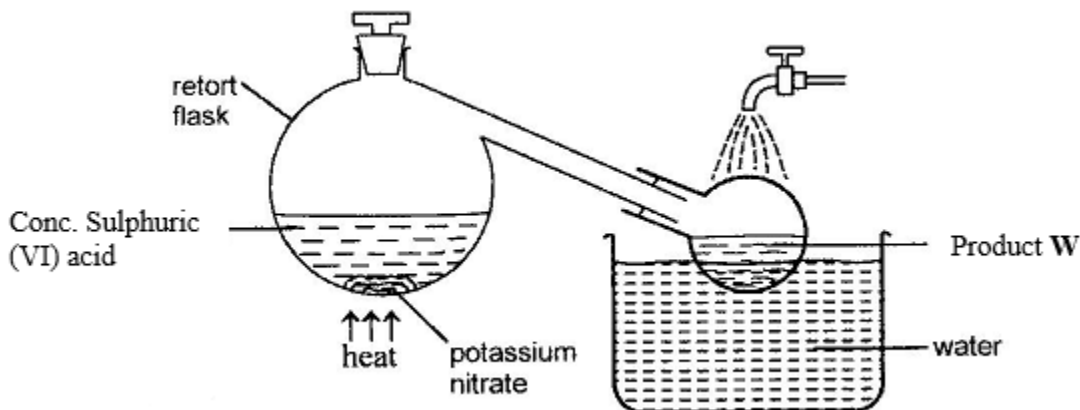
(a) Write chemical equation for the reaction that takes place in the retort flask. (1 mark)

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(b) Explain why product W appears yellow in colour. How is the colour removed?

(2 marks)

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15. Study the electrode potential in the table below and answer the questions that follow.

$$E \text{ volts}$$

$Cu^{2+}_{(aq)} + 2e- \rightarrow Cu_{(s)}$ +0.34

$Mg^{2+}_{(aq)} + 2e- \rightarrow Mg_{(s)}$ -2.38

$Ag^{+}_{(aq)} + e- \rightarrow Ag_{(s)}$ +0.80

$Ca^{2+}_{(aq)} + 2e- \rightarrow Ca_{(s)}$ -2.87

Is it possible to store a solution of copper (II) sulphate in a container made of magnesium

.Explain (2 marks)

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16. The table below shows the PH volumes of solution **A, B, C** and **D.**

Solution	A	B	C	D
PH	2	7	11	14

Select solutions in which a sample of zinc hydroxide is likely to dissolve give reasons for

each solution selection (2mks)

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17. Given that the atomic number of Y is 13 and that of Z is 9.

(a) Write the electron arrangement of **Y** and **Z** (1mk)

Y…………………………………………………………………………………………………

Z……………………………………………………………………………………………………….

(b)Draw the dot (.) and (x) diagram for the compounds formed by Y and Z (1mk)

(c) An element X with RAM of 6.94 has two isotopes ^7X and ^6X .Determine the relative

abundance of each isotope (3mks)

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18. (a) State Charles' law (1mk)

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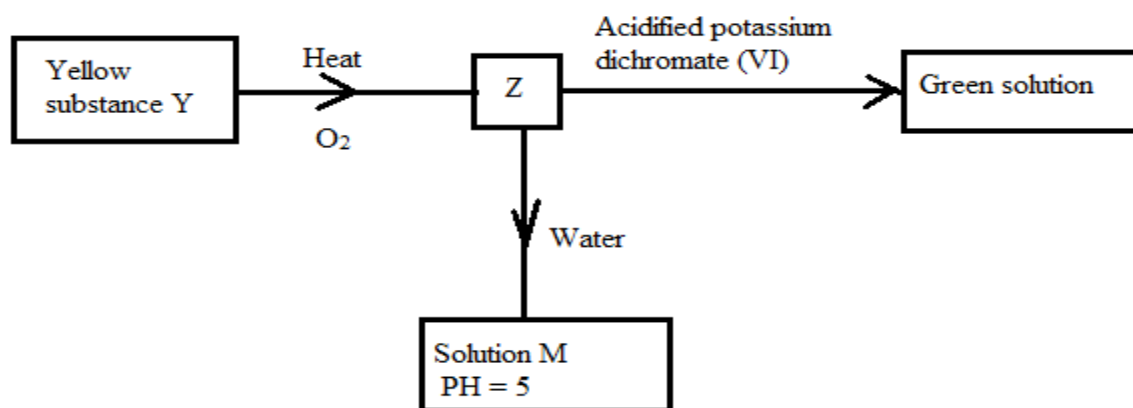………

(b) 50cm^3 ammonia gas diffuses through a small orifice in 20 seconds. How long will it take

a similar volume of propane (C_3H_8) to diffuse through the same orifice under the same

conditions of temperature and pressure? (C=12.0, H =1.0, N=14.0) (2mks)

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19. Study the flow chart below and answer the questions that follow .

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┌──────────────┐     Heat      ┌─────┐   Acidified potassium    ┌──────────────┐
│ Yellow       │ ───────────►  │  Z  │   dichromate (VI)        │ Green solution│
│ substance Y  │               │     │ ──────────────────────► │              │
└──────────────┘     O₂        └─────┘                          └──────────────┘
                                  │
                                  │ Water
                                  ▼
                           ┌──────────────┐
                           │ Solution M   │
                           │ PH = 5       │
                           └──────────────┘
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a)Identify Z and M   (2mks)

Z……………………………………………………………………………………………

M……………………………………………………………………………………………….

b) Write a chemical equation for the formation of solution M   (1mk)

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20.The table below gives three experiments on the reaction of excess sulphuric acid and 0.5g of zinc done under different conditions in each case the volume of gas was recorded at different time intervals.

EXPERIMENT	ZINC	SULPHURIC ACID CONCENTRATION
I	Powder	0.8M
II	Powder	1.0M
III	granules	0.8M

On the axes below draw and label the three curves that would be obtained from such results.

(3mks)

Volume of gas (cm³) vs Time (seconds)

21. When $20cm^3$ of 1M sodium hydroxide was mixed with $20cm^3$ of 1M hydrochloric acid, the temperature rose by 6.7^0c. Assuming the density of the solution is $1g/cm^3$ and the specific heat capacity of the solution is $4.2 j/g^{-1}/k^{-1}$.
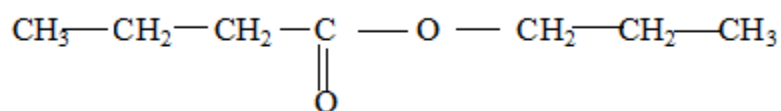
  (a) Calculate the molar heat of neutralization (2mks)

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  (b) Draw the energy level diagram for the reaction in (a) above (1mk)

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22.   The structure below represents a sweet smelling compound

$$CH_3-CH_2-CH_2-\underset{\underset{O}{\|}}{C}-O-CH_2-CH_2-CH_3$$

  (a) To which class of organic compound does the structure above belong? (1mk)

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  (b) Give the name of the two organic compounds that can be used to prepare that can be used to prepare the compound in the laboratory. (1mk)

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(c) Give the structural formula of   Ethylpropanoate (1mk)

23. Classify the following processes as chemical changes or physical changes. (2mks)

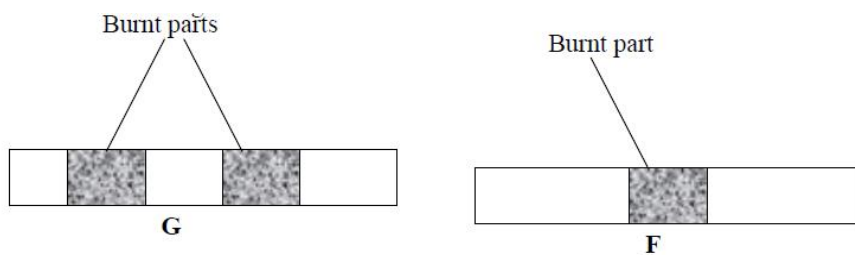i)   Neutralization …………………………………………………………………………

ii)   Sublimation……………………………………………………………………………..

iii)   Fractional distillation……………………………………………………………………

iv)   Displacement …………………………………………………………………………..

24. Wooden splints F and G were placed in different zones of a Bunsen burner flame.

The diagram below gives the observations that were made.

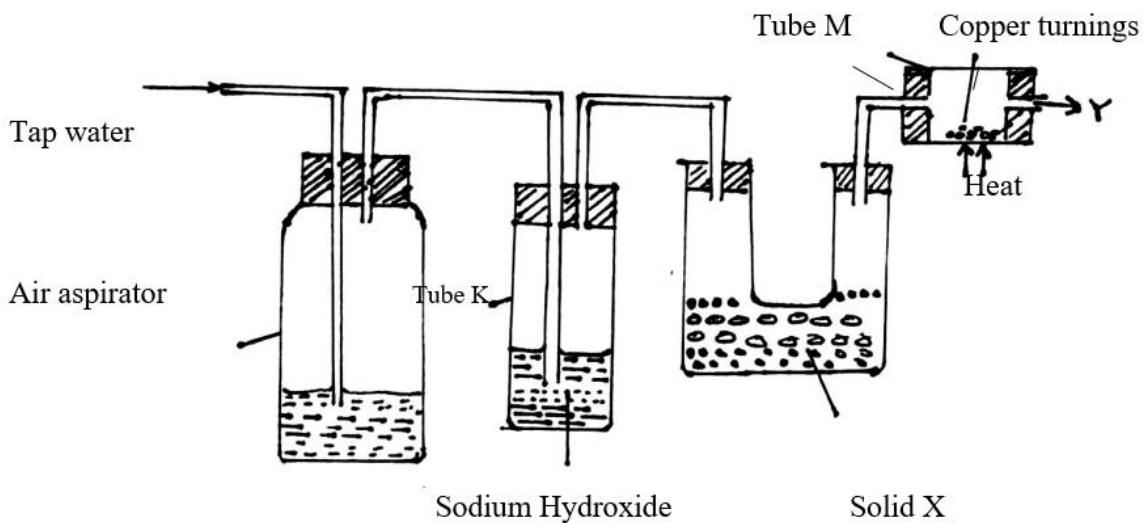i)   Explain the difference between F and G. (1 mark)

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ii)   Name the type of flame that was used in the above experiment.   (1 mark)

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25. Study the diagram below and answer the questions that follow.

(i)   State and explain the observation that would be made in tube M after sometime. (1mk)

(ii)   The sample of nitrogen collected at point Y had greater density than expected. What conclusion could be made about the gas?   (1mk)
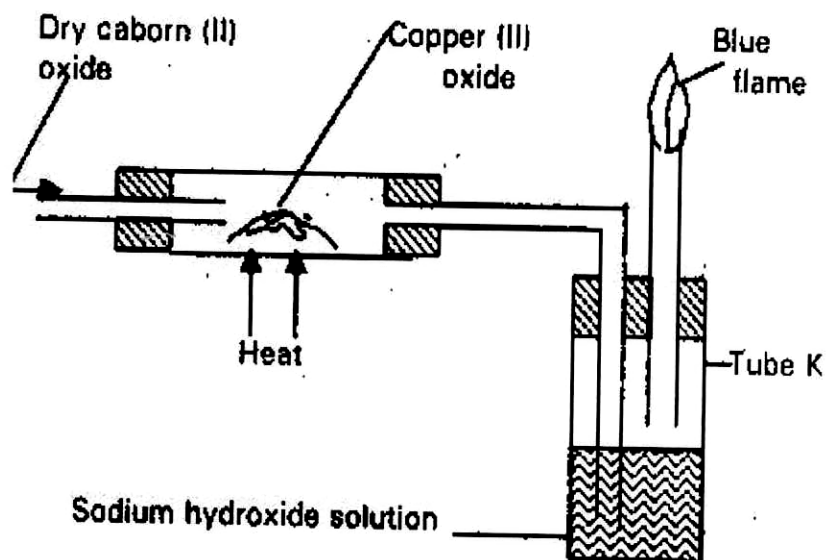
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26. (a) State **two** differences between the terms electrolyte and non-electrolyte.   (2mks)

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27. (b) Graphite is a non-metal yet it conducts electric current. Explain.   (1mk)

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28. The apparatus shown below was used to investigate the effect of carbon (II) oxide on Copper (II) oxide.

(a) State the observation that was made in the combustion tube at the end of the experiment.
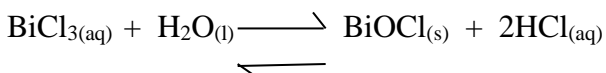   (1mk)

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(b) Write an equation for the reaction that took place in the combustion tube.   (1mk)

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(c) Why is it necessary to burn the gas coming out of tube K?   (1mk)

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29. When bismuth (III) chloride is added to water, a reaction occurs and a white precipitate forms as shown below.

$BiCl_{3(aq)} + H_2O_{(l)} \rightleftharpoons BiOCl_{(s)} + 2HCl_{(aq)}$

What would be the effect on the amount of the precipitate formed if sodium hydroxide solution is added to the equilibrium mixture? Explain your answer.   (2mks)

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30. The flow chart below shows some process in extraction of lead metal. Study it and answer the questions that follow.
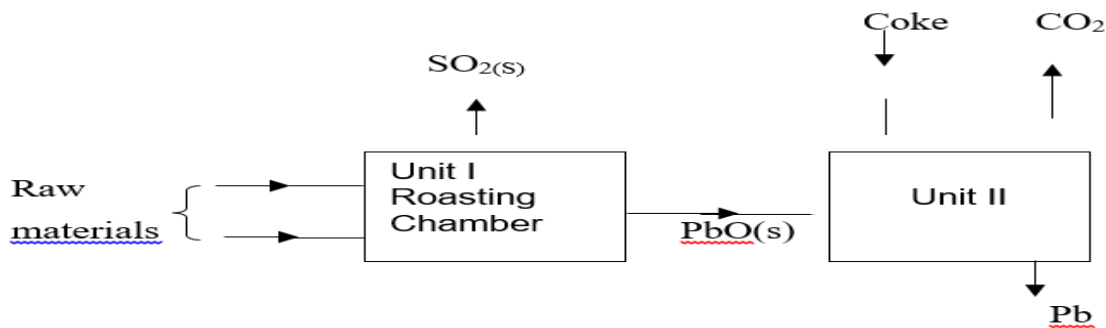
a) Name **two** raw materials that were fed into Unit I.   (1mk)

b). State **one** environment hazard associated with the process in Unit I.   (1mk)

c) What is the function of coke in unit II?   (1mk)