NAME: ……………..…………………………………………………………..

SCHOOL:……………………………………………………………………

DATE: ....

EXTRACTION OF METALS

<u>INSTRUCTIONS TO CANDIDATES</u>

*Answer **ALL** questions in this paper in the spaces provided.*

1. a) Give the names of the ores used in the production of iron and aluminium.   (2mks)
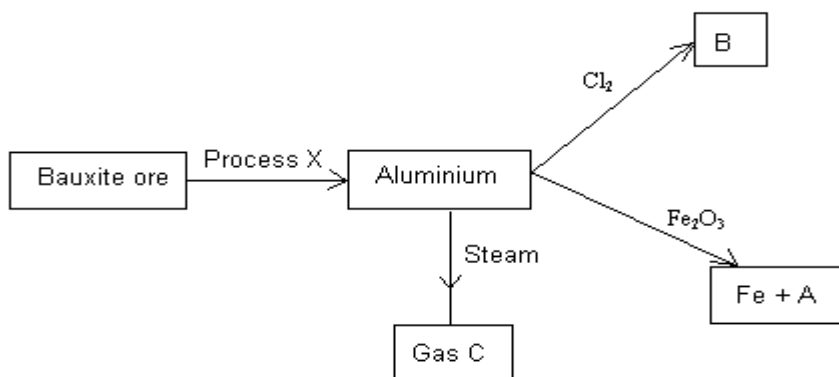
   Iron ……………………………………………………………………..

   Aluminium ……………………………………………………………..

   b) Name the method used to extract aluminium.   (1mk)

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2. The extraction and some properties of aluminium are summarized in the flow chart below.

(i) **Give** the chemical formula of Bauxite. (½ mk)

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(ii) **Name** the substances A, B and C in the diagram above. (1 ½mks)

A: ………………………………………………………………………………………

B: ………………………………………………………………………………………

C: ………………………………………………………………………………………

(iii) Explain the use of Cryolite in the extraction of Aluminum. (1mk)

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3. The table gives the reactions between metals S, T, U and some substances.

Metal	Reaction with air	Reaction with water	Reaction with dilute acid
S	Reacts	Does not react	Reacts
T	Does not react	Does not react	Does not react
U	Reacts	Reacts	Vigorous reaction

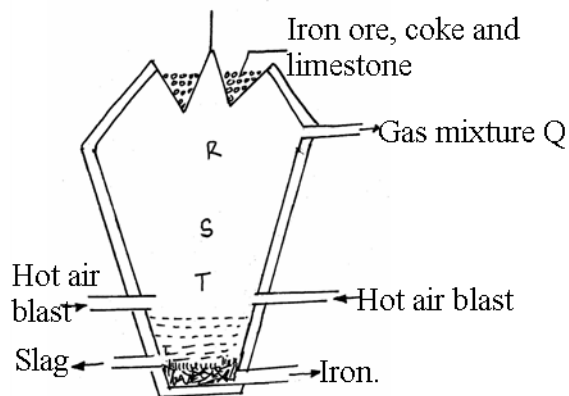(a) **Which** metal is likely to be magnesium? (1mk)

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(b) **Which** metal may be used to make a cooking pot? (1mk)

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(c) Arrange the **three** metals in order of reactivity starting with the most reactive.
(1mk)

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4. The diagram below shows the blast furnace for the extraction of iron. Study it and answer the question that follow.

(a) Name any one ore from which iron can be extracted. (1mk)

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(b) At which point R, S or T in the blast furnace is the temperature lowest? (½ mk)

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3

(c)   Name any one of the main gases in gas mixture Q   (½ mk)

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(d)   What is the function of the hot air blast?   (1mk)

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5. (a) Apart from Bauxite, **state** any other **two** ores of aluminium.   (1mk)

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(b) **Name** the method that is used to extract aluminium from Bauxite.   (1mk)

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(c) (i) **Name two** major impurities in Bauxite   (1mk)

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(ii) **Explain** how the impurities are removed.   (2mks)

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(d) Cryolite is used in the extraction of aluminium from Bauxite. **State** its function.
(1mk)
……………………………………………………………………………………...

(e) Aluminium is a reactive metal yet utensils made of aluminium do not corrode
easily. **Explain** this observation.   (2mks)

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(f) **Explain** the economic and environmental benefits of recycling aluminium (from
scrap metal) over extraction of aluminium from Bauxite.   (2mks)

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5. The flow chart below outlines some of the processes involved during extraction of copper from copper pyrites. Study it and answer the questions that follow.
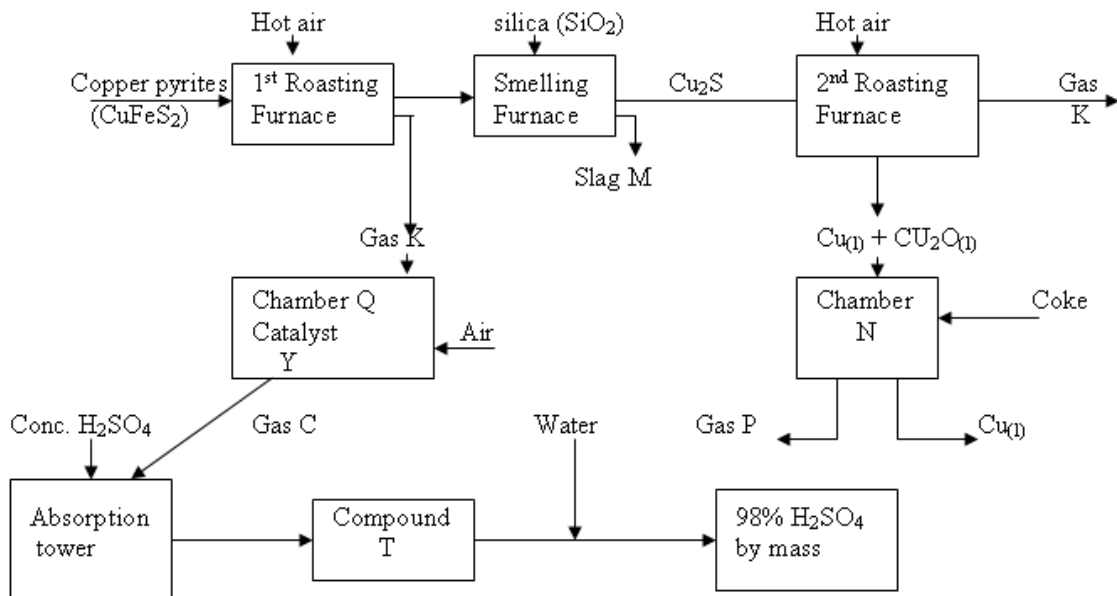
a) Identify:

i) Gas K …….…………………………………………………….. 1mk

ii) Gas P …………………………………………………………... 1mk

b) Write equations for the reactions that takes place in the;

i) 1st Roasting furnace   1mk

ii) Absorption tower   1mk)

(i) Write the formula of the cation present in the slag M   1mk

(ii) What name is given to the reaction that takes place in chamber N? Give a reason for your answer.   2mks

d) (i) Name catalyst Y   1mk

(ii) State two uses of sulphuric acid.   1mk

f) i) The copper obtained from chamber N is not pure. Draw a labeled diagram to show the set-up you would use to refine the copper by electrolysis.   3mks

ii) Given that the mass of copper obtained from the above extraction was 210kg, determine the percentage purity of the ore (copper pyrites), if 810kg of it was fed to the 1st roasting furnace (Cu=63.5, Fe=56.0, S=32.0)

6

7. The diagram below shows industrial extraction of aluminium

Molten alumina + cryolite

Graphite anode
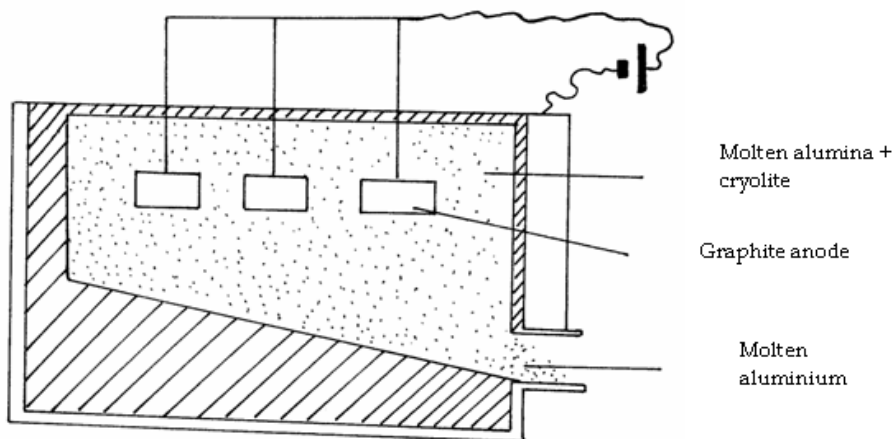
Molten aluminium

a) Name and write the formulae of the major ore for this process. (1mk)

Name

Formula

b) Write the equation of the reaction taking place at the

Anode (1mk)

Cathode (1mk)

c) Write the formula of the molten alumina. (1mk)

d) State the role of cryolite added to molten alumina (1mk)

e) It is cheaper to recycle aluminium other than to extract it. Explain.   (1mk)

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f) Explain why graphite anodes must be replaced after some time.   (1mk)

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g) State one property of aluminium that makes it suitable for wrapping food.   (1mk)

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h) Aluminium is high in the reactivity series yet it does not react with both acid and air.
Explain.   (1mk)

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i) When a current of 3 A is passed through fused aluminium oxide for 4 hour 30 minutes,
calculate the mass of aluminium obtained. [Al=27, 1F=96500C]

(2mks)

8

8.   Study the flow chart below and use it to answer the questions between.
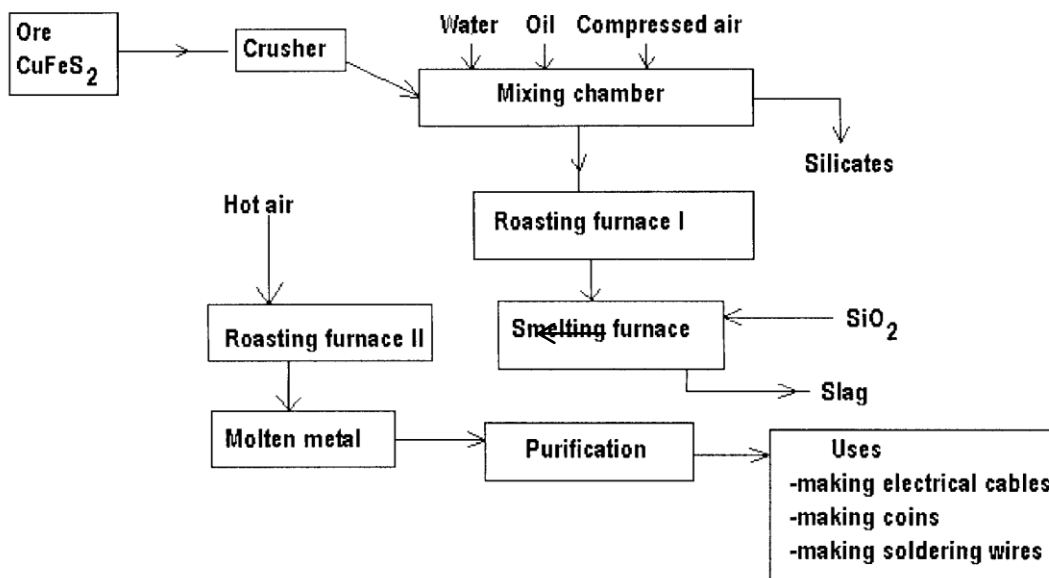
(a) Identify the process described by the flow chart
        (1 mark)

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(b) Explain why the Ore is crushed   (1 mark)

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(c) Which process occurs at mixing chamber?   (1 mark)

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(d) Explain the use of   (3mks)
I. water

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9

II. Oil

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III. Compressed air   (1 mark)

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(e) Write down an equation for the formation of slag.   (1 mark)

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(f) Identify the cations present where the metal is being purified.   (1 mark)

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(g) Given a reason for the following uses of this above metal.

I. making electrical wires.   (1 mark)

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II. Making soldering wires   (1 mark)

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9. The flow chart below shows the steps in extraction and purification of aluminum.
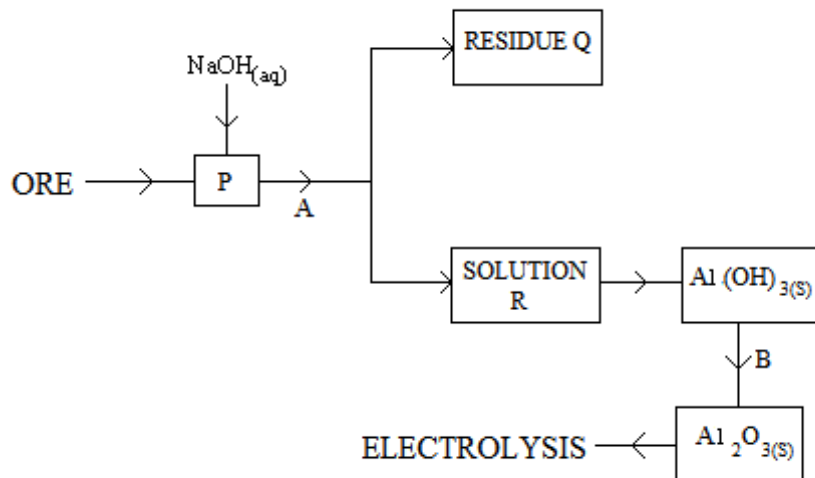
(a)   **Name** the ore used.   (1mark)

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(b)   **Write** the equation for the reaction in chamber p.   (1mark)

(c)   **Name** the main substance in residue Q.   (1mark)

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(d)   **Name** process A   (1mark)

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

(e)   **Give** a condition necessary for step **B** to take place

     (1mark)

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11

(f) **Give** equations for the reaction taking place during electrolysis at the.

   (i) Anode (1mark)

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

   (ii) Cathode (1mark)

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(g) **Give** another function of the graphite cathode apart from being an electrode. (1mark)

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(h) **Why** is it possible to obtain molten aluminium during electrolysis? (1mark)

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(i) **Write** an equation to explain what happens when dry hydrogen chloride gas is passed over hot aluminium turnings. (1mark)

(j) **Give one** use of aluminium. (1mark)

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(k) **Explain** the observations made when sodium carbonate is added to an aqueous solution of aluminium sulphate. (2marks)

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10. In a remote area in Kenya a scientist discovered a metal ore which he believed must have been containing Copper. After analysis he ascertained that what he had discovered was one of the principle ores of copper.

(a) **Name** and give the chemical formulae of the two principle ores of copper. (2marks)

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(b) **What** processes are first carried out to increase the concentration of copper? (2marks)

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(c) The concentration obtained in (b) above was first roasted and products mixed with silica. **Explain** using equations.   (2marks)

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(d) **How** is blister copper formed? **Name** the impurities.   (2 marks)

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(e) After removing sulpuric (IV) oxide from blister copper the impure copper was then purified by electrolysis. **Draw** a diagram showing an arrangement of apparatus used.

(3marks)

(f) **Write** half equation for the reactions that took place at the

  (i) Anode: (1mark)

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

  (ii) Cathode: (1mark)

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  (iii) **State two** uses of copper (2marks)

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11.
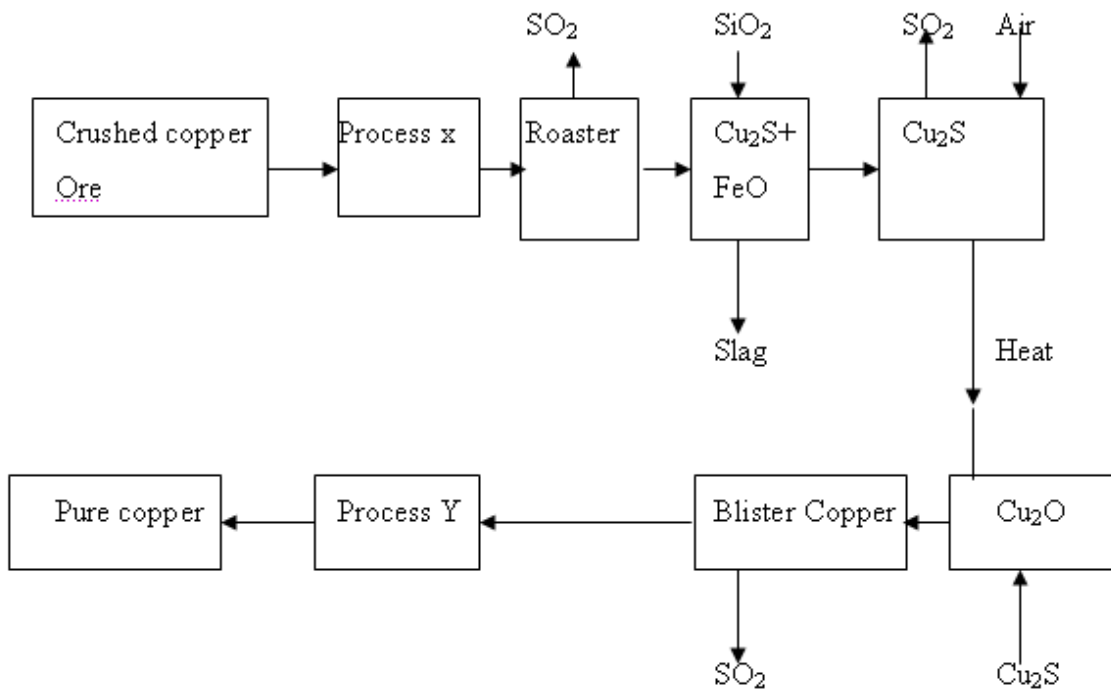
a) (i) Name the ore from which copper is extracted.   (½ mk)

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(ii) Name process.   (1mk)

X ....

Y ....

(iii) Write the formula of the major component of slag.   (1mk)

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(iv) Write a balanced equation to show how Cu_2O is obtained from Cu_2S.   (1mk)

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v) Draw a well labelled diagram to show how copper is obtained from blister copper.

                                                                                                        (2mks)

vi) Give one major use of copper.   (½ mk)

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b) Give one major effect of extracting copper on the environment.   (½ mk)

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