

**K.C.S.E CHEMISTRY PAPER 233/1B 2000**

1. a) The grid below represents part of the periodic table. Study it and answer the questions that follow. (The letters do not represent the actual symbols of the elements)

|  |   |  |  |   |  |   |
|--|---|--|--|---|--|---|
|  |   |  |  |   |  | A |
|  |   |  |  | B |  |   |
|  | C |  |  | D |  | E |
|  | F |  |  |   |  |   |
|  |   |  |  |   |  |   |

- i) What name is given to the group of elements to which C and F belong? (1 mark)

- ii) Which letter represents the element that is the least reactive? (1 mark)

- iii) What type of bond is formed when B and E react? Explain (2 marks)

- iv) Write the formula of the compound formed when element D and oxygen gas react (1 mark)

- v) On the grid, indicate with a tick (✓) the position of element G which is in the third period of the periodic table and forms  $G^{2-}$  ions. (1 mark)

- b) Study the information in the table below and answer the questions that follow (The letters do not represent the actual symbols of the substances)

| Substance | Melting point (°C) | Boiling Point (°C) | Solubility in water | Density at room temperature $g/cm^3$ |
|-----------|--------------------|--------------------|---------------------|--------------------------------------|
| H         | -117               | 78.5               | very soluble        | 0.8                                  |
| J         | -78                | -33                | very soluble        | $0.77 \times 10^{-3}$                |
| K         | -23                | 77                 | insoluble           | 1.6                                  |
| L         | -219               | -183               | slightly soluble    | $1.33 \times 10^{-3}$                |

- i) Which substance would dissolve in water and could be separated from solution by fractional distillation? Give a reason (2 marks)

- ii) Which substance is a liquid at room temperature and when mixed with water two layers would be formed? (1 mark)

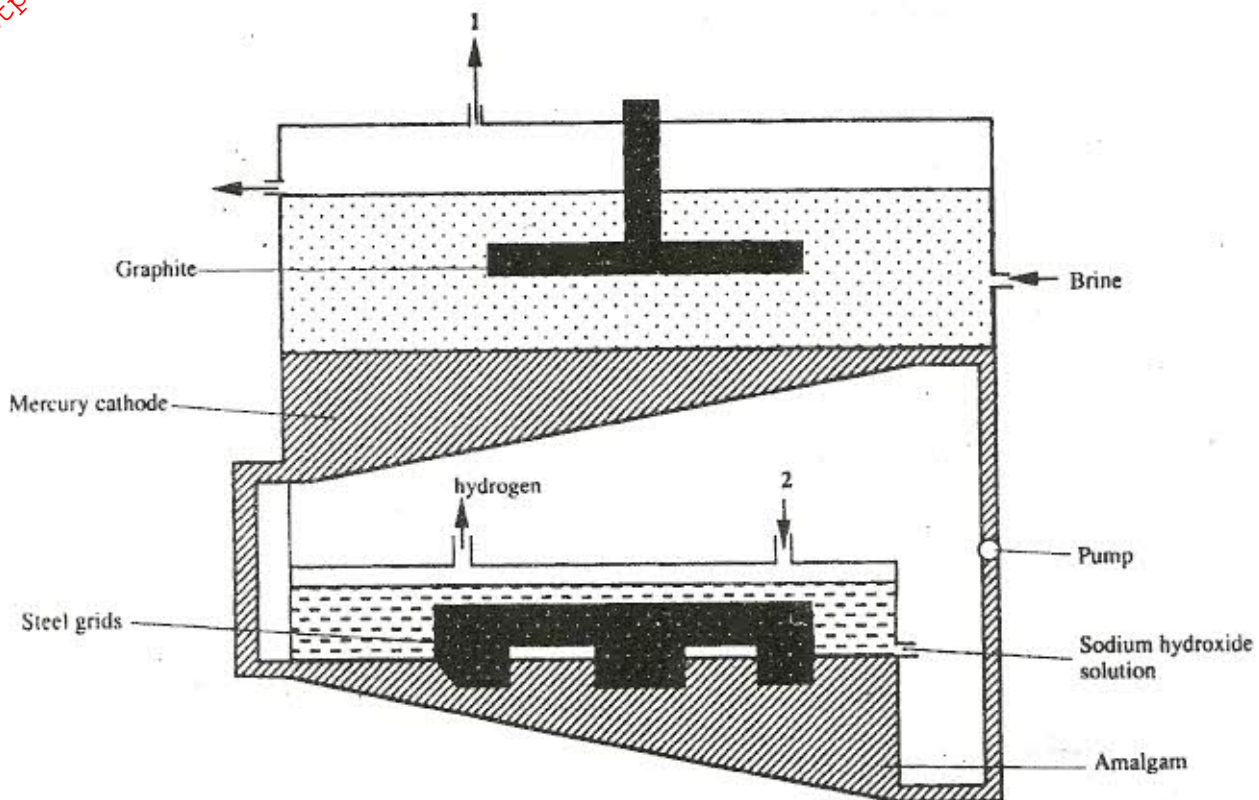
iii) Which letter represents a substance that is a gas at room temperature and which can be collected:

I over water? Explain

II by downward displacement of air? (Density of air is  $1.29 \times 10^{-3} \text{g/cm}^3$  at room temperature)

(1 mark)

2. a) The diagram below represents a mercury cell that can be used in the industrial manufacture of sodium hydroxide. Study it and answer the questions that follow



i) Name

I the raw material introduced at 2

(1 mark)

II Another substance that can be used in the cell instead of graphite

(1 mark)

ii) Identify by by-product the comes out at I

(1 mark)

iii) Give

I one use of sodium hydroxide

(1 mark)

II two reasons why mercury is recycled

(2 marks)

b) A current of 100 amperes was passed through the cell for five (5) hours

i) Write equations for:

I the reaction that occurred at the mercury cathode

(1 mark)

II the reaction in which sodium hydroxide was produced

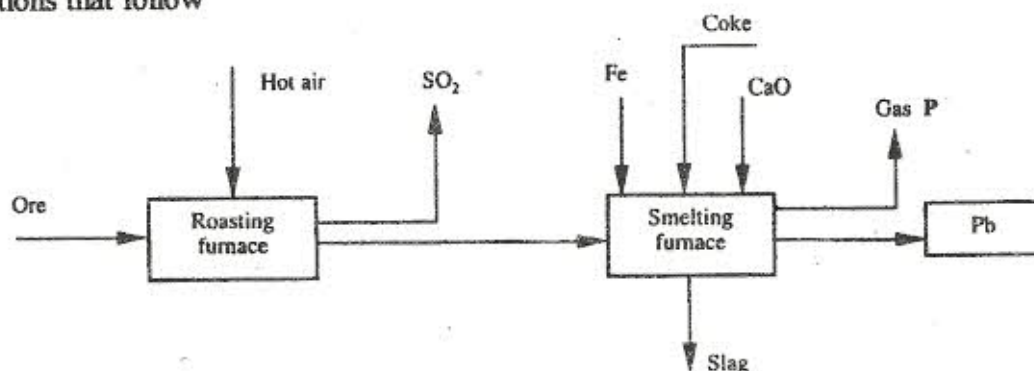
(1 mark)

ii) Calculate the mass of sodium hydroxide that was produced

(Na = 23.0, O = 16.0, H = 1.0, 1 Faraday = 96500 Coulombs)

(4 marks)

3. The flow chart below illustrates the industrial extraction of lead metal. Study it and answer the questions that follow



a) i) Name the ore that is commonly used in this process

(1 mark)

ii) Explain what takes place in the roasting furnace

(1 mark)

iii) Identify gas P

(1 mark)

iv) Write the equation for the main reaction that takes place in the smelting furnace?

(1 mark)

v) What is the purpose of adding iron in the smelting furnace?

(1 mark)

vi) Give two environmental hazards likely to be associated with extraction of lead

(2 marks)

b) Explain why hard water flowing in lead pipes may be safer for drinking than soft water flowing in the same pipes (3 marks)

c) State one use of lead other than the making of lead pipes (1 mark)

4. a) i) In the spaces provided, sketch a labelled diagram to show how hydrogen chloride gas can be prepared and collected in the laboratory using sodium chloride and concentrated sulphuric acid (the gas need not be dry) (4 marks)

ii) Write an equation for the reaction that takes place (1 mark)

iii) Name one drying agent for hydrogen chloride (1 mark)

iv) State and explain the observation that would be made when hydrogen chloride gas is bubbled through a solution of lead (II) nitrate. (2 marks)

v) Concentrated hydrochloric acid is used for removing oxides from metal surfaces (pickling). Explain why concentrated nitric acid cannot be used for the same purpose (2 marks)

b) A sample of hydrogen chloride gas was dissolved in water to make 250cm<sup>3</sup> of solution. 25cm<sup>3</sup> of the solution required 46cm<sup>3</sup> of 11.0M sodium hydroxide for complete neutralisation.

i) Calculate the number of moles of hydrochloric acid in 25cm<sup>3</sup> of solution (2 marks)

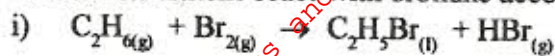
ii) Determine the mass of hydrogen chloride that was dissolved to make 250cm<sup>3</sup> of solution (Cl = 35.5, H = 1.0) (2 marks)

5. a) Give the names of the following compounds (2 marks)

i) CH<sub>3</sub>CH = CH CH<sub>2</sub> CH<sub>3</sub> \_\_\_\_\_

ii)  $\text{CH}_3\text{CH}_2\text{CH}_2\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$  \_\_\_\_\_

b) Ethane and Ethene react with bromine according to the equations given below

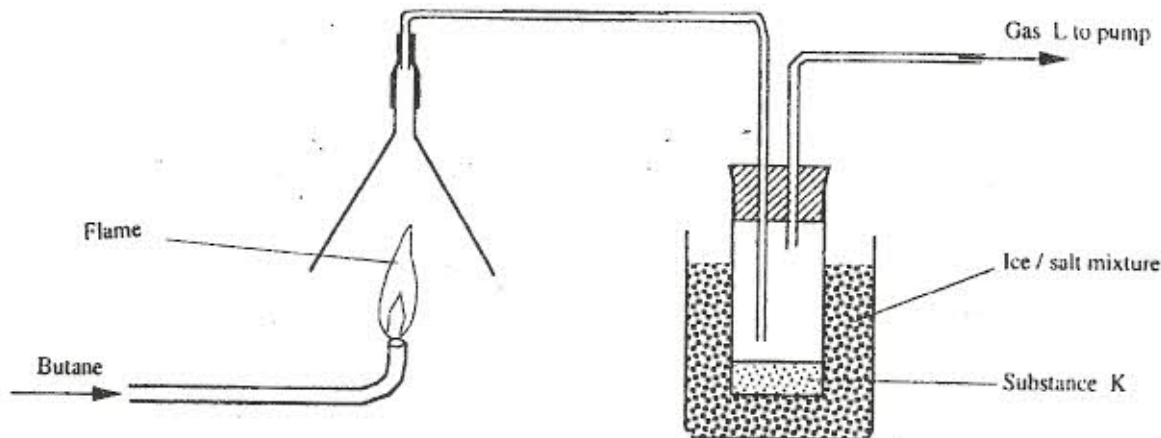


Name the type of bromination reaction that takes place in:

i) \_\_\_\_\_ (1 mark)

ii) \_\_\_\_\_ (1 mark)

Study the diagram below and answer the questions that follow



i) Write the equation for the combustion of butane (1 mark)

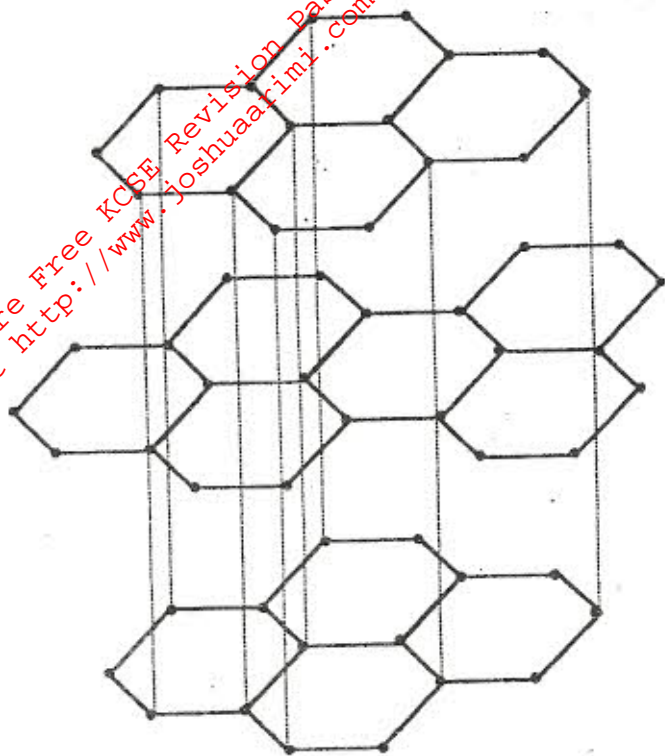
ii) The pH of substance K was found to be less than 7. Explain this observation (2 marks)

d) The polymerisation of tetrafluoroethene ( $C_2F_4$ ) is similar to that of ethene ( $C_2H_4$ )  
i) What is meant by the term polymerisation (1 mark)

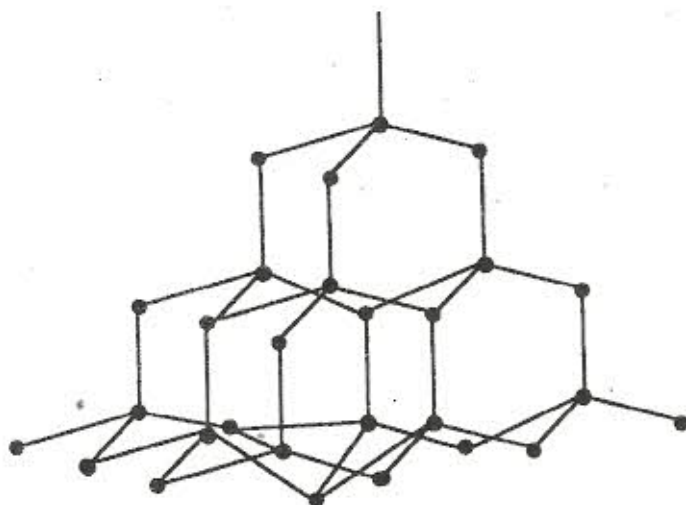
ii) Draw the structural formula of a portion of the polymer obtained from the monomer  $C_2F_4$  (1 mark)

e) State any two advantages that synthetic polymers have over natural polymers (2 marks)

6. a) The following diagrams show the structures of two allotropes of carbon. Study them and answer the questions that follow



Allotrope M



Allotrope N

i) Name allotrope: (2 marks)  
M \_\_\_\_\_

N \_\_\_\_\_

ii) Give one use of N (1 mark)

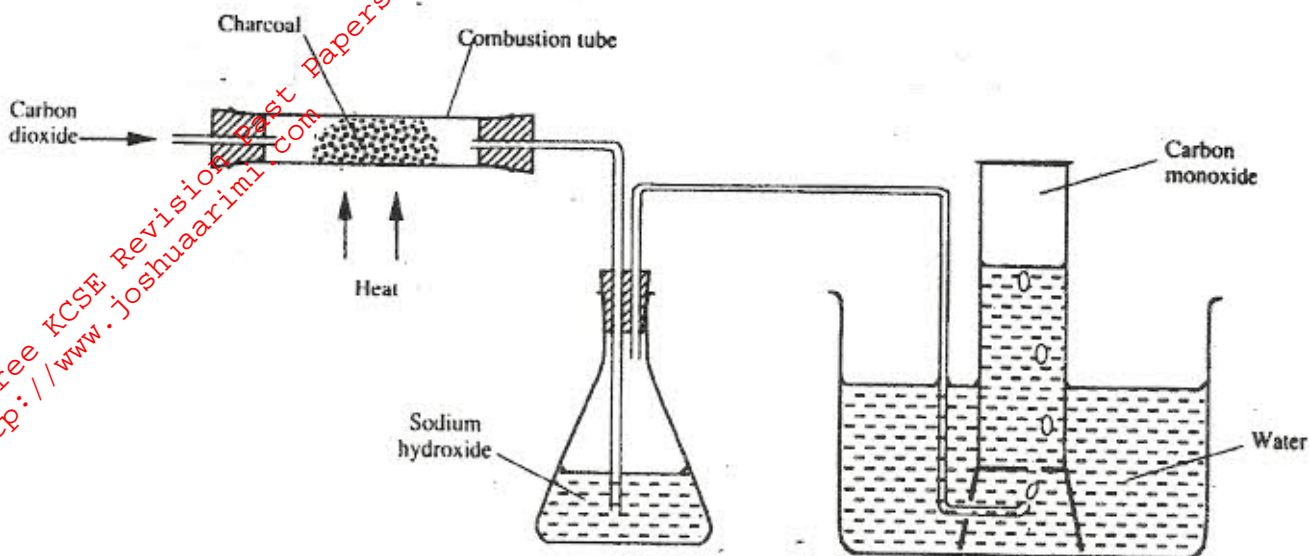
\_\_\_\_\_

iii) Which allotrope conducts electricity? Explain (2 marks)

\_\_\_\_\_

\_\_\_\_\_

- b) In an experiment, carbon dioxide gas was passed over heated charcoal and the gas produced collected as shown in the diagram below



- i) Write an equation for the reaction that took place in the combustion tube (1 mark)

- ii) Name another substance that can be used instead of sodium hydroxide (1 mark)

- iii) Describe a simple chemical test that can be used to distinguish between carbon dioxide and carbon monoxide (2 marks)

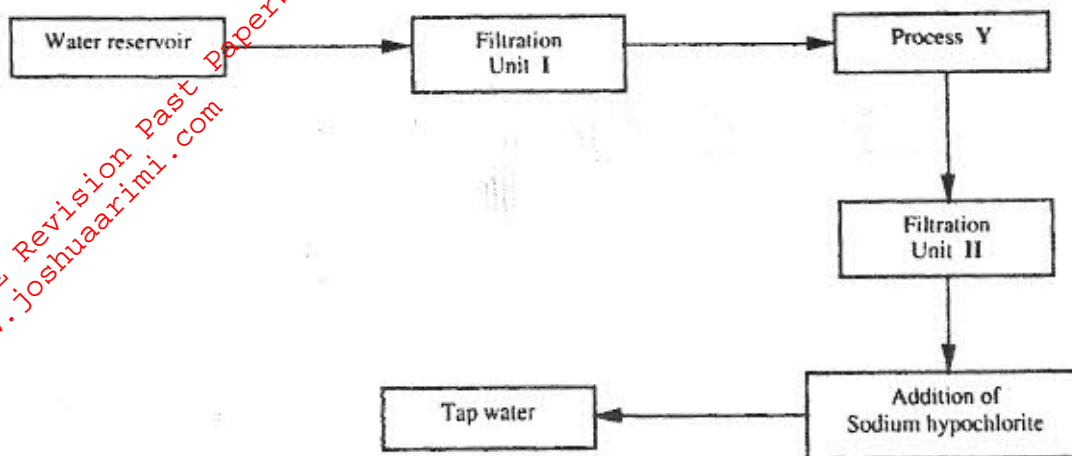
- iv) Give one use of carbon monoxide

7. a) A student was supplied with a colourless liquid suspected to be water.

- i) Describe one chemical test that could have been used to show that the liquid was water (2 marks)

- ii) How could it have been shown that the liquid was pure water? (1 mark)

- b) The flow chart below shows the various stages of water treatment. Study it and answer questions that follow



i) Which substances are likely to be removed in filtration unit I (1 mark)

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ii) What is the name of process Y (1 mark)

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iii) What is the purpose of:  
I process Y? (1 mark)

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II addition of sodium hypochlorite? (1 mark)

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c) It was confirmed that magnesium sulphate was present in the tap water

i) What type of hardness was present in the water? (1 mark)

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ii) Explain how the hardness can be removed (2 marks)

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