

**K.C.S.E CHEMISTRY PAPER 233/2 2002**

1. a) What method can be used to separate a mixture of ethanol and propanol? (1 mark)

- b) i) Explain how a solid mixture of sulphur and sodium chloride can be separated into solid sulphur and solid sodium chloride (4 marks)

- ii) How can one determine if the solid sulphur is pure? (2 marks)

- c) The table below gives the solubilities of potassium bromide and potassium sulphate at 0°C and 40°C

Substance	Solubility g/100g water at	
	0°C	40°C
Potassium bromide	55	75
Potassium sulphate	10	12

When an aqueous mixture containing 60g of potassium bromide and 7g of potassium sulphate in 100g of water at 80°C was cooled at 0°C, some crystals were formed.

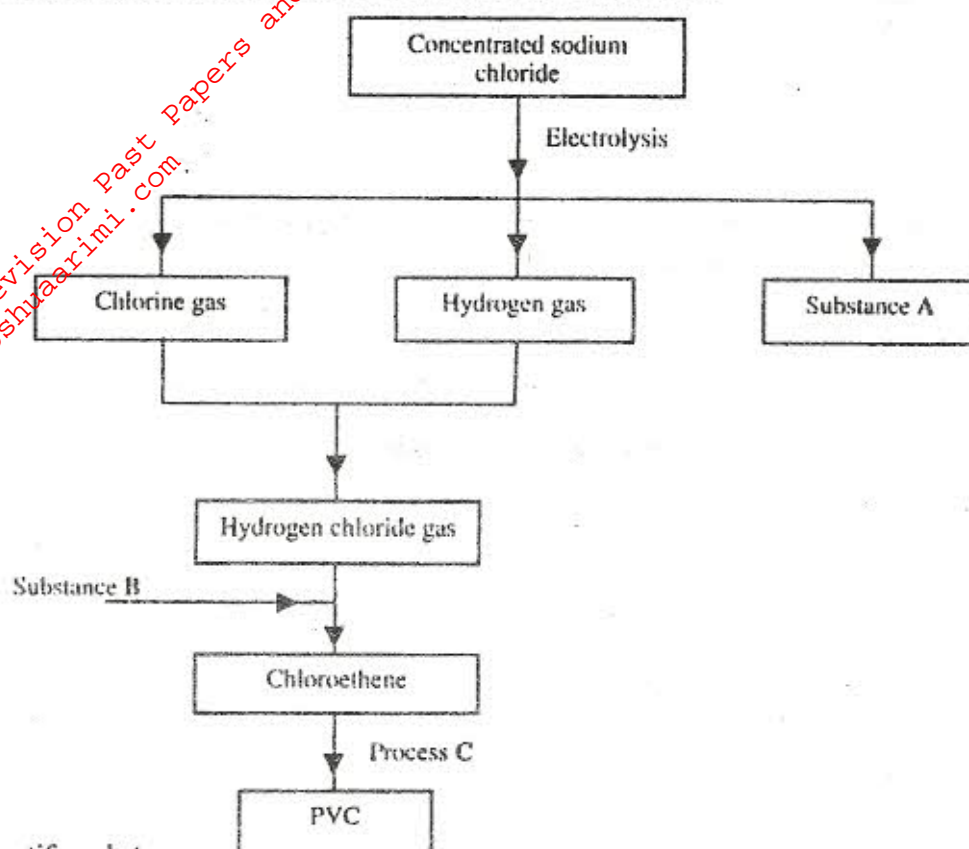
- i) Identify the crystals (1 mark)

- ii) Determine the mass of the crystals formed

- iii) Name the method used to obtain the crystals

- iv) Suggest one industrial application of the method named in (c) (iii) above (1 mark)

2. Study the flow chart below and answer the questions that follow:



- Identify substance:
  - A (1 mark)
  - B (1 mark)
- Name process C (1 mark)
- Give one use of PVC (1 mark)
- Write an ionic equation for the reaction in which chlorine gas is produced (1 mark)
- State and explain the observation that would be made if chlorine gas was bubbled into an aqueous solution of sodium iodide (2 marks)
- In the preparation of a bleaching agent (sodium hypochlorite), excess chlorine gas was bubbled into 15 litres of cold 2M sodium hydroxide.
  - Write an equation for the reaction between chlorine gas and cold dilute sodium hydroxide (1 mark)

- ii) Calculate the :  
number of moles of sodium hydroxide used

(1 mark)

mass in kilogrammes of the sodium hypochlorite produced  
(Na = 23.0, Cl = 35.5, O = 16.0)

(3 marks)

- a) Distinguish between exothermic and endothermic reaction

(2 marks)

- b) Changes of state are either exothermic or endothermic

Name a change of state that is:

- i) endothermic

(1 mark)

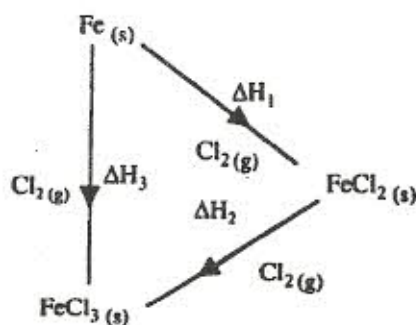
- ii) exothermic

(1 mark)

- c) When pure water is heated at 1 atmospheric pressure at sea level, the temperature of the water does not rise beyond 100°C even with continued heating. Explain this observation

(2 marks)

- d) Study the energy cycle diagram below and answer the questions that follow:



- i) What does  $\Delta H_1$  represent?

(1 mark)

- ii) Show the relationship between  $\Delta H_1$ ,  $\Delta H_2$  and  $\Delta H_3$

(1 mark)

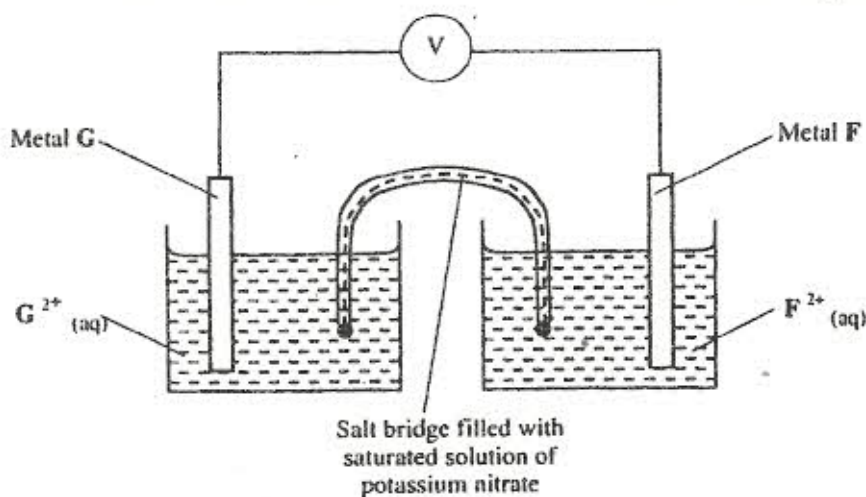
- c) Butane and propane are constituents of cooking gas. Which one produces more energy per mole on combustion? Explain (2 marks)

4. The table below gives standard electrode potentials for the metals represented by the letters D, E, F and G. Study it and answer the questions that follow

Metal	Standard electrode potential (volts)
D	-0.13
E	+0.85
F	+0.34
G	-0.76

- a) Which metal can be displaced from a solution of its salt by all the other metals in the table? Give a reason (2 marks)

- b) Metals F and G were connected to form a cell as shown in the diagram below



- i) write the equations for the reactions that occur at electrodes

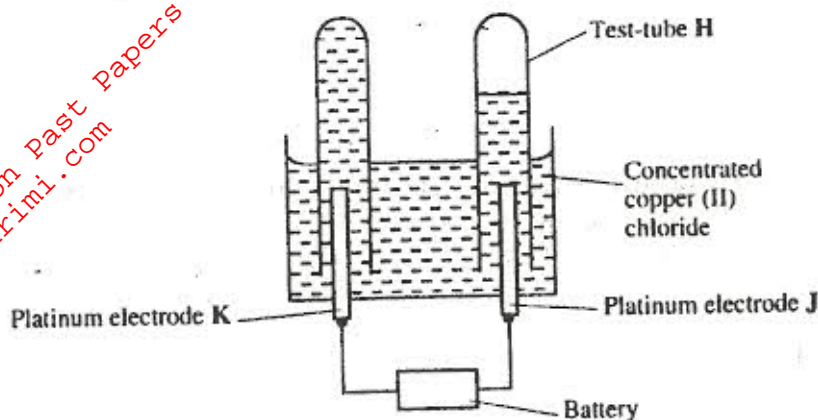
F

G

- ii) on the diagram, indicate with an arrow the direction in which electrons would flow (1 mark)
- iii) What is the function of the salt bridge?



- c) an electrical current was passed through a concentrated solution of copper (II) chloride as shown in the diagram below



- i) Explain the observation that would be made on the electrolyte as the experiment progresses (2 marks)

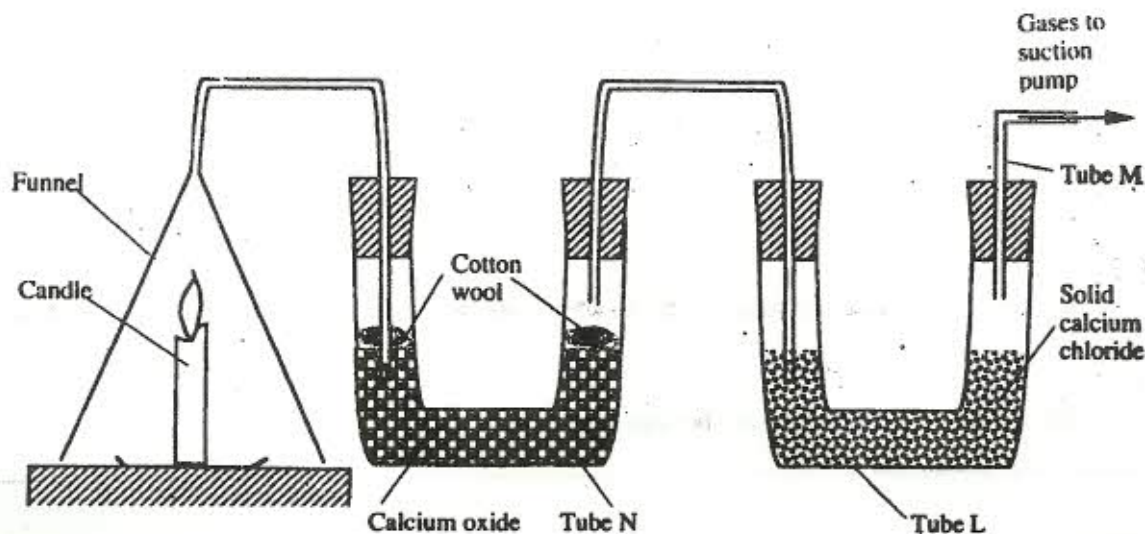
- ii) After sometime, test-tube H was found to contain a mixture of two gases. Explain this observation. (3 marks)

- iii) Which of the electrodes is the anode? Explain (2 marks)

5. a) Candle wax is mainly compound consisting of two elements. Name the two elements (2 marks)

- i) \_\_\_\_\_  
ii) \_\_\_\_\_

- b) The set-up below was used to investigate the burning of a candle. Study it and answer the questions that follow:



- i) What would happen to the burning candle if the pump was turned off? Give reasons (3 marks)

- ii) State and explain the changes in mass that are likely to occur in tube N by the end of the experiment (3 marks)

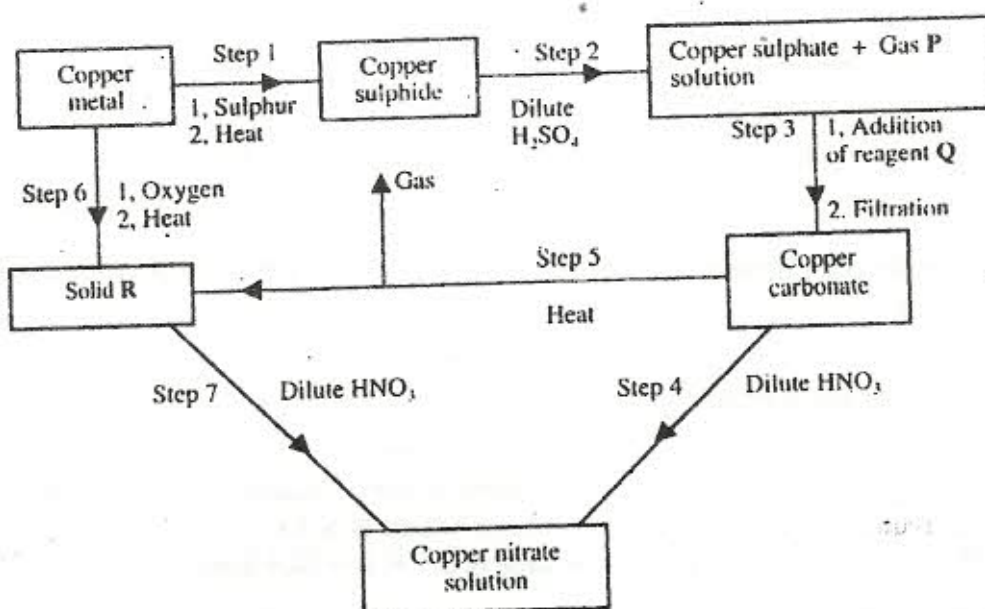
- iii) Name two gases that come out through tube M (2 marks)

- iv) What is the purpose of calcium chloride in tube L? (1 mark)

- v) Name another substance that could be used in the place of calcium oxide in tube N (1 mark)

6. a) Name one ore from which copper metal is extracted (1 mark)

- b) The flow chart below shows a sequence of reactions starting with copper. Study it and answer the questions that follow



- i) Identify: Gas P (1 mark)

Reagent Q

(1 mark)

Solid R

(1 mark)

ii) Write an equation for the reaction that takes place in step 5

(1 mark)

iii) State the observations made in steps 4 and 7

(2 marks)

Step 7

(1 mark)

c) Bronze is an alloy of copper and another metal

i) Name the other metal

(1 mark)

ii) Give one use of bronze

(1 mark)

7. a) Write the structural formulae of

i) methanol

(1 mark)

ii) methanoic acid

(1 mark)

b) Write an equation for the reaction between methanoic acid and aqueous sodium hydroxide

(1 mark)

c) i) Name the product formed when methanol reacts with methanoic acid

(1 mark)

ii) State one condition necessary for the reaction in (c) (i) above to take place

(1 mark)

d) i) Describe one chemical test that can be used to distinguish between hexane and hexene

(2 marks)

ii) State one use of hexene

iii) Hydrogen gas reacts with hexene to form hexane. Calculate the volume of hydrogen gas required to convert 42g of hexene to hexane at S.T.P.

(C = 12.0, H = 1.0, molar gas volume at S.T.P. is = 22.4 litres)

(4 marks)