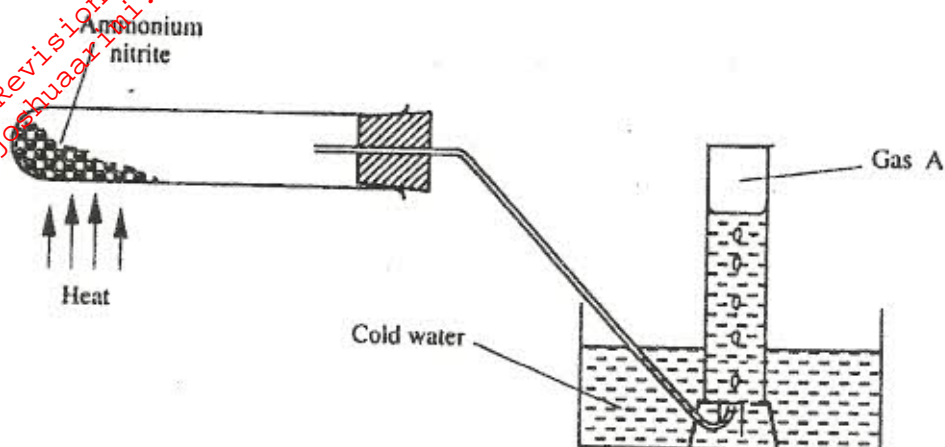


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1. When a candle was burnt completely, the total mass of the products was found to be greater than the original mass of the candle. Explain. (2 marks)
2. Ammonium nitrate was heated as shown in the set-up below.



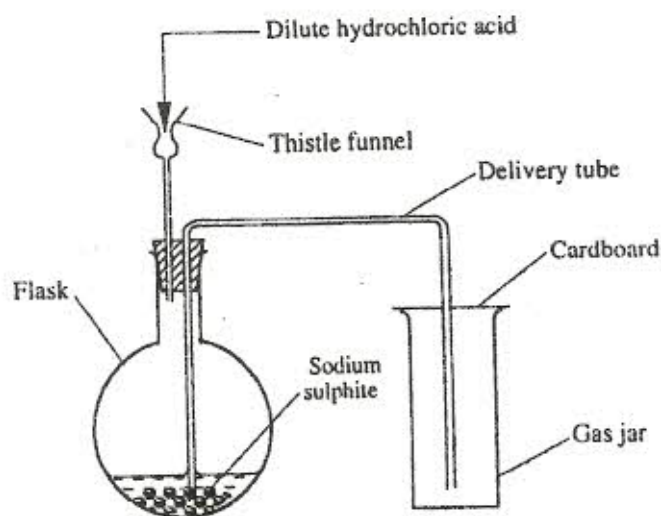
- a) Identify gas A (1 mark)
- b) State and explain the precaution that must be taken before heating is stopped (2 marks)

3. The table below shows the first ionisation energies of elements B and C

Element	Ionisation energy kJmol^{-1}
B	494
C	736

What do these values suggest about the reactivity of B compared to that of C? Explain (2 marks)

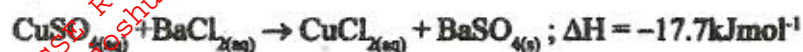
4. Dilute hydrochloric acid and solid sodium sulphite were reacted as shown in the set-up below.



a) Name the gas produced in the flask (1 mark)

b) Give two reasons why no gas was collected in the gas jar (2 marks)

5. Copper (II) Sulphate reacts with barium chloride according to the equation below



Calculate the temperature change when 900cm³ of 1M Copper (II) sulphate were added to 600cm³ of 1M barium (II) Chloride.

(Assume heat capacity of solution is 4.2Jg⁻¹K⁻¹ and density is 1g/cm³) (3 marks)

6. Both diamond and graphite have giant atomic structures. Explain why diamond is hard while graphite is soft (3 marks)

7. Nitrogen forms many compounds in which its oxidation state varies

(a) What is meant by oxidation state? (1 mark)

(b) What is the oxidation state of nitrogen in Mg₃N₂? (1 mark)

8. When wood is burnt, a grey powder called ash remains. When the ash is stirred with water and filtered, a colourless solution is obtained.

(a) What is the main component of the colourless solution? (1 mark)

(b) Explain your answer in (a) above (2 marks)

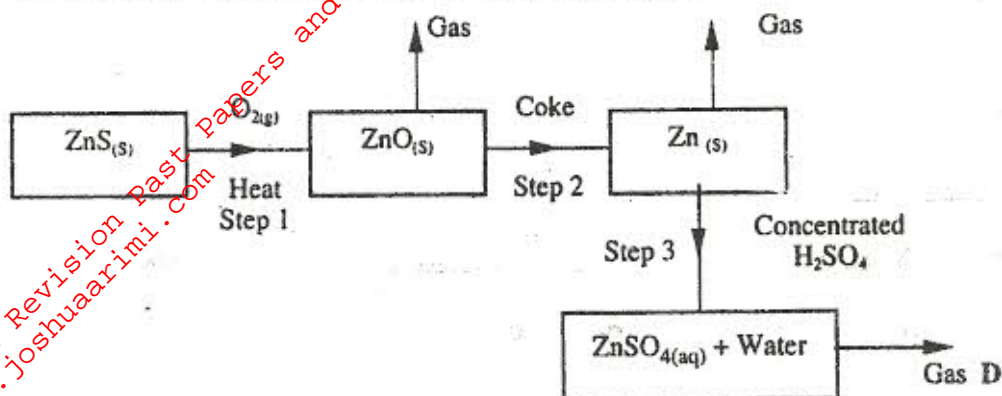
9. Study the information in the table below and answer the question that follows.

Alcohol	Heat of combustion kJmol ⁻¹
Methanol	715
Ethanol	1371
Propanol	2010
Butanol	2673

Give a reason why the differences in the molar heats of combustion between successive alcohols are close (3 marks)

10. Explain why a high temperature is required for nitrogen to react with oxygen (1 mark)

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



(a) State the condition necessary for the reaction in step 2 to occur (1 mark)

(b) Name:

i) Gas D (1 mark)

ii) One use of zinc (1 mark)

12. Starting with aluminium sulphate, describe how a solid sample of aluminium hydroxide could be prepared. (3 marks)

13. (a) What is the name given to the smallest repeating unit of a polymer? (1 mark)

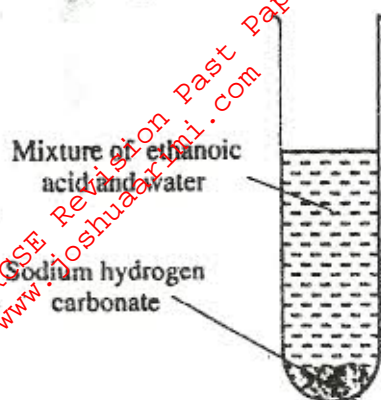
(b) Draw the structure of the smallest repeating unit of polyvinyl chloride (1 mark)

14. When $X\text{cm}^3$ of a solution of 0.5M magnesium nitrate were reacted with excess ammonium carbonate solution, the mass of magnesium carbonate formed was 8.4g.

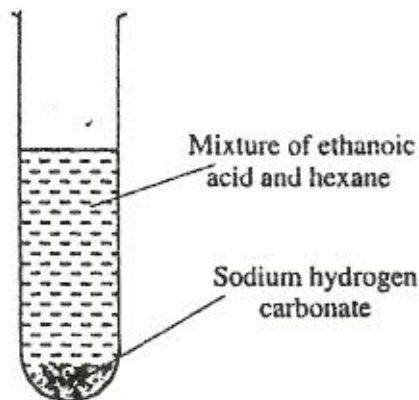
(a) Write the ionic equation for the reaction that took place. (1 mark)

(b) Calculate the value of X (C=12.0; Mg= 24.0; O =16.0) (2 marks)

15. In an experiment, a student put equal volumes of mixtures of ethanoic acid in water and ethanoic acid in hexane in two test tubes as shown below. In each test-tube, equal amounts of solid sodium hydrogen carbonate were added.



Test - tube 1



Test - tube 2

- (a) State the observation which was made in each test-tube (1 mark)

Test-tube 1

Test-tube 2

- (b) Explain the observations in (a) above (2 marks)

16. Four metals, F, G, H and J were each separately added to cold water, hot water and steam. The table below is a summary of the observations made and the formulae of the hydroxides formed.

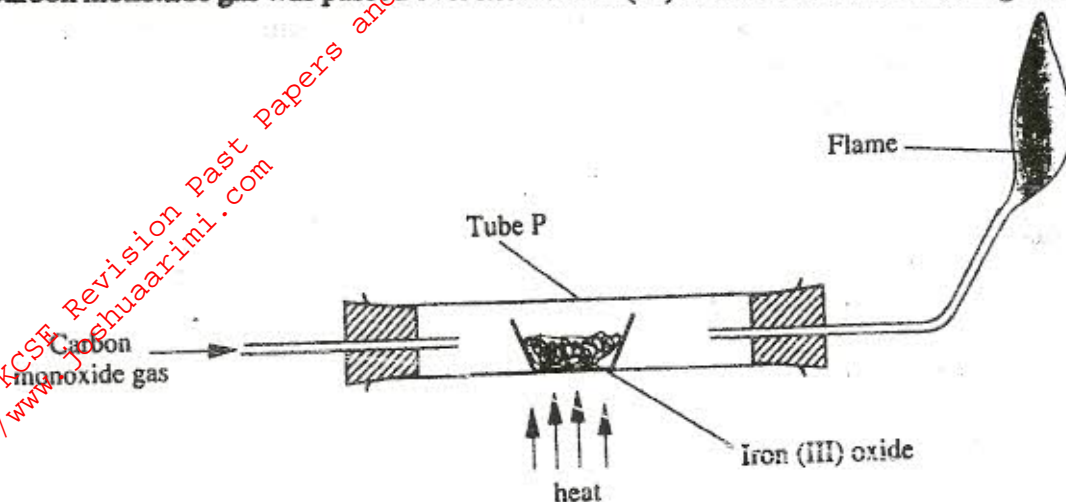
Metal	Cold water	Hot water	Steam	Formula of hydroxide
F	Reacts slowly	Reacts fast	Reacts very fast	$F(OH)_2$
G	No reaction	No reaction	No reaction	-
H	Fast	Reacts very fast	Reacts explosively	HOH
J	No reaction	Reacts slowly	Reacts fast	$J(OH)_2$

- (a) Which two elements are likely to be in the same group of the periodic table? (1 mark)

- (b) Arrange the metals in the order of their reactivity starting with the most reactive (2 marks)

17. Name the organic compound formed when $CH_3CH_2CH_2CH_2OH$ is reacted with concentrated sulphuric acid at $170^\circ C$ (1 mark)

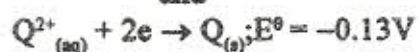
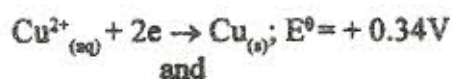
18. Carbon monoxide gas was passed over heated iron (III) oxide as shown in the diagram below.



(a) Give the observation made in tube P. (1 mark)

(b) Write the equation for the reaction which takes place in tube P (1 mark)

19. A strip of metal Q was dipped into a solution of copper (II) sulphate and allowed to stand overnight. Given that:

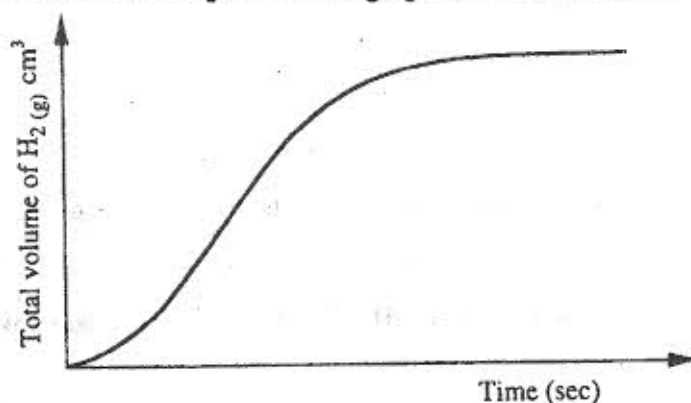


(a) State the observations which were made. (2 marks)

(b) Give a reason for your answer in 19 (a) above. (1 mark)

20. State two factors which determine the stability of an isotope (2 marks)

21. The reaction between a piece of magnesium ribbon with excess 2M hydrochloric acid was investigated at 25°C by measuring the volume of hydrogen gas produced as the reaction progressed. The sketch below represents the graph that was obtained.



a) Name one piece of apparatus that may be used to measure the volume of hydrogen gas produced (1 mark)

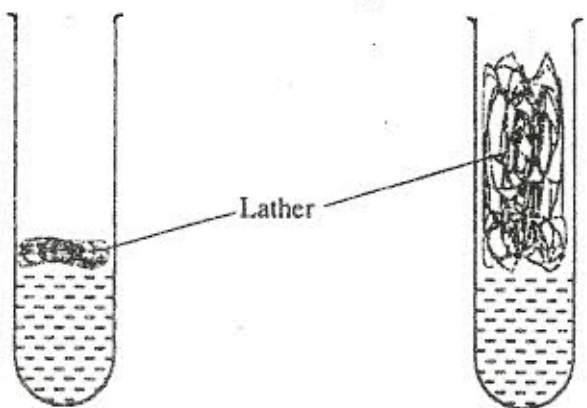
- b) On the same diagram, sketch the curve that would be obtained if the experiment was repeated at 35°C. (2 marks)

22. When excess chlorine gas was bubbled into hot concentrated sodium hydroxide, the following reaction occurred.



In which product did chlorine undergo oxidation? Explain. (3 marks)

23. 1 cm³ of soap solution was added to two test tubes each containing water obtained from different sources. The lather produced in each test tube is represented as shown in the diagrams below.



Test - tube 1

Test - tube 2

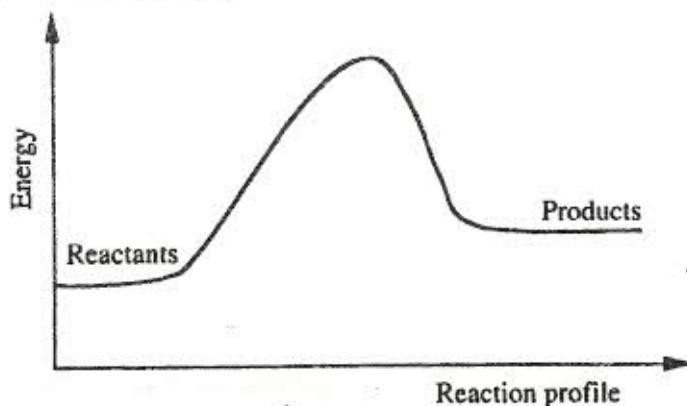
Explain why there is more lather in test-tube 2 than in test-tube 1. (3 marks)

24. Carbon dioxide can be dissolved in water under pressure to make an acidic solution

(a) What is meant by an acidic solution? (1 mark)

(b) Aqueous lead (II) nitrate reacts with the acidic solution to form a precipitate. Write an ionic equation for the reaction (1 mark)

25. Below is a sketch of a reaction profile

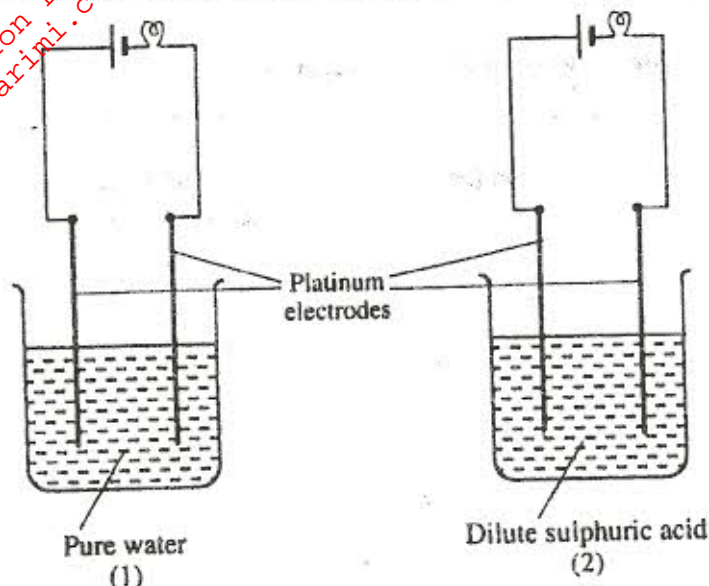


(a) On the diagram, show the heat of reaction, ΔH . (1 mark)

(b) State and explain the type of reaction represented by the profile

(2 marks)

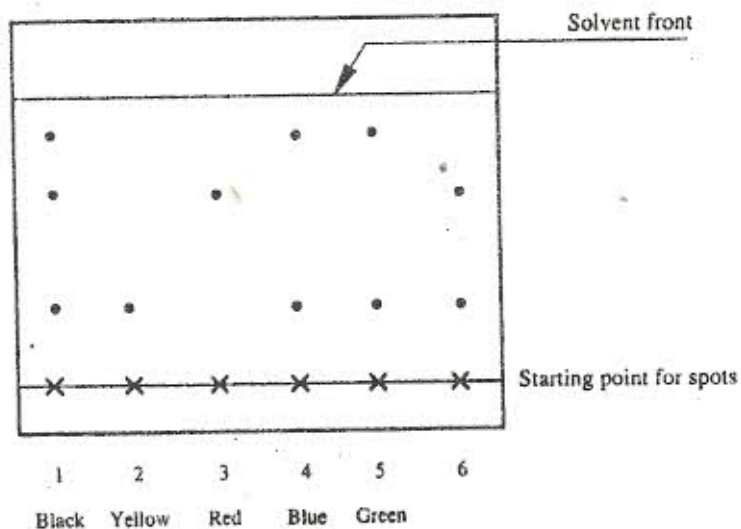
26. The diagram below represents the set-ups that were used to study the effect of an electric current on pure water and dilute sulphuric acid.



State and explain the observation made when each experiment was started

(3 marks)

A piece of chromatography paper was spotted with coloured inks obtained from pens labelled 1 to 6. The diagram below shows the spots after the chromatogram was developed.



(a) Which two pens contained the same pigment?

(1 mark)

(b) Which pens contained only one pigment?

(1 mark)

(c) According to the chromatogram, which pigments are present in the ink of pen number 6?

(1 mark)