

Section B

Answer **any two** questions in this section.
Write your answer in the spaces provided.

8 Metals undergo different chemical reactions to produce different products.

(a) The rate of reaction between a metal and an acid is investigated.

A piece of zinc foil is added to 50 cm³ of hydrochloric acid, of concentration 2.0 mol / dm³. The acid is in excess. The hydrogen evolved is collected in the gas syringe and its volume measured every minute. The results are plotted and labelled as graph 1. This is shown in Fig. 8.1.

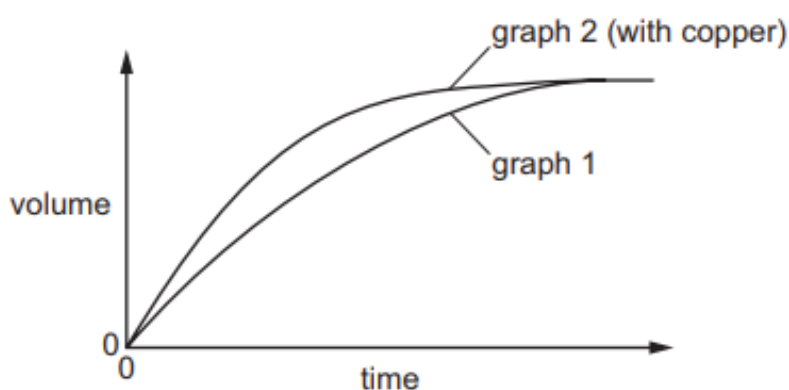


Fig. 8.1

The experiment is repeated to show that the reaction between zinc metal and hydrochloric acid is catalysed by copper. A small volume of aqueous copper(II) chloride is added to the acid before the zinc is added. The results of this experiment are plotted on the same grid and labelled as graph 2 in Fig. 8.1.

(a) (i) Explain why the reaction mixture in the second experiment contains copper metal. Include an equation in your explanation.

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[2]

- (ii) If the first experiment is repeated using ethanoic acid, CH_3COOH , instead of hydrochloric acid, explain how and why the graph would be different from graph 1. Indicate the speed of this reaction on Fig. 8.1 and label it as graph 3.

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[3]

- (b) When lithium reacts with water, it moves about on the surface of the water. Bubbles are seen and the lithium disappears slowly.

Predict how the reaction of potassium with water compares with the reaction of lithium with water.

In your answer, include

- any three differences in observations,
- the names of the products formed when lithium and potassium react with water.

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[5]

9 In the laboratory, scientists are always doing research and conducting experiments to make useful products for mankind.

(a) One such useful product is phosphine, PH_3 , which is used as a fumigant. It has the smell of garlic and is effective in pest control.

(i) Predict two physical properties of phosphine at room conditions.

Explain your answer.

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[5]

(ii) Draw the electronic structure of phosphine. Show outer electrons only.

[2]

(b) Scientists also make margarine from vegetable oils. List the conditions and explain how vegetable oils are used to make margarine for use in foods.

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[3]

10 Thermal decomposition of compounds breaks them down into smaller substances when sufficient heat is applied.

- (a) Air bags are used to protect passengers in a car during an accident. When the crash sensor detects an impact, it causes a mixture of chemicals to be heated to a high temperature. Reactions take place which produce nitrogen gas. The nitrogen fills the air bag. This is shown in Fig. 10.1.

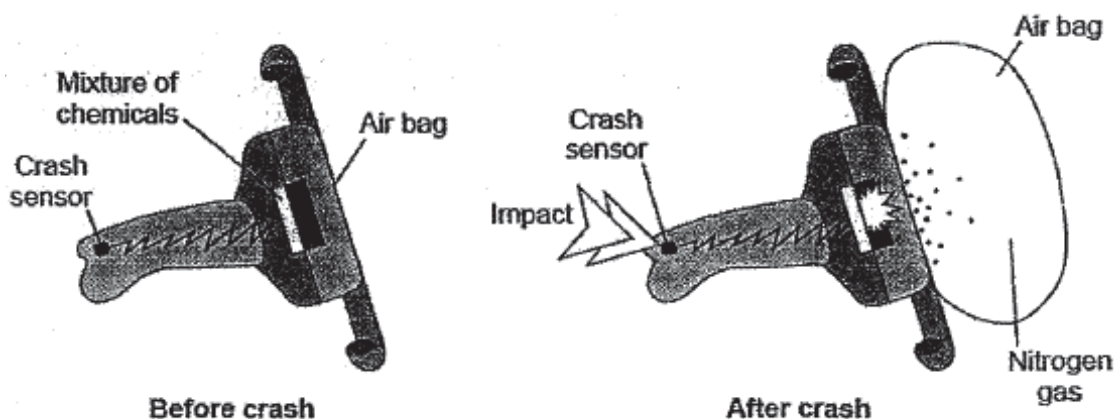


Fig. 10.1

The mixture of chemicals contains solid sodium azide, NaN_3 which decomposes to form sodium and nitrogen as follows.



- (i) Balance the chemical equation and complete the state symbols in the chemical equation above. [2]
- (ii) Draw the electronic structure of nitrogen gas. Show outer electrons only. [2]

[2]

[Turn over]

- (iii) An air bag consists of 130 g of sodium azide. When the sodium azide decomposed, 60 dm³ of nitrogen was obtained at room temperature and pressure.

Show, using calculations, if the thermal decomposition of sodium azide has been efficient in producing nitrogen to fill up the air bag.

[3]

- (b) A student used the apparatus in Fig. 10.2 to investigate what happens when liquid paraffin is heated to a high temperature.

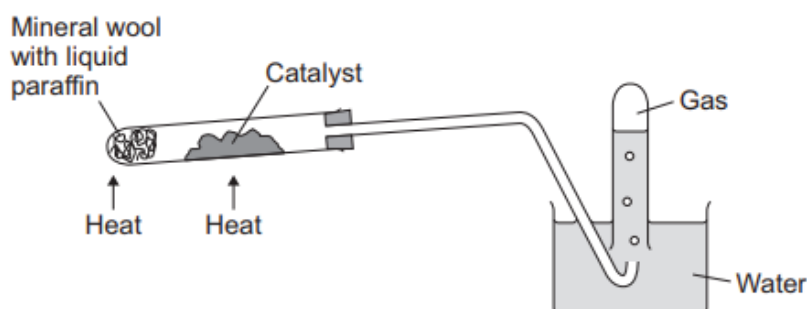


Fig. 10.2

Liquid paraffin contains alkanes. The most abundant alkane has a chemical formula of C₂₀H₄₂.

Name the reaction shown in Fig. 10.2. Describe, with the aid of a chemical equation, what happens to the alkane molecules in the reaction.

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[3]

END OF PAPER