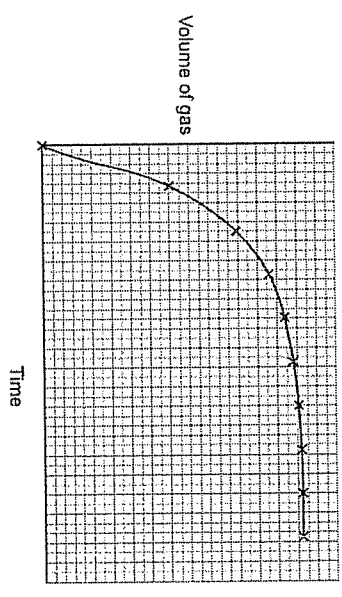


Rates of reaction

1. Pieces of zinc react with dilute acid to form hydrogen gas.  
The graph shows how the volume of hydrogen gas produced changes with time.



- (a) Describe, as fully as you can, how the volume of gas produced changes with time.

.....  
 .....  
 .....

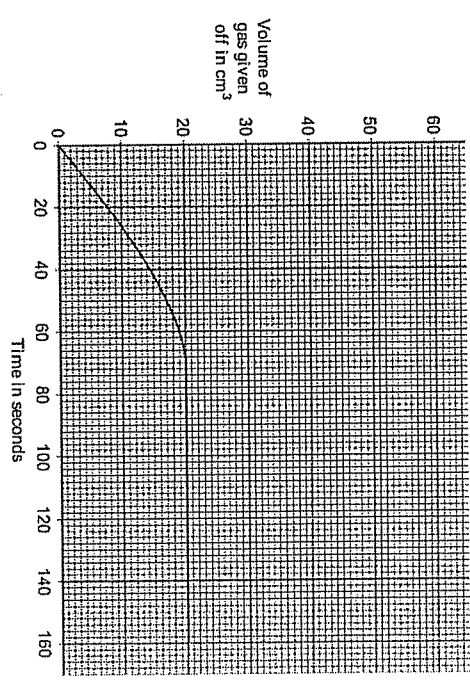
(2)

- (b) A student wants to make the reaction take place faster.  
Some suggestions are given in the table.  
Put ticks (✓) next to the two suggestions that would make the reaction take place faster.

Suggestions	
Use bigger pieces of zinc.	(✓)
Use a more concentrated acid.	
Use zinc powder.	
Decrease the temperature of the acid.	

(Total 4 marks) (2)

2. The graph shows the volume of gas given off during an experiment using hydrogen peroxide solution and manganese oxide.



Draw, on the axes above, a graph to show the result you would expect if the volume of hydrogen peroxide solution had been the same, but it was twice as concentrated.

(Total 3 marks)

3. This label was on a bottle of stain remover:

**Simply Amazing**

*Super Stain Remover*

*Removes stains caused by grass, blood, mould etc.*

**Instructions**

Mix Simply Amazing with hot water and pour onto the stained areas. The hotter the water the stronger the cleaning power. After 30 minutes rinse with water and then allow to dry.

End of topic assessment  
Unit C2, C2.4

When 'Simply Amazing' is mixed with water a reaction takes place which produces bubbles of oxygen gas.

(i) Suggest a method that you could use to measure how quickly this reaction takes place.

.....  
 .....  
 .....  
 .....  
 .....  
 .....  
 (2)

(ii) Read the instructions on the label and then suggest how increasing the temperature of the water affects the rate of this reaction.

.....  
 .....  
 .....  
 .....  
 .....  
 .....  
 (1)

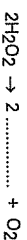
(iii) Suggest one other way in which the rate of a reaction can be changed.

.....  
 .....  
 .....  
 .....  
 .....  
 .....  
 (1)  
 (Total 4 marks)

4. This question is about rates of reaction.

(a) Hydrogen peroxide ( $H_2O_2$ ) decomposes very slowly at room temperature.

(i) Complete the balanced chemical equation for this reaction by writing in the formula of the missing product.



(1)

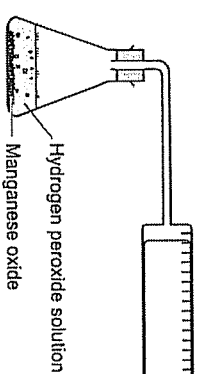
(ii) The decomposition is much faster if manganese oxide is mixed with the hydrogen peroxide. Complete the sentence.

Manganese oxide acts as a ..... for decomposition of hydrogen peroxide.

(1)

End of topic assessment  
Unit C2, C2.4

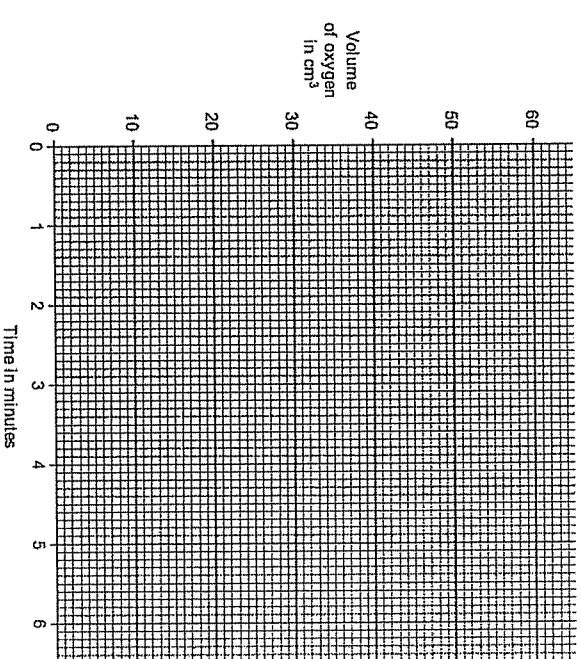
(b) In an experiment 1g of manganese oxide was mixed with 50 cm<sup>3</sup> of hydrogen peroxide solution.



The results show the volume of oxygen collected during six minutes.

Time in minutes	0	1	2	3	4	5	6
Volume of oxygen in cm <sup>3</sup>	0	34.5	47.5	54.5	58.5	60.0	60.0

(i) Draw a graph of these results.



(ii) How long did it take for the decomposition to stop?

(1)

(3)

(iii) Why did the decomposition stop?

..... (1)

(c) In a second experiment water had been added to the hydrogen peroxide solution. Again 50 cm<sup>3</sup> of this hydrogen peroxide solution was mixed with 1g of manganese oxide.

(i) For this second experiment, sketch, on the same grid, a graph line you would expect to get. (2)

(ii) In this second experiment, why would the rate of reaction be different to the first experiment?

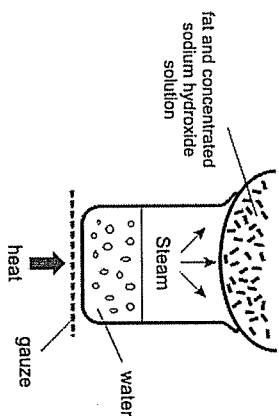
..... (1)  
(Total 10 marks)

5. Soap can be made by reacting fats with sodium hydroxide solution.

fat + sodium hydroxide → soap + glycerol

The diagram shows a laboratory experiment to make soap.

From the information in the diagram, give two factors which increase the rate of this reaction. In each case explain, in terms of particles, why the rate of reaction increases.



Factor 1

.....

Reason

.....

Factor 2

.....

Reason

.....

..... (Total 7 marks)