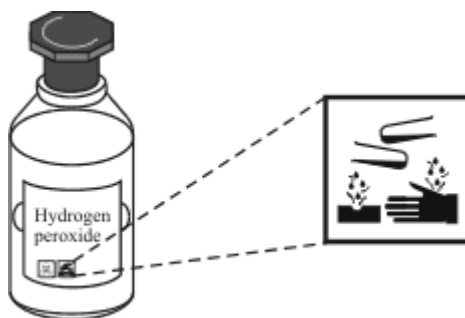


Rates of reaction

1. Hydrogen peroxide (H₂O₂) contains the same elements as water (H₂O).
 (a) Name the hazard symbol shown by using the correct word from the box.

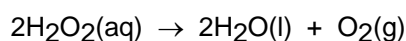
- Corrosive
 Flammable
 Oxidising
 toxic



.....

(1)

- (b) Hydrogen peroxide decomposes in the presence of a catalyst.



- (i) Complete the word equation for this chemical reaction.

hydrogen peroxide → water +

(1)

- (ii) What does a catalyst do to a chemical reaction?

.....

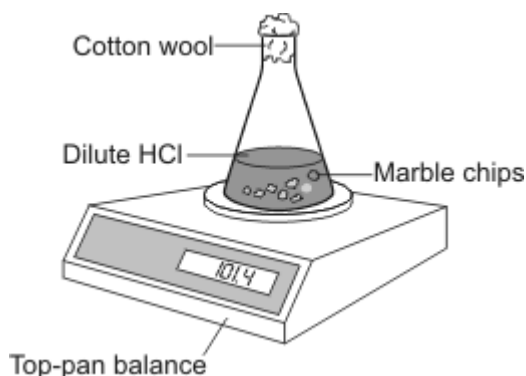
(1)

(Total 3 marks)

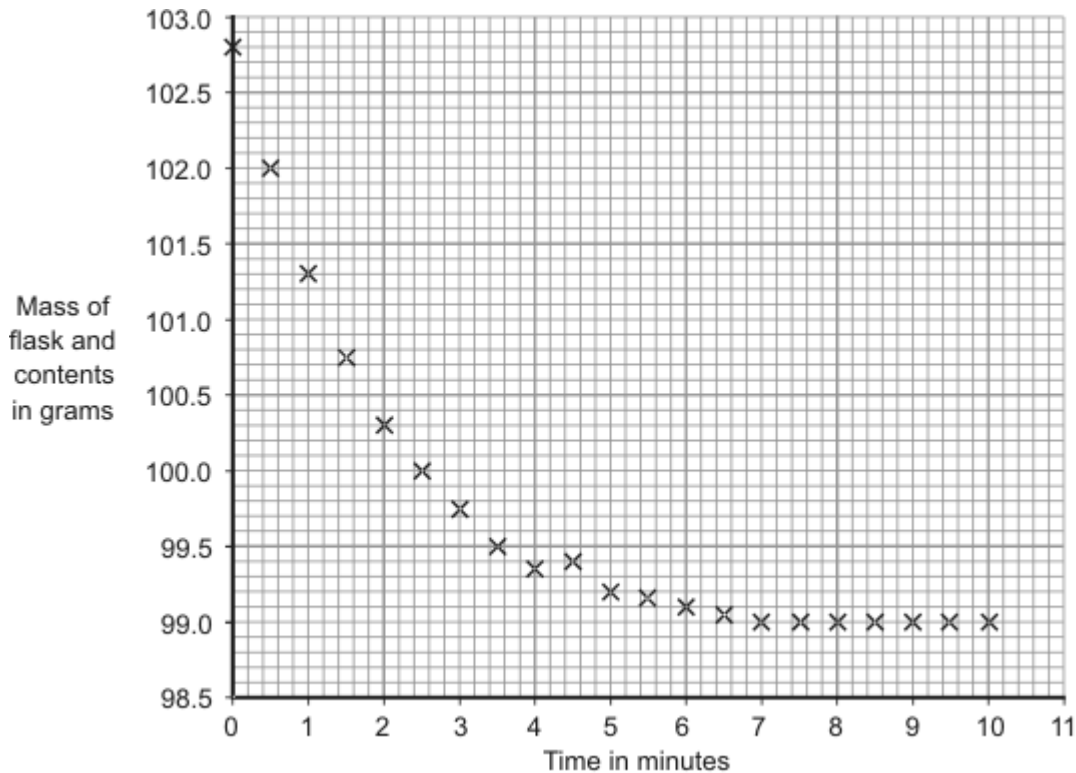
2. A student investigated the rate of reaction between marble and hydrochloric acid.
 The student used an excess of marble.
 The reaction can be represented by this equation.



The student used the apparatus shown in the diagram.



The student measured the mass of the flask and contents every half minute for ten minutes. The results are shown on the graph. Use the graph to answer the questions.



(a) Complete the graph opposite by drawing a line of best fit. (1)

(b) Why did the mass of the flask and contents decrease with time?

(1)

(c) After how many minutes had all the acid been used up?
 minutes (1)

(d) The student repeated the experiment at a higher temperature. All other variables were kept the same as in the first experiment. The rate of reaction was much faster.
 (i) Draw a line on the graph to show what the results for this second experiment might look like. (2)

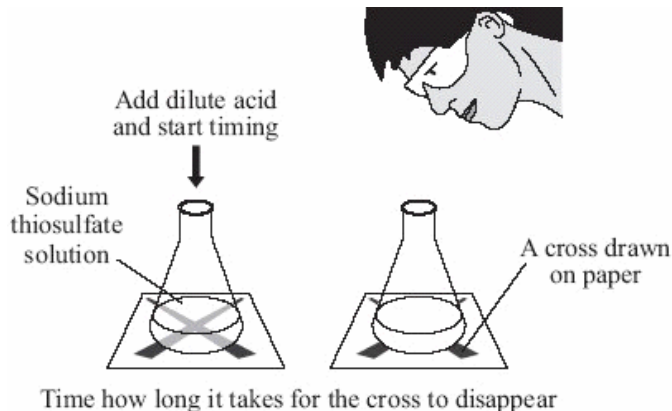
(ii) Why does an increase in temperature increase the rate of reaction?

(3)
 (Total 8 marks)

Unit C2, C2.4.1

3. Sodium thiosulfate solution reacts with hydrochloric acid. As the reaction takes place the solution slowly turns cloudy.

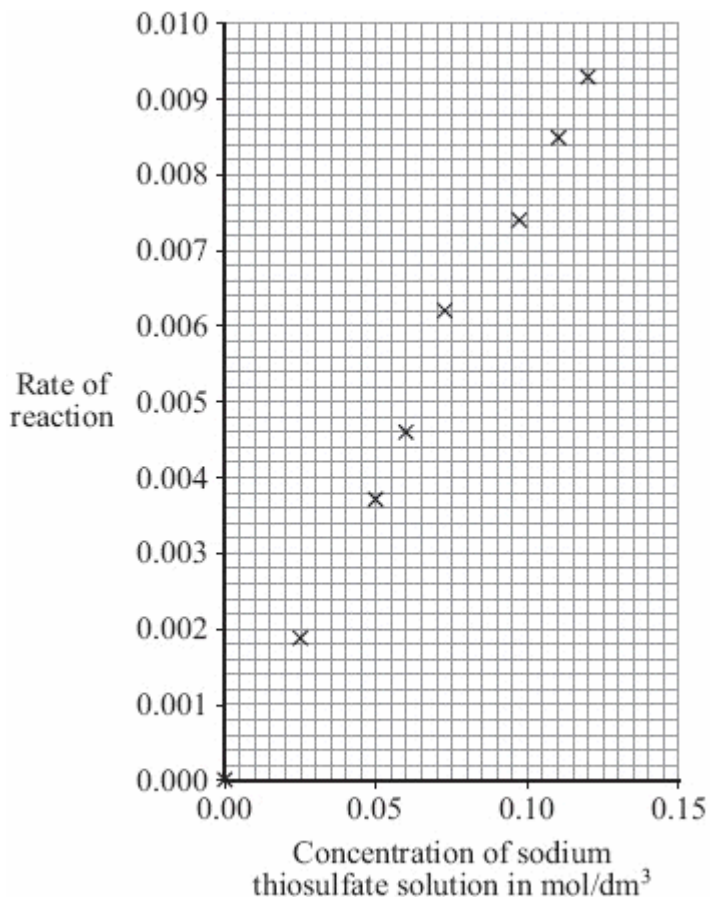
The diagram shows a method of measuring the rate of this reaction.



A student used this method to investigate how changing the concentration of the sodium thiosulfate solution affects the rate of this reaction.

The student used different concentrations of sodium thiosulfate solution. All the other variables were kept the same.

The results are shown on the graph below.



Unit C2, C2.4.1

- (a) (i) Draw a line of best fit on the graph. **(1)**
- (ii) Suggest **two** reasons why all of the points do not lie on the line of best fit.
- 1
-
- 2
-
- (2)**

- (b) (i) In a conclusion to the investigation the student stated that:
'The rate of this reaction is directly proportional to the concentration of the sodium thiosulfate solution.'
How does the graph support this conclusion?
-
-
- (1)**

- (ii) Explain, in terms of particles, why the rate of reaction increases when the concentration of sodium thiosulfate is increased.
-
-
-
-
- (2)**
- (Total 6 marks)**