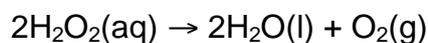


Activity AC6.8 Interpreting data about rates of reaction

To do and to answer

- 1 Hydrogen peroxide solution decomposes slowly, releasing oxygen.



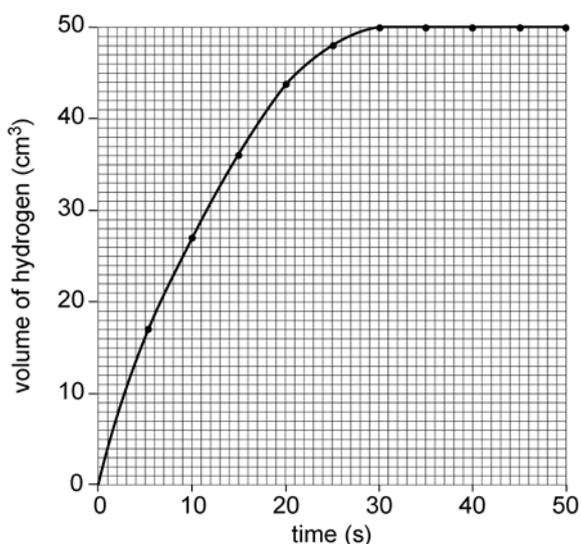
A catalyst for the reaction is manganese(IV) oxide, MnO_2 . The table shows the measured volume of oxygen at a series of times after adding a spatula measure of catalyst powder to 50 cm^3 of hydrogen peroxide solution at 20°C .

Time (s)	0	20	40	60	80	100	120	140	160	180
Volume of oxygen (cm^3)	0	10	20	26	32	35	38	39	40	40

- a Plot the results on a graph showing the volume of oxygen formed on the vertical (y) axis against time on the horizontal (x) axis. Use a vertical scale that goes up to 100 cm^3 .
- b On the same axes, sketch the curves you would expect when plotting the data from repeating the procedure with all the conditions the same except that:
- the temperature is raised to 20°C
 - the volume of hydrogen peroxide solution is 100 cm^3
 - the catalyst is added as coarse granules instead of a powder
 - the 50 cm^3 of hydrogen peroxide is mixed with an equal volume of water before adding the catalyst.
- 2 In an investigation into the rate of reaction of a metal with acid, 0.05 g samples of clean magnesium ribbon were added to 5 cm^3 samples of dilute hydrochloric acid in a test tube. The gas given off was collected and measured.

The graph on the next page shows a plot of one set of results. In this example there was more than enough acid to react with all the metal.

Activity AC6.8 Interpreting data about rates of reaction



- a The first piece of magnesium ribbon was weighed accurately. How could other pieces of metal ribbon with the same mass be obtained without using a chemical balance?
- b Draw and label a diagram of the apparatus that could be used in the investigation.
- c In the set of results shown in the graph:
- what was the volume of gas collected when the reaction stopped?
 - how long did it take for all the magnesium to react?
- d The results shown in the table were recorded with a different concentration of hydrochloric acid.

Time (s)	0	5	10	15	20	25
Volume of gas (cm³)	0	25	40	45	50	50

- Was the acid here used more or less concentrated than the acid used to obtain the results plotted on the graph?
 - Why was the final volume of hydrogen 50 cm³?
- e A third set of results was obtained using another concentration of hydrochloric acid. This time the total gas collected when the reaction stopped was only 40 cm³ and there was some magnesium left in the test tube.
- Suggest a reason why less hydrogen was collected this time (assuming that the apparatus did not leak).
 - What mass of magnesium remained when the reaction stopped?