

Rates of Reaction and Catalysts

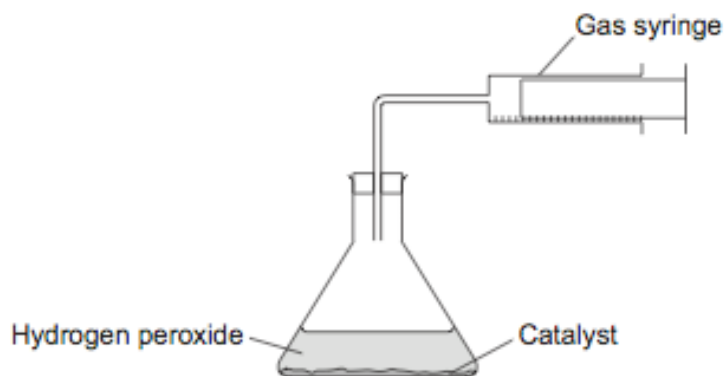
- 1 The rate of decomposition of hydrogen peroxide is very slow. The equation shows the decomposition reaction.



Balancing equations is required throughout the C1, C2, C3 specifications. Always good to keep up the practise.

- 1 (a) (i) The equation is not balanced. Add numbers to the equation to balance it. (1 mark)

- 1 (b) The diagram shows how the rate of decomposition of hydrogen peroxide can be investigated. The gas given off is collected in the gas syringe.



A powdered catalyst is added to the hydrogen peroxide.

- 1 (b) (i) What is a catalyst?
Increases the rate of a reaction [1 mark]
Not used in the reaction or not doesn't take part in the reaction [1 mark] (2 marks)

- 1 (b) (i) The experiment above was repeated four times.

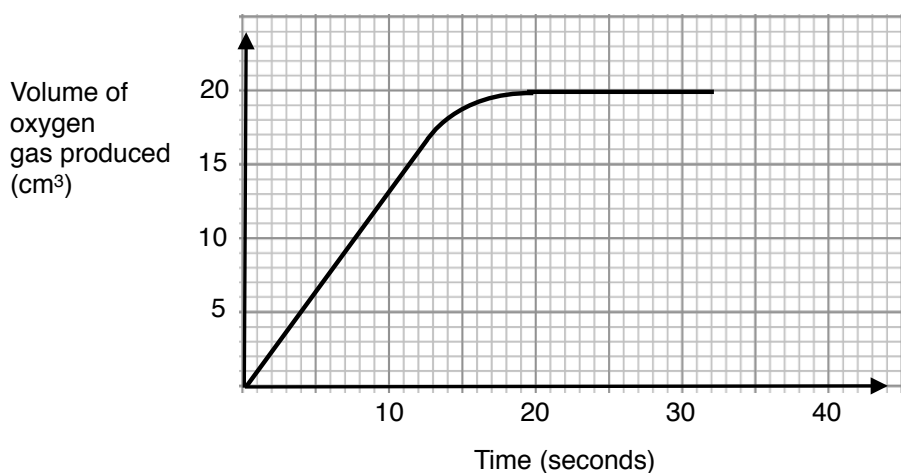
Why was the experiment repeated?

To check for anomalous results [1 mark]
To see if the results were reproducible [1 mark]
For reliability [1 mark]

The word 'reliable' is not going to be used by the exam board any more, although it can still be acceptable in an answer. The terminology now talks about 'reproducibility' or 'repeatability'.

(2 marks)

- 1 (b) (ii) The graph shows the results from one of the experiments with hydrogen peroxide and a catalyst.

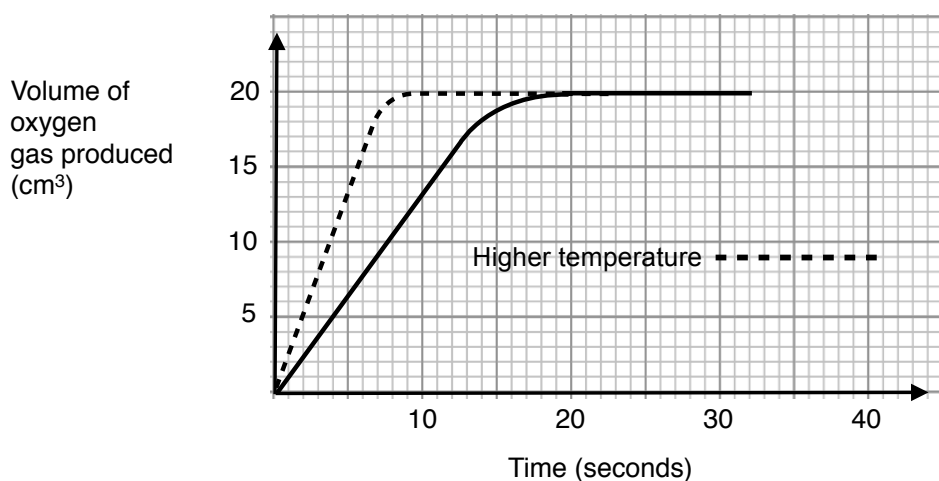


- 1 (b) At what time did the reaction stop?

20 seconds [1 mark]

(1 mark)

- 1 (b) (i) The experiment above was done again at a higher temperature. The graph shows the results of the two experiments.



Use your knowledge of particles to explain the shape of the graph for the higher temperature. .

Particles/atoms/ions have more energy [1 mark]

They (the particles) move faster [1 mark]

and collide more often or there are more successful collisions [1 mark]

Collide with more energy or more particles have the activation energy [1 mark]

(3 marks)

2 (a) Nitric acid is useful for the production of fertilisers. It is produced in two main stages

In the first stage, hydrogen and nitrogen are reacted with an iron catalyst to produce ammonia.

In the second stage the ammonia is reacted with oxygen and water in the presence of a platinum catalyst to produce nitric acid.

Why are two different catalysts used in the production of nitric acid?

They work with or catalyze or speed up different reactions or catalysts only speed up one reaction.

(1 mark)

2 (a) (ii) Why are catalysts used in production processes such as this one?

Speed up reactions [1 mark]

Reduce costs or make the process more economic [1 mark]

Reduce energy requirements [1 mark]

(2 marks)

2 (a) (iii) Platinum is a very expensive metal.

Suggest why catalysts are used even though they may be very expensive?

Can be reused or only small amounts needed. [1 mark]

(1 mark)