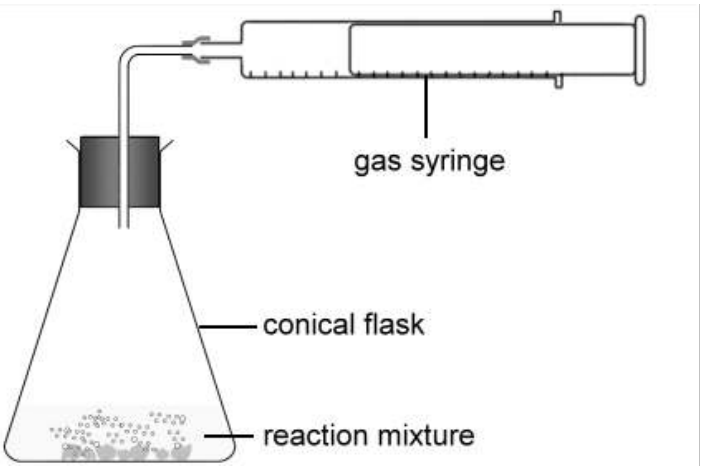
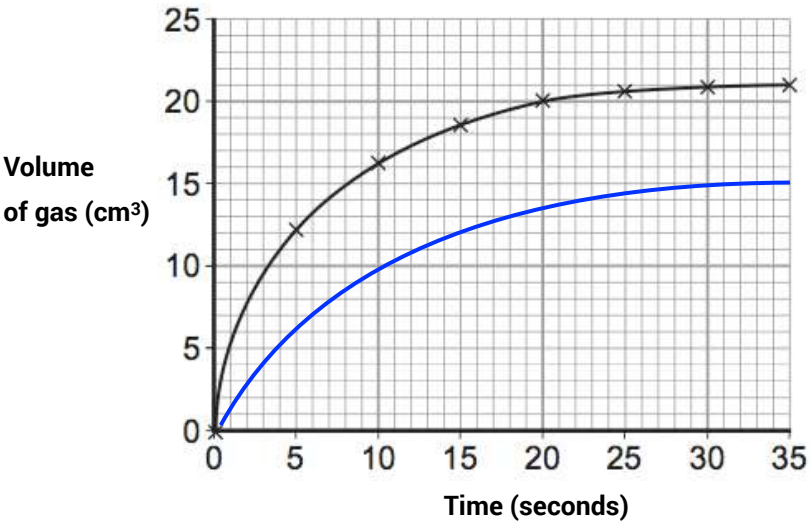
0 1 The diagram shows the apparatus used to investigate the effect of concentration of hydrochloric acid on the rate of reaction with marble chips. The gas produced is collected in the gas syringe.



The results of the experiment are shown in the graph below.



0 1 . 1 Use the graph to describe the changes in the rate of the reaction over the first 35 seconds.

[3 marks]

Rapid increase initially/at first [1]

Then decrease in rate of gas production or rate of reaction. [1]

Eventually volume of gas production levels off. [1]

Any numbers used to help description. [1]

The experiment was repeated using the following conditions.

The mass and surface area of the marble chips was the same.

The volume and temperature of the hydrochloric acid was the same. The concentration of the hydrochloric acid was reduced.

0 1 . 2 The rate of the reaction decreased. **On the graph**, sketch a line to show the result you would expect for the above conditions.

See graph - a line anywhere below the one on the graph with the same shape **[1 mark]**

0 1 . 3 Use your knowledge of particles to explain why the rate of the reaction decreased. **[3 marks]**

Less (reacting) particles in a given volume [1]

Particles less likely to collide [1]

...with enough energy or less successful collisions [1]

0 1 . 4 The purpose of the experiment was to see the affect of concentration on the rate of this reaction. Why was it important to keep the temperature the same for the second experiment? **[2 marks]**

It (temperature) is a control variable [1]

To ensure only concentration is affecting the rate or so the temperature doesn't affect the rate or changing the changing temperature would change the amount of gas produced/rate of reaction. [1]

(Total 9 marks)

TOP TIP :
It's not usually enough to say fair test' without explaining what it means.

End