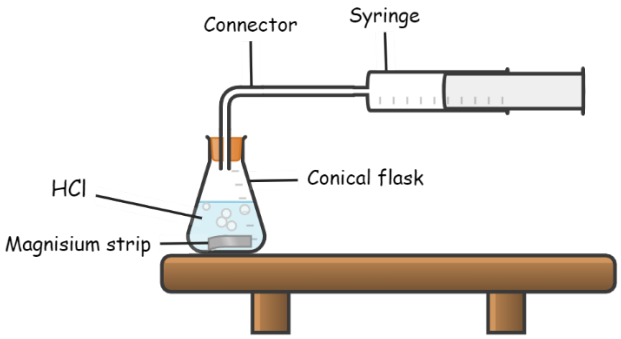
Illustrating reaction rate graphically and interpret experimental data

Experiment to measure rate of reaction of magnesium and hydrochloric acid.

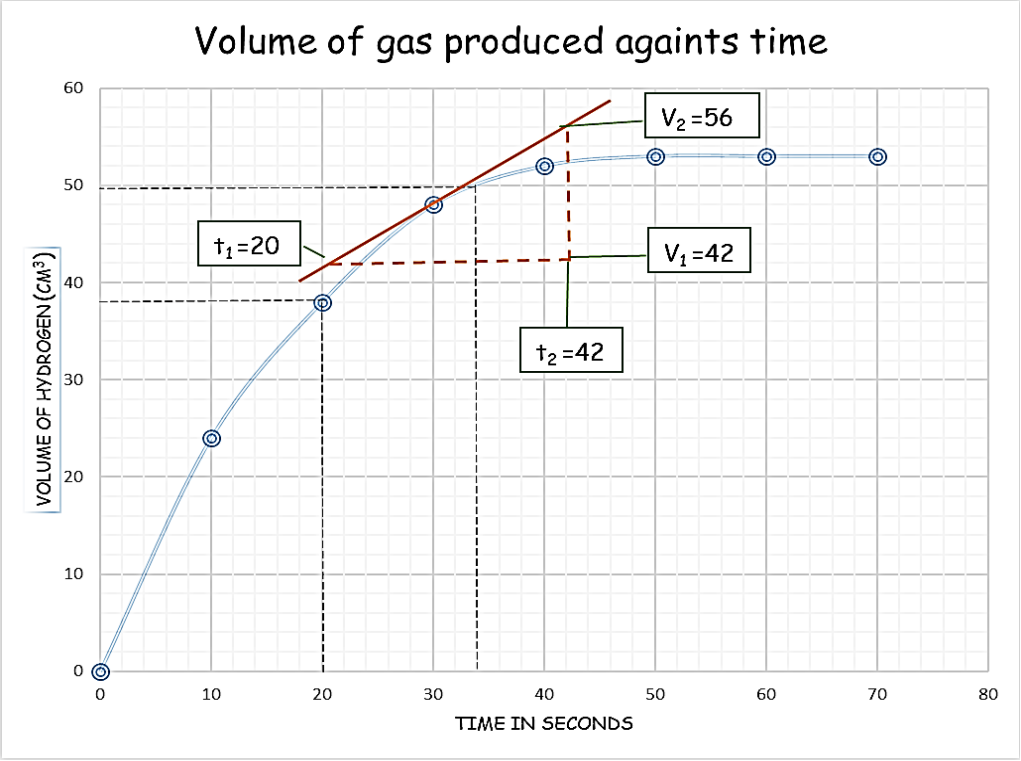


Procedure

(i) Place 100cm^3 of 0.5M hydrochloric acid in a conical flask.
(ii) Drop a piece of clean magnesium strip into the acid in the conical flask, immediately stopper the flask and start a stopwatch.
(iii) Collect the gas evolved in a graduated syringe.
(iv) Record the volume of the gas every 30 seconds for about 5 minutes.

Results

Time in seconds	0	10	20	30	40	50	60	70
Volume of gas in cm^3	0	24	38	48	52	53	53	53



Description of the shape of the graph

- The graph is *steeper at the start* when concentration of both reactants is high.
- It is clear that as the reaction progresses, a lower volume of hydrogen gas is liberated. Both the amount of magnesium and the concentration of the acid are decreasing during the experiment. The graph *becomes less steep*.
- The reaction slows down and eventually stops when one or all the reactants are used up. The graph *becomes horizontal*.

Calculating reaction rate

Use the graph to calculate:

(a) Average rate of gas produce between 20-34 sec.
(b) Rate of reaction at t= 30

Solution

(a) Average rate of reaction = $\frac{Volume\ of\ hyrogen\ produced}{time\ taken}$

$= \frac{V2-V1}{t2-t1}$

$\frac{50-38}{34-20}$ = 0.857 cm^3/sec

(b) Average rate of reaction at t=30.
Draw a tangent at the point t=30 on the graph line.
Find the gradient of the tangent at the point.

$= \frac{V2-V1}{t2-t1}$

$= \frac{56-42}{42-20}$ = 0.63 cm^3/sec