# Candidate 2 evidence

The effect of concentration changes on rate of reaction

Aim -

To investigate the decreasing of concentration of potassium Iodide solution on rate of reaction.

underline chemistry -

Collision theory is were particals must collide for a succesful reaction to happen. The higher the concentration the more reacting particals there is meaning more succesful collisions will occur during the reaction and the reaction will be faster.

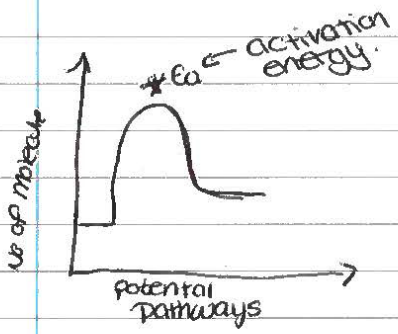
$H_2O_{2(aq)} + 2H^+_{(aq)} + 2I^-_{(aq)} \rightarrow 2H_2O_{(l)} + I_{2(aq)}$

$I_{2(aq)} + 2S_2O_3^{2-}{}_{(aq)} \rightarrow 2I^-_{(aq)} + S_4O_6^{2-}{}_{(aq)}$

With one of these reactions being a slower reaction as a catalyst hasn't been added to it yet so the reaction isn't really happning but then hydrogen peroxide is added making the reaction have succesful collisions and showing a colour change. Meaning the other reaction is showing that something has happened.

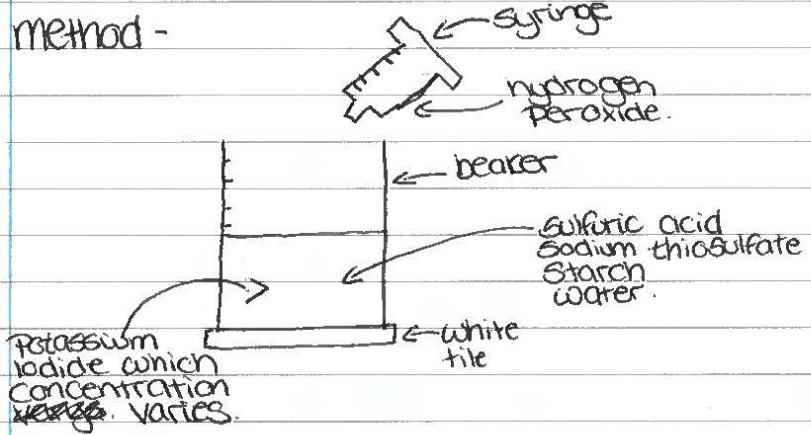
$$\text{Reaction rate} = \frac{1}{\text{time taken for reaction}}$$

This calculates the amount of relative rate that there is in the reaction / concentration that it's at.




Activation energy is the energy required for molecules to collide to form an activated complex. For this to be sucsseful the reacting particles must sucssefully collide together for the reaction to happen.

method -




In the beaker I am reaction sulfuric acid, sodium thiosulfate, starch, water and Potassium Iodide Solution were the concentration varies. Hydrogen peroxide is then put into a syringe which is what starts the reaction. This was then repeated with everything staying the same except the potassium Iodide solution which changes. All safety procedures were taken.

Results -

| Concentration of KI (aq) mol-1 | | Time(s) | |
|---|---|---|---|
| | 1 | 2 | 3 |
| 0.05 | 21 | 29 | 24 |
| 0.04 | 28 | 32 | 32 |
| 0.03 | 38 | 46 | 41 |
| 0.02 | 64 | 71 | 62 |
| 0.01 | 185 | 125 | 116 |

| average (s) | rate $(\frac{1}{t})s^{-1}$ |
|---|---|
| 24.7 | 0.04 |
| 30.7 | 0.03 |
| 41.7 | 0.02 |
| 65.7 | 0.015 |
| 142 | 0.007 |

average Calculation -

0.05 - 21 + 29 + 24 = 74

$\frac{74}{3} = 24.7$

0.04 - $\frac{92}{3} = 30.4$

0.03 - $\frac{125}{3} = 41.7$

0.02 - $\frac{197}{3} = 65.7$

0.01 = $\frac{426}{3} = 142$

Rate Calculation -

0.05 - $\frac{1}{24.7} = 0.04$

0.04 - $\frac{1}{30.7} = 0.03$

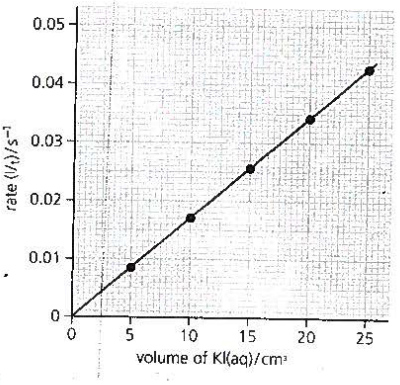
0.03 - $\frac{1}{41.7} = 0.02$

0.02 - $\frac{1}{65.7} = 0.015$

0.01 - $\frac{1}{142} = 4.04 \times 10^{-3}$

$= 0.007$

(1)

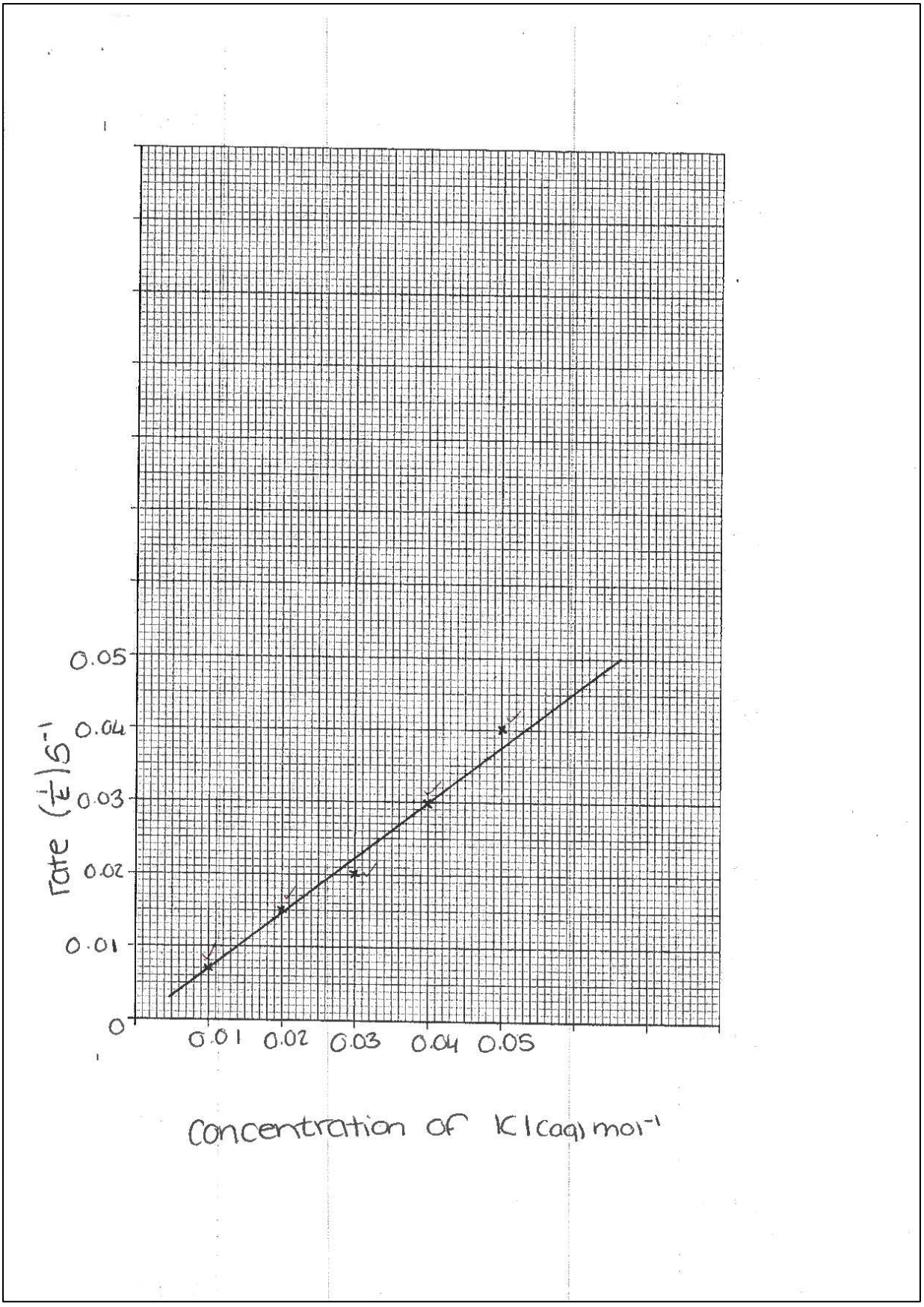



Analysis -

The graphs both show the same which is that the higher the concentration of potassium iodide solution the higher the rate is. The graphs show that the less there is the less rate it is going to have.

Conclusion -

In conclusion as you decrease the concentration of potassium iodide solution the relative rate also decreases. This is due to more water being in the lower concentrated solution making the reacting time much slower that what the solution is with no water at all.


0.05
0.04
0.03
0.02
0.01
0
rate $(\frac{1}{t})s^{-1}$
0.01
0.02
0.03
0.04
0.05
Concentration of KI(aq) $mol^{-1}$

Evaluation -

One way our experiment could have went better is when timing the experiment we staped the timer as soon as we seen a little bit of colour but it could of took longer for the whole thing to change colour meaning the results would be more reliable as we would know the time it took for the whole thing to change colour not just a little bit of it.

Another way the experiment could have been better is if we had used the same bottle of potassium iodide solution because the bottle ran out after the first 2 times the 3rd time was with a differen bottle of potassium iodide solution meaning that something could have been different about the other bottle showing that the results could have been way off.

One way that the experiment went well was that we repeated the experiment 3 times to get a more accurate result than if we did it only once it wouldn't be as reliable as you could have done something wrong but with doing it a few more times it means you know that you have done it accurate and get an average at the end.

Sources -

① Higher Chemistry for CfE
John Anderson, Eric Allan and John Harris
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978 - 1 - 4441 - 6752 - 8