Candidate 1 evidence

The Effect of Concentration on Reaction Rate

Aim

To find the effect of different concentrations of potassium iodide has on the rate of reaction between hydrogen peroxide and potassium iodide.

Underlying Chemistry

Collision theory says that for a reaction to occur and to be successful the particles must collide with the correct geometry which is the positions that reactants must be in as they collide. Also must have energy which is the same or bigger than the activation energy. Activation energy is the minimum energy needed in order for reactants to form an activated complex.

Reaction rate can be increased by increasing the concentration of the reactants as there are more reactive particles, therefore more collisions can occur. Increasing the surface area of a reactant will increase reaction rate due to reactions taking place at the surface of the reactants, this means more collisions happen, therefore increasing reaction rate. Increasing surface area can be increased by using powdered reactants instead of a lump of reactant. Reaction rate can also be increased by increasing temperature, this is because temperature gives the reactants greater energy, meaning that the energy the particles now have are probably equal or bigger than the activation energy needed for the reaction to occur. (1)

Data Collection and Handling

Used five glass beakers and added sulphuric acid, sodium thiosulphate, starch, different volumes of potassium iodide for the varying concentrations, lastly different volumes of water into each one. The experiment is to take place on a white tile to see the colour change. Safety goggles had to be worn, no other safety procedures had to occur. The experiment was repeated fully three times.

Volume of KI cm^3	Volume of H^1Ocm^3	Time (s)			Average (s)	Rate $(1/t)s^{-1}$
		1	2	3		
25	0	8·81	7·94	7·68	8·14	0·123
20	5	12·39	13·24	11·57	12·4	0·081
15	10	12·89	12·36	10·57	11·94	0·084
10	15	13·70	15·11	14·89	14·57	0·069
5	20	19·99	18·31	22·23	20·18	0·05

$$\text{Average} = \frac{8·81 + 7·94 + 7·68}{3} = 8·14\dot{3} = 8·14$$

$$\text{Rate} = \frac{1}{t} = \frac{1}{8·14}$$

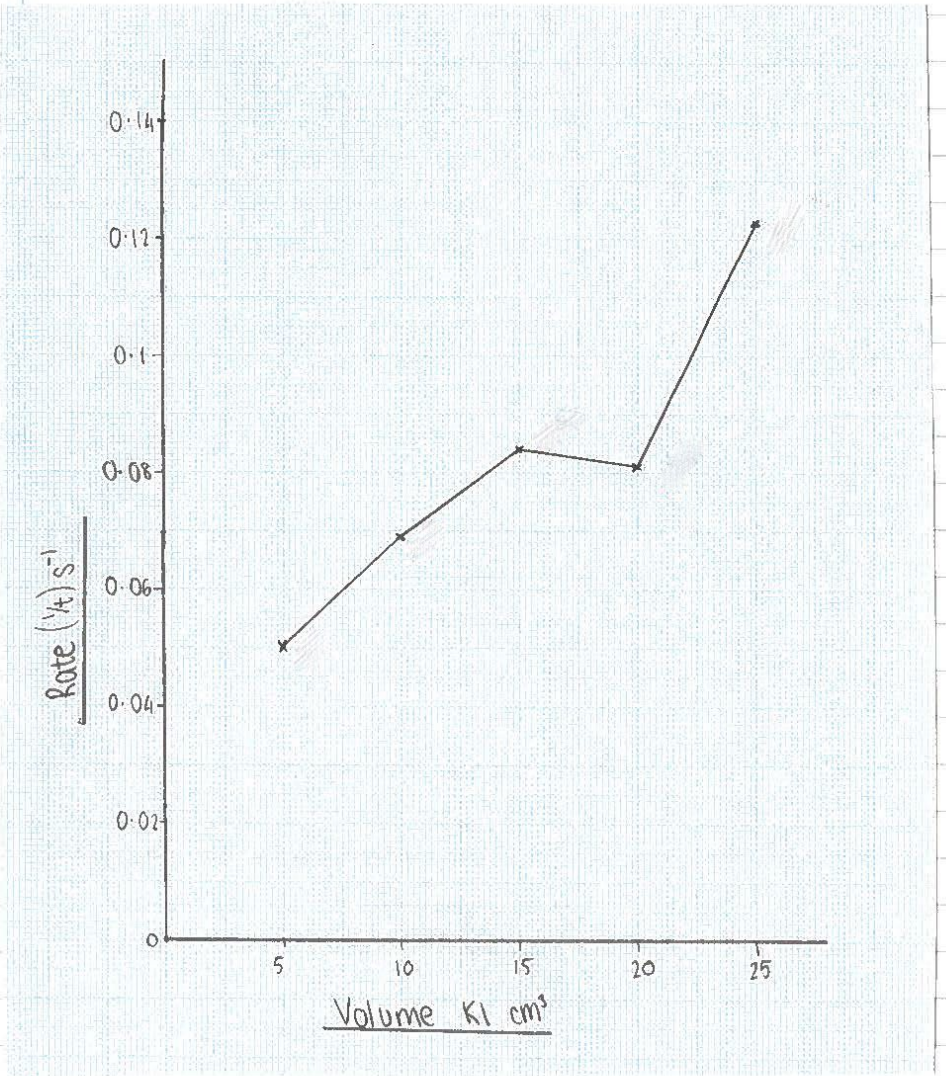
$$= 0·\dot{1}22850$$
$$= 0·123$$

Literature Source

Volume of KI(aq)/cm³	Volume of H_2O/cm³	Time (t)/s	Rate (1/t)/s^{-1}
25	0	23	0.043
20	5	29	0.034
15	10	39	0.026
10	15	60	0.017
5	20	111	0.009

(2)

Graphical Presentation



Analysis

Comparing both my results and my literature source both results follows the same trend of, if the concentration of KI is high eg) 25 cm^3 then the rate of reaction is at it's highest.

Conclusion

In conclusion as the concentration of KI increases the reaction rate of the reaction increases.

Evaluation

Not using fully dried beakers, this means the beakers still contained water, therefore diluting my potassium iodine solution. This means my concentrations were inaccurate. Next time I would ensure my beakers were fully clean and dry before completing the experiment to maintain accuracy throughout.

My literature source didn't specify if the reaction was repeated. This means an average wouldn't have been calculated decreasing the reliability of the results. In the future I would find a source that has repeated the experiment more than once to compare with my results to get an accurate and reliable comparison.

I used a measuring cylinder to measure my solutions however if I was to complete the experiment again I would use syringes to measure the volumes out, as using a syringe is more accurate and can make the volumes closer to being perfect compared to a measuring cylinder

References

(1) - Book
Title: Need to Know Higher Chemistry
Author: John Anderson
Page: 58 and 59
ISBN: 978-1-5104-5120-9

(2) - Book
Title: Higher Chemistry for CfE
Authors: John Anderson, Eric Allan, John Harris
Page: 10
ISBN: 978-1-4441-6752-8