TeStInG tHe EfFeCt Of SuRfAcE aReA oN tHe SpEeD oF rEaCtIoN bEtWeEn cAlCiUm CaRbOnAtE aNd HyDrOcHlOrIc AcId

Testing the effect of surface area on the speed of reaction between calcium carbonate and hydrochloric acid

I am trying to find out if there is any effect on the speed of reaction between hydrochloric acid and the surface area of calcium carbonate.

PrEdIcTiOn

I think that an increase in the surface area of calcium carbonate will speed up the reaction because the particles in the hydrochloric acid solution will have more area to work on therefore there will be more useful collisions between particles as both reactants.

VaRiAbLeS

- Increase the temperature ~ the particles move quicker consequently, there are more collisions.
- Concentration of the Hydrochloric Acid ~ If the acid is more concentrated than there is more particles of reactant knocking about.
- Size of the Calcium Carbonate ~ If the Calcium Carbonate, a solid is broken up into smaller pieces it will increase its surface area. This means that the particles around it in the Hydrochloric Acid will have more area to work on so there will be more useful collisions.

I am going to change the surface area of the Calcium Carbonate as indicated in the title.

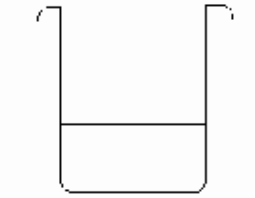
I intend to keep the mass of Calcium Carbonate constant every time. However, I will break it into small pieces and use some Calcium Carbonate powder so the surface area is different but the mass of the Calcium Carbonate is the same.

EqUiPmEnT

Beaker (100 ml) x3
Safety Goggles
Stopwatch
Spatula x3
Tongs
Hydrochloric Acid-
30 ml ~ 3x10 ml
Calcium Carbonate-
1g ~ Powder
1g ~ Big Pieces
1g ~ Small Pieces

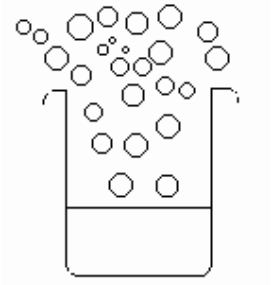
MeThOd

1. Place the beaker on a clean surface and add 10 ml of Hydrochloric Acid.



2. Drop the Calcium Carbonate (1g in **big** pieces) and start the stopwatch.

3. Watch the reaction, when the Calcium Carbonate has totally reacted with Hydrochloric Acid and no solid can be seen stop the stopwatch.



4. Record the results in a table.

POWDER (1g)	SMALL PIECES (1g)	LARGE PIECES (1g)

5. Repeat instructions 1-4 twice again but this time instead of using 1g of **big** pieces of Calcium Carbonate use 1g of **small** pieces and then 1g of **powder**.

6. Repeat the experiment thrice to get an average time.

7. Wash away all equipment once finished all **9** experiments.

SaFeTy 1St

1. Wear safety goggles throughout the experiment to protect your eyes.

2. Make sure you handle the Calcium Carbonate and Hydrochloric Acid with care, keeping them away from your eyes and try not to sniff them.

3. Use a spatula to pick up the CaCO3 and to add it or to take it aw ay from the solution if there are any problems.

A tAbLe ShOwInG mY rEsULtS...

RUN	POWDER (1g)	SMALL PIECES (1g)	LARGE PIECES (1g)
1	4.36s	19.44s	37.42s
2	5.07s	21.37s	39.43s
3	4.57s	18.58s	38.37s

aN aNaLySiS oF mY rEsULtS...

Overall, the results show us that the particles of the big pieces of the calcium carbonate took longer to collide with particles of the hydrochloric acid whilst the particles of the calcium carbonate powder reacted with the particles of the hydrochloric acid much quicker. This as I predicted was because the surface area of the powder was much bigger than that of the big pieces.

From the result table I can work out an average of the three columns, using the three runs, powder, big pieces, and small pieces:

RUN	POWDER (1g)	SMALL PIECES (1g)	LARGE PIECES (1g)
1	4.36s	19.44s	37.42s
2	5.07s	21.37s	39.43s
3	4.57s	18.58s	38.37s
Average	***5.07s***	***20.20s***	***38.41s***

eVaLuAtIoN

At first, I had an experiment in which I was going to measure the amount of carbon dioxide given off in this reaction but then due to the restricted amount of time we were given I had to alter it to the one I have written above. This too I did not finish in time therefore I obtained the results from the teacher.

I do not think my results are anomalous because all my results are in a way I predicted they would be.

If I was to do this experiment again I would work faster so I could get the results myself rather then of someone else.