

# Candidate 1 evidence

Particle size and rate of reactions

Aim: To find out if increasing the particle size affects the rate of reaction

Background Chemistry Large particles have small surface areas. Only the outside particles are exposed to the chemical so if there is only one stone the chemical will be able to ~~get~~ attach only the outside. However, if the particle size is decreased then chemicals are able to attach more particles that were previously on the inside. There is a larger amount of particles exposed when there is a larger surface area. When there is a larger surface area there is more of a chance of two atoms ~~colliding~~ colliding with each other. This creates a reaction. The more collisions there is the faster the reaction will be. The speed of a reaction can be interpreted by a graph however to find out the graph you must work out the rate. This is done by working out the change in weight of the ~~reaction~~ reaction and dividing it by the change in time. Once you know the rates you can make it ~~more~~ easier to read by putting it in a rate graph. If a reaction is quick it will have a steep line. ~~The steeper the line the faster the reaction will be.~~ The softer curve in the line, the slower the reaction will be. If there is a flat line ~~on the graph~~ on the graph that indicates that the reaction has stopped due to the reactant ~~is~~ being used up. The line will ~~begin~~ begin to be flat when there is less reactants. Bases are used to neutralise acid. Neutralisation reactions are when ~~the~~ bases come into contact with acids. Bases are alkali so they get the acids pH number closer to ~~the~~ 7 (neutral). This is because the number of hydrogen ions goes down. During a Neutralisation reaction salts are created ~~from~~ from new ions substances. The three main bases are metal oxides, metal hydroxides and metal carbonates. If a base cannot dissolve in water it is an alkali. Acids and metal carbonates reacting together ~~create~~ create a salt, water and carbon dioxide. ~~The gas test was~~ The method I used for collecting the gas test was by using a balance. Take note of the starting weight with a measuring cylinder (with chosen acid in it) ~~conical flask~~ conical flask with measuring ~~solid~~ solid in it. ~~Once~~ Once you take note of this pour the ~~or~~ measuring

cylinder with the acid in the conical flask with the solid in it. Wait your chosen amount of time and take note of your finishing weigh. Subtract the finishing weight from the starting weight and that is the amount of gas lost.

**description of Experiment**  
To work out the gas lost I had the acid in a ~~cylinder~~ measuring cylinder and ~~the~~ <sup>particles</sup> in a beaker ~~then~~ and placed them both on a balance. I recorded the starting weight, added the acid to the beaker waited 2 minutes and recorded the finishing weight.

**Raw data**

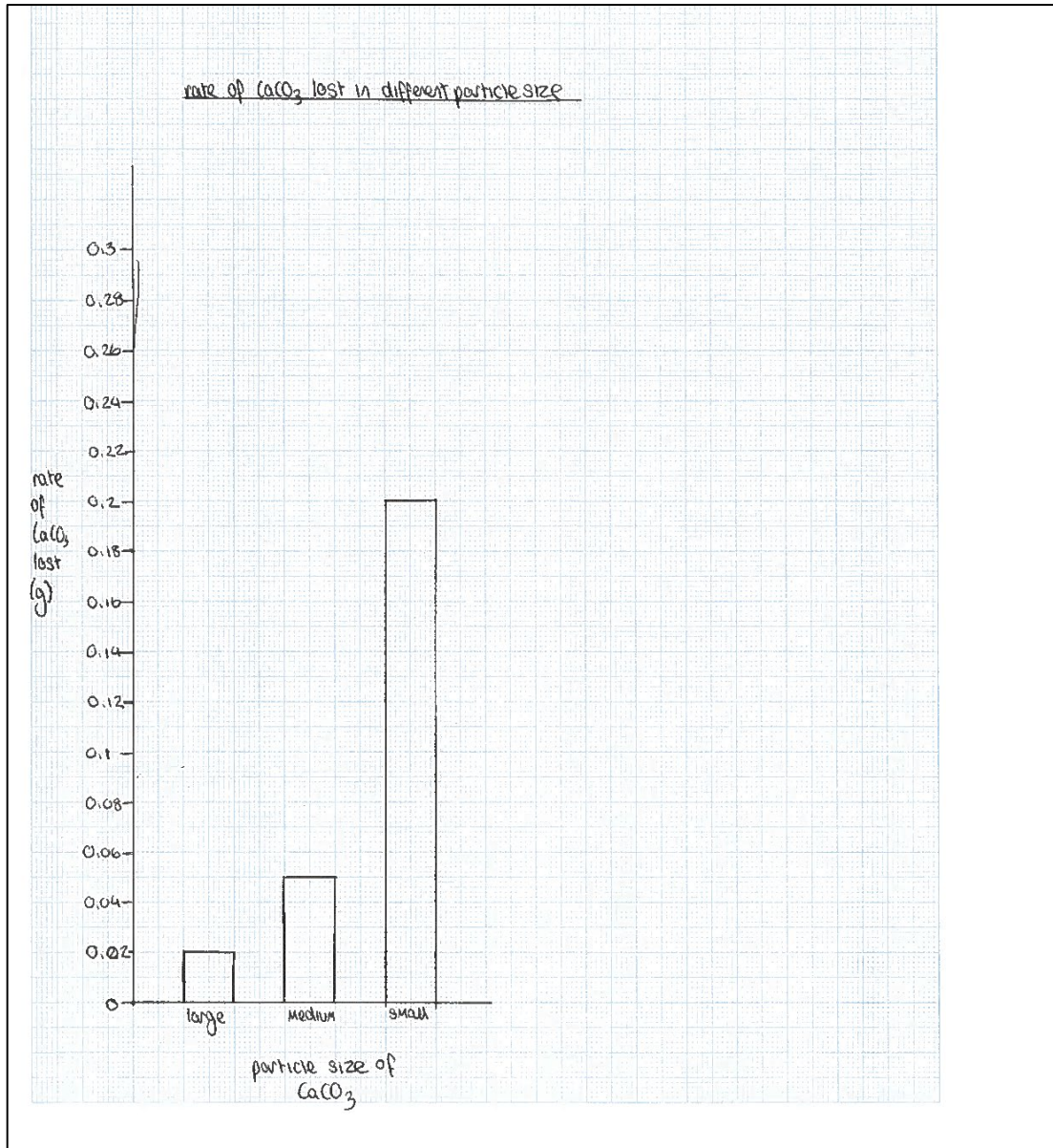
particle size	<del>particle size</del> attempt 1	<del>particle size</del> attempt 2
large	start = 118.20 finish = 118.18	start = 117.02 finish = 116.97
medium	start = 113.20 finish = 113.15	start = 118.32 finish = 118.19
small	start = 116.11 finish = 115.76	start = 117.37 finish = 116.91

**Results**

particle size	amount of $\text{CaCO}_3$ lost in grams	
	attempt 1	attempt 2
large	0.02	0.05
medium	0.05	0.13
small	0.35	0.45

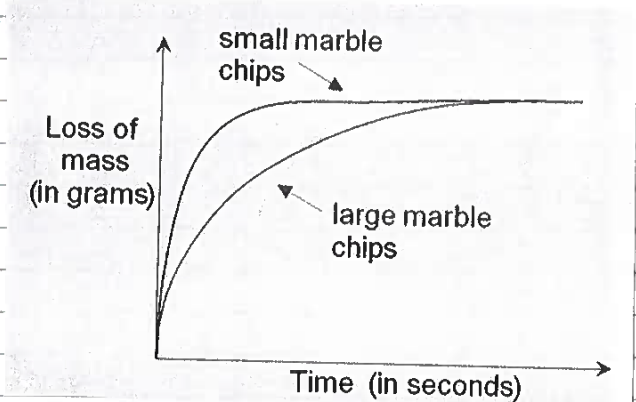
**Average and Rate**

particle size	average amount of $\text{CaCO}_3$ lost (g)	rate of $\text{CaCO}_3$ lost (g)
large	<del>0.02</del> 0.04	0.02
medium	<del>0.05</del> 0.1	0.05
small	0.4	0.2



<https://www.gcsescience.com/rc9-increase-surface-area.htm>

Second Source



Analysis

Both my second source and my graph show that smaller ~~marble~~ chips go faster. I can tell this by how steep the ~~small~~ small chips line is on the graph and how high the bar is on my bar graph. The large chips line isn't as steep as the small chips line showing that it was not as quick. This relates to my graph where the large chip bar is significantly smaller. These both show that the small ~~chip~~ chips react faster than the large chips.

Conclusion

~~For~~ To conclude, increasing the particle size does affect the rate of reaction as it slows the reaction down. I could tell this from my graph and my tables.

Evaluation

Using a stop watch to time my experiment made it significantly more accurate. ~~There were 2 attempts at 2 minutes~~ Each attempt was 2 minutes long making the experiment fair. If the time was not the same it would have made the results not accurate.