

WORKSHEET THREE

RATES AND PARTICLE THEORY

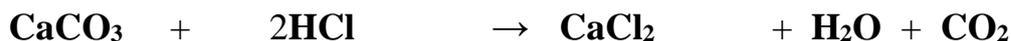
1.
 - (i) A collision must happen between particles
 - (ii) The particles must collide with enough energy for the reaction to occur
 - (iii) The particles must collide with the correct orientation

2.

2.	(a) Diluting the acid by adding water.	DECREASE
	(b) Crushing the marble chips.	INCREASE
	(c) Adding more marble chips.	INCREASE
	(d) Using the same mass but adding a big chunk of calcium carbonate instead of lots of smaller pieces.	DECREASE
	(e) Using 2 mol L ⁻¹ hydrochloric acid instead of 1 mol L ⁻¹ .	INCREASE

3.

Calcium carbonate + Hydrochloric acid → Calcium chloride + Water + Carbon dioxide



4.
 - Concentration
 - Surface area
 - Temperature
 - Using catalysts

5. By increasing the number of particles present in a reaction container, this should increase the reaction rate because more collisions will occur.

6. Two of:
 - Increasing the surface area means that more of the particle is exposed and therefore the likelihood of collisions occurring increases and this in turn increases the rate of reaction.
 - Increasing the temperature means that the particles move faster causing them to collide more frequently, also there is an increase in energy and this helps more products to form.

- Using a catalyst lowers the energy needed for the products to form in turn this speeds up the rate of reaction.
- 7.
- (a) **Collision theory** - the theory that relates to how reactions start and how the rates can change.
 - (b) Concentration- **the amount of particles present in a solution**
 - (c) **Surface area** - the amount of reactant exposed to its surroundings, if this is greater it will speed up the reaction.
 - (d) Temperature- **the measure of heat energy contained in a solution**
 - (e) **Catalyst** - something that is used to speed up the rate of a reaction but is not used up in the reaction.