

# FACTORS AFFECTING THE RATE OF A CHEMICAL REACTION

## TEMPERATURE

- THE HIGHER THE TEMPERATURE THE FASTER THE RATE OF REACTION
- PARTICLES ARE MOVING FASTER - HAVE GREATER KINETIC ENERGY.
- SO THERE ARE MORE COLLISIONS PER SECOND

## AND

- MORE OF THE PARTICLES HAVE ENERGY GREATER OR EQUAL TO  $E_a$  AND SO MORE OF THE COLLISIONS THAT ARE OCCURRING LEAD TO A SUCCESSFUL REACTION.

When explaining temperature you need BOTH of these important ideas!!

## Measuring rates of reaction.

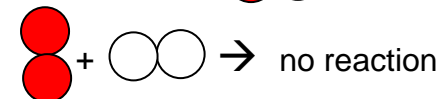
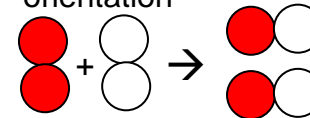
- Collect gas in a syringe or water filled measuring cylinder: record volume of gas at time intervals
- Measure loss of mass over time eg  $\text{CaCO}_3$  & acid in a flask standing on a digital balance
- Time how long for a coloured chemical to appear or disappear

## RATES OF REACTION

## Collision theory:

For a reaction to occur

- The reactants must collide!!!!
- They must collide with the correct orientation

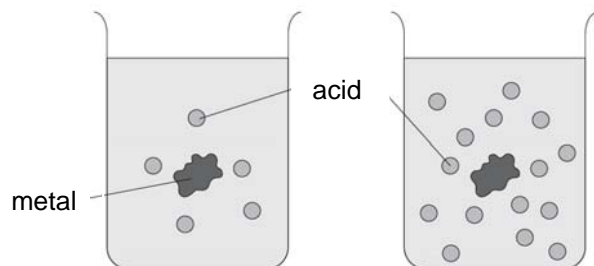


- They must collide with energy greater or equal to  $E_a$  (the activation energy) for that reaction

Anything that brings about more effective collisions per unit time will increase the rate of the reaction. "effective" – leading to a reaction. "collisions per unit time"? This just means how FREQUENTLY the particles collide, eg the number of collisions per second.

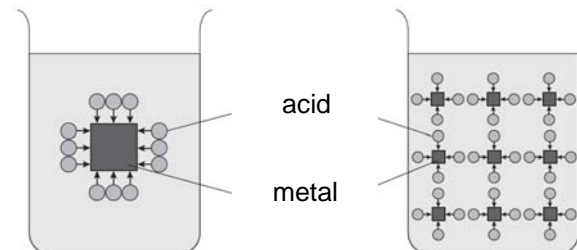
## CONCENTRATION

The higher the concentration of a reactant (or reactants), the more particles per unit volume will collide per second.



## SURFACE AREA

Consider a solid substance in a solution, e.g. magnesium metal in hydrochloric acid. When the solid is broken up, more ACID particles can collide with each piece in the same time.



Increase in collision frequency.....

## Catalysts

Provide an alternative pathway for a reaction with a lower  $E_a$  (so more molecules have the required energy to react and so the rate is faster). Are NOT used up in the process. Don't alter  $\Delta H$  for a reaction.

