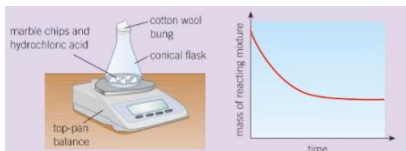


# Pure substances and mixtures

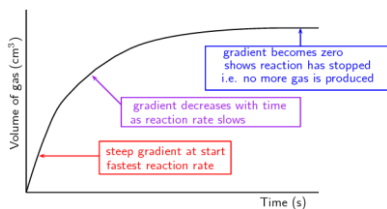
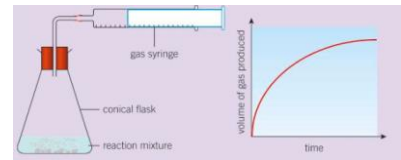
To measure the rate of a reaction you can:

- Measure how fast the reactants are used up
- Measure how fast the products are made

e.g. Measure mass lost due to gas formed



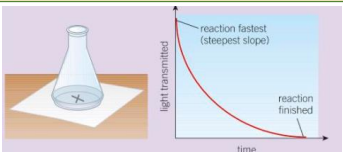
e.g. Measure volume of gas made



Rate = volume of gas ÷ time

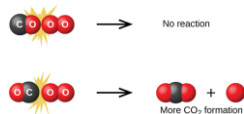
cm<sup>3</sup>/s

e.g. Measure time for insoluble product to form



# C12 Chemical Analysis

## Chromatography



A successful collision is one that leads to a reaction

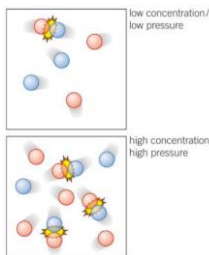
So to increase the rate of a reaction you must either

- Increase the frequency of collisions
- Increase the energy of the collisions
- Decrease the energy needed for a collision to be successful

## Gas tests

## Concentration and Pressure

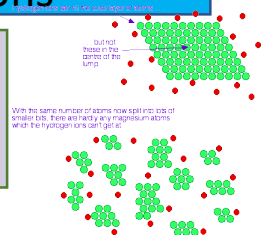
More particles in the same space.  
More frequent collisions



# TRIPLE ONLY

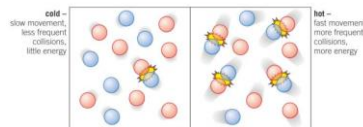
## Tests for Positive ions

More particles available to react.  
More frequent collisions



## Temperature

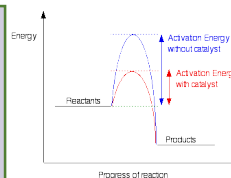
Particles **move faster**.  
So they **collide more frequently**.  
Particles collide **with more energy**.  
So more of the collisions are **successful**.



## Tests for Negative ions

## Catalysts

Lower the energy needed for successful collisions. (Activation energy)  
Not used up.  
Biological catalysts are called **enzymes**

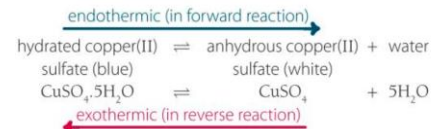


# Instrumental Analysis

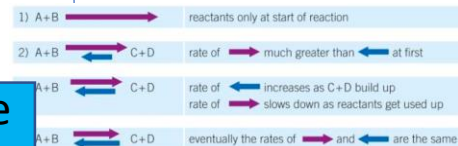
Can go in both directions.



If a reaction is exothermic in one direction it is endothermic in the other direction.



In a closed system (where nothing can get in or out) an **equilibrium** is reached where the **rate of reaction is the same in both directions**.



At equilibrium:

- Rate of forward reaction = rate of reverse reaction.
- Mount of products and reactants don't change.

