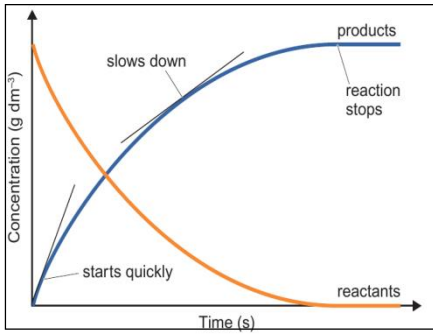
CHEMISTRY: Rates of reaction

Word	Meaning
product	A substance formed in a reaction.
rate	How quickly something happens.
reactant	A substance used up in a chemical reaction.
variable	A factor that can change.

activation energy	The minimum amount of energy needed to start a reaction.

Rate of reaction is the speed at which reactants are turned into products
Some reactions are fast (like explosions)
Some reactions are slow (like rusting)
If we alter variables in a reaction, we can control the rate



Faster reaction – steeper part of graph

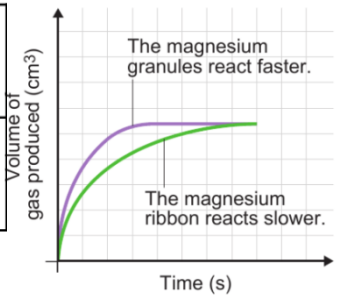
Curve gets less steep as reaction slows

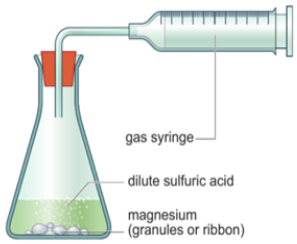
Reaction stops when curve flattens

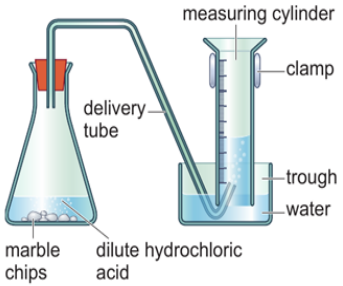
For chemical reactions to occur, particles must COLLIDE with enough energy to react

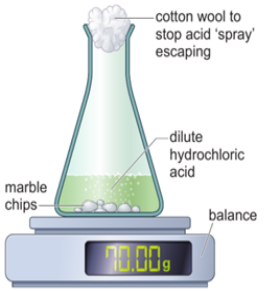
Effect of concentration on rate	Increasing the concentration increases the rate because there are more particles so there are more collisions and more reactions.
Effect of surface area on rate	Increasing the surface area (by decreasing particle sizes) in creases the rate by exposing more particles to collisions leading to more collisions and more reactions.
Effect of pressure on rate	Increasing the pressure increases the rate because particles are pushed closer together so they collide more often.
Effect of temperature on rate	Increasing the temperature increases the rate because particles move faster so they collide more, and collide with more energy to a greater proportion of collisions lead to reactions.

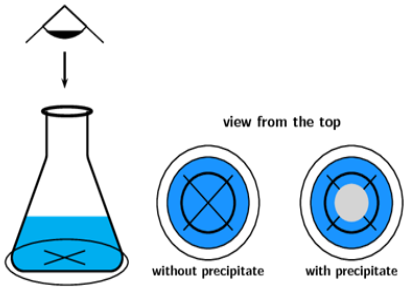
Measuring rates – reactions that produce gas	- Collect gas in a gas syringe and measure the volume every 30 secs. - Collect gas over water (up-turned measuring cylinder full of water) and measure volume every 30 secs. - Do reaction on a balance and record the change in mass every 30 secs.
Measuring rates – reactions that form a precipitate (go cloudy)	Do the reaction in a beaker placed on piece of paper with a cross marked on it. Looking down through the beaker, time how it takes for the cross to disappear.











Smaller pieces of solid reactant- more gas is produced

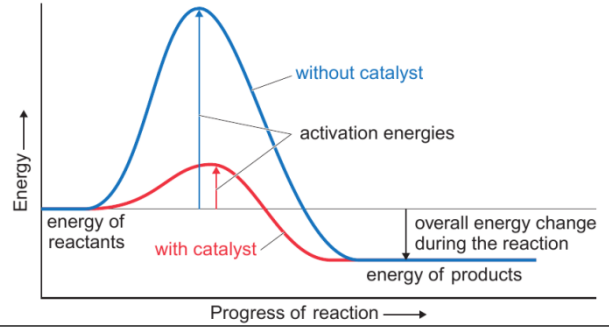
ST IVO ACADEMY
Astrea Academy Trust
INSPIRING BEYOND MEASURE

CHEMISTRY: Rates of reaction

Word	Meaning
active site	The space in an enzyme where the substrate fits during an enzyme-catalysed reaction.
catalyst	A substance that increases the rate of a reaction without itself being used up.
denatured	An enzyme in which the shape of the active site has changed so much that its substrate no longer fits and the reaction can no longer happen.
enzyme	A protein produced by living organisms that acts as a catalyst to increase the rate of a reaction.
protein	A polymer made up of amino acids.
reaction profile	A diagram to show how the energy stored in substances changes during a chemical reaction.
substrate	A substance that is changed during a reaction.

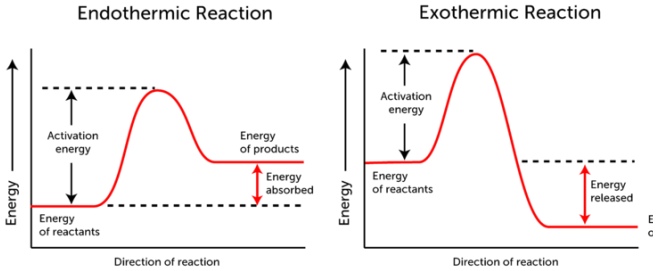
Catalysts provide an alternative reaction route that requires less activation energy.. As less energy is needed to start the reaction, more reactant molecules have enough energy y = more collisions = faster reaction

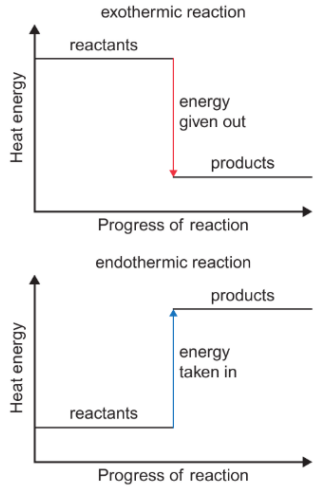
Reaction profiles show the energy changes . Overall energy does not change



Energy is transferred between surroundings and reactants in chemical reactions- most often by heat

Word	Meaning
endothermic	A type of reaction in which energy from the surroundings is transferred to the products. The products have more stored energy than the reactants have.
exothermic	A type of reaction in which energy is transferred to the surroundings from the reactants. The products have less stored energy than the reactants have.





Measuring energy changes	-Sit a polystyrene beaker inside a glass beaker (insulation) - Measure the starting temperature of the reactants. - Mix the reactants in the polystyrene beaker - Cover with lid fitted with a thermometer - Monitor and record the lowest temperature.

Temperature INCREASES in exothermic reactions
Temperature DECREASES in endothermic reactio

Bond breaking- Endothermic
Bond making- Exothermic

Endothermic reaction examples	- Dissolving (most) salts - Some precipitation - Photosynthesis

Exothermic reaction – more energy given out making bonds than needed to break bonds
Endothermic reaction – more energy needed to break bonds than is given out when bonds made

Calculating energy changes from bond strengths (H)	The energy change in a reaction is the difference between the energy required to break the old bonds and the energy released by making the new ones. Add up the total strength of old bonds broken and subtract the total strength of new bonds made. You will be given the data to use A negative answer is exothermic.

Exothermic reaction examples	- Neutralisation - Displacement - Combustion - Some precipitation - Respiration