

Edexcel Chemistry A-level

Topic 9 - Kinetics I

Flashcards

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What is the equation used to calculate rate?



What is the equation used to calculate rate?

Rate = change in concentration / time



What is the unit for rate of reaction?



What is the unit for rate of reaction?

$\text{mol dm}^{-3}\text{s}^{-1}$



What must particles do in order to react?



What must particles do in order to react?

Collide with sufficient energy (activation energy) and the correct orientation



Do most collisions result in a reaction?



Do most collisions result in a reaction?

No



What are the factors that affect rate of reaction?



What are the factors that affect rate of reaction?

- Temperature
- Pressure
- Concentration
- Surface area
- Catalyst



What is the effect of increasing temperature on rate of reaction? why?



What is the effect of increasing temperature on rate of reaction and why?

Increasing temperature → increased rate of reaction

Much higher proportion of particles have energy greater than the activation energy → many more successful collisions per second → increased rate



What is the effect of increasing concentration/pressure on rate of reaction and why?



What is the effect of increasing concentration/pressure on rate of reaction and why?

Increased concentration/pressure → increased rate of reaction

There are more particles in a given volume → more frequent successful collisions → increased rate



What are the variables in an experiment that can be monitored to calculate the rate of reaction?



What are the variables in an experiment that can be monitored to calculate the rate of reaction?

- Concentration of reactant or product
- Gas volume of products
- Mass of substances formed



How to calculate rate from a concentration time graph?

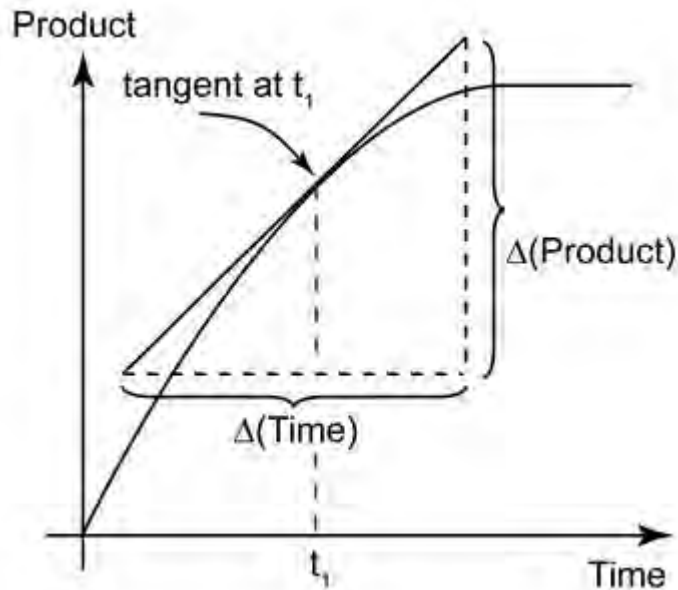


How to calculate rate from a concentration time graph?

Draw a tangent

Work out the gradient of the tangent using the equation

Gradient = change in y /
change in x



What is a catalyst?



What is a catalyst?

A substance which increases the rate of reaction but is not used up in the reaction



How do catalysts work and how do they increase the rate of reaction?



How do catalysts work and how do they increase the rate of reaction?

They provide an alternate reaction pathway (with a lower activation energy)

Due to lower activation energy, more particles have energy $>$ activation energy, so more frequent successful collisions, so increased reaction rate



What does homogeneous catalyst mean?



What does homogeneous catalyst mean?

A catalyst that is in the same phase as the reactants.

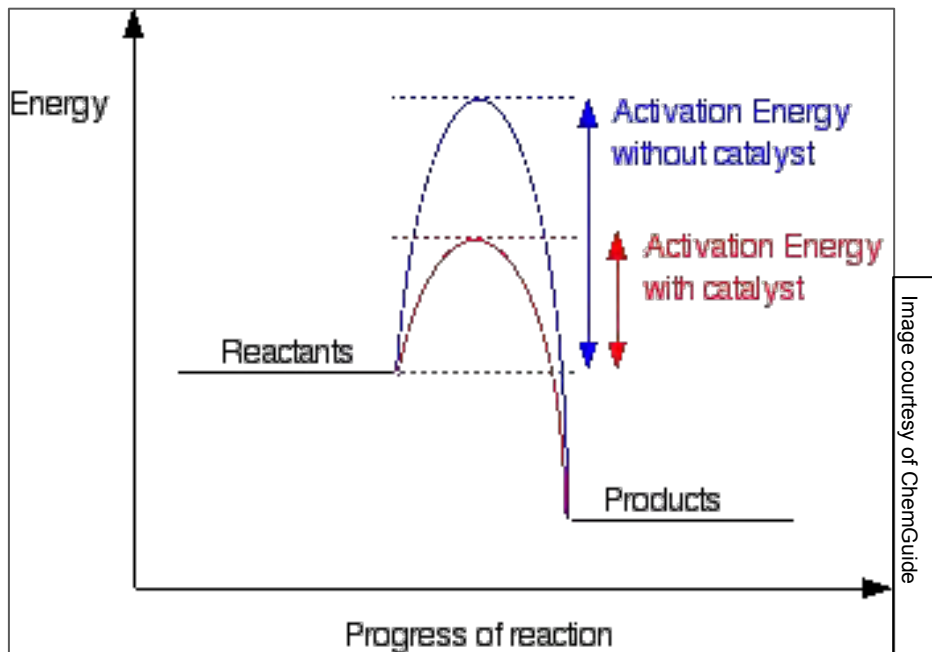
Eg. liquid catalyst mixed with liquid reactants



Draw an energy profile of a catalysed and uncatalysed reaction



Draw an energy profile of a catalysed and uncatalysed reaction



What does heterogeneous catalyst mean?



What does heterogeneous catalyst mean?

Catalyst used in the reaction is in different phase to the reactants

Eg. gaseous reactants passed over solid catalyst



What are the economic benefits of the use of catalysts in industrial reactions?



What are the economic benefits of the use of catalysts in industrial reactions?

Catalysed reactions can occur at lower temperature so less fuel needed therefore fewer emissions from fuels.

Catalysed reaction enables use of an alternative process with higher atom economy so fewer raw materials are needed and less waste products are produced



Define activation energy



Define activation energy

The minimum energy that particles must collide with for a reaction to occur



Name some important features of Boltzmann distribution (5)



Name some important features of Boltzmann distribution

- Area under the curve = total number of molecules
- Area under the curve does not change when conditions alter
- The curve starts at the origin
- Curve does not touch or cross the energy axis
- Only the molecules with energy greater than activation energy can react



What are the axis in a Boltzmann distribution?



What are the axis in a Boltzmann distribution?

X axis - energy

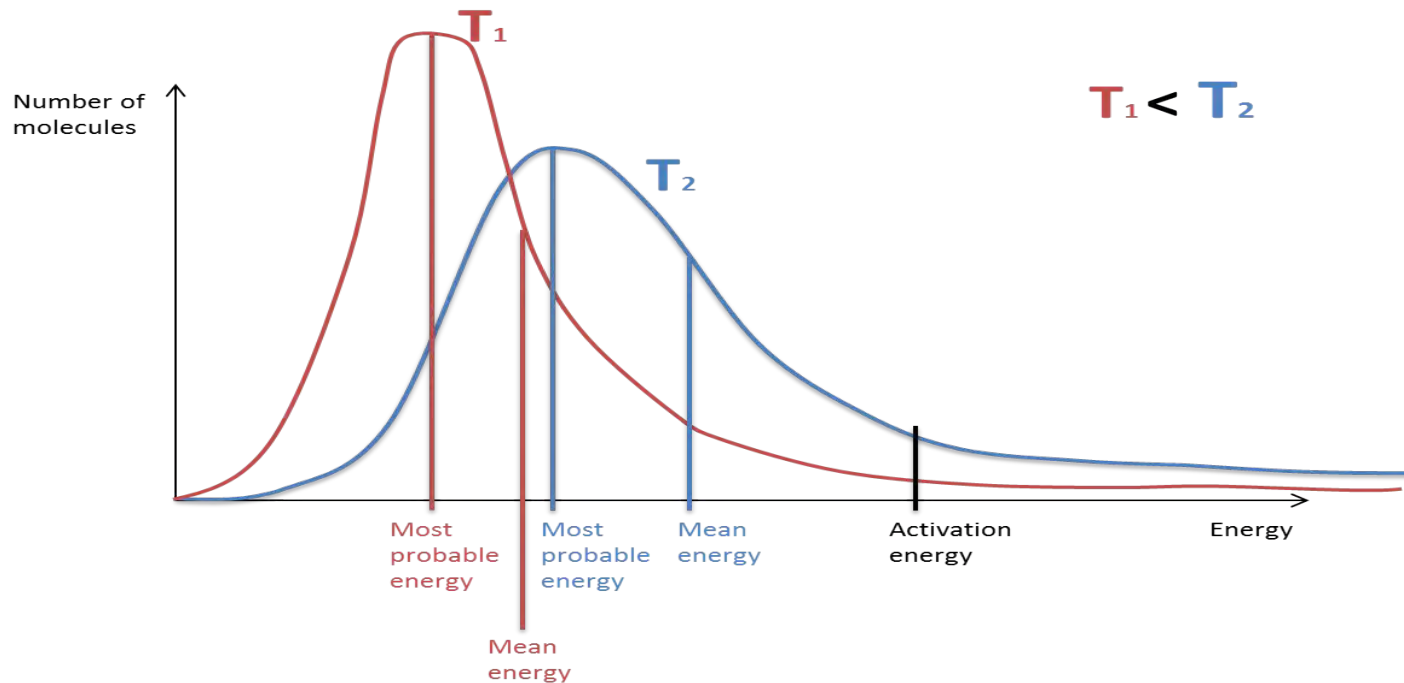
Y axis - number of molecules with a given energy



Draw a labelled Boltzmann Curve with labels of average energy, activation energy and most probable energy. Draw in a different colour the effect of increasing temperature



Draw a labelled Boltzmann Curve with labels of average energy, activation energy and most probable energy. Draw in a different colour the effect of increasing temperature



Draw a labelled Boltzmann
Curve showing the effect of
catalyst of rate of reaction



Draw a labelled Boltzmann Curve showing the effect of catalyst of rate of reaction

