WJEC (Eduqas) Chemistry A-level

Core Topic 2.3 - Rates of Reaction

Flashcards

What is collision theory?

What is collision theory?

For a chemical reaction to take place:

- Reactant particles must collide in the correct orientation.
- Reactant particles must have the activation energy.

Define activation energy

Define activation energy

The minimum amount of energy required for a reaction between two particles to take place.

Describe and explain the gradient of the curve on a rate of reaction graph

Describe and explain the gradient of the curve on a rate of reaction graph

Initially the gradient is very steep because the rate of reaction is fastest at the start (there are more reacting particles so more frequent successful collisions).

The gradient decreases over time as the reactants are used up.

The curve eventually levels off when the reaction is complete (one or all of the reactants have been completely used up).

How can you calculate rate of reaction?

How can you calculate rate of reaction?

$$\text{Rate of reaction} = \frac{\text{Amount of reactant used / product formed}}{\text{Time (s)}}$$

What units could be used for rate of reaction?

What units could be used for rate of reaction?

g/s

cm^3/s

mol/s

What conditions can be changed to increase the rate of a reaction?

What conditions can be changed to increase the rate of a reaction?

- Increase temperature
- Increase pressure
- Increase surface area of reactants
- Increase concentration of reactants

How does temperature affect the rate of reaction?

How does temperature affect the rate of reaction?

Increasing temperature increases the rate of reaction because the reactants have more energy so more particles have energy more than or equal to the activation energy so more collisions will produce successful reactions. Collisions also occur more frequently because the particles have more kinetic energy.

How does surface area affect the rate of reaction?

How does surface area affect the rate of reaction?

Increasing surface area increases the rate of reaction because more reacting particles are exposed so there are more frequent successful collisions.

How does concentration affect the rate of reaction?

How does concentration affect the rate of reaction?

Increasing concentration increases the rate of reaction because there are more reacting particles in the same volume. This means more frequent successful collisions occur.

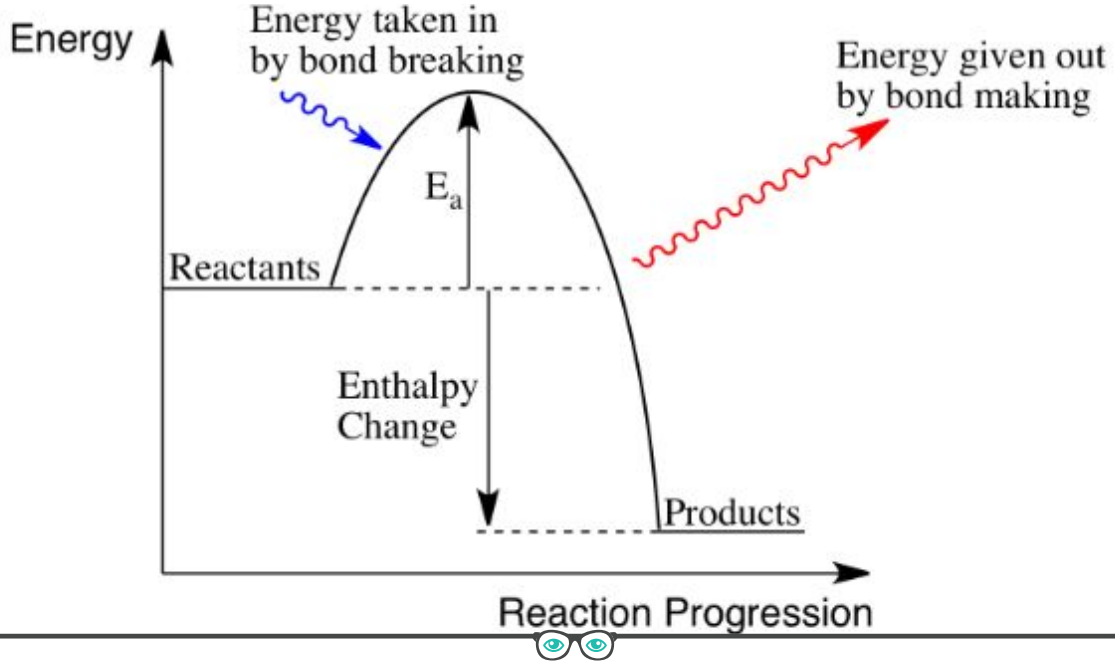
How does pressure affect the rate of a gaseous reaction?

How does pressure affect the rate of a gaseous reaction?

Increasing the pressure of a gaseous reaction increases the rate of reaction because there are more reacting particles in the same volume of gas (or the same number of reacting particles in a smaller volume) so there are more frequent successful collisions.

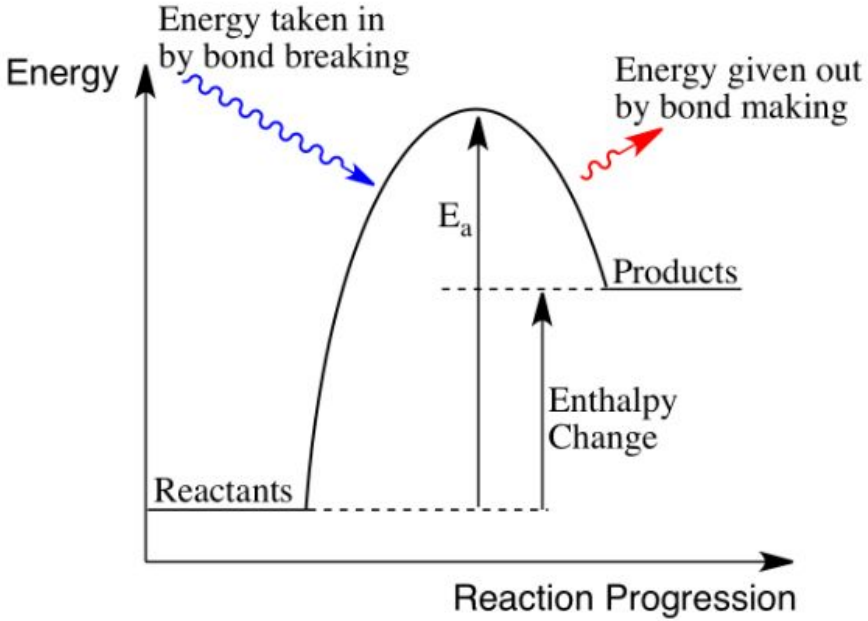
Draw a reaction profile diagram for an exothermic reaction, labeling activation energy

Draw a reaction profile diagram for an exothermic reaction, labeling activation energy



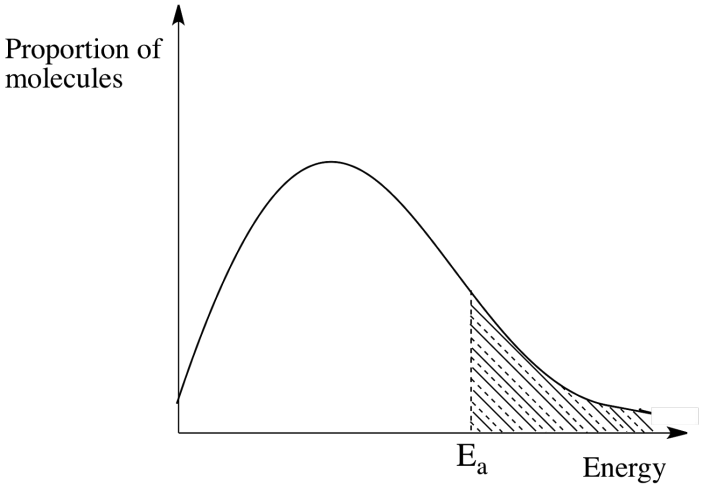
Draw a reaction profile diagram for an endothermic reaction, labeling activation energy

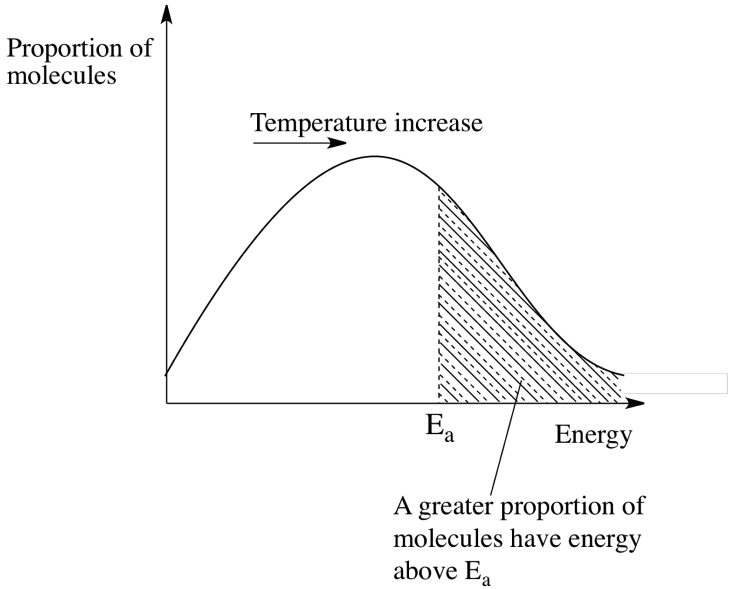
Draw a reaction profile diagram for an endothermic reaction, labeling activation energy



What does the Maxwell-Boltzmann distribution look like for a temperature increase?

What does the Maxwell-Boltzmann distribution look like for a temperature increase?





What can be added to speed up the rate of a reaction?

What can be added to speed up the rate of a reaction?

A catalyst

What is a catalyst?

What is a catalyst?

A substance which speeds up the rate of reaction without being chemically changed at the end.

How does a catalyst affect the rate of reaction?

How does a catalyst affect the rate of reaction?

A catalyst increases the rate of reaction because it provides an alternate reaction pathway with a lower activation energy. More particles have energy equal to or more than the activation energy so more frequent successful collisions will occur.

How can a catalyst be identified in a reaction?

How can a catalyst be identified in a reaction?

They are chemically unchanged so can be distinguished from the product. They are not involved in the reaction equation as they are not used up.

How can you measure the rate of reaction when a gas is given off?

How can you measure the rate of reaction when a gas is given off?

- Collect the gas produced in an upside down measuring cylinder in a trough of water or in a gas syringe to measure the volume of gas produced.
- Measure the amount of gas collected over regular time intervals.

How can you measure the rate of reaction when a precipitate is formed?

How can you measure the rate of reaction when a precipitate is formed?

Put a black cross below a beaker containing one reactant. Time how long it takes for the cross to disappear after the second reactant is added.

Why is using the precipitation method to investigate rate of a reaction not very accurate?

Why is using the precipitation method to investigate rate of a reaction not very accurate?

It's subjective so people are likely to disagree over the exact point at which the cross is no longer visible.

How can you measure rate of reaction using a mass balance?

How can you measure rate of reaction using a mass balance?

A mass balance can be used when a gas is produced, as this will cause the mass to decrease as the reaction proceeds. The experiment can be carried out on a mass balance and the rate of reaction can be calculated by recording the mass at regular time intervals.

A graph is plotted to show time and the amount of gas given off during a reaction. Describe the shape of the curve

A graph is plotted to show time and the amount of gas given off during a reaction. Describe the shape of the curve

- Initially the curve is very steep as the rate of reaction is relatively fast at the start.
- The curve becomes less steep as the reactants get used up because there are fewer successful collisions occurring.
- At the end, the graph is a flat line because all the reactants have been turned into products.

How do the concentrations of reactants and products change during a reaction?

How do the concentrations of reactants and products change during a reaction?

The concentrations of the products increase rapidly at the start then slows down before staying constant when the reaction is complete.

The concentrations of the reactants decrease as the reaction progresses. They decrease rapidly at the start then slow down before staying constant when one or all of the reactants have been used up.

Marble chips react with hydrochloric acid to produce calcium chloride, water and carbon dioxide. How could you calculate the rate of reaction?

Marble chips react with hydrochloric acid to produce calcium chloride, water and carbon dioxide. How could you calculate the rate of reaction?

Since gaseous carbon dioxide is released, the rate can be measured by using digital balance to measure the change in mass over a period of time or by using a gas syringe/ measuring cylinder to collect the gas and measure its volume at regular intervals.

Marble chips react with hydrochloric acid to produce calcium chloride, water and carbon dioxide. How could you increase the rate of this reaction?

Marble chips react with hydrochloric acid to produce calcium chloride, water and carbon dioxide. How could you increase the rate of this reaction?

- Increase the surface area of the marble chips by turning them into a powder.
- Increase concentration of acid.
- Increase temperature of the reaction.