

Kinetics

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Please note that these guides are a collation of my personal notes, teachers' notes, chemistry books, and websites such as chemguide, chemsheets, chemwiki and wikipedia.

Factors Affecting Rate of Reaction

- Concentration
- Temperature
- Pressure
- Surface Area
- Catalysts

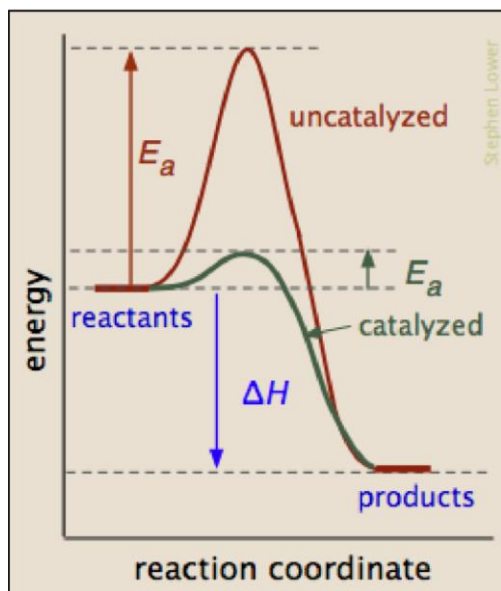
For a reaction to occur, particles need to collide with sufficient energy. When **concentration is increased**, there will be **more particles in a given volume**, resulting in more (successful) collisions. When **temperature is increased**, particles move **faster**, resulting in more (successful) collisions with **increased energy**.

Increasing pressure means **collision frequency increases** hence faster rate of reaction. **More surface area** means a **larger area is exposed to react** and hence faster rate of reaction. Finally, a **catalyst** increases the rate of reaction by **providing an alternative way** for the reaction to happen which has a **lower activation energy**.

Catalyst

A catalyst is a substance that speeds up a reaction but does not get chemically changed itself. Examples of catalysts – iron in the Haber process, vanadium (V) oxide in the Contact process and nickel in the hydrogenation of alkenes.

In an exothermic reaction:

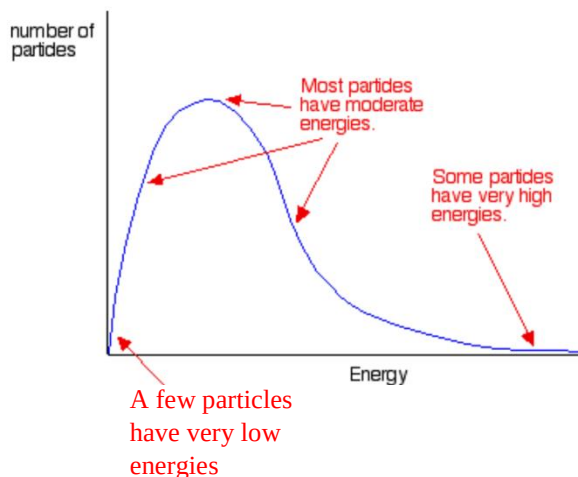


If this was an endothermic reaction, the only thing that would change in the enthalpy level diagram is the E_a , it would be smaller, other than that nothing will change.

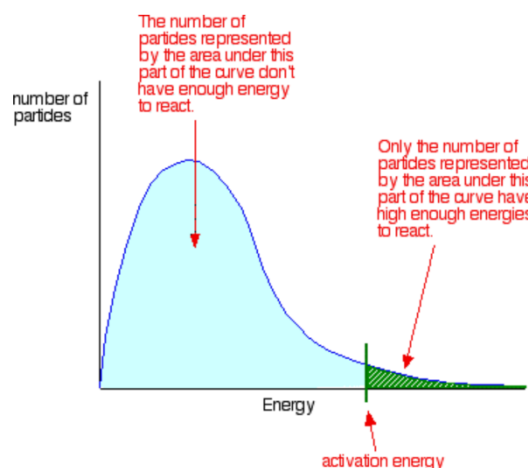
E_a is the minimum energy required to get the reaction going.

Maxwell-Boltzmann Distribution

In any system, the particles present will have a very wide range of energies. For gases, this can be shown on a graph called the Maxwell-Boltzmann Distribution which is a plot of the number of particles having each particular energy.

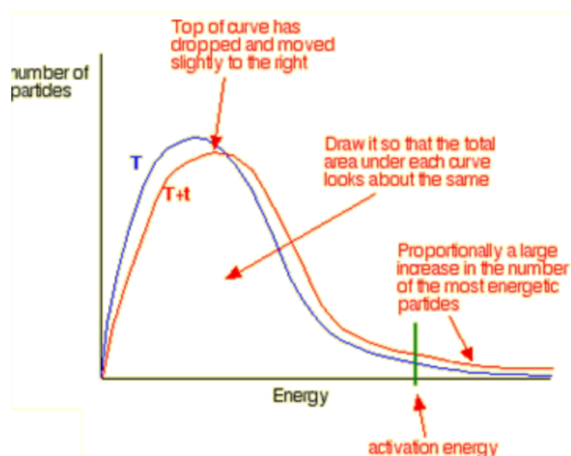


Notice that the large majority of the particles don't have enough energy to react when they collide. To enable them to react we either have to change the shape of the curve, or move the activation energy further to the left.



Increasing the temperature:

- Increases the average kinetic energy of the gas (slight shift to the right)
- Increases the number of particles whose energy exceeds the activation energy
- Hence changes the shape of the curve



Adding a catalyst:

- Provide alternative pathway with a lower the activation energy
- E_a on M-B curve is shifted left
- No effect on distribution curve itself

