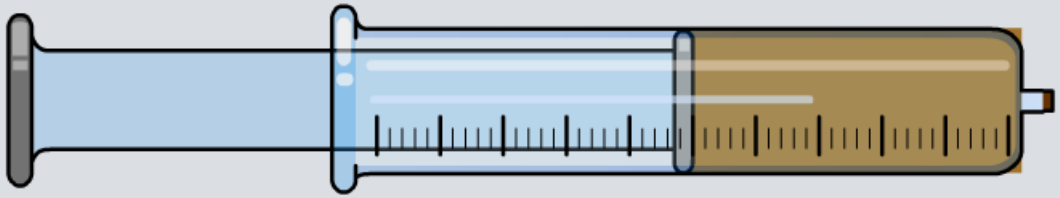
Le Chatelier's Principle



What is Le Chatelier's principle?

Le Chatelier's principle states that:

If a factor affecting the position of an equilibrium is altered, the position of the equilibrium shifts to oppose the effect of the change.

Le Chatelier's principle is used to determine what effect a change will have on a mixture at equilibrium.

However, it does not explain why that change will occur, or what the extent of the change will be.

The effect of temperature on equilibrium

The reaction of A and B results in the formation of C and D. The reaction of C and D results in the formation of A and B.

Click "**play**" to see how the equilibrium is affected by changes in temperature.

$$A + B \rightleftharpoons C + D$$

Temperature and the equilibrium position

Changing the temperature can affect the equilibrium position. This can be seen most clearly for reactions where the products and reactants have different colours.

Click "**start**" to find out more.

$$[Co(H_2O)_6]^{2+} + 4Cl^- \underset{-\Delta H}{\overset{+\Delta H}{\rightleftharpoons}} [CoCl_4]^{2-} + 6H_2O$$

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Concentration and equilibrium

If the concentration of one of the substances involved in a dynamic equilibrium changes, the equilibrium will shift to oppose that change.

$$A + B \rightleftharpoons C + D$$

If the concentration of A is **increased**, the equilibrium will shift to the **right** to **reduce** the amount of A. Increasing the concentration of any substance causes the equilibrium to shift to use up more of that substance.

If the concentration of A is **reduced**, the equilibrium will shift to the **left** to **increase** the amount of A. Decreasing the concentration of any substance causes the equilibrium to shift to make more of that substance.

Concentration and the equilibrium position

Changing the concentration of reactants affects the equilibrium position. This can be seen by carrying out the reaction shown here.

Click "**start**" to find out more.

$$BiOCl_{(s)} + 2HCl_{(aq)} \rightleftharpoons BiCl_{3(aq)} + H_2O_{(l)}$$

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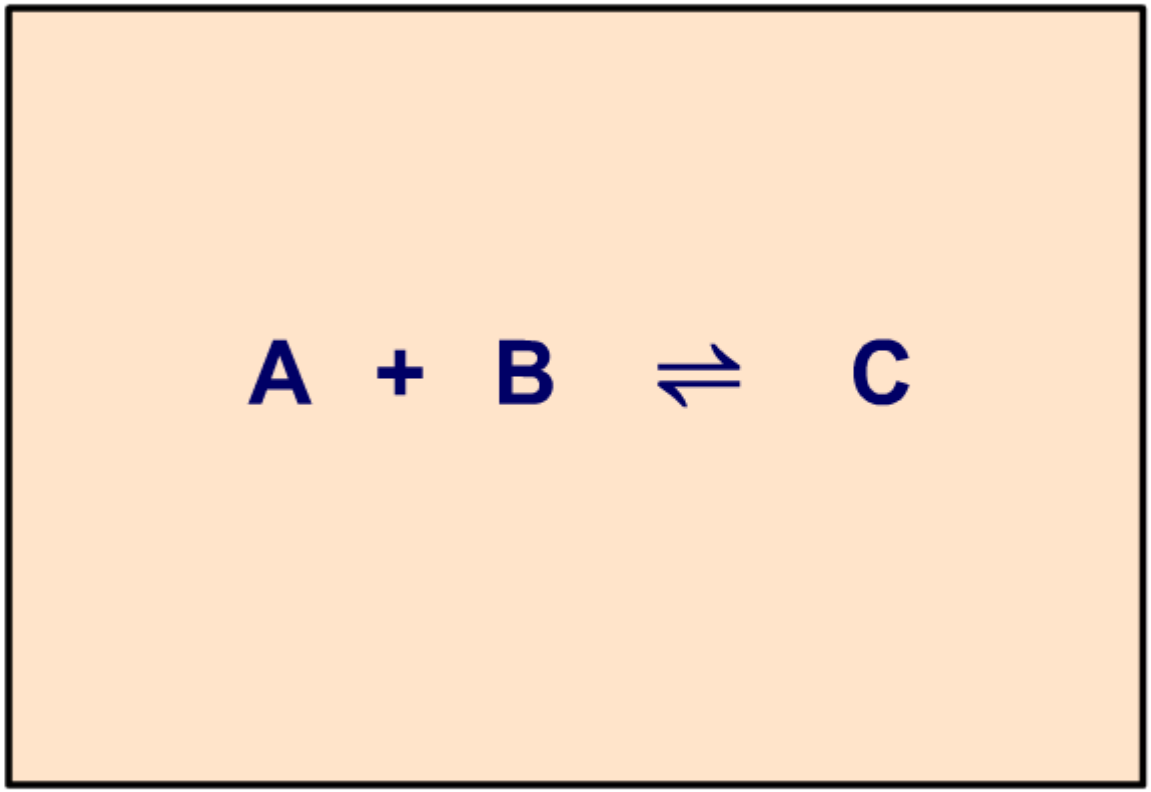
The effect of pressure on equilibrium

The reaction of A and B results in the formation of C. C decomposes to form A and B.

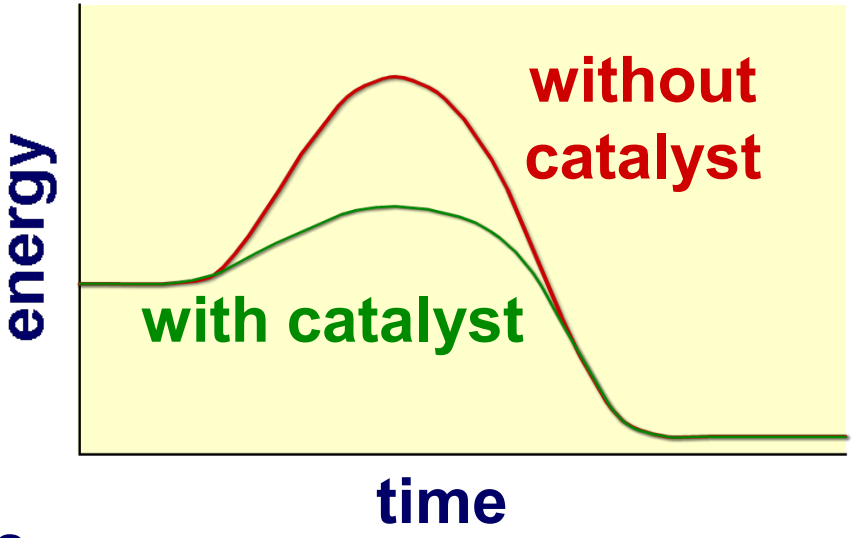
Click "**play**" to see how the equilibrium is affected by changes in pressure.



Pressure and equilibrium

Catalysts and equilibrium

A catalyst is a substance that speeds up the rate of reaction by providing an alternative reaction pathway of lower energy.



When added to a reversible reaction, a catalyst increases the rate of both the forward and reverse reactions equally. This has two results:

- there is **no change** to the **position** of the equilibrium
- equilibrium is reached **faster**.

The use of catalysts is particularly important in industry.

Le Chatelier's principle: summary

How do different variables affect the equilibrium position?

Various factors can affect the equilibrium position for reversible reactions.

Click "**start**" to see how much you know.

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