



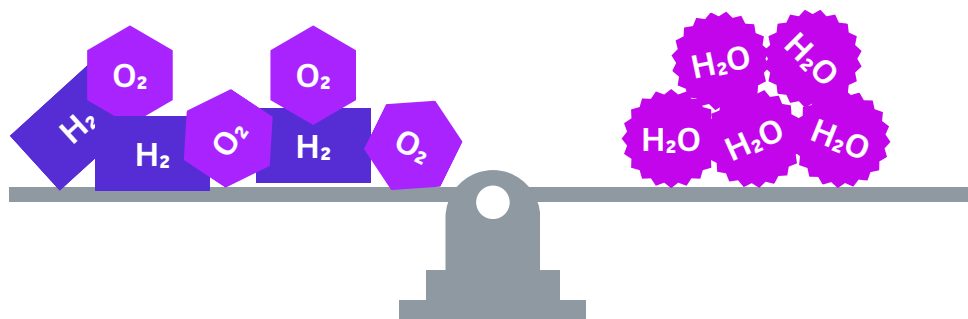
Le Chatelier's Principle

- State Le Chatelier's principle
- Use Le Chatelier's principle to predict changes in the equilibrium position when:
 - The concentration of reactants or products is changed
 - The temperature of the reaction vessel is increased/decreased'
 - The pressure of the system is increased/decreased

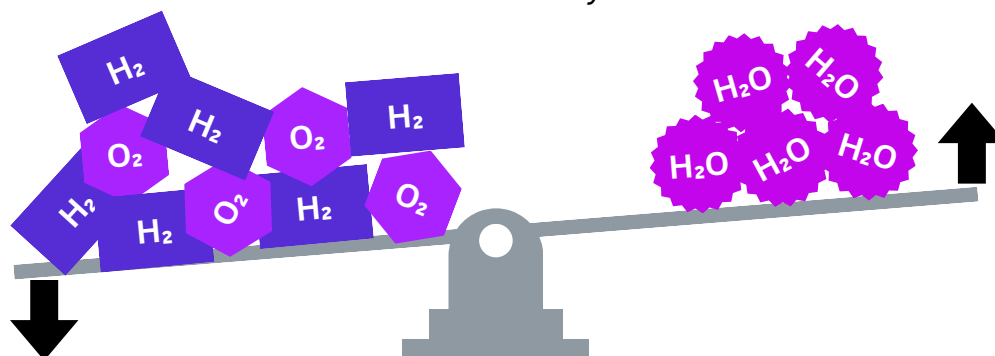
UNDERSTANDING LE CHATELIER'S PRINCIPLE

When the equilibrium in a closed system is disturbed the system will reinstate a new equilibrium by favouring the reaction that opposes the disturbance. Consider the following reaction taking place in a closed system that has reaches equilibrium:
 $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$

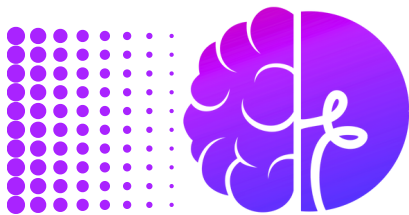
You can think of the system in equilibrium as a balanced seesaw



If we increase the amount of reactants in the system the seesaw would be offset



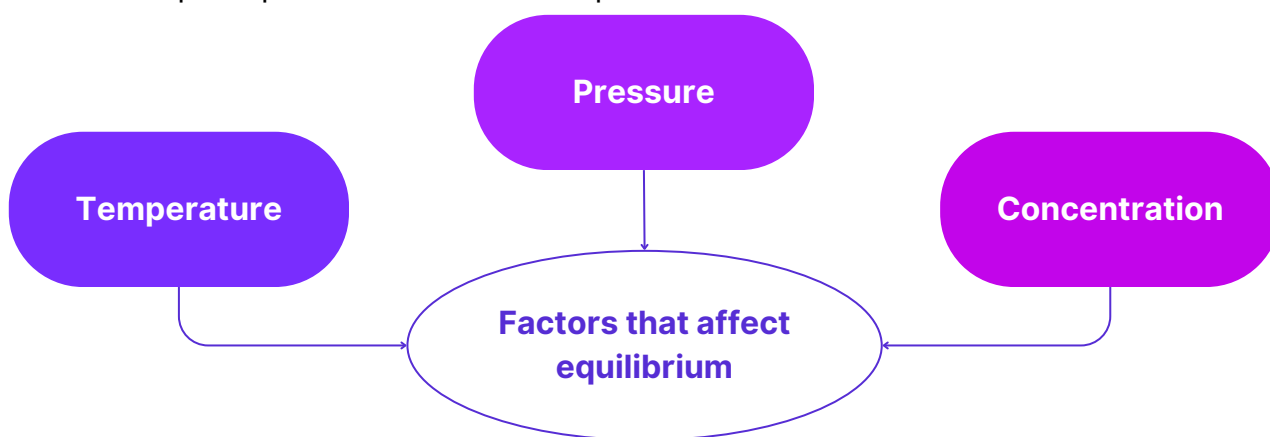
The system will no longer be in a state of equilibrium. According to Le Chatelier's principle the system will attempt to reinstate balance. To do so it will favour the reaction that reduces the excess reactants i.e. opposes the change.



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Equilibrium is established at a specific temperature, pressure and concentration. Any changes to these factors results in a shift in the equilibrium position. Le Chatelier's principle allows us to make predictions about the direction of the shift.



USING LE CHATELIER'S PRINCIPLE

TEMPERATURE

TEMPERATURE IS INCREASED

the reaction that reduces temperature is favoured

ENDOTHERMIC REACTION
(absorbed energy/heat)

TEMPERATURE IS DECREASED

the reaction that increases temperature is favoured

EXOTHERMIC REACTION
(releases energy)

PRESSURE

PRESSURE IS INCREASED

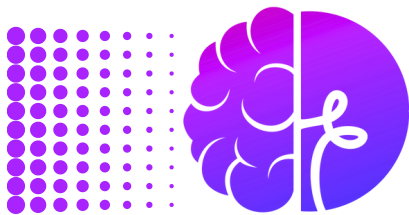
the reaction that produces the fewest number of moles is favoured

When a fewer number of moles are present in the vessel the pressure is decreased

PRESSURE IS DECREASED

the reaction that produces the greater number of moles is favoured

When a greater number of moles are present in the vessel the pressure is increased



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CONCENTRATION

CONCENTRATION IS

INCREASED

the reaction that uses up the substance that is increased, is favoured

Concentration of REACTANTS are increased

Forward reaction is favoured as it uses up the excess reactants

Concentration of PRODUCTS are increased

Reverse reaction is favoured to use up the excess products

CONCENTRATION IS DECREASED

the reaction that produces more of the substance that is decreased, is favoured

Concentration of REACTANTS are decreased

Reverse reaction is favoured in order to form more reactants

Concentration of PRODUCTS are decreased

Forward reaction is favoured to increase the concentration of products