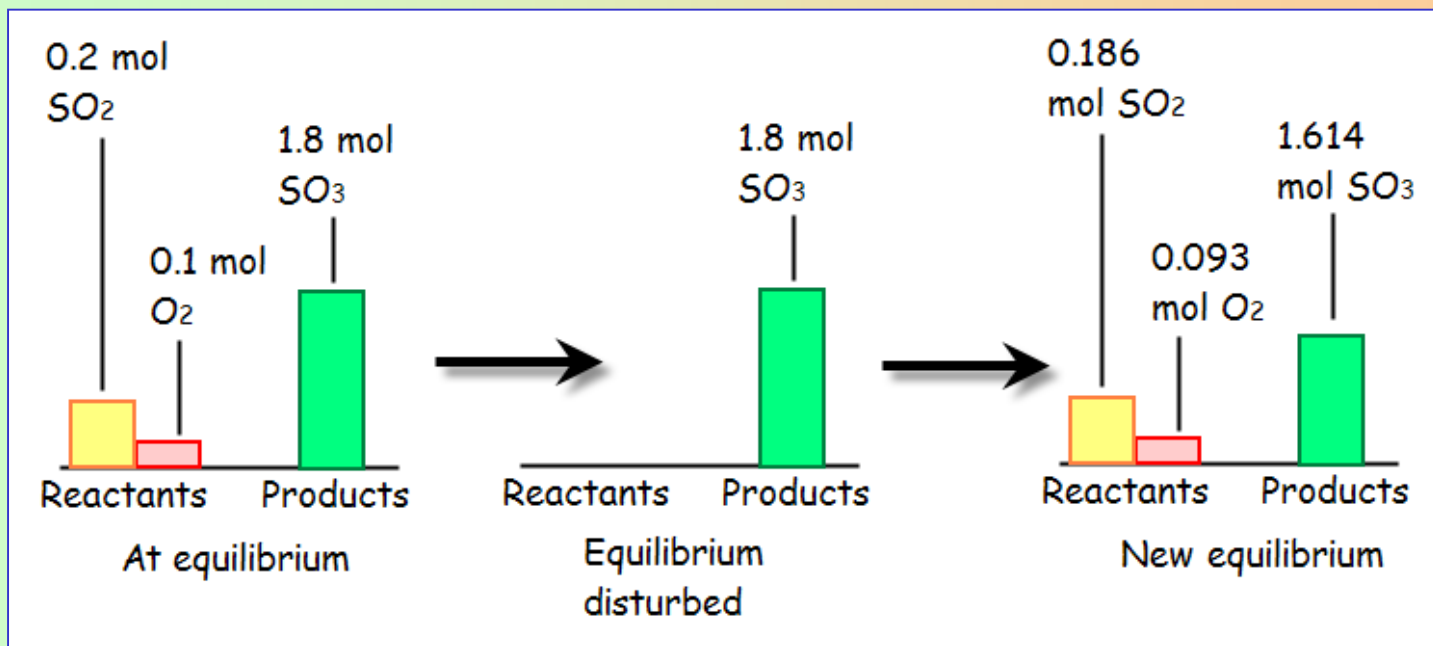


# Le Châtelier's Principle

**Introduction.** Equilibrium disturbed by changing concentrations.

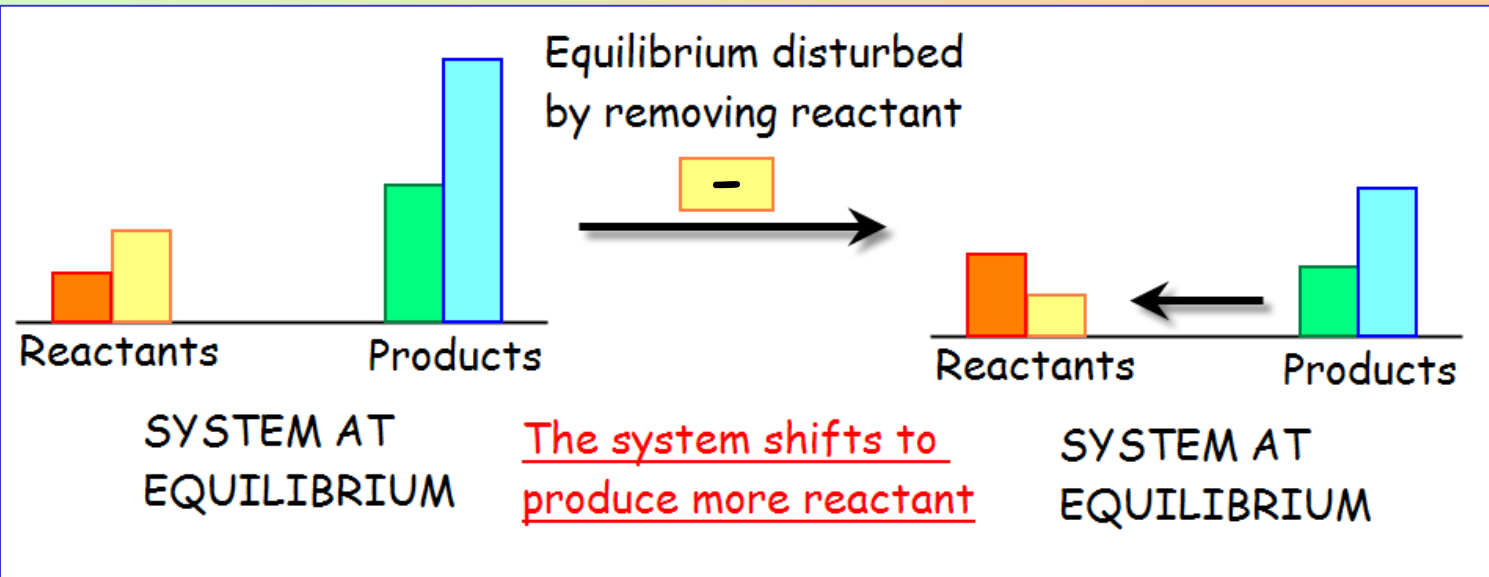
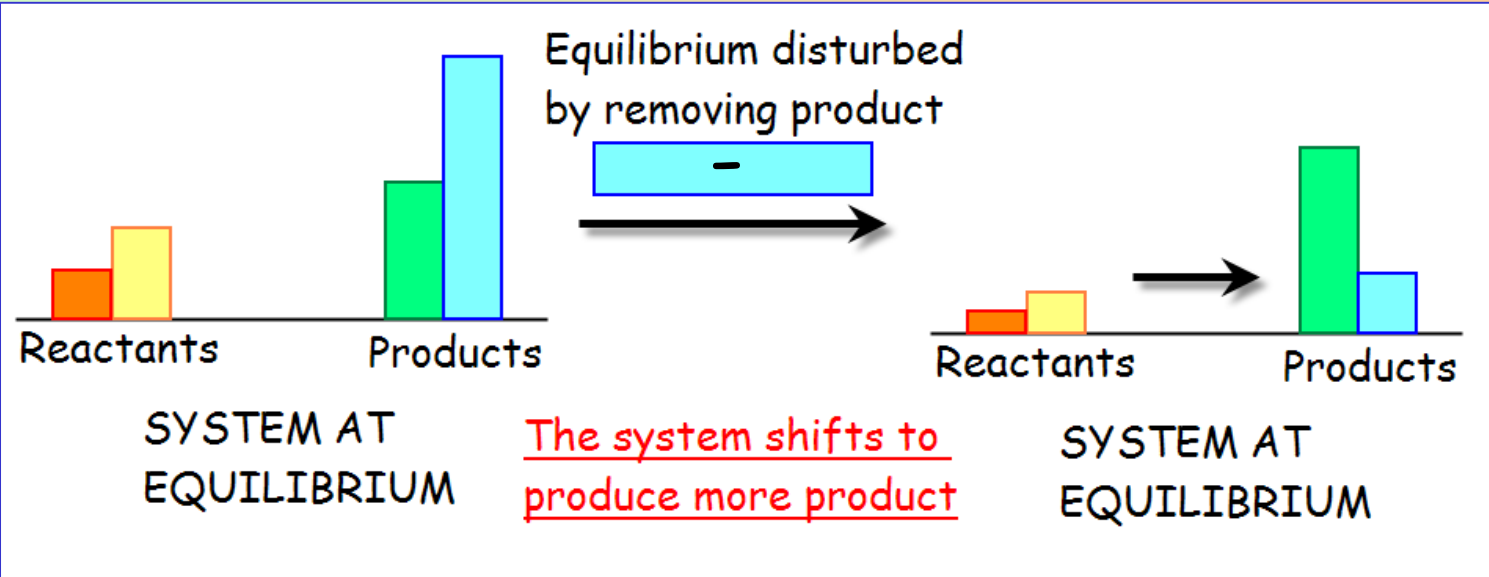
If you disturb a reaction at equilibrium, the reaction will return to equilibrium by shifting in such direction as to undo the disturbance.

The reaction will shift in the direction to produce more of what has been removed. When something is added, the reaction will shift in a direction to remove it.



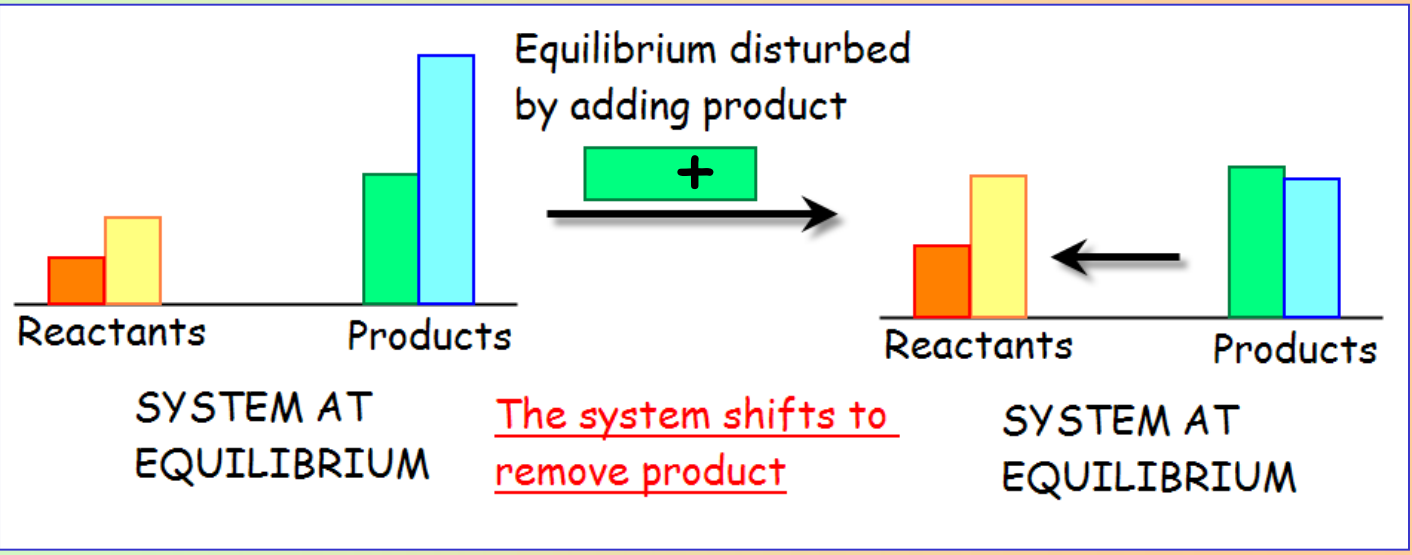
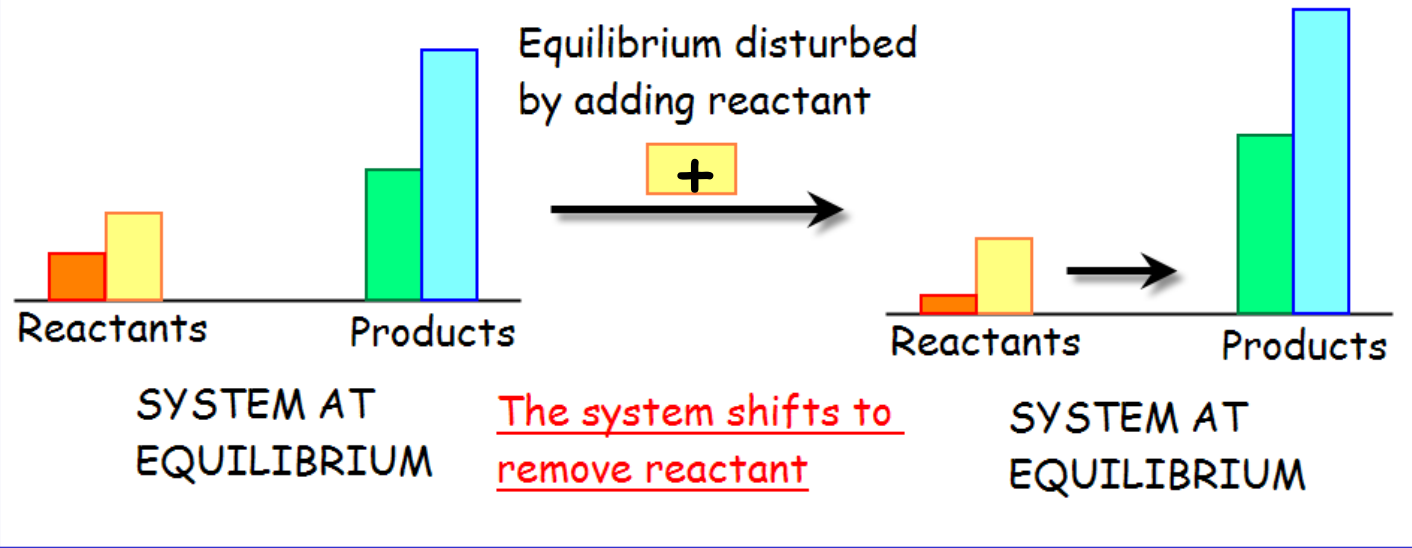
# Le Châtelier's Principle

Equilibrium disturbed by removing matter



# Le Châtelier's Principle

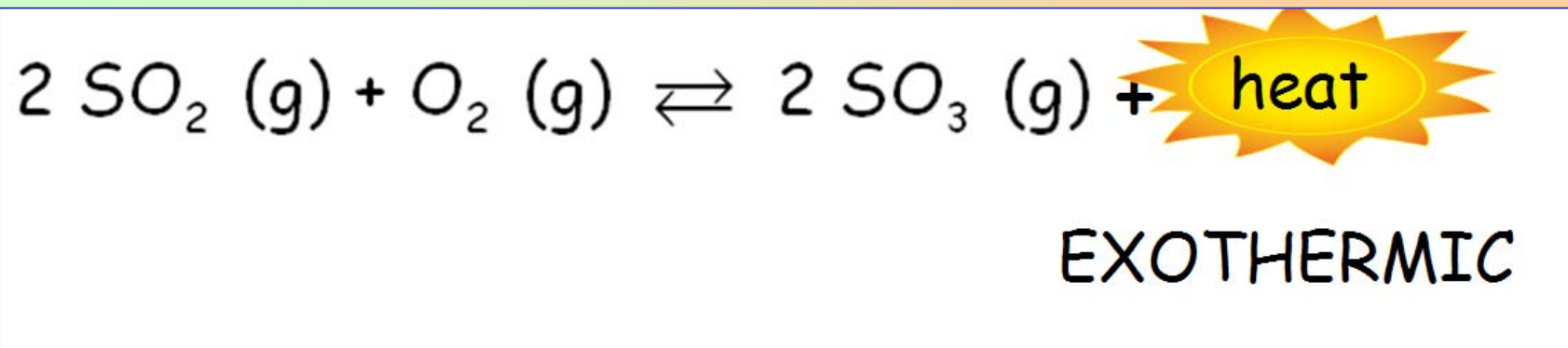
Equilibrium disturbed by adding matter



# Le Châtelier's Principle

## Changes in temperature.

Another way to disturb a reaction is to change its temperature by adding or removing heat from it.



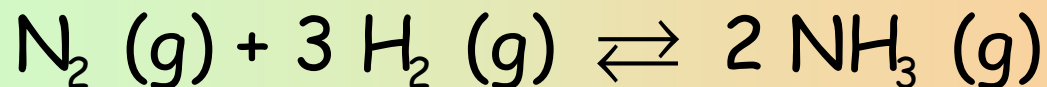
In this example, if equilibrium is disturbed by heating the system, the system will shift to eliminate the excess of heat: the system will form more reactants

# Le Châtelier's Principle

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## Changes in pressure.

Another way to disturb a reaction is to change its pressure by changing the volume of the container. In that case, the system will oppose the change in pressure by changing the number of moles



In this example, if equilibrium is disturbed by increasing the pressure of the system, the system will shift to eliminate the excess of pressure: the system will decrease the pressure by decreasing the number of molecules; that is, the reaction will shift to the side of the products

## Catalysts.

A catalyst increases the rate at which equilibrium is achieved, but it does not change the composition of the equilibrium mixture.