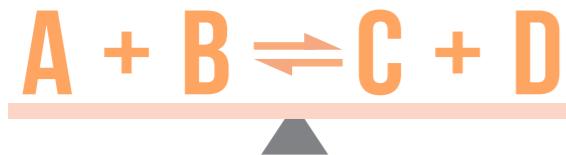


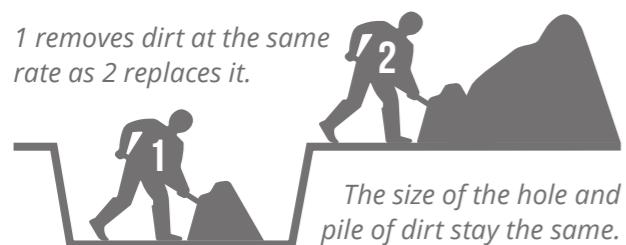
EQUILIBRIUM AND LE CHÂTELIER'S PRINCIPLE

Reversible chemical reactions reach equilibrium in closed systems (no substances added or lost). Here's how different conditions affect that equilibrium.

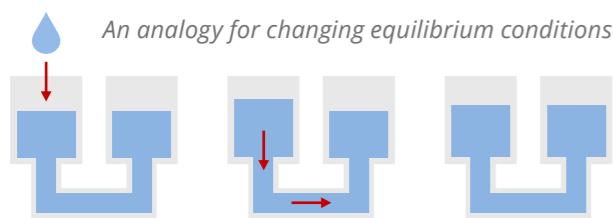
EQUILIBRIUM



In reversible reactions products of the reaction can react to produce the original reactants. At dynamic equilibrium the rates of the forwards and backwards reactions are equal; the concentrations of the reactants and products don't change.



LE CHÂTELIER'S PRINCIPLE



Le Châtelier's principle states that when a change is made to the conditions of a dynamic equilibrium, the system moves to counteract the change, causing changes in quantities of reactants and products.

CONCENTRATION

REACTANT CONCENTRATION INCREASED



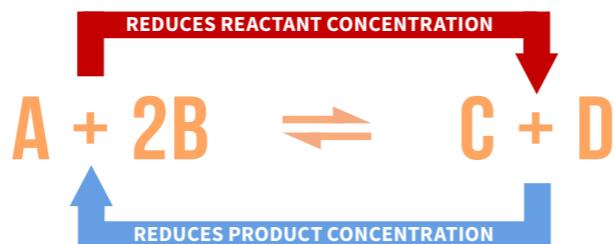
The equilibrium position shifts to reduce the reactant concentration.



REACTION FORMING PRODUCTS FAVoured



In the example below the new equilibrium mixture will contain a higher concentration of C and D.



PRODUCT CONCENTRATION INCREASED



The equilibrium position shifts to reduce the product concentration.



REACTION FORMING REACTANTS FAVoured



In the example above the new equilibrium mixture will contain a higher concentration of A and B.

TEMPERATURE

TEMPERATURE INCREASED



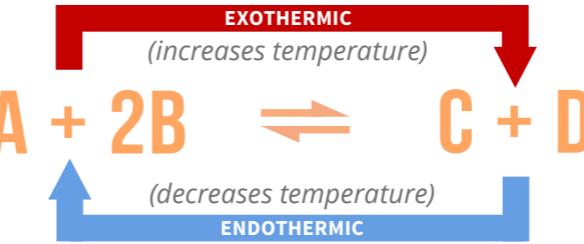
The equilibrium position shifts to reduce the temperature.



THE ENDOTHERMIC REACTION WILL BE FAVoured



In the example below the new equilibrium mixture will contain more A and B, and less C and D.



TEMPERATURE DECREASED



The equilibrium position shifts to increase the temperature.



THE EXOTHERMIC REACTION WILL BE FAVoured



In the example above the new equilibrium mixture will contain more C and D, and less A and B.

PRESSURE

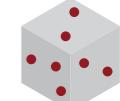
PRESSURE INCREASED



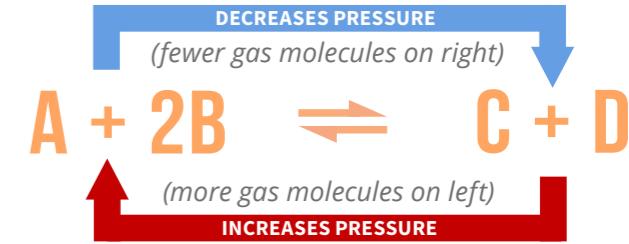
The equilibrium position shifts to reduce the pressure.



SIDE OF REACTION WITH FEWER GAS MOLECULES FAVoured



In the example below the new equilibrium mixture will contain more C and D, and less A and B.



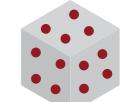
PRESSURE DECREASED



The equilibrium position shifts to increase the pressure.



SIDE OF REACTION WITH MORE GAS MOLECULES FAVoured



In the example above the new equilibrium mixture will contain more A and B, and less C and D.

Note: using a catalyst increases the rate of both the forwards and backwards reactions but doesn't change the equilibrium position.

