Rate Of Reaction

Rate	- ΔReactants / Δt = Δproducts / Δt
Reactants are *negative*	
Collision Theory	states that particles must collide for a reaction to occur, and must have the right orientation and enough energy
Activated Complex	a complex that exists very briefly in the time between the breaking down of reactants and forming of products
Activation Energy	the minimum amount of energy needed to form the activated complex
Exothermic Reaction	a reaction that releases energy; the products end up having less energy that the reactants
Endothermic reaction	a reaction that must absorb enough energy to overcome the energy barrier; the products have more energy at the end
Factors that affect the rate	catalysts - the nature of the substances - Concentration - Surface Area - Temperature

Factors Affecting Equilibrium

Characteristics of equilibrium	1- fixed ratio, 2- closed system, 3-fixed temp, 4-dynamic equilibrium
Le Chatelier's Principle	a change in one variable that describes a system produces a shift in the position of the equilibrium, countering the change
Effects of Changing Concentration:	higher reactant concentration = reaction shifts to the right, and vice versa
Effects of Changing Temperature	adding heat to and exothermic reaction = more reactants; adding heat to an endothermic reaction = more products

Factors Affecting Equilibrium (cont)

Effects of Changing Pressure and Volume	Higher pressure + lower volume = lower number of moles; lower pressure + higher volume = more moles
if the number of moles are equal on both sides, pressure and volume will have no effect	

Rate Law

Rate Law	$R = k [A]^x [B]^y$
Order of the reaction	x+y
Rate Constant (k)	is only affected by temp
Rate Constant Units	s^{-1} , L/mol.s , $L^2/mol^2.s$
A and B are the molar concentrations of reactants; the rate is directly proportional to the concentrations	
the coefficients are the exponents	

Reversible Reactions and Equilibrium

Complete Reaction	when reactants change to products (→)
Reversible reaction	can go both ways (⇆)
Equilibrium	when the rate of the forward reaction equals the rate of the backwards one
Chemical Equilibrium Law	states that at a certain temperature, the ratio of the reactants and products can remain constant
for aA + bB = cC +dD	
Chemical Equilibrium Law Formula	$K eq = [C]^c[D]^d / [A]^a[B]^b$
if K eq > 1, the products have a higher concentration, if K eq < 1 the reactants have a higher concentration	
Homogeneous Equilibrium	when the reactants and products are in the same state of matter
Heterogeneous Equilibrium	when the reactants and products are in multiple states (the pure solid and liquids are removed from the equation)

Temperature and The Equilibrium Constant

K eq is directly proportional to temp id the equation is:	endothermic
K eq is inversely proportional to temp id the equation is:	exothermic
catalyst	increases the speed at which a reaction reaches equilibrium, but does not change the equilibrium
K sp = solubility product constant	
Q sp = ionic product	
if K sp > Q sp	unsaturated, no precipitate
if K sp = Q sp	saturated, no precipitate
if K sp < Q sp	saturated, precipitate is formed

Temperature and The Equilibrium Constant

K eq is directly proportional to temp id the equation is:	endothermic
K eq is inversely proportional to temp id the equation is:	exothermic