Chemistry Exam 2: Unit 7 Cheat Sheet

by Liliaeve via cheatography.com/216606/cs/47374/

Conditions that Drive a Chemical Reaction

Concentration

increase (reactants) - increase number of collisions - increase reaction rate

Temperature

increase temperature - increase the energy of each molecule - increase collision and further successful collisions - increase reaction rate

Catalysts

- substance that speeds up the rate of reaction by lowering the activation energy (lower E_a - faster reaction)
- recovered unchanged in a reaction
- does not appear in the product

Uncatalyzed reaction	**higher** E_a - **slower** reaction
Catalyzed reaction	**lower** E_a - **faster** reaction

Chemical Equilibrium

chemical reactions are **often reversible**

Ex.

- reactants create products (**forward** reaction - moving to the **right**)
- products can also form reactants (**reverse** reaction - moving to the **left**)

Equilibrium

reversible reactions reach **equilibrium**

- rate of the **forward** reaction = rate of the **reverse** reaction

Equilibrium Constant (K)

- characteristic value for a given reaction at a given temperature
- concentration is key = number of moles in a given volume

Calculating K

calculate K for the reaction between the general reactants A_2 and B_2. The concentrations mol/L = Molar (M) at equilibrium are as follows:

$(A_2) = 0.25$ M

$(B_2) = 0.25$ M

$(AB) = 0.50$ M

$A_2 = B_2 \rightarrow 2AB$

$K = (AB)^2 / (A_2) \times (B_2) = (0.50)^2 / (0.25) \times (0.25) = (0.50) \times (0.50) / 0.0625 = 0.25 / 0.0625 =$ **4.0**

Chemical Reaction Kinetics

Chemical reactions occur when molecules collide

Requirements:

- the molecules have to come close enough to interact
- have to have the proper orientation when they collide
- the molecules colliding have to have sufficient energy, since the kinetic energy from a moving molecule is used to break bond

most collisions do NOT result in a chemical reaction

The transition state in a chemical reactants occur **before** formation of the products

- once adequate reaction connections are met a reaction will occur
- reactions occur in steps. Often partial bonds between the molecules, and in the process creating a transition state
- transition state is higher in energy due to repulsive forces of electrons between all the three atoms

Steps:

Reactants

Transition state

Products

Energy Diagrams

illustrates energy changes

- the height of the energy barrier indicates the **rate** of reaction (E_a)

Activation energy (E_a)

- minimum amount of energy needed for a reaction to occur

High = SLOW (few molecules can transition)

Low = FAST (lots of molecules can transition)

Exothermic Reaction

the average energy of the reactants is **higher** than that of the products, indicating that energy has been released in the reaction

Endothermic Reaction

the average energy of the reactants is **less** than that of the products, indicating that energy has been absorbed in the reaction