

CHEMISTRY CONTENT FACTS

The following is a list of facts related to the course of Chemistry. A deep foundation of factual knowledge is important; however, students need to understand facts and ideas in the context of the conceptual framework. This list is not intended to provide a comprehensive review for State and National Assessments. Its purpose is to provide a highlight of the factual material covered in Chemistry. This list is not all inclusive, be sure to check Nevada State Standards and your district syllabi.

Kinetics and Equilibrium

- **Heat of reaction (ΔH)** - the difference between the potential energy of the products and the reactants
- **Exothermic reactions** release energy, (ΔH) < 0, products formed are MORE stable compounds than the reactants
- **Endothermic reactions** absorb energy, (ΔH) > 0, products formed are LESS stable compounds than the reactants
- **Factors effecting the reactions rate**
 - **Catalyst** - speeds up the reaction by reducing the activation energy needed for the reaction. A catalyst does NOT effect the heat of reaction or the potential energy of the products or the reactants
 - **Increasing the concentration of one of the reactants** usually increases the rate
 - **Increase in temperature** gives more effective collisions and increases the rate
 - **Increase in surface area** of solids increases the reaction rate
- **Entropy (S)**- the randomness of a system. If $\Delta S > 0$ then there is an increase in entropy or Randomness and if $\Delta S < 0$ then there is a decrease
- Order of increasing entropy: solids \rightarrow liquids \rightarrow gases
- **Gibb's equation** $\Delta G = \Delta H - T \Delta S$ states whether or not a reaction occurs spontaneously or not. If $\Delta G < 0$ the reaction will occur spontaneously and if $\Delta G > 0$ the reaction is non-spontaneous. When $\Delta G = 0$ the system is at equilibrium
- $$K_{eq} = \frac{[C]^c [D]^d}{[A]^a [B]^b} \quad aA (g) + bB (g) \leftrightarrow cC (g) + dD (g)$$
- When K_{eq} is large that means that the reaction favors the products
- When K_{eq} is small that means that the reaction favors the reactants.
- Remember that the coefficients in front of the compounds become the exponents in the equilibrium constant equation for all (g) and (aq) substances
- Effects of stresses on systems at equilibrium (Le Chatelier's Law)
 - Increasing concentrations of reactant(s) shifts system to produce more products (right)
 - Increasing concentrations of product(s) shifts system to produce more reactants (left)

- Decreasing concentrations of reactants shifts system to the left
 - Decreasing concentrations of products shifts system to the right
 - Increasing temperature favors endothermic reaction
 - Decreasing temperature favors exothermic reactions
 - Increasing pressure favors side with fewer moles of gas
 - Decreasing pressure favors side with more moles of gas
 - Adding or removing solid has no effect
 - Adding or removing catalyst has no net effect
- Solubility product equation - K_{sp} = Dissociated ions ONLY [Ions are charged particles; +/-]
 - When K_{sp} is large that means the substance is soluble
 - When K_{sp} is small that means that the substance has low solubility
 - **Ionization constant for acids**- same as equilibrium constant but you use K_a instead
 - When K_a is large that means that the reaction favors the ionization. This is a strong ACID
 - When K_a is small that means that the reaction favors the non dissociated part of the equation. This is a weak ACID

