Unit II Learning Log: Dynamic Equilibrium

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| **Learning Intentions** | **Practice** | **Evidence** |
| B1: Explain the concept of chemical equilibrium with reference to reacting systems.* Describe the reversible nature of most chemical reactions and how it can be represented on a PE diagram.
* Describe the dynamic nature of chemical equilibrium.
* Relate the changes in rates of the forward and reverse reactions to the changing concentrations of the reactants and products as equilibrium is established.
* Describe chemical equilibrium as a closed system at constant temperature: whose macroscopic properties are constant, where the forward and reverse rates are equal, that can be achieved from either direction, and where the concentrations of reactants and products are constant.
* Infer that a system not at equilibrium will tend to move toward a position of equilibrium.
 | II. 1 and 2#1 – 13 |  |
| B2: Predict, with reference to entropy and enthalpy, whether reacting systems will reach equilibrium.* Explain the significant of enthalpy and entropy.
* Determine entropy and enthalpy changes from a chemical equation (qualitatively).
* Predict the results when entropy factors: both favour the products, both favour the reactants, or oppose one another.
 | II. 3#14 – 16 | Quiz #1 |
| B3: Apply Le Chatelier’s principle to the shifting of equilibrium.* Explain the term shift as it applies to equilibria.
* Describe shifts resulting from the following: temperature change, concentration change, volume change of gaseous systems.
* Explain equilibrium shifts using the concepts of reaction kinetics.
* Identify the effect of a catalyst on dynamic equilibrium.
 | II. 4#17 – 28Problem Sets #2 to 5 | Quiz #2Inquiry Lab: Equilibrium |
| B4: Apply the concept of equilibrium to a commercial or industrial process.* Describe the Haber process for the production of ammonia (NH3)
 | II. 5#30 |  |

Mid Unit Test (includes learning outcomes B1 – B4)

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| B5: Draw conclusions from the equilibrium constant expression.* Gather and interpret data on the concentration of reactants and products of a system at equilibrium.
* Write the expression for the equilibrium constant when given the equation for either a homogeneous or heterogeneous equilibrium system.
* Explain why certain terms (ex/ pure solids and liquids) are not included in the equilibrium constant expression.
* Relate the equilibrium position to the value of Keq and vice versa.
* Predict the effect (or lack of effect) on the value of Keq of changes in the following factors: temperature, pressure, concentration, surface area, and catalyst.
 | II. 6 – 7#31 – 46 |  |
| B6: Perform calculations to evaluate the changes in the value of Keq and in concentrations of substances within an equilibrium system.* Perform calculations involving the value of Keq and the equilibrium concentration of all species.
* Perform calculations involving the value of Keq, the initial concentrations of all species, and one equilibrium concentration.
* Perform calculations involving the equilibrium concentrations of all species, the value of Keq, and the initial concentrations.
* Determine whether a system is at equilibrium, and if not, in which direction it will shift to reach equilibrium when given a set of concentrations for reactants and products.
 | II. 8#47 – 65Problem Set #7Problem Set #8Problem Set #10 | Quiz #3 |

End of Unit Test (includes all learning outcomes)