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 – 28  Problem Sets #2 to 5 | Quiz #2  Inquiry 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 – 65  Problem Set #7  Problem Set #8  Problem Set #10 | Quiz #3 |

End of Unit Test (includes all learning outcomes)