Review List (AP Chem) Name ____________________________
Chap 14- Chemical Equilibrium Period __________ Date ____________

- **Chapter 14 Review Problems:**
  - Multiple Choice Review WKS
  - Textbook Review WKS
  - In Study Guide (optional): pg. 286-288 #6, 7, 12, 14, 18, 19; pg. 296-299 #4 (K_f only), 11, 13, 16, 17 (K_p only)

** Underlined questions should be done b/c these types of questions were not in text book review.

**Topics:**
1) Concept of Equilibrium: rate of forward rxn = rate of reverse, understanding plots of concentration vs. time and rate vs. time, writing $K_C$ and $K_P$ expressions:

   \[ K_C = \frac{[C]^c[D]^d}{[A]^a[B]^b}; K_p = \frac{P_C^cP_D^d}{P_A^aP_B^b} \]

2) Basic calculations using $K_C$ and $K_P$ expressions. (Know that pure solids and liquids are not written in equilibrium constant expressions.)

3) Some rules about equilibrium constants:
   - Use PV = nRT to calculate P or M from the other to determine $K_P$ or $K_C$
   - $K$ of a forward reaction is equal to the reciprocal of the $K$ ($K^{-1}$) of its reverse reaction
   - Multiplying a reaction by a factor $n$ raises $K$ to the same power ($K' = K^n$)
   - $K$ of overall rxn (step 1 + step 2 + ⋯ + step n) = $K_1 \times K_2 \times \cdots \times K_n$

4) Predicting the direction a reaction will proceed by calculating reaction quotient $Q$. $Q$ has the same form as $K$ but uses initial rather than equilibrium conditions.

   \[ Q_C = \frac{[C]^c_0[D]^d_0}{[A]^a_0[B]^b_0}; Q_P = \frac{(P_C)_0^c(P_D)_0^d}{(P_A)_0^a(P_B)_0^b} \]

   a) If $Q = K$ the system is at equilibrium
   b) If $Q < K$, [Reactants] is too large and $rate_{forward} > rate_{reverse}$ so the system proceeds to the right
   c) If $Q > K$, [Products] is too large and $rate_{reverse} > rate_{forward}$, so the system proceeds to the left

5) Using “ICE” to calculate initial concentrations, equilibrium concentrations, or equilibrium constants. (There will be no use of the quadratic equation—either you will have an expression that is a perfect square and you can take the root of both sides or you will be able to use the 5% rule.)

6) Le Châtelier’s Principle: Know how a system will return to equilibrium when a stressor is added (change in a concentration, change in volume or pressure when reaction involves gases, change in temperature, and addition of a catalyst).

   a) Temperature is the only parameter that changes $K$ (we’ll see how in Chapter 18),
      i) Treating $\Delta H_{rxn}$ as a product or reactant we say that increasing T favors the endothermic direction.
      ii) Kinetically, increasing temperature increases $k$ for the endothermic direction of a reversible reaction faster than the exothermic direction (since $E_a$ for the endothermic reaction is larger), so the equilibrium constant becomes larger for an endothermic reaction and smaller for an exothermic one, which is endothermic in the reverse direction).
   b) Increasing the partial pressure of a gaseous reactant or product favors the direction that produces fewer moles of gas. Changing the partial pressure of a gas not involved in the reaction has no effect unless the volume of the container also changes (assuming constant T).