Ksp and Review Name: _____ Per. ____

1. Calculate the Ksp for $AlPO_4$ if a saturated solution has a concentration of $9.9 \times 10^{-11}$.
   $Ksp=[Al^{3+}][PO_4^{3-}]$, so then $Ksp=x^2$
   $Ksp=(9.9 \times 10^{-11})^2$
   $Ksp= 9.80 \times 10^{-21}$
2. Calculate the $[I^-]$ if the Ksp of $PbI_2$ is $9.8 \times 10^{-9}$.
   $PbI_2 \leftrightarrow Pb^{2+} + 2I^-$
   $Ksp=[Pb^{2+}][I^-]^2$, so then $Ksp=4x^3$ because it is a 1 to 2 ratio
   $9.8 \times 10^{-9} = 4x^3$ , so then divide by 4 to get $x^3$
   $2.45 \times 10^{-9} = x^3$, so then to get x by itself find the cubed root
   0.00135M = x, but we had 2 of the $I^-$ ions we need to multiply by 2
   [I-]= 2(0.00135) = 0.00270M
3. Write the equilibrium constant expressions for the following:
   a. $NCl_3\ (g) + Cl_2\ (g) \leftrightarrow NCl_5\ (g)$
      $Keq = \frac{[NCl_5]}{[NCl_3][Cl_2]}$
   b. $4HCl\ (aq) + O_2\ (g) \rightleftarrows 2\ Cl_2\ (g) + 2\ H_2O\ (l)$
      $Keq= \frac{[Cl_2]^2}{[HCl]^4[Cl_2]}$
4. When a reaction reaches equilibrium, the rate of the forward reaction is _equal_ the rate of the reverse reaction. (more, less, equal)
5. When a reaction reaches equilibrium, the amounts of the reactants and products are ___constant__. (more, less, constant)
6. When Keq is ___greater_____ than 1, products are favored at equilibrium.
7. When Keq is ___less_____ than 1, reactants are favored at equilibrium.
8. State Le Chatelier's Principle.
   When a stress is applied to a system at equilibrium, the system shifts to relieve the stress.
9. What are 3 types of stress that can be applied to a system at equilibrium?
   1. Concentration
   2. Temperature
   3. Volume/Pressure
10. When the following stresses are applied to the equilibrium system below, determine if the system will shift left, shift right, or have no change **and** describe if the [reactants] and [products] increase or decrease.

    **Heat + $N_2$ (g) + $O_2$ (g) ↔ 2 NO (g)**

    a. **Addition of NO: shifts left, so [reactants] increase and [products] decrease**
    b. **Removing $O_2$: shifts left, so [reactants] increase and [products] decrease**
    c. **Increasing the volume: no change because equal # moles (both sides have 2 moles)**
    d. **Heating the reaction: shifts right, so [reactants] decrease and [products] increase**
11. For the following slightly soluble salts, write the dissociation equation **and** Ksp expression.
    a. $ZnCO_3$
    Dissociation equation: $ZnCO_3 \leftrightarrow Zn^{2+} + CO_3^{2-}$
    Ksp Expression: $Ksp= [Zn^{2+}][CO_3^{2-}]$
    b. $Fe(OH)_3$
    Dissociation equation: $Fe(OH)_3 \leftrightarrow Fe^{3+} + 3OH^-$
    Ksp Expression: $Ksp=[Fe^{3+}][OH^-]^3$