Equilibrium Worksheet

1. For the following reactions at equilibrium:

$$H_2(g) + I_2(g) \rightleftharpoons 2\,HI(g)$$

1) Predict the shift in equilibrium when more HI(g) is added to the system.
Adding something on the product side of the reaction will cause equilibrium to shift to the reactant side. In other words, the reverse reaction will be favored, or you could say that equilibrium shifts to the left.

2) How will the concentration of I_2 change?
The concentration of I_2 will increase.

2. For the reaction below, predict the direction the equilibrium will shift given the following changes. Temperature and volume are held constant.

$$2\,NO2(g) + 7\,H_2(g) \rightleftharpoons 2\,NH_3(g) + 4\,H_2O(g)$$

Addition of ammonia (NH_3) Reverse reaction is favored to use up the additional ammonia

Removal of nitrogen dioxide (NO_2) Reverse reaction is favored to replace the lost nitrogen dioxide

Removal of water vapour Forward reaction is favored to replace the lost water vapor

Addition of hydrogen Forward reaction is favored to use up the additional hydrogen

3. $AgCl_{(s)} \rightleftharpoons Ag^+_{(aq)} + Cl^-_{(aq)}$

Predict the direction of equilibrium shift for:

a. Increase $[Ag^+]$ *left*
b. Decrease $[Ag^+]$ *right*
c. Increase $[Cl^-]$ *left*
d. Decrease $[Cl^-]$ *right*
e. Add solid $AgNO_3$ *left*
f. Add solid $NaNO_3$ *no shift*

4. Find the Q value for the initial reaction and the K value for the reaction at equilibrium.

$H_2(g) + I_2(g) \leftrightharpoons 2HI(g)$

	H_2	I_2	HI
Initial (M)	1.00	1.00	0
Change (M)	-0.666	-0.666	1.33
Equilibrium (M)	0.334	0.334	1.33

$K = \frac{[HI]^2}{[H_2][I_2]}$, Q and K use the same equation.

$Q = (0)^2/(1.00)(1.00) = 0$
$K = (1.33)^2/(0.334)(0.334) = 15.86$