

$$① K_c = \frac{[SO_2][Cl_2]}{[SO_2Cl_2]}$$

$$K_c = \frac{[CO_2]}{[H_2O_2]^2}$$

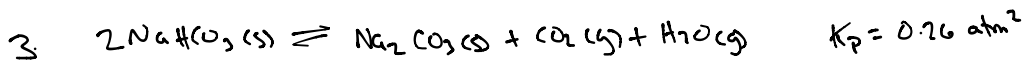
2. a. ↓ amount reactant → more reactants form

b. ↑ product → more reactants form

c. No change! solids are not part of the equilibrium

d. More mole of gas in the reactants. A decrease in volume equals to an increase in pressure of gas (Boyle's Law).  $P_{reactants}$  goes up more than  $P_{products}$

So... need to make more products



I	0	0
C	+x	+x
E	x	x

$$0.26 \text{ atm}^2 = x^2$$

$$x = 0.51 \text{ atm}$$

$$P_{CO_2} = 0.51 \text{ atm}$$

$$P_{H_2O} = 0.51 \text{ atm}$$

4.  $Q = \frac{P_{CH_4}}{P_{H_2}^2} = \frac{3 \text{ atm}}{(0.2 \text{ atm})^2} = 75 \text{ atm}^{-1}$

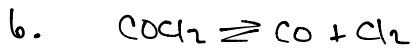
$K > Q$  Not at equilibrium  
need to make more products

5.  $K_c = \frac{[Ni(CO)_4]}{[CO]^4}$

$$5 \times 10^{-1} \text{ M}^{-3} = \frac{0.85 \text{ M}}{[CO]^4}$$

$$[CO]^4 = 1.75 \times 10^{-5} \text{ M}^4$$

$$[CO] = 0.0642 \text{ M}$$



I	0.5 M	0	0
C	-x	+x	+x
E	0.5-x	x	x

$$K_c = \frac{[CO][Cl_2]}{[COCl_2]} = \frac{(0.046 \text{ M})(0.046 \text{ M})}{0.454 \text{ M}}$$

$$K_c = 0.00466 \text{ M}$$

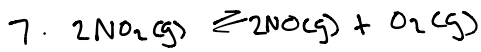
known:  $[CO]_{\text{equilibrium}} = 0.046 \text{ M}$

$$x = 0.046 \text{ M}$$

$$[CO] = 0.046$$

$$[Cl_2] = 0.046 \text{ M}$$

$$[COCl_2] = 0.5 - 0.046 = 0.454 \text{ M}$$



I	0.5 atm	0	0
C	-2x	+2x	+x
E	0.5 - 2x	2x	x

$$P_{\text{NO}_2} = 0.5 - 2(0.232) = 0.036 \text{ atm}$$

$$P_{\text{NO}} = 2(0.232) = 0.464 \text{ atm}$$

$$P_{\text{O}_2} = 0.232 \text{ atm}$$

$$P_{\text{tot}} = P_{\text{NO}_2} + P_{\text{NO}} + P_{\text{O}_2}$$

$$0.732 = 0.5 - 2x + 2x + x$$

$$0.732 = 0.5 + x$$

$$x = 0.232$$

$$K_p = \frac{(0.464 \text{ atm})^2 (0.232 \text{ atm})}{(0.036 \text{ atm})^2} = 38.52 \text{ atm}^2$$



I	0.433	0	0
C	-2x	+x	+x
E	0.433 - 2x	x	x

$$[\text{I}_2] = \frac{0.65 \text{ mol}}{1.5 \text{ L}} = 0.433 \text{ M}$$

$$K_c = 0.11 = \frac{x^2}{(0.433 - 2x)^2} = \frac{x^2}{(0.1875 - 0.866x - 0.866x + 4x^2)}$$

$$0.11(0.1875 - 1.732x + 4x^2) = x^2$$

$$0.02096 - 0.1905x + 0.44x^2 = x^2$$

$$0 = 0.56x^2 + 0.1905x - 0.02096$$

$$[\text{Cl}_2] = x = 0.0875 \text{ M}$$

$$[\text{I}_2] = x = 0.0875 \text{ M}$$

$$[\text{ICl}] = 0.433 - 2x = 0.258 \text{ M}$$

$$a = 0.56 \quad b = 0.1905 \quad c = -0.02096$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = 0.0875$$

$$x = -0.428 \quad \text{not possible!}$$