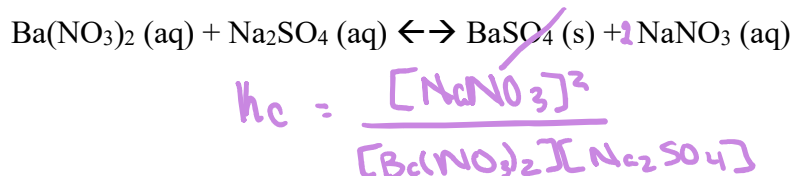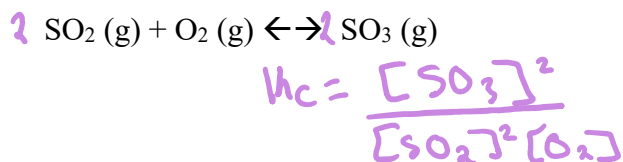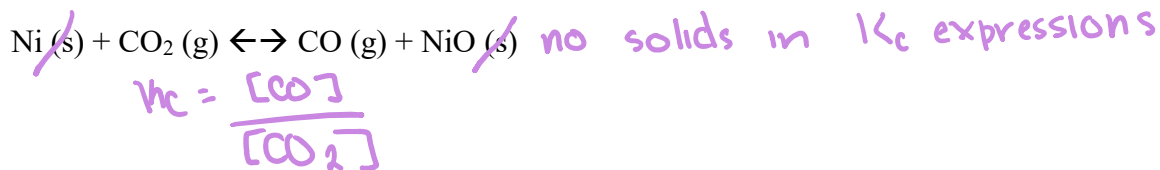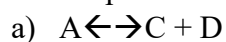# Equilibrium

1. Balance the following reactions if they are not balanced already and then write the equilibrium constant expression for each reaction:

Ni (s) + CO_2 (g) ⟷ CO (g) + NiO (s)   no solids in K_c expressions

$$K_c = \frac{[CO]}{[CO_2]}$$

2 SO_2 (g) + O_2 (g) ⟷ 2 SO_3 (g)

$$K_c = \frac{[SO_3]^2}{[SO_2]^2[O_2]}$$

$Ba(NO_3)_2$ (aq) + Na_2SO_4 (aq) ⟷ $BaSO_4$ (s) + 2 $NaNO_3$ (aq)

$$K_c = \frac{[NaNO_3]^2}{[Ba(NO_3)_2][Na_2SO_4]}$$

2. For the system, if we start with 0.100 mol/L of CO_2 and H_2, what are the concentrations of the reactants and products at equilibrium given that $K_{eq} = 0.64$ at 900K:

3. Calculate the equilibrium constant for the following hypothetical reactions. Assume that all components of the reactions are gaseous:
   a) A ⟷ C + D

At equilibrium, the concentration of A is 2.24 x 10^{-2} M and the concentrations of both C and D are 6.41 x 10^{-3} M:

b) A + B $\longleftrightarrow$ C + D
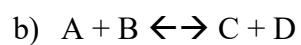
At equilibrium, the concentrations of both A and B are 3.23 x 10^{-5} M and the concentrations of both C and D are 1.27 x 10^{-2} M: