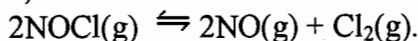
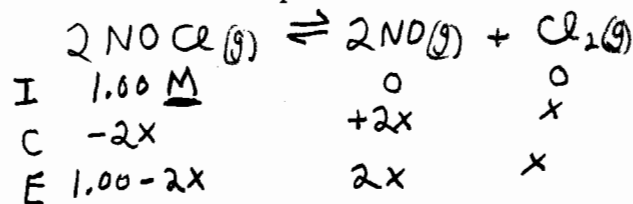


1. (5 Pts) 2.50 mol NOCl was placed in a 2.50 L reaction vessel at 400°C. After equilibrium was established, it was found that 28% of the NOCl had dissociated according to the equation



Calculate the equilibrium constant,  $K_c$ , for the reaction.



$$K_c = \frac{[\text{NO}]^2 [\text{Cl}_2]}{[\text{NOCl}]^2}$$

$$K_c = \frac{[0.28]^2 [0.14]}{[0.72]^2} = 0.021$$

$2x = \text{amount dissociated} = 0.28 \times 1.00 = 2x \quad x = 0.14 \text{ M}$

2. (4 Pts) Calculate  $K_p$  for the reaction  $2\text{NOCl}(g) \rightleftharpoons 2\text{NO}(g) + \text{Cl}_2(g)$  at 400°C if  $K_c$  at 400°C for this reaction is  $2.1 \times 10^{-2}$ .

$$K_p = K_c (RT)^{\Delta n}$$

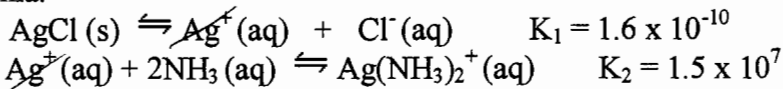
$$= (2.1 \times 10^{-2}) (0.0821 \times 673)^1 = 1.16 \approx 1.2$$

3. (4 Pts) Calculate  $K_c$  for the reaction  $2\text{HI}(g) \rightleftharpoons \text{H}_2(g) + \text{I}_2(g)$  given that the concentrations of each species at equilibrium are as follows:  $[\text{HI}] = 0.85 \text{ mol/L}$ ,  $[\text{I}_2] = 0.60 \text{ mol/L}$ ,  $[\text{H}_2] = 0.27 \text{ mol/L}$ .

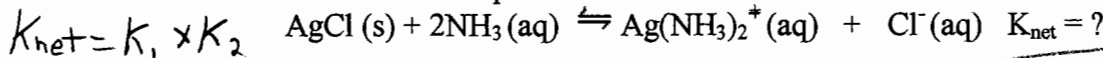
$$K_c = \frac{[\text{H}_2][\text{I}_2]}{[\text{HI}]^2}$$

$$K_c = \frac{[0.27][0.60]}{[0.85]^2} = 0.22$$

4. (4 Pts) The solubility of silver chloride can be increased by dissolving it in a solution containing ammonia.



What is the value of the equilibrium constant for the overall reaction?

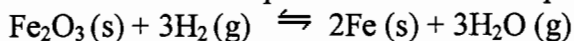


$$K_{\text{net}} = 1.6 \times 10^{-10} \times 1.5 \times 10^7 = 0.0024 = 2.4 \times 10^{-3}$$

5. (4 Pts) The equilibrium constant for the reaction  $\text{Ni}(s) + 4\text{CO}(g) \rightleftharpoons \text{Ni}(\text{CO})_4(g)$  is  $5.0 \times 10^4$  at 25°C. What is the equilibrium constant for the reaction  $\text{Ni}(\text{CO})_4(g) \rightleftharpoons \text{Ni}(s) + 4\text{CO}(g)$ ?

$$K_2 = \frac{1}{K_1} = \frac{1}{5.0 \times 10^4} = 2.0 \times 10^{-5}$$

6. (4 Pts) Which is the correct equilibrium constant expression for the following reaction?



$$K_c = \frac{[\text{H}_2\text{O}]^3}{[\text{H}_2]^3} \quad \text{solids are ignored}$$