18. No, it doesn't matter which direction the equilibrium position is reached. Both experiments will give the same equilibrium position since both experiments started with stoichiometric amounts of reactants or products.

20. a. \[ K_p = \frac{P_{NO}^2}{P_{N_2} \times P_{O_2}} \]
   b. \[ K_p = \frac{P_{NO}^2}{P_{N_2} \times P_{O_2}} \]
   c. \[ K_p = \frac{P_{NO}^2 \times P_{O_2}^3}{P_{N_2} \times P_{O_2}^3} \]
   d. \[ K_p = \frac{P_{NO}^2 \times P_{O_2}^3}{P_{N_2} \times P_{O_2}^3} \]

22. \[ H_2(g) + Br_2(g) \rightarrow 2 \text{HBr(g)} \]
   \[ K_p = \frac{P_{\text{HBr}}^2}{P_{H_2} \times P_{\text{Br}_2}} = 3.5 \times 10^4 \]
   a. \[ \text{HBr} = \frac{1}{2} \text{H}_2 + \frac{1}{2} \text{Br}_2 \]
   \[ K_p = \left( \frac{P_{\text{HBr}}}{P_{H_2} \times P_{\text{Br}_2}} \right)^{1/2} = \left( \frac{1}{2.9 \times 10^4} \right)^{1/2} = 5.3 \times 10^2 \]
   b. \[ 2 \text{HBr} = \text{H}_2 + \text{Br}_2 \]
   \[ K_p = \left( \frac{P_{\text{HBr}}}{P_{H_2} \times P_{\text{Br}_2}} \right) = \frac{1}{2.9 \times 10^4} = 2.9 \times 10^{-4} \]
   c. \[ \frac{1}{2} \text{H}_2 + \frac{1}{2} \text{Br}_2 = \text{HBr} \]
   \[ K_p = \frac{P_{\text{HBr}}}{P_{H_2}^{3/2} \times P_{\text{Br}_2}^{3/2}} = (K_p)^{3/2} = 150 \]

24. \[ K = \frac{[\text{Cl}_2]^2}{[\text{N}_2][\text{Cl}_2]^2} = \frac{(0.19)^2}{(1.4 \times 10^{-5})(4.3 \times 10^{-3})^2} = 3.2 \times 10^3 \]

26. \[ \left[ \text{N}_2 \right] = \frac{2.40 \times 10^{-4} \text{mol}}{2.00 \text{L}}; \left[ \text{H}_2 \right] = \frac{2.80 \times 10^{-4} \text{mol}}{2.00 \text{L}}; \left[ \text{O}_2 \right] = \frac{2.50 \times 10^{-4} \text{mol}}{2.00 \text{L}} \]
   \[ K = \frac{[\text{N}_2][\text{O}_2]}{[\text{H}_2][\text{O}_2]^2} \]
   \[ = \left( \frac{2.40 \times 10^{-4}}{2.00} \right) \left( \frac{2.50 \times 10^{-4}}{2.00} \right)^2 \]
   \[ = (1.00 \times 10^{-10})^2 (1.25 \times 10^{-5}) \approx 6.08 \times 10^4 \]

28. \[ K_p = \frac{P_{\text{N}_2} \times P_{\text{O}_2}}{P_{\text{H}_2} \times P_{\text{H}_2} \times P_{\text{O}_2}^3} = \frac{(0.1 \times 10^5)^2}{(0.85)(3.1 \times 10^3)^2} = 3.8 \times 10^9 \]

30. \[ K_p = K(\text{RT})^{\Delta n} \]
   \[ K = \frac{K_p}{(\text{RT})^{\Delta n}} \]
   \[ \Delta n = 2 - 3 = -1; \quad K = \frac{(0.08206 \times 1100)}{23} = 23 \]

32. a. \[ K_p = \frac{1}{P_{\text{NO}}^{1/2}} \]
   b. \[ K_p = \frac{1}{P_{\text{CO}_2}} \]
   c. \[ K_p = \frac{P_{\text{CO}} \times P_{\text{O}_2}}{P_{\text{H}_2} \times P_{\text{O}_2}} \]
   d. \[ K_p = \frac{P_{\text{CO}}^3 \times P_{\text{O}_2}}{P_{\text{H}_2} \times P_{\text{O}_2}} \]

34. \[ K_p = \frac{P_{\text{NO}}^4}{P_{\text{H}_2} \times P_{\text{O}_2}} \]
   \[ P_{\text{NO}} = P_{\text{H}_2} + P_{\text{O}_2} \]
   \[ 36.3 \text{torr} = 15.0 \text{torr} + P_{\text{NO}} \]
   \[ P_{\text{NO}} = 21.3 \text{torr} \]

Since 1 atm = 760 torr, then:
   \[ K_p = \frac{(21.3/760)^4}{(13.8/760)^4} = 4.07 \]

36. When \( \Delta n = 0 \), then \( K_p = K \). In Exercise 13.31, only reaction \( d \) has \( \Delta n = 0 \) so only reaction \( d \) has \( K_p = K \). In Exercise 13.32, none of the reactions have \( K_p = K \) since none of the reactions have \( \Delta n = 0 \).