# Day 4.4 Warm-Up

1.

$$2\ SO_3(g) \leftrightarrow 2\ SO_2(g) + O_2(g)$$

After the equilibrium represented above is established, some pure $O_2(g)$ is injected into the reaction vessel at constant temperature. After equilibrium is reestablished, which of the following has a lower value compared to its value at the original equilibrium?

a. $K_{eq}$ for the reaction.
b. The total pressure in the reaction vessel.
c. The amount of $SO_3(g)$ in the reaction vessel.
d. The amount of $O_2(g)$ in the reaction vessel.
e. The amount of $SO_2(g)$ in the reaction vessel.

2.

$$CuO(s) + H_2(g) \leftrightarrow Cu(s) + H_2O(g) \qquad \Delta H = -2.0\ kJ/mol$$

When the substances in the equation above are at equilibrium at pressure P and temperature T, the equilibrium can be shifted to favor the products by

a. Increasing the pressure by means of a moving piston at constant T
b. Increasing the pressure by adding an inert gas such as nitrogen
c. Decreasing the temperature
d. Allowing some gases to escape at constant P and T
e. Adding a catalyst

3.

$$PCl_3(g) + Cl_2(g) \leftrightarrow PCl_5(g) + \text{energy}$$

Some $PCl_3$ and $Cl_2$ are mixed in a container at 200°C and the system reaches equilibrium according to the equation above. Which of the following causes an increase in the number of moles of $PCl_5$ present at equilibrium?

I. Decreasing the volume of the container.
II. Raising the temperature.
III. Adding a mole of He gas at constant volume.

a. I only
b. II only
c. I and III only
d. II and III only
e. I, II, and III

4.

$$2\ NO_2(g) \leftrightarrow 2\ NO(g) + O_2(g)$$

For the reaction above, $K_c$ at a certain temperature is 0.50. Calculate Q and then predict the direction in which the system will shift to reach equilibrium in each of the following cases:

a. $[NO_2] = [NO] = [O_2] = 0.10$ M

b. 1.23 mol NO and 0.168 mol $O_2$ in a 10. L container

c. $[NO_2] = 2$ M, $[NO] = 3$ M, and $[O_2] = 1$ M

d. Complete an ICE chart for the conditions given in question c.