Chemistry CP

Name:

LeChatelier's Principle

Section:

For the following equilibrium systems, determine the direction in which the equilibrium will shift for the change indicated:

1. $[Cr(H_2O)_3Cl_3] + 3\ H_2O \leftrightarrow [Cr(H_2O)_6]^{3+} + 3\ Cl^-$ — add NaCl(aq)
   green violet

2. $2\ NO_2(g) \leftrightarrow N_2O_4(g) + 58.8\ kJ$ — increase the temperature

3. $[Zn(H_2O)_4]^{2+} + H_2O \leftrightarrow [Zn(H_2O)_3(OH)]^+ + H_30^+$ — add an acid (H_3O^+)
   colorless colorless

4. $Pb(s) + PbO_2(s) + 2\ H_2SO_4 \leftrightarrow 2\ PbSO_4 + 2\ H_2O$ — add $NaNO_3(aq)$

5. $H_2(g) + I_2(g) \leftrightarrow 2\ HI(g)$ — increase pressure

For the following equilibrium systems, indicate the direction of the shift by an arrow and the change in concentration (increase or decrease) of each component in the reaction with the given stresses:

6. $[Co(H_2O)_6]^{2+} + 4\ Cl^- \leftrightarrow [CoCl_4]^{2-} + 6\ H_2O$ — add HCl
   pink deep blue

7. $2\ NO_2(g) \leftrightarrow N_2O_4(g)$ — add NO_2
   brown colorless

8. $N_2(g) + 3\ H_2(g) \leftrightarrow 2\ NH_3\ (g)$ — remove NH_3

9. Consider the following reaction: $2\ HI(g) \leftrightarrow H_2(g) + I_2(g)$
   colorless colorless purple

   Upon heating these gases in a tube, the tube became more purple. Based on this observation, is the reaction endothermic or exothermic? Explain.

10. What effect does the presence of a catalyst have on the position of equilibrium for a reversible reaction? Why?