Spontaneity Worksheet **Name:** _____

For each of these processes, predict if Entropy increases or decreases.

1. $2\ H_{2(g)} + O_{2(g)} \Leftrightarrow 2\ H_2O_{(g)}$
2. $2\ SO_{3(g)} \Leftrightarrow 2\ SO_{2(g)} + O_{2(g)}$
3. $Ag^+_{(aq)} + Cl^-_{(aq)} \Leftrightarrow AgCl_{(s)}$
4. $Cl_{2(g)} \Leftrightarrow 2\ Cl_{(g)}$
5. $H_2O_{(l)} \Leftrightarrow H_2O_{(g)}$
6. $CaCO_{3(s)} + 180\ kJ \Leftrightarrow CaO_{(s)} + CO_{2(g)}$
7. $I_{2(s)} + 608\ kJ \Leftrightarrow I_{2(aq)}$
8. $4\ Fe_{(s)} + 3\ O_{2(g)} \Leftrightarrow 2\ Fe_2O_{3(s)} + 1570\ kJ$

Consider both Enthalpy and Entropy and determine if each reaction will
a) go to completion
b) not occur or
c) go to equilibrium

9. $H_2O_{(l)} \Leftrightarrow H_2O_{(g)}$ $\Delta H = 150\ kJ$
10. $CaCO_{3(s)} + 180\ kJ \Leftrightarrow CaO_{(s)} + CO_{2(g)}$
11. $I_{2(s)} \Leftrightarrow I_{2(aq)} + 608\ kJ$
12. $4Fe_{(s)} + 3O_{2(g)} \Leftrightarrow 2Fe_2O_{3(s)}$ $\Delta H = +1570\ kJ$
13. $Cl_{2(g)} \Leftrightarrow 2Cl_{(g)}$ $\Delta H = +26.8\ kJ$
14. $Ag^+_{(aq)} + Cl^-_{(aq)} \Leftrightarrow AgCl_{(s)} + 86.2\ kJ$
15. $H_2SO_{4(aq)} + Zn_{(s)} \Leftrightarrow ZnSO_{4(aq)} + H_{2(g)}$ $\Delta H = +207\ kJ$
16. 16. $NH_4NO_{3(s)} \Leftrightarrow NH_4^+{}_{(aq)} + NO_3^-{}_{(aq)}$ $\Delta H = -30\ kJ$
17. $N_{2(g)} + 3H_{2(g)} + 92\ kJ \Leftrightarrow 2NH_{3(g)}$
18. $H_2O_{(l)} + 150\ kJ \Leftrightarrow H_2O_{(g)}$
19. $Ca_{(s)} + H_2O_{(l)} \Leftrightarrow Ca(OH)_{2(aq)} + H_{2(g)}$ $\Delta H = +210\ kJ$
20. $C_2H_{2\ (g)} + 2\ Cl_{2\ (g)} \Leftrightarrow C_2H_2Cl_{4\ (l)} + 386\ kJ$