Name _____ Period _____

Qualitative Thermodynamic Change

Without performing specific calculations predict the sign of ΔH, ΔS, and ΔG for the following processes. Will they be positive or negative? Or could they be either?

1. This phase change at 298 Kelvin:

$$H_2O(l) \rightarrow H_2O(g)$$

ΔH= ΔS= ΔG=

2. This phase change at 374 Kelvin:

$$H_2O(l) \rightarrow H_2O(g)$$

ΔH= ΔS= ΔG=

3. This phase change at 298 Kelvin:

$$H_2O(l) \rightarrow H_2O(s)$$

ΔH= ΔS= ΔG=

4. This phase change at 298 Kelvin:

$$H_2O(s) \rightarrow H_2O(l)$$

ΔH= ΔS= ΔG=

5. This phase change at 298 Kelvin:

$$CO_2(s) \rightarrow CO_2(g)$$

ΔH= ΔS= ΔG=

6. This reaction is spontaneous:

$$CaO(s) + SO_2(g) \rightarrow CaSO_4(s)$$

ΔH= ΔS= ΔG=

7. This reaction is not spontaneous at 298 K:

$$MgCO_3(s) \rightarrow MgO(s) + CO_2(g)$$

ΔH= ΔS= ΔG=

8. This endothermic reaction:

$$CaO(s) + CO_2(g) \rightarrow CaCO_3(s)$$

ΔH= ΔS= ΔG=

9. This exothermic reaction:

$$2H_2O_2(l) \rightarrow 2H_2O(l) + O_2(g)$$

ΔH= ΔS= ΔG=

10. The following reaction is highly endothermic and very spontaneous:
$Ba(OH)_2 \cdot 8H_2O_{(s)} + 2\ NH_4SCN_{(s)} \rightarrow Ba^{2+} + 2\ SCN^- + 2\ NH_{3(g)} + 10\ H_2O_{(l)}$

ΔH= ΔS= ΔG=

How can both the enthalpy be what it is and the free energy what it is? What drives this reaction?