Name _____ Date _____ Period _____

Driving Forces for Reactions
*****Will a reaction occur spontaneously?*****

Depends on:

1. **Enthalpy (ΔH)** units:

   =

   *

   If ΔH > 0:

   If ΔH < 0:

2. **Entropy (ΔS)** units:

   =

   *

   If ΔS > 0:

   If ΔS < 0:

   In general,

   solid ← → liquid ← → gas

ex) Which has a greater entropy?

Sugar dissolved in iced tea	or	Sugar settled at the bottom of a glass of iced tea

ex) Which has a greater entropy?

Students at a football game sitting in the bleachers	or	Students playing football on the field

Practice: Determine the sign of ΔH and ΔS for the following reaction:

$$2NH_4NO_{3(s)} + \text{heat} \rightarrow 2N_{2(g)} + 4H_2O_{(l)} + O_{2(g)}$$

ΔH:

ΔS:

Now, combine ΔH and ΔS:

$$\Delta G^\circ = \Delta H^\circ - T\,\Delta S^\circ$$

What is ΔG?

° = standard conditions
1 atm, 298K (25°C)

*

If ΔG > 0:

If ΔG < 0:

Practice Problems: Determine if the following reactions will occur spontaneous under standard conditions.

ex) $C_2H_{4(g)} + H_{2(g)} \rightarrow C_2H_{6(g)}$

ΔS° = -0.1207 kJ/mol · K
ΔH° = -136.9 kJ/mol

ex) $CH_{4(g)} + H_2O_{(g)} \rightarrow CO_{2(g)} + 3H_{2(g)}$

ΔS° = +0.215 kJ/mol · K
ΔH° = +206.1 kJ/mol