

Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

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

Depends on:

1. **Enthalpy ( $\Delta H$ )** units:

=

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If  $\Delta H > 0$ :If  $\Delta H < 0$ :2. **Entropy ( $\Delta S$ )** units:

=

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If  $\Delta S > 0$ :If  $\Delta S < 0$ :

In general,

solid  $\leftrightarrow$  liquid  $\leftrightarrow$  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  $\Delta H$  and  $\Delta S$  for the following reaction:



$\Delta H$ :

$\Delta S$ :

Now, combine  $\Delta H$  and  $\Delta S$ :

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

What is  $\Delta G$ ?

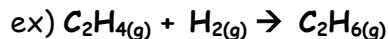
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If  $\Delta G > 0$ :

If  $\Delta G < 0$ :

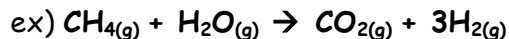
$^\circ$  = standard conditions  
1 atm, 298K (25°C)

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



$$\Delta S^\circ = -0.1207 \text{ kJ/mol} \cdot \text{K}$$

$$\Delta H^\circ = -136.9 \text{ kJ/mol}$$



$$\Delta S^\circ = +0.215 \text{ kJ/mol} \cdot \text{K}$$

$$\Delta H^\circ = +206.1 \text{ kJ/mol}$$