**CHGM-141  
General and Analytical Chemistry I**

With Dr. Bailey

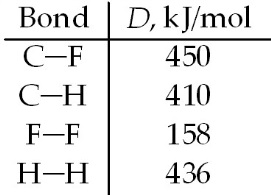
**Recitation Week 13**

(Bond Dissociation Energies, Entropy, Free Energy)

**Part A:**

1) **Use the given average bond dissociation energies, *D*, to estimate Δ*H* for the reaction of methane, CH4(*g*), with fluorine according to the equation:**

CH4(*g*) + 2 F2(*g*) → CF4(*g*) + 2 H2(*g*)



**Part B:**

1) **Determine the sign of Δ*S*° for each of the following:**

I. C6H6(*s*) → C6H6(*l*)

II. 2 SO2(*g*) + O2(*g*) → 2 SO3(*g*)

A) Δ*S*° should be negative for I and negative for II.

B) Δ*S*° should be negative for I and positive for II.

C) Δ*S*° should be positive for I and negative for II.

D) Δ*S*° should be positive for I and positive for II.

2) **The reaction of gaseous H2 and liquid Br2 to give gaseous HBr has**

**ΔH = -17.4 kcal/mol and ΔS = 27.2 cal / (mol x K)**

1. Write the balanced equation for this reaction
2. Does entropy increase or decrease in this process?
3. Is this process spontanious at all temperature? Explain.
4. What is the value of ΔG for the reaction at 300 K?

**Part C:**

Given:

Specific heat of water ice, 2.09J/g.oC

Heat of fusion of water, 334J/g

Specific heat of water, 4.18J/ g.oC

Heat of vaporization of water, 2260J/g

Specific heat of water steam, 2.03J/g

Specific heat capacity of cupper is 0.382J/g.oC.

Heat of fusion for copper is 205J/g

1. **How much heat energy, in joules, is required to melt following:**

a) 1.25.kg of copper at its melting point of 1083oC?

b) One mole of copper?

1. **Calculate the amount of heat required, in joules, to convert 125.0 g of ice at -15.0oC to steam at110.0oC**

(Hint: calculate the amount of heat required in each of the steps, and then add these amounts together to get your final answer).