NAME: **HONORS CHEMISTRY**

SECTION: Enthalpy, Entropy and Free Energy

Gibb’s Free Energy

1. For the reaction: CO(g) + H2O(g) → CO2(g) + H2(g), Ho = -42.2 kJ and So = -135 J/K.
2. Calculate Go at room temperature, 298K.
3. Is the forward reaction spontaneous at this temperature?
4. Calculate Go at 700 K, assuming that Ho and So are temperature independent.
5. Is the forward reaction spontaneous at this temperature?

1. Which factor, entropy or enthalpy, most affects the sign of G at high temperatures? At low temperatures?
2. Calculate Go at 305 K. Which reaction, forward or reverse, is spontaneous at this temperature?
3. Below what temperature will the reaction occur spontaneously?

Free elements have zero enthalpy and zero free energy. Table A-6 (the coral sheet) has the thermodynamic values for these state functions or find a table online.

Ho(rxn) = nHfo(products) – mHfo(reactants)

Go(rxn) = nGfo(products) – mGfo(reactants

So(rxn) = nSo(products) – mSo(reactants)

1. What is the enthalpy change for the following reaction? Cl2(g) + 2 HBr(g) 🡪 2 HCl(g) + Br2(l)
2. For the reaction Ca(cr) + 2 H2O(l) 🡪 Ca(OH)2(cr) + H2(g), Sorxn= 25.7 J/K. What is So for Ca(OH)2 (cr)?
3. Calculate Go(rxn) for the reaction: 2 H2O2(l) 🡪 2 H2O(l) + O2(g)
4. Find Ho(rxn) for the reaction: 2 NaBr(cr) + H2SO4(aq) 🡪 Na2SO4(cr) + 2 HBr(g)
5. Find So(rxn) for the reaction: SO2(g) + H2O(l) 🡪 2H2SO3(aq)

Answers to selected problems

1. –111.8 kJ
2. 76.2 J/mol K
3. –234 kJ

Answers to part 1 (for me, do not print)

1. -1.97 kJ,
2. spontaneous
3. 52.3 kJ,
4. not spontaneous
5. enthalpy dominates at low temps, entropy is determining at high temps
6. -1.03 kJ, forward reaction is spontaneous

g. 313 K