I have had consistent problems with redox reactions and half-reactions. I muddled through last semester, but would feel better if I was more comfortable with balancing reactions. Do you have any pointers/tips/advice that might make it easier? I know these are simple, and I have muddled through and got the answer, but it is hard for me-it can’t really be this hard. The elements make sense. The H+ and O and H2O etc…are the hardest for me. Not sure why.

Balance the following redox equations by the ion-electron method:

1. H2O2 + Fe2+ ---> Fe3+ + H2O (in acidic solution)

 CN- + MnO4- ---> CNO- + MnO2 (in basic solution)

2) Calculate the standard emf of a cell that uses the Mg/Mg2+ and Cu/Cu2+ half cell reactions at 25 deg C. What is the equation for the cell reaction that occurs under standard-state conditions?

3) If 2.50 g of CuSO4 are dissolved in 9.0 x 102 mL of 0.30 M NH3, what are the concentrations of Cu2+, Cu(NH3)2+4, and NH3 at equilibrium? (I am so lost on this one!)

4) In the complex ion [Fe(CN)6]4–, the oxidation number of Fe is\_\_\_\_\_??

5) Consider an electrochemical cell constructed from the following half cells, linked by an external circuit and by a KCl salt bridge:

an Al(*s*) electrode in 1.0 *M* Al(NO3)3 solution
a Pb(*s*) electrode in 1.0 *M* Pb(NO3)2 solution

What is the balanced overall (net) cell reaction?

1. Pb(*s*) + Al3+(*aq*) Pb2+(*aq*) + Al(*s*)
2. 3Pb(*s*) + 2Al3+(*aq*) 3Pb2+(*aq*) + 2Al(*s*)
3. 3Pb2+(*aq*) + 2Al(*s*) 3Pb(*s*) + 2Al3+(*aq*)
4. Pb2+(*aq*) + Al(*s*) Pb(*s*) + Al3+(*aq*)

6) Calculate the cell emf for the following reaction:

2Ag+(0.010 *M*) + H2(1 atm) 2Ag(*s*) + 2H+ (pH = 10.0)

7) Calculate the value of Eocell for the following reaction:

2Au(*s*) + 3Ca2+(*aq*) 2Au3+(*aq*) + 3Ca(*s*)

I don’t know if seeing how I am attempting to do the problems will help in giving me some guidance, but I included the solution I reached with this problem. My question is-does a negative free energy mean I need to use a positive figure in my calculation? I am not good at algebra (you could probably tell), but I suspect this to be the case. Not mentioned in the text-I know I am supposed to know this. Your detailed explanations are a big help!

8) In the Mond process for the purification of nickel, CO is passed over the metallic nickel to give Ni(CO)4:

 Ni(s) + 4CO(g) 🡨🡪 Ni(CO)4(g)

Given that the standard free energies of formation of CO(g) and Ni(CO)4(g) are -137.3 kJ/mol and -587.4 kJ/mol, respectively, calculate the equilibrium constant of the reaction at 80 Degrees C. (Assume Gfo to be independent of temperature)

Here is my attempt:

 Gibbs free energy = standard free energy of formation of products - standard free energy of formation of reactants

Gibbs free energy = Gf(Ni(CO)4) - Gf(Ni(s)) -4Gf(CO)

Gibbs free energy = -587.4 - 0 + (4 x 137.3)

Gibbs free energy = -587. 4 + 549.2 = -38.2 kJ/mol

K = e (-Gibbs free energy/RT)
K = e (-38200 J/mol/(8.314 J/K.mol x 353K))
K = e (-13.016033)
    = 2.2 x 10 -6 (if positive number used, would be K = e (13.016033)  = 449,563.7241

9) Which is the systematic name for the compound represented below?

