GG325 -- PRINCIPLES OF GEOCHEMISTRY

Homework set #4 - Due on 11/27

1a) Give 3 chemical reasons that we know our sun is at least a second generation star

1.

2.

3.

1b) How and why has the abundance of He in our sun changed since it formed?

2a) Explain the general idea of the "condensation" sequence is in 3 sentences or less. You will address details of this sequence in 2b, so tailor your answer accordingly.

2b) Explain which stages of the condensation sequence the CAI, chondrule, and phylosilicate matix components of C1 chondrites represent.

3. The following equilibrium applies to the condensation of corundum, Al_2O_3, from the gasses of the solar nebula: Al_2O_3 (s) ↔ 2 Al (g) + 3 O (g).

solar nebula abundances for the elements in the atomic state relative to Si at 1 x 10^6 atoms.

H = 2.2x10^{10}	Al = 7.4 x 10^4	O = 2.0 x 10^7	Si = 1 x 10^6

3a) write out the K_{eq} expression for this reaction. What are the units this constant is in?

3b) The condensation temperature of Al_2O_3 is 1768°K when P_{total} = 10^{-4} atm. What is the partial pressure of Al in a unit volume of solar nebula at 1780°K?
R = 0.08206 L atm mol^{-1} K^{-1}

3c) Assuming the above condensation has gone to completion at 1768°K and that it is the only reaction governing the amount of Al and O in the nebula, would you expect there to be any O left in the gas phase? If yes, how much? *Hint: consider the stoichiometry of the reaction.*

3d) why is the abundance of Al in the solar system so much lower than that of Si?

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4. In preparation for your final project…
pick a chemical element other than H, He, O, Si, Al, Fe, Mg, Ca, Na, K, Ti; perhaps avoid really obscure ones too. You will be using this element below and in your final project, so pick one you like. (We will make final selections in class on ***Monday the 25th (before thanksgiving)***, so come prepared with a first and second choice)

4a) What is the abundance of YOUR element in the solar system relative to Si at 1 x 10^6 atoms.

4b) What is it's most abundant isotope of YOUR element and what % of that element does it comprise?

4c) How did the most abundant isotope of your element form during nucleosynthesis (i.e., He-burning, r-process, s-process, etc..)?