**Low-temperature Aqueous Geochemistry**

**Partial Pressure Diagram for the Iron Compounds**

1) Using the following thermodynamic data, construct a partial- pressure diagram for the iron oxides and iron carbonate, following steps outlined in the Powerpoint tutorial for the Cu system. Remember to use Le Chatelier's Principle to determine on which side of the phase boundaries the two minerals occur. **When constructing your diagram do not bother to calculate the stability limits of water and extend your mineral stability boundaries into the regions outside those stability limits.**

Phase ΔGfo (25oC)(kcal/mol)

Feo 0

FeO -58.4

Fe3O4 -242.7

Fe2O3 -177.4

FeCO3 -162.6

CO2 (g) ` -94.3

H2O (l) -56.7

2) To help you keep track of which reactions need to be written, put a check in the blank boxes below after you have written the reaction and calculated the equation for each pair of minerals. In some cases you will determine that a particular reaction is metastable and can eliminate it without calculating an equation. Put a large “M” in the box for these metastable reactions.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Phases | Fe | FeO | Fe3O4 | Fe2O3 | FeCO3 |
| Fe | XX |  |  |  |  |
| FeO | XX | XXX |  |  |  |
| Fe3O4 | XX | XXX | XXXX |  |  |
| Fe2O3 | XX | XXX | XXXX | XXXX |  |
| FeCO3 | XX | XXX | XXXX | XXXX | XXXX |
|  |  |  |  |  |  |

3) What is the stable mineral in equilibrium with a gas phase containing the indicated gasses at the following pressures:

**log P O2 log P CO2**

a) -75 -20

b) -92 +5

c) -63 -5