Introduction to Mineral Equilibria

After completing this exercise, students should be able to:

- •Plot mineral compositions on a ternary diagram.
- •Apply the phase rule to determine how many minerals may coexist under what conditions.
- •Use a phase diagram to determine the conditions where a particular minerals assemblage is stable.

Before they do this, instructors should discuss the phase rule. Explain what P, C and F are, etc., and how many degrees of freedom correspond to a reaction, an invariant point, etc.

Students will also need some explanation re. how to plot compositions on a ternary diagram.

Sticking point: For some reason, students really seem to get confused using the phase diagram to determine stability of assemblages. There several key points to stress:

- •For a 3 component system, 3 phases may exist together in a portion of PT space. For a 4-component system, 4 phases may exist together in a region of PT space.
- •For a 3 component system, 4 phases may only exist together if they are related by a reaction. Any 4-phase assemblage that is not represented by a reaction cannot be stable. Ditto for a 4-component system, except that the number of phases in the assemblage is 5.
- •For a 3 component system, 5 phases may only exist together at an invariant point. For a 4-component system, 6 phases may only exist together at an invariant point.
- •A reaction of the sort A+B=C+D says nothing about the stability of A <u>unless B is also present.</u> For example, the reaction Gr+Q=An+Wo limits the stability of Gr+Q but <u>does not limit the stability of Gr in the absence of Q.</u>