

BINARY PHASE DIAGRAMS - PERITECTIC BEHAVIOR KEY

1. Examine figure 1 on the attached sheet. On the attached diagram, outline each liquidus line in green, each solidus line in brown.

a. What is the minimum number of components necessary to describe all of the phases shown? TWO

b. How many phases are present in the region labeled Fo + En?
TWO

c. How many phases are present in the region labeled Qtz + Liq?
TWO

d. How many phases are there in the region labeled Fo + Liq?
TWO

e. How does the number of degrees of freedom change on going from En + Liq to En + Quartz? No change

f. How does the number of degrees of freedom change on going from Fo + Liq to En + Liq?
No change

g. List the phases present at the peritectic point.
Forsterite, Enstatite, Melt

h. How many degrees of freedom does the sample have at the peritectic point?
Zero

i. List the phases present at the eutectic point.
Enstatite, Quartz, Melt

j. How many degrees of freedom does the sample have at the eutectic point?
Zero

k. How do your answers to g through j explain the observed cooling curve (figure 2) which could apply to either the peritectic or eutectic points?

At the peritectic point leucite is converted to K-spar and heat is released. At the eutectic point both K-spar and tridymite crystallize, releasing heat. This keeps the temperature constant. Both the peritectic and eutectic points are triple points so no degrees of freedom are present.

2. Starting with a composition of 31% silica, trace the behavior of the melt from 1700°C to 1500°C. Show the path followed by the liquid in red, the path followed by the solid in blue.

- a. At what temperature does the solid first appear? 1640°C
 - b. What is the composition of the first solid? 100% Fo
 - c. At 1560°C, what phases are present? Enstatite and Melt
 - d. What percent of each phase is present? 94% Enstatite, 6% Melt
- (HINT: See Lever Rule file)
- e. At 1540°C, what percent of each phase is present? 95% Enstatite, 5% Melt
 - f. What phases are present at 1480°C? Quartz, Enstatite
 - g. At 1480°C what is the percent of each phase present?
99% Enstatite, 1% Quartz
 - h. What temperature does the last liquid disappear? 1530°C
 - i. What is the composition of the last liquid? Qtz₄₆

FIGURE 2



