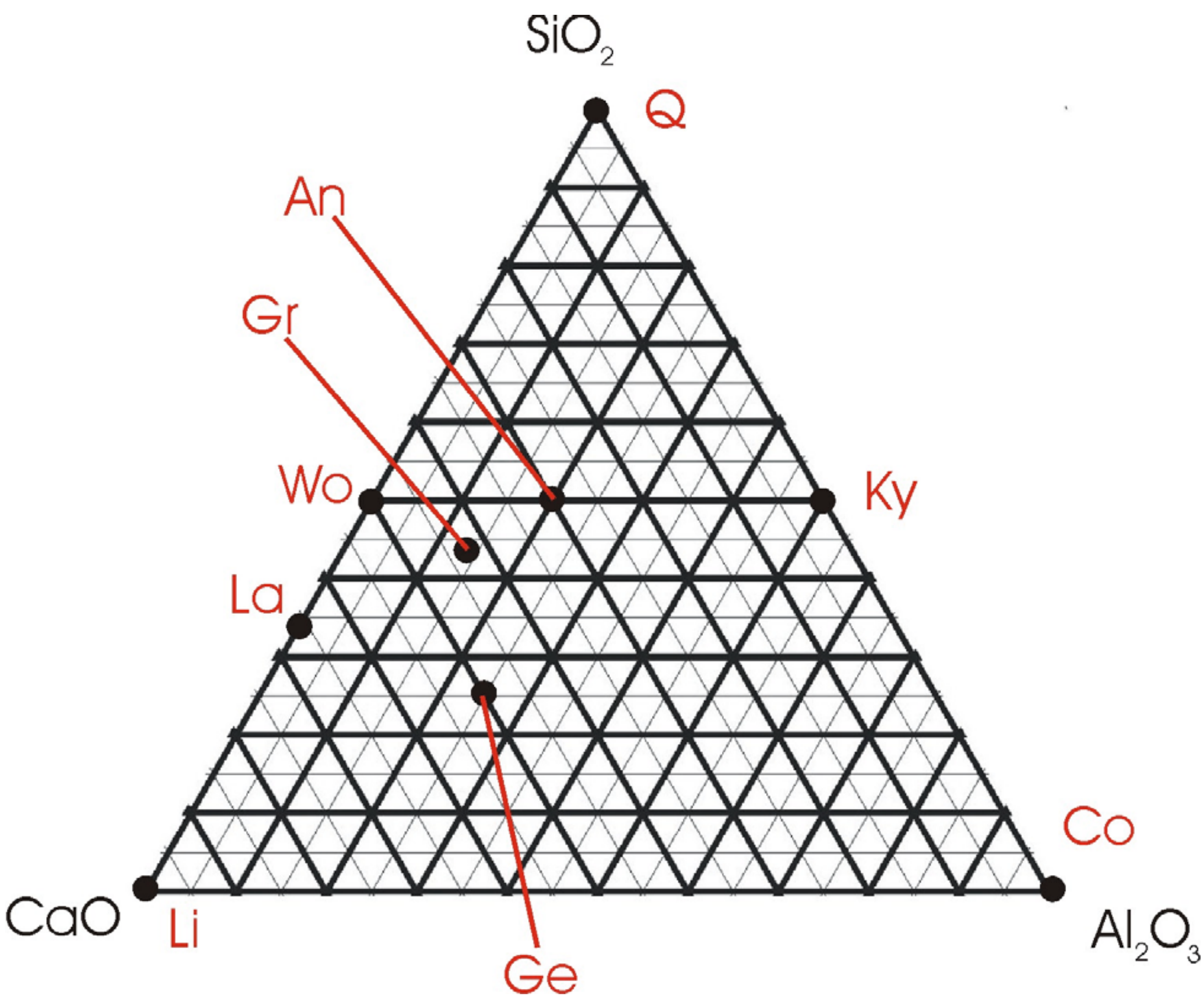
Introduction to Phase Equilibria

On the triangular diagram below, plot each of the following mineral compositions. Show locations with dots:

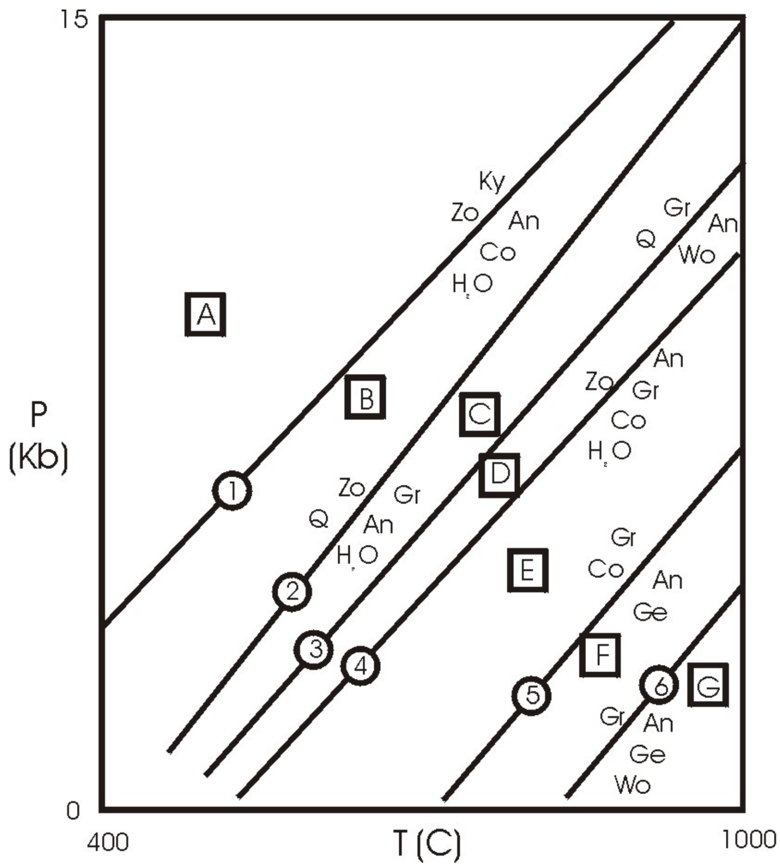
grossular $Ca_3Al_2Si_3O_{12}$
quartz SiO_2
anorthite $CaAl_2Si_2O_8$
wollastonite $CaSiO_3$
kyanite Al_2SiO_5
larnite Ca_2SiO_4
corundum Al_2O_3
lime CaO
gehlenite $Ca_2Al_2SiO_7$



This figure shows a phase diagram involving minerals in the CASH (CaO-Al_2O_3-SiO_2-H_2O) system. It includes some of the same phasess you considered above, plus a couple of new ones.

There are six reactions (numbered 1 through 6) which divide PT space into seven fields (A through G).

Note, this is a 4 component system. Fill in the following table:



degrees of freedom	# of phases that may coexist
0	6
1	5
2	4

For each of the following 15 assemblages, tell in what zones or on what reactions it is stable. Some may be stable nowhere, some everywhere.

Co everywhere
Zo left of 4
Ge everywhere
Zo-An left of 4
An-Ge FG
Zo-An-Ge nowhere
Gr-An-H_2O CDEF
An-Wo-Q right of 3
Gr-Co-An-Ge 5

Gr-An-Co-H_2O E
An-Ge-Wo-Zo nowhere
Zo-Ky-Co-Gr-H_2O nowhere
Gr-An-Zo-Q-H_2O 2
An-Co-Gr-Ge-H_2O nowhere
An-Co-Gr-Q-H_2O nowhere

What general observation can you make about the stability field (range of PT space where something is stable) and the number of minerals in an assemblage? The more minerals that are together in an assemblage, the smaller the stability field.