

The American University of Beirut
Final Examination



Petrology (221)
Department of Geology
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Feb. 2, 1996
Time: 2 hours
Exam rules apply

Part I

Answer all questions of Part I

(MARKS)

(15)

1. (a) Concisely describe the following terms:
i) spilite ii) rhythmic layering
iii) filter pressing iv) lamprophyres

(b) What is the difference between the norm and the mode of a rock?

(c) What is a pegmatitic rock, and what is a leucogabbro?

(15)

2. (a) Using silica content as a base for the classification of igneous rocks, give the SiO_2 range of an ultrabasic rock, intermediate rock, and a basalt.

(b) Briefly describe "carbonatite" rocks, and comment on their tectonic environment of emplacement.

(c) Illustrate by means of a diagram a typical section of an ophiolite sequence; label all.

(15)

3. (a) What textural evidence do you expect to see under the microscope to indicate a fractional crystallization origin of a rock?

(b) Describe these textures using diagrams along with text; ophitic texture, myrmekite, perlitic texture, and perthite.

(c) Briefly describe the origin of the Sierra Nevada batholith (western US), in the context of plate tectonics. Note that this batholith is a typical calc-alkaline plutonic suite.

(15)

4. Indicate in which one of the fields on the attached P-T diagram each of the following minerals would most likely be found. Do so by writing the name of the minerals in the appropriate field;

Staurolite
Chlorite

Hornblende
Biotite

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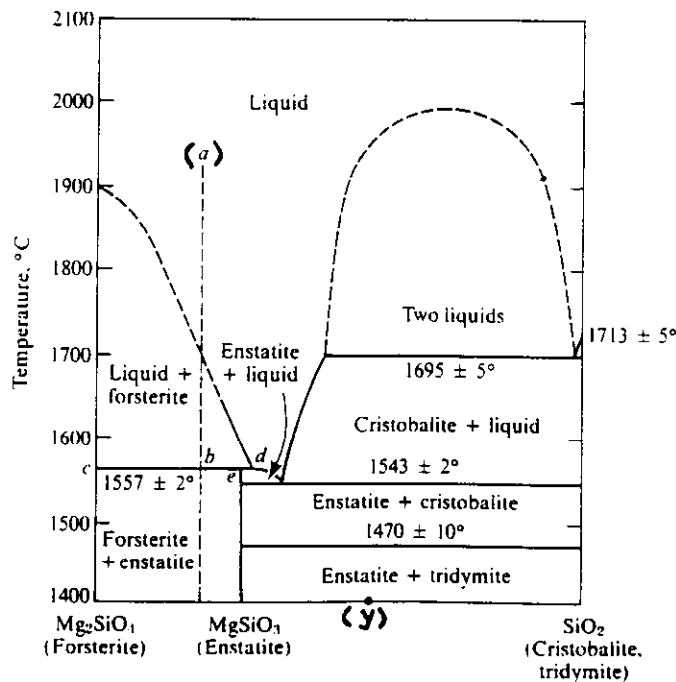
Actinolite	Hypersthene
Glaucophane	Plagioclase (An 25)
Epidote	Andalusite
Wollastonite	Almandine
Albite	Prehnite
Diopside	Talc

- (10) 5. (a) Define the so-called "metamorphic facies".
- (b) The muscovite breakdown reaction is an important reaction occurring at the boundary between the amphibolite-, and the granulite facies: write this reaction.
- (c) What is meant by the term "skarn", and by the term "migmatite".
- (d) How does the An content of plagioclase vary with increasing grade of metamorphism.
- (10) 6. (a) Write a metamorphic reaction that occurs at the boundary between greenschist-, and amphibolite facies.
- (b) Name two minerals that are most characteristic of the low pressure part of the amphibolite facies, and another two most characteristic of the high pressure part of the same facies.
- (c) Do you expect to find a special type of slate produced as a result of metamorphism within the granulite facies conditions? Why?

Part II

Answer only two out of three questions in Part II

- (10) 7. Use the phase diagram given below to; i) Describe the crystallization path of a melt of composition "a", and ii) Describe the melting path of a rock of composition "y", and name such a rock.



- (10) 8. Construct a fully labelled diagram to indicate the relationship between the various metamorphic facies and an Andean-type (subduction) tectonic environment.
- (10) 9. (a) Plot the following equilibrium assemblage on one appropriate diagram:
Grossularite + wollastonite + diopside + quartz
- (b) To which facies does this assemblage belong?
- (c) Give a reaction that leads to the formation of wollastonite and another that forms diopside.

