

The American University of Beirut
Final Examination

Petrology (Geol 221)
Department of Geology
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February 2, 2006
Time: 2 hours
Exam rules apply

(Marks)

- (15) 1. (a) The various metamorphic facies are usually developed in specific areas with respect to a given tectonic environment. Label these facies directly on the diagram (Fig. 1) given below.
- (b) Label all fields of the IUGS classification diagram (Fig. 2) given below.
- (c) Label all fields, and the two planes directly on Fig. 3 given below.
- (15) 2. Define or describe the following terms:
- | | |
|-------------------------------------|-----------------------------|
| a) Parental magma | b) Cataclastic metamorphism |
| c) Metamorphic facies | d) Hypersolvus rocks |
| e) Komatiite | f) Helicitic texture |
| g) Lithostatic-, and Fluid pressure | |
- (15) 3. (a) Write metamorphic reactions that lead to the formation of cordierite, jadeite, almandine, and chloritoid (one reaction for each mineral). Indicate within which metamorphic facies does each of these reactions take place.
- (b) Fractional crystallization has been suggested as one of the processes responsible for the formation of granitic magmas. Discuss this process, providing evidence of a magmatic origin for granites, and specific types of evidence of fractional crystallization.
- (15) 4. (a) Write an essay on "arc basalts" with emphasis on composition, distribution, and petrogenesis.
- (b) The presence or absence of quartz has a major effect on the products of metamorphism of dolomitic limestone. Give three examples involving calcite, magnesite and dolomite, with metamorphic reactions with and without quartz to fully explain the significance of quartz. Use the proper diagram, along with text to illustrate your answer.

- (15) 5. Use the phase diagram given to:
- a) Label all fields, curves, lines, and point "d" directly on the diagram.
 - b) Describe in detail the equilibrium crystallization path of a melt of composition (*a*).
 - c) Use the lever rule to determine the proportions of crystals and solids at temperature of 1600°C.
 - d) Describe the melting path of a rock of composition (Y).