

The American University of Beirut  
Final Examination

Student name: -----

Petrology (Geol 221)  
Department of Geology  
Dr. A.M. Abdel-Rahman

January 29, 2000  
Time: 2 hours  
Exam rules apply

PART I

Answer all of the three questions in part I.

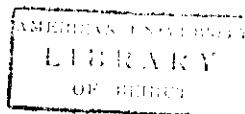
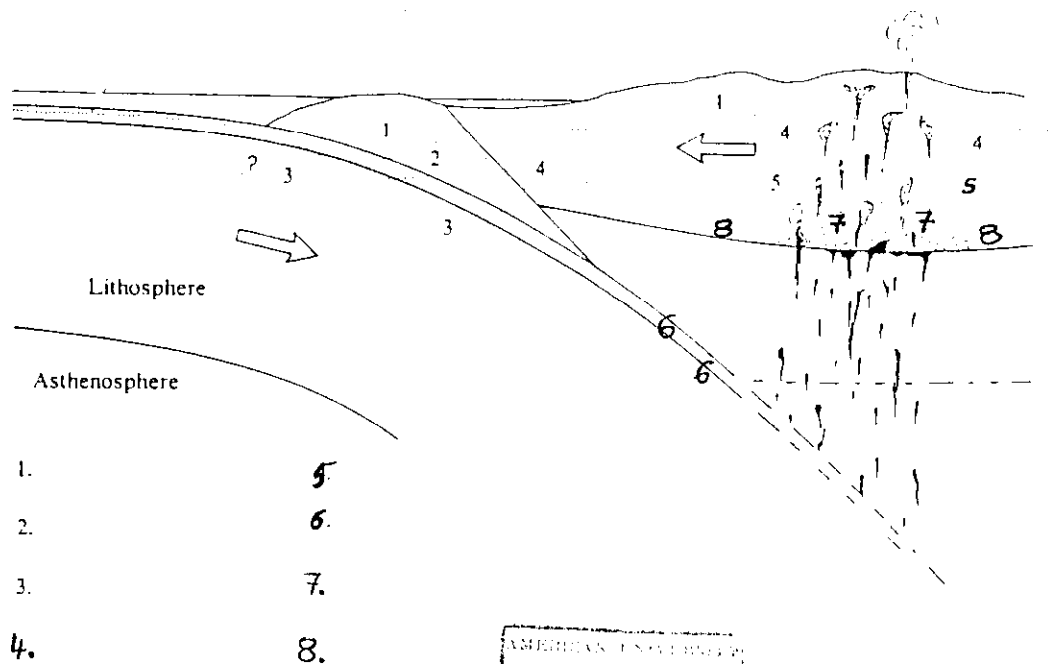
(MARKS)

- (20) 1. Define or describe the following terms:
- |                        |                       |
|------------------------|-----------------------|
| a) troctolite          | b) harzburgite        |
| c) norm                | d) cryptic layering   |
| e) incongruent melting | f) adcumulate texture |
| g) parental magma      | h) xenoblast          |
| i) metamorphic facies  | j) helicitic texture  |

- (20) 2. (a) Write metamorphic reactions that lead to the formation of jadeite, almandine, chloritoid, and cordierite (one reaction for each mineral). Indicate within which metamorphic facies does each of these reactions take place.

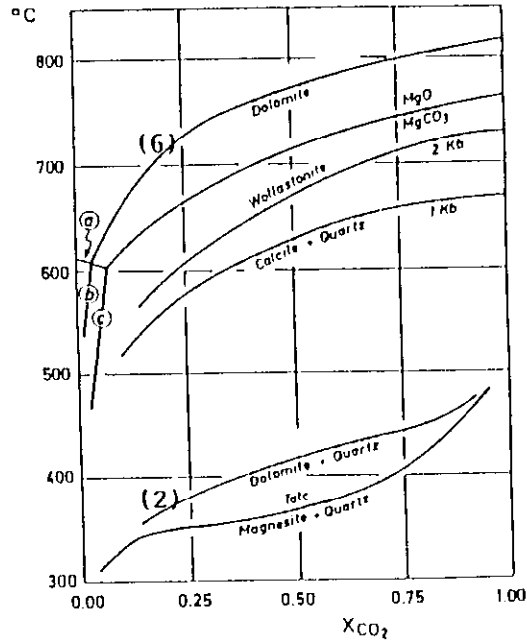
(b) Use the diagram shown below (Fig. 1) to describe the relationship between tectonism and metamorphism and indicate the metamorphic facies (1 to 8) that correspond to the various parts of this tectonic regime.

Figure 1



(c) Use Figure 2 (given below) to explain the effect of the various parameters on metamorphism. Write the exact metamorphic reactions for curve #2 and #6.

Figure 2.



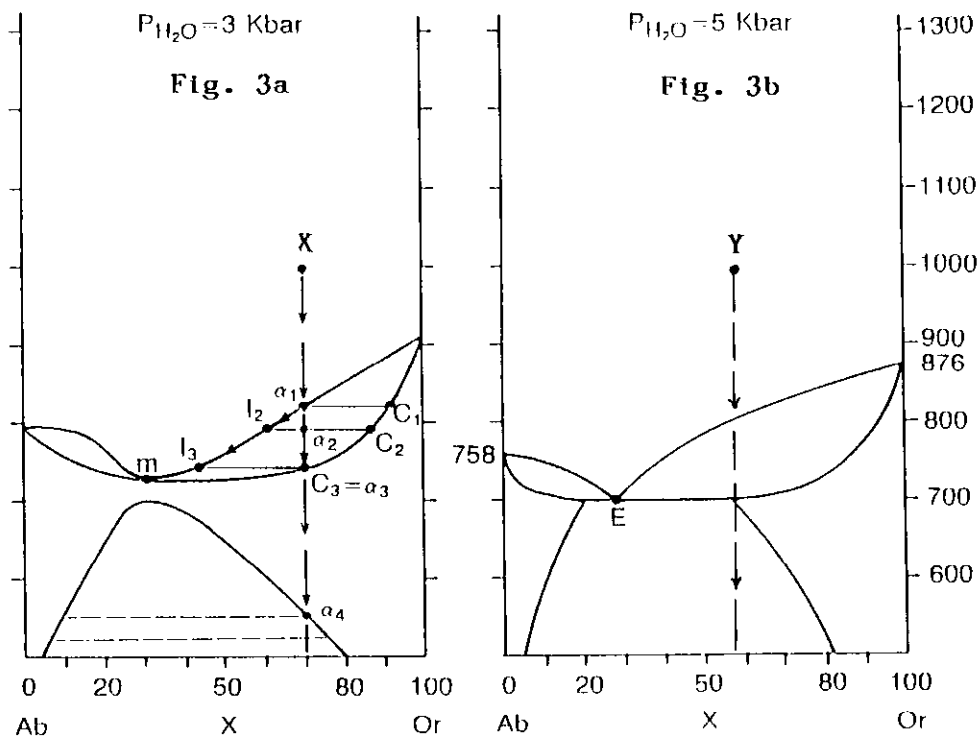
(15)

3. Use the phase diagram given below to:

a) Label points E and m, and label all fields, and curves directly on the diagram.

b) Describe in detail the crystallization path of a melt of composition "X" on Fig. 3a, and the crystallization path of a melt of composition "Y" on Fig. 3b.

c) Comment on the main "differences" between the case of Fig. 3a and 3b and their products of crystallization.



PART II

Answer any two of the following three questions in part II

- (15) 4. Write an essay on the "metamorphism of mafic igneous rocks". Your essay should include details of the mineralogical changes that take place during progressive metamorphism of these rocks particularly within the amphibole, pyroxene, feldspar, garnet, and the hydrous Ca-Al silicate minerals.
- (15) 5. Write an essay on "arc basalts" with emphasis on composition, distribution and petrogenesis
- (15) 6. a) List the four main components of an ophiolite complex, and provide a brief description for each component.
- b) Define the so called "retrograde metamorphism. Explain why this process is not as common as the process of prograde metamorphism. A thermal metamorphic rock, after reaching the peak of metamorphism, has been later subjected to retrograde metamorphism; Name the metamorphic facies that will be reached (from very high to very low grade) during this process.
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