



The American University of Beirut
Final Examination

Crystallography/Mineralogy (211)
Department of Geology
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Jan. 29, 1997
Time: 2 hours
Exam rules apply

Part I

Answer all questions in Part I

(Marks)
(12)

1. Give the exact chemical formula for each of the following minerals.

- | | |
|----------------|-------------------|
| (a) Orthoclase | (g) Phlogopite |
| (b) Coesite | (h) Wollastonite |
| (c) Muscovite | (i) Pyrope |
| (d) Chalcocite | (j) Anthophyllite |
| (e) Fayalite | (k) Talc |
| (f) Kyanite | (l) Ilmenite |

(18)

2. (a) Order-Disorder polymorphic transformations: Describe, and give mineralogical examples.

(b) What is meant by the term "solid solution"? What are the factors that control the presence of this phenomenon in some mineral groups?

(c) What types of rocks (be specific) that contain these minerals:

- | | |
|----------------------------|----------------------|
| i) Augitic pyroxene | ii) Zeolite minerals |
| iii) Calcite | iv) Anthophyllite |
| v) Riebeckite and aegirine | vi) Kaolinite |

(10)

3. To which crystal system does each of these point groups belong:

$2/m$, $\bar{6}m2$, 23, mmm, 1, 4mm, 431, 32, 642, 222

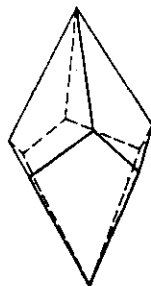
(12)

4. (a) List eight crystal forms within the tetragonal system.

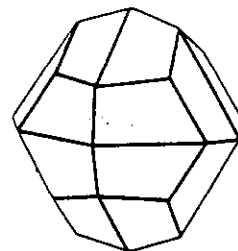
(b) Plot the stereographic projections of all crystal faces and symmetry elements representing the two crystal forms shown below. Give the point group (or crystal class) of each form, based on its stereographic projection.



(i)

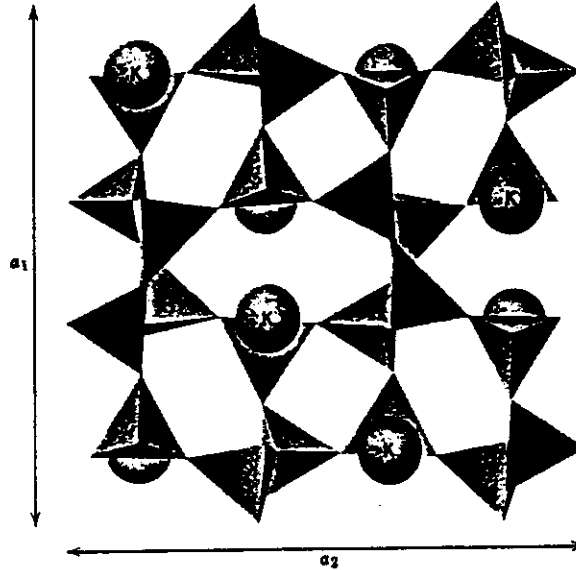


(ii)



(Marks)
(8)

5. (a) What is the chemical composition of Leucite?
(b) Which mineral group does it belong to?
(c) What type of rocks that contain this mineral?
(d) The diagram given below represents a projection of the leucite structure (projected down the c axis). Describe this structure.



Part II

Answer only one out of two questions in Part II; please note that the question is worth 20 marks

- (20) 6. Describe in detail the classification and the structure of the carbonate mineral group. Comment on the distinct nature of the structure within this group. Comment on the extent of solid solution among the various phases within the carbonates. Indicate how does the variation in pressure of formation affect the coordination number, and thus, the structure of some mineral phases within this group. Use diagrams when possible to illustrate your answer.
- (20) 7. Describe in detail the classification of the sheet silicates (or phyllosilicates), with special emphasis on the general formulae, the types of sheets found, and the role and characteristics of the cations. Give mineralogical examples, with their chemical compositions, for each of the classification categories.

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