The American University of Beirut
Final Examination

Crystallography/Mineralogy (211)
Department of Geology
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June 12, 2000
Time: 2 hours
Exam rules apply

Part I

Answer all questions in Part I

(MARKS)

(15) 1. Concisely define (or describe) the following terms and give examples when applicable:
(a) Trapezohedron
(b) Unit face
(c) Bravais lattices
(d) space group
(e) Twinning
(f) Biopyriboles

(10) 2. Write an essay on the "Native elements (or minerals)": make sure to describe their classification, giving the mineral names, and their chemical formulae.

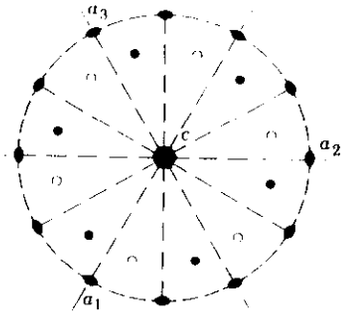
(20) 3. (a) To which crystal system does each of these point groups belong:

2, 4/m, 2mm, $2/m\bar{3}$, 32, 23, 432, 6

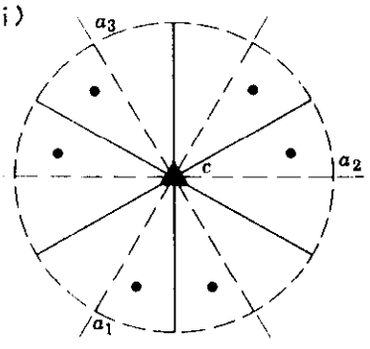
(b) Give a mineralogical example for each of the following crystal systems: Hexagonal rhombohedral, isometric, triclinic, and orthorhombic.

(c) What is the point group that each of the following five stereographic projections represent;

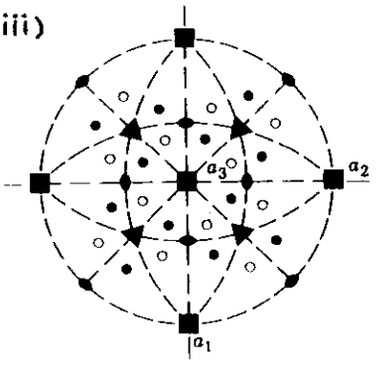
(i)



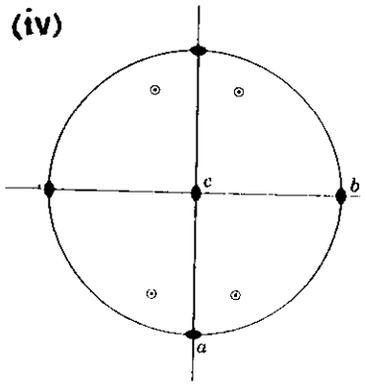
(ii)



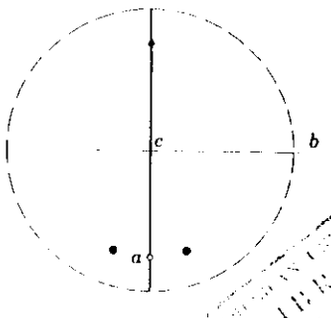
(iii)



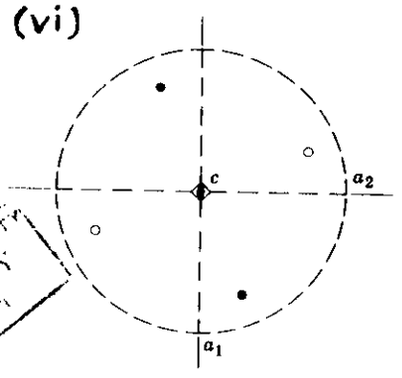
(iv)



(v)



(vi)



(20) 4. (a) Describe the structure and the occurrence of these minerals, and give their chemical composition; i) olivine, ii) tremolite, and iii) biotite.

(b) List the various types of twinning.

(c) Write an essay on the geochemical classification of elements (provide examples), and its significance in mineralogy.

Part II

Answer only <u>Two</u> out of three questions in Part II.

(20) 5. Pyroxene is an important silicate mineral group that is commonly present in many rock types. Describe in detail the classification of the pyroxene mineral group, giving the mineral names and the exact chemical formulae.

(20) 6. Describe in detail the classification of the feldspar mineral group, with special emphasis on the general formulae, and the types of feldspars present, giving mineralogical examples, with their chemical compositions (listing the An content when applicable) for each of the classification categories (use diagrams whenever possible). Comment on the nature of substitution within this mineral group. Comment on the temperature conditions of their formation.

(20) 7. Briefly describe the classification of the garnet mineral group, giving the mineral names and the exact chemical formulae. Use the general formula to describe the coordination polyhedra of the various cations. Comment on the substitution among these minerals (use diagrams to further illustrate your answer), and comment on their occurrence.

The diagram given below represents the structure of epidote projected on (010). Describe this structure.