



The American University of Beirut
Final Examination



Optical Mineralogy (Geol 212)
Department of Geology
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Feb. 7, 1998
Time: 2 hours
Exam rules apply

Answer any five of the following six questions

(MARKS)

(15)

1. Define each of the following terms:

- a) Optic axial plane
- b) Extinction
- c) The pleochroic formula
- d) Wave front
- e) Acute bisectrix figure
- f) Snell's law
- g) A uniaxial negative indicatrix

(15)

2. a) Using grain mounts, describe the method of determining the indices of refraction of n_{β} and n_{γ} of an orthorhombic mineral.

b) Neatly sketch a fully labelled ZX plane (or a principal section) of a negative indicatrix of a crystal that belongs to the triclinic system.

(15)

3. a) Describe in detail the fundamental operations for Mallard's method (including the rapid visual estimate), and for Kamb's method of determining the optic angle ($2V$). Use text, diagrams, and equations (when applicable) to illustrate your answer.

b) What is the shape of the indicatrix of the mineral halite? How many refractive indices does it have? Why?

(15)

4. a) In a comparative table format, show how do you distinguish (under a polarizing microscope) between the following mineral pairs, giving the three most characteristic optical properties of each mineral:

- i) Quartz and orthoclase
- ii) Augite and forsterite
- iii) Chlorite and hornblende

b) Briefly describe and illustrate by means of a diagram the origin of the (black) isogyres that characterize a centered uniaxial optic axis figure.

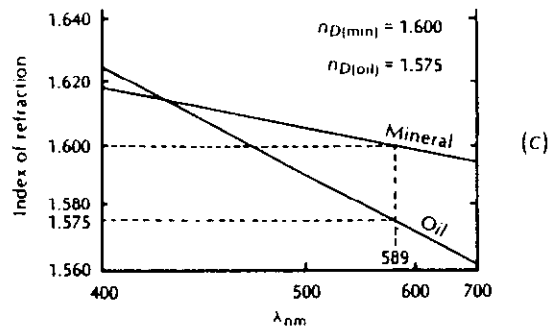
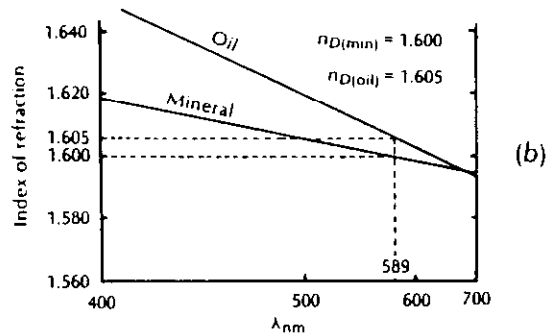
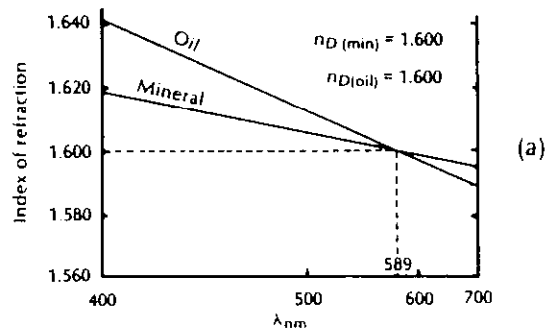
(15)

5. a) Use the diagram given below to explain the formation of colored Becke lines and discuss the way these coloured Becke lines move with respect to the mineral and the oil upon



increasing the distance between the sample and the objective lense in case (a) indices of mineral and oil matched for light whose wavelength is 589 nm, (b) indices of mineral and oil matched near the red end of the spectrum, and (c) indices of mineral and oil matched near the blue end of the spectrum.

- b) You are given a thin section containing one unknown mineral and another known mineral. Using the interference colour chart, explain how do you determine the thickness of the thin section, and the numerical birefringence of the unknown mineral.



(15) 6. Answer question #6 on the space provided (page 3).