

2018

GEOLOGY

(Major)

Paper : 2-1

(Optical Mineralogy)

Full Marks : 60

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

1. Choose the correct answer of the following :

1×7=7

(a) A mineral section remains dark throughout the rotation of the section under the crossed Nicol condition of the microscope. The mineral also shows interference figure under the conoscopic condition of the microscope. It indicates that the mineral belongs to

(i) the cubic system and the section is parallel to the (001) face

(ii) the uniaxial mineral and the section is parallel to the c-crystallographic axis

- (iii) the uniaxial mineral and the section is perpendicular to the c-crystallographic axis
- (iv) the biaxial mineral and the section is perpendicular to the acute bisectrix

(b) The path difference of light in the gypsum plate is

- (i) 1λ
- (ii) 2λ
- (iii) $\frac{1}{4}\lambda$
- (iv) variable

(c) Pleochroism of a mineral is determining the

- (i) change of colour from one extinction position of the mineral section to the next extinction position
- (ii) change of colour under the plane polarized light without using the analyzer
- (iii) change of colour under the conoscopic condition of the microscope
- (iv) None of the above

(d) The fast and slow vibration directions of a mineral section can be determined by

- (i) using accessory plates
- (ii) knowing the extinction position
- (iii) extinction angle of the mineral
- (iv) interference colour of the mineral

(e) A biaxial mineral is called as positive, if

- (i) X vibration direction is the acute bisectrix
- (ii) Y vibration direction is the acute bisectrix
- (iii) Z vibration direction is the acute bisectrix
- (iv) Z vibration direction is the obtuse bisectrix

(f) Optic axial angle is the angle by the

- (i) two optic axes
- (ii) two crystallographic axes
- (iii) two vibration directions X and Z
- (iv) two vibration directions X and Y

(g) The extinction angle of the mineral enstatite belonging to the pyroxene group of minerals is

- (i) parallel extinction
- (ii) oblique extinction
- (iii) symmetrical extinction
- (iv) None of the above

2. Write short notes on the following :

2×4=8

- (a) Polarization of light
- (b) Uniaxial and biaxial mineral
- (c) Birefringence
- (d) Optical characters of microcline

3. Answer any *three* of the following questions :

5×3=15

- (a) Discuss a biaxial indicatrix of positive mineral with a suitable diagram. 3+2=5
- (b) Describe briefly the methods for determining the vibration directions of a mineral. 5
- (c) Discuss about the determination of optic sign of a biaxial mineral cut perpendicular to the acute bisectrix. 5

(d) Write about the Nicol prism. 5

(e) Discuss the optical characteristics of the minerals belonging to the olivine group. 5

4. Answer any *three* of the following : $10 \times 3 = 30$

(a) Describe the interference figure of a uniaxial mineral section perpendicular to the optic axis. Discuss the method of determining the optic sign using the different accessory plates. $4+6=10$

(b) What do you mean by pleochroism of a mineral? Discuss the method of determining the pleochroic scheme of a biaxial mineral. $1+9=10$

(c) What do you mean by interference colour of a mineral? Discuss the method for determining the interference colour of a mineral using the accessory plate. $2+8=10$

(d) What are the different accessory plates? Write about the vibration directions of the accessory plates. Discuss about the uses of the accessory plates for determination of the optical properties of the mineral. $1+1+8=10$

(e) Describe the distinguishing optical properties of the different minerals of the pyroxene group of minerals. 10

(f) Describe the distinguishing optical properties of the following minerals :

2×5=10

(i) Plagioclase

(ii) Nepheline

(iii) Calcite

(iv) Leucite

(v) Kyanite

★ ★ ★