

[This question paper contains 4 printed pages.]

Your Roll No.

5877

B

B.Sc. (Hons.) Geology/Sem. I

Paper-GEHT-102 : Mineralogy and Crystallography

(Admissions of 2010 and onwards)

Time : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Answer any *Five* questions.

All questions carry equal marks.

Use of calculator is allowed.

1. The 32 crystal classes can be grouped into 6 crystal systems. 15
 - (a) What is crystallographic axis ?
 - (b) Name the six crystal systems. Describe them by giving the relative lengths of each axis and the angles between the axes.
 - (c) One system has a sub system. Describe the sub system and how it differs from the system.

2. Answer the following : 15
 - (a) Give the common habit of the following minerals :
Diamond, Beryl, Serpentine, Garnet, Staurolite.

[P. T. O.]

- (b) Classify the following minerals into isotropic and anisotropic class :
- Garnet, Biotite, Olivine, Spinel, Tourmaline
- (c) Answer the following :
- (i) Give the optical properties of the two common micas.
 - (ii) What is understood by crystal zone ?
 - (iii) Give twin laws of K-feldspar and draw neat diagrams.
 - (iv) What do you understand by uniaxial wave surface ?
 - (v) Explain briefly the phenomenon of exsolution in minerals.
3. Fill in the gaps : 1×15=15
- (i) Kyanite is a triclinic crystal but andalusite is crystal.
 - (ii) An anisotropic uniaxial substance has optic axes.
 - (iii) The indicatrix of a uniaxial negative crystal is
 - (iv) A screw axis is a combination of
 - (v) Contact twins form by symmetry.

- (vi) Monoclinic crystals have axes of length.
 - (vii) Interference colors indicates of light.
 - (viii) The isotopic number of an atom is defined by the total number of
 - (ix) Hexagonal-close packed co-ordination occurs when ions are stacked in an configuration.
 - (x) Chemical composition of Pyrope is
 - (xi) The silicon oxygen ratio in sillimanite is
 - (xii) Coesite is a polymorph of
 - (xiii) Olivine is a silicate.
 - (xiv) Muscovite is characterized by order of interference colour.
 - (xv) Pyrite is an ore of
4. (a) In reference to a crystal face, we make use of reference axes, *i.e.*, x, y, z and a, b, c. What are their interrelationships ?
- (b) What is the importance of radius ratio of ions ? Give suitable examples. 8+7=15
5. (a) Comment on the nature of light and phenomena of refraction, reflection and polarization of light. Illustrate with suitable examples.

(b) Define the following with neat sketches :

Unit cell

Space lattice 10+5=15

6. (a) What are X-rays ? How are they generated ? Derive the Bragg's law using suitable diagram.

(b) Describe with suitable sketches how the co-ordination of ions effect the mineral stability. 10+5=15

7. Answer the following : 5+10=15

(a) Theorize the phenomenon of total reflection.

(b) Describe the nature of light waves through a nicol prism.

8. What is the difference between the following ? Illustrate with sketches : 3×5=15

(a) Crystal form and crystal habit

(b) Uniaxial wave surface and Uniaxial indicatrix

(c) Uniaxial minerals and Biaxial minerals.