

This question paper contains 4 printed pages]

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S. No. of Question Paper : 7826

Unique Paper Code : 2191102

F-1

Name of the Paper : Crystallography and Mineralogy

Name of the Course : B.Sc. (Hons.) (Geology) [DC-1.2]

Semester : I

Duration : 3 Hours

Maximum Marks : 75

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

Attempt any Five questions.

All questions carry equal marks.

1. The 32 crystal classes can be grouped into 6 crystal systems : 15

(i) What is a crystallographic axis ?

(ii) Name the six crystal system. Describe them by giving the relative lengths of each axis and the angles between the axes.

(iii) One system has a sub-system. Describe the sub-system and how it differs from the system.

P.T.O.

2. (i) Write a detailed account on the structural classification of silicates with examples and free hand sketches of each structure type. 15
- (ii) Write a note on hcp and ccp structure types and elaborate the concept of radius ratio in determining co-ordination number.
3. Briefly describe the following and illustrate with sketches wherever needed : 3×5=15
- (i) Uniaxial indicatrix
- (ii) Bonding in minerals
- (iii) Elements of symmetry
- (iv) Space lattices
- (v) Screw axis and glide plane.
4. Explain the following : 3×5=15
- (a) Crystal parameters and indices
- (b) Crystal zones
- (c) Pauling's co-ordination principles.
5. Answer the following : 15
- (i) Indicate which crystal system corresponds to each point group 1, 432, 2/m, 4 mm, 622, 6 mm.

(ii) Name one ore sulfide mineral for each of the following metals :

Zn, Cu, Fe, Ni.

(iii) Name the polymorphs of Quartz, calcite, kyanite.

(iv) Name the crystal system in which the following minerals crystallize :

olivine, albite, hornblende, biotite, diopside, quartz.

(v) Name *three* isotropic and *three* anisotropic minerals.

6. Fill up the gaps :

15

(i) When the phase difference between light rays is interference colour is produced.

(ii) A mineral section cut perpendicular to optic axis will show interference figure.

(iii) When the extraordinary ray is faster in a uniaxial mineral the mineral is optically

(iv) Almandine garnet crystallizes in system.

(v) In uniaxial minerals, extraordinary ray will vibrate in a plane parallel to

(vi) Monoclinic crystals have axes of length.

(vii) The silicon to oxygen ratio in plagioclase feldspars is

(viii) A glide plane is a combination of

- (ix) An anisotropic biaxial mineral has optic axis/axes.
- (x) Calcite shows set/sets of cleavage.
- (xi) Andalusite crystallizes in system.
- (xii) Muscovite is a silicate.
- (xiii) Cubic close packed coordination occurs when ions are stacked in a configuration.
- (xiv) The indicatrix of a biaxial negative mineral is
- (xv) Iron cross is an example of twinning.
7. (i) What are X-rays ? How are they generated ? Derive Bragg's law using suitable diagram. Explain its utility in crystallographic studies.
- (ii) What do you understand by polarization of light ? How ordinary light can be polarized ? 15
8. (i) Analyze the behaviour of two light rays vibrating in the same plane but with different frequencies.
- (ii) Explain the application of the principles mentioned above in construction of polarizing microscopes. 15