

① P.P. Code. 63691

Paper Code - 79527

ANSWER KEY
S.Y.B.Sc

1A Duration: 3hrs
max marks: 100

NB: Draw neat sketches wherever necessary.

Fill in the blanks:

- i. Cube is a form bounded by six similar square faces.
- ii. Seven planes of symmetry are present in normal class type Beryl of Hexagonal system.
- iii. In monoclinic system the inclined axis a is termed as the clin-axis.
- iv. In axial conventions of crystallography the axis c is vertical and runs from top to bottom.
- v. Drawings of crystals are made on axial cross in clinographic projections.
- vi. In the expression $2d \sin\theta = n\lambda$, everything is known except for d .
- vii. An octahedron has a general Miller indices of (111) .
- viii. In the stereographic projection the axis normal to the plane of projection is Pole.
- ix. A triclinic normal class crystal has only centre of symmetry.
- x. When a crystal inverts from one polymorph to another the atomic displacement induces transformation twin.

1B Define the following:

- i) Stereographic projection is a method used in crystallography and structural geology to depict the angular relationships between crystal faces and geologic structures, respectively. In order to make plotting of the stereographic projection easier, a device called a stereographic net or stereonet is used.
- ii) not bounded by all similar faces eg. prism. Closed forms bounded by similar faces eg. octahedron
- iii) Twin plane and composition plane.
Because symmetry is added to a crystal by twinning, twinning can be defined by the symmetry operations that are involved. These include:

Reflection across a mirror plane. The added mirror plane would then be called a twin plane.

The surface along which the lattice points are shared in twinned crystals is called a composition surface

- iv) Continuous spectra and characteristic spectra of x-ray.
Continuous X-ray spectra : It consists of radiations of all possible wavelengths, from a certain lower limit to higher values continuously, as in the case of visible light. Origin - Continuous X-ray spectra : X-rays are produced, when high velocity electrons strike the target material of high atomic number
Characteristic X-ray spectrum: This part consists of distinct spectral lines in the form of small groups superimposed on the continuous

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spectrum. This part of the spectrum is characteristic of the target.

- v) Dome form and Prism form
- DOME - two non parallel faces related by mirror plane symmetry
- Prism - A group of similar faces of 3,4,6,8,12 parallel to the vertical axis.

2 - Answer any two of the following:

- i) Define the term axial ratio. Explain the procedure used for calculations of axial ratios.
Definition and Explanation to determine axial ratio. Example : Tetragonal a:c. Orthorombic a:b:c.
 - ii) Describe graphical symbol used in stereographic illustration.
bubble 2 fold, Triangle - 3 fold, \square - 4 fold
 - iii) \diamond - 2 fold, --- - Plane of symmetry
 - iii) Describe different elements of symmetry in crystals.
 - iv) Explain with neat sketch, On what basis crystals are classified, illustrate with neat sketch
- 14 crystal systems and orientations.
- Seven systems and point groups.

B3- 1. Definition of forms.
CUBIC, OCTAHEDRON, DODECAHEDRON, TETRAHEDRA
HEDRON, TRIOCTAHEDRON, HEXOCTAHEDRON
TRAPEZOHEDRON.

2. $a \neq b \neq c$, All are perpendicular to each other.
Three classes and its symmetry elements.

3. 48 forms. List down the forms of Tetragonal system.

4. $1A^{(u)}$, $7P$, $6A^{(i)}$, C .
HM symbol - $6/m$ $2/m$ $2/m$.

4 a) 3 types of origin.
1) Growth twin, 2. Transformation twin
Deformation twin.

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iii) polysynthetite - by Albité law
parallel to 010 plane in plagioclase
crystals bed. ~~001~~ form a penetration twin
in orthoclase.
Baveno - (021) form a contact twin in
orthoclase.

iii) X-Ray, origin, $n\lambda = 2d \sin \theta$
Application in determining d-space.
Explain the procedure.

iv) Clay minerals study under x-ray is not feasible so x-ray give d space data in determining the mineral species.

- 5) i) Explain 14 Bravais Lattice.
ii) centre of symmetry explain T.M.M.
iii) octahedron & faces belongs to hexahedron.
Trigonal bipyramid belongs to trigonal system.
iv) Symmetry of both has to be explained.
v) H.M.L. for T-system $n.c.s.a. = 4/m \ 2/m \ 2/m$
vi) Brazil Law
Dauphine Law
Japanese Law in orthoclase.
vii) Microcline shows (010) habit twin
Albité Law + Pericline Law.