CYL 729 Tutorial III (2011- 2012 Sem II) Prof A K Ganguli : Course Coordinator

Symmetry / Crystallography

1. Give the Schoenflies and Hermann-Mauguin notation for the point group having 2-fold rotation and (a) mirror plane containing the 2-fold axis and (b) mirror plane perpendicular to the axis.

2. Draw two objects or molecules which have the above point groups.

3. Write down the matrices for (a) reflection on xz plane (b) inversion operation (c) rotation along the z-axis by 60deg .

4. Define a point group (crystal class) . How many point groups exist ?

5. Give the total number of possible crystal systems and Bravais lattices.

6. Draw the Bravais lattices of the orthorhombic crystal system.

7. What is a Laue group ? How many are possible?

9. Draw the stereographic projections of the following crystal systems(point groups)
(a) mmm (b) 2/m (c) 222 (D) 3m

10. Show that a F-centered tetragonal cell does not exist.

11. Starting from the coordinates (x,y,z) find the resulting corrdinates obtained after a 2_1 screw operation (along c-axis) followed by a b-glide on the yz plane.

12. What are the restriction on the parameters of a Monoclinic unit cell?

13. Which crystal system has a four-fold symmetry?

14.Explain (a) 2_1 screw axis and (b) c - glide with suitable diagrams.

15. A unit cell has the following parameters , a = 4 Å, b = 12 Å and c = 16 Å, $\alpha = \beta =$ 90deg and γ = 120deg.
a) Determine the parameters of the reciprocal cell.
Find the volume of the real cell and the reciprocal cell.

16, Calculate the reciprocal lattice parameters for a tetragonal cell with the real lattice parameters of a = 2, and b = 5 A.

17. Calculate the reciprocal lattice parameters of a cubic cell with a = 5, b = 4 and c = 3 Å.

18. If Na ions are at the corners of the unit cell of NaCl what is the composition of the (002) plane.

19. Given a lattice, explain how Brillouin Zones are obtained.