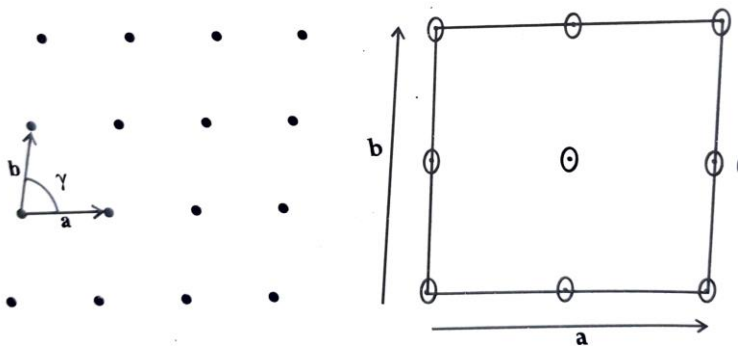
Practice Problems Set –2

PH30204/ PH41014

Condensed Matter Physics

Q1) The planar projection (on the a-b plane) of a monoclinic lattice is a planar lattice as show below in the left figure. The various symmetry operations of the planar lattice is also marked on the right figure (with each lattice point having a two-fold rotational symmetry) –



Similarly, identify and properly mark the various symmetry operations of the planar projection (on the a-b plane) of an orthorhombic lattice.

Q2) Lead has a FCC structure with cell edge "a". The radius (r) of the atoms is 0.174 nm. If the atomic balls touch along the face diagonal, i.e. $\sqrt{2}a = 4r$, find the atomic density (per cm^{-3}) of Lead.

Q3) Sketch part of a simple cubic crystal and indicate on it the (100) and (101) planes. For such a crystal of spherical atoms of radius a nm and unit-cell size $2a$ nm, calculate the interplanar spacing for each plane and also the areal density (atoms/m^2) on each of these planes.