

Please return by Monday 1.2.2010 12:00 to the designated box in the entrance to the teaching laboratories (Physicum 2nd floor). The exercise session will be held at Physicum D115 on the same day at 16:15.

1. Determine the packing fraction for close packing of hard spheres in the
  - (a) simple cubic
  - (b) face-centered cubic
  - (c) body-centered cubic
  - (d) diamondcrystal structures.
2. Determine the ratio  $c/a$  for hexagonal close packing of hard spheres.
3. Determine the angle between any two of the lines joining a site of the diamond lattice to its four nearest neighbors.
4. Show that the reciprocal lattice of the face-centered cubic lattice is body-centered cubic.
5. Show that the reciprocal lattice vector  $\mathbf{v} = h\mathbf{a}^* + k\mathbf{b}^* + l\mathbf{c}^*$  is normal to the  $(hkl)$  plane for a general lattice with primitive vectors  $\mathbf{a}$ ,  $\mathbf{b}$ ,  $\mathbf{c}$ .

You can contact the the teaching assistant by e-mailing [tuomas.pylkkanen@helsinki.fi](mailto:tuomas.pylkkanen@helsinki.fi)