## The hexagonal and face centered cubic arrangement

## Formation of first layer:

In this arrangement, the first layer is formed by arranging the spheres as in the case of two dimensional ABAB arrangements i.e. the spheres of second row fit into the depression of first row.



## Formation of second layer:

In the first layer (a) there are two types of voids (or holes) and they are designated as x and y. The second layer (b) can be formed by placing the spheres either on the depression (voids/holes) x (or) on y.

let us consider the formation of second layer by placing the spheres on the depression (x).



## Formation of third layer:

The third layer of spheres can be formed in two ways to achieve closest packing

- (i) aba arrangement hcp structure
- (ii) abc arrangement ccp structure

The spheres can be arranged so as to fit into the depression in such a way that the third layer is directly over a first layer as shown in the figure. This "aba" arrangement is known as the hexagonal close packed (hcp) arrangement. In this arrangement, the tetrahedral voids of the second layer are covered by the spheres of the third layer.



aba arrangement - hcp structure



abc arrangement – ccp structure