CHAPTER I
THE CRYSTALLINE STATE

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Unit cell: The lattice array of a group of atoms is just a periodic repetition of fundamental grouping.

Any integral multiple of vectors $a, b$ and $c$ reproduce a similar region of a crystal, called as unit cell.

It is a basic building of any crystal structure.

It is a parallelepiped formed by above three non coplanar vectors.

It possesses all the structural properties of bulk crystal.
UNIT CELL PARAMETERS

➢ Primitive vectors a,b,c defines the lengths of three edges of the unit cell and represent the crystallographic axes, X, Y and Z respectively.

➢ Each edge of unit cell is the distance between the atoms of the same kinds and called as lattice constant.

➢ The angle formed between the edges b and c is denoted by \( \alpha \), between a and c, \( \beta \) and between a and b as \( \Upsilon \).

➢ These 3 angles are call as interfacial or interaxial angles and represented as \( \alpha \), \( \beta \), \( \Upsilon \).

➢ These 3 edges and 3 angle are called as lattice parameters.

➢ Unit cell has six lattice parameters.

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1. Primitive unit cell
2. Non-primitive unit cell

1. **Primitive unit cell**: It contains only one lattice point or atoms are located only at 8 corners of the unit cell.
2. Non-primitive unit cell: It contains more than one lattice points or it has atoms located at the corners of unit cell also extra atoms are located in the interior of unit cell.
1. Body centered unit cell (I) :
2. Base centered unit cell (C):
3. Face centered unit cell (F):

1. **Body centered unit cell (I):**

It has atoms at the 8 corners of it and there is one extra atom situated at the centre of body.
2. BASE CENTERED UNIT CELL:

➢ It has 8 atoms at the 8 corners of it and 2 extra atoms at the base of each base of it.
3. Face centered unit cell:
It has 8 atoms at the 8 corners of unit cell and 6 extra atoms located at the centre of each face of it.