Class ⇒ B.Sc. (Part-I) Subsidiary
Subject ⇒ Chemistry
Chapter ⇒ Solid state
Topic ⇒ Unit cell and their types
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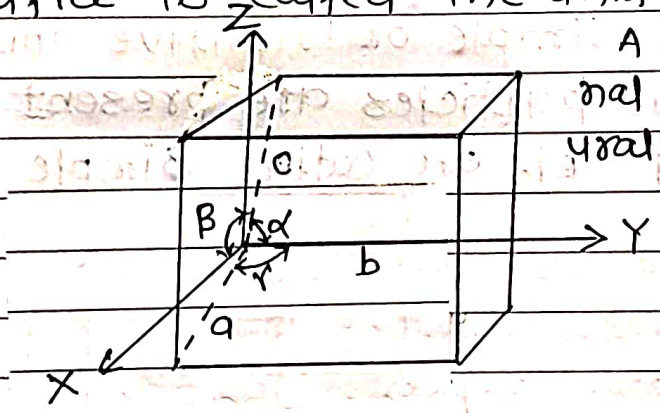
Unit cell

The smallest portion of the complete space lattice, which when repeated over and over again in different directions produces the complete space lattice is called the unit cell. OR



A small three-dimensional representative structural subunit of the lattice is called unit cell.

Characteristics of unit cell

(i) The size of the unit cell is defined using lattice parameters. (also called lattice constants or cell parameters.)

(ii) These are the relative dimensions of the three edges a, b, c of the unit cell along the three axes and the angle between these edges are given by α (angle between b and c), β (angle between a and c) and γ (angle between a and b).

(iii) The position of the atoms in the unit cell is defined by its co-ordinates (x, y, z) along the crystallographic axes.

Date:

Parameters of unit cell

There are six parameters of unit cell namely a, b, c and α, β, γ.

(i) Relative lengths of the edges along the three axes (a, b, c).

(ii) The three angles between the edges (α, β, γ).

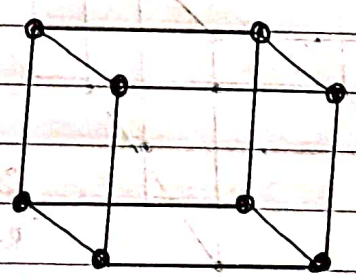
Types of unit cell

unit cell can be divided into four types.

(i) Simple or Primitive unit cell
(ii) Body-Centered unit cell
(iii) Face-centered unit cell
(iv) End-Centered unit cell.

(i) Simple or Primitive unit cell

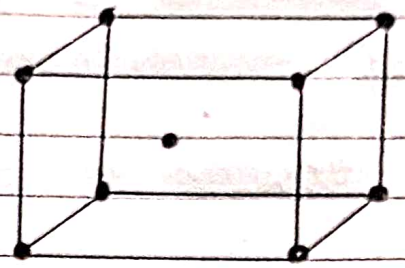
When the particles are present only at the Corners of the unit cell are called simple or primitive unit cell.



This type of unit cell include seven crystal systems namely cubic, tetragonal, orthorhombic, hexagonal, Rhombohedral, monoclinic and triclinic.

(ii) Body-Centered unit cell

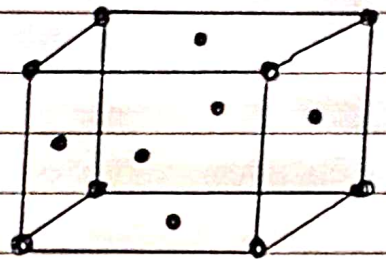
When the particles are present at the centres of the unit cell in addition to the Corners are Called Body-centered unit cell.



The crystal systems with this type of unit cell include cubic, tetragonal and orthorhombic.

(iii) Face-Centered unit cell

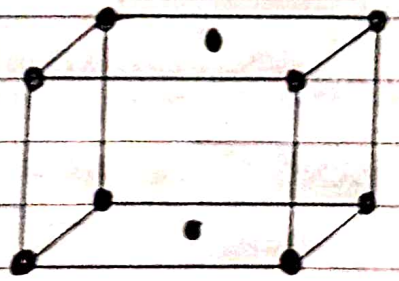
When the particles are present at the centre of each face in addition to the corners are called face-centered unit cell.



The crystal systems with this type of unit cell include cubic and orthorhombic.

(iv) End-Centered unit cell

When the particles are present at the centre of diagonal joining the nearest neighbors at one set of faces (opposite faces) in addition to the corners are called end-centered unit cell.



The crystal system of this type of unit cell include orthorhombic and monoclinic