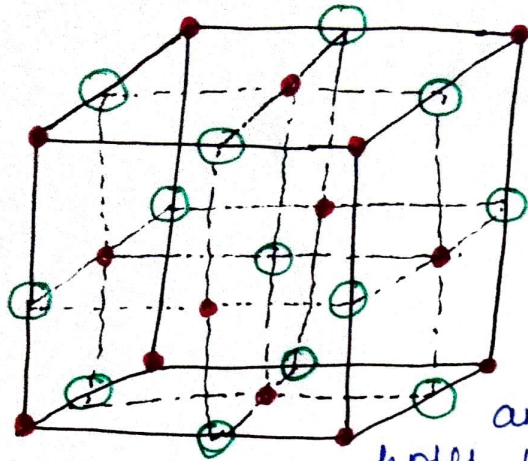


○ Na  
○ Cl

## Crystal structure of NaCl



→ The structure of NaCl is based on f.c.c. array of bulky anions in which cations occupy all the octahedral holes.

→ Alternatively the structure can be deemed as anions occupying the octahedral holes with f.c.c. array of cations.

- Each ion is surrounded by 6 counter ions at octahedron.
- The coordination number of each type of ion is 6 and structure is referred as (6:6) coordination. The first number in parenthesis is the coordination number of cation and second number is anions.

To determine the number of ions of each type in a unit cell, the following rules should be borne in mind:-

- An ion in the body of a unit cell belongs entirely to that unit cell and counts as 1.
- An ion in a face is shared by two unit cells and contributes  $\frac{1}{2}$  to unit cell in question.
- An ion on an edge is shared by 4 ~~eight~~ unit cells and thus contributes  $\frac{1}{4}$ .
- An ion at a vertex is shared by 8 unit cells and so contributes  $\frac{1}{8}$ .

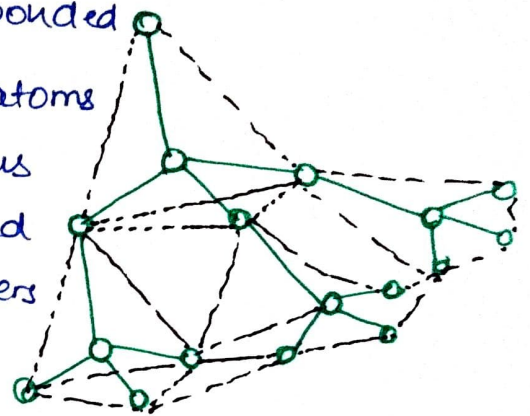
NaCl has rock-salt structure and there is 4 NaCl formula units.

→ Structure of KCl is similar to the NaCl.

Q. Draw ZnS structure (Zinc Blende and Wurtzite) and mail on ankitaajha26@gmail.com.

→ Covalent crystal (case study of diamonds)

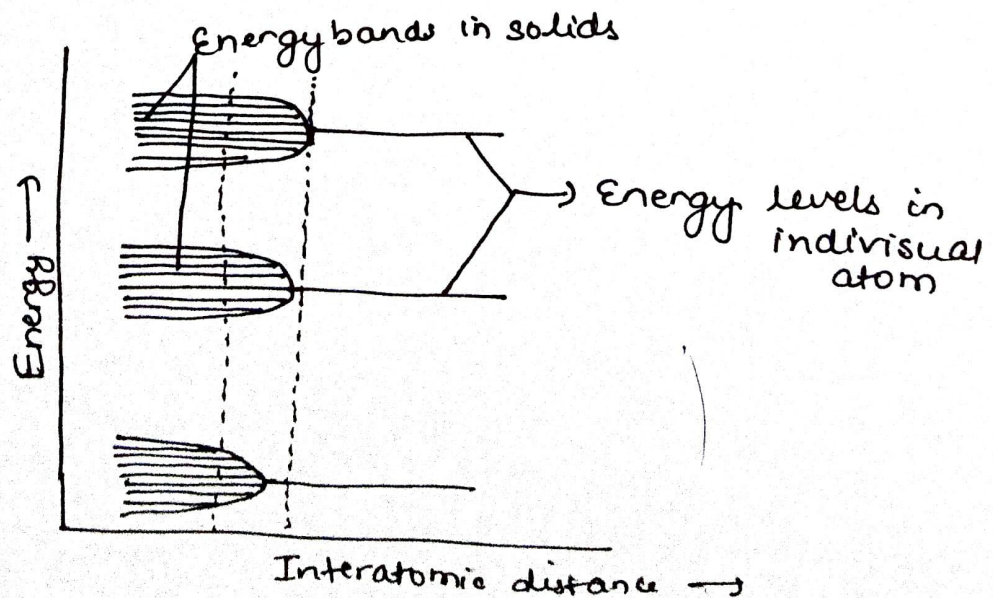
Each carbon atom is covalently bonded by sharing of electrons to four atoms involving  $sp^3$  hybridization. Thus each carbon atom is surrounded by four others at four corners of regular tetrahedron.



This gives reason why diamond is hardest structure known with high density and melting point.

The entire structure is regarded as one large carbon molecule and is called a macromolecule.

Energy Band Theory of Conductors, Semiconductors and Insulators:-

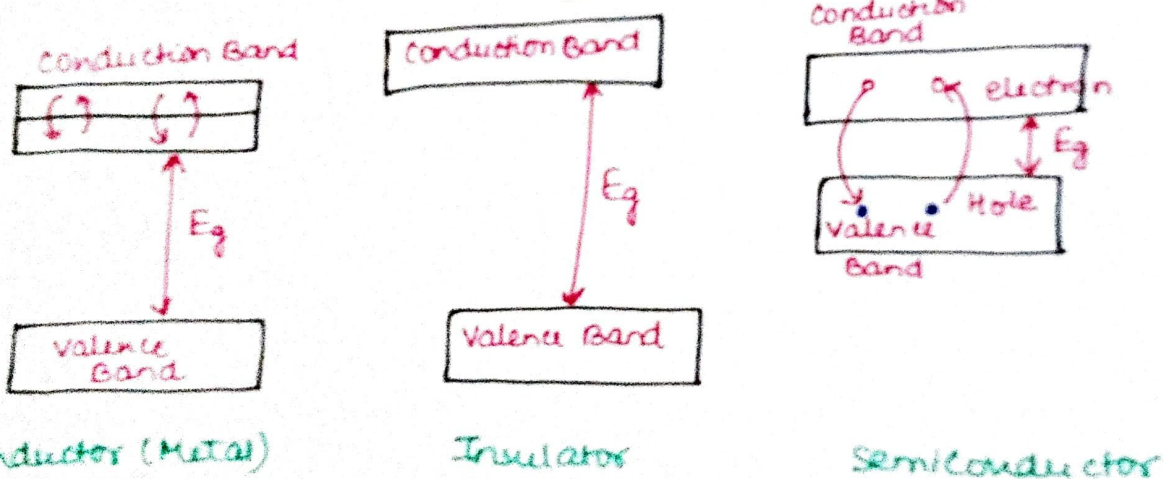


The basic difference between conductors, semiconductors and insulators lie in the number of free electrons present in the material.

This difference can be best understood on the basis of band theory of solids.

Since the energy levels are quantized, the energy levels of electrons form a series which can be grouped into band.

The difference of energy between the energy levels within a band is very small compared with the energy gap between the bands. The energy band diagram of conductor, semiconductors and insulators ~~can~~ can be given as:-



Conductor: In a conductor (such as a metal), the valence band (V.B.) is full of electrons while the conduction band (C.B.) is only partly filled. Only a small amount of energy suffices to allow electrons to move within the conduction band, some rising to higher energy level and others returning to lower energy level.