

The Solid State

A substance is said to be in the solid state if its melting point is above the room temperature under atmospheric pressure. Characteristic of solid state-

- They have definite mass, volume and shape.
- Intermolecular distances are short.
- Intermolecular forces are strong.
- Their constituent particles (atoms, molecules or ions) have fixed positions and can only oscillate about their mean positions.
- They are incompressible and rigid.

Classification of solids.

Crystalline

- Definite characteristic geometrical shape.
- Sharp melting point.
- Clean cleavage when cut.
- Definite heat of fusion.
- Long order arrangement.
- Anisotropic in nature.
ie. their physical properties are different in different directions.
- True solids.
- Ex: ~~Zn~~ NaCl, LiCl etc.

Amorphous

- Irregular shape.
- Gradually soften.
- Irregular change.
- No definite heat of fusion.
- Short order arrangement.
- Isotropic in nature.
ie. their physical properties are same in all directions.
- Super-cooled liquids or pseudo solids.
Ex: Glass, rubber etc.

Classification of crystalline solids.

<p>Ionic solids</p> <p>a) Salt Ions as constituent particles</p> <p>b) Coulombic or electrostatic bonding.</p> <p>c) Hard but brittle in nature.</p> <p>d) High mp.</p> <p>e) Insulators in solid state but conductors in molten state and aqueous solutions.</p> <p>f) Ex: NaCl, ZnS.</p>	<p>Covalent solids</p> <p>a) Atoms as constituent particles</p> <p>b) Covalent bonding</p> <p>c) Hard, soft in nature.</p> <p>d) Very high mp.</p> <p>e) Generally insulators but Graphite is conductor. (exception)</p> <p>f) Ex: SiO₂, SiC, C (Diamond, Graphite).</p>	<p>Molecular solids</p> <p>a) Molecules as constituent particles</p> <p>b) Classified in 3 parts.</p> <p>i) <u>Non-polar</u> → Dispersion or London forces.</p> <p>ii) <u>Polar</u> → Dipole-dipole interactions.</p> <p>iii) <u>Hydrogen bonded</u> - Hydrogen bonding.</p> <p>c) Soft, Hard in nature.</p> <p>d) low to very low mp.</p> <p>e) Insulators</p> <p>f) Ar, H₂, I₂ etc.</p>	<p>Metallic solids.</p> <p>a) Positive ions in a sea of delocalised δ electrons as constituent particles.</p> <p>b) Metallic bonding.</p> <p>c) Hard but malleable and ductile.</p> <p>d) Fairly high mp.</p> <p>e) Conductors in solid state as well as in molten state.</p> <p>f) Fe, Cu, Ag.</p>