

1. SOLID STATE

IMPORTANT POINTS

- Solids** have **definite mass, volume and shape**. This is due to strong interactions and short distances among their constituent particles.
- Solids are two types:**
 - Amorphous solids** like Plastic, Glass, Rubber can be melted, softened, moulded over a low range of temperatures. Their constituent particles have
 - irregular geometrical structures
 - short range ordered patterns.
 - Crystalline solids** like Quartz, Diamond, NaCl are rigid. Their constituent particles have
 - regular geometrical structures
 - long range ordered patterns.
 Crystalline solids are divided into molecular, ionic, metallic and covalent solids.
- Crystal lattice** is the regular and repeating pattern of constituent particles in three dimensional arrangement. Altogether there are 14 possible lattices called **Bravais Lattices**.
- Unit cell** is the smallest portion of a crystal lattice which, when repeated in three dimensions, generates the entire crystal lattice. A unit cell has
 - 3 edges a,b,c
 - 3 angles α, β, γ between those edges.
- Coordination number** of an atom is the number of nearest neighbours [atoms (or) ions] that a central atom holds in the unit cell of the crystal.
- Packing Structures:** The metal atoms are spherical and the structures of metallic elements are described in terms of **packing structures** of spheres in space.
 - Simple cubic arrangement:** Coordination number is 6.
Ex: Polonium (Po)
 - Body centered cubic (bcc) structure:** Coordination number is 8
Ex: Na, K Rb, Cs, Cr, Mo, W
 - Hexagonal close packed (hcp) structure:** Arrangement is AB AB AB.... type
Coordination number is 12.
Ex: Be, Mg, Cd, Co, Zn
 - Face centered cubic (fcc) structure:** Arrangement is ABC ABC ABC....type
Coordination number is 12.
Ex: Al, Cu, Au, Pb, Pd, Ni and Ca.
- Point Defect** in a crystalline structure is a **deviation** from the **ideal arrangement** around a point or an atom.
- Bragg's equation** : $n\lambda = 2d \sin\theta$

Our Daily LIFE

CHEM BEATS!

- Chemistry of our Daily Life: Solid Food + Liquid Water + Gaseous Oxygen!**
 - మాంచి జబర్దస్టు బాడీ ఉన్న వాడిని చూస్తే వీడు 'మస్టు సాలిడ్' భయ్యా అంటుంటాం కదా!
 - So, **Solid** అనే పదాన్ని వాడుక భాషలో 'గట్టిగా, స్ట్రాంగ్గా' ఉండే దానికి వాడుతుంటాం.
 - Body in the Childhood is like **Amorphous Solid**(Tender) and at the Middle age it's like **Crystalline Solid**(Rigid).
 - Unit Cell** is just like a **Brick** of a Building.
 - ఎక్స్‌సైజ్ బాడీలను **SIX Pack, EIGHT Pack** అంటారు కదా!
 - అలాగే **Crystal Solids** లోని **Atoms** యొక్క **Coordination Number** ప్రకారం వాటిని **Simple Cubic, hcp, bcc, fcc.....** అని **Classify** చేశారు.
- Man's Solid Body** \rightleftharpoons Solid Body with **Liquid Blood** \rightleftharpoons Liquid Blood Cells with **Gaseous Oxygen**.

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CHEM BEATS!

In 1914, experimental Physicist **W.H. Bragg** observed a phenomenon that when **X-ray beams** are passed through a **crystal**, a pattern of **bright & dark spots** are seen on the screen placed opposite to it.



Father W.H. Bragg asked his **Son W.L. Bragg (Theoretical Physicist)** to find a possible reason for that phenomenon. Son W.L.Bragg took it as a challenge, worked on it and finally **succeeded** to prove the **Bragg's law of X-Ray Diffraction (XRD)**. They both were awarded **Noble Prize** for this work in **1915**. Thus, **Sir William Lawrence Bragg** at the age of **just 25 years** became the **Youngest Noble Prize Laureate** in Physics.

Hatsoff to BRAGG Pair

BABY BULLET-Q