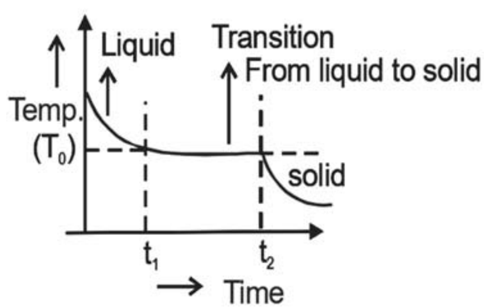
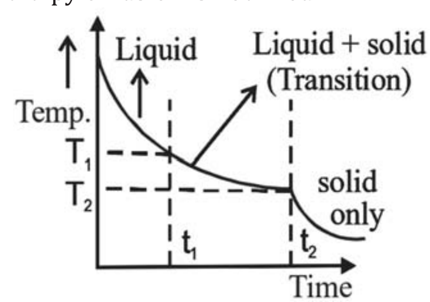
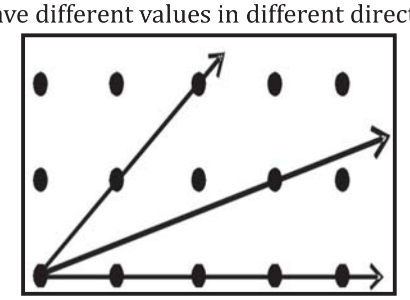
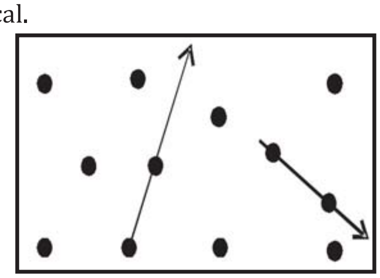
AMORPHOUS AND CRYSTALLINE SOLIDS

<table>
<tr><th>S.NO.</th><th>Crystalline Solid</th><th>S.NO.</th><th>Amorphous Solids</th></tr>
<tr><td></td><td>True Solid</td><td></td><td>Pseudo solids, super cooled
between solid & liquid]</td></tr>
<tr><td>1</td><td>The constituent practical (atoms, molecule, ion) follows a definite repetition arrangement.</td><td>1</td><td>No particular pattern is followed practical are random arranged</td></tr>
<tr><td>2</td><td>These are produced by slow cooling under controlled condition of liquid. The crystalline structure is also dependent on conditions.
Same substance can have different crystalline structure in different condition. Different crystalline structure of the same substance are called its polymorphic forms & this is known as polymorphism.</td><td>2</td><td>Rapid or suddenly cooling of the liquid generate the amorphous solid.</td></tr>
<tr><td>3</td><td>These have fixed or sharp melting point and enthalpy of fusion.
Cooling Curve:

</td><td>3</td><td>These have a range of temperature in which they melts as. There melting point and enthalpy of fusion is not fixed.

</td></tr>
<tr><td>4</td><td>These are anisotropic: Physical properties will have different values in different direction.

Ex. : Ag, Fe, Cu, NaCl, H O (s), Dimond,Quartz, Sucrose (Sugar)</td><td>4</td><td>These are isotropic: All different physical properties are same in all different direction.
Reason: Due to random arrangement of practical.

Ex. : Glass, Plastic, Amorphous silica, Rubber, Starch.</td></tr>
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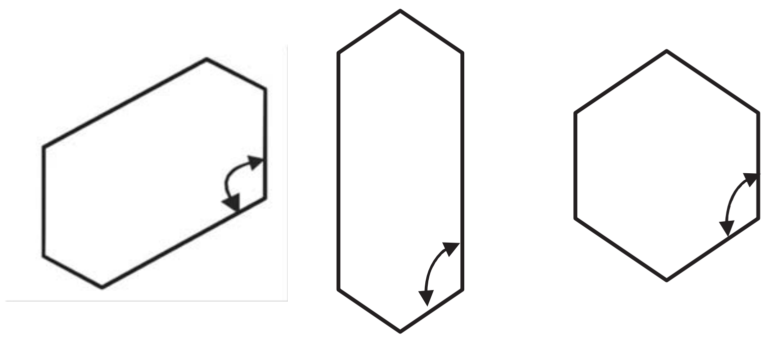
Crystalline Solid and its Characteristics

"A crystal is a solid composed of atoms (ions or molecules) arranged in an orderly repetitive array." Most naturally occurring solids exhibit recognizable crystalline shapes, often in large sizes. This is attributed to their slow formation, providing particles with ample time to assume proper positions within the crystal structure. Some crystalline solids, although appearing small and amorphous, reveal distinct crystalline shapes under careful examination with a powerful microscope, categorizing them as microcrystalline solids.

The crystallinity of a crystal is defined as "a condition of matter resulting from an orderly, cohesive, three-dimensional arrangement of its component particles (atoms, ions, or molecules) in space." This three-dimensional arrangement is known as a crystal lattice or space lattice, with the occupied positions termed lattice sites or lattice points. The lattices are bounded by surfaces, typically planar, known as faces of the crystal.

"The smallest geometrical position of the crystal, serving as a repetitive unit to construct the entire crystal, is called a unit cell." The angle between the two perpendiculars to intersecting faces is referred to as the interfacial angle, which may be the same as the angle between the edges of the unit cell. A goniometer is employed to measure the interfacial angle. It's crucial to note that the interfacial angle of a substance remains constant, even if its shape differs due to varying formation conditions.



Interfacial angles of crystal

Amorphous Solid and its Characteristics

Amorphous solids are characterized by the absence of a specific order in the arrangement of their particles, lacking the overall structure associated with a crystal lattice. The term 'amorphous,' derived from its Greek roots, roughly translates to "without form." This category encompasses various substances, and many polymers fall under the classification of amorphous solids. Notable examples include glass, gels, and nanostructured materials.

In contrast to an ideal crystal, which is defined by an atomic arrangement featuring infinite translational symmetry in all three dimensions, an ideal amorphous solid (a-solid) lacks a precise definition. The inherent disorder in the arrangement of particles distinguishes amorphous solids from their crystalline counterparts, leading to distinct properties and behaviors. The term "amorphous" encapsulates the diverse range of materials that exhibit this lack of long-range order in their structural organization.