

SOLID STATE



Solid State Class 1

Q1.1 :

Why are solids rigid?

Solution :

The intermolecular forces of attraction that are present in solids are very strong. The constituent particles of solids cannot move from their positions i.e., they have fixed positions. However, they can oscillate about their mean positions. This is the reason solids are rigid.

Q1.2 :

Why do solids have a definite volume?

Solution :

The intermolecular forces of attraction that are present in solids are very strong. The constituent particles of solids have fixed positions i.e., they are rigid. Hence, solids have a definite volume.

Q1.3 :

Classify the following as amorphous or crystalline solids:

Polyurethane, naphthalene, benzoic acid, teflon, potassium nitrate, cellophane, polyvinyl chloride, fibre glass, copper.

Solution :

Amorphous solids

Polyurethane, teflon, cellophane, polyvinyl chloride, fibre glass

Crystalline solids

Naphthalene, benzoic acid, potassium nitrate, copper

Q1.4 :

Why is glass considered a super cooled liquid?

Solution :

Similar to liquids, glass has a tendency to flow, though very slowly. Therefore, glass is considered as a super cooled liquid. This is the reason that glass windows and doors are slightly thicker at the bottom than at the top.

Q1.5 :

Refractive index of a solid is observed to have the same value along all directions. Comment on the nature of this solid. Would it show cleavage property?

Solution :

An isotropic solid has the same value of physical properties when measured along different directions. Therefore, the given solid, having the same value of refractive index along all directions, is isotropic in nature. Hence, the solid is an amorphous solid.

When an amorphous solid is cut with a sharp edged tool, it cuts into two pieces with irregular surfaces.

Q1.1 :

Define the term 'amorphous'. Give a few examples of amorphous solids.

Solution :

Amorphous solids are the solids whose constituent particles are of irregular shapes and have short range order. These solids are isotropic in nature and melt over a range of temperature. Therefore, amorphous solids are sometimes called pseudo solids or super cooled liquids. They do not have definite heat of fusion. When cut with a sharp-edged tool, they cut into two pieces with irregular surfaces. Examples of amorphous solids include glass, rubber, and plastic.

Q1.2 :

What makes a glass different from a solid such as quartz? Under what conditions could quartz be converted into glass?

Solution :

The arrangement of the constituent particles makes glass different from quartz. In glass, the constituent particles have short range order, but in quartz, the constituent particles have both long range and short range orders.

Quartz can be converted into glass by heating and then cooling it rapidly.