

# Unit 6-SOLID STATE

## Learning Objectives

After studying this unit, the students will be able to

- ❖ Describe general characteristics of solids
- ❖ Distinguish amorphous and crystalline solids
- ❖ Define unit cell
- ❖ Describe different types of voids and close packed structures
- ❖ Calculate the packing efficiency of different types of cubic unit cell
- ❖ Solve numerical problems involving unit cell dimensions
- ❖ Explain point defects in solids

## Important Notes and Points

- ❖ Graphite is used inside pencils. It slips easily off the pencil onto the paper and leaves a blackmark. Graphite is also a component of many lubricants, for example bicycle chain oil, because it is slippery.

- ❖ Of all the metals in the periodic table, only polonium crystallizes in simple cubic pattern.
- ❖ The number of voids depends on the number of close packed spheres. If the number of close packed spheres be 'n' then, the number of octahedral voids generated is equal to n and the number of tetrahedral voids generated is equal to 2n.

- ❖ **Energy harvesting by piezoelectric crystals:**

Piezoelectricity (also called the piezoelectric effect) is the appearance of an electrical potential across the sides of a crystal when you subject it to mechanical stress. The word piezoelectricity means electricity resulting from pressure and latent heat. Even the inverse is possible which is known as inverse piezoelectric effect.

- ❖ If you can make a little amount of electricity by pressing one piezoelectric crystal once, could you make a significant amount by pressing many crystals over and over again? What happens if we bury piezoelectric crystals under streets to capture energy as vehicles pass by?

This idea, known as energy harvesting, has caught many people's interest. Even though there are limitations for the large-scale applications, you can produce electricity that is enough to charge your mobile phones by just walking. There are power generating footwears that has a slip-on insole with piezoelectric crystals that can produce enough electricity to charge batteries/ USB devices.