

## Chapter 12 Intermolecular Forces: Liquids, Solids, and Phase Changes

Several concepts from this chapter are essential to the AP curriculum. They include: the terms “intermolecular forces” and “intramolecular forces” and the relationship between them and the different phase change processes like melting and boiling. It is important for AP students to be able to distinguish network from molecular covalent solids. Network solids have strong covalent bonds throughout the substance making it difficult to break apart.

Intermolecular forces are those between isolated, non-network, molecules. They are generally weaker forces. Therefore, the molecules which are held together by these weaker forces, tend to be liquids or gases at room temperature and will therefore have low melting and boiling points.

The stronger the intermolecular forces, the higher the boiling point. More energy must be applied to pull the molecules apart. However, **covalent bonds** are not broken during melting or boiling. **Hydrogen bonds** are a special type of dipole-dipole interaction between certain molecules and can be broken during melting or boiling.

AP content covered in this chapter includes: explanation of the trend in boiling points in groups 5A, 6A, and 7A and the difference between ionic, molecular, metallic, and covalent crystals. AP students are expected to be able to explain the properties of water and draw its structure, phase diagrams, and heating and cooling curves. They should also be able to use these curves to calculate how much energy needs to be added or removed to move up and down the curve and through phase changes. All these concepts are tested on the AP Exam.