Section Summary

11.1 Temperature and Thermal Energy

- Temperature is the quantity measured by a thermometer.
- Temperature is related to the average kinetic energy of atoms and molecules in a system.
- Absolute zero is the temperature at which there is no molecular motion.
- There are three main temperature scales: Celsius, Fahrenheit, and Kelvin.
- Temperatures on one scale can be converted into temperatures on another scale.

11.2 Heat, Specific Heat, and Heat Transfer

- Heat is thermal (internal) energy transferred due to a temperature difference.
- The transfer of heat Q that leads to a change ΔT in the temperature of a body with mass m is $Q = mc\Delta T$, where c is the specific heat of the material.
- Heat is transferred by three different methods: conduction, convection, and radiation.
- Heat conduction is the transfer of heat between two objects in direct contact with each other.
- Convection is heat transfer by the movement of mass.
- Radiation is heat transfer by electromagnetic waves.

11.3 Phase Change and Latent Heat

- Most substances have four distinct phases: solid, liquid, gas, and plasma.
- Gas is the most energetic state and solid is the least.
- During a phase change, a substance undergoes transition to a higher energy state when heat is added, or to a lower energy state when heat is removed.
- Heat is added to a substance during melting and vaporization.
- Latent heat is released by a substance during condensation and freezing.
- Phase changes occur at fixed temperatures called boiling and freezing (or melting) points for a given substance.