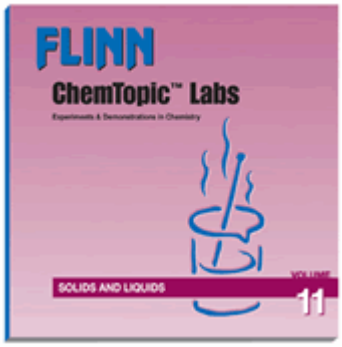
Solids and Liquids—
Experiment Summaries and Concepts



It's Just a Phase—Heating and Cooling Curves

It seems counter-intuitive—when freezing weather is predicted, orange growers spray the trees with water to protect the fruit from freezing. The water actually releases heat as it solidifies! The purpose of this experiment is to investigate the solid–liquid phase changes for lauric acid, an organic compound that is used to make soap. Students measure the heating and cooling curves for lauric acid and analyze the results to determine the melting point and the energy changes that take place when a liquid freezes or a solid melts.

Concepts
- Solids and liquids
- Phase changes
- Melting point
- Kinetic-molecular theory

Properties of Liquids—Surface Tension and Capillary Action

Water hardly seems special. It is, after all, a very common "chemical." Water is an unusual liquid, however, with unique physical properties, such as a very high surface tension. The purpose of this experiment is to observe the "forceful" effects of surface tension in water and to compare the capillary action and surface tension of water versus other liquids. Students investigate how the properties of liquids depend on the nature and strength of attractive forces between molecules.

- Properties of liquids
- Surface tension
- Capillary action
- Intermolecular forces

Vapor Pressure of Water—Effect of Temperature

Dry air in buildings and homes causes many health problems during the winter months, because the amount of water vapor in the air depends on temperature. Why does warm air hold more water than cold air? The purpose of this experiment is to determine the vapor pressure of water at different temperatures. The vapor pressure will be measured by trapping a small amount of air in an inverted graduated cylinder and then measuring how the volume of gas changes as the temperature is reduced.

- Evaporation and condensation
- Vapor pressure
- Kinetic-molecular theory
- Ideal gas law and Dalton's law

How Cool is That?—Evaporation of Liquids

The "cooling effect of evaporation" is nature's most important way of cooling not only our bodies but also the Earth. Water evaporating from the Earth's surface, for example, helps to moderate the temperature and climate around large bodies of water. How cool is evaporation? The purpose of this experiment is to measure the temperature changes that occur when different liquids evaporate and to compare their rates of evaporation. Liquids will be compared pair-wise and the results will be analyzed in terms of the strength of attractive forces between different types of molecules.

- Evaporation
- Kinetic-molecular theory
- Polar vs. nonpolar compounds
- Hydrogen bonding

Teaching with Toys—Drinking Bird and Hand Boiler

Learning is child's play! Use this inquiry-based activity to let students discover the chemical principles at work (and in play!) for two popular toys, the "Drinking Bird" and the "Hand Boiler." The drinking bird demonstrates the cooling effect of evaporation and the effect of temperature on vapor pressure, while the hand boiler is actually a distillation apparatus in disguise!

- Evaporation
- Vapor pressure
- Distillation

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