



# Achievements and Competencies

## Learning Outcomes

<b>Grades 10-12</b>
From structures to properties

Achievements and Competencies are based on the Common Framework of Science Learning Outcomes (K-12) set by the Canadian Council of Ministers of Education (1997).

## Specific Expectations

### **Grade 11 & 12**

#### CHEMISTRY

From structures to properties

321-5 Illustrate and explain hydrogen bonds and van der Waals' forces.

The secret of the bursting colors in the *Swirly Whirly Milk* activity is the chemistry of the tiny drop of soap. The dish soap, because of its bipolar characteristics, weakens the chemical bonds that hold the proteins and fats in solution. The soap's hydrophilic end hydrogen bonds and dissolves in water, while its hydrophobic end attaches to a fat globule in the milk through van der Waals' forces.

321-11 Explain the structural model of a substance in terms of the various bonds that define it.

The structural model of soap can be identified by its bonds that it forms with the fat and water molecules in the milk. The molecules of fat bend, roll, twist, and contort in all directions as the soap molecules race around to join up with the fat molecules. During all of this fat molecule gymnastics, the food coloring molecules are bumped and shoved everywhere, providing an easy way to observe all the invisible activity.