

# Chemistry 101

## Chemistry Experiments for the Home

### *Solubility of Oils*

**I. Objective:** To show that fats and oils are soluble in organic solvents, but insoluble in water and aqueous solutions.

**II. Discussion:** Materials found in plant and animal tissue that dissolve in organic solvents, but don't dissolve in water, are known as **lipids**. Fats and oils are a subclass of lipids, characterized by being composed of three fatty acids and glycerol (triglycerides). Examples of fats are butter, lard, and tallow. Examples of oils are the vegetable oils, coconut, peanut, corn, olive, and safflower. Steroids, fat-soluble vitamins, and other biological compounds are also classified as lipids.

Fats and oils are the most abundant lipids in nature. Most people are familiar with butter and vegetable oil as model examples of these compounds. A fat is solid at room temperature (about 20°C), while an oil is liquid at this temperature.

For health reasons, it is a good idea to have edible lipids make up less than 30 % of our diet. Recently, the role of lipids in the diet has received a great deal of attention due to the apparent connection of saturated fats and blood cholesterol, with arterial and other diseases. The National Cancer Institute has recommended that our consumption of fats should be reduced, since a correlation between high fat intake and some forms of cancer has been established.

In this experiment, you will test the solubility of fats and oils in a variety of solvents.

**III. Materials:** Vegetable oil (corn oil, olive oil, or peanut oil), a vitamin E capsule, butter, acetone, water, ammonia water, vinegar, soap solution, teaspoon, a small clear glass, acetone.

#### **IV. Procedure:**

Place 1 teaspoon of a vegetable oil in a small glass.

Add 5 teaspoons of acetone to the glass, and swirl the mixture. Observe if the oil dissolves. Record your observation in the Table below.

Wash the glass thoroughly with soap and water. Rinse the glass thoroughly with water, and then dry with a towel.

Repeat the solubility test on a small piece of butter and the oil in a vitamin E capsule. Record your observations in the Table.

Substance	Soluble or Insoluble in Acetone
Vegetable oil	
Butter	
Vitamin E	

Repeat steps 1-4 using ammonia water as the solvent. **Make sure your eye protection is on and you work in a well-ventilated area.**

Record your observations in the Table below.

<b>Substance</b>	<b>Soluble or Insoluble in Ammonia Water</b>
Vegetable oil	
Butter	
Vitamin E	

Repeat steps 1-4 using vinegar as the solvent.

Record your observations in the Table below.

<b>Substance</b>	<b>Soluble or Insoluble in Vinegar</b>
Vegetable oil	
Butter	
Vitamin E	

Repeat steps 1-4 using water as the solvent, and record your observations in the Table below. Add a couple of drops of dishwashing detergent. Swirl and see if the lipid dissolves. Record your observations below.

<b>Substance</b>	<b>Soluble or Insoluble in Water</b>	<b>Soluble or Insoluble in Soap Water</b>
Vegetable oil		
Butter		
Vitamin E		

**V. Questions:**

What is a solvent?

Why were the lipids soluble in some solvents, but not in others?

What did the soap do to the water-oil mixture?

Are fats and oils soluble in the same solvents?

What is the difference between a fat and an oil?

Describe the relationship of fats and oils to lipids?

Is vegetable oil chemically similar to the oil used in a car?