

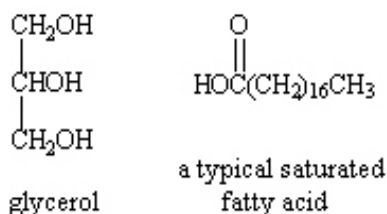
# Chemistry 101

## Chemistry Experiments for the Home

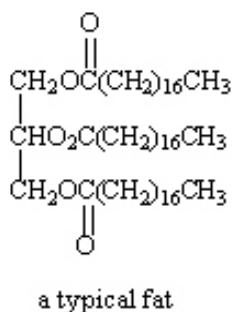
### *Saturated and Unsaturated Fats and Oils*

**I. Objective:** To understand the chemical difference between saturated and unsaturated fats and oils. To observe the reaction of saturated and unsaturated oils with iodine.

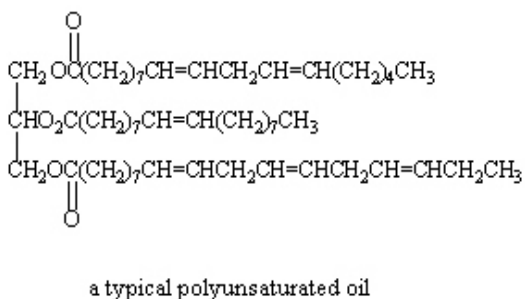
**II. Discussion:** Chemically speaking, oils and fats are triglycerides, i.e., triesters of glycerol and long chain carboxylic acids (called **fatty acids**). A saturated fatty acid is one that does not contain any carbon-carbon double bonds, as shown below.



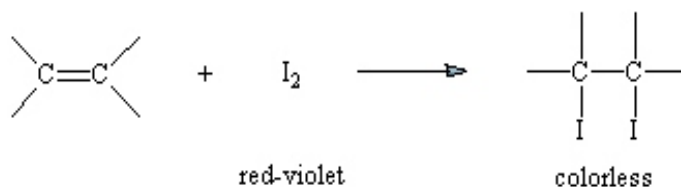
The triglyceride would have the following structure. These saturated triglycerides are generally solids at room temperature, i.e., they are fats.



If saturated fatty acids are replaced with unsaturated fatty acids (those containing carbon-carbon double bonds), the triglyceride is generally an oil. An example of a polyunsaturated triglyceride is shown below.



Oils and fats share many common chemical characteristics. One difference is in their reaction with iodine. Carbon-carbon double bonds tend to react with iodine to produce diiodides. While iodine has a red-violet color, the diiodides are colorless. This reaction is shown below.



The degree of unsaturation in a triglyceride is reflected nicely by a value known as the **iodine number**. This represents the number of grams of iodine that will react with 100 g of the triglyceride. The larger the value of the iodine number, the greater the extent of unsaturation. In general, vegetable oils generally show larger iodine numbers than animal fats. For example, corn oil has an iodine number of 110-130, while beef fat has an iodine number of 35-42.

In this experiment, you will investigate the reaction of two vegetable oils with iodine, and try to determine which one has the greater degree of unsaturation.

**III. Materials:** Safflower oil, peanut oil, 2 small glasses, tablespoon, tincture of iodine solution, eyedropper.

**IV. Procedure:**

Put a tablespoon of safflower oil in a small glass. To a second small glass, add a tablespoon of peanut oil. Both oils should be about the same in color.

To each oil, add a few drops of tincture of iodine. Make sure you add the same amount to each oil.

The iodine solutions will not dissolve in the oils, so swirl the mixtures gently to disperse the iodine as small droplets.

Allow each mixture to stand for a while. If a change in color is not noticed within 10 minutes, place both of the glasses in a pan containing hot water (from the tap). Record your observations in the **Table**. If both mixtures turn colorless (or to their original color), add more iodine solution.

Oil	Observation
Safflower	
Peanut	

The mixtures may be disposed of in the sink. Wash the glasses thoroughly with soap and water.

**V. Questions:**

What are fatty acids?

What is the iodine number of a triglyceride?

How do fats differ from oils in chemical terms?

What does it mean for a triglyceride to be polyunsaturated?

Which was more unsaturated: safflower oil or peanut oil? How do you know?