

# Food Explorations Lab I: Lipid Language

## STUDENT LAB INVESTIGATIONS

Name: \_\_\_\_\_

### Lab Overview

In this investigation, you will record observations involving the melting and solidifying of different types of fat (margarine, butter, and vegetable oil).

### Lab Objectives

*In this lab, you will learn how to...*

1. Observe physical properties of dietary fats and the physical changes occurring in dietary fats during temperature changes.
2. Use measured melting and solidifying temperatures to determine the relative amounts of saturated and unsaturated fats present in different types of fat.
3. Identify dietary fat that is beneficial to the body's health.
4. Identify dietary fat that can be harmful to the body's health.

**Lab Safety:** Before beginning ANY investigation you should put on your safety goggles and apron. It is important to avoid getting chemicals on your hands. Always wash your hands following the completion of an investigation. When handling food, you should also wash your hands prior to beginning an investigation.

# Observation of Lipid Properties Under Varying Temperatures

## Lab Question

Which type of fat (margarine or butter) will melt faster? Which type of fat (margarine, butter, or vegetable oil) will solidify the fastest? (Circle your answers.)

**Predictions:** The \_\_\_\_\_ will melt faster because...

and the \_\_\_\_\_ will solidify faster because...

## MATERIALS

- 1 small bowl
- 1 small, clear plastic cup containing  $\frac{1}{4}$  cup of assigned fat type
- Stopwatch or kitchen timer
- 2 cups ice
- 1 thermometer

Obtain your fat assignment from your teacher. Record your group's assignment (butter, margarine, or oil) below.

My group's fat type is: \_\_\_\_\_

## PROCEDURE

Describe your *visual* observations of each fat type before treatment. Record your observations in Table A under the column labeled "Observation BEFORE Treatments."

## Heat Treatment

1. Your teacher will demonstrate how to find the melting points of butter and margarine. Oil will not undergo heat treatment, because it is already a liquid at room temperature.
2. Your teacher will add  $\frac{1}{2}$  cup of cold butter to a saucepan and add  $\frac{1}{2}$  cup of cold margarine to a saucepan.
3. Your teacher will heat each fat type on medium heat until each fat has completely melted.
4. Use the stopwatch to find the amount of time (minutes:seconds) it takes to melt each fat type and record the time in Table B under the column labeled "Heat Treatment."
5. Your teacher will measure the temperature of each melted fat type. Record the temperature of each fat in Table B under the column labeled "Heat Treatment."
6. Describe your *visual* observations of each melted fat type after heat treatment. Record your observations in Table B under the column labeled "Observations."
7. Your teacher will pour  $\frac{1}{4}$  cup of each melted fat type into a separate plastic cup to be used for cold treatment.

## Cold Treatment

1. Obtain  $\frac{1}{4}$  cup of your assigned fat type in a plastic cup. All fats should be in liquid form.
2. Obtain ice in your small bowl from your teacher.
3. Place the cup containing the liquid fat in the bowl and surround with the ice.  
  
Use the stopwatch to determine how long it takes your liquid fat type to solidify. Lift your cup periodically to look for solidification on the bottom. The oil will not solidify like butter and margarine. Instead, look for a cloudy appearance to indicate solidification.
4. Record the time it takes for your fat type to solidify in Table C under the column "Cold Treatment."
5. Note the temperature of your fat type once it completely solidifies. Record the temperature in Table C under the column "Cold Treatment."
6. Describe your *visual* observations of your assigned fat type **after** cold treatment. Record your observations in Table C under the column labeled "Observations."
7. Share your findings with other groups. Be sure to record observations and data missing from your tables for the fat types not assigned to your group.

Table A: Fat Observations Before Treatments

Substance	Observations BEFORE Treatment
Butter	A little bit of foam Solid at room temperature Yellow and smooth
Margarine	No foam Solid at room temperature Yellow and smooth
Oil	Almost clear with a yellow tint Liquid at room temperature

Table B: Fat Heat Treatment and Observations

Substance	Heat Treatment (Time to Melt and Temperature)	Observations
Butter	Total Time: 4:25 Final Temperature (Melting Point): ~170°F (77°C)	
Margarine	Total Time: 3:15 Final Temperature (Melting Point): ~204°F (96°C)	

**TEACHER'S NOTE:** Numbers in the tables above are estimates only. The values students obtain will vary.

Table C: Fat Cold Treatment and Observations

Substance	Cold Treatment (Time to solidify and Temperature)	Observations
Butter	Total Time: 4:00 Final Temperature: ~ 64°F (18°C)	Solidified on bottom with a little bit of liquid on top. Solidified more than margarine.
Margarine	Total Time: 2:30 Final Temperature: 70°F (24°C)	Some solidification on the bottom, but mostly liquid.
Oil	Total Time: 6:15 Final Temperature: 60°F (16°C)	Did not show signs of solidification.

**TEACHER'S NOTE:** Numbers in the tables above are estimates only. Students' values will vary.

## Conclusion:

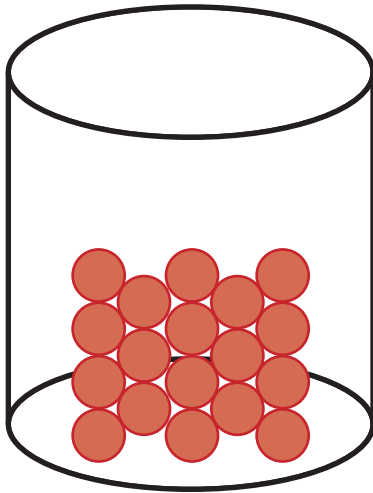
1. Which fat type melted at the lowest temperature? Which fat type solidified at the highest temperature? Referring to the reading "Fatty Distinction", explain the results observed.

*Butter melted at the lowest temperature. Margarine solidified at the highest temperature because it has less saturated fat than butter.*

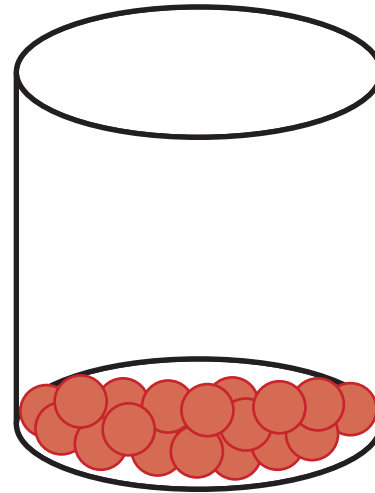
2. Explain how the motion of the fat molecules (particles) is affected as temperature increases and as temperature decreases.

*The fat molecules began to spread apart and move faster when they were being heated. When the fat molecules were being cooled, they move more slowly and closer together.*

3. Draw a diagram illustrating the difference between the fat molecules in a solid state versus in the liquid state.



**Fat Molecules in Solid State**



**Fat Molecules in Liquid State**

4. Explain which fat type contains the largest amount of saturated fat molecules and which contains the least. Support your answer using data from the investigation.

*Butter contains the largest amount of saturated fat because it has the highest melting point and is made from animal sources. Vegetable oil contains the least saturated fat because it is liquid at room temperature.*

5. Explain which fat type contains the largest amount of unsaturated fat molecules and which contains the least. Support your answer using data from the investigation.

*Vegetable oil contains the largest amount unsaturated fat because it is liquid at room temperature.*

*Butter contains the least amount of unsaturated fat because it has the highest melting point.*

6. Based on the reading and your observations, identify which type of dietary fat is the healthiest for your body and explain why.

Unsaturated fat (liquid at room temperature) is the healthiest for my body because it does not raise cholesterol levels.

7. Identify the type of fat that might cause the most health problems for a person's circulatory system and explain why.

Eating saturated fat prevents you from eating unsaturated fat that is healthier.