

How is Butter Made?

Have you ever wondered how butter is made? People have been making butter for more than 4,000 years. Long ago, cream was shaken in animal-skin bags until it turned into butter. Today, science is the same, even though modern equipment does most of the work. When you shake cream, you add mechanical energy that causes fat molecules to collide and stick together. As the fat separates from the liquid, the cream thickens and eventually forms butter. The remaining liquid is called buttermilk. This process, called **inversion**, changes the texture and appearance of the cream, but the amount of matter stays the same.

Butter-making also connects to Oregon agriculture. Dairy farming is an important industry in Oregon, supporting rural communities and producing milk, cheese, yogurt, and butter for consumers across the region.



Butter in a Jar

Description: Students will explore a tasty way to learn about phase changes with a real-life application.

Materials:

- Test Tube
- Tablespoon of Cream
- Marble
- Stopwatch
- Pencil/Pen

Procedure:

- Introduce the lesson focus: exploring how cream (a liquid) changes into butter (a solid) through the transfer of energy.
- Divide students into groups of 3-4 and distribute materials.
- Have students complete the Investigation Sheet as they conduct their experiment.
 - Students should add their marble and cream to their test tube
 - Measure the mass of both (container and liquid)
 - Draw a model of their liquid **before and after shaking**
 - Start their timer as they begin shaking the test tube
 - Make observations as they go
 - Measure the final mass and answer reflection questions
- Facilitate a class discussion to develop a scientific explanation of how cream changes into butter.



Harvest of the Month October - Dairy



Investigation Sheet

Name: _____ Group: _____

Before You Shake!

Cream Type: _____

Prediction: What do you think will happen to the cream as it is shaken?

Starting Mass (test tube + marble + cream): _____g

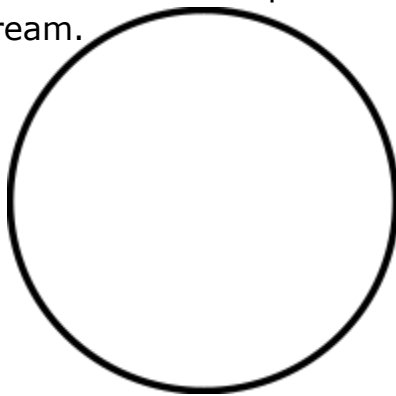
Will the mass change after making butter? ☐ Yes ☐ No

Start the timer and observe the cream as your group shakes the test tube. Take notes below:

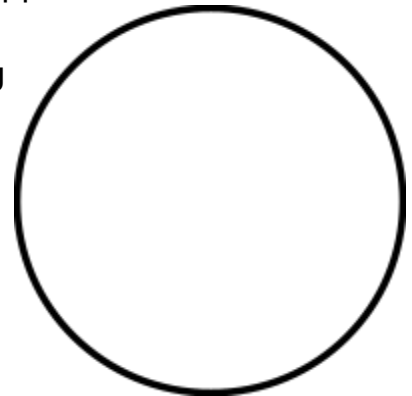
Time	Observations (What does it look like?)	State of Matter
Start (Time: __:__)		Liquid
Halfway (Time: __:__)		
End (Time: __:__)		

Model What Happened: Draw a simple model showing what happened to the fat molecules in the cream.

Before Shaking



After Shaking



Results:

Final Mass (test tube + butter + buttermilk): _____g

Was the final mass the same as the starting mass? ☐ Yes ☐ No

Explain the Science:

1. The cream started as _____ and changed into _____ and _____.
2. What caused the butter and buttermilk to separate?
3. How did shaking (mechanical energy) help turn cream into butter? _____
4. What evidence shows that matter was conserved during the investigation? _____

Standards: 5-PS1-1, 5-PS1-2, MS-PS1-1, MS-PS1-2, HS-PS1-3, HS-PS2-6