HELLO! WELCOME TO THE HOMESCHOOL SCIENTIST

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Making Butter

Welcome!

Thank you for downloading this resource from The Homeschool Scientist. This packet goes with this Making Butter Experiment on our site.

Please use the pages that best fit your child's level. We recognize that many homeschooling families are teaching multiple grade levels at one time, so we have provided a variety of pages, including coloring and puzzle pages for younger children.

Our experiment tested shaking the cream with marbles vs. without marbles. Other variables to test:

- Room temperature cream vs. refrigerated cream
- Salt added to the cream vs. no salt
- Lower fat cream vs. higher fat cream
- All variables are the same, but two different people shaking each jar. (Same amount of cream, same starting temperature, no salt, same fat content, no marbles.) The independent variable is the person shaking the jar.
- Keep all variables the same, but change the amount of heavy cream put in each jar.
- Keep all variables the same, but change the size of the jar. For example, a baby food jar vs. a small Mason jar.

If you need the instructions for this activity, please visit this post on our site.

The chemistry behind making butter is posted on the next page.

Enjoy!
Michelle

The Chemistry Behind Making Butter

The chemistry behind the butter science experiment - The short, concise explanation

The shaking of the cream causes the milk fats to coalesce, forming butter, while the liquid portion is the buttermilk. Coalesce means the process of tiny fat droplets coming together and merging to form larger masses or globs. When you shake the cream vigorously, the mechanical agitation causes the fat droplets to collide and stick together. These collisions result in the coalescence (coming together) of the fat droplets, forming larger clumps or masses of fat.

The detailed explanation

Let's talk first about the heavy cream and its composition. The cream is an emulsion. An emulsion is a mixture of two immiscible liquids—fat and water. Immiscible means they do not mix. Have you ever poured cooking oil into a measuring cup or bowl and added water? Oil and water do not mix; they are immiscible.

The fat in the heavy cream is in the form of tiny droplets suspended in the water.

(For students who have studied fats: The fats in the cream are primarily triglycerides. Triglycerides are molecules consisting of three fatty acid chains attached to a glycerol backbone.)

So, as the churning continues, the fat droplets coalesce or stick together. This process is known as agglomeration. Over time, these agglomerated fat droplets join to form larger masses or globs. The continual shaking encourages the separation of the fat from the water content in the cream.

This separation of the fat from the liquid part of the cream creates the butter and buttermilk.

Buttermilk is the liquid remaining after the fat globules have coalesced into butter. It contains water, proteins, and some fat globules that haven't yet coalesced.

Remember, fat molecules were suspended in water when we started with cream. After the churning, we have water molecules suspended in fat. This change is called phase inversion. This is a physical change.

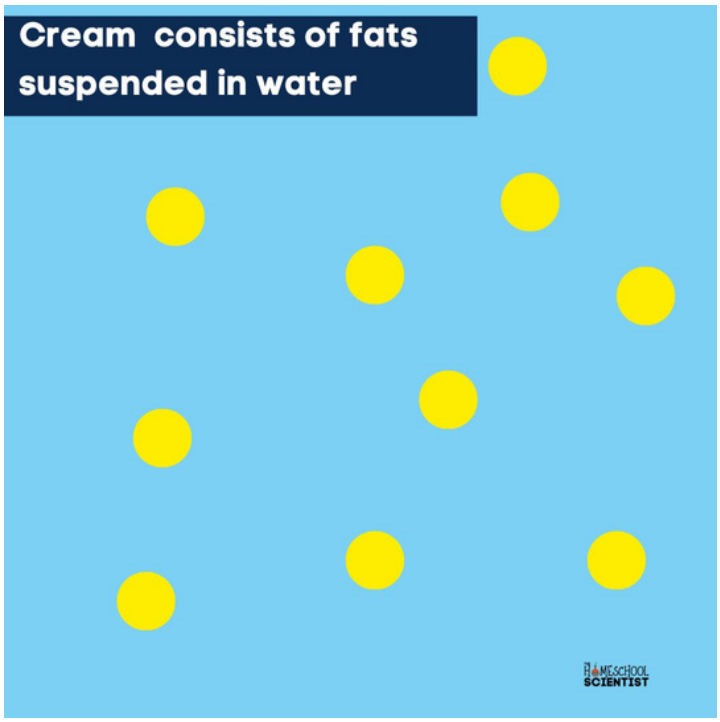
Physical or Chemical Changes?

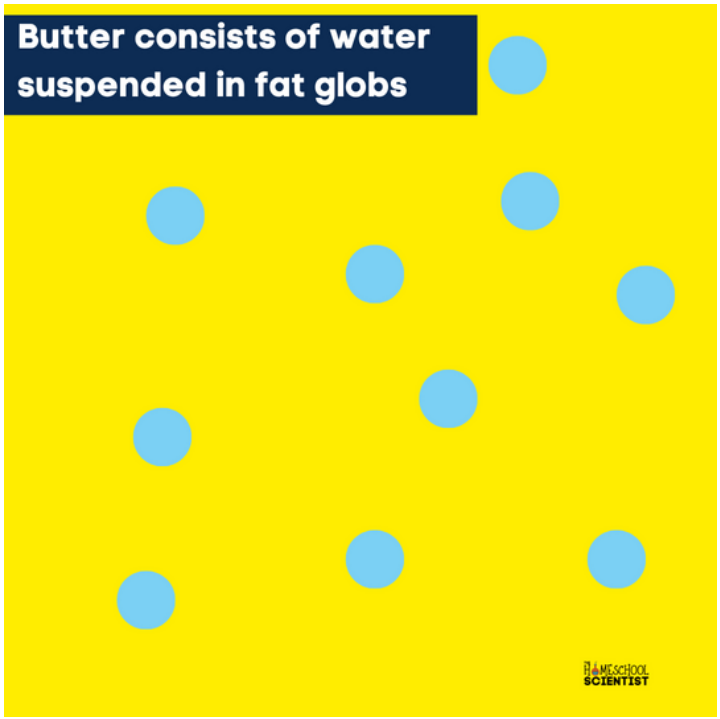
The fat in the heavy cream is in the form of tiny droplets suspended in the water. This is a fat in water emulsion.

An emulsion is a mixture of two liquids that don't usually mix together.

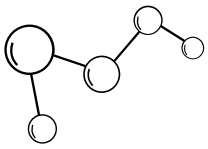
After the churning, we have water molecules suspended in fat. This is now a water in fat emulsion.

The change is called phase inversion.





This is a physical change, not a chemical change. We did not create a new substance. Instead the fat molecules that were suspended in water clumped together to form the glob of butter!



Butter Experiment Lab Report

What are you testing and what do you think will happen?

Independent Variable

Dependent Variable

Materials

Procedure

Teaching Note

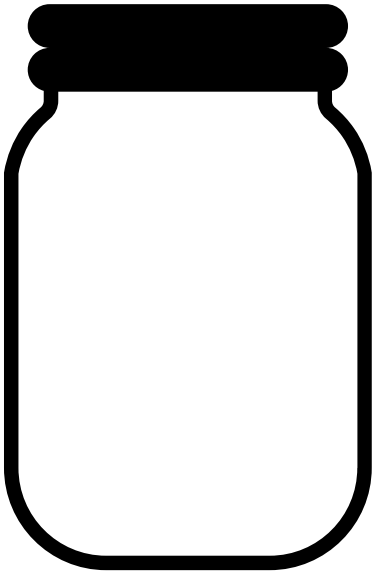
There are two levels of observation sheets. Please use the one that best fits your child.

There is an observation sheet for older students where the jars are left unnumbered. This blank sheet is intentional, should you test three levels of a variable. For example, cold, room temperature, and warm heavy cream or no-salt, slightly salted, and heavily salted heavy cream.

My experiment observations

Start

1



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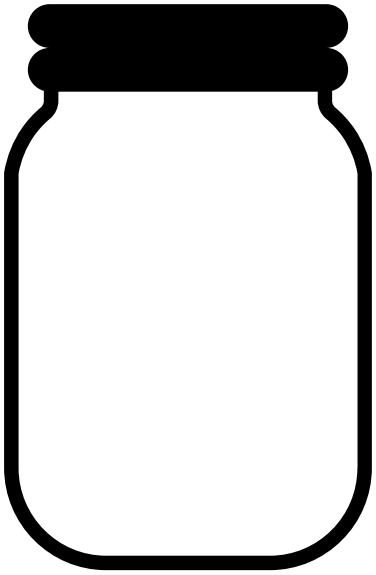
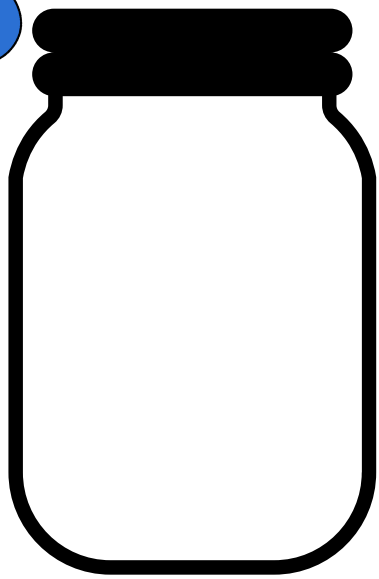


Start

1



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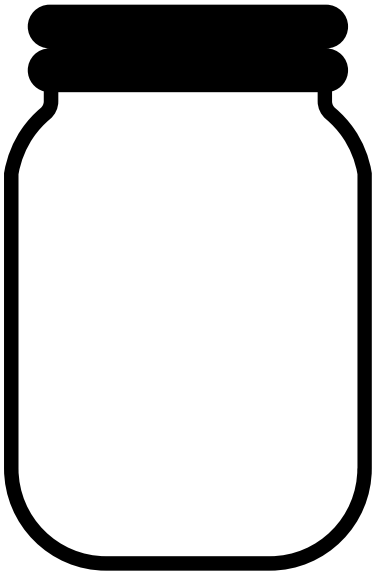


Butter Experiment Observation Sheet

Description _____

Time Elapsed	Description

Butter Experiment Observation Sheet

Description _____

Time Elapsed	Description

Butter Experiment Observation Sheet

Description _____

Time Elapsed	Description

1. How did the appearance, texture, and smell of the cream change during the experiment?

2. What do you think would happen if you continued shaking the cream beyond the 10-minute mark?

3. What was your independent variable? What were the differences between your two jars of butter?

4. If you designed a new making butter experiment, what would you test?

In Your Own Words

In your own words, explain what is happening as heavy cream is shaken in the jar? What changes are happening and what are the physical changes?

Teaching Note

Use the word wall cards as the vocabulary words. Have your student fill in the definition worksheet for each word. A blank is included to create your own new word cards.

coalesce

emulsion

agglomeration

phase inversion

immiscible

triglycerides

Vocabulary Practice

Fill out the table below for each vocabulary word.

Write the word. _____

Define it.

_____

_____

_____

_____

_____

How does this word apply to making butter?

_____

_____

_____

_____

_____

Teaching Note

If this is an age-appropriate activity for your family or class, research and record the nutritional information (the amount contained in grams and the % daily value) for unsalted and salted butter on the following pages.

Here are some additional resources:

- Learning to read nutrition labels - printables and links to nutrition resources
- Nutritional information for unsalted butter from myfooddata.com
- Another nutrition lesson and printable from Thehomeschoolscientist.

Fill In the Nutrition Label

Research the nutritional composition of salted butter and fill in the numbers below. Show the amount of each item listed and the % daily value of each contained in 1 tablespoon of unsalted butter.

Unsalted Butter

Nutrition Facts

Serving Size: 1 Tablespoon

Calories::

% Daily Value

Total Fat:
Saturated Fat:
Cholesterol:
Sodium:
Total Carbohydrates:
Dietary Fiber:
Total Sugars:
Protein:

Vitamin C:
Vitamin D:
Iron:
Calcium:
Potassium:
Phosphorus:

Fill In the Nutrition Label

Research the nutritional composition of salted butter and fill in the numbers below. Show the amount of each item listed and the % daily value of each contained in 1 tablespoon of unsalted butter.

Salted Butter

Nutrition Facts

Serving Size: 1 Tablespoon

Calories::

% Daily Value

Total Fat:
Saturated Fat:
Cholesterol:
Sodium:
Total Carbohydrates:
Dietary Fiber:
Total Sugars:
Protein:

Vitamin C:
Vitamin D:
Iron:
Calcium:
Potassium:
Phosphorus:

Just for Fun Pages

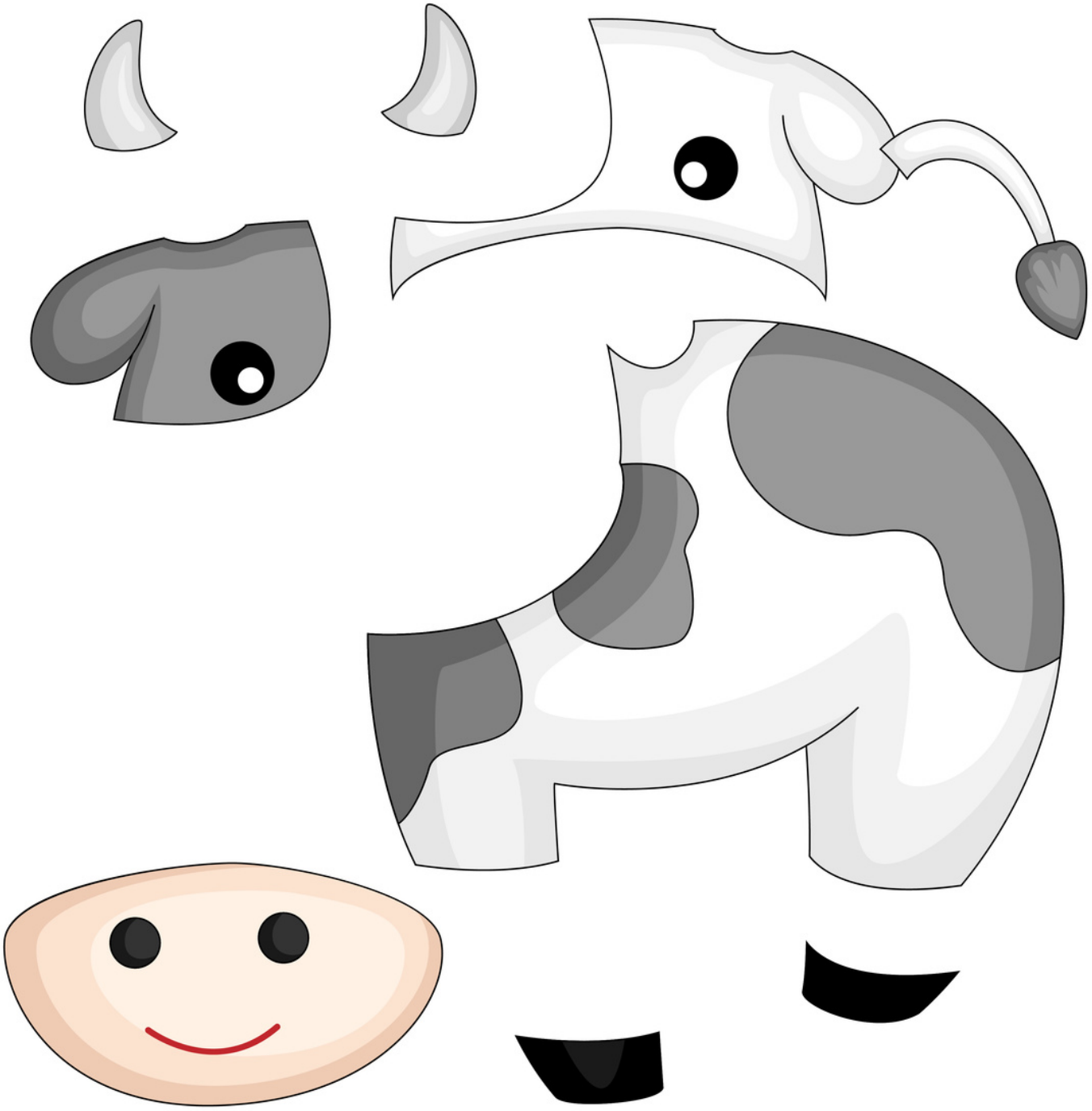
Which Path to Take?

The cows below want to visit their friend, Elsie Cow. However, two of the cows take the wrong path and are lost. Which cow followed the path to Elsie?

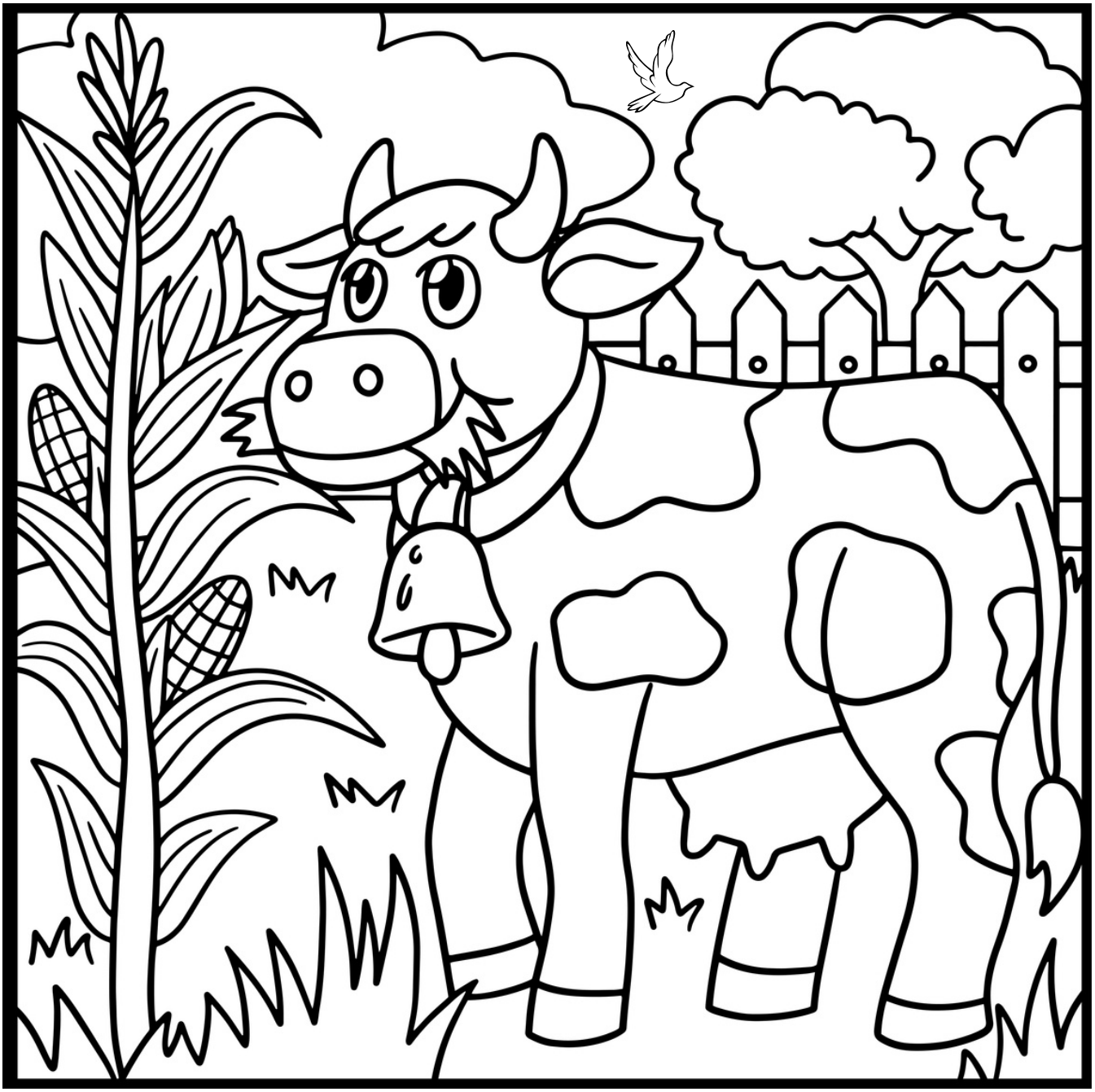
Mooo-ve the Pieces

Mooo-ve the pieces into place to solve the puzzle!

Print this page, cut out the pieces, then put the puzzle together!



Color and Count



How many spots does the cow have?	3	1	6
How many ears of corn do you see?	0	2	9
How many fence posts do you see?	1	6	5
How many birds are in the sky?	2	1	4

Find 12 Differences