

Milk Casein Experiment

Suggested Age / Grade Level	Curriculum Covered	Duration
Grades 5-8	Molecules and how they interact. Chemical reactions and their indicators.	1 hr

Overview

Students will investigate the concepts of monomers and how they can combine to form polymers. Students will examine how change between monomeric and polymer forms requires a chemical reaction. Students will learn what constitutes a chemical reaction, and practice identifying when one has occurred.

Learning goals

- ✓ To learn about how molecules make up the world around us
- ✓ To understand how molecules interact to form different substances
- ✓ To use the terms monomer, polymer, polymerization, and depolymerization to describe the way small molecules interact to form bigger objects
- ✓ To learn the five signs of a chemical reaction
- ✓ To be able to identify and describe when a chemical reaction has occurred

Background Information

Milk is made up of monomers of a protein called casein. When you heat the milk and add an acid to it, these monomers unfold and reorganize into a long chain. The resultant polymer that forms can be scooped up and molded into shapes. When this dries, it is as hard and rigid as plastic. From the early 1900s until about 1945, milk was commonly used to make many different plastic ornaments.

Key Terms

Monomer - The smallest unit of a substance that can be bonded to other molecules to build bigger chains

Polymer - A chain made of smaller monomers that can be similar or different bonded together

Polymerization - The process of reacting monomers by a chemical reaction together to form polymers

Depolymerization - The process of breaking a polymer down by a chemical reaction into its monomers

Precipitate - A solid deposit forming in a substance that started out as a liquid

Wafting - Using a sweeping motion of the hand to smell things in science

Ontario Curriculum Connections

Grade 5: Properties of and Changes in Matter

Grade 6: Understanding Matter

Grade 7: Pure Substances and Mixtures

Activity Timeline/Agenda

Watch Video (10 minutes)

Introduce the activity, review or introduce any key terms students will need and review key concepts (5 minutes)

Mix the milk and vinegar and extract the casein (10 minutes)

Mold casein into shapes (10 minutes)

Discussion (10-15 minutes)

Materials

1 cup of milk

Measuring cup/measuring spoons

Microwave safe mug/bowl

Microwave or a pot and stove

4-5 tablespoons of vinegar

Paper towels

Spoon

Oven mitt

garbage bag (in case of spills)

Food colouring or glitter (optional to decorate)

Additional Setup Requirements

The milk will need to be heated up. This can be achieved in a microwave, or if a microwave is unavailable it can be achieved with a pot on the stove.

Procedure

1. Add 1 cup of milk to a microwave safe dish and heat it up in the microwave for 2-3 minutes (alternatively heat up 1 cup of milk on the stove and then add it to the dish)
2. Add 4-5 tablespoons of white vinegar to the milk and stir continuously for a few minutes
3. Lay out a stack of 4-5 paper towels and using the spoon began to scoop out the white curds that formed from the dish (Tip: try to tilt the spoon against the side of the cup to let any excess water drain while you're scooping)
4. Use another sheet of paper towels on top to press down on your collected curds to dry them further
5. Knead the dry curds like playdough for a few minutes
6. Form the curds into any shape. This is the time to decorate if you would like
7. Leave your plastic creation out to dry for 2 days