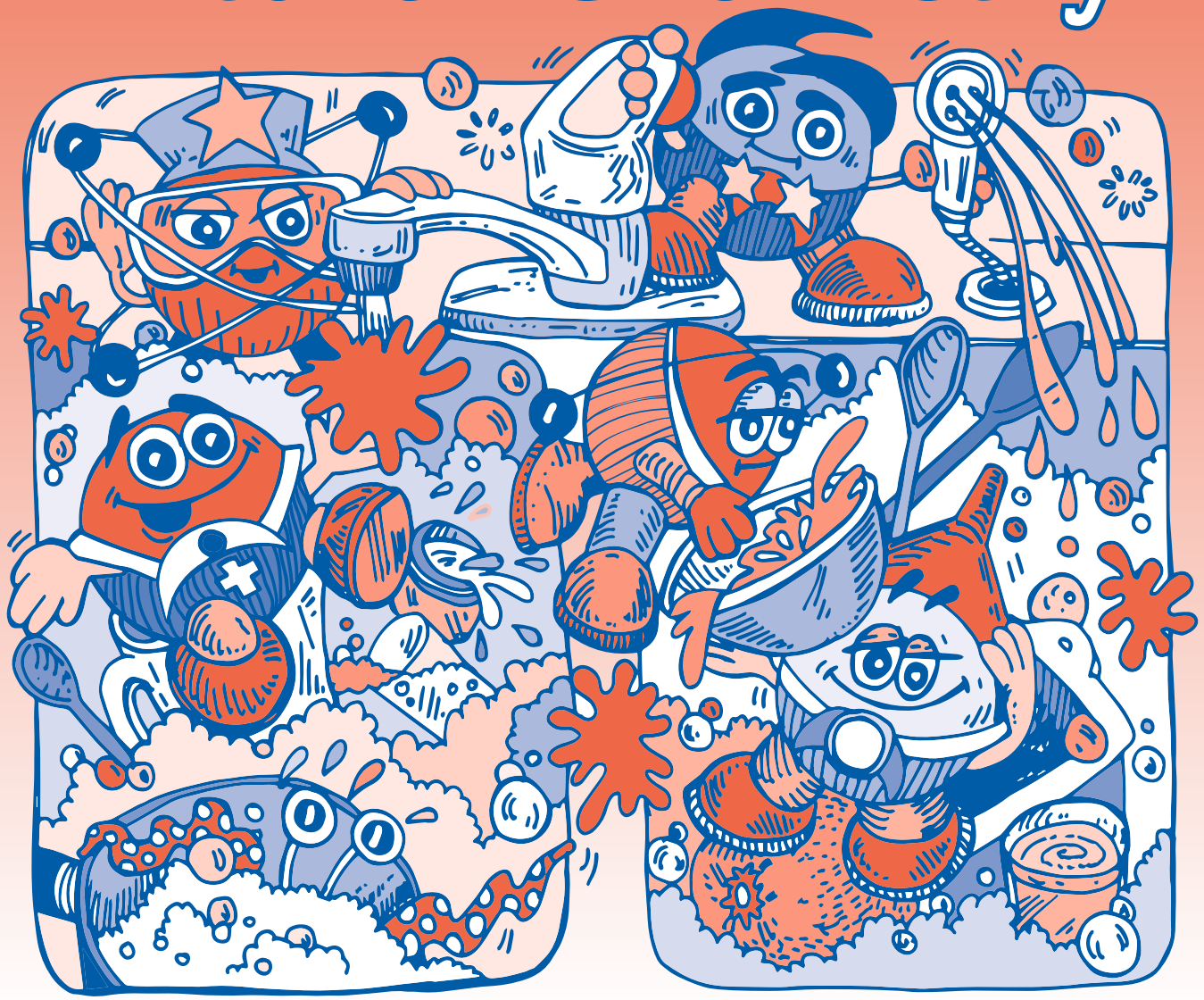
4-H 493

Science Fun with Kitchen Chemistry



Name: _____

Age (as of January 1 of the current year): _____

County: _____

Club Name: _____

Advisor: _____

THE OHIO STATE UNIVERSITY EXTENSION

4-H

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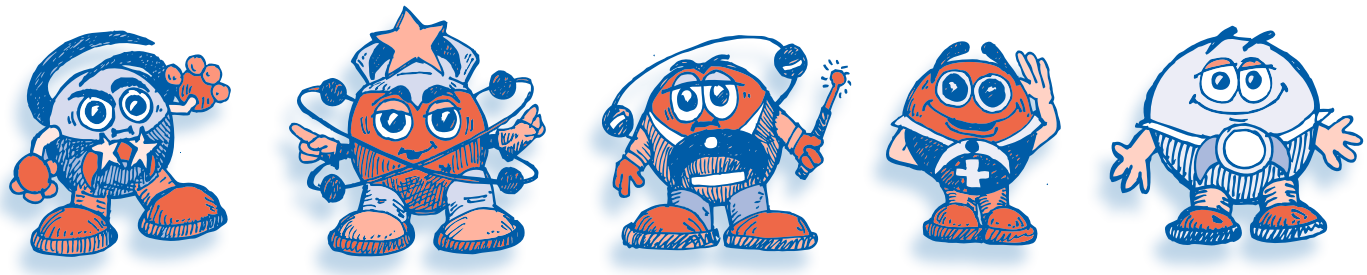


Contents

Note to the Project Helper

Congratulations! A 4-H member has asked you to serve as a project helper. You may be a parent, relative, project leader, friend, club advisor, or another individual important in the 4-H member's life. Your duties begin with helping the youth create and carry out a project plan, as outlined in the Member Project Guide. This is followed by helping the youth focus on each experiment, providing support and feedback, and determining what was done well, what could have been done differently, and where to go next.

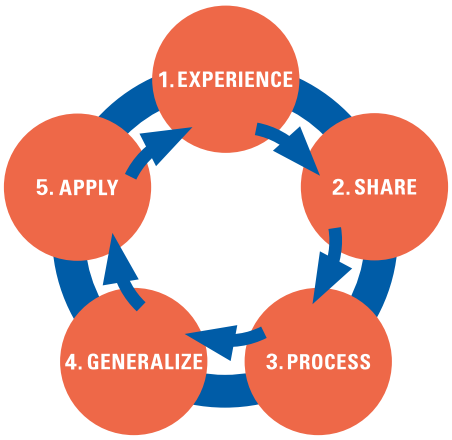
As a project helper, it is up to you to encourage, guide, and assist the 4-H member. How you choose to be involved helps to shape the 4-H member's life skills and knowledge of the importance of food science.

Your Role as Project Helper

- Guide the youth and provide support in setting goals and completing this project.
- Encourage the youth to apply knowledge from this project book.
- Serve as a resource person.
- Encourage the youth to go beyond the scope of this 4-H project book to learn more about food science.

What You Should Know About Experiential Learning

The information and experiments in this book are arranged in a unique, experiential fashion (see model). In this way, youth are introduced to a particular practice, idea, or piece of information through an opening (1) **experience**. The results of the experiment are then recorded in the accompanying pages. Youth then take the opportunity to (2) **share** what they did with their project helper, (3) **process** the experience through a series of questions that allow the learner to (4) **generalize** and (5) **apply** the new knowledge and skill.



Pfeiffer, J.W., & Jones, J.E., Reference Guide to Handbooks and Annuals. © 1983 John Wiley & Sons, Inc. Reprinted with permission of John Wiley & Sons, Inc.

What You Can Do

- Review the learning outcomes (project skill, life skill, educational standard, and success indicator) for each experiment to understand the learning taking place. See the inside back cover for a summary of the learning outcomes.
- Become familiar with each experiment and the related background information. Stay ahead of the learner by trying out experiments beforehand.
- Begin the project by helping the learner establish a plan for the project. This is accomplished by reviewing the Member Project Guide.
- After each experiment, conduct a debriefing session that allows the learner to answer the review questions and share results. This important step improves understanding from an experiential learning perspective.
- Help the learner celebrate what was done well and to see what could be done differently. Allow the learner to become better at assessing his or her own work.
- In the Member Project Guide, date and initial the experiments that have been completed.

Member Project Guide

Welcome to *Science Fun with Kitchen Chemistry*! This project is designed for 4-H members with beginning-level skills with science experiments. After completing this project, you are encouraged to explore other Science, Technology, Engineering, and Math (STEM) and Food and Nutrition books.

Check your county's project guidelines (if any) for completion requirements in addition to the ones below, especially if you plan to participate in county project judging or plan to prepare an exhibit for the fair.

Project Guidelines

Step 1: Complete **all 11** experiments.

Step 2: Take part in **at least two** learning experiences.

Step 3: Become involved in **at least two** leadership/citizenship activities.

Step 4: Complete a project review.

Step 1: Experiments

Complete **all 11** experiments. Private Proton's Challenges are optional, but may bring you closer to finding a strong alien defense method. Take good notes and record your experiment results. When you finish an experiment, review your work with your project helper. Then ask your project helper to initial and date your findings.

Experiments	Date Completed	Project Helper Initials
Project Area 1: Fortify with Changing Forms		
1. What's the Matter?		
2. Bubble Transporters		
Project Area 2: Protecting with Chemical Properties		
3. Acids and Bases		
4. Put Out the Fire!		
5. Orange Float		
Project Area 3: Resist with Reactions		
6. Let's Chill!		
7. Fizzy Foam Fun		
8. Shiny Penny		
Project Area 4: Shield Yourself with Scientific Testing		
9. Colorful Chromatography		
10. Color Splash		
11. Make Your Own Rock Candy Crystals		

Step 2: Learning Experiences

Learning experiences are meant to complement experiments, providing you with a chance to investigate Kitchen Chemistry more in-depth. What are some learning experiences you could do to show the interesting things you are discovering about Kitchen Chemistry? Here are some ideas:

- Attend a clinic, workshop, demonstration, or speech related to chemistry.
- Help organize a club meeting based on one of the experiments.
- Go on a related field trip or tour a business that uses chemistry to make a product.
- Host a workshop to share tips about Kitchen Chemistry.
- Prepare your own demonstration, illustrated talk, or project exhibit.
- Participate in county judging.

Once you have a few ideas, record them here. Complete **at least two** learning experiences. Then, describe what you did in more detail. Ask your project helper to date and initial in the appropriate spaces below.

Plan to Do	What I Did	Date Completed	Project Helper Initials
Example: Demonstration	*Showed club members how to make CO_2*	*5/5/YR*	*K.B.*

Step 3: Leadership and Citizenship Activities

Choose **at least two** leadership/citizenship activities from the list below (or create your own) and write them in the table below. Record your progress by asking your project helper to initial next to the date each one is completed. You may add to or change these activities at any time. Here are some examples of leadership/citizenship activities:

- Teach someone about the different phases of matter.
- Help another member prepare for his or her project judging.
- Help organize a club field trip to a local science center.
- Organize an event in your area.
- Encourage someone to enroll in *Science Fun with Kitchen Chemistry.*
- Arrange for a chemist to speak at your club.
- Plan your own leadership/citizenship activity.

Leadership/Citizenship Activity	Date Completed	Project Helper Initials
Example: Organized a club field trip to a local science center.	*5/12/YR*	*K.B.*

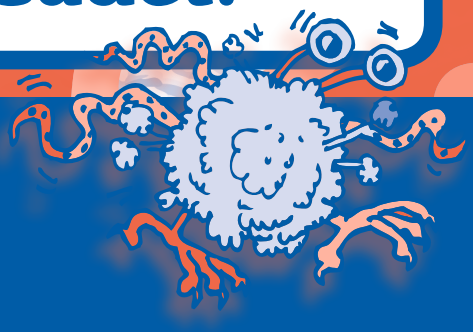
Step 4: Project Review

Completing a project review helps you assess your personal growth and evaluate what you have learned.

Use this space to write a brief summary of your project experience. Be sure to include a statement about the skills you have learned and how they may be valuable to you in the future.

Now, set up a project evaluation. You can do this with your project helper, club leader, or another knowledgeable adult. It can be part of a club evaluation or it can be part of your county's project judging.

Welcome to the Terrestrial Alien Defense Academy, Cadet!



Kitchen Chemistry Defense Guide

You are under attack! Aliens have been sighted in your neighborhood. Major Molecule, leader of the Terrestrial Alien Defense Academy (TADA), offers this guide to defend against alien invasion in your home. As you try each experiment to combat the aliens, you will use the "Kitchen Chemistry Defense" with common household items.

Searching through information collected from all branches of our military, we have discovered that aliens fear changes in **matter**. As you explore these changes, you will determine the best defense method to use when standard alien defense weapons fail.

This series of experiments has never been field tested before. Your mission: Attempt each experiment at least once, make careful observations, and record your results for future use. Everything you learn can be applied to new defense methods for the sake of humankind and our planet.

Neutron Helper Note

Words in **bold** throughout this book are defined in the glossary.

Research Fact from Admiral Atom

Chemistry is the study of matter and the changes to its different forms—solid, gas, liquid. There are even two more, plasma and the Bose-Einstein condensate or BEC, but we'll focus on the three most familiar states as we explore these various defense methods.

Ensign Electron Says Be Safe!

Do not taste any experiment unless it specifically states that you can. You will be mixing different items together and not all of them are suitable for drinking or eating.

Project Area 1: Fortify with Changing Forms

Before you can begin the experiments, you need to understand what matter is and how it can change from one form to another. Aliens have been known to shape shift, just like matter. Use the next couple of experiments to learn how Kitchen Chemistry can help you thwart an alien attack.

Experiment 1: What's the Matter?

Learning Outcomes

Project skill: *Mixing a liquid and a solid to create a new product*

Life skill: *Reasoning*

Educational standard: *Ohio Physical Science—All objects and substances in the natural world are composed of matter*

Success indicator: *Recognizes and understands the various phases of matter*

Introduction

Matter can exist in many phases as solids, liquids, or gases. Some, however, can behave like more than one of these at a time. In this experiment you will make some slime that is considered a **non-Newtonian** fluid. Liquids typically flow, but if you put pressure on a non-Newtonian fluid, it acts more like a solid.

Supplies

- large bowl
- 1 cup cornstarch
- about ½ cup water
- spoon
- aluminum pie pan
- kitchen scale

What to Do

Time needed: 15 minutes. Weigh the cornstarch and water, record the two measurements, and add them up. Write this answer in your observation notes. Now, pour the cornstarch into the bowl. Add the water slowly and stir carefully. It will be very thick but still feel like a liquid. Stir it fast and then very slowly. What happens? Squeeze some of the mixture in your hand. How does it feel? Try to roll it in a ball in your hands and then let it flow through your fingers. Pour some of it into the pie pan and hit it hard with your fist or the back of your spoon. What does it look like? Weigh the slime and compare your answer to the first measurement. Are they the same or different?

Neutron Helper Note

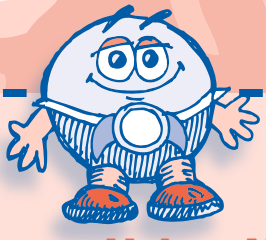
If you add too much water, just add a bit more cornstarch to thicken.

Record your observations here:

Explanation

A non-Newtonian fluid can act like both a solid and a liquid. It reacts to stress, or pressure, with an increased **viscosity** or resistance to flow. The slime is made up of tiny solid **particles** of cornstarch that are suspended in water. Chemists call this type of mixture a colloid (CAH-loid). Colloids like this behave strangely—putting pressure on them makes them act more like a solid. If you try to stir them quickly, they resist! Other examples of colloids are milk, fog, and ketchup. The weight of the cornstarch and water before they were mixed will be the same as the slime combination. The **mass** of individual parts remains the same even when combined.

Source: This experiment is cited in numerous science books and online science resources.



Neutron Helper Notes

- This material is easily cleaned up by letting the water evaporate and then vacuuming up the cornstarch. Adding food coloring is OK but the cleanup is much harder for spills!
- Slime can be saved in a plastic bag for a few days to be played with again; however, it will get moldy after a few days and should be thrown out.

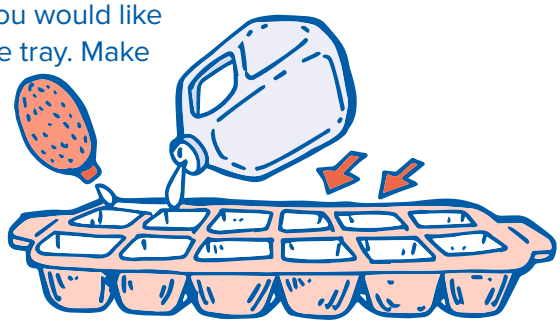
Admiral Atom Did You Know?

Chemistry has several "laws" that help scientists predict how matter will react. The most basic law is Conservation of Mass—matter can neither be created nor destroyed, though it can be rearranged.

Source: http://chemistry.about.com/od/generalchemistry/a/chemistrylaws.htm

Private Proton's Challenge

Test the freezing rate of different liquids. Pour liquids such as water, lemon juice, milk, salt water, rubbing alcohol, whatever you would like to experiment with, into an ice cube tray. Make predictions about which liquids will freeze first. Check the tray every 15 minutes and record your results. Were your predictions right?



Source: www.brainpopjr.com/science/matter/changingstatesofmatter/grownups.weml