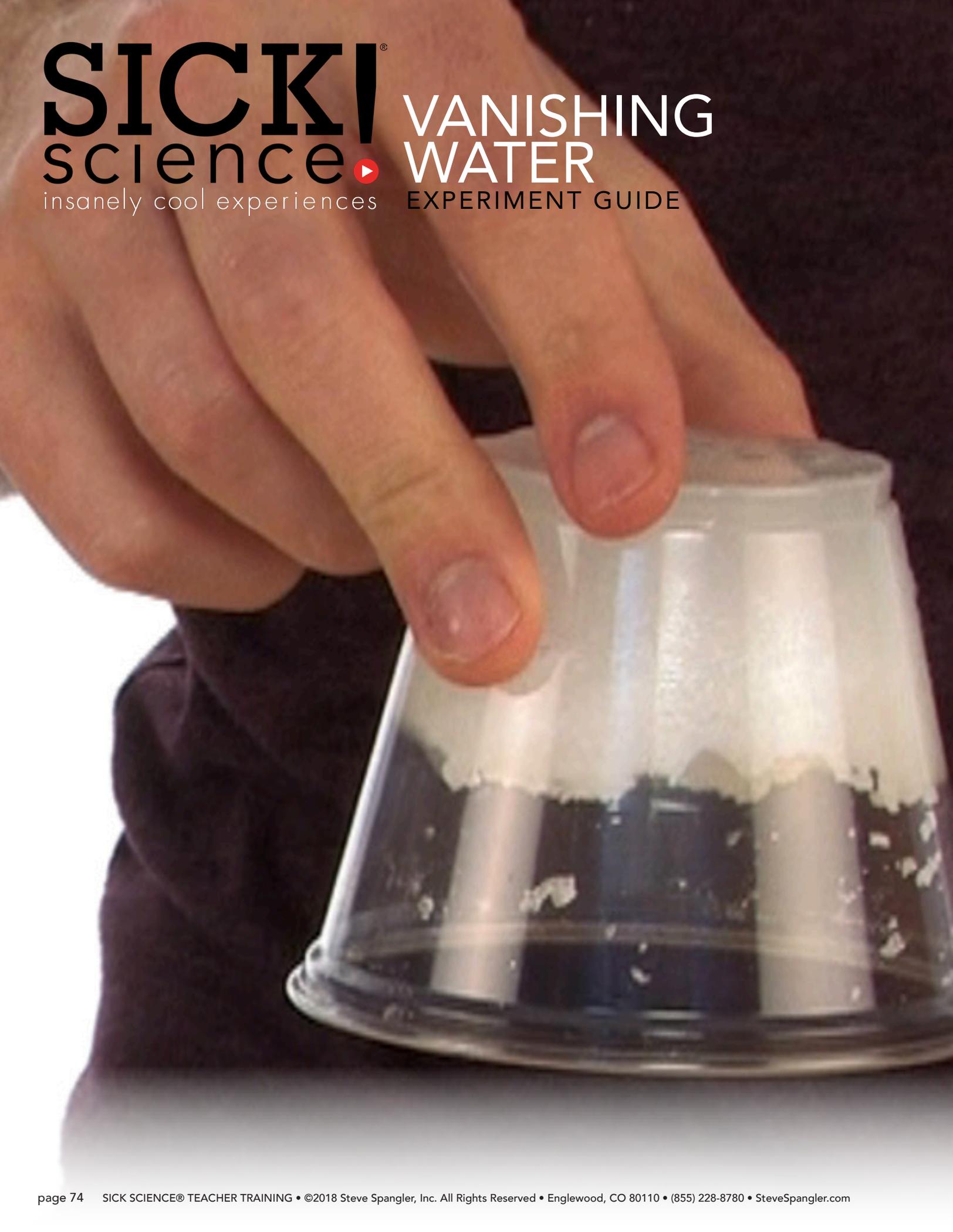


**SICK!**  
science   
insanely cool experiences

**VANISHING  
WATER**  
EXPERIMENT GUIDE



# VANISHING WATER

A super absorbent polymer is the perfect tool for teaching and learning about hydrogels and absorption. This white powder is able to absorb over 800 times its own weight in water and it is the secret ingredient in baby diapers! What you may not know about this amazing polymer is that it's also the perfect prop for pranksters and magicians.

## WHAT YOU NEED

- o A NEW, DISPOSABLE BABY DIAPER
- o ZIPPER-LOCK BAG
- o SCISSORS
- o A CUP
- o WATER
- o BLACK PIECE OF PAPER



1 Place a new, unused diaper on a black piece of paper. Use scissors to carefully cut along the center of the inside lining and then remove the cotton-like material. Shake the loose powder you find inside the diaper onto the paper.



3 Carefully remove the stuffing from the bag and pour the powder into the plastic cup.



4 Fill the cup half-full of water. Mix it with your finger until the mixture thickens. Stirring is actually not required as the gel thickens quickly on its own.



2 Put all the stuffing material into a clean, zipper-lock bag. Scoop up any white powder that may have fallen onto the paper and pour it into the bag with the stuffing. Blow a little air into the bag to make it puff up and seal it. Shake the bag for a few minutes to remove any powdery material from the stuffing. The powder will fall to the bottom of the bag.



5 Observe the gel that the powder and water create. Turn the cup upside-down and see how it has solidified.



# HOW DOES IT WORK

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The secret water-absorbing powder in a disposable diaper is a super absorbent polymer called sodium polyacrylate. A polymer is simply a long chain of repeating molecules. If the prefix “poly” means many, then a polymer is a large molecule made up of many smaller units, called monomers, which are joined together (think of a chain). Some polymers are made up of millions of monomers.

Super absorbent polymers expand tremendously when they come in contact with water because water molecules are drawn into and held by the molecules of the polymer. The polymer chains act like giant sponges. Some can soak up as much as 800 times their weight in water!

The cotton-like fibers you removed from the diaper help to spread out both the polymer and the liquid so that the baby doesn't have to sit on a gooshy lump of water-filled gel. It's easy to see that even a little bit of powder will hold a huge quantity of water, but it does have its limits. Eventually the polymer will not be able to absorb anymore liquid.

## ⇒ TAKE IT FURTHER - THREE CUP MONTE

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- 1 Start with three empty cups or glasses (non-see through). Before your audience arrives, put one blue scoop of Water Gel (or the polymer from a new baby diaper) into one of the cups.
- 2 Once in front of your audience, set all three cups, open end up, side by side in a row on a table.
- 3 Pour 8 oz. of water into the cup with Water Gel in it.
- 4 Shuffle the cups a number of times.
- 5 Ask the audience to pick the cup they think contains the water.
- 6 Tip the cup, opening down, onto the table. Repeat with the other two cups to reveal that water does not pour from any of them.

### WHAT YOU NEED

- 3 STYROFOAM CUPS
- POLYMER FROM A NEW BABY DIAPER OR A JAR OF WATER GEL
- BLUE SCOOP (1 TSP)
- WATER

## ⇒ TAKE IT EVEN FURTHER - POLYMER PRACTICAL JOKE

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- 1 Fill one cup with 8 oz. of water and the other cup with one blue scoop of Water Gel (or the polymer from a new baby diaper).
- 2 Walk up to a coworker, a teacher, a student, or a parent and pour the water from the first cup into the cup with the scoop of Water Gel.
- 3 Tip the cup over their head. Watch their shock when nothing comes out!

### WHAT YOU NEED

- 2 STYROFOAM CUPS
- POLYMER FROM A NEW BABY DIAPER OR A JAR OF WATER GEL
- BLUE SCOOP (1 TSP)
- WATER

# SCIENCE FAIR CONNECTION

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While making water “vanish” is a pretty cool trick, it is not a science fair project. You can create a science fair project by identifying a variable, or something that you can change, in this experiment. Let’s take a look at some of the variable options that might work:

- ▶ Test liquids other than water. What’s different about the polymer’s reaction in orange juice, milk, soda, vinegar, bleach, coffee, tea, ketchup, etc? Which of these liquids gels the fastest? Slowest? Not at all? How long does the reaction take in each one?
- ▶ Does the polymer’s reaction change when you use colored water with the Water Gel?
- ▶ What happens to the polymer’s reaction time if you change the temperature of a test liquid?

These are just a couple of ideas, but you aren’t limited to them! Come up with different ideas of variables to test and give them a try. Remember, you can only change one variable at a time for each test. For example, if you are testing other liquids, make sure that all other factors in the test remain the same!

# TEACHER NOTES:

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## SCIENCE CONCEPTS OVERVIEW ▶ Polymers, Chemical vs. Physical Reaction, Molecules

The learning experiences contained in the following Experiment Guide are designed to engage students and deepen understanding, not only of the underlying scientific concepts upon which these experiments/demonstrations are built, but also of critical thinking and problem solving skills. Teachers should allow students to actively participate in each activity as an investigation, where questions are being asked, hypotheses are developed and redeveloped, and where students own the discoveries. Vocabulary was included, assessments were created and critical thinking questions were designed with this underlying goal in mind.

### **The following are some suggested teaching points that could accompany this experiment/demonstration:**

**SICK Science Teaching Points:** The SICK Science video can be utilized in a variety of ways. It can be used to introduce a scientific concept or in place of doing the demonstration/experiment if materials are unavailable. The video can also be used as a review or to help students complete the various learning experiences included in this guide. The video can also be used as a review or to help students complete the various learning experiences included in this guide.

Visit the landing page below to locate the appropriate video for this activity  
**[stevespangler.com/sick-science-resources](http://stevespangler.com/sick-science-resources)**

**Vocabulary:** Students will enhance their science-content related vocabulary. You may choose to introduce the vocabulary words and explicitly teach the meaning of each. You may also use the vocabulary words as an investigation, where students may research the meanings of the words. Finally, students may develop their own meaning for each word through their experience with the experiments and critical thinking work.

**Scientific Method:** Students can complete a full lab report for the demonstration, including asking questions, identifying variables, forming a hypothesis, designing the experiment, collecting data, and drawing conclusions. Differentiation using the lab report is easy. For lower levels, complete the lab report as a class. As students are more independent, encourage students to work in partnerships or groups to complete the lab report. Eventually, students should be able to complete the lab report independently or design a new experiment using the lab report form based on the demonstration completed in class.

**Vocabulary Comprehension:** Students will be able to understand and define content related vocabulary words.

**Vocabulary in Context:** Students will determine the meaning of vocabulary words by using clues from the context around the words.

**Real World Application:** Students will be able to apply their critical thinking strategies and scientific concepts to a real world scenario.

**Opinion Writing:** After experimenting with two different brands of diapers, students should write a piece to persuade parents that one brand of diapers is better to use than the other. They should support their opinion with facts from their experience or other research that they have completed.

**WORDS AND DEFINITIONS —**

Match the word on the left with the correct definition on the right by filling in the blank with the correct letter.

## VOCABULARY WORDS

## DEFINITIONS

1 \_\_\_\_ **Absorb**

A process that leads to a change from one chemical substance to another.

2 \_\_\_\_ **Chemical Reaction**

A group of two or more atoms that stick together.

3 \_\_\_\_ **Polymer**

A process that leads to a change in the form of matter.

4 \_\_\_\_ **Molecule**

To take in or soak up.

5 \_\_\_\_ **Physical Reaction**

A chemical compound formed from a long chain of the same molecule group.



# Critical Thinking

NAME \_\_\_\_\_

## VOCABULARY COMPREHENSION —

Students will be able to understand and define content related vocabulary words.

Work with a partner and come up with a definition for what you think the word absorb means. Then think about school, home, and the world around you. List as many things as you can think of that absorb something else. Write those below.



# Critical Thinking

NAME \_\_\_\_\_

## VOCABULARY IN CONTEXT —

Students will determine the meaning of vocabulary words by using clues from the context around the words.

Research the definitions of the words below. Think about how they are related and explain how these words relate to the baby diaper experiment.

What is a **chemical reaction**? What is a **physical reaction**? What kind of reaction is it when the polymer absorbs the water? Explain your thinking.



# Critical Thinking

NAME \_\_\_\_\_

## REAL WORLD APPLICATION —

Students will be able to apply their critical thinking strategies and scientific concepts to a real world scenario.

A television commercial claims that Happy Baby Diapers are the most absorbent diapers on the market. How could you prove that Happy Baby Diapers' claim is true or false? Explain your plan.



# Assessment

NAME \_\_\_\_\_

## ASSESSMENT QUESTIONS —

Read each question, then circle the letter next to the correct answer or write your response on the back of this page or in the box.

- 1 Complete the simile. Polymer is like a \_\_\_\_\_ when it absorbs water.
  - a. suction cup
  - b. sponge
  - c. straw
  - d. bucket
  
- 2 Sodium polyacrylate is the scientific name for
  - a. a molecule
  - b. a chemical reaction
  - c. a baby diaper
  - d. diaper polymer
  
- 3 The superabsorbent polymer in diapers is able to absorb
  - a. 10 times its weight in water
  - b. 1000 times its weight in water
  - c. 800 times its weight in water
  - d. 9 billion times its weight in water
  
- 4 As a customer, explain why it would be helpful to know how much polymer each brand of diaper contains.  

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- 5 When water is absorbed by a polymer, is that a chemical or physical reaction? Use evidence from your observations or experiences to support your thinking.  

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# Expert Vocabulary - Answer Key

## WORDS AND DEFINITIONS —

Match the word on the left with the correct definition on the right by filling in the blank with the correct letter.

### VOCABULARY WORDS

### DEFINITIONS

- 1 **(D) Absorb**  A process that leads to a change from one chemical substance to another.
- 2 **(A) Chemical Reaction**  A group of two or more atoms that stick together.
- 3 **(E) Polymer**  A process that leads to a change in the form of matter.
- 4 **(B) Molecule**  To take in or soak up.
- 5 **(C) Physical Reaction**  A chemical compound formed from a long chain of the same molecule group.



# Critical Thinking- Answer Key

## VOCABULARY COMPREHENSION —

Students will be able to understand and define content related vocabulary words.

Work with a partner and come up with a definition for what you think the word absorb means. Then think about school, home, and the world around you. List as many things as you can think of that absorb something else. Write those below.

***Possible Answer:***

*We think absorb means to “suck up” or dissolve into something else. It makes the liquid disappear.*

*Here are some of the things we know which absorb liquids:*

- *sponge*
- *clothing*
- *skin*
- *carpet*
- *diaper*



# Critical Thinking- Answer Key

## VOCABULARY IN CONTEXT —

Students will determine the meaning of vocabulary words by using clues from the context around the words.

Research the definitions of the words below. Think about how they are related and explain how these words relate to the baby diaper experiment

What is a **chemical reaction**? What is a **physical reaction**? What kind of reaction is it when the polymer absorbs the water? Explain your thinking.

### ***Possible Answer:***

*We know a chemical reaction means new substance has been created and can never be changed back into its original state. A physical reaction means a new substance has been created but it can be changed back to its original state.*

*The water absorbing polymer is a physical change. We think that if we let the polymer sit out that the water would eventually evaporate, and leave only the Water Gel behind.*



# Critical Thinking- Answer Key

## REAL WORLD APPLICATION —

Students will be able to apply their critical thinking strategies and scientific concepts to a real world scenario.

A television commercial claims that Happy Baby Diapers are the most absorbent diapers on the market. How could you prove that Happy Baby Diapers' claim is true or false? Explain your plan.

### **Possible Answer:**

*If I were going to test the commercial's claim, I would conduct an experiment comparing Happy Baby Diapers to other brands of diapers. I could test the amount of water that each diaper absorbed before it began to leak. After comparing that data, I would be able to say whether or not the commercial's claim was accurate or not.*



# Assessment - Answer Key

## ASSESSMENT QUESTIONS —

Read each question, then circle the letter next to the correct answer or write your response in the boxes.

- 1 Complete the simile. Polymer is like a \_\_\_\_\_ when it absorbs water.
  - a. suction cup
  - b. sponge
  - c. straw
  - d. bucket
  
- 2 Sodium polyacrylate is the scientific name for
  - a. a molecule
  - b. a chemical reaction
  - c. a baby diaper
  - d. diaper polymer
  
- 3 The superabsorbent polymer in diapers is able to absorb
  - a. 10 times its weight in water
  - b. 1000 times its weight in water
  - c. 800 times its weight in water
  - d. 9 billion times its weight in water
  
- 4 As a customer, explain why it would be helpful to know how much polymer each brand of diaper contains.

**Possible Answer:**  
*Customers might want to know how much polymer is in a diaper because the more polymer there is, the more liquid it can absorb. Customers would want to buy the diaper that absorbs the most liquid.*
  
- 5 When water is absorbed by a polymer, is that a chemical or physical reaction? Use evidence from your observations or experiences to support your thinking.

**Possible Answer:**  
*Water absorbed by a polymer is a physical reaction. Even though the water and polymer combine to make a squishy white substance, I know its a physical reaction because if you let the polymer sit out, the water will eventually evaporate and the polymer would be left. Only a physical reaction can be reversed. Chemical reactions cannot.*

# Common Core State Standards

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Student Outcomes	Standards
Students will be able to ask and answer questions about details presented.	RI.K.1, RI.1.1, RI.2.1, RI.3.1
Students will be able to retell key details presented in the experiment.	RI.K.2, RI.1.2, RI.2.2, RI.3.2, RI.4.2, RI.5.2
Students will be able to explain the connection between scientific ideas presented in the experiment.	RI.1.3, RI.2.3, RI.3.3, RI.4.3
Students will be able to ask and answer questions to help determine the meaning of vocabulary presented as part of an experiment.	RI.K.4, RI.1.4, RI.2.4, RI.3.4, RI.4.4, RI.5.4
Students will be able to use information gained from observations of the experiment to demonstrate understanding of the concepts presented.	RI.3.7
Students will participate in shared writing projects and record scientific observations.	W.2.7
Students will be able to recall information from experiences to answer a question.	W.K.8, W.1.8, W.2.8
Students will be able to write an opinion piece that states and supports a point of view.	W.K.1, W.1.1, W.2.1, W.3.1, W.4.1, W.5.1