

SICK!
science
insanely cool experiences

**RAINBOW
SNOW**
EXPERIMENT GUIDE

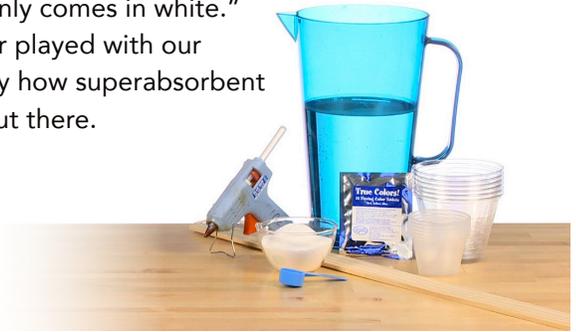


RAINBOW SNOW

We'll admit, we take a little bit of offense when someone says, "Snow only comes in white." Apparently, they've never seen the Rainbow Snow activity. If you've ever played with our Insta-Snow® powder, especially with our Color Fizzers, you know exactly how superabsorbent polymers can create a colorful blizzard of the most realistic fake snow out there.

WHAT YOU NEED

- INSTA-SNOW POWDER
- SIX 9 OZ PLASTIC CUPS
- SIX 2 OZ PLASTIC CUPS
- YARD STICK
- HOT GLUE GUN
- COLOR FIZZERS



1 Arrange the 9 oz cups in a straight line.

2



Evenly space the 2 oz cups on the yardstick in front of each 9 oz cup.

3



Use a hot glue gun to glue the 2 oz cups into place on the yardstick.

4



Fill each of the 2 oz cups with warm water.

5 Add color fizzers to the 2 oz cups as follows:

- Cup 1 - red
- Cup 2 - red + yellow
- Cup 3 - yellow
- Cup 4 - yellow + blue
- Cup 5 - blue
- Cup 6 - blue + red

6



Add 1 scoop of Insta-Snow to each of the 9 oz cups.

7



Carefully lift the yardstick with 2 oz cups and line them up with the 9 oz cups. Dump the water into the 9 oz cups and watch the magic!



HOW DOES IT WORK

Insta-Snow is actually derived from the superabsorbent polymer found in baby diapers. The only difference (and it's a big one) is that the Insta-Snow polymer not only absorbs water, but the long chains of molecules swell to an enormous size. The polymer soaks up water using the process of osmosis (water molecules pass through a barrier from one side to the other). When water comes in contact with the polymer, it moves from outside of the polymer to the inside and causes it to swell. The polymer chains have an elastic quality, but they can stretch only so far and hold just so much water. Because the water is colored, the Insta-Snow absorbs the color along with the water.

The Insta-Snow reaction is a great example of a physical reaction – a reaction where the substance itself does not change. When an ice cube melts, a physical reaction takes place where the solid ice turns into a liquid, but the substance (water) never changes – it's still water!

If you think of the Insta-Snow powder as millions of tiny sponges, it's easy to see that neither the Insta-Snow powder or the water was changed. If you allow the water to evaporate, the Insta-Snow powder dries out and returns to its previous state, ready to be used again.

TAKE IT FURTHER: HANDS-ON SNOW

- 1 Pour a scoop of powder into a friend's cupped hands.
- 2 Fill the small plastic cup with colored water and pour it directly onto the powder. Get ready for screams of excitement as the snow erupts in your friend's hands.
- 3 Catch the falling snow in a bowl or tray. If you let the snow sit out, the water will evaporate and the once fluffy snow will turn back into the dry powder. That's right... it's reusable!!!

SCIENCE FAIR CONNECTION

While adding water to a super water-absorbing polymer and watching the mound of fluffy white snow erupt is fascinating, 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:

- ▶ Try testing for the fastest reaction by using different temperatures of water. Which temperature of water will create the fastest reaction? Which one will create the fluffiest snow?
- ▶ Test different "recipes" of snow. You have created mounds of snow with the given amounts of water and Insta-Snow powder that we specified. Try different proportions of water and Insta-Snow powder to see which "recipe" creates the fluffiest snow.

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 different water temperatures, make sure that all other factors in the test remain the same!

TEACHER NOTES:

SCIENCE CONCEPTS OVERVIEW ▶ Physical Reaction, Polymers, Osmosis, Color

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

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.

Inference - Students will use knowledge gained from the experiment/demonstration to make judgements about outcomes and conditions of type of reactions.

Generalize - Students will relate knowledge gained from the experiment/demonstration to the concepts of physical and chemical reactions.

Literature Connection: [Pink Snow and Other Weird Weather](#) by Jennifer Arena. This is a fun and engaging informational book that will introduce students to a variety of weather-related concepts and experiences.

Math Connection (with a Science Twist):

Conservation of Mass

1. Start by accurately weighing 1 blue scoop of the snow polymer (1 teaspoon, or about 3 grams).
2. Perform the experiment described above by adding 2 ounces (60 mL) water to the powder to make snow. Accurately weigh the snow.
3. Place the snow in an open container and allow the water to evaporate. This may take several days, depending on the humidity. When all of the water has completely evaporated, accurately weigh the remaining powder.
4. If the law of conservation of mass is correct, you should have recovered the same amount of Insta-Snow powder you started with at the beginning of the experiment. This proves that the reaction that took place was a physical reaction and not a chemical reaction. The composition of the Insta-Snow powder never actually changed.

Expert Vocabulary

NAME _____

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 ____ **Polymer**

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

2 ____ **Physical Reaction**

The passage of molecules through a semipermeable membrane to create an equal concentration of molecules on both sides of the membrane.

3 ____ **Absorb**

A group of two or more atoms that stick together.

4 ____ **Osmosis**

To take in or soak up.

5 ____ **Molecule**

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.

A physical reaction is a reaction between two substances that leads to a change in the form of matter, but does not create a new substance. Explain how adding water to Insta-Snow creates a physical reaction.



Critical Thinking

NAME _____

INFERENCE —

Students will use knowledge gained from the experiment/demonstration to make judgements about outcomes and conditions of type of reactions.

Fill a cup half-full with water. Add color to the water. Allow the water to sit out and evaporate over the next few days. Once the water has evaporated, what remains in the cup? What does this prove about the type of reaction that occurs when coloring water?

Using this understanding, if you leave the Rainbow Insta-Snow out for a few days, the water will evaporate, but the Insta-Snow powder that remains appears to retain the color. Explain what is actually happening here? Hint: Use a magnifying glass to get a close look at the Insta-Snow polymer.



Critical Thinking

NAME _____

GENERALIZE —

Students will relate knowledge gained from the experiments/demonstration to the concept of physical and chemical reactions.

Arthur and Milo are clever boys. They want to make orange snow, BUT don't want to just make orange water and add it to the Insta-Snow powder. They think there has to be another way to make orange snow. Arthur believes that he can add yellow water to dehydrated red snow to make orange snow. Milo thinks that he can mix his already made red and yellow snow and make orange snow. Which boy is correct? Or are they both correct? Make a hypothesis and record it below. Conduct the experiment. Explain your discoveries below.

Hypothesis -

Big Discovery -



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 What is it called when the Rainbow Insta-Snow is left out, the water molecules leave, and the snow dries up?
- a. Condensation
 - b. Evaporation
 - c. Osmosis
 - d. Shrinkage

- ② Insta-Snow is a type of
- a. sponge.
 - b. catalyst.
 - c. cotton.
 - d. polymer.

- ③ A rainbow consists of
- a. Primary colors only.
 - b. Secondary colors only.
 - c. Both primary and secondary colors.
 - d. Natural colors.

- ④ Which is the best definition for osmosis?
- a. Something that you can see through
 - b. The movement of water downhill
 - c. The movement of water through a membrane
 - d. A polymer that can absorb large amounts of water

- ⑤ Explain how you know that coloring the snow in this activity is a physical reaction.



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 | (E) Polymer |  A A process that leads to a change in the form of matter. |
| 2 | (A) Physical Reaction |  B The passage of molecules through a semipermeable membrane to create an equal concentration of molecules on both sides of the membrane. |
| 3 | (D) Absorb |  C A group of two or more atoms that stick together. |
| 4 | (B) Osmosis |  D To take in or soak up. |
| 5 | (C) Molecule |  E 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.

A physical reaction is a reaction between two substances that leads to a change in the form of matter, but does not create a new substance. Explain how adding water to Insta-Snow creates a physical reaction.

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 it's 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.



Critical Thinking- Answer Key

INFERENCE —

Students will use knowledge gained from the experiment/demonstration to make judgements about outcomes and conditions of type of reactions.

Fill a cup half-full with water. Add color to the water. Allow the water to sit out and evaporate over the next few days. Once the water has evaporated, what remains in the cup? What does this prove about the type of reaction that occurs when coloring water?

Possible Answer:

I know that a physical reaction is one that can be reversed and a chemical reaction is one that cannot be reversed. I thought that adding color to the water meant that the water was permanently changed. But once the water evaporated, I discovered that the color was left behind in the bottom of the cup. That means that the color and the water did not actually make a new substance. Instead, they simply appeared to be mixed. When coloring water it is a physical reaction. The water evaporated away and the color was left behind.

Using this understanding, if you leave the Rainbow Insta-Snow out for a few days, the water will evaporate, but the Insta-Snow powder that remains appears to retain the color. Explain what is actually happening here? Hint: Use a magnifying glass to get a close look at the Insta-Snow polymer.

Possible Answer:

If you look closely at the polymer, you will see the color particles are separate from the snow polymer. The fact that the color does not disappear from the Insta-Snow polymer along with the water tells me that it is a physical reaction. The polymer is left and the color is left after the water evaporates.



Critical Thinking- Answer Key

GENERALIZE —

Students will relate knowledge gained from the experiments/demonstration to the concept of physical and chemical reactions.

Arthur and Milo are clever boys. They want to make orange snow, BUT don't want to just make orange water and add it to the Insta-Snow powder. They think there has to be another way to make orange snow. Arthur believes that he can add yellow water to dehydrated red snow to make orange snow. Milo thinks that he can mix his already made red and yellow snow and make orange snow. Which boy is correct? Or are they both correct? Make a hypothesis and record it below. Conduct the experiment. Explain your discoveries below.

Hypothesis -

Big Discovery -

Possible Answer:

When you add yellow water to dehydrated red snow you will create orange snow. The red coloring will mix with the yellow coloring to create orange water, which will then hydrate the Insta-Snow powder. This will create orange snow.

When you mix already made red and yellow snow, you will make orange snow, sort of. From a distance the snow will look orange because your eyes automatically mix the red and yellow snow together. But when you look closely at the snow you have mixed, you will discover that the snow is not actually orange at all. There are is a bunch of red coloring and yellow coloring in with the snow polymer. No orange was actually created.



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 What is it called when the Rainbow Insta-Snow is left out, the water molecules leave, and the snow dries up?
 - a. Condensation
 - b. **Evaporation**
 - c. Osmosis
 - d. Shrinkage

- 2 Insta-Snow is a type of
 - a. sponge.
 - b. catalyst.
 - c. cotton.
 - d. **polymer.**

- 3 A rainbow consists of
 - a. Primary colors only.
 - b. Secondary colors only.
 - c. **Both primary and secondary colors.**
 - d. Natural colors.

- 4 Which is the best definition for osmosis?
 - a. Something that you can see through
 - b. The movement of water downhill
 - c. **The movement of water through a membrane**
 - d. A polymer that can absorb large amounts of water

- 5 Explain how you know that coloring the snow in this activity is a physical reaction.

Possible Answer:

A physical reaction is one that can be reversed. All of the components that I added to the experiment- the water, color and polymer- are able to be separated through evaporation. The water evaporates and disappears. This process will leave behind the coloring and the polymer. I can see that the polymer is not colored, but the coloring is separate. This proves that it is a physical reaction.

Common Core State Standards

Student Outcomes	Standards
Students will be able to ask and answer questions about key details about their observations and discussion to demonstrate their understanding of the scientific concepts presented through the experiment.	RI.K.1, RI.1.1, RI.2.1, RI.3.1, RI.4.1
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 explain the connection between scientific ideas presented in the experiment.	RI.1.3, RI.2.3, RI.3.3, RI.4.3, RI.5.3
Students will be able to retell key details presented in the experiment in order to understand/determine the main idea.	RI.K.2, RI.1.2, RI.2.2, RI.3.2, RI.4.2, RI.5.2
Students will be able to refer back to their observations and discussion to demonstrate their understanding of the scientific concepts presented through the experiment.	RI.3.1
Students will be able to use information gained from observations of the experiment to demonstrate understanding of the concepts presented.	RI.4.5
Students will be able to draw inferences from a specific scientific learning experience.	RI.4.1, RI.5.1