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ERUPTING SNOW POLYMER

EXPERIMENT GUIDE

as seen on YouTube™

POWERED BY Steve Spangler SCIENCE

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Concept based on a video series by Steve Spangler Science and distributed through the YouTube Original Content Series.

Published by Steve Spangler Science, Englewood, Colorado
www.SteveSpanglerScience.com

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ERUPTING SNOW POLYMER

You won't believe your eyes. Just add water to the mysterious white powder and in seconds, the transformation begins. The liquid magically changes into a fluffy white powder that looks just like snow. It's actually a safe, non-toxic polymer that absorbs water and fluffs up to look like snow.

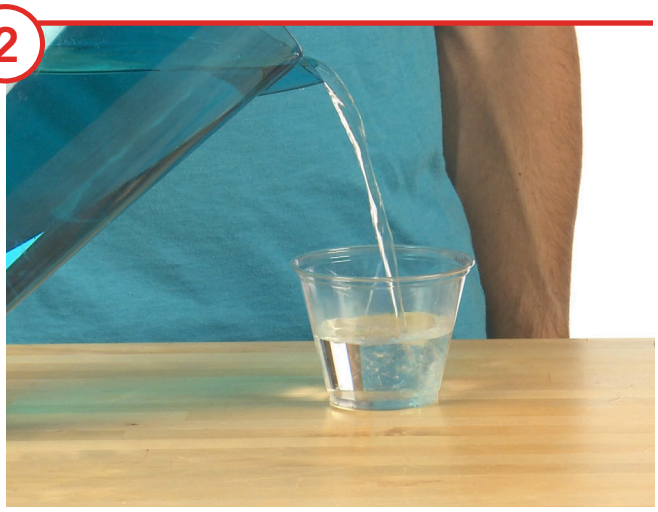
WHAT YOU NEED

- INSTA-SNOW® POWDER
- 2 PLASTIC CUPS
- BLUE MEASURING SCOOP (1 TSP)
- WATER
- ADULT SUPERVISION

1

Use the blue scoop that came in your kit to measure out 1 teaspoon (about 3 grams) of Insta-Snow powder into the empty plastic cup.

2



Measure 8 ounces of room temperature water into a second cup.

3

Quickly pour all of the water into the cup with the Insta-Snow powder. Don't take your eyes off the erupting snow!

4

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!!!

HOW DOES IT WORK

Insta-Snow is actually derived from the superabsorbent polymer found in baby diapers. The only difference 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 the 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.

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! This is different than a chemical reaction where a new substance is actually formed and energy is either given off or absorbed.

If you think of the Insta-Snow powder as millions of tiny sponges, it's easy to see that neither the Insta-Snow powder nor the water was changed. If you allow the water to evaporate, the Insta-Snow powder dries out and returns to its previous state as a powder, ready to be used again.

TAKE IT FURTHER - 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.

WHAT YOU NEED

- **INSTA-SNOW® POLYMER**
- **2 PLASTIC CUPS**
- **BLUE MEASURING SCOOP (1 TEASPOON)**
- **SCALE**
- **WATER**

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 since the composition of the Insta-Snow powder never actually changed.

TAKE IT FURTHER - COLOR CHALLENGE

Can you think of a way to color the snow without coloring the water? Try it! Record your trials and figure out which method creates the best colored snow.

ADDITIONAL INFORMATION

Insta-Snow is a synthetic polymer with super water-absorbing properties. It's the only fake snow on the market today that erupts when water is added. Similar superabsorbent polymers have been used in the past to absorb moisture in disposable baby diapers... without the incredible expanding property! Insta-Snow is so realistic that it is now being used in indoor snowboarding parks throughout the world.

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?

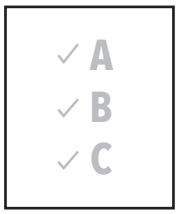
- Test different "recipes" of snow. You have created mounds of snow with the given amounts of water and Insta-Snow powder that we specified. Try different proportions of water and Insta-Snow powder to see which "recipe" creates the fluffiest snow.

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!

WHAT ARE THESE SYMBOLS ALL ABOUT?

LAB REPORT

In this section, you will learn to define and prepare your experiments like scientists do. You will ask big questions, develop hypotheses, list materials, write procedures, record results and make big discoveries.

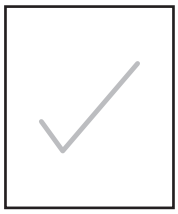


EXPERT VOCABULARY

In this section, you will learn to use the language scientists use to discuss and explain the concepts covered in this experiment.

CRITICAL THINKING

Follow the layers of critical thinking density with this icon. As the beakers fill from page to page, you will notice the level at which the beaker is filled indicates the depth of critical thinking needed to complete the question(s), from least complex being the least full to most complex being the most full.



ASSESSMENT

In this section, you will find questions at a variety of levels which assess student understanding of the scientific content covered in the experiment.

A WORD ABOUT SAFETY

Everything we suggest using in this guide is safe when used with proper adult supervision. We guarantee young scientists will get a lot more from the experience if you're there to guide them. Remember, this is science, and science tends to get a bit messy. Stuff falls on the floor... so you'll need to clean it up. Don't put chemicals in your eyes or ears and don't eat your experiment. Trust us, they don't taste good and it's a bad thing to do. The bottom line is that this science experiment guide requires adult supervision and common sense. These simple concepts help ensure a fun and safe experience.

TEACHER NOTES:

SCIENCE CONCEPTS OVERVIEW ▸ Physical Reaction I Polymers I Osmosis

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.

Suggested Teaching Points:

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.

Vocabulary: Students 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.

The 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 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 word.

Evaluation: Students will predict and describe the impact that changing the liquid would have on the experiment/demonstration.

Literature Connections: 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.

Axle Annie by Robin Pulver. This fiction story will keep kids laughing as they read about the determination of a school bus driver to get the kids to school, even on the snowiest of days.

Snow Day by Ezra Jack Keats. This colorful story describes a little boys excitement about the first snow of the year.

Snowflake Bentley by Jacqueline Briggs Martin. This biography tells about Wilson A. Bently, and his discovery that no two snowflakes are exactly the same.

Thomas' Snowsuit by Robert Munsch. This comedic tale follows Thomas who refused to wear his new snowsuit despite everyone's best effort to convince him that he needs to wear it.

Lab Report

NAME

BIG QUESTION:
Scientists ask big questions to guide their experiment.

What big question are we answering in this experiment?

HYPOTHESIS:
Scientists make predictions about what they think will happen during the experiment.

What is your hypothesis for this experiment?

Lab Report

NAME

MATERIALS AND PROCEDURES:
Scientists make a list of materials they need and will use in their experiments. It is important other scientists are able to duplicate and test each other's experiments.

What materials do you need to conduct this experiment?

Write out a step-by-step procedure for this experiment.

Lab Report

NAME

RESULTS AND OBSERVATIONS:
Scientists make observations and take notes as they conduct their experiments. Scientists are good observers and record all results of their experiments. It is important to measure your results using precise units and careful review.

What were the results of your experiment?

What did you observe as you conducted your experiment?

Lab Report

NAME

CONCLUSIONS AND DISCOVERY:
Scientists look carefully at their results, think critically about their observations, and draw conclusions about their experiments, as they relate to their big question and original hypothesis.

What conclusions and discoveries did you make after completing the experiment?

NEXT STEPS:
Sometimes after scientists conduct their experiments, they think of new questions they want to test in new experiments.

What new questions do you have after you have completed your experiment?

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

Osmosis is the passage of molecules through a sponge-like surface to create an equal amount of molecules on both sides of the membrane. The Insta-Snow polymer soaks up the water and expands because of osmosis.

Create a diagram to show what osmosis looks like as the water passes through the surface of the Insta-Snow polymer and gets trapped inside, causing the Insta-Snow polymer to expand.

Critical Thinking

NAME

VOCABULARY IN CONTEXT —
Students will determine the meaning of vocabulary words by using clues from the context around the word.

Insta-Snow is an absorbent polymer which means that it is able to soak up the water around it. It is able to soak up the water because its surface is semipermeable. Water molecules can pass through the surface of the Insta-Snow polymer, which allows for some water molecules to stay inside and the Insta-Snow polymer expands. Later, the water is able to escape through the semipermeable surface as it evaporates and the Insta-Snow polymer shrinks back down to its original size.

What does it mean that the surface is semipermeable? Explain how you know using clues from the paragraph above. Then, give an example of something else that you can think of that is semipermeable.

Critical Thinking

NAME

EVALUATION —
Students will predict and describe the impact that changing the liquid would have on the experiment/demonstration.

The Insta-Snow polymer expands because water molecules are able to be absorbed through the semipermeable surface, leaving no residue behind. Predict what would happen if you used a different liquid, such as juice, instead of water. Explain your thinking.

Assessment

NAME

ASSESSMENT QUESTIONS —
Read each question carefully and circle the letter next to the correct answer or write your response in the box.

1. What is it called when the 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. Circle all of the items below that are semipermeable.
   a. Screen
   b. Concrete
   c. Sponge
   d. Towel

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. When the water is absorbed by the polymer, is that a chemical or physical reaction? Use evidence to support your thinking.

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

Osmosis is the passage of molecules through a sponge-like surface to create an equal amount of molecules on both sides of the membrane. The Insta-Snow polymer soaks up the water and expands because of osmosis.

Create a diagram to show what osmosis looks like as the water passes through the surface of the Insta-Snow polymer and gets trapped inside, causing the Insta-Snow polymer to expand.

Possible Answer:
Drawings will vary but should demonstrate student understanding that water moves in and out through the surface of the Insta-Snow polymers.

Critical Thinking- Answer Key

VOCABULARY IN CONTEXT —
Students will determine the meaning of vocabulary words by using clues from the context around the word.

Insta-Snow is an absorbent polymer which means that it is able to soak up the water around it. It is able to soak up the water because its surface is semipermeable. Water molecules can pass through the surface of the Insta-Snow polymer, which allows for some water molecules to stay inside and the Insta-Snow polymer expands. Later, the water is able to escape through the semipermeable surface as it evaporates and the Insta-Snow polymer shrinks back down to its original size.

What does it mean that the surface is semipermeable? Explain how you know using clues from the paragraph above. Then, give an example of something else that you can think of that is semipermeable.

Possible Answer:

I think that semipermeable means something that molecules can pass through. I think this because the paragraph says that the water molecules can pass through it to make it expand, and also that the molecules pass back through it as they leave and evaporate. I also know that "semi" means "some or part" so maybe only some molecules can pass through a surface that is semipermeable.

I think that a window screen might be semipermeable because it lets some things pass through like air and small particles. But, it blocks other things from passing through, like larger particles. Window screens also let things through in both directions like air and water.

Critical Thinking- Answer Key

EVALUATION —
Students will predict and describe the impact that changing the liquid would have on the experiment/demonstration.

The Insta-Snow polymer expands because water molecules are able to be absorbed through the semipermeable surface, leaving no residue behind. Predict what would happen if you used a different liquid, such as juice, instead of water. Explain your thinking.

Possible Answer:

I predict that the Insta-Snow would still expand because there are water molecules in juice that it could absorb. However, there would probably be a sticky residue left over because there are other molecules and ingredients in juice, like sugar, that cannot get through the membrane and would remain on the outside of the Insta-Snow polymers.

Assessment

NAME

ASSESSMENT QUESTIONS —
Read each question carefully and circle the letter next to the correct answer or write your response in the box.

1. What is it called when the Insta-Snow is left out, the water molecules leave, and the snow dries up?

   a. Condensation
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   c. Osmosis
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2. Insta-Snow is a type of...

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3. Circle all of the items below that are semipermeable.

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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. When the water is absorbed by the polymer, is that a chemical or physical reaction? Use evidence 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 it's a physical reaction because if you let the polymer sit out, the water will eventually evaporate and the polymer would be left. I also know it is a physical reaction because if you add salt to the polymer/water mixture, the water and polymer separate. Only a physical reaction can be reversed. Chemical reactions cannot.

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 actively engage in shared informational learning activity with purpose and understanding.	RI.K.10
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 participate in shared writing projects and record scientific observations.	W.K.8, W.2.7