Properties of Matter
Lesson 6: Changing Matter into Something New
Additional Support for NGSS Standards

Grade 2	**Length of lesson:** 60 minutes	**Placement of lesson in unit:** Extension lesson on properties of matter
Unit central questions: What is matter made of? How can matter change?		**Lesson focus question:** What happens when matter starts off as one thing and changes into something different?
Main learning goal: By rearranging the atoms in molecules, matter can change into something entirely new.		
Science content storyline: Some changes in matter are different from physical changes. In a physical change, solid matter can become liquid matter, and liquid matter can become solid matter, but the substance itself remains the same. The molecules are just arranged and move differently. For example, water can become a solid or a liquid, but the molecules (H_2O) are always the same. Another kind of change occurs when the atoms in molecules are rearranged, and the original substance becomes an entirely new substance with different properties. This is called a *chemical change.* The new substance may look or taste different from the original substance, or it may bubble or change color. When this type of change occurs, it means that the atoms in the original substance have recombined in new ways.		
Ideal student response to the focus question: I can observe when something changes from one substance to another. It looks different, tastes different, or bubbles. When this kind of change happens, the atoms are rearranged to make new molecules that are different from the original ones.		

Preparation

Materials Needed
- Science notebooks
- Chart paper and markers
- *A Drop of Water* by Walter Wick (from lesson 3a)
- For each group of 4 students:
  - Lego bricks (1 lime green, 2 × 4"; 5 white, 2 × 2"; 3 black, 2 × 4"; 5 red, 2 × 4"), preassembled as larger molecules that represent vinegar and baking soda
  - Vinegar and baking-soda experiment (1 setup per group, from lesson 1b): 1 quart-sized, sealable, plastic freezer bag; 1 teaspoon of baking soda; 2 tablespoons of vinegar; clear plastic vial with a snap-on cap; paper towels

Student Handouts
- 1.3 Data Table (Teacher Master) (from lesson 1a)
- 3.1 Lego Model (from lesson 3a)

Ahead of Time
- Review sections 7 and 8 (on chemical changes) in the content background document.
- Decide whether to repeat the optional human-model activity from lesson 4b during the first phase (Link to Previous Lessons) to reinforce key science ideas related to physical changes in matter.
- Refer to Conserving-Matter Setup (handout 7.1) in extension lesson 7 to preassemble the Lego molecules of vinegar, baking soda, and paper.
- Prepare 14 vinegar and baking-soda experiments:
  - Place 1 teaspoon of baking soda in a sealable freezer bag. Then place 2 tablespoons of vinegar in a clear plastic vial and secure the snap-on cap. Wipe any vinegar off the outside of the vial. Then place the vial in the freezer bag with the baking soda. Remove as much air as possible before sealing the bag.
  - To mix the vinegar with the baking soda, students will pop the cap off the vial (without opening the freezer bag) and pour out the vinegar.
  - As needed, review the activity in lesson 1b.

Lesson 6 General Outline

Time	Phase of Lesson	How the Science Content Storyline Develops
15 min	**Link to previous lessons:** Working in teams, students act out how particles move when a solid changes to a liquid and then back to a solid. Then the teacher reads a section from *A Drop of Water* to reinforce key ideas about how molecules move in solid and liquid matter.	• Molecules (particles) in solid and liquid matter are always in motion. In a solid, molecules form a rigid structure and vibrate in place. In a liquid, molecules move around more freely and slide past one another.
1 min	**Lesson focus question:** The teacher introduces the focus question, *What happens when matter starts off as one thing and changes into something different?*	
5 min	**Setup for activity:** The teacher reviews the data collected in lesson 1 from student observations of different changes in matter. Then students share their ideas about why some changes in matter don't involve melting or freezing.	• Some changes in matter are different from physical changes in which solid matter becomes liquid matter when heat is added and liquid matter becomes solid matter when heat is removed. When these different changes in matter occur, the original substance becomes an entirely new substance.
20 min	**Activity:** Students create a Lego model showing what happens when vinegar and baking soda are combined and the atoms in the molecules are rearranged to become an entirely new substance.	• When the atoms in molecules are rearranged or combined in different configurations, they form an entirely new substance, not just the same substance in a solid or liquid state. This new substance may look or taste different from the original substance, or it may bubble or change color.
10 min	**Follow-up to activity:** Students compare physical changes (melting and freezing) with chemical changes.	• In a physical change, matter changes back and forth between a solid and a liquid when heat is added or removed. In this kind of change, the substance remains the same; the molecules are just arranged and move differently. In a chemical change, the atoms that make up the molecules of a substance are rearranged, and the original substance becomes an entirely new substance with different properties.
6 min	**Synthesize/summarize today's lesson:** Using science ideas about chemical changes in matter, students write their best answers to the focus question in their science notebooks.	• When the atoms in molecules are rearranged or combined in different configurations, they form an entirely new substance, not just the same substance in a solid or liquid state. This new substance may look or taste different from the original substance, or it may bubble or change color.
3 min	**Link to next lesson:** Students consider whether the number of atoms is different after a chemical change. Then the teacher announces that in extension lesson 7, students will find out whether a chemical change can alter the number of atoms.	

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15 min	**Link to Previous Lessons** **Synopsis:** Working in teams, students act out how particles move when a solid changes to a liquid and then back to a solid. Then the teacher reads a section from *A Drop of Water* to reinforce key ideas about how molecules move in solid and liquid matter. **Main science idea(s):** • Molecules (particles) in solid and liquid matter are always in motion. In a solid, molecules form a rigid structure and vibrate in place. In a liquid, molecules move around more freely and slide past one another.	Link science ideas to other science ideas.	**Show slides 1 and 2.** In an earlier lesson, we talked about what happens to the molecules in solid and liquid matter when we add or remove heat. Who can share what we learned?	We learned that when you heat matter, it melts. In a solid, the molecules are packed together in a rigid structure, and they vibrate in place. If you add heat, the molecules move faster until they stop vibrating and move around like the Legos in the plastic bag.	What did we learn from our Lego model? So what happens to these vibrating molecules if you add heat to a solid? Would anyone like to add to that idea? Do you agree or

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				When we added heat to the ice, we took the Lego water molecules out of the box and put them in the plastic baggie to show the matter melting into a liquid. The ice in the cup did the same thing. The heat came from the room because the room was warmer than the ice. Maybe the heat came from the air in the room or from the table the cup of ice was sitting on.	disagree? We didn't put the ice on the stove or in the sun or anything, so where did the ice get the heat it needed to melt? So we know that solid water or ice melts and becomes liquid

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					water. Does the same thing happen when other solids melt, like butter, chocolate, crayons, or the copper in a penny?
				Yes, but the molecules are different. Water has two white Legos and a red Lego, but other kinds of matter have different molecules.	
					Is that the only difference when substances other than water melt?
				Yes.	What about the temperature? Would the penny and the crayon melt if they just sit on a table?
				No. Different things melt at different temperatures. You'd have to find a way to heat up the	

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				molecules more than the ice to make a crayon melt. And you'd have to heat the penny up even more to make it melt!	
			So we know that adding heat makes solid matter change to liquid matter, and that when this happens, the molecules stop vibrating in place and move around more freely. Who can describe what happens to the molecules when a liquid changes to a solid?	When heat is taken away from a liquid, the matter cools off, and the molecules slow down and stick together. Then they vibrate in place again. I don't know! From the air.	What happens to the heat when the matter cools off? Where did the ice get the heat to melt? So where do you

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		Select content representations and models matched to the learning goal and engage students in their use. Engage students in using and applying new science ideas in a variety of ways and contexts.	In this unit, we used a Lego model to show how molecules move and change in a liquid and a solid. **Show slide 3.** **Optional activity:** Today you'll act this out in teams as human models of molecules. **NOTE TO TEACHER:** *Although the human-model activity from lesson 4b is optional, you may want to repeat it to reinforce student learning related to physical changes in matter.* Can you imagine how you'd move if you were a water molecule? Let's find out! **NOTE TO TEACHER:** *Divide the class into teams of four students and have teams discuss how they would behave if they were four water molecules changing from a solid to a liquid and back to a solid.* **Show slide 4.**	Maybe into the air?	think the heat might go when something gets cooler?

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		Ask questions to probe	First, talk with your teammates about how you can model four water molecules in solid and liquid matter. How would you behave if you were molecules in solid water or ice? How would you behave if you were molecules in liquid water? Decide how close to *stand* and how to *move* as molecules of solid water and liquid water. You'll have 1 minute to talk over your plan. Then you'll act it out as a team. **Small-group discussion time.** Now that you have a plan, are you ready to become human models of water molecules? When I give the signal, I want you to act out how *solid water*, or ice, behaves. Remember, water molecules can't talk, so act this out quietly. Ready, set, GO! **NOTE TO TEACHER:** *Watch how students move during the role-play. As water molecules in a solid state, they should stand close to each other and vibrate in place rather than moving around. Ask probe and challenge questions to make*		*Questions to ask during the role-play:* • Why are you moving that way?

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		student ideas and predictions. Ask questions to challenge student thinking.	*student thinking visible and challenge incorrect ideas. If several groups are modeling molecular arrangements and movements in a scientifically inaccurate way, stop the role-play and have one group model how molecules should behave in a solid.* Good job, molecules! Please stop moving now and let's talk about how molecules change from one form to another. What causes water molecules to change from a solid to a liquid? That's right! So pretend that I'm adding heat to your group of molecules and think about what happens when a solid changes to a liquid. When I give the signal, I want you to act out molecules changing from solid water or ice to liquid water. Think about how molecules of liquid water would move and behave. And remember that molecules can't make a sound! Ready, set, GO! **NOTE TO TEACHER:** *Watch how students move during the role-play. As water molecules in a liquid state, they*	Adding heat!	• How does that represent a solid?

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		Ask questions to probe student ideas and predictions. Ask questions to challenge student thinking.	*should still be standing near each other, but they should move around more freely and slide past each other. They could potentially bump into each other, but they shouldn't move all over the classroom. (Moving all over the room in different directions would represent water molecules as a gas or water vapor.) Ask probe and challenge questions to make student thinking visible and challenge incorrect ideas. If several groups are modeling molecular arrangements and movements in a scientifically inaccurate way, stop the role-play and have one group model how molecules should behave in a liquid.* You've done a wonderful job, molecules! Please stop moving now and let's talk about how a liquid changes back to a solid. What has to happen for liquid water to change back to solid water, or ice?	It has to get really cold! Heat has to be taken away, like when you	*Questions to ask during the role-play:* • Why are you moving that way? • How does that represent a liquid? Can you use the same words scientists do scientists when they talk about changes in matter? How is heat involved?

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		Ask questions to probe student ideas and predictions. Ask questions to challenge student thinking.	OK, pretend that I'm removing heat from your group of molecules. Think about what happens when a liquid changes to a solid. When I give the signal, act out molecules changing from liquid water to solid water, or ice. Show how molecules of solid water would move and behave, and remember to act this out quietly! **NOTE TO TEACHER:** *Watch how students move during this role-play. As they change from a liquid to a solid, they should slow down, move closer to one another again, and begin vibrating in place. Ask probe and challenge questions to make student thinking visible and challenge incorrect ideas. If several groups are modeling molecular arrangements and movements in a scientifically inaccurate way, stop the role-play and have one group model how molecules should behave in a solid.* Thank you, molecules! You can stop moving now and return to your seats. **Show slide 5.**	took the chocolate and crayons off the griddle.	*Questions to ask during the role-play:* • Why are you moving that way? • How does that represent a solid?

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			In a previous lesson, we learned about molecules in a book called *A Drop of Water*? Let's review a section from this book. Pay attention to what it says about molecules in liquid water and solid water. **NOTE TO TEACHER:** *Read pages 18 and 21 from* A Drop of Water. *Emphasize the molecular motion and the role of heat.*		
1 min	**Lesson Focus Question** **Synopsis:** The teacher introduces the focus question, *What happens when matter starts off as one thing and changes into something different?*	Summarize key science ideas. Set the purpose with a focus	**Show slide 6.** We've been learning about how matter changes into a solid or a liquid when heat is added or taken away. Heating or melting and removing heat or freezing can cause changes in matter. Matter changes from a solid to a liquid when heat is added and the molecules more around more freely. Matter changes from a liquid to a solid when heat is taken away and the molecules slow down and vibrate in place. **Show slide 7.** Today we're going to explore how matter can change without melting or freezing. Our focus question is *What happens when matter starts off as one thing and changes*		

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		question or goal statement.	*into something different?* Write this question on a clean page in your science notebooks and draw a box around it. **NOTE TO TEACHER:** *Write the focus question on the board for students to refer to throughout the lesson.* Let's find out what happens when matter starts off as one thing and changes into something different!		
05 min	**Setup for Activity** **Synopsis:** The teacher reviews the data collected in lesson 1 from student observations of different changes in matter. Then students share their ideas about why some changes in matter don't involve melting or freezing. **Main science idea(s):** • Some changes in matter are different from physical changes in which solid matter becomes liquid matter when heat is added and	Make explicit links between science ideas and activities **before** the activity. Engage students in analyzing and interpreting data and observations. Ask questions to elicit student	**Show slide 8.** In our first lesson of this unit on matter, we observed some of the different ways matter changes. For example, we saw how ice can change to liquid water and solid butter can change to melted butter when heat is added. But we also saw some ways that matter can change without melting or freezing the way water and butter did. Who can tell me about the other ways you saw matter changing?	We saw paper burning. We saw the baking soda and vinegar fizzing when we	

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	liquid matter becomes solid matter when heat is removed. When these different changes in matter occur, the original substance becomes an entirely new substance.	ideas and predictions. Engage students in using and applying new science ideas in a variety of ways and contexts.	So these changes happened without the matter melting or freezing, didn't they? What do you think burning and fizzing have in common? How might they be alike? Let's look at our data table from lesson 1 to see if we can identify any similarities. **NOTE TO TEACHER:** *Display the data table you created on chart paper (from handout 1.3) in lesson 1.*	mixed them together. In the last column of our table, we said that these changes aren't reversible. The stuff could go back and forth between melting and freezing? The matter could change from a solid to a liquid and then back to a solid. The ashes or the	What does *reversible* mean to you? What do you mean by "stuff" and "back and forth"? Why do you think these other kinds of changes aren't reversible?

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				black stuff can't change back into paper. I don't think the fizzy stuff could change back to vinegar and baking soda.	
		Summarize key science ideas.	So you might say that when these kinds of changes happened, the matter we start off with becomes something totally new, right? We can't change the burned paper or ashes back into a clean sheet of paper by changing the temperature because the matter changed into something new and different.		
20 min	**Activity** **Synopsis:** Students create a Lego model showing what happens when vinegar and baking soda are combined and the atoms in the molecules are rearranged to become an entirely new substance. **Main science idea(s):** • When the atoms in molecules are	Make explicit links between science ideas and activities **during** the activity. Select content representations and models	**Show slide 9.** Today we're going to use our Lego model again and think about what might cause matter to change from one type of substance into something entirely different. Look in your science notebooks and find the handout with the pictures and descriptions of our Lego model. **NOTE TO TEACHER:** *Have students locate handout 3.1 (Lego Model) from*		

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	rearranged or combined in different configurations, they form an entirely new substance, not just the same substance in a solid or liquid state. This new substance may look or taste different from the original substance, or it may bubble or change color.	matched to the learning goal and engage students in their use. Engage students in using and applying new science ideas in a variety of ways and contexts.	*lesson 3a.* On this handout, we can see that a water molecule is made out of two white hydrogen atoms and one red oxygen atom. That's why water is sometimes called H_2O. For our next investigation, you'll work in teams and use our Lego model to show how another kind of matter changes. **Show slide 10.** **Turn and Talk (2 min):** First, I'd like you to pair up with an elbow partner and talk about the question on the slide: *What happened in lesson 1 when we mixed vinegar with baking soda in a plastic freezer bag?* **Whole-class share-out:** Let's hear some of your ideas? What happened in lesson 1 when we mixed the vinegar with the baking soda in a plastic freezer bag?  Listen to students' ideas. What's visible about student thinking? How are they making sense of their observations? **NOTE TO TEACHER:** *Invite a few*	The bag puffed up, and the vinegar and baking soda fizzed. I think it puffed up because it got some	What do you think made the bag puff up?

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		Ask questions to probe student ideas and predictions.	*students share their ideas about the vinegar and baking soda. Accept all answers without correcting misconceptions or inaccuracies.* *Make sure to ask students these follow-up questions: (1) What do you think made the bag puff up? and (2) Where did the air come from that puffed up the bag? Ask probe questions to make sure you understand students' thinking.* Now let's use our Lego model to show what happens when baking soda and vinegar are mixed together. Then we'll perform the actual experiment again and see if we're right. **NOTE TO TEACHER:** *Divide the class into teams again and ask one member of each team to come up and get the materials they'll need (see overview page): one Lego molecule of vinegar and one Lego molecule of baking soda, as well as a sealed freezer bag containing baking soda and a vial of vinegar.* Have one teammate come to the supply table and get the materials you'll need for our investigation. Each team will have a Lego molecule of vinegar and a Lego molecule of baking soda. You'll also have a	air in it. I don't know. Maybe from what happened when we mixed the baking soda and vinegar?	Where do you think the air came from?

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			plastic freezer bag containing vinegar and baking soda. Don't open the bag, and be very careful not to pop the cap off the container until I tell you to. **NOTE TO TEACHER:** *To make sure students don't fiddle with the freezer bag, ask them to carefully set it aside while they work with their Lego models.* I'd like you to close your eyes for a moment and imagine that you could shrink small enough to see the molecules that make up the baking soda and the vinegar. **Show slide 11.** Now look at the molecule with the green Lego brick like the one on the slide. This represents one baking-soda molecule. How is this molecule like a water molecule? How is it different?	The baking-soda molecule is bigger than a water molecule. A water molecule has three atoms: one	What do you mean by "bigger"? Can you be more specific?

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				red Lego and two white Legos. The baking-soda molecule has three red Legos, one white Lego, a black Lego, and a green Lego. There are six atoms in one baking-soda molecule. There are four different kinds of atoms—red, white, black, and green.	So how many atoms are in one baking-soda molecule? Everyone count them. How many different kinds of atoms are in the baking-soda molecule?
			Show slide 12. We don't need to learn the names of all the different kinds of atoms. All we need to know is that the baking-soda molecule has *six* atoms. Two of these atoms are the same		

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			as the atoms in water, and two are different. **Show slide 13.** Now let's look at the vinegar molecule. Who can describe this molecule? How is it different from the baking-soda molecule? **Show slide 14.** So a vinegar molecule is bigger than a baking-soda molecule, with a total of *eight* atoms. But it has only three different kinds of atoms.	The vinegar molecule is bigger than the baking-soda molecule, but it has only three colors of Legos. It has three different kinds of atoms. There are *eight* atoms in one vinegar molecule.	What does this tell you about the vinegar molecule? How many atoms are there in one molecule? Everyone count them.

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			A molecule of vinegar is also bigger than a molecule of water.		
		Ask questions to elicit student ideas and predictions.	**Show slide 15.** Let's think about the vinegar and baking-soda molecules. What do you predict will happen to these molecules when we mix the vinegar and baking soda together?	They'll turn into something else. Maybe the red and white Legos will combine, and we'll get new colors, like pink and gray. We could take these	How do you think that might happen? Atoms don't change, so we can't have new Lego-brick colors. But we can make new molecules. Does anyone else have an idea about how that might happen?

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		Highlight key science ideas and focus question throughout.	You came up with some good predictions. Now let's test them using our Lego models. In your teams, take the vinegar and baking-soda Lego molecules apart and then use the atoms to build one or more new molecules. You'll have 1 minute to build your molecules. **NOTE TO TEACHER:** *Circulate around the room as teams work on rearranging their Lego models into new configurations and provide support as needed.* I notice that some teams came up with one new molecule and others came up with two or more new molecules. We can build all kinds of different molecules with our Legos, but this doesn't happen in real life. When you combine baking soda and vinegar in real life, the atoms rearrange in a certain way, and we end up with the same new molecules every single time.	Lego molecules apart and put back them together differently. Then we'd have a new molecule.	Does anyone else have some predictions?

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			Let me show you what happens. When we combine baking soda and vinegar, one of the new molecules we get is this one with two white molecules and one red molecule. **NOTE TO TEACHER:** *Show students a Lego water molecule with two white bricks and one red brick.* Does anyone remember what we call this molecule? That's right! We get a water molecule. Another molecule we get has three atoms. **NOTE TO TEACHER:** *Show students a Lego molecule with two red bricks (oxygen) and one black brick (carbon) to represent carbon dioxide.* This molecule is different from a water molecule because it has one black Lego, which is a carbon atom, and two red Legos, which are oxygen atoms. We call this molecule *carbon dioxide*. Carbon dioxide is a gas that comes out of our mouths when we breathe. It's also the gas that makes the	Water. H_2O.	

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			plastic bag puff up when we mix vinegar with baking soda. One more molecule forms when baking soda and vinegar recombine into a new kind of matter. This molecule makes up the fizzy substance you see in the plastic bag. So we end up with three substances that are different from the two substances we started out with. Our Lego model gives us a better idea of what happens when the tiny vinegar and baking-soda molecules combine and form new molecules. Now let's see what happens in real life! Have one teammate pick up the freezer bag and *wait for my signal.* Then without opening the plastic bag, *very carefully* pop the cap off the container and pour out the vinegar so it mixes with the baking soda. If you have trouble, just ask me for help. Watch closely to see what happens when the vinegar mixes with the baking soda. Imagine that you're small enough to see the molecules rearranging to become something entirely new. Remember, don't open the bag!		

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		Engage students in constructing explanations and arguments.	Is everyone ready? GO! **NOTE TO TEACHER:** *Give students time to observe the reaction before moving on to the Turn and Talk.* Based on your observations, do you think the vinegar and baking-soda molecules recombined into new molecules, or did the molecules stay the same? How do you know? **Turn and Talk (1 min):** Turn to an elbow partner and talk about these questions. What did you see happening in the bag? Think about the molecules even though you couldn't see them. **Whole-class share-out:** So what did you see happening? Do you think the vinegar and baking-soda molecules turned into something new when they mixed together, or did they stay the same? How do you know?  Listen to students' ideas. What's visible about student thinking?	When the vinegar and baking soda combined, they got really fizzy. We started with two different big molecules, and then	

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		Highlight key science ideas and focus question throughout.	So when molecules of matter combine, the atoms in the molecules rearrange in new ways and make new molecules that are different from the original molecules.	when they mixed together, the atoms came apart and made new molecules. They were the same atoms; they just got put together in a new way. We started with a liquid and a solid, and we ended up with a lot of fizzy stuff in the bag. And the bag puffed up with air.	Did we get any new atoms when we mixed the two molecules together, or were they the same atoms you started with? How do we know that new molecules were formed in the bag?

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			We could tell the vinegar and baking-soda molecules changed into something new because the plastic bag puffed up with air and the stuff inside the bag was fizzy. Next, we'll talk about different changes in matter, but first, please have one member of your team return your materials to the suppy table.		
10 min	**Follow-Up to Activity** **Synopsis:** Students compare physical changes (melting and freezing) with chemical changes. **Main science idea(s):** • In a physical change, matter changes back and forth between a solid and a liquid when heat is added or removed. In this kind of change, the substance remains the same; the molecules are just arranged and move differently. In a chemical change, the atoms that make up the molecules of a substance are	Make explicit links between science ideas and activities **after** the activity.	Throughout this unit, we saw matter melting or changing from a solid to a liquid when heat was added. We also saw matter freezing or changing from a liquid to a solid when heat was removed. But today we saw matter changing from one kind of substance into something entirely new and different. Melting and freezing weren't involved at all in this kind of change. **Show slide 16.** I'd like you and your teammates to compare these two kinds of changes in matter and talk about how they're different. To make this easier, let's use the words *physical change* to describe matter changing from a solid to a liquid and back to a solid. And let's use the words *chemical*		

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	rearranged, and the original substance becomes an entirely new substance with different properties.	Ask questions to probe student ideas and predictions. Engage students in communicating in scientific ways. Engage students in constructing explanations and arguments.	*change* to describe matter changing from one kind of substance into an entirely new substance or substances. **NOTE TO TEACHER:** *Give teams several minutes to discuss the differences between physical and chemical changes in matter. Circulate among the teams and listen to their ideas. Ask questions to probe student thinking if comments are unclear. Encourage students to agree or disagree with the ideas others share, ask questions, and piggyback on others' ideas.* **Whole-class discussion:** Who would like to share some of the differences between these two kinds of changes in matter?	One difference is that when something melts or freezes, the molecules stay the same. But in a chemical change, the molecules change into totally new molecules. The atoms in the molecules separate from each other and rearrange to create	Can you be more specific? How do the molecules change?

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				new molecules. For a physical change to happen, we had to add or take away heat, but in a chemical change, we only had to mix two things together.	Can you think of some other differences?
		Ask questions to probe student ideas and predictions. Engage students in communicating in scientific ways.	Now I want you to talk with your teammates about how physical and chemical changes in matter are similar, or alike. **NOTE TO TEACHER:** *Give teams several minutes to discuss similarities between physical and chemical changes in matter. Circulate among the teams and listen to their ideas. Ask questions to probe student thinking if comments are unclear. Encourage students to agree or disagree with the ideas others share, ask questions, and piggyback on others' ideas.* **Whole-class discussion:** Who would like to share how physical and chemical changes in matter are similar?	Physical and chemical changes	

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		Engage students in constructing explanations and arguments.		both have atoms and molecules. Well, with melting and freezing, the molecules are exactly the same before and after the change, but when we mixed vinegar and baking soda, we started with two molecules and ended up with three. So that was different. The number of atoms was the same in both kinds of changes because we had the same number of Lego pieces before and	Can you say more about that? Were the number of molecules and atoms the same before and after a change in matter? Did we have the same number of atoms before and after a change in matter?

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				after a change. In both kinds of changes in matter, there were reds and whites. Red is an oxygen atom, and white is a hydrogen atom. So in both these changes, we saw oxygen and hydrogen atoms.	What do you mean? What do the reds and whites represent?
6 min	**Synthesize/Summarize Today's Lesson** **Synopsis:** Using science ideas about chemical changes in matter, students write their best answers to the focus question in their science notebooks. **Main science idea(s):** • When the atoms in molecules are rearranged or combined in different	Highlight key science ideas and focus question throughout.	**Show slide 17.** Let's revisit today's focus question, *What happens when matter starts off as one thing and changes into something different?* **Turn and Talk (3 min):** Share your ideas with an elbow partner; then write your best answer to this question in your science notebooks using one or two complete sentences. Listen carefully to your partner's ideas and ask questions to help each other come up with clear answers that include science		

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	configurations, they form an entirely new substance, not just the same substance in a solid or liquid state. This new substance may look or taste different from the original substance, or it may bubble or change color.		words and ideas about matter. **Whole-class share-out:** How did you answer our focus question? Let's hear your ideas. And make sure to use complete sentences.	Atoms come apart and make new molecules. No. I mean the atoms break apart from other atoms.	Are you saying the individual atoms come apart?
3 min	**Link to Next Lesson** **Synopsis:** Students consider whether the number of atoms is different after a chemical change. Then the teacher announces that in extension lesson 7, students will find out whether a chemical change can alter the number of atoms.	Link science ideas to other science ideas.	**Show slide 18.** In today's investigation, we started with two types of molecules: baking soda and vinegar. When we mixed them together, we ended up with three new molecules: water or H_2O, carbon dioxide (the stuff that made the bag puffy), and the molecule of fizzy stuff in the bag. So if we can end up with a different number of molecules in a chemical change, can the number of atoms change too? **Think-Pair-Share:** Think about this question and then turn to an elbow partner and share your ideas. Make sure to explain		

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			why you think the number of atoms can or can't change. You can use the sentence starter on the slide to help you get started. *I think the number of atoms [can/can't] change because _____.* **NOTE TO TEACHER:** *If time allows, invite a few students to share their ideas and explanations. Accept all ideas without challenging them.*	*Possible answers:* I think the number of atoms can change because sometimes you get new stuff. I think the number of atoms can change because we started out with only two substances and ended up with three different substances when we mixed the vinegar and baking soda. I don't think the atoms change because only the	Can you give me an example of "new stuff"? Does anyone agree or disagree with this idea?

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			Show slide 19. Next time, we'll talk more about whether the number of atoms can change like the number of molecules in a chemical change. Then we'll see if our ideas match the ideas of scientists.	molecules change.	