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| **Grade 5** | **Lesson:** **Matter Part 3** | Reference to English Interconnections LessonChemical Reactions pg. 167 |
| **Science Standard(s): Standard IObjective 3** |
| **Content Objective(s):** | **Language Objective(s):** |
| Students will be able to determine if a physical or chemical change in taking place by participating in an experiment with a small group.***I can decide if a physical or chemical change is taking place by doing an experiment with a group of friends.*****我能在小组实验里判断出是否发生了物理或者化学变化** | Students will be able to describe a chemical reaction and state evidence that proves a chemical reaction is taking place by observing experiments with a small group.***I can describe a chemical reaction and explain how I know a chemical reaction is taking place by observing experiments with a group of friends*.****我能在小组实验里描述一个化学反应。并且解释我怎样知道这是一化学反应** |
| **Essential Questions:***What are characteristics of matter? How do physical and chemical changes affect matter?* | **Required Academic Vocabulary for Word Wall:****Listen:**reactants, chemical reaction, physical reaction, properties, characteristics, experiment, formation, emission, solid, liquid, gas**反应物，化学反应，物理变化，属性，特性，实验，形成，排放，固体，液体，气体****Speak:** reactants, chemical reaction, physical reaction, experiment, formation, emission, solid, liquid, gas**反应物，化学反应，物理变化，实验，形成，排放物？，固体，液体，气体****Read:** reactants, chemical reaction, physical reaction, experiment, formation, emission, solid, liquid, gas**反应物，化学反应，物理变化，实验，形成，排放物？，固体，液体，气体****Write:** dissolve, separate, chemical reaction, physical reaction, formation, emission, solid, liquid, gas**溶解，分离，化学反应，物理变化，形成，排放？，固体，液体，气体** **Sentence Frames:**Before the experiment, the reactant \_\_\_\_\_\_\_\_\_ (reactant) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (observations: appearance, taste, smell, temperature, etc.)在实验之前，反应物\_\_\_\_\_\_\_\_\_是\_\_\_\_\_\_\_\_\_（观察：外表，味道，气味，温度，等等）After the experiment, the reactant \_\_\_\_\_\_\_\_\_ **(reactant)** ？？？（product） is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (observations: appearance, taste, smell, temperature, etc.)在实验之后，反应物(生成物)\_\_\_\_\_\_\_\_\_是\_\_\_\_\_\_\_\_\_（观察：外表，味道，气味，温度，等等）Is there a formation of gas?生成物里有气体吗？Is there an emission of heat, light or odor?有热，光和气味排放物吗？Is a color change produced?有颜色变化吗？Is a solid formed during the change?在变化中有固体形成吗？Yes, I observe \_\_\_\_\_\_\_\_\_\_\_\_\_\_.有，我观察到\_\_\_\_\_\_\_\_\_\_\_\_\_\_.No, I do not observe \_\_\_\_\_\_\_\_\_\_\_\_\_\_.没有，我没有观察到\_\_\_\_\_\_\_\_\_\_\_\_\_\_.No, I observe \_\_\_\_\_\_\_\_\_\_\_\_\_\_.没有，我观察到\_\_\_\_\_\_\_\_\_\_\_\_\_\_. |
| **Materials:*** Pancake mix with eggs and water
* Hot griddle OR video of pancakes being made
* Vocabulary card
* Signs of Chemical Reaction Poster
* Glass Bowl
* Sugar
* Water
* Baking Soda
* Balloon
* Safety goggles for each student
* Plastic cups- 1 for each group of students
* Large Ziplock bags- 1 for each group of students
* Ice Melt with Calcium Chloride- 1 tsp for each group of students
* Experiment Record Sheets- 1 for each partnership
 | **Additional Lesson Vocabulary:**Appearance, smell, taste, heat, light, odor, observation, pancakes, sugar, baking soda, **ice melt（？）**, calcium chloride外表，味道，气味，热，光，臭味，观察，煎饼，糖，小苏打，融冰剂， 氯化钙 |
| **Lesson:** | **Instructional Time:50 Minutes** |
| **Opening:(8minutes)**Hook:Show the class a box of pancake mix.Question: “Who has ever made pancakes? What ingredients are used in pancakes? Describe them with your partners.”谁做过煎饼？煎饼里都有什么原料？像你的同伴描述一下。* Have some students share their responses with the class.
* Place a bowl underneath the document camera and add the ingredients for making pancakes. Mix them together.

Question: “What do you notice about the textures, colors, smells, consistency of the mixed ingredients? Is this mixture a solid, liquid or a gas? Describe these things with your partners.”你注意到 混合的配料的质地，颜色，气味，浓稠度了吗？ 混合物是固体，液体，还是气体？像你的同伴描述一下。 * Have some students share their responses with the class.
* Either provide a hot griddle where you can actually cook the pancake, or show a video of a pancake cooking (youtube or one you take yourself).

Question: “What happens to our mixture once we pour it onto the hot griddle? What do you see? How does the mixture look? What do you smell? Does it look and smell the same or different? Is it a solid, liquid or a gas? Talk with your partners.”当你把混合物倒到**烫锅**上时， 你看见了什么？混合物是什么样的？你闻到了什么？他看起来和闻起来和原来一样嘛？它现在是固体，液体，还是气体？和你的搭档讨论一下* Have some students share their responses with the class.

Explain: “The ingredients, or reactants, have combined to make a new product with its own set of properties including a new texture, new color, new smell, etc. This tells us that a chemical reaction has occurred. It is more than just a physical change. A chemical change too place because it has a whole new set of properties.”这些原料，或者是反应物，通过混合，形成了新的产物。这个新的产物有新的质地，颜色，气味等等。这告诉我们发生了一个化学反应。 不仅仅是物理变换，化学反应也同时发生了，因为有了新的特性。Introduce the Objectives: Have the students read the content as a class. Have Partner 1 tell Partner 2 one thing the class will learn today. Have Partner 2 tell Partner one how we will know that we learned it.**Introduction to New Material (Direct Instruction): (7 minutes)**Explain: “Today we are going to be learning about chemical reactions. A chemical reaction is when two or more reactants are mixed to make something new. A chemical change is different from a physical change. In a physical change a substance can change physical forms, but still holds on to its properties and characteristics.”今天我们要学习化学反应。当两个或两个以上的反应物放在一起时，生成了新的东西，这个就是化学反应。化学变化和物理变化不同。物理变化改变了物体的物理形状。但是依旧保持物体的性质和特性。* Post the new vocabulary card.

Question:“Think about our last lesson when we had a bag of cereal and we crushed it up. Compare this change to the change we saw in the pancakes. How are they different? Talk with your groups or partners.”想一想上节课，我们把一袋麦片弄碎了。把这个变化和煎饼的变化做比较，他们有什么不同？和你的小组成员一起讨论。* Have students share with the class what they discussed with their groups or partners.

Explain:“You are right. With the cereal, it smelled and tasted the same before and after the change. The colors were even the same, but they were just crushed up. Its physical appearance may have changed, but it was still cereal. With the pancakes, I don’t think we could have called the mixture of ingredients in the bowl pancakes. They were just a combination of ingredients. **We probably smelled some eggs and a batter smell**. The change occurred when they were heated up. They went from a liquid to a solid and their appearance completely changed. They were a different color, they smelled differently, and they definitely would taste different from the mixture of ingredients. They were made into pancakes. This was a chemical change.”你对了！麦片在碎之前和碎之后闻起来和尝起来都一样。颜色也一样，仅仅是被弄碎了。它的物理外形也许被改变了，但是它依旧是麦片。那一碗做薄饼的混合物不是薄饼，我们仅仅是把不同原料混合在了了一起。我们可能闻到鸡蛋和面糊的味道。 变化发生在这些原料被加热的时候。他们从液体变成了固体。他们的外形也完全改变了。他们有了不一样的颜色，闻起来不一样，尝起来也和原来混合之前的原料不一样。现在这些原料变成了煎饼。这是化学变化。* Post the 4 clues that a Chemical Change has occurred.

Explain:“Sometimes it is really hard to tell if a chemical change has happened. We have these four clues to help us know if a chemical reaction has occurred:1. There is a formation of gas which can be seen by a fizzing or bubbling
2. The reaction will cause heat, light or odor to be emitted
3. A color change is produced
4. A solid is formed during the change

有时候，很难去发现是否有化学变化发生。我们有四个线索来帮助你判断是否产生了化学变化。1. 是否有气体形成？气体的形成常常是冒泡或是有嘶嘶声。
2. 这个反应是否产生了热，光和气味？
3. 颜色有没有变化？
4. 在变化后有没有固体形成？

Question:“Think of the pancakes. Did we receive any clues through our pancake experiment that a chemical reaction occurred? Talk with your partners and identify the different clues that told us that a chemical reaction occurred with the pancakes.”想想煎饼的例子，我们在实验过程中有发现任何化学反映的线索了吗？ 和你的搭档讨论一下并且确认找出这些能告诉我们* Have students share with the class what they discussed with their groups or partners.

Explain:“You are right. **Heat was emitted**, and we had a new smell. A color change was produced and a solid was formed during the change. These clues could definitely help us identify a chemical change with the pancakes.”恩，你们对了。在这个过程中，产生了热，而且有了新的味道。颜色改变了，而且还有固体物质的形成。这些现象帮助我们在煎饼的制做过程中发生了化学变化。**Guided Practice: (17 minutes)*** Divide students into groups of 4 or 6 students, and give each student a partner within their groups. Give each partnershipa record sheet.
* Show students the two ingredients- sugar and water. Have them discuss in their groups different observations about each of the reactants. Have the groups share the responses. Write them on your sheet on the document camera and have each partnership work together to write their observations for each as well.
* Show students the first sentence frame. Have them turn to their partners and use the sentence frame to describe the sugar to one another, then the water. Have a couple of students share their descriptions with the class.
* Use a clear glass cup or bowl to demonstrate the combination of sugar and water. Stir the combination together.
* Have them discuss in their groups different observations about each of the reactants after the experiment. Have the groups share the responses. Write them on your sheet on the document camera and have each partnership work together to write their observations for each as well.
* Show students the second sentence frame. Have them turn to their partners and use the sentence frame to describe the sugar to one another, then the water after the experiment. Have a couple of students share their descriptions with the class.
* Post the other sentence frames on the board. Point to the first question and read it aloud. Tell students they will talk with their partners within their group to decide if there was a formation of gas. Show them the sentence frames they could use in their responses. Next they will talk in their groups and write in their record sheets. They will put a check next to yes or no, and they will explain what they observed.

*Use the modeling cycle:**Teacher Does:** Use an imaginary partner. As the teacher, ask the question, “Is there a formation of gas?” “有气体形成吗？” As the student respond,“Yes, I observe fizzing and bubbling. My observation was not true, but it was an example of something I could say.” 是的，我观察到了嘶嘶声和气泡 Model discussing your response with the group. Model how to fill out the record sheet.

*Teacher Does with Student:** Select a student to help you model. As the teacher, ask the question, “Is there a formation of gas?” “有气体形成吗？” As the student respond to your partner, “No, I observe a clear liquid without a visual gas.”“没有，液体很清澈，没有任何气体”。 Have your partner respond to you as well. Model discussing your responses with the group. Model how to fill out the record sheet.

*Two Students Do:** Select two students to help you model. As the teacher, ask the question, “Is there a formation of gas?” “有气体形成吗？” The students should take turns responding. Encourage at least one of the students to use the last sentence frame, “No, I do not observe fizzing or bubbling.” “没有，我没有观察到了嘶嘶声和气泡”Students should model how to discuss their responses as partners with the group. Students should work together to fill out the record sheet.

*All Students Do:** Ask the other three questions involving the clues. “Is there an emission of heat, light or odor? Is a color change produced? Is a solid formed during the change?” “有产生热，光和气味吗？”After each questions, give students time to respond in their partnerships, discuss with their groups, and record the information on their record sheets.
* When all partnerships have written their responses, have a couple of groups share their thoughts with the class. Add to their responses as needed.
* When students respond to all four questions involving the clues, have them talk with their partners to decide if this was a physical or chemical reaction. Next they will share their responses with their group and decide how they know it is a physical or chemical reaction. They should record their responses on their record sheets and explain how their reasoning.
* When all partnerships have written their responses, have a couple of groups share their thoughts with the class. Add to their responses as needed.
* Have students turn their papers over. Help them fill out the descriptions of each of the reactants before the experiment. Begin next experiment. Combine the baking soda and vinegar in a glass bottle. Place a balloon on top to show the collection of gas. Be sure students can see the evidence of the clues. Have students follow the same procedure as the previous experiment. Have groups share their thoughts with the class and add to their responses as needed.

**Independent Practice: (15 minutes)*** Pass out the second Experiment Record Sheet and the materials: ziplock bag with one teaspoon of calcium chloride (ice melt) in the bag and a plastic cup, and safety goggles.

Explain:* “Each group will need to fill the cup up halfway with water. Your group will then work together to describe each of the reactants before the experiment and record the information on your record sheet in your partnerships. Use the sentence frames to discuss your ideas with your partners and groups. When the entire group is done writing on their record sheets, you will then combine the two reactants. You will carefully set the cup of water in the ziplock bag WITHOUT tipping the cup over or spilling the water. You will seal up the zipper bag so it is completely closed. Next you will tip the cup of water over inside the bag to combine the two reactants. Record your observations of the reactants after the experiment and use the sentence frames to discuss your observations with your partners. You will then work together in groups to use the clues to decide if a chemical reaction occurred. Use the sentence frames with your partners and groups to ask the questions, respond orally, and record your observations on your record sheet. It is important to not smell or touch very strong chemicals that are having a reaction. It could cause damage. You may begin.”

“每个小组都需要将杯子注入半杯水。在实验之前，你们要一起来描述每一个反应物并且记录在你的记录单上。记得用我们学过的句型来和你的小组成员讨论。当小组没给人都完成记录以后，你们就可以混合这两个反应物了。小心把整个杯子都放进 “ziplock” 的袋子里。注意不要倾斜杯子把水弄洒了。把袋子的口封上确保它完全合上了。然后把杯子里的水倒出来，混合两个反应物。实验之后记录下你的观察，并且用我们学过的句型来和你的小组成员讨论你的观察结果。接下来你们要一起来用这些线索来看看有没有化学反应的发生。用我们学过的句型来问问题和回答问题。记得记录在的记录单上。不要随便闻和接触正在反应的化学物品。有可能会引起危险。好了，你们可以开始了。”* The modeling cycle likely won’t be needed since this is the same procedure and language as the guided practice, but it may be used if students could use the extra modeling.
* Walk around and ensure students are staying in the target language and only talking with their partners and groups. Have a short discussion about their findings when the groups have finished. Collect the record sheets to assess.

**Closing: (3 minutes)**Revisit the Objectives: Have students reread the content objective as a class. Have students explain to their partners one new skill they learned today, and how they know they learned it. Have some students share with the class.Real World Application: Tell students to observe closely when two reactants are combined and to use the clues to decide if it is a physical or chemical reaction. Provide an opportunity in a future class period for students to share their observations with partners or with the class. |
| **Assessment:** |
| Observe students’ conversations during guided and independent practice to assess their mastery of the language objective. Observe students’ discussions and recordings on their record sheets to assess their mastery of the content objective. Collect their record sheets as a formative assessment of the language and content objectives. |
| **Extra Ideas:** |
| * Try some more experiments (http://sadie423.hubpages.com/hub/hands-on-experiments-to-learn-about-chemistry):
	+ Materials Needed: 1 tsp of yeast, 1/4 cup of hydrogen peroxide, a stirring stick, a thermometer, a bowl
		- Pour the peroxide into the bowl and place the thermometer in the liquid. Let it sit for a few minutes until the temperature has stabilized. Have the kids record this starting temperature. Now have them make their guess as to what will happen and if it will be a chemical or physical change. Pour in the yeast and stir. The mixture should start to fizz and bubble which is a clue to the fact that a chemical reaction is happening, but have the kids keep their eye on the thermometer. They can also touch the outside of the bowl to physically feel the temperature change. Have them record the temperature the end. Were they right? What type of change occurred? What made the temperature rise?
	+ Materials Needed: 3/4 cup of warm water, 1 cup of glue, a large bowl, a cup, an additional 1/2 cup of warm water, 2 tsp borax, a spoon *Adults: Place the 1/2 cup of warm water into a cup and stir in the 2 tsp of borax*
		- Have the kids pour the water and glue into the bowl and stir them together. Ask them for any observations. Then have them stir while slowly pouring in the borax solution (this is a good 2 person job). Have them keep stirring until the solid forms completely. Ask for their observations. Did a chemical change occur? How do they know? This is fun experiment with a fun outcome so don't forget to let them play with the new substance for awhile!
	+ Material Needed: 3 test tubes with lids (or any container) filled half full with water, food coloring, 3 containers: 1 containing bleach, 1 containing vinegar, 1 containing hydrogen peroxide, 3 droppers
		- Have the kids drop a couple drops of food coloring into each of the tubes containing water. Tell them you are going to add a different liquid to each of the 3 tubes of colored water and they have to decide if a chemical change happens or not. Have them take one dropper full of the vinegar and add it to one of the colored tubes. Cap and shake, or stir, the tube. Allow them to make any observations before repeating this process with the remaining 2 liquids and tubes. The bleach will produce a change in color indicating that a chemical change has occurred.
	+ Materials Needed: an empty plastic soda bottle (about 16 oz), 1/2 cup of hydrogen peroxide ( the 3% version you can get at the store), 1 pkg of yeast, 1/4 cup of warm water, dish soap, a cup, optional: food coloring *Adults: Pour the peroxide into the bottles*
		- Have the kids place a few drops of food coloring into the bottles with the peroxide. Add a squirt of dishsoap and swirl the bottle to mix. In the cup, mix the water and yeast and stir for a few seconds to combine. Then have them pour the yeast into the bottle with the peroxide and watch what happens! Once the reaction has completed, they can feel the foam and observe the heat that was created. What did they observe? What are the clues that a chemical change occurred?
		- \*Note: if you want to make this a demonstration, you can use a higher percentage hydrogen peroxide. You can find 6% at beauty supply stores. And sometimes even higher online. The resulting reaction will be much bigger and more impressive, but should be done completely by an adult.
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**CHEMICAL REACTION**

**化学反应**

When two or more reactants are mixed to make a new substance.

当两个或更多地反应物混合在一起，产生了新的物质。

-produces a gas

产生出气体

- emission of heat, light, odor

散发出热，光，和气味

-color change

颜色的改变

-a solid is formed

形成固体



**SIGNS OF A CHEMICAL REACTION**

1. There is a formation of gas which can be seen by a fizzing or bubbling

有气体的产生，能听见嘶嘶声或看见气泡。

1. The reaction will cause heat, light or odor to be emitted

反应能引起热，光或气味的排放。

1. A color change is produced

有颜色的改变。

1. A solid is formed during the change

在变化中有固体的形成。

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**Before:反应之前**

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| **Reactants****反应物** | **Observations (appearance, smell, taste, temperature, etc.)** |
| Calcium Chloride (Ice Melt) 氯化钙（融冰剂） |  |
| Water水 |  |

**After:反应之后**

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| **Reactants****反应物** | **Observations (appearance, smell, taste, temperature, etc.)** |
| Calcium Chloride (Ice Melt) 氯化钙（融冰剂） |  |
| Water水 |  |

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| **Clues of a Chemical Change****化学反应的线索** | **Yes****有** | **No****没有** | **Observations****观察结果** |
| 1. Formation of gas which can be seen by fizzing or bubbling

有气体的产生，能听见嘶嘶声或看见气泡。 |  |  |  |
| 1. Causes heat, light or odor to be emitted.

反应能引起热，光或气味的排放。 |  |  |  |
| 1. A color change is produced

有颜色的改变 |  |  |  |
| 1. A solid is formed during the change

在变化中有固体的形成。 |  |  |  |

Do you believe this was a chemical or physical reaction? 你认为这是一个化学反应还是一个物理变化？

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How do you know? 你怎么知道？

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