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| **Grade 5** | **Lesson:**  **Electricity Part 1** | | Reference to English Interconnections Lesson  Static Electricity Investigations pg. 191  Static Electricity and Lightning pg. 195 | |
| **Science Standard(s): Standard 4 Objective 1** | | | | |
| **Content Objective(s):** | | **Language Objective(s):** | | |
| Students will be able to give examples of static electricity in everyday life, predict whether an electrically charged object will attract or repel other objects, identify how different materials react to electrically charged objects, and compare the charges of different objects by participating in 4 stations with a partner.  ***I can demonstrate what I’ve learned about the 4 Facts about Static Electricity by participating in 4 stations with a partner.***  ***我可以和我的同伴透过操作四个不同的实验来示范我们所学到的四个关于静电的事实。*** | | Students will be able to describe examples of static electricity in everyday life and explain what happens when electrically charged objects come in contact with different materials by participating in 4 stations with a partner.  ***I can give examples of static electricity in my life and explain what happens when electrically charged objects come in contact with different materials by participating in 4 stations with a partner*.**  **我可以举出几个在生活中常看到的关于静电的例子，并且透过跟我的同伴操作四个实验来解释当一个带电的物体跟不同的物质接触的时候，会发生什么状况。** | | |
| **Essential Questions:**  *In what situations/materials will static electricity build up? How is the flow of electricity dependent on the type of material or the components of a circuit?* | | **Required Academic Vocabulary for Word Wall:**  **Listen:** static, electricity, attract, repel, charge, positive, negative, lightning  听：静电、电、吸引、排斥、电荷、正极、负极、闪电  **Speak:** static, electricity, attract, repel, charge, positive, negative, lightning  说：静电、电、吸引、排斥、电荷、正极、负极、闪电  **Read:** static, electricity, attract, repel, charge, electrically, approached, produced  读：静电、电、吸引、排斥、电荷、带电的、接近、产生  **Write:** static, electricity, attract, repel, charge, positive, negative, electrically, approached, produced  写：静电、电、吸引、排斥、电荷、正极、负极、带电的、接近、产生  **Sentence Frames:**  I see evidence of static electricity when \_\_\_\_\_\_\_\_\_\_\_\_\_.  当\_\_\_\_\_\_\_\_\_的时候，我看到静电产生的证据。  I think the \_\_\_\_\_\_\_ will attract/repel the \_\_\_\_\_\_\_ because \_\_\_\_\_\_\_(refer to positive and negative charges)  我觉得\_\_\_\_\_\_\_跟\_\_\_\_\_\_\_\_会互相吸引/互相排斥是因为\_\_\_\_\_\_\_\_\_\_（要提到正极电荷和负极电荷）。  I think the \_\_\_\_\_\_ will \_\_\_\_\_\_ when approached by an electrically charged balloon.  我觉得当一个带电荷的气球接近\_\_\_\_\_\_\_\_的时候，它会\_\_\_\_\_\_\_\_。  In reality, the \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_ when approached by an electrically charged balloon.  事实上，当一个带电荷的气球接近\_\_\_\_\_\_\_的时候，它\_\_\_\_\_\_\_ \_\_\_\_\_\_\_。  I think \_\_\_\_\_\_\_ will produce a greater static electricity charge than \_\_\_\_\_\_ because \_\_\_\_\_\_\_\_.  我觉得\_\_\_\_\_\_\_\_会比\_\_\_\_\_\_\_\_产生更多静电电荷，因为\_\_\_\_\_\_\_\_\_\_。  In reality, \_\_\_\_\_\_\_\_\_ produced a greater static electricity charge than \_\_\_\_\_\_\_\_.  事实上，\_\_\_\_\_\_\_\_\_比\_\_\_\_\_\_\_\_产生更多的静电电荷。 | | |
| **Materials:**   * Pictures of Static Electricity and/or wool hat * Vocabulary Card * Poster of 4 Facts about Static Electricity * Whiteboards, markers, and erasers (1 for each partnership) * Balloons (1-2 balloons for each student as well as a couple for teacher demonstration and Station 4) * Combs (1 for each student as well as one for teacher demonstration) * Empty aluminum soda can (1 for each partnership) * Water faucet * Cheerios (1 large handful for Station 3) * String (1 for each partnership) * Paper (1 piece for each partnership) * Tissue paper (many cut up squares for Station 4 and teacher demonstration) * Wool (A couple of wool items for Station 4 and teacher demonstration) * Fur (A couple of fur items for teacher demonstration) * Wooden pencils (A couple for Station 4) * Pennies (A couple for Station 4) * Plastic spoons (A couple for Station 4) * Keys (A couple for Station 4) * Record Sheets (1 for each student) * Sentence frames for each station * Station instructions for each station | | **Additional Lesson Vocabulary:**  Fact, shock, rub, materials, balloon, fur, wool, comb, spoon, key, soda can, tissue paper  事实，触电，摩擦，物质，气球，毛皮，羊毛，梳子，汤匙，钥匙，汽水罐，卫生纸 | | |
| **Lesson:** | | | | **Instructional Time: 60 Minutes (or two class periods)** |
| **Opening:** **(3minutes)**  Hook: Come walking in wearing a wool hat, if you can, and pull it off showing how your hair is sticking up. Display the different pictures of static electricity.  Question: “What do you think all of these pictures have in common? Turn to your partners and discuss what you think these pictures have in common. Make sure you stay in the target language. If there are words you don’t know, describe them.”  问题：“你觉得这些照片有什么相同的地方？请跟你的同伴讨论一下你觉得这些照片有什么相同的地方。记得要用中文说。如果有些字你不知道怎么说，你可以用你会的词语表述它们。”   * Give the students time to discuss. Have some students share their responses with the class.   Explain: “It seems like many of you have a good idea what we are talking about today. Many of you had a challenge because you did not know the vocabulary for ‘static electricity’. That is what we’re going to learn about today. Let’s take a look at our objectives.”  解释：“看起来很多同学知道我们今天将要讨论的题目，可是很多人在讨论的时候有困难是因为不知道”静电“这个字。这就是我们今天要学的主题。现在就来看看我们今天的学习目标。  Introduce the Objectives: Have students read the objectives as a whole class. Have Partner 1 ask partner 2 what we’re going to learn today and have Partner 2 respond.  **Introduction to New Material (Direct Instruction): (8 minutes)**  Explain: “Today we are learning about static electricity. Static electricity is the buildup of an electrical charge on the surface of an object. Electricity tends to move or flow to another area, but static electricity has a charge that remains in one area for a while.”  解释：“今天我们要学习静电。静电是指在一个物体表面不断增强的电荷。电通常会由一个物体移动或流向另外一个物体，可是静电是指电荷停留在一个区域一段时间不动。”   * Post the new vocabulary card.   Explain: “We are going to learn about 4 Facts about static electricity today   1. Static electricity happens in everyday life 2. Objects charged with static electricity attract or repel objects without touching 3. Various materials react differently to statically charged objects 4. Different objects produce different charges when rubbed by various materials”   解释：“我们今天要学四个关于静电的事实：   1. 静电在我们日常生活中天天发生。 2. 一个带有静电的物体虽然不经过表面接触也能吸引或排斥另外一个物体。 3. 不同的物质对带有静电的物体的反应也不同。 4. 不同的物体经由不同材质的物质摩擦会产生不同强度的电荷。  * Post poster of 4 Facts. Refer to it throughout the lesson and explanation of information.   Explain: “First, we see static electricity every day! I am going to give some examples, and if you’ve experienced this I want you to stand up. Sit down in between questions.”  解释：“第一，我们每天都会看到静电！我现在要举几个例子，如果你们曾经有过这样的经验就请你们站起来。在两个问题之间可以坐下。”  Question: “Who has been shocked when touching someone or something in your house? Who has had laundry stick together when it comes out of the dryer? Who has jumped on the trampoline and then had their hair stick up? Who has rubbed their feet on the carpet and then touched something and got a shock? Who has brushed their hair and hear it crackle or saw it stick to the brush? Who has rubbed a balloon on their head and had it stick? Who has gone down a slide and then had their hair stand up straight? Who has seen lightning?”  问题：“谁曾经有过在家里碰到别人或者一样东西的时候被电到的经验？谁曾经有过把衣服从烘干机拿出来的时候衣服粘在一起的经验？谁曾经有过跳蹦床的时候头发都粘起来的经验？谁曾经有过用脚摩擦地毯然后接触一样东西而被电到的经验？谁曾经有过在梳头发的时候听到头发发出小小的爆裂声或者头发粘在梳子上的经验？谁曾经有过用头摩擦气球然后把气球粘在头上的经验？谁曾经有过溜滑梯下来然后头发全部立起来的经验？谁看过闪电？”   * Students should be standing and sitting as you ask these questions.   Question: “Can any of you think of other examples of static electricity in everyday life? Talk with your partners.”  问题：“你能不能举出几个在生活中可以看到的关于静电的例子？请你跟你的伙伴谈谈。”   * Have some students share what they discussed with their partners. Confirm or correct their examples.   Explain: “All of these are examples of static electricity. Static electricity will exist more in cold, dry areas rather than hot, humid areas. That is probably why we see a lot of static electricity in Utah. Static electricity can be useful. We use it in technology. Printers and photocopiers use static electricity charges to attract the ink to the paper. Static electricity is also used in paint sprayers and dust removal such as with feather dusters.”  解释：“这些都是静电的例子。静电多半发生在冷而且干燥的环境下，而比较不会发生在热而潮湿的环境下。那就是为什么在犹他州常常会看到静电产生的例子，因为这里很干燥。静电有时候很有用，我们常常会把静电应用在科技上。例如：打印机和复印机就是利用静电电荷来吸引墨水到纸上。油漆喷枪和用鸡毛掸子掸灰也是利用静电的原理。”  Explain: “Secondly, we are going to learn how static electricity causes objects to attract or repel objects without touching. Static electricity is the buildup of an electrical charge on the surface of an object. When something has a charge, it’s either a positive or a negative charge. Just as we learned about magnetism and how opposites attract with the north and south poles, opposite charges attract too. Like charges repel, just like two north sides of a magnet repel. When we rub a balloon on our heads, the balloon is getting a buildup of an electrical charge which is a negative charge. Our hair is getting a positive electrical charge. They are attracting one another because opposites attract. That is why the hair is attracted to the balloon. If I were to place two balloons together that were both negatively charged, they would repel. The objects don’t even need to be touching to attract or repel, just like magnets. We will look at some experiments of this shortly.”  Question: “How are the static electricity charges like the north and south poles of a magnet? Turn to your partners and discuss.”  解释：“第二，我们要来学习静电是如何导致一个物体和另外一个物体不接触却能够互相吸引或排斥。静电是指在一个物体表面不断增强的电荷。当物体表面有电荷的时候，这些电荷所带的电不是正极电荷就是负极电荷。就像我们学过的磁铁南极北极异性相吸的原理一样，电荷也是异性相吸。电荷同性相斥的原理也跟磁铁两个北极一定互相排斥的原理一样。当我们用气球摩擦我们的头的时候，气球充满了负极电荷，同时，我们的头发充满了正极电荷。他们俩因为是异性所以互相吸引。因此，头发会被气球吸引过去。如果我把两个摩擦以后都充满负极电荷的气球放在一起，它们俩就会因为是同性所以互相排斥。这两样东西根本不必互相接触，就会相吸或相斥，就像磁铁一样。我们马上就要做几个实验来观察一下静电是如何运作的。  问题：“静电荷是如何像磁铁一样运作的？请你跟你的伙伴讨论一下。   * Have some students share what they discussed with their partners.   Explain: “Third, we are going to learn that various materials react differently to charged objects. Sometimes they attract, sometimes they repel. Sometimes there’s a cracking noise, and sometimes there’s a visual spark. Some objects won’t react at all to a charged object, while other objects may have a stronger reaction. This ties into fact number 4.”  解释：“第三，我们现在要来学学不同的物质对带电荷的物体会起什么作用。有时候他们会互相吸引，有时候会互相排斥。有时候会发出爆裂声，有时候会看到小火花。有些东西对带电的物体完全没有反应，有些物体会有较强烈的反应。这跟等一下要讨论的第四个事实有关系。“  Explain: “Rubbing objects is one way to get them electrically charged. Different objects respond in different ways when you rub them. Some objects won’t get an electric charge at all. Some objects will get a weak charge, while others get a strong charge. Let’s practice all of this information we have learned. We are going to practice applying this information together about the four facts about static electricity.”  解释：“摩擦一样东西是让它带电荷的一种方法。不同的东西对于摩擦有不同的反应。有些东西对于摩擦一点也不起作用，根本不会产生静电，有些东西对于摩擦只会产生微弱的电荷，有些东西摩擦过后会产生强烈电荷。现在我们就来练习一下我们今天学到的资讯，然后我们要练习把这些关于静电荷的四个事实综合应用。”  Question: “What have you learned about static electricity? Work with a partner. Each one of you should take turns reading through each of the four facts about static electricity. When one partner reads the fact, the other partner should explain it in his/her own words, or give an example. Go ahead and begin.”  问题：“你今天学到什么关于静电的知识？请你跟你的伙伴伴轮流念一下关于静电的四个事实。当一个人念其中一个事实的时候，另外一个人就用自己的话或举一个例子来解释它的意思。现在开始。”  **Guided Practice: (13 minutes)**  Fact #1  Explain: “First we are going to practice what we learned about static electricity in everyday life. I will be drawing a picture on the board representing a time we might see static electricity in everyday life. If you have an idea what I am drawing, you must turn to your partner and use this sentence frame: I see evidence of static electricity when \_\_\_\_\_\_\_\_\_\_\_\_\_. You must use the entire sentence. If your partner agrees with you that I am drawing what you suggested, both of you can raise your hands. I will then select a partnership of students to guess and see if they truly guessed what I am drawing.”  解释：“首先，我们要来练习一下我们学习到的在日常生活中会看到的静电。我会在白板上画一个图代表我们在日常生活中可能会看到的静电。如果你知道我在画什么，你一定要用下面这个句型告诉你的伙伴：当\_\_\_\_\_\_\_\_\_\_\_\_的时候，我看到静电产生的证据。你一定要说一整句话。如果你的伙伴认为你说的对，你们两个人就同时举手。我会请一组同学来发表，看看他们到底猜对了没有。”   * Post the sentence frame.   *Use the Modeling Cycle:*  *Teacher Does:* Use a stuffed animal, puppet or imaginary partner to model for students. As the teacher, draw laundry sticking together in the dryer. As a partner, use the sentence frame to suggest your answer to your imaginary partner: “I see evidence of static electricity when clothes stick together in the dryer.” （“当在烘干机里的衣服粘在一起的时候，我看到了静电产生的证据。”） Your imaginary partner agrees with you and you both raise your hands.  *Teacher Does with a Student:* Select a student to help you model. As the teacher, draw laundry sticking together in the dryer. Have your student partner use the sentence frame to suggest an answer to you: “I see evidence of static electricity when clothes stick together in the dryer.” （“当在烘干机里的衣服粘在一起的时候，我看到了静电产生的证据。”）You, as the partner, agree and you both raise your hands.  *Two Students Do:* Select two students to help you model. As the teacher, draw laundry sticking together in the dryer. Have your student partners use the sentence frame to suggest an answer to one another: “I see evidence of static electricity when clothes stick together in the dryer.” （“当在烘干机里的衣服粘在一起的时候，我看到了静电产生的证据。”） The other partner agrees and they both raise their hands.  *All Students Do:* Play a couple of rounds of this game.  Explain: “Wonderful. You will be playing this game in partnerships as a center in our next station activity. You will have a whiteboard and one partner will draw an example of static electricity in everyday life. The other partner will guess using the sentence frame. You both will then draw the picture and write the sentence frame on your record sheet.”  解释：“太好了！在我们等一下的分组活动中，你们就会跟伙伴玩这个游戏。你们每个人都会有一个小白板，一个人画出一个在日常生活中可以看到的静电的例子，另外一个人就用这个句型来猜是什么。然后两个人都把这张画和这句话记录在你们的科学记录单当中。”  Fact #2  Explain: “We are going to practice what we learned about fact two by seeing how objects can be attracted or repelled by static electricity without touching. In this activity, I will charge one object and you will all predict whether it will attract or repel another object and why. You will use the sentence frame: I think the \_\_\_\_\_\_\_\_\_\_\_\_\_ will attract/repel the \_\_\_\_\_\_\_\_\_\_\_\_\_ because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_(refer to positive and negative charges). You will turn to your partners and use the sentence frame to make your prediction.”   1. 解释：我们现在要练习第二个事实，就是一个带有静电的物体虽然不经过表面接触也能吸引或排斥另外一个物体。在这个活动中，我会先让一个东西充满电荷，然后你们要预测它会吸引或是排斥另外一个东西，并且告诉我为什么。你们在解释的时候要用下面这个句型：我觉得\_\_\_\_\_\_\_跟\_\_\_\_\_\_\_会互相吸引/排斥是因为\_\_\_\_\_\_\_\_\_\_（要提到正极电荷和负极电荷）。你们要用这个句型来跟你的伙伴说出你的预测。”  * Post the sentence frame. Rub a balloon on your head and hold up another balloon in your other hand.   Question: “Do you predict this balloon that is charged will attract or repel the other balloon and why? Which is positively or negatively charged? Turn to your partner and use the sentence frame to make your prediction.”  问题：“你预测这个充满电荷的气球会吸引或是排斥另外一个气球，为什么？哪一个东西充满正极电荷？哪一个充满负极电荷？请你用这个句型来跟你的伙伴说出你的预测。”   * Have some students share their responses with the class. Demonstrate using the balloons.   Explain: “This balloon attracted the other balloon because the balloon I rubbed on my head got a negative charge. It was looking for a positive charge, because opposites attract. The other balloon had not been negatively charged, so it attracted that balloon. If I were to draw a diagram on the board with the charges, it might look something like this:”  解释：“这个气球吸引那个气球因为这个我用头摩擦过的气球充满了负极电荷，它会吸引正极电荷，因为异性相吸。另外一个气球因为没有充满负极电荷，所以它会吸引那个带负极电荷的气球。如果我把两个气球相吸的原理用一张图表来表示，那就会像这张图表。”   * Draw a picture of the two balloons attracted to each other and label one with a + charge and the other with a – charge. * Rub two balloons on your head and hold them both up.   Question: “Do you predict these balloons that are both charged will attract or repel each other and why? Which is positively or negatively charged? Turn to your partner and use the sentence frame to make your prediction.”  问题：“你们预测这两个充满电荷的气球会互相吸引还是互相排斥？为什么？哪一个东西充满正极电荷？哪一个充满负极电荷？请你用这个句型来跟你的伙伴说出你的预测。”   * Have some students share their responses with the class. Demonstrate using the balloons.   Explain: “The balloons repelled each other because they both had a negative charge. Opposite charges attract, and like charges repel. If I were to draw a diagram on the board with the charges, it might look something like this:”  解释：“这两个气球互相排斥，因为它们俩都带负极电荷。异性相吸，同性相斥。如果我把两个气球相吸的原理用一张图表来表示，那就会像这张图表。”   * Draw a picture of the two balloons repelling each other and label both with a– charge.   Explain: “You will be participating in a similar experiment in partnerships as a center in our next station activity. You will share materials with your partner and use the sentence frame to make predictions. You will be using a balloon and an empty soda can, and a balloon and a comb. After you make your predictions, you will see what actually happens and will record your observations on your record sheet by drawing a diagram and labeling the charges.”  解释：“在我们等一下的分组活动中，你们就会跟伙伴做一个类似的实验。你们会跟伙伴拿到一些材料，然后你们要用这个句型来说出你的预测。你们会用一个气球和一个空的汽水罐，以及一个气球和一把梳子来做实验。当你预测完以后，你们就实际做实验来看看到底会发生什么事，然后你们要把你们的观察用图表和正负电荷的记号记录在你们的记录单中。”  Fact #3  Explain: “We are going to practice what we learned about fact number three by charging an object, such as a balloon, and using it to attract and repel different objects. We will see different reactions depending on what we attract. We will use the sentence frames to make and check predictions with our partners: I think the \_\_\_\_\_\_\_\_\_\_\_ will \_\_\_\_\_\_\_\_\_\_\_\_\_ when approached by an electrically charged balloon. In reality, the \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when approached by an electrically charged balloon. You will turn to your partners and use this first sentence frame to make your predictions.”  解释：“现在我们要练习第三个事实，那就是先把一个东西，像气球，充电，然后用它来吸引和排斥不同的物体。我们就来看看用这个气球吸引不同的物体，会有什么不同的反应。我们要用下面这个句型来跟我们的伙伴谈谈我们的预测：我觉得当用一个带电荷的气球接近\_\_\_\_\_\_\_的时候，它会\_\_\_\_\_\_\_。事实上，当用一个带电荷的气球接近\_\_\_\_\_\_\_的时候，它\_\_\_\_\_\_\_。你要用第一个句型跟你的伙伴说出你的预测。”   * Post the sentence frames. Rub a balloon to get it electrically charged. Hold up a piece of tissue paper.   Question: “How do you think the tissue paper will react when it is approached by an electrically charged balloon? Use the sentence frame and talk with your partners.”  问题：“你觉得当用一个带电荷的气球接近这张卫生纸的时候，它会怎么样？请用第一个句型跟你的伙伴说出你的预测。”   * Have some students shared what they discussed with their partners. Place the charged balloon next to the tissue paper.   Question: “How did the tissue paper actually react when it was approached by an electrically charged balloon? Use the second sentence frame to talk with your partners about what happened in reality.”  问题：“当用一个带电荷的气球接近这张卫生纸的时候，它实际上会有什么反应呢？请用第二个句型跟你的伙伴说出实际上到底产生了什么现象。”  Explain: “You will be participating in a similar experiment in partnerships as a center in our next station activity. You will share materials with your partner and use the first sentence frame to make predictions and the second sentence frame to verify what happened in reality. You will record your prediction and observation as sentences on your record sheet.”  解释：“在我们等一下的分组活动中，你们就会跟伙伴做一个类似的实验。你们会跟伙伴拿到一些材料，然后你们要用第一个句型来说出你的预测，然后用第二个句型来查证到底实际上产生什么现象。你们要把你们的预测和观察到的实际现象用这两个句子记录在记录单中。”  Fact #4  Question: “We are going to practice what we learned about fact number four by rubbing objects to get a charge and see how strong of a charge they produce. You will use sentence frames to make and check predictions: I think \_\_\_\_\_\_\_\_\_\_\_\_\_ will produce a greater static electricity charge than \_\_\_\_\_\_\_\_\_\_\_\_ because \_\_\_\_\_\_\_\_\_\_\_. In reality, \_\_\_\_\_\_\_\_\_\_\_\_ produced a greater static electricity charge than \_\_\_\_\_\_\_\_\_\_\_\_.”  问题：“我们现在要练习我们学过的第四个事实，那就是摩擦一个东西可以产生强度多大的静电荷。你要用下面的两个句型来说出你的预测和你的观察结果：我觉得\_\_\_\_\_\_\_\_会比\_\_\_\_\_\_\_\_产生更大的静电荷，因为\_\_\_\_\_\_\_\_\_。实际上，\_\_\_\_\_\_\_\_比\_\_\_\_\_\_\_\_产生更大的静电荷。”   * Post the sentence frames. Rub fur on a glass rod, and then rub fur on a metal rod.   Question: “Which do you predict will produce a greater static electricity charge? Use the sentence frame to talk with your partners and make predictions.”  问题：“你们觉得哪一个东西会产生更强的静电荷？请用第一个句型跟你的伙伴说明你的预测。”   * Have students raise their hands to show which they think will produce the greater charge. Rub fur on a glass rod, and the rub fur on a metal rod. Next test the charge by picking up a piece of paper, a balloon, or another object. The glass rod will produce a greater charge. * Have students use the second sentence frame to talk to their partners about what happened in reality. * Repeat the same procedure for rubbing a balloon on hair and rubbing a plastic bag on hair.   Explain: “You will be participating in a similar experiment in partnerships as a center in our next station activity. You will share materials with your partners and use the first sentence frame to make predictions and the second sentence frame to verify what happened in reality. You will record your prediction and observation as sentences on your record sheet.”  解释：“在我们等一下的分组活动中，你们就会跟伙伴做一个类似的实验。你们会跟伙伴拿到一些材料，然后你们要用第一个句型来说出你的预测，然后用第二个句型来查证到底实际上产生什么现象。你们要把你们的预测和观察到的实际现象用这两个句子记录在记录单中。”  **Independent Practice: (28 minutes- 7 minutes in each station)**   * Pass out the record sheets to each of the students. There should have been adequate modeling in guided practice with language and procedure to show students what to do. Use the modeling cycle if needed. Likely you will need to only briefly remind them by going over the following:   Station 1: Explain: “You will have a whiteboard and one partner will draw an example of static electricity in everyday life. The other partner will guess using the sentence frame. You both will then draw the picture and write the sentence frame on your record sheet.”  第一站：解释：“你们每个人会有一个小白板，两个人一组，一个人在白板上画一个在生活中可以看到的静电的例子，另外一个人用固定的句子猜猜那张图是什么意思。然后两个人都要在你们的记录单上画这个图并且写下句子说明。”  Station 2: Explain: “You will share materials with your partner and use the sentence frame to make predictions. You will be using a balloon and an empty soda can, and a balloon and a comb. After you make your predictions, you will see what actually happens and will record your observations on your record sheet by drawing a diagram and labeling the charges.”  第二站：解释：“你们会跟伙伴拿到一些材料，然后你们要用固定的句型来说出你的预测。你们会用一个气球和一个空的汽水罐，以及一个气球和一把梳子来做实验。当你预测完以后，你们就实际做实验来看看到底会发生什么事，然后你们要把你们的观察用图表和正负电荷的记号记录在你们的记录单中。”  Station 3: Explain: “You will share materials with your partner and use the first sentence frame to make predictions and the second sentence frame to verify what happened in reality. You will record your prediction and observation as sentences on your record sheet.”  第三站：解释：“你们会跟伙伴拿到一些材料，然后你们要用第一个句型来说出你的预测，然后用第二个句型来查证到底实际上发生什么情况。你们要把你们的预测和观察到的实际情况用这两个句子记录在记录单中。”  Station 4: Explain: “You will share materials with your partner and use the first sentence frame to make predictions and the second sentence frame to verify what happened in reality. You will record your prediction and observation as sentences on your record sheet.”  第四站：解释：“你们会跟伙伴拿到一些材料，然后你们要用第一个句型来说出你的预测，然后用第二个句型来查证到底实际上发生什么情况。你们要把你们的预测和观察到的实际情况用这两个句子记录在记录单中。”   * Divide students into four groups and assign them to different stations. Display the sentence frames and directions for each group in the area where that station will be set up. Set up materials needed for each station:   + Station 1: whiteboards, markers, erasers for each partnership   + Station 2: balloons and combs for each student, empty aluminum soda can for each partnership   + Station 3: set station up near a sink- water faucet, Cheerios, string, paper for each partnership, balloon for each student   + Station 4: wool, balloons, combs, wooden pencils, pennies, plastic spoons, keys, cut up squares of tissue paper * Give each station 7-10 minutes (dependent on what you decide) to complete their stations in partnerships. Students will be working together, but will need to write on their own record sheets. As the teacher, walk around and ensure students are understanding the tasks and using the different sentence frames to stay in the target language. * Collect their record sheets to use as a formative assessment of language and content objectives.   **Guided Exploration (5 minutes)**  Question: “Now that we have learned about static electricity, does anyone have an idea how lightning is created? Talk with your partners and discuss your ideas.”  问题：“现在我们学完了静电的原理。有没有人知道闪电是怎么来的？请你跟你的伙伴讨论一下你的想法。”   * Have a couple of students share their ideas with the class.   Explain: “Let’s use this balloon and this light bulb to help us understand what happens.”  解释：我们现在用这个气球和这个灯泡帮助我们了解到底闪电是怎么回事。”   * Charge a balloon by rubbing with the wool cloth. Hold the charged balloon very near the glass of the bulb. There should be a spark. It may help to turn off the lights.   Explain: “As we’ve learned, the balloon gets a negative charge and is attracted to its opposite with a negative charge. In this case it is the light bulb. As a result of their attraction, we see a spark. This is just like lightning. In a cloud we have many small bits of ice that are light and water droplets that are heavy. They light ice crystals stay at the top of the cloud, and the heavy water droplets sink to the bottom of the cloud. As they move around in the air they bump into each other. Their collisions create an electric charge. After a while, the whole cloud fills up with electrical charges. The positive charges form at the top of the cloud in the ice, and the negative charges form at the bottom of the cloud in the water droplets. Since opposites attract, the negative charges at the bottom of the cloud search for positive charges on things such as mountains, people, trees or other clouds. In a thunderstorm, the positive charges travel upwards from the ground, and the negative charges travel downwards from the clouds. When these charges connect there’s a zap, and lightning strikes leaving a spark we can see.”  解释：“我们之前学过，一个充满负极电荷的气球会跟正极电荷互相吸引。在这个实验中，电灯泡就是带正极电荷的物体，正负极电荷互相吸引的结果就是我们看到的火花。这跟我们看到的闪电是一样的道理。在一片云层中，充满了很多非常小而轻的冰晶，也充满了很多很重的小水滴。那些细小而轻的冰晶保持在云的上层，而那些重量重的水滴就沉到云的下层。当云层在空中移动的时候，这些冰晶和水滴会互相摩擦而产生电荷。一段时间以后，整个云层就充满了电荷。在上层的冰晶产生正极电荷，在下层的水滴产生负极电荷。由于异性相吸的原理，在下方的负极电荷会去寻找带正极电荷的物体，例如：山，人，树木，或其他带正极电荷的云。当有大雷雨的时候，正极电荷从地面往上方移动，而云层中的负极电荷往下方移动。当正极电荷和负极电荷接触的时候，就会产生很大的声音和闪光，那就是我们看到的闪电和听到的雷声。”  Question: “Can you compare lightning to one of our static electricity experiments? Talk with a partner and explain how lightning occurs by comparing it to something we learned about static electricity today.”  问题：“你能比较闪电和我们做过的静电实验有什么地方相同吗？请你向你的伙伴解释一下，闪电发生的原理跟我们今天学到的关于静电的知识有什么相同的地方。”   * Have a couple of students share their ideas with the class.   **Closing: (2 minutes)**  Revisit the Objectives: Have the whole class reread the objectives. Have Partner 2 ask partner 1 what we learned today and have Partner 1 respond.  Real World Application: Encourage students to go home and experiment with static electricity. Tell them to look for examples of static electricity in everyday life and make predictions about charges, strength of charges, and what might be attracted or repelled. Give students an opportunity in a future class period to share what they experimented with at home. | | | | |
| **Assessment:** | | | | |
| Observe students’ conversations during the guided practice to assess their mastery of the language objective.  Observe students working together in stations to assess their mastery of the content objective.  Collect their record sheets as a formative assessment of the language and content objectives. | | | | |
| **Extra Ideas:** | | | | |
| * Teach a separate lesson about lightning using Interconnections lesson Static Electricity and Lightning on page 195 or using the lesson on UEN titled Stuck on You at http://www.uen.org/Lessonplan/preview?LPid=11345 | | | | |

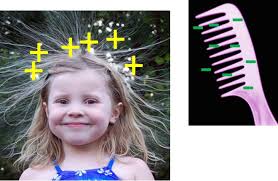






**STATIC ELECTRICITY** the buildup of an electrical charge on the surface of an object

静电是指在一个物体表面不断增强的电荷



**4 Facts about Static Electricity**

1. Static electricity happens in everyday life
2. Objects charged with static electricity attract or repel objects without touching
3. Various materials react differently to statically charged objects
4. Different objects produce different charges when rubbed by various materials

**四个关于静电的事实**

1. 静电在我们日常生活中天天发生。
2. 一个带有静电的物体虽然不经过表面接触也能吸引或排斥另外一个物体。
3. 不同的物质对带有静电的物体的反应也不同。
4. 不同的物体经由不同材质的物质摩擦会产生强度不同的电荷。

**STATION 1**

I see evidence of static electricity when \_\_\_\_\_\_\_\_\_\_\_\_\_.

**第一站**

当\_\_\_\_\_\_\_\_\_的时候，我看到静电产生的证据。

**STATION 2**

I think the \_\_\_\_\_\_\_\_\_\_\_ will attract/repel the \_\_\_\_\_\_\_\_\_\_\_\_ because \_\_\_\_\_\_\_\_\_\_(refer to positive and negative charges).

**第二站**

我觉得\_\_\_\_\_\_\_跟\_\_\_\_\_\_\_\_会互相吸引/互相排斥是因为\_\_\_\_\_\_\_\_\_\_（要提到正极电荷和负极电荷）。

**STATION 3**

I think the \_\_\_\_\_\_\_ will \_\_\_\_\_\_\_\_\_\_ when approached by an electrically charged balloon.

In reality, the \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ when approached by an electrically charged balloon.

**第三站**

我觉得当用一个带电荷的气球接近\_\_\_\_\_\_\_\_的时候，它会\_\_\_\_\_\_\_\_。

事实上，当用一个带电荷的气球接近\_\_\_\_\_\_\_的时候，它\_\_\_\_\_\_\_ \_\_\_\_\_\_\_。

**STATION 4**

I think \_\_\_\_\_\_\_\_\_\_\_ will produce a greater static electricity charge than \_\_\_\_\_\_\_\_\_\_ because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

In reality, \_\_\_\_\_\_\_\_\_\_ produced a greater static electricity charge than \_\_\_\_\_\_\_\_\_\_.

**第四站**

我觉得\_\_\_\_\_\_\_\_会比\_\_\_\_\_\_\_\_产生更强的静电电荷，因为\_\_\_\_\_\_\_\_\_\_。

事实上，\_\_\_\_\_\_\_\_\_比\_\_\_\_\_\_\_\_产生更强的静电电荷。

**STATION 1**

MATERIALS: whiteboards, markers, and erasers for each partnership

INSTRUCTIONS:

1. You and your partner will share a whiteboard, marker, and eraser.
2. Partner 1 will draw an example of static electricity in everyday life.
3. Partner 2 will guess using the sentence frame.
4. You both will then draw the picture and write the sentence frame on your record sheet.
5. Next, Partner 2 will draw and Partner 1 will guess using the sentence frame.

**第一站**

材料: 每组都有小白板，白板笔，和白板擦

做法:

1. 你和你的伙伴一起用一个小白板，一枝白板笔，和一个白板擦。
2. 伙伴一要画一个在日常生活中可以看到关于静电的例子。
3. 伙伴二要用这个句型来猜猜是什么情况。
4. 然后两个人都要把这张图和这个句子写在你们的记录单当中。
5. 下一步，伙伴二要画一个例子让伙伴一来猜。

**第一站**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_的时候，我看到生的。

**STATION 2**

MATERIALS: balloons and combs for each of you, empty aluminum soda can for each partnership

INSTRUCTIONS:

1. You will be using your own balloon and be sharing an empty soda can with a partner.
2. Make a prediction about what will happen when you electrically charge a balloon and put it next to the soda can using the sentence frames.
3. Write it on your record sheet.
4. Rub the balloon on your own head. Share a soda can with your partner, and see what actually happens.
5. Record your observations on your record sheet by drawing a diagram and labeling the charges as + and -.
6. Rub the balloon on your own head and run the comb through your own hair to electrically charge them both. State prediction using sentence frames, record prediction on record sheet, see what actually happens and observation on your record sheet with a diagram and label the charges.

**第二站**

**第二站**

材料：每一组都有一个气球、一把梳子和一个空的铝罐

做法：

1. 你们会用自己的气球并且和伙伴共用一个铝罐来做实验。
2. 请你用固定的句型来预测一下当你把一个充满电荷的气球靠近一个铝罐的时候会发生什么事。
3. 把你的预测写在记录单上。
4. 把气球拿到头上摩擦。然后把气球靠近你和你的伙伴共用的铝罐，看看会发生什么事。
5. 用图表和正负极符号（+ 和 -）在记录单上记录你的观察。
6. 把气球拿到头上摩擦，然后用梳子梳头，让两样东西都充满静电电荷。先用这个句型来预测一下，会发生什么情况，记录在你的记录单上。然后实际实验看看会发生什么情况，最后用一个图表和正负极符号（+ 和 -）把你观察到的实际情形记录在记录单里。

**第二站**

我觉得\_\_\_\_\_\_\_\_\_\_\_\_\_\_跟\_\_\_\_\_\_\_\_\_\_\_会/是因为\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_（要到极电和极电）。

**STATION 3**

MATERIALS: water faucet to share with group, handful of Cheerios to share with group, string and paper for each partnership, balloon for each of you

INSTRUCTIONS:

1. Make a prediction about what will happen when you electrically charge a balloon and put it next to running water from the faucet using the sentence frame with your partner and record it on your record sheet.
2. Rub your own balloon on your head and put it next to running water out of a faucet. Use the sentence frames to state what actually happened and record it on your record sheet.
3. Tie a string around a cheerio and the other end to your desk so it is hanging from a string. Make predictions, record on record sheet, charge your balloon, observe what happens, state what actually happened, record it on your record sheet.
4. Place a piece of paper on your desk. Make predictions, record on record sheet, charge your balloon, observe what happens, state what actually happened, record it on your record sheet.

**第三站**

材料：全班共用水龙头和早餐麦片圈，每组共用绳子和纸，每个人有一个气球

做法：

1. 先预测一下当你把一个充满电荷的气球靠近水龙头下流动的水时会发生什么情况？请你用固定的句型向你的伙伴说明，然后记录在你的记录单里。
2. 把气球拿到头上摩擦，然后把气球靠近水龙头下流动的水。用固定的句型陈述实际上发生的情况，然后就记录在你的记录单中。
3. 把线的一端绑住一个早餐麦片圈，另外一端绑在桌子上，让麦片圈悬空。预测一下充满电荷的气球靠近麦片圈的时候会发生什么情况，记录在记录单上。把气球摩擦产生静电荷然后靠近麦片圈，观察然后陈述发生的情况，最后把它记录在记录单上。
4. 在你的桌子上放一张纸，预测一下当充电的气球靠近纸的时候会发生什么情况，记录在记录单上。把气球摩擦产生静电荷然后靠近桌上的纸，观察然后陈述发生的情况，最后把它记录在记录单上。

**第三站**

我觉得当用一个带电荷的气球接近\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_的时候，气球会\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_它。

**STATION 4**

MATERIALS: wool, balloons, combs, wooden pencils, pennies, plastic spoons, keys, cut up squares of tissue paper—all of it to share

INSTRUCTIONS:

1. Share wool, balloon and comb with a partner.
2. Predict if a balloon or a comb will have a stronger charge using sentence frames.
3. Record prediction on record sheet.
4. Rub both the balloon and comb with the wool object (do not use your hair). Place next to tissue paper squares and see which object attracted more squares. More squares = stronger charge.
5. State which actually had a stronger charge using sentence frames.
6. Record observation on record sheet.
7. Share wool, wooden pencil and penny with a partner, predict which will have a stronger charge using sentence frames, rub both with wool, state which actually had a stronger charge using sentence frames, record observation on record sheet.
8. Share wool, plastic spoon and key with a partner, predict which will have a stronger charge using sentence frames, rub both with wool, state which actually had a stronger charge using sentence frames, record observation on record sheet.

**第四站**

材料: 全班共用羊毛布，气球，梳子，木头铅笔，一分钱钱币，塑胶叉，钥匙，裁成小正方形的面纸。

做法：

1. 跟伙伴共用羊毛布，气球和梳子。
2. 预测一下气球还是梳子会产生较强的电荷，用固定的句子来陈述。
3. 把预测记录在记录单上。
4. 用羊毛布摩擦气球和梳子（不要用头发来摩擦）。然后把气球和梳子都放在面纸的旁边，看看哪样东西可以吸引更多张的方形面纸。吸引越多张方形面纸等于产生越强的电荷。
5. 用固定的句型陈述哪一样东西有比较强的电荷。
6. 把观察到的结果记录在记录单上。
7. 跟伙伴共用羊毛布、木头铅笔、和一分硬币，用固定的句型预测一下哪一样物体会产生较强的电荷。然后用羊毛布摩擦铅笔和一分硬币，陈述实际上哪一样物体产生较强的电荷。最后把观察到的结果记录在记录单上。
8. 跟伙伴共用羊毛布、塑胶汤匙、和钥匙，用固定的句型预测一下哪一样物体会产生较强的静电荷。然后用羊毛布摩擦塑胶汤匙和钥匙，看看到底哪一样物体产生较强的静电荷。用固定的句型陈述你所观察到的结果，最后记录在记录单上。

**第四站**

第四站

我觉得\_\_\_\_\_\_\_\_\_\_\_\_\_会比\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_生的电电，因为\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_。

**Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Station 1**

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**Station 2**

Prediction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Prediction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Station 3**

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| Prediction: | In reality: |

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| Prediction: | In reality: |

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| --- | --- |
| Prediction: | In reality: |

**Station 4**

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| Prediction: | In reality: |

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| --- | --- |
| Prediction: | In reality: |

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| --- | --- |
| Prediction: | In reality: |

**姓名 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 日期\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**第一站**

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**第二站**

预测： \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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预测: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**第三站**

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| 预测: | 实际结果: |

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| 预测： | 实际结果: |

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| 预测: | 实际结果: |

**第四站**

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| 预测: | 实际结果: |

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| 预测: | 实际结果: |

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| 预测: | 实际结果: |