**Unit 1 Broken Chopstick**

**Translate the sentences.**

1. A car is driving along the road. What happens if it drives onto someone’s lawn?

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2. The speed of the car changes. The road and the lawn are made of different things.

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3. The car turns, too. What about light? It’s the same for light.

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4. Light passes through many materials. They change its speed.

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5. Water is denser than air. Because of this, light slows down when it enters water.

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6. It refracts the light. The light changes direction.

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7. When we look at an object inside water, it looks different. Light refraction changes how it looks.

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8. Step 1. Prepare a solid cup and a chopstick.

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9. Step 2. Put the chopstick into the empty cup. You can see the straight chopstick.

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10. Step 3. Now, fill the cup with water and put in the chopstick. What does it look like now?

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11. Did the chopstick look straight when it was inside the water?

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12. No, it didn’t. It looked bent. It looked like the chopstick was broken.

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13. The chopstick in the water also looked slightly wider.

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14. Why is this? Light changed direction when it entered the water.

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15. When the light reflected from the chopstick hit our eyes, it looked like the chopstick was in a different position.

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16. Refracted light is focused. It makes things look bigger. So the chopstick looked wider, too.

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**Unit 2 Tall Boy, Short Legs**

**Translate the sentences.**

1. Rick was the tallest boy in the entire school. He had really long arms and legs.

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2. One hot summer, Rick, Ted, and Amy went to the swimming pool.

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3. Rick dove into the water. He was so surprised when he saw his legs!

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4. “Look! My legs look so short and wide! What happened to my legs?” he laughed.

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5. “Ha ha, you look so funny!” said Ted.

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6. Amy said, “It’s because of light refraction.

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7. Light goes into the water and slows down. It changes direction.”

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8. “Why does that make my legs look strange?”

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9. “The light from the sun bounces off your legs in the water.

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10. Our brain only sees light as a straight line. It doesn’t know the light has been refracted.

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11. So your legs look curved and strange. They look shorter than they really are...”

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12. Amy wanted to keep talking, but Rick pulled her into the pool.

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13. “I can’t be the only one with short legs. Come in, everyone!”

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**Unit 3 Pressure Changes, Volume Changes**

**Translate the sentences.**

1. Pressure is the amount of force air makes on a certain area.

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2. Can pressure change the volume of things? If we apply pressure to water, will its volume change?

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3. What about the volume of a gas? Yes, pressure changes the volume of a gas.

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4. When you apply gentle pressure to a gas, the volume gets a little smaller.

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5. And when you apply high pressure to it, it gets a lot smaller. Let’s watch it happen.

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6. Step 1. Put 40 ml of water in a syringe without a needle. Cover the end with your finger.

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7. Step 2. Press the plunger lightly and observe the changes. Then press the plunger hard.

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8. Step 3. Now, put 40 ml of air in the syringe. Cover the end with your finger.

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9. Step 4. Repeat step 2 with air instead of water.

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10. Observe the changes based on the pressure you put on the plunger.

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11. What happened? The volume of water in the syringe didn’t change.

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12. No matter the pressure you put on it, it stayed at 40 ml.

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13. What about when you put air in the syringe? Did the volume stay the same?

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14. It didn’t. When you pressed the plunger lightly, the volume got a little smaller. It was lower than 40 ml.

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15. When you pressed the plunger hard, the volume of the air got a lot smaller.

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16. The harder you pressed the plunger, the smaller the volume of the air got.

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17. Now you know that pressure can easily change the volume of a gas.

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**Unit 4 A Bag of Chips**

**Translate the sentences.**

1. Irene went hiking with her family.

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2. She packed a bag of her favorite chips in case she got hungry.

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3. Irene was so proud when she reached the top of the mountain!

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4. She sat down for a rest and took out her bag of chips.

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5. She was very surprised! The bag was swollen.

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6. It looked like it was about to burst. Irene showed it to her mom.

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7. “Mom, look, the bag of chips is inflated. It looks like it’s gone bad!”

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8. Mom answered, “It’s the air pressure here that makes the bag inflate.

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9. The air pressure gets lower as you go up the mountain.

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10. Do you notice how it’s harder to breathe up here?

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11. That’s because of the low air pressure.

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12. When air pressure outside the bag lowers, air volume inside it increases. This is why it inflates.”

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13. Irene looked at her mom. She had a suspicious look on her face.

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14. “So, these chips are safe to eat?”

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15. “Of course they are! Can I have some chips?” said Mom.

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**Unit 5 Two Different Lenses**

**Translate the sentences.**

1. We use a lens to bend and focus light. Lenses can be convex or concave.

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2. Convex lenses are thick in the middle and thin at the edges.

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3. Concave lenses, on the other hand, are thick at the edges and thin in the middle.

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4. Let’s take a closer look at convex lenses. Convex lenses are mostly round.

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5. They are made of glass or transparent plastic. Let’s watch how light goes through a convex lens.

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6. Step 1. Prepare a convex lens and a laser pointer.

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7. Step 2. Point the laser at the edge of the lens. You’ll see the laser beam curve toward the middle.

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8. Step 3. Now, point the laser at the middle of the lens.

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9. The laser beam doesn’t curve, but goes straight through.

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10. The laser beam bent toward the middle as it went through the edge of the lens. It was refracted.

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11. The laser beam went straight through the middle of the lens. It didn’t bend.

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12. When a light beam passes through a convex lens, it is refracted just like the laser beam.

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13. All light beams that hit the edge of a convex lens are refracted to the middle.

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14. Light is focused at one point. This focused light makes things look bigger.

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15. Sunlight, a type of light, can also be refracted through a convex lens.

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16. What happens when it is focused in one place?

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**Unit 6 Telescopes, Microscopes, and More!**

**Translate the sentences.**

1. Fran went on a field trip to the observatory. She learned about stars and planets.

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2. She saw rocks from space. She saw many cool telescopes there, too.

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3. Fran was very excited. “Wow, it’s my first time seeing a real telescope! It’s so big!”

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4. “These are Keplerian telescopes,” explained the teacher. “How do they work?” asked Fran.

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5. “Well, they use two lenses. A convex lens gathers and focuses light from far away.

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6. It makes faraway things look bigger or closer. We can see stars and planets in more detail.

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7. Then a concave lens takes this light, and it spreads into your eye.”

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8. “Teacher,” said Fran, “cameras use convex and concave lenses, too, right?”

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9. “That’s right,” the teacher answered.

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10. “Cameras use convex and concave lenses. Binoculars use them, too.

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11. Convex lenses help us see far away and make small things look bigger and closer.

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12. This is why microscopes use convex lenses.

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13. Concave lenses spread the light and give us a clearer image.”

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**Unit 7 The Flow of Electricity**

**Translate the sentences.**

1. How does electricity flow? First, it needs an electrical circuit.

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2. The electricity flowing through the circuit is called an electric current.

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3. Can we make a circuit to turn on a light bulb?

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4. Prepare a battery, wires, and a light bulb. Let’s make two different circuits.

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5. Circuit 1. Step 1. Get two wires. Connect one end of each wire to each pole of the battery (+/-).

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6. Step 2. Connect the other ends of the wires to the light bulb. What happens?

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7. Circuit 2. Step 3. Get two wires. Connect one end of two wires to one pole of the battery.

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8. Step 4. Connect the other ends of the wires to the bulb. What happens?

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9. When did the bulb light up? It only turned on in Circuit 1.

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10. Why do you think that was? An electrical circuit needs certain things.

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11. 1. The battery, wires, and bulb should all be connected.

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12. 2. The electrical conductors should be connected to both poles of the battery.

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13. 3. The light bulb should be connected to both conductors.

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14. In Circuit 2, only one pole of the battery was connected.

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15. The bulb didn’t turn on because the electrical circuit wasn’t complete. The electricity couldn’t flow.

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16. Take the battery, wires, and light bulb again. What other circuits could you make with them?

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**Unit 8 All of the Lights**

**Translate the sentences.**

1. Liam and his dad were getting ready for New Year’s Day.

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2. They were going to have a party. Liam was putting up a string of lights.

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3. “Dad, these lights are too short. Can I cut the wire in half?

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4. Then I can add some thread to make the lights longer.”

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5. “No,” said Dad. “You need to connect the bulbs to conductors.

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6. Otherwise they won’t light up. They’re joined with copper wires which conduct electricity.

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7. Thread isn’t a conductor, so the lights won’t light up.”

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8. “Okay, Dad. Is there anything else I need to know?”

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9. “You should check whether the wires are connected to both poles of the battery.

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10. They should be connected to the positive and negative poles.

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11. Otherwise the circuit won’t be complete.”

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12. “The wires go into a battery pack. I’m sure they’re already connected to both poles.

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13. I’m going to turn them on!”

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14. “Wow, Liam! These lights look great. Let’s show Mom!”

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**Unit 9 More Batteries**

**Translate the sentences.**

1. We made an electrical circuit with just one battery. We can use two or more batteries, too.

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2. You can connect the opposite poles of each battery. That’s called a “series connection.”

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3. You can connect the same poles of each battery. That’s called a “parallel connection.”

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4. Let’s make both types of electrical circuits.

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5. Circuit 1. Step 1. Connect the positive (+) pole of one battery to the negative (-) pole of the other battery.

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6. Connect wires to the remaining positive and negative poles.

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7. Connect both wires to a light bulb.

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8. Circuit 2. Step 2. Connect the positive and negative poles of two batteries together.

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9. Connect wires to each pole of one of the batteries. Connect to the light bulb.

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10. Step 3. Compare the brightness of the bulb in each connection.

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11. Which circuit was series? Which was parallel?

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12. Circuit 1 was a series connection. Circuit 2 was a parallel connection. Which was brighter?

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13. The bulb with the series connection was brighter than the one with the parallel connection.

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14. Why is that? Series connections increase battery voltage. They make the batteries stronger.

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15. Parallel connections aren’t as strong. But they make the batteries last longer.

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16. Which do you think is better? Do you know any other ways to make a series or parallel circuit?

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**Unit 10 Electricity Everywhere**

**Translate the sentences.**

1. Sophia was at home watching TV. She had the lights on.

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2. The electric heater was also running. The TV was boring, so she turned on the radio as well.

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3. Her phone battery was low. She plugged her phone and the TV into the same outlet.

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4. Then she looked outside. It was snowing!

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5. She called her brother James. They went outside to play in the snow.

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6. They threw snowballs and made a snowman.

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7. Sophia started getting cold. She went back inside to make some hot chocolate.

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8. The snow on her gloves melted and made her hands wet.

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9. She was about to plug in the kettle when...

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10. “Stop!” Her mom was just back from the grocery store.

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11. “Sophia, don’t touch electrical things with wet hands. It’s very dangerous.”

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12. “Oh! Sorry, Mom.” “And look! You didn’t turn off any of the electrical things.

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13. You plugged the TV and your phone, which are electronics, into the same outlet.”

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14. “Is that wrong?” “Yes, it is. The plug could overheat. It could start a fire.”

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**Unit 11 Sea Breeze and Land Breeze**

**Translate the sentences.**

1. Have you ever felt the breeze at the sea coast? It’s not always the same.

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2. In the daytime, a cool breeze blows from the sea. We call it a sea breeze.

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3. In the evening, a cool breeze blows as well. But now it blows from the land to the sea.

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4. This is a land breeze. Why does this happen? Let’s see.

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5. Step 1. Prepare two lamps, a bowl filled with water, a bowl filled with sand, a transparent box, and an incense stick.

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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. Turn on the lamps and heat the sand and water for about 5 minutes.

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7. Step 2. Put the box over the heated sand and water. Put the lit incense stick into the box.

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8. Step 3. Observe the movement of smoke for 30 seconds.

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9. The smoke moved from the cool water to the warm sand.

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10. Why did this happen? The sand was warm, but the water was still cool.

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11. Sand heats up more quickly than water. The warm sand created a low air pressure area.

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12. The cool water created a high pressure area. Air always moves from high to low pressure.

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13. This movement is what we call wind. In the daytime, the land heats up faster than the sea.

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14. The temperature of the land is higher. A sea breeze blows from the sea to the land.

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15. At night, the land cools down faster than the sea. Now the temperature of the land is lower.

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16. A land breeze blows from the land to the sea.

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**Unit 12 Flying a Kite**

**Translate the sentences.**

1. One sunny weekend, Daniel took a trip to the beach with his family.

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2. He flew a kite with his dad.

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3. “Dad, why is the kite flying toward us? I thought it would fly above the sea.”

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4. “Well, Daniel, the wind blows from the sea to the land in the daytime.”

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5. “Will the kite fly toward the land at night, too?”

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6. “Why don’t we check it out after eating dinner?”

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7. They went out to the beach again after dinner. Daniel flew his kite again.

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8. Now it flew in the opposite direction.

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9. “Dad, it’s flying toward the sea! Does the wind blow in the opposite direction at night?”

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10. “Yes, because it’s cooler at night. Sand cools down much faster than water.

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11. So the sand’s temperature is lower than the water’s temperature at night.”

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12. “Wind always blows from a cooler place to a warmer place, right?”

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13. “Yep. Cool air creates higher air pressure, and warm air creates lower pressure.

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14. Wind is the flow of air as it moves from higher to lower pressure,” said Dad.

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**Unit 13 The Height of the Sun**

**Translate the sentences.**

1. Have you ever noticed something about the sun?

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2. In summer, it’s very high in the sky. On the other hand, in winter, the sun is much lower.

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3. The height of the sun differs from season to season.

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4. The height of the sun in the sky affects the length of the day.

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5. It affects the temperature, too. Let’s do an experiment.

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6. Step 1. Set a lamp at a steep angle to a bowl of sand.

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7. Step 2. Heat the sand using the lamp for 5 minutes. Then, measure the temperature.

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8. Step 3. Now, set the lamp at a shallow angle to the sand.

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9. Step 4. Once again, heat the sand for 5 minutes and measure the temperature.

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10. When was the temperature of the sand higher?

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11. It was higher when the lamp and the sand formed a steep angle.

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12. The lamp was at its highest.

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13. This is what the sun is like in summer. The sun is high up in the sky.

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14. When the sun is at its highest, it shines on a narrower area.

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15. The heat energy in that area increases. The ground is heated up.

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16. The temperature rises. That’s why it is hot in summer when the sun is high.

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17. That’s why it is cold in winter when the sun is low.

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**Unit 14 The Length of the Day**

**Translate the sentences.**

1. It’s too cold to play outside. Emily reads books at home instead.

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2. She reads by the sunlight through the window. She notices her shadow is long.

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3. It starts getting dark. Emily can’t see her book well. She looks outside.

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4. The sun has almost set! She looks at the clock. It’s only 5 p.m.

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5. How strange! In summer, it was so bright at 5 p.m.!

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6. Emily turns on the light. She looks for another book.

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7. She finds a science book. She learns about solar altitude and the sun.

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8. Solar altitude changes during the day. It changes with the seasons as well.

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9. She learns that Earth is at an angle.

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10. As it revolves around the sun, we get closer and farther away from the sun.

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11. During the summer, solar altitude is at its maximum.

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12. The days are longer. During the winter, solar altitude is at its minimum. The days are shorter.

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13. Emily closes her book. She learns something today.

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14. And she can’t wait for summer to come again!

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**Unit 15 Electricity from the Sun**

**Translate the sentences.**

1. We can’t imagine a world without electricity. We use it every day.

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2. But most of our electricity comes from burning coal or gases.

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3. This creates pollution. It causes climate change. It’s bad for our planet.

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4. Solar power comes from the sun. Solar engineers turn light from the sun into electricity.

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5. This is much better for the planet.

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6. Solar power has many uses. It can power houses and cars. It can heat water.

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7. Solar engineers work to make solar power more effective.

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8. They plan, design, and implement solar energy projects.

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9. There are problems with solar power. It only makes power when the sun is shining.

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10. It is expensive, too. As a result, only 2% of the world’s electricity comes from solar power.

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11. But solar power is essential to the future of the planet.

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12. The work of solar engineers is very important.

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13. Their hard work can make solar power stronger and cheaper.

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14. They can help make the world a cleaner place.

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**Unit 16 Web Developer**

**Translate the sentences.**

1. You want to buy tickets for your favorite singer.

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2. You go on the website to buy them. You click on the “Buy” button for the tickets.

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3. Nothing happens. You click again. The website crashes.

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4. What is happening? Too many people are using the website.

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5. Finally it works. You manage to put the tickets in your basket.

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6. You want to pay, but you can’t find the button for it.

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7. You scroll down the page. You find it at the bottom of the page.

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8. Finally, you click “Pay.” But the tickets have sold out. You were too slow!

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9. Doesn’t this sound annoying?

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10. Web developers have an important job. They design websites.

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11. They design what websites look like.

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12. Text should be easy to read. Buttons should be easy to find.

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13. They also design the technical side of the website.

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14. Websites should load fast. They shouldn’t crash when many people use them.

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15. Websites are fun to use. But they’re difficult to design!

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