STEM Sims™

Static Electricity

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Do you need an idea for a scientific study?
Try out one of our ideas or make one of your own.

You might have heard the phrase: "Opposites attract." The phrase describes what happens during an electric interaction. Take the following brief quiz to see how much you already know about a common electric interaction called static electricity. See the bottom of page 4 to check your answers.

1. Which is the best definition of the term "static?"
   a. electricity
   b. conduction
   c. not moving
   d. moving

2. About how fast does a typical discharge of lightning between a cloud and the ground travel?
   a. 270 mph
   b. 2,700 mph
   c. 27,000 mph
   d. 270,000 mph

3. What causes lightning during a thunderstorm?
   a. strong winds blowing ice particles together in clouds
   b. the rapid heating of air inside the cloud
   c. a buildup of opposite electrical charges within a cloud or between a cloud and the ground
   d. water droplets freezing and releasing energy

4. Lightning is incredibly hot, reaching temperatures exceeding the surface of the sun! But it's surprisingly thin, about the width of a pencil. Imagine you have a giant slingshot and could launch a small object towards a storm cloud. Which object would be most likely to attract a lightning strike?
   a. rubber bouncy ball
   b. metal trash can lid
   c. wet beach towel
   d. helium-filled balloon

5. You're outside enjoying a summer afternoon when you see a flash of lightning in the distance. Should you wait to hear thunder before seeking shelter?
   a. Yes, it's safe as long as you don't hear thunder.
   b. No, lightning can travel much farther than thunder can be heard, so seek shelter immediately upon seeing a flash.
   c. It depends on how much you dislike loud noises.
   d. Only seek shelter if the lightning hits something near you.

Make It Stick

Frizzy hair, small shocks as you slide across a car seat and touch the door handle, and lightning all are examples of a common phenomenon called electrostatic interactions. Get started now investigating static electricity.

<u>Materials Required</u>

1- balloon window cleaner 1- marker

1- sheet notebook 1- sheet aluminum foil 1- wool sock

<u>Procedure</u>

1. Blow up the balloon and tie the end so air cannot escape.
2. Use the marker to write a large "X" on one side of the balloon. Only touch this side of the balloon.
3. Tear the notebook paper into small pieces. Place the small pieces in a pile on a table.
4. Do the same tearing process with the aluminum foil and place the foil pieces in a separate pile on the table.
5. Clean the balloon with window cleaner and set the balloon aside to completely dry.
6. Rub the balloon on the side opposite the "X" vigorously with the wool sock.
7. Holding the balloon on the "X," slowly move the balloon over the pile of pieces of paper without touching the paper. Do not touch the balloon on the side opposite the "X."
8. Describe in Table 1 below what happens when the balloon is moved over the paper.
9. Repeat steps 5 – 8, only this time moving the balloon over the pieces of aluminum foil instead of the paper. Make sure to describe in Table 1 what happens.

Table 1. Observations

Moving Balloon Over:	Observations
Paper Pieces	
Aluminum Foil Pieces	

<u>Questions</u>

1. Propose a reason for the results of moving the balloon over the pieces of paper.

2. Propose a reason for the results of moving the balloon over the pieces of aluminum foil.

Static Electricity

Lightning!

Imagine a giant cotton candy cloud filled with a wild mix of things: tiny water droplets, ice crystals, and even dust particles. Inside this cloud, a crazy electrical party is brewing! As the cloud gets tossed by wind currents, the water droplets and ice crystals bump into each other. The lighter water droplets rise to the top of the cloud, while the heavier ice crystals sink towards the bottom. This movement separates electrical charges, like sorting socks in a dryer. The water droplets become positively charged, and the ice crystals become negatively charged.

The bottom of the cloud becomes a giant negatively charged zone, while the top builds up a positive charge. This separation is like stretching a rubber band – the more you stretch, the stronger the pull back. As the charges build, the pull between positive and negative gets stronger. Eventually, the air between the charges can't hold it anymore, and a giant spark jumps through the cloud – that's lightning!

Sometimes, the negative charge at the cloud's bottom gets so strong that it reaches down towards the ground. If it finds a tall object like a tree or a building acting as a conductor, it blasts a path of electricity straight down – that's a lightning strike! This discharge is what heats the air so much, making the lightning bolt incredibly hot, even hotter than the sun's surface!

So, next time you see a lightning flash, remember it's the result of a giant electrical party happening high in the clouds, with charges separating and finally reconnecting in a spectacular display of light and heat!

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Answers: Page 2 Answers: 1) c, 2) d, 3) c, 4) b, 5) b. **Page 3 Answers:** Make it Stick 1) The paper and balloon had an electrostatic interaction. 2) The aluminum foil and balloon did not have an electrostatic interaction.