



# SCIENCE Learning

## Severe Weather

### Hurricane Safety

**Background Information:** It is the time of year that the Atlantic, and sometimes the Pacific Oceans experience Hurricane Season. A hurricane is a huge storm. It can be up to 500 miles across and have strong winds spiraling inward and upward at speeds of 75 to 200 miles per hour. Each hurricane may last up to a week, gathering energy from warm tropical waters north of the equator. In the center of the hurricane is an “eye.” It is the calmest part of the storm. The winds rotate counter-clockwise around the “eye.” As the hurricane moves toward land, the heavy rain, strong winds and large waves can damage buildings, trees and cars. Eventually, the hurricane will lose its energy over land. The Atlantic hurricane season is from June 1 to November 30, but most hurricanes occur during the fall months.

#### What you will need:

- Chart paper and pens
- Paper and pencils
- Hurricanes for Kids <https://www.youtube.com/watch?v=jSX9VKanpcg>
- What Is A Hurricane? <https://www.youtube.com/watch?v=vP2z8QAmQAA>
- Hurricane Safety for Kids <https://www.youtube.com/watch?v=gAglmKwtbTY>

#### Instructions:

1. Ask youth what they know about hurricanes. Make a list on a chart.
2. Bring children together and show them the three videos about hurricanes.
3. After viewing the videos, ask them to imagine they are above a hurricane looking down. Ask them to draw a picture showing huge clouds rotating counter-clockwise, swirling very fast.
4. Remind them to place the “eye” of the hurricane in the middle. There are very light winds and fair weather in the “eye.”
5. Draw the hurricane over the ocean.
6. Ask youth to brainstorm how to be safe during a hurricane.
7. Divide them into small groups, ask each group to consider what to do Before a Hurricane, During a Hurricane, After a Hurricane, and to create a Hurricane Supply Checklist.
8. The U.S. Weather Bureau gives names to hurricanes. Ask students to think of 26 names, one for each letter of the alphabet, ready to name hurricanes, should they occur. For example: Able-Ben-Charlie-David-Elizabeth-Frank and so on.

#### Debrief:

- What did you learn about hurricanes?
- What advice would you give to someone who lives in an area where hurricanes occur?
- Why do you believe hurricanes can be so dangerous?



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## Lightning Strikes

**Background Information:** Lightning is an electric current. Have you ever gotten a shock by shuffling across a carpet and then touching something made of metal? Then you have experienced the same process that makes lightning. Within a thundercloud, many small bits of ice bump into each other as they swirl around in the air. All these collisions create a negative electrical charge, just like the one that built up in you when you crossed the carpet. After a while, the whole cloud fills up with electrical charges. Since opposites attract each other, this attraction causes a positive charge to build up on the ground beneath the cloud. The charge streaming up from high points (mountains, trees, or people) connects with a charge reaching down from the clouds, and ZAP! - Lightning strikes! To find out how many miles away the lightning is, when you see lightning, begin counting, "One Mississippi, two Mississippi, etc." If you counted, "Three Mississippi," you know that when you hear the thunder, the lightning was three miles away.

### What you will need:

- Styrofoam plate
- Thumbtacks
- Pencil with new eraser
- Aluminum pie pan
- Small piece of wool fabric (It must be wool for this investigation to work)
- Access to videos:
- What Causes Thunder and Lightning [https://www.youtube.com/watch?v=fEiVi9TB\\_RQ](https://www.youtube.com/watch?v=fEiVi9TB_RQ)
- What Causes Thunder and Lightning <https://www.youtube.com/watch?v=ZR001wodxyE>

### What you will do:

1. Ask students what they know about lightning. (A few students may be afraid of the sound of thunder. Let students express their feelings.) Once you have listed the information youth share with you, show them the videos. After the videos add to what they know about lightning and thunder
2. Lightning is dangerous. Talk about being safe in a thunderstorm. Brainstorm safety ideas (Examples: Get into a house or car. Stay away from tall trees or poles, open areas like field, bodies of water, like lakes or the ocean, metal fences, sports equipment, bikes, etc.)
3. After doing this preliminary work, you are going to conduct an investigation. Here are the steps.
4. Divide students into groups. Provide materials for each group.
5. Push the thumbtack through the center of the aluminum pie pan from the bottom.
6. Push the eraser end of the pencil into the thumbtack. The pencil becomes a handle to lift the pan.
7. Put the Styrofoam plate upside-down on a table.
8. Rub the underside of the plate with the wool for one minute.
9. Now, rub hard and fast for 30 seconds!
10. Replace the pie pan on the Styrofoam plate.



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11. Touch the pie pan with your finger. If you don't feel anything when you touch the pan, try rubbing the plate again.
12. Try turning the light out before touching the pan. Do you see anything when you touch the pan? (You should see tiny flashes or sparks of static electricity.)
13. Have groups share with the others.

## Debrief

- What did you learn from this investigation?
- What advice would you give to someone just starting this experiment?
- Explain what you might do the next time you are in a lightning and thunder storm.



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## Lightning in Your Mouth

**Background Information:** Lightning is a bright flash of electricity produced by a thunderstorm. All thunderstorms produce lightning and are very dangerous. If you hear the sound of thunder, then you are in danger from lightning. How can lightning occur in your mouth? When you break the lifesaver apart, you're breaking apart sugars inside the candy. The sugars release little electrical charges in the air. These charges attract the oppositely charged nitrogen in the air. When the two meet, they react in a tiny spark that you can see.

### What you will need:

- Wintergreen or Pop-O-Mint Lifesavers
- Mirrors for each pair
- Dark room
- You may want to show this short video so youth know what to look for. Watch it first and decide. It is made with a young girl, but the lightning is cool to see.

<https://www.youtube.com/watch?v=8jlaLD9em9I>

### What you will do:

- Review what students know about lightning.
- Ask, "Where does lightning from?"
- Explain youth are going to have an opportunity to try to make lightning in their mouth using a Lifesaver. (This is where you would show the video)
- Have students make predictions about what will happen when they break apart the Lifesaver® in their mouths. "I predict . . ." Ask this question: Will there be more sparks if you chew more than one Lifesaver® at a time? Have them predict that as well.
- Give each student a wintergreen candy.
- Ask the students to go into a really dark room and stand in front of the mirror.
- Wait a few minutes until their eyes get accustomed to the darkness.
- Ask the students to place the mint Lifesaver® in their mouths.
- While keeping their mouths open, ask them to break the candy with their teeth and look for sparks. If they do it right, they should see bluish flashes of light.
- Discuss the results of this experiment.

### Debrief

- What did you learn from this investigation?
- What advice would you give to someone just starting this experiment?
- If you were able to see the lightning-why do you think it worked? If you weren't able to see the lightning, what else might you try?



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## More About Weather

**Background Information:** Did you know that there is a recipe for weather? Here it is. In order to have weather, you need four components: temperature, pressure, volume, and density.

In this activity, youth are learning about air pressure. Because there are miles of air above us and it is all pushing down, the air at the bottom gets squeezed like the pressure you feel at the bottom of a swimming pool. In this investigation, the egg is actually pushed inside the bottle by atmospheric pressure. The match heats the air inside the bottle causing it to expand. When the match goes out, the pressure inside the bottle drops below the outside pressure, therefore pushing the egg in from the outside. Air pressure is always trying to equalize itself.

### What you will need:

- Glass bottle with a long, narrow neck. (A bottle for vinegar would work well—be sure it is glass not plastic) Be sure inside of bottle is dry.
- Hard boiled eggs
- Matches (kitchen variety)
- Weather School for Kids [https://www.youtube.com/watch?v=SeN1VdG1v\\_0](https://www.youtube.com/watch?v=SeN1VdG1v_0) There are a number of experiments for youth to do as well as the one with the egg listed below.

### What you will do:

1. Choose eggs that are more than 5 days old. Fresh eggs are hard to peel. Prior to the lesson, boil the egg. It is suggested you boil two or three eggs so you can repeat the activity.
2. This is a demonstration lesson. The youth are NOT doing activity, but they are observing it. Do this lesson with the whole class. Find a safe place to conduct the experiment far away from flammable materials.
3. Have youth make predictions about what will happen when you put the lighted match into the bottle and the egg on top.
4. After predictions, put the empty bottle on a table.
5. Peel the boiled egg.
6. Light a match. Place it inside the bottle while the match is still burning.
7. Quickly put the egg over the mouth of the bottle.
8. Watch as the egg gets sucked into the bottle.
9. Have youth explain what happened.

### Debrief

- What did you learn from this investigation?
- What advice would you give to someone just starting this experiment?
- Why do you think it was important to peel the egg rather than leave the shell on it?



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## Twister In A Jar

**Background Information:** A tornado is a type of very violent and severe weather. It begins as an area of low pressure inside a thunderhead. The low pressure is caused by rising warm air. As the air rises, it pulls warm, moist air up into the cloud at very high speeds. The rising air begins to spin and soon picks up speed, whirling faster and faster. Moisture begins to condense forming a funnel. The funnel dips down from the cloud. The rain and hail in the thunderstorm cause the funnel to touch down creating a tornado. If the tornado reaches the ground, it races along, usually leaving a path of destruction. Tornadoes may last only a few minutes. Most tornadoes in the United States occur in the Midwest, in an area known as Tornado Alley. This area includes Texas, Oklahoma, Kansas, Missouri, Nebraska, Iowa, Illinois, and Indiana

### What you will need:

- Paper and pencils
- 8 oz. jar with lid
- Water
- Vinegar
- Clear dish soap
- Pinch of glitter
- Video: What is a Tornado? <https://www.youtube.com/watch?v=-s3UwOq1P1E>

### What you will do:

1. Bring youth together and ask what they know about tornadoes.
2. Show the video in the link above, and add to the information.
3. Use paper and pencil for youth to draw a model of a tornado. Remind them to include ground with houses and trees, funnel cloud touching the ground curving upward, increasing in width, and the funnel merging into the giant thunderstorm
4. Clarify these terms: vortex (tornado), thunderstorm (large clouds with flat tops and dark bottoms, rain, thunder and lightning), and funnel shaped (wide at the top getting progressively more narrow at the bottom).
5. Ask youth these questions:
  - a. "What causes the tornado to rotate?"
  - b. "How can we keep safe during a tornado?"
  - c. Talk about houses with basements. Since violent tornadoes can rip roofs off houses, where is a safe place to stay during a storm? (basement, interior room with no windows, or bathtub) Often tornadoes don't pick up the bathtub in the house. Do you have a basement where you live?
6. Draw a picture of people in the basement during a storm. What supplies should be in the basement to keep people comfortable? (water, food, blankets, portable radio, first-aid kit, and flashlights
7. Then divide youth into groups. Provide each group with materials. Have them follow these directions:



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- a. Fill the jar  $\frac{3}{4}$  full of water
- b. Put one teaspoon of vinegar and one teaspoon of dish soap into the water.
- c. Sprinkle a small amount of glitter into the mixture.
- d. Close the lid and twist the jar to see a vortex or funnel shape form.
- e. Model how to twist the jar. Youth do not need to shake the jar, the simple rotation will do the trick.

## Debrief

- What did you learn from this investigation?
- What advice would you give to someone just starting this experiment?
- Why do you think it is important to move to safety in a tornado?



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## Earthquakes

**Background Information:** Earthquakes can strike suddenly on a massive scale over a wide area with a death toll in the tens of thousands. While the tsunami threat after an earthquake does allow a brief time to post a warning, often it is too little to save lives. In the case of earthquakes and volcanoes, the series of aftershocks or continued activity poses an ongoing threat in the midst of the chaos after the initial event. And in countries like Haiti which has endured the devastation and death associated with major earthquakes in 2010 and again in 2021, the recovery process takes years and exposes communities to the effects of other disasters.

Although we can identify earthquake/volcano risk regions, such as the “Ring of Fire” in the South Pacific or the San Andreas fault in Southern California, we have little warning when a sudden event devastates a country or entire region. The latest deadly earthquake in Afghanistan struck suddenly in a vulnerable region of a country struggling with many challenges and especially vulnerable to such disasters. Sometimes the event starts a cascade of catastrophe as in the Japan Earthquake of 2011 that added a monstrous tsunami and then a nuclear disaster with reactor damage and radioactive contamination of air, soil and water.

### What you will need:

Earthquake in a Classroom Video: you will watch this to know how to conduct this investigation. This is not for the kids. Supplies below are for each group of 3-4 youth

<https://www.youtube.com/watch?v=mMnEXukSmdg>

- 8” aluminum pan—fill with Jell-o and set in the refrigerator
- Toothpicks
- Mini Marshmallows
- Video: What Causes Earthquakes [https://www.youtube.com/watch?v=AArne-wh\\_Uc](https://www.youtube.com/watch?v=AArne-wh_Uc)
- Video: Plate Tectonics for Kids <https://www.youtube.com/watch?v=bVn04eJRjV4>

### What you will do:

1. Watch all of the videos first. Do not plan to show the Earthquake in a Classroom video to the kids.
2. Prepare the containers of Jell-o prior to meeting with the kids
3. Ask youth what they know about earthquakes—create a chart of what they say
4. Show What Causes Earthquakes and Plate Tectonics for Kids
5. Explain they are going to simulate an earthquake by building a structure out of toothpicks and marshmallows and sticking it into Jell-o which represents the Earth
6. They will then cause an earthquake
7. They will build and rebuild their structure to survive the earthquake
8. When finished, have youth share with the entire group.





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## Debrief

- What did you learn from this investigation?
- What advice would you give to someone just starting this experiment?
- Why do you think it is important to create buildings which can withstand the earth shaking during an earthquake?



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## Earthquake Safety

**Background Information:** Earthquake preparedness is a set of measures taken at the individual, organizational and societal level to minimize the effects of an earthquake. Preparedness measures can range from securing heavy objects, structural modifications and storing supplies, to having insurance, an emergency kit, and evacuation plans.

In most situations, you can protect yourself if you immediately:

- **DROP down onto your hands and knees** before the earthquake knocks you down. This position protects you from falling but allows you to still move if necessary.
- **COVER your head and neck** (and your entire body if possible) underneath a sturdy table or desk. If there is no shelter nearby, get down near an interior wall or next to low-lying furniture that won't fall on you, and cover your head and neck with your arms and hands.
- **HOLD ON to your shelter** (or to your head and neck) until the shaking stops. Be prepared to move with your shelter if the shaking shifts it around.

If you are inside, stay inside.

- Move away from windows and outside walls.
- Stay in the building.
- DO NOT use the elevators. The electricity may go out, and the sprinkler systems may come on.
- If you are trapped, stay calm. Try to get someone's attention by tapping on hard or metal parts of the structure. Doing so may increase your chances of being rescued.

If you are inside a crowded place, drop, cover, and hold on.

- Do not rush for the doorways. Others will have the same idea.
- Move away from display shelves containing objects that may fall.
- If you can, take cover and grab something to shield your head and face from falling debris and glass.

If you are outside, stay outside.

- Move away from buildings, utility wires, sinkholes, and fuel and gas lines. The greatest danger from falling debris is just outside doorways and close to outer walls of buildings.
- Go to an open area away from trees, telephone poles, and buildings. Once in the open, get down low and stay there until the shaking stops.
- The area near the outside walls of a building is the most dangerous place to be. Windows, facades, and architectural details are often the first parts of the building to collapse. Stay away from this danger zone.

If you are in a moving vehicle, stop as quickly and safely as possible.

- Move your car to the shoulder or curb, away from utility poles, overhead wires, and under- or overpasses.
- Stay in the car and set the parking brake. A car may jiggle violently on its springs, but it is a good place to stay until the shaking stops.
- Turn on the radio for emergency broadcast information.
- If a power line falls on the car, stay inside until a trained person removes the wire.
- When it is safe to begin driving again, watch for hazards created by the earthquake, such as breaks in the pavement, downed utility poles and wires, rising water levels, fallen overpasses, or collapsed bridges.

If you are in a stadium or theater, stay in your seat. Protect your head and neck with your arms or any way possible.



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- Do not leave until the shaking is over.
- Walk out carefully watching for anything that could fall during the aftershocks.

If you are near the shore, drop, cover, and hold on until the shaking stops.

- If severe shaking lasts 20 seconds or more, immediately evacuate to high ground as a tsunami might have been generated by the earthquake.
- Move inland 2 miles (3 kilometers) or to land that is at least 100 feet (30 meters) above sea level immediately. Don't wait for officials to issue a warning.
- Walk quickly, rather than drive, to avoid traffic, debris, and other hazards.

If you cannot drop to the ground, try to sit or remain seated so you are not knocked down.

- If you are in a wheelchair, lock your wheels. Remove any items that are not securely attached to the wheelchair.
- Protect your head and neck with a large book, a pillow, or your arms. The goal is to prevent injuries from falling down or from objects that might fall or be thrown at you.
- If you are able, seek shelter under a sturdy table or desk. Stay away from outer walls, windows, fireplaces, and hanging objects.
- If you are unable to move from a bed or chair, protect yourself from falling objects by covering up with blankets and pillows.

## What you will need:

- Chart paper and pens
- Paper and pencils
- Video: How to Protect Yourself During An Earthquake  
<https://www.youtube.com/watch?v=BLEPakj1YTY>
- Copies of the Tips above if you would like to have kids have a copy

## What you will do:

1. Bring youth together and ask them what they have heard or believe you should do to be safe during an earthquake and the aftermath of the earthquake.
2. Show youth the video: How to Protect Yourself During An Earthquake—add to the list.
3. Review the Tips included above in this lesson plan
4. Divide the youth into groups of 3-4
5. Explain each group is to make a plan for what to do during an earthquake, how to evacuate a classroom, multipurpose room or outdoor space in the expanded learning program, and to make a list of the items they believe are necessary to help people survive the aftermath of an earthquake.
6. When groups are finished with their plans, they should share with one another.

## Debrief

- What did you learn from this activity?



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- What advice would you give to someone just starting this activity?
- Why do you think it is important to have a plan in case there is an earthquake?