SCHOLASTIC

What Gives You Goosebumps?

Bring Halloween to life in your classroom with these spooky lessons and activities!

- Scare up some ghostly static electricity experiments
- Explore the hair-raising science of goosebumps
- Turn treats into tricks with creepy chemical reactions
- Spark your knowledge of the Tesla coil with an electrifying activity

Goosebumps 2
Haunted Halloween

IN THEATERS OCTOBER 12

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SCHOLASTIC

What Gives You Goosebumps?

Use the scientific method to determine what causes those hair-raising shivers, shakes, and bumps!

PURPOSE	Ask a question.
HYPOTHESIS	What is your guess?
EXPERIMENT	Are you on the right track?
OBSERVE	What are the results?
CONCLUSION	Share your findings.

Goosebumps 2
Haunted Halloween

IN THEATERS OCTOBER 12

What Gives You Goosebumps?

Get into the Halloween spirit with these STEM–based lessons and corresponding activities.

TEACHERS: Download the scientific method poster to help guide your students through the activities. Encourage them to think like a scientist and find evidence-based answers to questions they come up with during these creepy lessons.

LESSON 1

Spooky Static Electricity

In *Goosebumps 2: Haunted Halloween*, kids are spooked by flying bedsheet ghosts. Have your students create their own flying ghosts with the help of static electricity and three fun challenges.

MATERIALS

Balloons, thread, tape, rulers, tissue paper or facial tissue, card stock, markers, scissors, Activity Sheet 1

STEPS

1) Introduce the concept of static electricity—the buildup of an electrical charge on the surface of an object. Rubbing a balloon on your hair will cause the balloon to have a negative charge. Since opposites attract, the balloon will be attracted to things that have a positive charge (stick the balloon to your clothing).

2) Download the activity sheet and distribute it with the materials to pairs or small groups of students. Ask students to cut flat, single-ply ghost shapes from the tissue and use markers to draw faces on the ghosts.

3) Ask students to follow instructions, experiment, and complete the challenges.

4) Conclude the activity with a class discussion. Ask: Did your balloon attract or repel the ghosts? Why? After a while, the balloon stops working to move the ghosts. Why? What do you need to do to charge the balloon again?

LESSON 2

The Science of Goosebumps

Author R.L. Stine has written countless scary stories in the *Goosebumps* series. Why do we enjoy stories that frighten us? And what exactly causes us to get goosebumps when things get downright creepy?

MATERIALS Activity Sheet 2

STEPS

1) Download and distribute the activity sheet; work as a class to read the article aloud.

2) Stop to check for understanding and to help with new vocabulary as necessary.

3) Have students work in pairs to answer the questions at the bottom of the page.

4) On a separate sheet of paper, ask students to design their own ideas for human survival in the present day.

5) Have students share their ideas with the class or in small groups. What makes their ideas helpful or useful for human survival? Can students make suggestions to build on one another's ideas?

LESSON 3

Attack of the Gummy Bears!

Gummy bears are not as sweet as they seem when they come to life and go on the attack. Amaze your students with gummy bears that grow, shrink, and dissolve in your classroom!

MATERIALS

Gummy bears, water, salt, white vinegar, clear cups, spoons, masking tape, markers, other liquid or solution of students' choice (such as soda, juice, vegetable oil, baking soda dissolved in water, etc.), Activity Sheet 3

STEPS

1) Introduce the scientific method (download the poster) as a way to find evidence-based answers to questions. Download and distribute the activity sheets. Ask: What happens to gummy bears that are submerged in different liquids overnight?

2) Have students create a hypothesis for each liquid.

3) Distribute materials and ask students to label cups (water, salt water, vinegar, liquid of students' choice) and then fill them halfway with liquids.

4) Students should set aside one gummy bear as their control and drop one gummy bear into each cup.

5) Ask students to observe the gummy bears. Do they notice any changes right away? Let the gummy bears stay submerged overnight.

6) The following day, have students observe what they can see, feel, smell, measure, or weigh. Remind students not to taste the gummy bears as they are not safe to eat.

7) Ask students to create a set of results

→

comparing their observations with the control gummy bear. How did the results compare with their hypotheses?

8) Conclude the activity with a class discussion and questions like: Why do you think some liquids caused the gummy bear to grow and some liquids caused the gummy bear to shrink? Why do you think some liquids caused the gummy bear to break down or change in texture? How do you think this experiment might work with other candy, like a peppermint or a mini chocolate bar? What other types of questions could we find the answers to using the scientific method?

LESSON 4

Light It Up!

In *Goosebumps 2: Haunted Halloween*, Sonny "lights up" the town with his science project, the Tesla Tower, an invention capable of producing impressive electrical arcs that glow and flash like lightning bolts. Find out how the Tesla coil works in your classroom!

MATERIALS

Activity Sheet 4

STEPS

1) Source and show a short video of a Tesla coil creating electrical arcs.

2) Explain that the Tesla coil is named after its creator, Nikola Tesla, an inventor who was especially interested in mechanical and electrical engineering.

3) Download and distribute the activity sheet to students and ask them to investigate how the coil works. Support your students as they work on the activity, walking them through the key question: How does the Tesla coil create giant, electrical arcs?

1. A power source is attached to the primary coil.
2. The capacitor "soaks up" the electricity like a sponge.
3. Once the capacitor is full, the electric current streams back into the primary coil and toward the spark gap.
4. The current flows through the spark gap into the secondary coil.
5. Electric current flows back and forth between the coils.
6. The transformer boosts the voltage of the current as it flows back and forth.

4) Once the activity is complete, ask your students to guess why Nikola Tesla would have created such an invention. What is its purpose? Do your students have any wild or wacky ideas?

Help to facilitate a class discussion using the following points:

- The Tesla coil doesn't have a practical application in today's society besides demonstrating awesome electrical arcs for amazed onlookers.
- Around 100 years ago, however, Tesla was attempting to demonstrate that electrical energy could be transmitted wirelessly, i.e., he could use his Tesla coil to light a light bulb without it being screwed into a lamp or plugged into a wall socket!
- Powering things wirelessly didn't take off beyond the proof of concept, but Tesla contributed to the development of other emerging technologies of the day, including the X-ray machine, the radio, and the telegraph.

5) Are your students interested in learning more? Source videos of the Tesla coil lighting a light bulb wirelessly and investigate how this happens. Or, generate a list together as a class featuring the other inventions and advancements that Nikola Tesla has contributed to the world!

Answer Key

1) power; 2) sponge; 3) spark; 4) secondary; 5) between; 6) boosts

FAMILY TAKE-HOME ACTIVITY

Creepy Chemical Reactions

Are your students eager for even more spooky science? Introduce these creepy chemical reaction activities and invite students to experiment together with their families at home!

Ask students to share pictures, videos, or accounts of their at-home activities with the class.

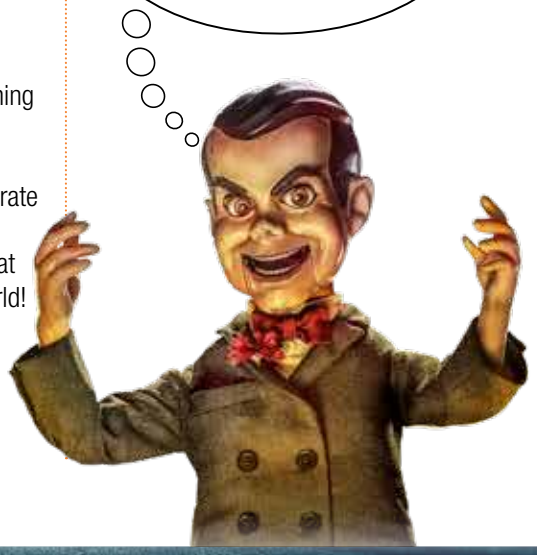
MONSTERS ALIVE

When baking soda and vinegar come into contact, a new acid is created. Almost right away, the acid begins to break down into two parts: water and gas. The balloon monster grows as it fills with the gas that is created from the chemical reaction.

DINE ON SLIME

Gelatin is made from long strings of acids that are bonded to one another. When you add heat, these strings break apart, become liquid, and mix with the water in the recipe. As you let the mixture cool, the amino acids bond with the water, creating a new, slimy substance.

Watch the trailer and other custom videos at scholastic.com/goosebumps2.



NAME _____

Spooky Static Electricity

Use tissues and markers to design some friendly, scary, or mischievous ghosts. Work with your classmates to complete these three static electricity challenges.

CHALLENGE #1

Flying Ghosts

1. Rub your balloon on your shirt to create a static charge.
2. Slowly lower your balloon over your ghosts, causing them to rise toward the balloon and "fly" upward.
3. Try taping the tail of a ghost to your desk to watch it rise but not "fly."

CHALLENGE #2

Tricky Ghosts

1. Tie a length of thread around a ruler.
2. Fasten a ghost to the dangling end of the thread with tape and suspend the ruler between two desks.
3. Rub your balloon on your shirt to create a static charge.
4. Move your balloon around the dangling ghost to see what tricks you can make it perform.

CHALLENGE #3

Capture the Manuscript

In *Goosebumps 2: Haunted Halloween*, an unfinished version of one of R.L. Stine's manuscripts is key to the adventure. Can your ghosts capture the manuscript?

1. Cut a tiny booklet from card stock to represent the manuscript.
2. Use static electricity (same as above) to move your ghost to the manuscript.
3. Take turns with a friend guiding the ghost and placing the manuscript in tricky places.

Describe one of the challenges and solutions you and your friend created: _____

_____

_____

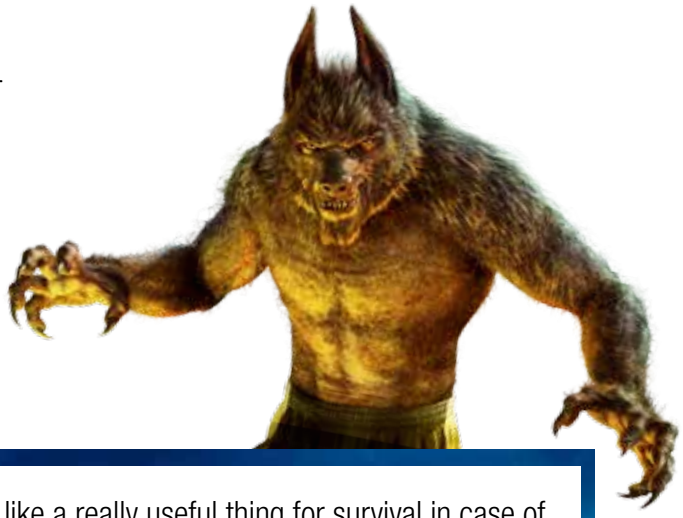
_____

_____

NAME _____

The Science of Goosebumps

Have you ever had goosebumps? It's when your hair stands on end and your skin looks like a chicken without any feathers. Have you ever wondered *why* we get them? Think like a scientist and let's find out!



When we become chilled, excited, or frightened, our bodies produce a hormone called adrenaline. It makes our heart beat faster, prepares our lungs to take in more oxygen, and causes our pupils to dilate. It also causes tiny muscles beneath our skin to contract, tugging at the roots of the hairs that cover our bodies. This is when our hair stands on end and gives us "goosebumps."

Scientists believe that our bodies react to fear and excitement in this way as a means of survival. Back many thousands of years, if a human heard a strange sound in the forest or was afraid of an attack by an animal, adrenaline would prepare the human body to run from danger or to stay put and defend itself.

Having bumps on your skin doesn't seem like a really useful thing for survival in case of cold or an attack. But scientists believe that a very long time ago, when the human body was covered in a thicker coat of hair, having a "hair-raising experience" served two main purposes. First, your puffed-up hair could trap a layer of air next to your skin, which would insulate you against the cold. Second, having all of your hair stand up would give you the appearance of being larger and scarier in case of an attack!

Because humans aren't covered in hair like they used to be, goosebumps don't seem to have a purpose, other than to signal to us that we're chilly, excited, or creeped out. But you may have seen goosebumps plus a coat of fur in action if you've ever seen a dog's fur bristling when it hears a strange noise, or a cat that puffed up after being startled!

"Hair-Raising" Questions

On the back of this paper, answer the following:

1. What causes goosebumps to form?
2. Explain two reasons scientists believe humans get goosebumps.
3. Have *you* ever had goosebumps? If so, what do you think caused yours?

NAME _____

Attack of the Gummy Bears!

Use the scientific method to experiment with these chewy critters. First, know your purpose and pose your question: What happens when gummy bears are soaked in different liquids overnight?

Your Hypotheses What do you think will happen to the gummy bears?

In water	In salt water	In vinegar	In _____ (choose a liquid)

Gummy Bear Observations Record what you can see, feel, smell, measure, or weigh after a night's soaking.

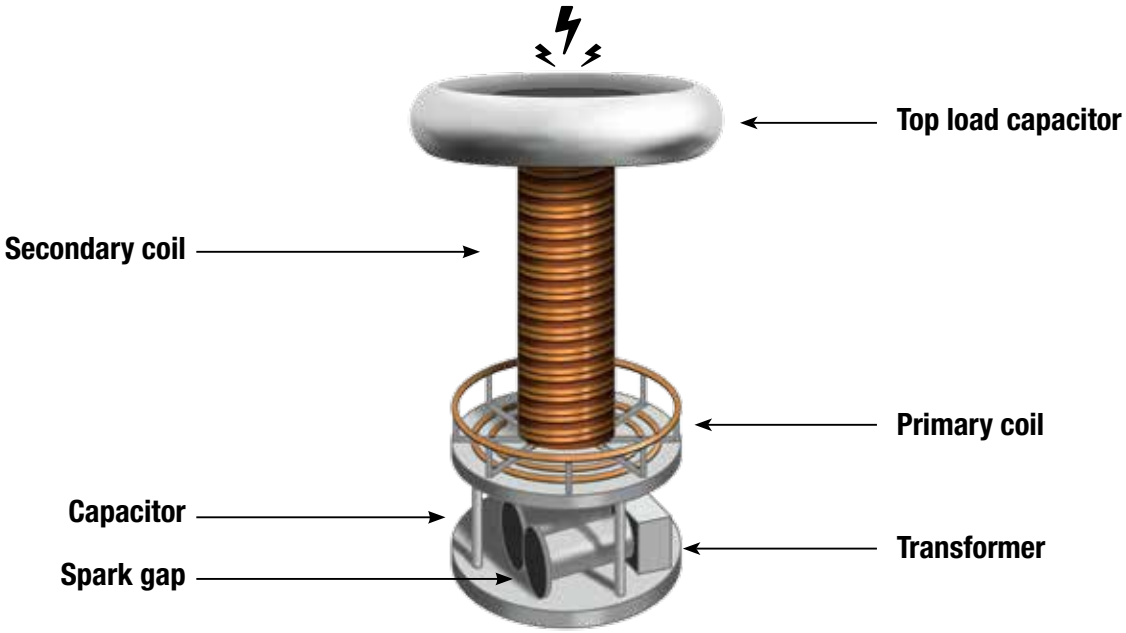
In water	
In salt water	
In vinegar	
In _____	

Gummy Bear Conclusions How did your results compare with your hypotheses?

NAME _____

Light It Up!

In *Goosebumps 2: Haunted Halloween*, Sonny's science project is a Tesla coil. With the help of Slappy, it electrifies his town! Investigate the parts that make up the Tesla coil using this diagram.



The Tesla coil creates awesome sparks. Learn more about how it works by filling in the blanks in the sentences below.

boosts	**between**	**sponge**
power	**spark**	**secondary**

1. A _____ source is attached to the primary coil.
2. The capacitor "soaks up" the electricity like a _____.
3. Once the capacitor is full, the electric current streams back into the primary coil and toward the _____ gap.
4. The current flows through that gap into the _____ coil.
5. Electric current flows back and forth _____ the coils.
6. To increase the power, the transformer _____ the voltage of the current as it flows back and forth.

Creepy Chemical Reactions

Use these Halloween-themed family activities to "scare up" more learning at home.

Dear Parents,

Your child has been studying chemical reactions in class. Get into a spooky state of mind and try these fun, hands-on experiments together. They will help strengthen STEM skills—and are also just plain fun!

MONSTERS ALIVE

Bring a monster to life with this fun and fizzy Halloween experiment.

MATERIALS

Small plastic or glass bottle
Balloon
Funnel
Measuring spoons
Measuring cup
Clothespin or food clip
Permanent marker
Baking soda
Vinegar

STEPS

1. Use permanent marker to draw the face of a jack-o'-lantern, a ghost, or a monster on your balloon.

2. Measure 2 tablespoons of baking soda. Use the funnel to add the baking soda into the balloon.

3. Twist the neck of the balloon and clip it with a clothespin (or food clip).

4. Measure 4 ounces of vinegar. Use the funnel to add the vinegar to the bottle.

5. Fit the opening of the balloon over the mouth of the plastic or glass bottle.

6. Release the clothespin and hold the balloon up to allow the baking soda to drop into the bottle.

7. Watch your Halloween creation "come alive" with the help of a creepy chemical reaction!

WHAT'S GOING ON?

When baking soda and vinegar mix, a new acid is created. Almost right away, the acid breaks down into two parts: water and gas. Your balloon monster grows as it fills with the gas created from the chemical reaction!

DINE ON SLIME

Whip up a batch or two of gloopy, gloppy Halloween slime! Give it a taste…if you dare!

INGREDIENTS

1¾ cups tonic water
⅓ cup potato starch
2 Tbsp flavored gelatin

HOW TO

Combine all ingredients in a saucepan. Cook over medium heat for 2 to 3 minutes until goopy, stirring constantly. Remove from heat and allow to cool.

Try making different colors and flavors of slime. Give each creepy concoction a name. Arrange your slime in glass jars like potions in a scientist's lab or in dishes and goblets for a horrible and haunted Halloween display.

WHAT'S GOING ON?

Gelatin is made from long strings of acids that are bonded together. When you add heat, these strings break apart, become liquid, and mix with the water in your recipe. When you let your mixture cool, the acids bond with the water, creating a new, slimy substance!

LESSON 2

Make a Scary Soundtrack

Moviemakers use all sorts of tricks to up the fright factor of their films. Spooky music, eerie silences, and thrilling sound effects are designed to increase the creepiness of scary scenes. This activity explores the science of sound waves and guides students to make their own score that scares!

OBJECTIVE Students will explore the amplitude and frequency of sounds and diagram simple sound wave models. Then students will create brief movie scripts and record their own mini soundtrack.

TIME REQUIRED 45 minutes

MATERIALS Activity Sheet B

STEPS

1) Source spooky sounds, such as this video of haunted sound effects: **bit.ly/hauntedsoundeffects**. Play only the audio for students. Can your students guess what they'll be learning about today? Explain that they'll be learning more about the science of sound, especially the spooky kind!

2) Distribute Activity Sheet B and replicate the sound wave models from the activity sheet on your smart board.

3) Discuss each of the four model sound waves with your class: loud sounds, soft sounds, high-pitched sounds, and low-pitched sounds. Help your students form the link between the formal and common terms: amplitude (volume) and frequency (pitch, or how high or low the music note).

4) Have students create comparisons between the sets of waves. Prompt for:

- Amplitude is modeled by the height of the wave. A louder sound has a taller wave; a softer sound has a shorter wave.
- Frequency is modeled by the width of the wave. A higher-pitched sound has waves that are narrower; a lower-pitched sound has waves that are wider.

5) Have students complete their activity sheets using the sound waves provided as a guide. Explain that their waves should reflect changes in the amplitude or frequency of the sound.

6) Next, tell students that they'll be writing their own short scene for a scary film and creating the sound effects. Prompt them to write a spooky paragraph using their own ideas or one of the writing prompts below:

- We were finishing our experiment in science class, when all of a sudden, the lights went out ...
- The chest looked old. Really old. I wiped away the dust and cobwebs with my hand. I undid the latch and opened the lid...
- I'd definitely heard a noise. It was coming from upstairs. I tiptoed slowly in the darkness, up the staircase...

7) Have students research how audio engineers create sound effects for film and television. Ask them to use their research to identify 3–5 opportunities to add sound effects to their scenes. Can your students use resources found in the classroom to create these sounds?

8) After students create their sounds, ask them to diagram sound waves for each sound effect. Wrap up by having students present their scenes and spooky audio to the class.

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NAME _____

What Gives You Goosebumps?

Have you ever had goosebumps—where your hair stands on end and your skin becomes bumpy like the skin of a plucked chicken? Have you ever wondered why we get them? Think like a scientist and let's find out.

When we become chilled, excited, or frightened, our bodies produce adrenaline, a hormone that makes our heart beat faster, prepares our lungs to take in more oxygen, and causes our pupils to dilate. And you know what else? Adrenaline causes tiny muscles beneath our skin to contract, tugging at the roots of the hairs that cover our bodies. This is when our hair stands on end and gives us "goosebumps."

Scientists believe that our bodies react to fear and excitement as a means of survival. Many thousands of years ago, if a human heard a strange sound in the forest or was afraid of an animal attack, adrenaline would prepare their body for a fight-or-flight response.

Having bumps on your skin doesn't seem like a particularly useful survival adaptation for a human who feels cold or threatened. However, scientists believe that more than one million years ago, when the human body was covered in a thicker coat of hair, having a "hair-raising experience" served two main purposes. First, hair that stood on end and settled back into place had the ability to trap a layer of air next to the skin, insulating against the cold. Second, hair that stood on end would give a human the appearance of being larger and more intimidating in case of an attack.

Because humans aren't covered in hair like they used to be, it was hard to know if these two hypotheses are true, which is why naturalist and biologist Charles Darwin observed animals in nature and designed experiments to answer some of his own questions about the usefulness of goosebumps as an evolutionary adaptation in animals. Whatever the reasoning, our bodies' physical reactions are intriguing clues to our evolutionary history.

"Hair-Raising" Questions

On the back of this paper, answer the following:

1. What causes goosebumps to form?
2. Explain two reasons scientists believe humans get goosebumps.
3. Write a sentence or two explaining the meaning of these key terms: fight-or-flight response, evolutionary adaptation, hypotheses.
4. Do a bit of research. Who was Charles Darwin? How did he observe the goosebumps phenomenon in animals in nature? What experiments did he design to test his hypotheses on goosebumps?

NAME _____

Make a Scary Soundtrack

Filmmakers use all sorts of tricks to up the scare-factor of their movies with spooky music, eerie silences, and frightening sound effects. Let's learn more about the science of scary sound!

Directions Examine these sound wave models. Look at how **amplitude** (the volume of sound) is modeled. Then look at **frequency** (how high- or low-pitched a sound is).

Quiet sound

AMPLITUDE

Loud sound

High-pitched sound

FREQUENCY

Low-pitched sound

Compare each set of sound wave models. What do you notice when you compare them? _____

_____

_____

Now you try! Use the sound wave models, the examples, and the control sound wave to create your own scary sound waves!

Control sound wave  [This sound wave has medium amplitude and frequency]	Whispering
Ghost woo-oo 	Scream
Rat squeaking 	A creaking door…that slams shut!
Thunder clap 	Scary sound of your choice _____

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