HALLOWEEN

SCIENCE EXPERIMENT GUIDE

stevespangler
AMAZING SCIENCE EXPERIENCES

Dry Ice Safety & Secrets

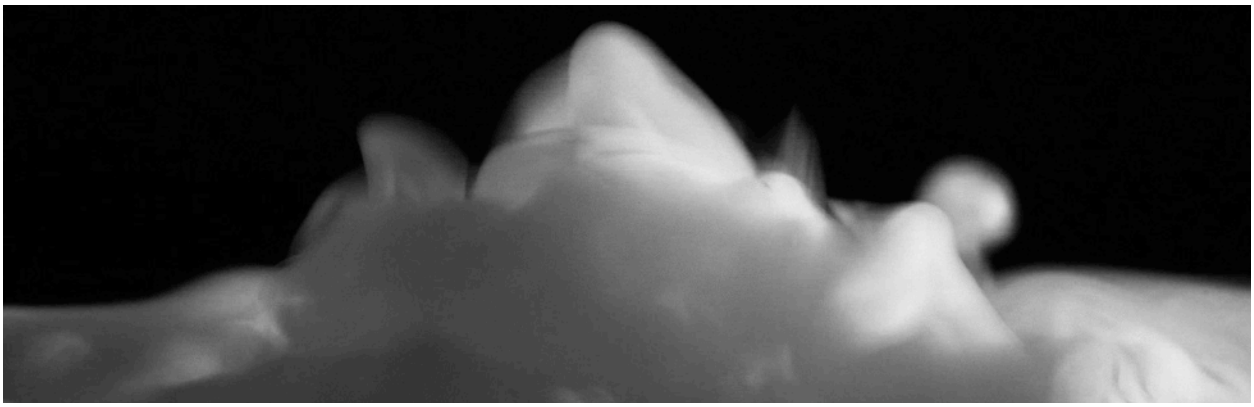
Dry Ice Science

Halloween is the perfect time for oozing, bubbling, eye-catching science! If you love to perform science demonstrations, Halloween is a wonderful excuse to fill the cooler with dry ice and get ready for a day filled with "ooze" and ahhhs! Great Halloween Science!

Buying Dry Ice

Grocery stores use dry ice to keep food cold during shipping. Some grocery stores and ice cream shops will sell dry ice to the public (especially around Halloween) for approximately $1 per pound. Dry ice comes as flat square slabs a few inches thick or as cylinders that are about three inches long and about a half of an inch thick. Either size will work fine for your dry ice experiments.

Remember... dry ice turns from a solid into a gas - a process called sublimation. In other words, the dry ice in the grocery bag will literally vanish in about a day! The experts tell us that dry ice will sublimate (turn from a solid into a gas) at a rate of five to ten pounds every 24 hours in a typical ice chest. It's best to purchase the dry ice as close to the time you need it as possible. This is the one time when last minute shopping is necessary. If you are planning to perform a number of dry ice demonstrations, plan to purchase 5 to 10 pounds.



Dry Ice Safety

First of all, here's the background information and safety lesson on dry ice. Dry ice is frozen carbon dioxide. Under normal atmospheric conditions, carbon dioxide is a gas. Only about 0.035% of our atmosphere is made up of carbon dioxide. Most of the air we breathe is nitrogen (79%) and oxygen (20%). Instead of melting, dry ice turns directly into carbon dioxide gas but does not melt like real ice. Dry ice must be handled with care as it is -109.3°F (-78.5°C). It must be handled using gloves or tongs, as it will cause severe burns if it comes in contact with your skin. Never put dry ice into your mouth. When you drop a piece of dry ice in a bucket of water, the gas that you see is a combination of carbon dioxide and water vapor. So, the gas that you see is actually a cloud of tiny water droplets.

Transporting and Storing Dry Ice

You'll need a good pair of gloves to handle the dry ice and a beverage cooler like a Styrofoam ice chest to carry it. The insulated container will help to slow down the rate of sublimation. Remember the basic science of dry ice... Dry ice turns from a solid into a gas - sublimation - as it heats up. Since the gas takes up more space than the solid, the container you choose to store and transport the dry ice must be vented. **Never place dry ice in a sealed container!** As dry ice turns from a solid into a gas, the volume increases and the container will explode.

It is best not to store dry ice in your freezer because your freezer's thermostat will shut off the freezer due to the extreme cold temperature of the dry ice. Tricky! It's best just to store the dry ice in a well ventilated, insulated container until you're ready to use it.

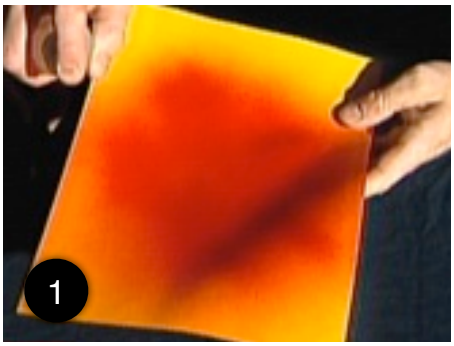
Did you know...

- Dry ice is extremely useful for freezing and keeping things frozen because of its very cold temperature (-109.3°F or -78.5°C). Dry Ice is widely used because it is simple to freeze and easy to handle using insulated gloves.
- Dry ice gives more than twice the cooling energy per pound of weight and three times the cooling energy per volume than regular water ice.
- Dry ice is often mixed with regular ice to save shipping weight and extend the cooling energy of water ice.
- Sometimes dry ice is made on the spot from liquid carbon dioxide. The resulting dry ice snow is packed in the top of a shipping container offering extended cooling without electrical refrigeration equipment and connections.

How is Dry Ice Made?

The first step in making dry ice is to compress carbon dioxide gas until it liquefies, at the same time removing the excess heat. The CO_2 gas will liquefy at a pressure of approximately 870 pounds per square inch at room temperature. Once liquid CO_2 is formed, the CO_2 is sent through an expansion valve and enters a pressure chamber. The pressure change causes the liquid to flash into a solid and causes the temperature to drop quickly. About 46% of the gas will freeze into "dry ice snow." The rest of the CO_2 gas, 54%, is released into the atmosphere or recovered to be used again. The dry ice snow is then collected in a chamber where it is compressed into block, pellet or rice size pieces using hydraulics.

Bloody Goldenrod Paper



Fill a jar with a small amount of ammonia water. Dip a cotton ball in the ammonia water and wipe it across the paper.

Use the old piece of wax candle to write a secret message (such as "Hi!" "WOW!" or "BOO!") across the bottom half of the paper.

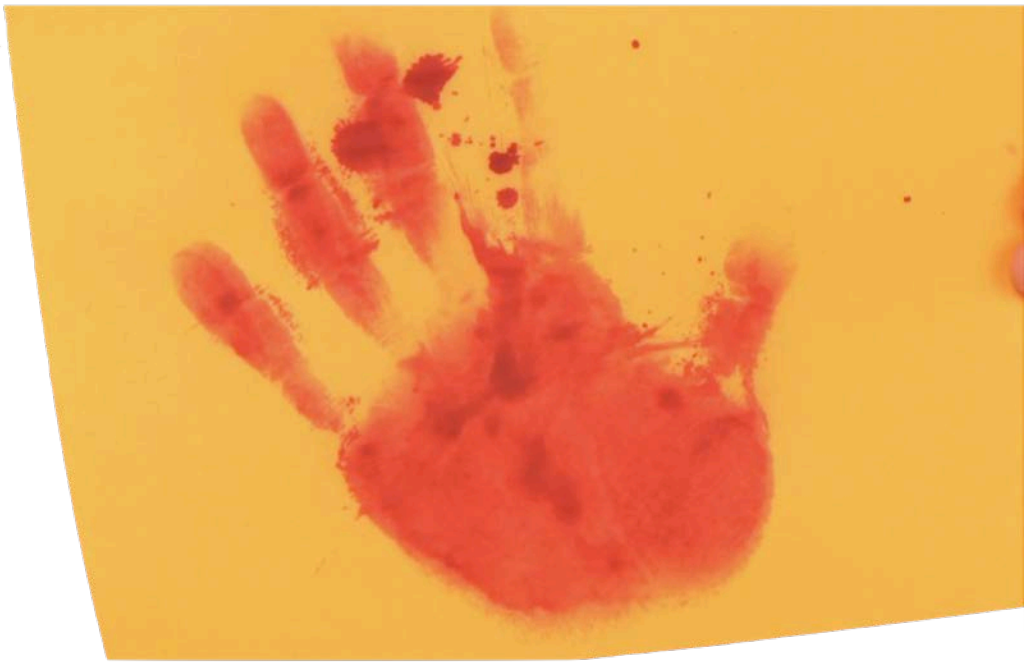
Wipe the cotton ball with ammonia water across the secret message to see what develops.

Get a fresh piece of Goldenrod Paper and spray your hand (away from the paper) with a little bit of ammonia water.

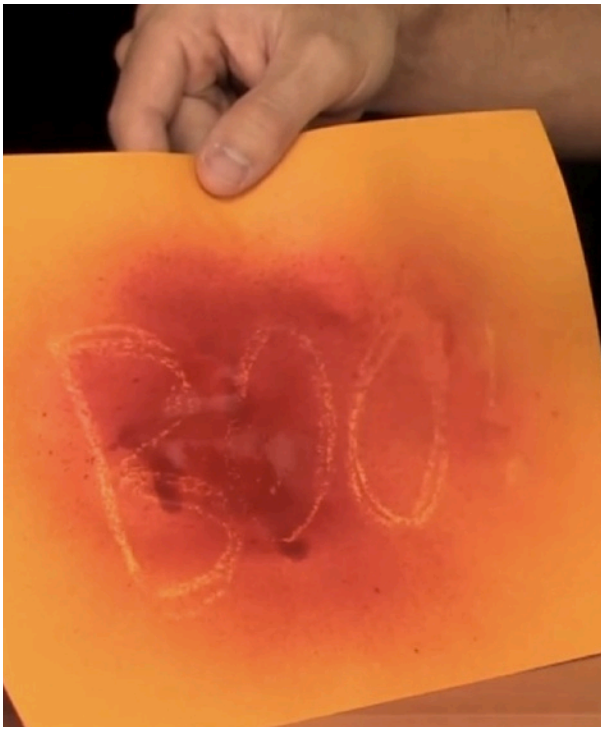
Gently slap your hand down on the Goldenrod Paper... oh no! It's a bleeding handprint!

Here's What You'll Need...

- Goldenrod Paper
- Cotton balls
- Ammonia-water solution (household ammonia from the grocery store)
- Candle or clear wax crayon



Spooky Science Secrets

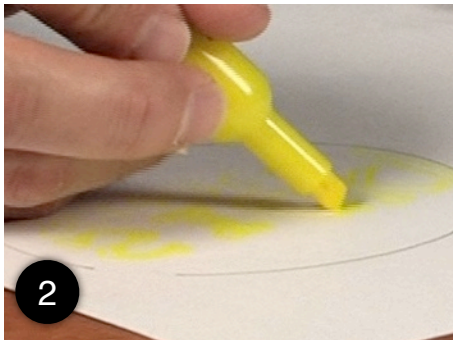


The ammonia on the cotton ball is a base and causes the dye in the special Goldenrod Paper to change color. You probably noticed that the red color fades over time and the paper eventually changes back to its original yellow color. Why? The carbon dioxide gas that is in the air we breathe is slightly on the acidic side of the pH scale. The carbon dioxide reacts with the ammonia on the paper to produce ammonium carbonate, which changes the pH of the paper to neutral (roughly a pH of 7) and the dye changes back to yellow.

If you use a stronger base like washing soda, the red message will not disappear with just the carbon dioxide in the air. You will need to use a stronger acid like lemon juice or vinegar to change it from red to yellow. You can also use Goldenrod Paper as inexpensive pH paper to classify safe household products as being either acidic or basic.

Black Light Secret Message

Trace the circumference of a plastic cup on a piece of white paper.



Use Sharpie highlighters to create brightly-colored designs within the circle you traced. Try using different colors when creating your design.

Cut the traced circle out with a pair of scissors.

Poke a small hole in the bottom of the plastic cup using the scissors. Try to poke the hole as close to the center of the cup as possible.

Apply a thin layer of glue around the edge of the circle. Make sure the glue is on the back side of the circle, away from your design, otherwise your design or message will be backwards.

Press the mouth of the cup onto the glue-covered edge of the paper circle. We recommend letting the glue dry before moving on to the next step.

Now that your cup and design are attached, push the Mini Black Light's bulb into the hole you poked in the bottom of the cup.

Here's What You'll Need...

- Mini Black Light
- Glue
- Sharpie highlighters
- Scissors
- Plastic cup
- Pen
- White paper

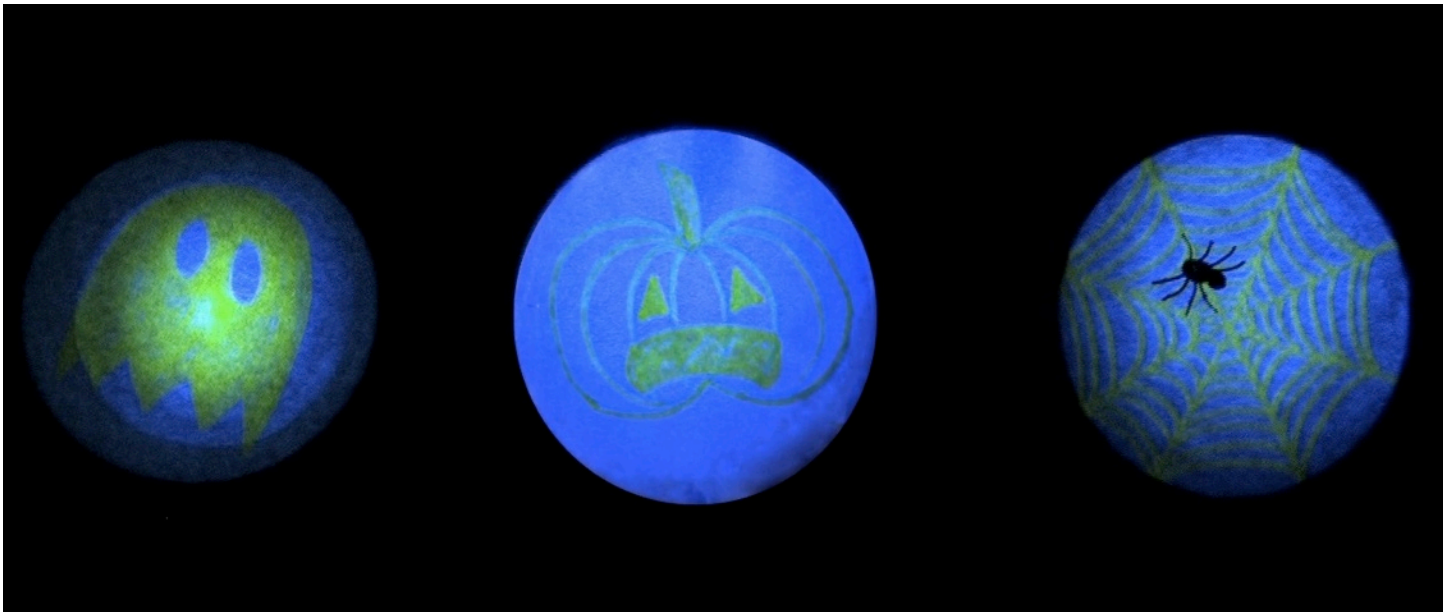
Spooky Science Secrets

When it comes to glow in the dark, it's important to know the difference between the two common types of glow, fluorescence and phosphorescence.

Fluorescence - This type of glow occurs when some form of radiation, such as light, causes an object to glow. For example, fluorescent papers and poster boards glow in the daylight. They may seem to glow even brighter under black light (ultraviolet), but in either case, as soon as the light is removed, the glow stops. Fluorescent things do not glow in the dark all by themselves – they require some other form of energy such as ultraviolet light to "excite" them.

Phosphorescence - Phosphorescence is just like fluorescence, except that the glow continues even after the light used to excite it is removed. "Glow in the dark" toys phosphoresce brightly in total darkness after being "charged" or excited by ordinary white or ultraviolet light.

Some highlighters use ink that contains dyes that are fluorescent. When you draw the designs on the circle, it probably looks like those designs will glow when you turn the lights off, but they don't. The dyes in the highlighter ink require a black light to produce the special glow.



Boo Bubbles

Use a utility blade (like a box cutter) to carefully cut the top off of the two liter bottle. Make sure the the hole in the top of the two liter bottle is not larger than the funnel you'll be using.

Attach a length of rubber tubing to the narrow end of the funnel by squeezing the funnel into the tubing.

Use the utility blade to cut a hole in the bottom of a small plastic portion cup just large enough to fit the rubber tubing.

Slide the end of the rubber tubing (not attached to the funnel) into the hole in the portion cup.

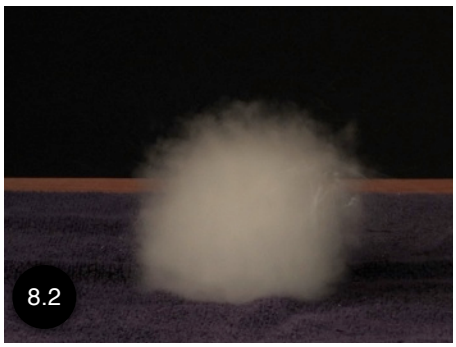
Fill 1/6 of the two liter bottle with warm water and add in a few pieces of dry ice.

Here's What You'll Need...

- Two liter bottle
- Dry ice
  (ask your local grocers)
- Heavy duty glove
- Funnel
- Strip of cotton fabric
- Rubber tubing
- Dish soap
- Utility blade
- Small plastic portion cups
  (2 oz works best)
- Towel
- Bubble gloves
- Safety glasses
- Adult supervision

Place the funnel over the hole in the two liter bottle. Awesome! The smoke comes pouring out of the tube! If you adjust how much of the hole is covered by the funnel, you'll see a change in the pressure of the smoke coming from the tubing. Once you've figured out a comfortable pressure, remove the funnel.

Dunk the portion cup into bubble solution (30 mL dish soap & 240 mL water and cover the top of the bottle with the funnel.

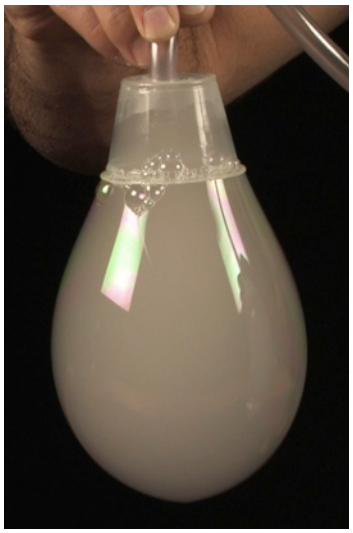


When the bubble reaches the perfect size, gently shake it off of the portion cup and it will quickly fall to the ground (it's heavier than a normal bubble because the bubble is filled with carbon dioxide gas and water vapor). When the bubble hits the ground, it bursts and the cloud of fog erupts from the bubble. Very cool.

Want your Boo Bubbles to last? Shake them onto a towel!

Touchable Boo Bubbles

Purchase a pair of Bubble Gloves (100% cotton gloves also work well). Blow a Boo Bubble about the size of a baseball & bounce the bubble off of your gloves.



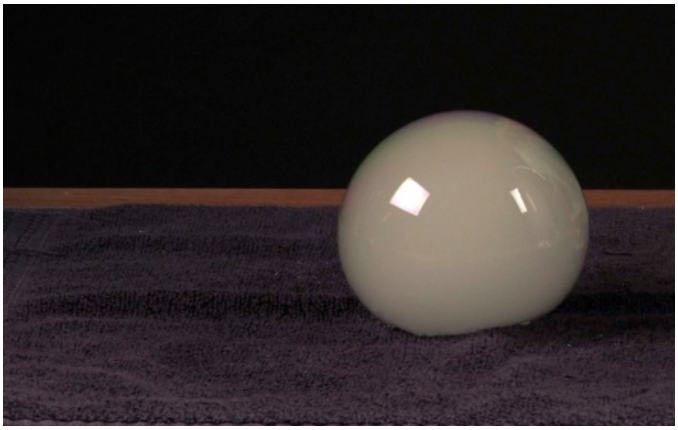
Get the kit!

You can get everything you need to perform this activity with one ready to use kit! How? Get your hands on the **Boo Bubble Generator**.

Spooky Science Secrets

Dry ice is frozen carbon dioxide. When you drop pieces of dry ice into water, you get a wicked-cool combination of carbon dioxide gas and water vapor that bubbles out of the water. The creation of gas inside the two liter bottle quickly becomes too much volume for the two liter bottle to contain and the dry ice smoke flows over. By capping the two liter bottle with a funnel, the smoke builds pressure as it is forced into a more confined area. This pressure pushes the smoke through the tube, creating a flow of smoke that fills the bubbles.

Steve Spangler combined the idea of filling bubbles with dry ice fog with his Bouncing Bubble activity to create a Bouncing Boo Bubble. While blowing bubbles indoors, you might have noticed the occasional bubble that fell to the carpet but didn't pop. Regular bubbles burst when they come in contact with just about anything. Why? A bubble's worst enemies are oil and dirt. Boo Bubbles will bounce off of a surface if it is free of oil or dirt particles that would normally break down the soap film. They break when they hit the ground, but they don't break if they land on a softer fabric like gloves or a towel.



Crystal Ball Bubble

Mix 2 tablespoons (30 mL) of liquid dish soap with 1 tablespoon (15 mL) of water in a plastic cup.

Find a bowl or bucket that has a smooth rim and is smaller than 12" (304 mm) in diameter. You don't need a clear bowl or bucket, but trust us, you'll want one. Fill the bowl half full with warm water. Using heavy gloves or tongs, transfer two or three pieces of dry ice into the warm water. You don't want too little or too much fog.

Dip one or two fingers in the soap solution and run your fingers on the lip of the bowl. (Don't get soap in the water, or you'll end up doing another experiment.)

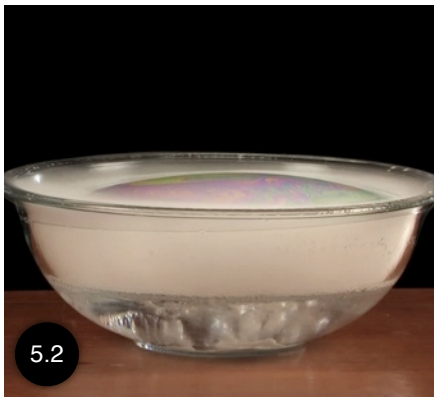
Soak the strip of cloth in the soapy solution you made in step two. Make sure the entire cloth is submerged in the solution. Remove the cloth and remove any excess soap.

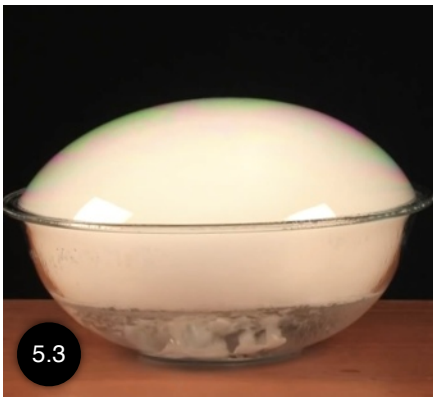
Here's What You'll Need...

- Dry ice
- Large bowl with rounded rim
- Dish soap
- Heavy glove or tongs
- Long, narrow piece of cloth
- Small plastic cup
- Warm water
- Adult supervision

Get the kit!

You can get everything you need to perform this activity and many more dry ice demonstrations. How? Get your hands on the **Ultimate Dry Ice Science Kit**.





Take It Further!!!

Try placing a waterproof flashlight in the bowl along with the dry ice so that the light shines up through the fog. Draw the cloth across the rim to create the soap film and, if you're inside, turn off the lights. The crystal ball bubble will emit an eerie glow and you'll be able to see the fog churning inside the transparent bubble walls.

Stretch the cloth between your hands and slowly pull the soapy cloth across the rim of the bowl. The goal is to create a soap film that stretches across the entire bowl.

Once you've made the soap film, it will start to expand and fill with the dry ice fog. Once it bulges out, it looks just like a crystal ball. When the giant bubble bursts, the cloud of "smoke" falls to the floor, followed by an outburst of ooohs & ahhhs!

HINT: Getting the soap film to stretch across the rim of the bowl can take a little practice until you get the technique mastered. If all else fails, try cutting a new strip of cloth from a different type of fabric (try an old t-shirt) or change the soap solution by adding more water or more soap.

Spooky Science Secrets

Stretch the cloth between your hands and slowly pull the soapy cloth across the rim of the bowl. The goal is to create a soap film that stretches the entire bowl.

Once you've made the soap film, it will start to expand and fill with the dry ice fog. Once it bulges out, it looks just like a crystal ball. When the giant bubble bursts, the cloud of "smoke" falls to the floor, followed by an outburst of ooohs & ahhhs!

HINT: Getting the soap film to stretch across the rim of the bowl can take a little practice until you get the technique mastered. If all else fails, try cutting a new strip of cloth from a different type of fabric (try an old t-shirt) or change the soap solution by adding more water or more soap.

Fake Blood Recipes

What would Halloween be without a few gallons of fake blood? There are lots of recipes floating around, but the biggest complaint is that the fake blood looks nothing like real blood. There's a science to making realistic looking fake blood, but like any good scientist, it takes a little experimentation.

The recipes below are designed to give you the tools needed to make up your own recipe based on your particular application. Most of these recipes only require ingredients found at a grocery store and the final product is completely edible – just in case you need a little dribble of blood coming down the side of your mouth!

When you're mixing up a batch of fake blood, it's important to remember that what you see in the mixing bowl or blender is not what the blood will look like on your skin or dripped onto a piece of fabric. Real blood is not really red... it's reddish-brown. Real blood is not transparent or see-through. There's an opaque quality to real blood that you'll need to duplicate in your fake blood recipe.

One final word of warning... making fake blood is totally fun and can be very messy. Since the main color agent is a food-grade coloring, these fake blood recipes will likely stain anything and everything! Your hands will be a red mess at the end of your mad scientist mixing session, but don't worry. Mix up a small batch of OxiClean® and use it to wash your hands, your clothes and your friends' clothes. It does a great job of washing the stain right out.

Here's What You'll Need...

- Corn syrup
- Water
- Red food coloring
- Green food coloring
- Cornstarch
- Chocolate syrup
- Tropical fruit punch (Hawaiian Fruit Punch® works great)
- Powdered cocoa
- White towel

Classic Blood

This is one of the most common recipes, but you'll see that it doesn't really look anything like blood. That's okay... go ahead and make the batch because you'll use the ingredients a little later.

- 1 cup corn syrup (commonly sold as Karo Syrup)
- 1 tablespoon water
- 2 tablespoons of red food coloring
- A few drops of green food coloring

Combine all of these ingredients in the blender and blend away for a few seconds. You can adjust the amount of green food coloring to make the blood a little more brownish-red in color. However, you'll notice that the blood is a little too transparent.

Take the white towel test... drip a few drops of blood onto a white towel to see how realistic it looks.

Chocolate Blood

In the days before color television, chocolate syrup was the perfect solution to the problem of making fake blood. On a black and white screen, chocolate syrup looked just like real blood. Even though times have changed, chocolate syrup is still an important ingredient in making great edible fake blood.

- 1 cup corn syrup
- 2 tablespoons water
- 2 tablespoons of red food coloring
- 1 tablespoon of chocolate syrup
- 2 tablespoons of cornstarch

Mix all of the ingredients in the blender for a few seconds. Watch as the fake blood oozes down the inside wall of the blender to get a good idea of what it will really look like on the white towel. Each of the ingredients in this recipe adds its own special quality to the fake blood – thickness, color, and transparency.

Take the white towel test... drip a few drops of blood onto a white towel to see how realistic it looks.

The Best Fake Blood... So Far

This recipe combines everything you've learned so far about making fake blood and adds a few ingredients that pack a great punch (pun intended... as you'll see below).

- Tropical fruit punch
  (Hawaiian Fruit Punch® works great)
- 1 cup corn syrup
- 2 tablespoons of red food coloring
- 1 tablespoon of chocolate syrup
- 2 tablespoons of cornstarch
- 1 tablespoon of powdered cocoa

Combine all of the ingredients in the blender and mix for 10 seconds. Since different brands of fruit punch vary in color, you'll need to use your vast experience in making fake blood to tweak the recipe to arrive at your perfect batch of fake blood.

Some fake blood connoisseurs recommend a cup of coffee in place of the fruit punch. You may need to reduce (or eliminate) the amount of chocolate syrup and powdered cocoa used in the recipe. Remember, it's all about experimentation!

Take the white towel test... drip a few drops of blood onto a white towel to see how realistic it looks. Or better yet... roll up your sleeve and drip a little on your arm if you run into a neighbor!

Spooky Science Secrets

Take a moment to see how the variables work as you adjust your mixtures...

- Corn syrup is used to thicken the liquid.
- Cornstarch is used to make the liquid less transparent.
- Chocolate syrup and powdered cocoa darken the blood, turning it reddish-brown, and add depth to the color.
- It may be necessary to add a few drops of green food coloring to change the color ever so slightly to the brown side. Mixing green and red makes brown and a few drops can do the trick.

Glowing Pumpkins

Draw the face pieces on the contact paper and cut each piece out. Peel the pieces off the paper backing and arrange them as a face for your pumpkin.

Pour the Glow Powder into an empty portion cup. Cover the top of he portion cup with aluminum foil and hold it in place with a rubber band. Use a thump tack to poke holes in the tin foil... just like a salt shaker!

Spray sections of the pumpkin with the spray adhesive, immediately following with the Glow Powder. For best results, hold the adhesive 10-14 cm (4-6 in) away from the pumpkin and spray a heavy coat. When sprinkling the powder, you may also want to tilt your pumpkin to get it evenly covered.

Here's What You'll Need...

- Real or foam pumpkins
- Glow Powder - Zinc Sulfide
- Contact paper
- Permanent marker
- Spray adhesive
- Spray sealant
- Scissors
- Drop cloth or large cardboard box
- Black light
- Ventilation mask (if indoors)
- Plastic portion cup
- Tin foil
- Thumb tack
- (Optional) Empty salt shaker

When sprinkling the powder, you may also want to tilt your pumpkin to get it evenly covered. Spray sealant to make sure the powder stays put.

After the pumpkin is dry, your spooky Halloween decoration is ready! Carefully pull the contact paper off of the pumpkin.

Don't forget a black light!

Spooky Science Secrets

Fluorescence - This type of luminescence occurs when some form of radiation, such as light, causes an object to glow. For example, fluorescent papers and poster boards glow in the daylight. They may seem to glow even brighter under black light (ultraviolet), but in either case, as soon as the light is removed, the glow stops. Fluorescent things do not glow in the dark all by themselves – they require some other form of energy such as ultraviolet light to "excite" them.

Phosphorescence - Phosphorescence is just like fluorescence, except that the glow continues even after the light used to excite it is removed. "Glow in the dark" toys phosphoresce brightly in total darkness after being "charged" or excited by ordinary white or ultraviolet light.

So, how does zinc sulfide work? Imagine that an atom looks something like our solar system. The sun would be the nucleus consisting of positive charges called protons and neutral charges called neutrons. The planets spinning around the sun would be similar to the electrons of an atom in orbits around the nucleus.

When the electrons in the atoms of special molecules like zinc sulfide become excited, they move farther away from the nucleus – into higher or more distant orbits. In order to become excited, the electrons must take on energy. In this case, light provided the required energy to cause the electrons to move to a higher energy level. It's as if Earth were to move farther away from the sun into the orbit of Mars or Jupiter.

The electrons will remain in the excited state as long as they receive light to energize them. But, when the light used as an exciter is removed, the electrons will slowly return to their original lower orbits. As they do so, they give up the energy that excited them in the form of light.

Gravi-Goo

Fill one cup or beaker with 450 mL of room-temperature water. Add a couple drops of food coloring if you want a colorful experience.

Fill the other beaker with 1 blue scoop of Gravi-Goo powder. Quickly pour the water from its cup into the cup with the powder.

Here's What You'll Need...

- 150 gram jar of Gravi-Goo
- Blue measuring scoop
- 2 cups or beakers, at least 480 mL (16 oz)
- Water
- Paper towels

Pour the liquid back and forth, from cup to cup. For the first 2-3 minutes you will need to carefully pour the liquid quickly from cup to cup. Stir to avoid clumping.

After 2-3 minutes of pouring, the liquid should start to form "strings" of goo as you pour it back and forth. After the formation of the "strings" pour the liquid back and forth more slowly for an additional 5 minutes.

Now, after the excitement has started to build... you need to be patient for 30-40 more minutes while the liquid sits.

NOTE: Make sure to let the liquid sit all in one cup. If it is separated between the two cups you will end up with two separate sets of Gravi-Goo.

After your concoction has settled for 30-40 minutes you are ready for the coolest anti-gravity experiment you've ever seen! Just start pouring the liquid between the two cups again...

After just a few pours back and forth, you will start to notice a very strange occurrence. Once you start to pour the liquid you just can't stop as the liquid crawls up and over the sides of the cup in a "self-siphoning" action. Make sure that you keep the cup you are pouring from higher than the cup you are pouring into.

As the Gravi-Goo continues to flow, you will find that you hardly need to pour the liquid at all... it will climb up and out of the cup on its own!

When you are finished playing with your Gravi-Goo, dispose of it in a trash can. Don't pour it down the drain unless you want some very strange occurrences in your plumbing!

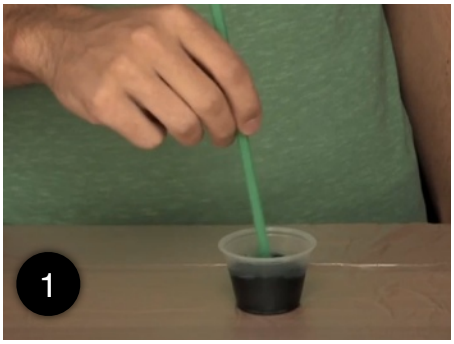
WARNING: Don't be surprised if you become so transfixed on the self-siphoning action of the polymer that you forget to line up the bottom cup with the top cup. In other words, you're bound to miss the bottom cup and your hands will be covered with goo. You'll feel like the stand-in creature in the Alien movies. Don't worry it easily washes right off your skin, but, and trust us here, clothes, fabric and carpet are a little trickier.

Spooky Science Secrets

Specially formulated by Steve Spangler Science, Gravi-Goo is a unique type of polymer. When added to water, it acts both like a sponge to suck up the water and also links the molecules in a long chain. Gravi-Goo is a combination of polyacrylamide and acrylic co-polymers. Think of Gravi-Goo as a combination of Insta-Snow, which absorbs tons of water, and Slime which bonds into long chains of molecules. Now, please don't go pour Insta-Snow into your Slime... it doesn't work like that!

In order to illustrate the molecular structure of Gravi-Goo, it might be helpful to picture a bowl of spaghetti all tangled up. The spaghetti-like structure causes the polymer to thicken water and provides a strong elastic effect. Although extremely elastic, the Gravi-Goo remains fluid like pancake syrup. The straight chain format of the Gravi-Goo molecule with no side chains to attach to other molecule strands allows the chains to slide past each other and stay fluid.

Oozing Pumpkins



Fill a small cup with 30 mL of hydrogen peroxide (12%). Add a squirt of dish soap to your hydrogen peroxide. Mix in some some food coloring to give your reaction a bit of effect.

Open up the top of your jack-o-lantern and carefully lower the cup of mixture into the jack-o-lantern. Don't tip it over or you'll have to start over from the beginning.

Now you're going to need to create your Elephant's Toothpaste catalyst. Mix an entire package of dry yeast with 4 tablespoons of very warm water in a small plastic cup. If the mixture is too thick, like a paste, add a bit more warm water to thin it out.

Pour the yeast solution into the cup and quickly replace the top of your jack-o-lantern. It may take a few seconds, but once the reaction starts the result is well worth the wait.

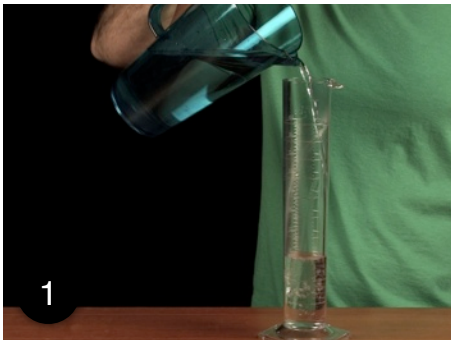
Here's What You'll Need...

- Hydrogen peroxide - 12% (You can find this in the hair care section.)
- Liquid dish soap
- Food coloring
- Package of dry yeast
- Small cup (make sure it's small enough to fit all the way in your pumpkin)
- Don't forget... a small carved pumpkin

In this reaction, you've got a catalyst in the form of your yeast solution. This catalysts works to release the oxygen molecules that are contained in the hydrogen peroxide. Those molecules are being released as the hydrogen peroxide breaks down into two components, water (H2O) and oxygen (O2), from the addition of the yeast catalyst. The foam is the molecules of oxygen being made into tiny bubbles as they pass through the soap that your added. In addition, as the bonds break between the H2O and O2, they release energy in the form of heat. Try performing the experiment without the pumpkin and feel the sides of the cup. They're warm!

Spooky Science Secrets

Smoking Bubbles



Fill your graduated cylinder half-full with warm water. If you don't have a graduated cylinder laying around, you can use something similar, like a flower vase or another tall, narrow container.

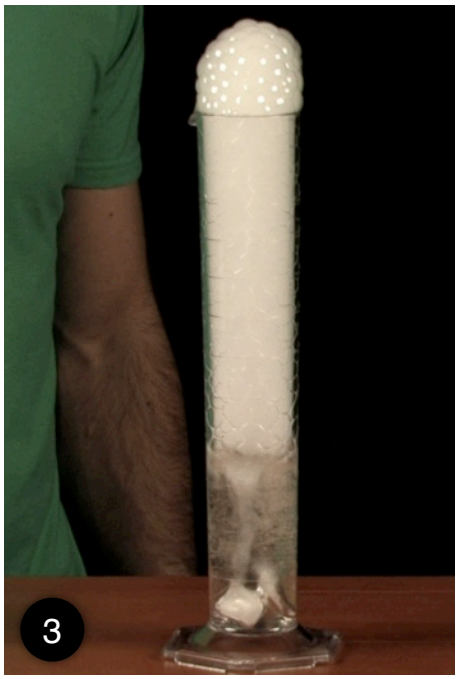
Make sure that you have pieces of dry ice that are small enough to fit inside your graduated cylinder. Once you've created the small pieces, drop a few into the graduated cylinder.

Get the kit!

You can get everything you need to perform this activity and many more dry ice demonstrations. How? Get your hands on the **Ultimate Dry Ice Science Kit**.

Here's What You'll Need...

- Dry ice
- Hammer
- Dish soap
- Graduated cylinder (or similar container)
- Heavy glove
- Warm water
- Safety glasses
- Food coloring or Fizzers (optional)



Take your bubbling, smoking cylinder to a whole new level with... soap? That's right, just put a squirt of dish soap into the cylinder and watch what happens!

Grab those bubbles and give them a squeeze! These bubbles burst with an amazing explosion of fog.

Spooky Science Secrets

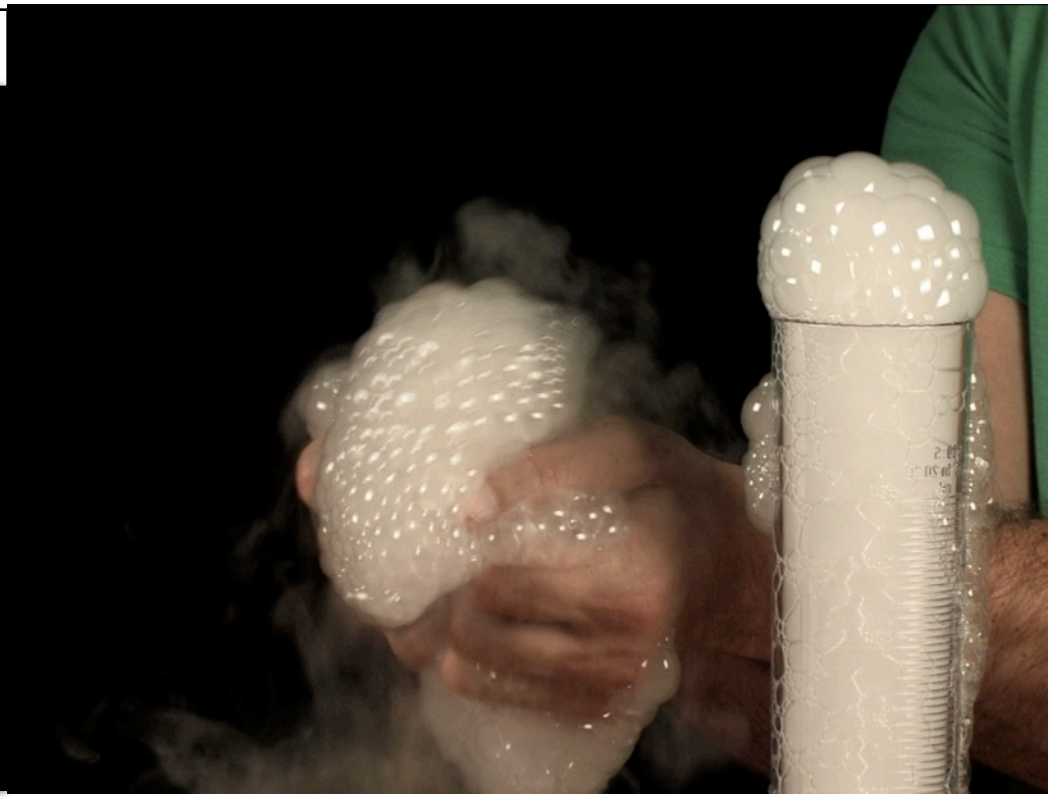
When you add dry ice to warm water, you immediately see the dry ice begin to bubble and create fog within its container. This effect, which we've lovingly titled "burping, bubbling, smoking water" is directly caused by the rapid warming of the dry ice. Dry ice is frozen, compressed carbon dioxide gas and when you add it to warm water, it combines with the water to create the fog (carbon dioxide and water vapor) that you see bubbling out of your cylinder.

Adding soap to burping, bubbling, smoking water creates a whole new effect. Instead of the dry ice just bubbling in the water to make a cloud, the soap in the water traps the carbon dioxide and water vapor in a soapy bubble. Bursting the bubbles in your hands (or as they flow out of the cylinder) releases the gases in a brilliant cascade of fog.

Take It Further!!!

Try adding some fun effects or adjusting ingredients to your smoking bubbles:

- **Add a few drops of food coloring or our Fizzers.**
- **Use a glow stick to create an eerie brew.**
- **Try adding some of our Atomic Glow for glow-in-the-dark fun.**
- **Experiment with using more or less soap and dry ice.**



Ultimate Gooey Slime

Empty an entire 8 oz. bottle of glue into a mixing bowl. Fill the empty bottle with warm water and shake (okay, put the lid on first and then shake). Pour the glue-water mixture into the mixing bowl and use the spoon to mix well. If you want, now is the time to mix in some food coloring for colorful slime.

Measure 1/2 cup of warm water into the plastic cup and add a teaspoon of Borax powder to the water. Stir the solution. This Borax solution is the secret linking agent that causes the Elmer's Glue molecules to turn into slime.

While stirring the glue in the mixing bowl, slowly add a little of the Borax solution. Use your hands for some serious mixing.

Keep adding the Borax solution to the mixture and you'll feel the strands of molecules connect until you get a perfect batch of Elmer's slime. You might like your slime stringy while others like firm slime.

When you're finished playing with your Elmer's slime, seal it up in a zipper-lock bag for safe keeping.

Here's What You'll Need...

- Elmer's Glue® (8 oz bottle of Elmer's Glue-All)
- Borax (a powdered soap found in the grocery store)
- Large mixing bowl
- Plastic cup (8 oz works well)
- Spoon
- Measuring cup
- Food coloring (the spice of life)
- Water
- Paper towel
- Zipper-lock bag
- Water

Now that you have some Ultimate Gooey Slime... PLAY WITH IT! Squish it, stretch it, smush it, and squeeze it. Who knew that playing with glue and soap could be so much fun? You can take it even further by mixing in cool (or gross) stuff like confetti, plastic bugs, or boogers. No... never mind. Don't use boogers.

Spooky Science Secrets

The mixture of Elmer's Glue with Borax and water produces a putty-like material called a polymer. In simplest terms, a polymer is a long chain of molecules. You can use the example of cooking spaghetti to better understand why this polymer behaves in the way it does. When a pile of freshly cooked spaghetti comes out of the hot water and into the bowl, the strands flow like a liquid from the pan to the bowl. This is because the spaghetti strands are slippery and slide over one another. After awhile, the water drains off of the pasta and the strands start to stick together. The spaghetti takes on a rubbery texture. Wait a little while longer for all of the water to evaporate and the pile of spaghetti turns into a solid mass – drop it on the floor and watch it bounce.

Many natural and synthetic polymers behave in a similar manner. Polymers are made out of long strands of molecules like spaghetti. If the long molecules slide past each other easily, then the substance acts like a liquid because the molecules flow. If the molecules stick together at a few places along the strand, then the substance behaves like a rubbery solid called an elastomer. Borax is the compound that is responsible for hooking the glue's molecules together to form the putty-like material. There are several different methods for making this putty-like material. Some recipes call for liquid starch instead of Borax soap. Either way, when you make this homemade Silly Putty you are learning about some of the properties of polymers.

Elmer's Slime is very easy to make, but it's not exactly what you'll find at the toy store. So, what's the "real" slime secret? It's an ingredient called polyvinyl alcohol (PVA). The cross-linking agent is still Borax, but the resulting slime is longer lasting, more transparent... it's the real deal.

Disappearing Ghost Eggs

1

Compare dehydrated ghost eggs with the fully grown ghost eggs. You'll notice that there are many things different: size, texture, and now you can practically see through them!

Before You Start...

You'll need to get your hands on some Jelly Marbles and grow them. These clear polymer spheres start tiny, but grow to the size of large marbles.

Once you have Jelly Marbles, soak 1 teaspoon of tiny beads in 6-8 oz of water overnight. When you come back, you'll have squishy, squirmy orbs that are full of water!

Here's What You'll Need...

- **Jelly Marbles**
- **Water**
- **Clear container**
- **Food coloring (optional)**
- **Fluorescent dye (optional)**

2

Place all of your grown ghost eggs into a clear glass or cup that they fill nearly to the top.

Notice that you can't see all the way through the container?

3

Fill the bowl with water. As you surround the ghost eggs with water, you'll notice that they completely vanish. Now that's spooky!

Spooky Science Secrets

Try adding food coloring or fluorescent dye to the water. This will reveal the hiding ghost eggs, or make them eery glow-in-the-dark Ghost Eggs!

It looks like an ordinary glass of water... crystal clear water. But hiding just below the surface of the water is an amazing collection of large, jelly-like marbles that become invisible when submerged in water. These Ghost Eggs become invisible due to an identical index of refraction with the liquid. In other words, they vanish like ghosts! As you'll see, there's more to this experiment than meets the eye.

Ghost Eggs are more commonly known as Jelly Marbles. Jelly Marbles start out as hard crystals, but they are actually made from a superabsorbent polymer that absorbs 300 times its weight in water. These hydrophilic spheres are approximately 99% water. If you look closely, you can barely see the outline of the sphere in the bowl of water. That's because light passing through the sphere is only refracted (or bent) by the edge of the sphere. Without this refraction along the edges, the Jelly Marbles would seem to vanish altogether. In other words, the water-filled Jelly Marbles become invisible due to an identical index of refraction with the water in the bowl. The secret is to keep the Jelly Marbles clean and free of oil from your skin. The more you touch the spheres, the less invisible they become because dirt and oil on your fingers are transferred to the surface of the sphere, which also reflects the light to reveal the sphere.