

December 2020

## Science: Black Holes!

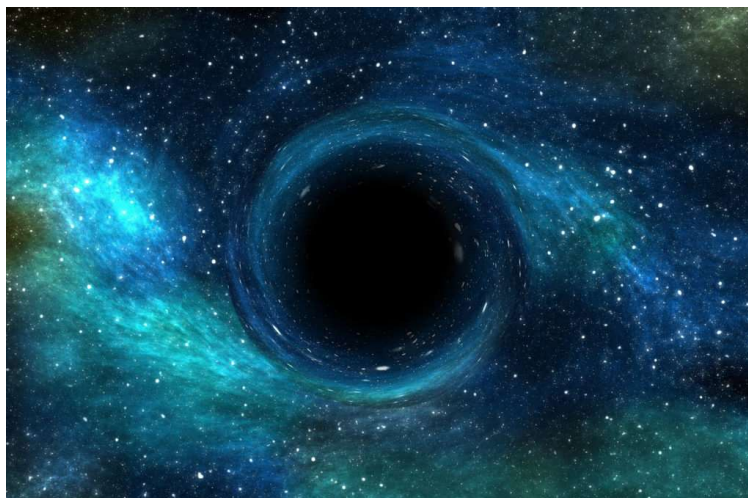
**Ages: 7 - 13**

Hello everyone. This is Bill from the Okanagan Regional Library System. Welcome to the fun and inventive world of making STEAM projects in your own home. Each month, I will share a fun and interesting project that you can make using materials commonly found in your own home.

Even though we can't be together right now, we can still learn how to make exciting projects each week!

This month's project: Black Holes

### Black Holes



Black Holes are points in space that are so dense they create deep gravity sinks. Beyond a certain region, not even light can escape the powerful tug of a black hole's gravity. And anything that ventures too close—be it star, planet, or spacecraft—will be stretched and compressed like putty in a theoretical process aptly known as spaghettification.

There are four types of black holes: stellar, intermediate, supermassive, and miniature. The most commonly known way a black hole forms is by stellar death. As stars reach the ends of their lives, most will inflate, lose mass, and then cool to form white dwarfs. But the largest of these fiery bodies, those at least 10 to 20 times as massive as our own sun, are destined to become either super-dense neutron stars or so-called stellar-mass black holes.

## Materials Needed:

This recipe will make 6 Black Holes

- Baking Soda (Sodium Bicarbonate)
- Gel Food Colouring (Black)
- Silicone Donut Mold
- Vinegar
- Glitter and Stars (optional)
- Large Deep Sided Tray or Dish
- Dish Soap
- Basting Syringe
- Disposable Gloves
- Large Mixing Bowl
- Water
- Small Cup or Dish



**NOTE ON GLITTER** – Glitter has become very controversial due to the negative impacts on the environment, but I know many of you still love a little sparkle in your projects! When it comes to glitter, I believe it is always optional. None of my projects require it. But if you decide you do want a little sparkle and shine in your creations, I highly recommend using a biodegradable glitter. There are lots of fantastic options available. Links have been provided below to some great options.

**Time:** 30 minutes (plus freezing overnight)

This experience is designed to give you a visual idea about what happens to everything around it when a Black Hole is formed.

**Steps:**

1. In a large mixing bowl, add a box of baking soda (500g). Add a teaspoon of black gel food colouring.



2. As an option step, mix in some glitter and stars. You can also sprinkle some glitter and stars into the molds before you fill them with the mixture.



3. Mix it together with a spoon or gloved hands. Add a tablespoon at a time of water to the mixture and mix it together. Continue to do this until it forms a thick paste, almost like wet sand. You will use approximately  $\frac{1}{4}$  cup of water. If necessary, add more food colouring to ensure you have a nice dark colour (not grey).



4. Pack the mixture into the silicone donut molds.



5. Put the tray in the freezer overnight until frozen solid.



6. Once frozen solid, set out your large tray with high sides. Carefully pop out the black holes from the mold and place them in the tray.



7. Sprinkle dish soap around the tray. This will help create even more bubble action when the reaction starts.



8. Fill a small cup or bowl with the vinegar and use it to fill the syringe.



9. Using the syringe, squirt the vinegar onto the black holes and then enjoy the erupting bubbly reaction!

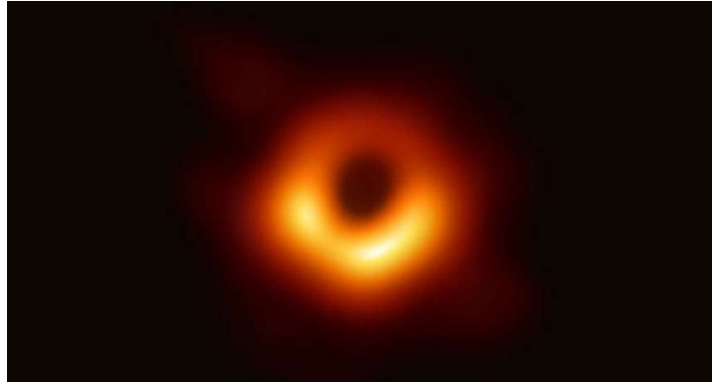


## The Science behind your Black Holes

The science behind this black hole experiment, is the chemical reaction between the donut base (baking soda) and the acid (vinegar). When the two ingredients combine, a gas is created in the form of bubbles, giving the impression that your black holes are exploding and destroying everything around them.

This gas is carbon dioxide or  $\text{CO}_2$ . The gas creates the bubbles that you see, giving the impression that the black holes are disintegrating.

## Real World Science – The First Picture of a Black Hole



More than 50 million light-years away, in the heart of a giant elliptical galaxy called Messier 87, a gargantuan beast is devouring anything that strays too near. Stars, planets, gas, and dust—not even light escapes the monster’s grasp once it crosses a threshold called the event horizon.

Scientists recently unveiled an image of that object, a *supermassive* black hole containing the same mass as 6.5 billion suns. Resembling a circular void surrounded by a lopsided ring of light, this landmark image is the world’s first glimpse of a black hole’s silhouette, a picture that creeps right up to the inescapable edge of the black hole’s maw.

## STEAM

This activity includes everything you need for a comprehensive STEAM project.

**Science:** Understanding how an acid and a base react to each other.

**Technology:** Understanding how the extreme gravitational pull of a black hole destroys every thing around it.

**Engineering and Art:** Making the frozen black holes.

**Math:** Measuring out the quantities (acid and base) needed to complete your black hole experiment.