20 Science Experiments for Group Time

1. Make a rainbow:
http://www.physicscentral.com/experiment/physicsathome/rainbow.cfm

What You Need

- A shallow pan
- Water
- A flashlight or sunlight
- A white surface or piece of paper
- A mirror

What to Do

- Fill the shallow pan about half way full with water.
- Place the mirror in the water at an angle.
- Shine the light into the water where the mirror is under water (or, using the sunlight, bring the pan and mirror outside so the sun can shine on the mirror underwater)
- Hold the white paper above the mirror; adjust the angle until you see the rainbow appear!

2. Carbonated Color Mixing
https://happyhooligans.ca/baking-soda-vinegar-experiment-for-preschoolers/

What you'll need:

- Box of baking soda
- Small bowl of white vinegar
- Medicine dropper (also known as a pipette)
- Food colouring or liquid watercolours
- Baking sheet or a messy craft mat

What to do:

- Shake baking soda all over the baking sheet
- Shake the baking sheet back and forth to evenly distribute the baking soda.
- Using food coloring and liquid watercolors, we squeezed drops of color all over the baking soda.
- Drop vinegar on top of food coloring

3. Heavier Than Air

https://www.acs.org/content/acs/en/education/whatischemistry/adventures-in-chemistry/experiments/flame-out.html

What you need

- Baking soda
- Vinegar
- Bottle
- Candle

What to do

- Ask the adult you are working with to light the tea light candle.
- Place about two teaspoons of baking soda in the jar.
- Next pour about two tablespoons of vinegar in a cup.
- When you are ready, carefully pour all the vinegar from the cup into the jar with the baking soda.
- Hold your hand gently over the top to keep most of the carbon dioxide in the jar.
- Ask the adult you are working with to carefully pour the carbon dioxide gas onto the flame. Be sure no liquid comes out – just the gas.
- Carbon dioxide molecules are heavier than air. Because of this, they push the oxygen and other molecules in the air out of the way as they sink down over the flame and candle. When oxygen is pushed away from the wick, it can't react with the wax anymore. This makes the flame go out.

You will need:

- One small empty plastic soda or water bottle
- 1/2 cup of vinegar
- Small balloon
- Baking soda
- Funnel or piece of paper

What to do:

- Carefully pour the vinegar into the bottle.
- This is the tricky part: Loosen up the balloon by stretching it a few times and then use the funnel to fill it a bit more than half way with baking soda. If you don't have a funnel you can make one using the paper and some tape.
- Now carefully put the neck of the balloon all the way over the neck of the bottle without letting any baking soda into the bottle.
- Ready? Lift the balloon up so that the baking soda falls from the balloon into the bottle and mixes with the vinegar. Watch the fizz-inflator at work!

How does it work?

The baking soda and the vinegar create an ACID-BASE reaction and the two chemicals work together to create a gas, (carbon dioxide) Gasses need a lot of room to spread out and the carbon dioxide starts to fill the bottle, and then moves into the balloon to inflate it.

5. Make Gas With Yeast

https://sciencebob.com/blow-up-a-balloon-with-yeast/

You will need:

- A packet of yeast (available in the grocery store)
- A small, clean, clear, plastic soda bottle (16 oz. or smaller)
- 1 teaspoon of sugar
- Some warm water
- A small balloon

What to do:

- Fill the bottle up with about one inch of warm water.
  (When yeast is cold or dry the microorganisms are resting.)
- Add the entire yeast packet and gently swirl the bottle a few seconds.
  (As the yeast dissolves, it becomes active – it comes to life! Don't bother looking for movement; yeast is a microscopic fungus organism.)
- Add the sugar and swirl it around some more.
  Like people, yeast needs energy (food) to be active, so we will give it sugar. Now the yeast is "eating!"
- Blow up the balloon a few times to stretch it out then place the neck of the balloon over the neck of the bottle.
- Let the bottle sit in a warm place for about 20 minutes
  if all goes well the balloon will begin to inflate!

How does it work?

As the yeast eats the sugar, it releases a gas called carbon dioxide. The gas fills the bottle and then The answer sounds a little like the plot of a horror movie. Most breads are made using YEAST. Believe it or not, yeast is actually living microorganisms! When bread is made, the yeast becomes spread out in flour. Each bit of yeast makes tiny gas bubbles and that puts millions of bubbles (holes) in our bread before it gets baked. Naturalist's note – The yeast used in this experiment are the related species and strains of Saccharomyces cervisiae. (I'm sure you were wondering about that.) Anyway, when the bread gets baked in the oven, the yeast dies and leaves all those bubbles (holes) in the bread. Yum.

6. Hot Air, Cold Air Science Activity

https://www.learning4kids.net/2015/01/15/hot-air-cold-air-science-activity/

What you will need:

- You will need two containers, one filled with hot tap water and the other with ice and cold water.
- You will also need 1 balloon and a 1.25litre (or 2litre) plastic soft drink bottle.
- The larger the bottle the more room the air has to push up and expand.
- Please do not use boiling hot water for this activity. Hot water from the tap will effectively work for this activity.
- During the following steps of the activity, provide children with the opportunity to predict, ask questions and discuss ideas.

What to do:

- Blow the balloon up to stretch it and help make it more flexible and let the air out.
- Place the balloon over the mouth of the empty plastic bottle.
- Stand the bottle in the center of the container filled with hot water. Wait a few minutes and notice the balloon start to inflate and expand.
- Remove the bottle from the hot water and place it in the container with cold water and ice. Wait a few moments and notice that the balloon starts to deflate and contract.
- Repeat step 3 and 4 again….it's amazing!

When the air inside the plastic bottle is warmed, it expands and needs more space, therefore it stretches out the balloon. When the bottle is transferred to the icy cold water, the air is cooled; it contracts and needs less space, so the balloon deflates. The mass of air remains constant inside the bottle, so this shows that the warm air requires more space and is less dense than cool air.

7. Mystery Balloon Pop

https://www.stevespanglerscience.com/lab/experiments/mystery-balloon-pop/

What you need:

- Black balloon
- Clear balloon
- Magnifying glass
- Sunshine

What to do:

- Blow up the clear balloon, but do not tie off the open end.
- Partially insert the black balloon into the clear balloon. Make sure the opening to the black balloon is still accessible.
- Blow up the black balloon until it is about half the size of the clear balloon and tie off the black balloon. Once tied off, push the black balloon the rest of the way into the clear balloon and tie off the clear balloon.
- Use the magnifying glass to focus sunlight on the black balloon inside. The black balloon pops!

If you can't find a clear balloon use a black balloon and a light colored balloon in a side-by-side comparison of which pops faster. The light colored balloon might not pop at all.

8. Water Pressure

http://www.andybrain.com/sciencelab/2007/12/02/learn-about-air-pressure-from-a-leaky-bottle/

What you need:

- One clear, plastic bottle with an airtight top (a two-liter pop bottle with a screw-on cap works great)
- A large bowl (something big enough to hold all the water that may be in the plastic bottle)

What to do:

- Punch very small holes (less than a quarter-inch diameter) in the bottom of the plastic bottle. Three holes works well.
- Fill the bottle with water. The holes will start draining the water, so you may have to turn the water on full blast to fill, or use one hand to cover the holes.
- When the bottle is full, screw the top on tight. If you lift the bottle up, there may be a few drips, but after a few seconds no water should flow out. (If water still glugs out of the bottle at this point, you've made the holes too big.)
- Unscrew the cap.
- The water will start pouring out the holes in the bottom.
- If you screw the cap back on before the water drains, the water flow will stop.

What's happening here? Many things, but one big one is **air pressure**. With the cap screwed on, the water stays in the bottle. This is because the water needs more air to take the space at the top of the bottle, to replace the space previously filled by the water. Gravity is pulling on the water, and the water tries to flow out, but needs the air to expand and take up more space to do so. The air pressure isn't changed – the air won't expand or contract from the very small pull of the water. **The air pressure is stronger than the pull of gravity. So the water stays in place.**

If the cap is screwed on, there is nothing to replace any space used by the water. So the water doesn't move. Unscrewing the cap allows air to flow into the bottle, which allows the water to pour out from the bottom, and the air takes up more and more space at the top.

9. Water Pressure #2

http://www.metrofamilymagazine.com/February-2016/Simple-Science-Experiment-Drip-Drop-Bottle/

What you need:

- Plastic water bottle with a tight fitting lid, small nail, water

What to do:

- Put a small hole near the bottom of the water bottle using the nail. Be careful! Push it through or tap it in with a hammer
- Put a small hole through the lid of the bottle with the nail (you will probably have to tap this through with a hammer, the plastic is thicker)
- Fill the bottle to the top with water, holding your finger on the hole on the side of the bottle
- Tighten the lid
- Do this next part over a sink!
- Cover the top with your thumb
- Remove your finger from the side of the bottle and wait a second
- Notice the water is not pouring out!
- Take your thumb off the top now so the water pours out

- Alternate putting your thumb back on the top of the lid hole and removing it

Explanation:

Did you notice the only time the water poured out of the bottle was when you weren't covering the hole on the top? Isn't that strange? There's a hole there, why doesn't the water come out? Shouldn't gravity be pulling it down? There are different forces involved besides gravity. Air pressure is a strong force and it always acts in a certain way: High Pressure moves towards Low Pressure.

This basically means "more air" moves to "less air." It is how wings cause flight, how spray paint cans works, how a plunger works, and much more! If there is a "vacuum" (a place with no air or less air than normal) then air will rush in to fill that void. So where does that happen in the Drip Drop Bottle?

When you cover up the lid to the bottle, the water is pulling down but that air up in the top of the bottle is becoming a vacuum. That means "low pressure." The air pressure outside the bottle is higher, so it actually tries to push into the bottle through the bottom hole. In doing so, it keeps the water in!

When you release the hole on the top, there is no vacuum, so the water is free to flow out the hole into your sink.

10. Water Pressure 3

What you need:

- Plastic bottle
- Pin or something to poke hole in the bottle
- Water
- Basin to catch water
- Duct or electrician's tape

What to do:

- Make three holes vertically spaced approximately 2 inched apart
- Cover holes with tape
- Fill bottle with water
- Put cap on tightly
- Ask students to predict what will happen when you take the tape off
- Take off tape
- Ask students to predict what will happen when you take the lid off
- Take off the lid

11. Citrus Sink or Float

http://coolscienceexperimentshq.com/why-does-the-heavier-orange-float/

What you need:

- Two Oranges (We used Clementines, but any orange will work)
- Two Glasses or Containers (Note: They must be big enough to put an orange into)
- Water

What to do:

- Begin with two empty glasses or containers. (Note: They must be big enough to put an orange into)
- Fill each container 3/4 of the way full with water.
- Slowly and carefully place an orange in one of the containers. What happens to the orange? Does it float or does it sink?
- Next, remove the peel from the second orange.
- Slowly and carefully place the peeled orange in the second container. What happens to this orange? Does it float or sink?

12. Static Electricity

http://www.sciencekids.co.nz/experiments/staticelectricity.html

What you'll need:

- 2 inflated balloons with string attached
- Your hair
- Aluminum can
- Woolen fabric

What to do:

- Rub the 2 balloons one by one against the woolen fabric, then try moving the balloons together, do they want to or are they unattracted to each other?
- Rub 1 of the balloons back and forth on your hair then slowly it pull it away, ask someone nearby what they can see or if there's nobody else around try looking in a mirror.
- Put the aluminium can on its side on a table, after rubbing the balloon on your hair again hold the balloon close to the can and watch as it rolls towards it, slowly move the balloon away from the can and it will follow.

13. Static Electricity

https://www.scientificamerican.com/article/static-electricity-bring-science-home/

What you need:

- Three small Styrofoam cups (alternatively, you can use two paper cups to hold the water and an inflated balloon to provide the static charge)
- Toothpick
- Water
- Someone with a head of clean, dry hair

What to do:

- Carefully push a toothpick half way through the bottom of one of the Styrofoam cups. Don't remove the toothpick—leave it stuck in the cup to ensure a gentle trickle of water when you fill it up.
- Hold this cup directly over the second Styrofoam cup.
- Fill the top Styrofoam cup (with the toothpick in the bottom) with water, and make sure that it is leaking a steady but small stream of water into the cup below.

Procedure

- Observe how the water is flowing straight down from the top cup into the one below.
- Rub the third Styrofoam cup against the head of someone with clean dry hair hairs start to stand apart from each other).
- Hold this statically charged cup near the stream of water without letting it get wet.
- *What happens to the stream of water?*
- **Extra:** Try the activity with other objects, such as a paper cup, a balloon you've rubbed against your hair or other items. *What works to change the water's stream? What doesn't?*

14. Musical Jars

http://coolscienceexperimentshq.com/musical-jars/

What you need:

- Set of Glasses of equal shape and size
- Water
- Metal Spoon
- Food Coloring (optional)

What to do:

- Begin with empty glass jars of the same shape and size. Use the metal spoon to tap on each one. You'll notice that each sound is the same. Now let's find out if we can make the sounds different.
- Pour water into each jar. Make sure that the water level is different in each jar.
- Add food coloring to each jar to make it easier to see the different water levels. You can use the same color in each jar or use a rainbow of colors like we did. (Optional)
- Use the same metal spoon to tap on the jars again. Listen carefully so you can hear how the sounds have changed.

15. Rubber Band Banjo

http://www.monstersciences.com/sound/sound-science-experiment-tissue-box-guitar/

What you will need:

- A cardboard box – tissue boxes are ideal
- Three elastic bands of different thicknesses
- A pencil
- Tape
- A piece of paper
- A ruler (optional)

What you will do:

- Take the plastic out of the hole in the tissue box. Do it neatly – don't rip the cardboard!
- If you need to, tape up the ends of the box so that the only opening is the hole in the top of the box.
- Put the elastic bands long ways around the box so that they are evenly spaced over the hole in the box.
- Put the thickest elastic band on the left, the thinnest on the right and the middle one in the middle.
- Slide a pencil under the elastic bands, and then push it up so that it is just past the hole in the box.
- Pluck the "strings" one at a time. What is the difference in the sound that they make?
- Move the pencil into different places along the strings and try the strings again.
- You may even like to put another pencil under the strings at the other end of the box.
- Fold the piece of paper so that you can slide it in between the strings and the hole in the box.
- Try plucking the strings again.
- How is the sound different?
- OPTIONAL: If you would like to you can tape a ruler to one end of the box to make it look more like a guitar.

16. Capillary Action

What you need:

- 24 hours
- White carnations (1 would be enough, but you can get a few and do different colors)
- Flower vase(s)
- Food coloring
- Water

What to do:

- Fill vase 1/4 full of water.
- Add a fair amount of food coloring (10 to 20 drops) or more if your vases are large
- Put a flower in each vase and let it sit for a day. Just like you would for any cut flower, have an adult trim the stem at an angle before placing it in the vase
- Check back every few hours to see how it's working.
- At the end of your experiment, examine the whole plant carefully (stem, leaves, buds, petals, etc). What parts can you see the food color in?

What Happened:

Most plants "drink" water from the ground through their roots. The water travels up the stem of the plant into the leaves and flowers. The plant uses the water to make food.When a flower is cut, it no longer has it's roots. But the stem of the flower still "drinks" up the water and provides it to the leaves and flowers.

Note: Red and blue food coloring work the fastest.

17. Germination Race

What you need:

- Ziploc bags
- Several different types of seeds (bean, radish, peas, etc.)
- Paper towels
- Water
- Marker
- Tape
- Sunny window

What to do:

- Label bags with date and names of seeds
- Put damp paper towel in bag
- Place two or three seeds in middle of bag, push out air and seal
- Tape bags to windows and let the race begin

18. Density

https://sciencebob.com/blobs-in-a-bottle-2/

What you need:

- A clean 1 liter clear soda bottle
- 3/4 cup of water
- Vegetable Oil
- Food coloring

What to do:

- Pour the water into the bottle
- Use a measuring cup or funnel to slowly pour the vegetable oil into the bottle until it’s almost full. You may have to wait a few minutes for the oil and water separate
- Add 10 drops of food coloring to the bottle (we like red, but any color will look great.) The drops will pass through the oil and then mix with the water below
- Put cap on very tightly
- Shake vigorously

How does it work?

To begin, the oil stays above the water because the oil is lighter than the water or, more specifically, less dense than water. The oil and water do not mix because of something called "intermolecular polarity."

19. Water Tension

https://www.sublimescience.com/free-science-experiments/how-to-float-a-paperclip-in-water/

What you need:

- Glass of water
- Paperclip

What to do:

- Just prove to yourself what you already know, if you drop a paperclip into a cup of water then it's sure to sink!
- We need to lower the paperclip extremely gently onto the surface of the water. The simplest way to do this is to take another paperclip, extend it out, and then use it as a lever to lower the paperclip that you want to float. (Make sure to fill your glass of water near to the top as that will make things easier.)
- It's always a good idea to wash your hands with water only - not with soap - before you get started. More on why you need to do this in a sec!
- Sit back and relax and enjoy your floating paperclip! When you've finished doing that we'll have a look at what's going on!
- You know that as paperclips are made out of metal they're denser than water, that's why they normally sink. How come this one is floating? It all has to do with surface tension. It's actually the surface of the water that's holding the paperclip up!

20. Surface Tension 2

https://www.scientificamerican.com/article/measure-surface-tension-with-a-penny/

What you need:

- Penny
- Medicine dropper or eyedropper
- Glass, cup or small bowl
- Tap water
- Dish soap
- Dish towel or paper towel
- Flat, level surface that can get wet, such as a kitchen counter
- Paper and pencil or pen (optional)

What to do:

- Place your penny on a flat, level surface that can get a little wet, such as a kitchen counter.
- Fill a glass, cup or small bowl with tap water
- Fill the medicine dropper with water.

- Now carefully add one drop of water at a time to the top of the penny. Hold the medicine dropper just above the top of the penny (not touching it) so each new drop has to fall a short distance before it merges with the drop on the penny. You can write down the number of drops you add if you like. *How many drops of water do you think will fit on top of the penny?* Watch the drop on top of the penny carefully as it grows. It should keep getting bigger and bigger until it touches the edges of the penny.
- Keep adding drops (refill your medicine dropper as necessary) one at a time. *How big does the drop on the penny get before it finally spills over the edges?*
- Once the drop spills over the penny's edge, use a towel to completely dry off the penny and surrounding surface. *How many drops of water were you able to add before the water ran over the penny's sides?*
- Mix a small amount of dish soap with your tap water.
- Now, repeat the experiment using soapy water. *Do you think you will be able to add more drops or less before the liquid spills over the sides of the penny?* Again, slowly add one drop at a time. *How big does the drop of water on top of the penny get before it breaks and flows over the edges?*
- **Extra**: Try the experiment with different liquids or other things you can find in your kitchen. (Make sure you have an adult's approval to use any liquids before you handle them.) *How do different soaps and detergents like hand soap or laundry detergent compare with one another? What about other liquids like milk or juice? Which ones make the biggest (or smallest) drops? With the most or least number of drops?*
- **Extra**: Try using something other than a penny to collect the droplets. What happens if you use different materials, such as the flat top of a small plastic bottle cap or a button?

Observations and results

You should find that plain tap water produces a much larger, stable drop of water on top of the penny than the soapy water does. This is because plain tap water has higher surface tension, so the surface is "stronger" and can hold together a larger drop. Adding soap lowers the water's surface tension so the drop becomes weaker and breaks apart sooner. Making water molecules stick together less is what helps soaps clean dishes and clothes more easily.

Conclusion

Always to take the time to ask the students what they think will happen (prediction, hypothesis) and ask why before and after the experiments.