

Quarantine Day 1 Science Experiment: Dollar Bills

Topic: CENTER OF GRAVITY

Materials: Dollar Bill, Wall

Step 1: Stand with your feet together and heels up against a wall.

Step 2: Have someone put the dollar bill on the floor 12 inches in front of your feet.

Step 3: Try to pick up the dollar bill without bending your knees or moving your feet.

The Science Behind It! (Spoilers ahead!)

It is impossible to do! Why? When you are standing against a wall, your center of gravity is over your feet. If you bend forward, you must move your center of gravity forward to keep your balance. Since you can't move your feet during this trick, you're flat out of luck. But that's better than being flat on your face!

Quarantine Day 2 Science Experiment: Ringing in my Ears

Topic: Sound Waves

Materials: Fork, spoon, 3 feet of string or thread

Step 1: Take the string and tie the fork to the center of the string/thread.

Step 2: Take one end of the string/thread and tie it around your right index finger (pointer), then tie the other end of the string/thread around your left index (pointer) finger.

Step 3: Place your fingers (index/pointer) to your ears and let the fork dangle in front of you.

Step 4: Get someone to tap the fork with the spoon. You should hear loud ringing in your ears.

The Science Behind It! (Spoilers ahead!)

Sound travels in waves. These sound waves travel through the string (which is called a medium) to your ears!

Quarantine Day 3 Science Experiment: Naked Egg

Topic: Chemical Changes

Materials: Egg, White Vinegar, A container to hold the egg with a lid, a spoon

Step 1: Place egg in the container.

Step 2: Add enough vinegar to cover the egg.

Step 3: Observe the egg. Notice that bubbles form on the egg.

Step 4: Cover the container. Let the eggs sit in the vinegar for 24 hours.

Step 5: Using the spoon, scoop the egg out of the vinegar. Be careful—the eggshell has been dissolving. The egg membrane, which is not as durable as the shell, maybe the only thing holding the egg together.

Step 6: Carefully dump out the vinegar. Put the egg back in the container and cover it with fresh vinegar. Leave the egg for another 24 hours.

Step 7: When complete, there will be an egg without a shell. It looks like an egg but is translucent.

The Science Behind It! (Spoilers ahead!)

An egg shell dissolves when submerged in vinegar. Vinegar contains acetic acid, which breaks apart the solid calcium carbonate crystals that make up the eggshell— into their calcium and carbonate parts. The calcium ions float free (calcium ions are atoms that are missing electrons), while the carbonate goes to make carbon dioxide. (Those are the bubbles that you see.) Whenever elements are rearranged into new compounds that were not present before, a chemical change has occurred!

Quarantine Day 4 Science Experiment: Alka seltzer rockets

Topics: Chemistry and Physics

Materials:

plastic container with lid (ex: film canister or similar)

Alka Seltzer tablets (you can also try with fizzy multivitamin tablet or baking soda)

Step 1: Fill container with 1 teaspoon of water and an effervescent tablet. Put lid on quickly.

Step 2: Place lid side down on a surface. Stand back!

Step 3: Enjoy the mayhem!

The Science Behind It! (Spoilers ahead!)

This experiment creates a model rocket fashioned from a 35mm film canister and propelled by the generation of gas from an effervescent liquid. After a short time, the carbon dioxide gas reaches sufficient pressure to cause the body of the canister to be launched into the air with a popping sound.

Quarantine Day 5 Science Experiment: Invisible Ink

Topic: Acids

Materials: 2 tablespoons of lemon juice, cotton swabs, paper (alternate step 3 wax crayon and salt)

Step 1: Pour the lemon juice into a small dish.

Step 2: Soak the end of a cotton swab in the lemon juice. Use it to write a secret message or draw a picture on a piece of paper.

Step 3: To read or see your secret message, hold the paper near a warm light bulb, burner, or toaster.

Alternate step 3: Put salt on the drying ink. After a minute, wipe off the salt. Color over the paper with a wax crayon to reveal your message.

The Science Behind It! (Spoilers ahead!)

Lemon juice is an acid. Acids are corrosive. This means that they break down materials over time. The writing turns brown because the weakened paper burns before the rest of the paper. Be careful not to overdo your heating and ignite the paper!

Quarantine Day 6 Science Experiment: Dancing Popcorn

Topic: Chemical Reactions

Materials: Glass, bowl, water, vinegar, baking soda, un-popped popcorn

Step 1: Fill a glass half full with water. Place glass in bowl.

Step 2: Drop in a few kernels of un-popped popcorn. Observe what happens.

Step 3: Add $\frac{3}{4}$ cup of vinegar to glass.

Step 4: Add $\frac{1}{2}$ teaspoon of baking soda to glass. Stir if necessary.

Step 5: Watch the popcorn kernels rise and fall!

Variations: Try substituting club soda for the vinegar and baking soda. You can also try using other objects like buttons or pebbles.

The Science Behind It! (Spoilers ahead!)

Before the baking soda was added to the water, nothing has changed. Afterwards, you could quickly see a chemical reaction. The baking soda and vinegar form particles of carbon dioxide. Eventually, the popcorn rises to the surface due to the gases being trapped underneath the popcorn. The particles stick to the popcorn and makes it rise or descend. When it rises to the surface of the water, the carbon dioxide pops and the popcorn goes down.

Quarantine Day 7: Inky Elevators

Topic: Chromatography

Materials: 3 white paper towel strips, sharpened pencil, Water soluble markers of different colors, clear cup, water

Step 1: Use a pencil to draw a horizontal line $\frac{3}{4}$ inch above bottom edge of a paper towel strip. Trace line with a black water-soluble marker.

Step 2: Hold the strip next to the clear cup so that the strip almost reaches the bottom of the cup. Push the point of a pencil through the top of the strip exactly even with the rim of the cup.

Step 3: Lift the pencil from the cup. Push the paper to the middle of the pencil.

Step 4: Pour $\frac{1}{4}$ inch of water into the cup. Set the pencil across the rim of the cup. The bottom of the paper should be in the water. The marker line should be above the water.

Step 5: When the water gets near the top of the strip, remove and lay on a paper towel to dry.

Step 6: Repeat with different colors.

The Science Behind It! (Spoilers ahead!)

While the inks in markers appear to be a single color, they are mixtures of several different colored pigments. The above procedure allows us to separate these pigments and is called chromatography. The paper is porous, meaning it has tiny openings in it. Water move up these openings. This upward movement of water is called capillary action. The marker ink dissolves in water. When the water reaches the marker line, it dissolves the ink and carries the pigments with it. Different pigments have different attractions to the paper. The ones with the strongest attraction to the paper move the least distance up the paper towel. The ones with a weaker attraction to the paper move farther up the paper towel.

Quarantine Day 8: Vertically Challenged

Topic: Air Resistance vs Water Resistance

Materials: 10 pennies, Target in dry area, Target submerged in a container of water

Step 1: Place some kind of target on the ground and another in a container of water.

Step 2: Try dropping pennies from different heights onto the dry target.

Step 3: Try dropping pennies from different heights onto the submerged target.

Challenge: Try dropping pennies at different angles onto the dry and submerged targets.

The Science Behind It! (Spoilers ahead!)

It was probably very easy to hit the dry target with the pennies. It was more difficult to hit the target that was submerged in water! When the pennies hit the water, they slow down and veer in one direction or another. This happens because water resistance is greater than air resistance. When the pennies hit the water, it absorbed some of the kinetic energy the pennies had.

Quarantine Day 9: Water Xylophone

Topic: Sound Waves

Materials: Glasses or jars, water, wooden stick or kitchen utensil, food coloring (optional)

Step 1: Fill glasses or jars with different levels of water.

Step 2: Hit sides of glass with wooden stick or utensil gently.

The Science Behind It! (Spoilers ahead!)

You've just created your own musical instrument! The pitch you hear varies with the amount of water in the glass. More water in a glass creates a lower pitch. Less water in a glass creates a higher pitch. When you tapped each glass, the sound you heard started out as a vibration of the glass and was quickly transferred to vibrating through the water inside the glass as well. The glass with more water had more matter for the sound to travel through, causing the vibrations to become larger and produce a sound with a lower pitch. To compare, think about a stringed instrument such as a bass or guitar: the thicker strings have more mass and create a lower sound than the thinner strings! The glass with the least amount of water had shorter vibrations and created a sound with a higher pitch.

Quarantine Day 10: Which way?

Topic: Light Refraction

Materials: Sticky note, Marker, transparent water bottle, water

Step 1: Draw two arrows on a sticky note. Stick it to a wall.

Step 2: Fill a clear water bottle with water.

Step 3: Look at the arrows through the water bottle. Move the water bottle right to left.

The Science Behind It! (Spoilers ahead!)

As you move the water bottle in front of the arrows, the arrows appear to change the direction they are pointing. This is because of the refraction (bending) that occurs when light passes through different mediums such as water and plastic.

Quarantine Day 11: Saltwater Density

Topic: Density

Materials: 4 glasses, water, salt, sugar, baking soda, small, lightweight objects (grapes, plastic lids, etc)

Step 1: Fill 4 glasses $\frac{3}{4}$ full of water

Step 2: Add 1 tablespoon of salt to the first glass. Stir.

Step 3: Add 1 tablespoon of sugar to the second glass. Stir.

Step 4: Add 1 tablespoon of baking soda to the third glass. Stir.

Step 5: Do not add anything to the fourth glass.

Step 6: Try to float your objects in each glass. Compare results.

The Science Behind It! (Spoilers ahead!)

The mixtures of water and sugar, salt, baking soda have different densities than plain water. The additives increase the density, which means some objects may float in the saltwater but sink in the regular water.

Quarantine Day 12: Sidewalk Constellations

Topic: Astronomy

Materials: Sidewalk chalk, diagrams of constellations, small stones

Step 1: Research and sketch out your favorite constellation.

Step 2: Gather materials and head outside.

Step 3: Use small stones to represent the stars and chalk to outline the patterns between the stars to create your constellation artwork!

The Science Behind It! (Spoilers ahead!)

A constellation is an area on the celestial sphere in which a group of stars forms an imaginary outline or pattern, typically representing an animal, mythological person or creature, or an inanimate object. The origins of the earliest constellations likely go back to prehistory. People used them to relate stories of their beliefs, experiences, creation, or mythology. Different cultures and countries adopted their own constellations, some of which lasted into the early 20th century before today's constellations were internationally recognized. The recognition of constellations has changed significantly over time. Many have changed in size or shape. Some became popular, only to drop into obscurity. Others were limited to a single culture or nation.

Quarantine Day 13 Science Experiment

Topic: Solar Energy, light rays

Materials: Ice Cubes, 6 squares of differently colored paper (must include black & white)

Step 1: Gather materials and find a sunny spot outside.

Step 2: Place six colored pieces of paper next to each other.

Step 3: Place an ice cube in the middle of each paper.

Step 4 Observe the rate that the ice cubes melt.

The Science Behind It! (Spoilers ahead!)

The ice cube on the black paper will melt fastest because black objects absorb all colors of light. The ice cube on the white paper will melt the slowest because white objects reflect all colors of light. This also explains how we see different colors. For example a blue object absorbs all colors of light except blue. It reflects blue light.

Quarantine Day 14: Tie-Dye Milk

Topic: Surface Tension

Materials: Shallow dish or bowl, milk (high fat works best), food coloring, Dish soap

Step 1: Partly fill a shallow dish with milk

Step 2: Add one drop of each food coloring color to different parts of the milk. (The food coloring will mostly stay where you placed it.)

Step 3: Carefully add one drop of dish soap to the middle of the milk. (This will cause the food coloring to stream through the milk and away from the dish soap.)

The Science Behind It! (Spoilers ahead!)

The dish soap breaks up the surface tension of the milk by dissolving the milk's fat molecules.