deSTEMber
SCIENCE ★ TECHNOLOGY ★ ENGINEERING ★ MATH
PRESENTED BY: girlstart

Air Cannons

A blast of air! Examine the different states of matter as you design and test a device that launches air particles.

TEKS:

SCI 3.5 B: The student is expected to describe and classify samples of matter as solids, liquids, and gases, and demonstrate that solids have a definite shape and that liquids and gases take the shape of their container.
SCI 6.8 B: The student is expected to identify and describe the changes in position, direction, and speed of an object when acted upon by unbalanced forces.
SCI 8.6 A: The student is expected to demonstrate and calculate how unbalanced forces change the speed or direction of an object's motion.

Materials:

- Air Cannons Activity Supplement – attached
- Duct tape
- Markers
- Paper cup – 12 or 16 oz.
- Pen
- Pom-pom or cotton ball
- Sandwich baggie
- Scissors

How To:

1. Cut the zipper part off the sandwich baggie.
2. Using a pen, poke a hole in the bottom of your cup. The hole should be about half the size of your pom-pom. If necessary, smooth the edges of the hole by twisting the pen gently.
3. Place the baggie over the mouth of the cup and tape the baggie to the cup so that the bag is airtight.
4. Gently squeeze the bag to see if there are any leaks. If there are, seal those leaks with tape. Air should only go through the hole you poked in the bottom of the cup.

5. Fill your air cannon with air! Blow through the hole on the bottom of the cup to inflate the baggie.
6. Quickly load the pom-pom by gently pushing it into the hole. It shouldn't go all the way through the hole, but it should fit snugly in the hole.
7. It's time to launch the pom-pom! Hold the cup with one hand and hit the baggie with your other hand. Watch the pom-pom fly!

STEM Explanation:

Matter is anything in the universe that has mass and takes up space. Matter occurs in four states: solids, liquids, gases, and plasma. But wait… do all states of matter really take up space? Even gases? They do! It's pretty easy to see that solids and liquids take up space. It can be more difficult to tell that gases take up space. But the Air Cannon that you just created helps demonstrate that gases take up spaces as well.

Air is a **gas**, a state of matter that expands to fill any container it is in. Air molecules aren't close together or attracted to one another. Instead, they move randomly and collide with one another by chance. Air doesn't hold its shape, so it's difficult to apply a consistent force to enough air molecules at a time to push, throw, or otherwise move them in a single direction.

However, the Air Cannon that you just created provided a way for you to *prove* that air takes up space! Because the pom-pom sits tightly in the hole, no air can get past. The pom-pom is a plug, sealing the air chamber. But it is a weak plug that can pop out. When you squeeze the bag, you increase the air pressure inside the Air Cannon. At some point, the air pressure overpowers the pom-pom's seal. Now, the air rushes out, carrying the pom-pom with it. Pea shooters, spitball shooters, leaf blowers, and paint sprayers all blast out a column of air that can be used to launch objects.

Career Connection:

Physicists investigate the world to better understand forces. They study what things are made of (matter) and how things behave. They also learn about acceleration, mass, and energy, studying how it changes from one form to another.

Resources:

http://pbskids.org/designsquad/build/air-cannon/
https://www.sciencefriday.com/educational-resources/design-a-better-vortex-cannon/
https://thekidshouldseethis.com/post/vortex-cannon-diy-video

AIR CANNONS

A blast of air! Examine the different states of matter as you design and test a device that launches air particles.

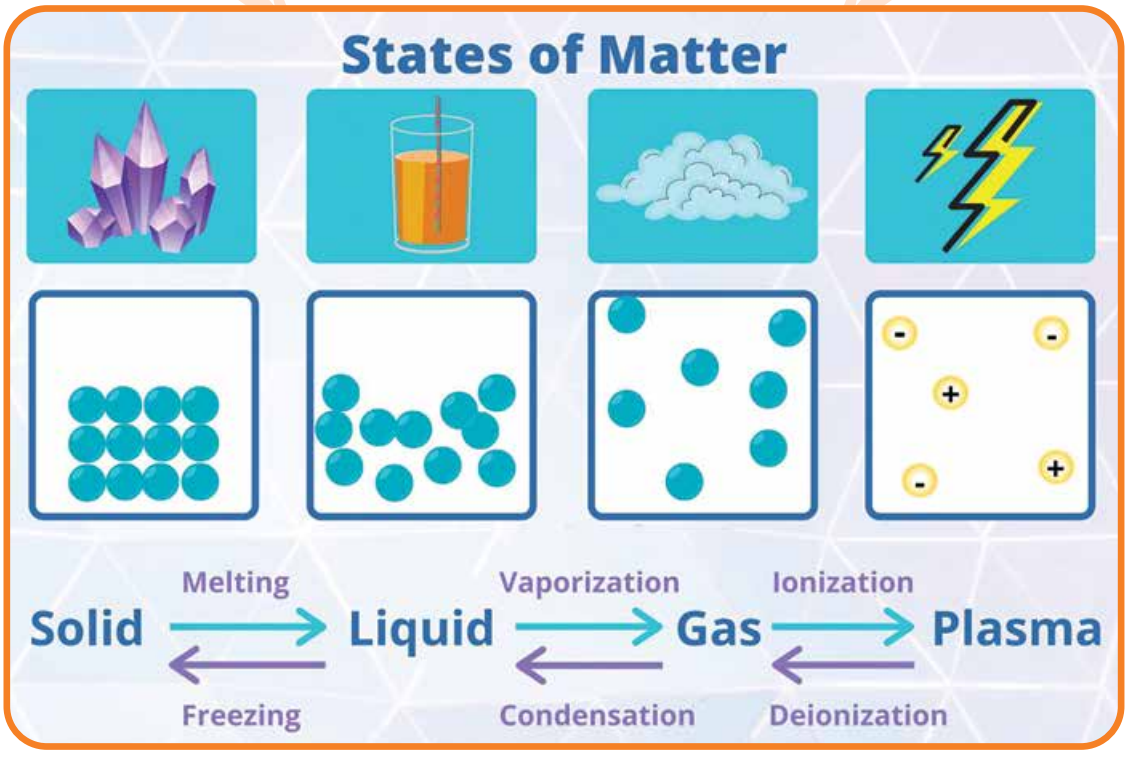
What are the four natural states of matter?

1. _____

2. _____

3. _____

4. _____



Do you think it's possible to *throw* air? Why or why not?

_____

_____

States of Matter Image Source: https://sciencenotes.org/states-of-matter/

Design your new-and-improved air cannon:

FUN FACT:

THE WORLD'S LARGEST AIR CANNON WAS BUILT IN THE CZECH REPUBLIC. THIS AIR CANNON REQUIRES MULTIPLE PEOPLE TO OPERATE IT, AND IT CAN SHOOT AIR MORE THAN 300 FEET!

Today you were a Physicist!

Physicists investigate the world to better understand forces. They study what things are made of (matter) and how things behave. They also learn about acceleration, mass, and energy, studying how it changes from one form to another.

Meet Fabiola Gianotti!

Fabiola Gianotti is an Italian particle physicist and the first woman to be Director-General of the European physics organization, CERN. CERN is home to 10,000 scientists from more than 100 countries! Gianotti joined CERN in 1994 and was part of the group of scientists who discovered the Higgs Boson, a basic particle that helps explain why things have mass. Gianotti is quoted as saying she has three passions in life: music, cooking, and physics, and that "all three follow very precise rules."

Fabiola Gianotti Image Source: https://home.cern/about/who-we-are/our-people/biographies/fabiola-gianotti