

Air Pressure Demonstration

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Nov. 2007
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Main concepts:

- 1) Pressure is a Force spread out over an Area.
- 2) Air exerts a pressure on all surfaces.

What to do:

Show Atoms in a Box

Review Solid, Liquid, & Gas. Show poster.

Today we are only going to talk about gas. Specifically, we're going to talk about **Air Pressure**.

Question: Is air something ?? I don't believe in air. Prove it to me. You can't see it, can't smell it, Ask the children, to describe how they know that air is real. Hold your breath / cover mouth and nose.

Answer: Blow a hair dryer or a fan. You but you can feel it. Hot air, cool air, moving air.

Question: What is air made of ?? **Ans:** Atoms & molecules. Show the Box of Atoms.

Notice that atoms bounce off the wall. Do they bounce off your skin ?? **Ans:** Yes they do.

Air is pushing on your body all the time. We don't notice it because we are used to it.

Question: What is a Force ? **Ans:** Pushing or pulling. Have the kids name some examples: Bat a ball, Tug-o-War, Gravity pulls you down when you fall, etc.

To understand forces, let's look at an example.

Blow up a Balloon. Why do the walls move to this size ?

Kids push on both sides of a board. (I hold the board, but let it move)

Show diagrams of Forces inside and outside of a balloon.

Question: Is the Force on the balloon all on one spot ? Poke a pencil eraser into the balloon.

Ans: No, the Force is spread out over the surface.

Push with finger tip, push with palm of your hand.(it does make a difference). Which one hurts more ?

Explain Pressure: Poster $P = F/A$

For older kids only (explain the concept of dividing by Area).

What matters more Force or Pressure ??

Push with finger tip, push with palm of your hand.

Volunteer: Kid steps on 1 cup -> it crushes / Steps on 50 cups -> cannot crush them.

Explain Bed of 1 Nail or 1000 Nails (show a picture) **Question:** Which one would you rather lay on.

Show the vacuum pump. Kids get to feel the suction at end of the vacuum tube.

Put marshmallow in a Flask (little tiny air bubbles expand)

Show Force diagram / we took away forces on the outside pushing in, so the marshmallow got bigger.

Balloon in the flask -> Balloon gets bigger.

Now what will happen if we take the air pressure away from the inside of something ?

Show that sucking on a straw draws liquid up (reduces pressure / causes a vacuum at one end)

Show the Force diagram / we took away the forces on the inside pushing out.

Question: How strong is Air pressure ?

Show crush the can (Boil water in a can, when can is turned upsidedown in tub of water, air instantly crushes the can) This is a good review of a gas condensing into a liquid, & liquids take up less space.

Question: Are you stronger than Air ?

Sure air pressure is strong enough to crush this thin wimpy little aluminum can, but air pressure cannot possibly be as strong as you, right ?

Demonstrate the Magdeburg Sphere. 2 kids pull but cannot get it apart.

Conclusion: Air Pressure is stronger than you.

Equipment needed

Atoms in a box

Blow dryer or Fan

Diagrams of Forces on a Balloon

Plywood Board (~ 2' x 2')

Poster: FORCE, PRESSURE = F/A

Picture of a Bed of 1 Nail / Bed of 1000 Nails

Cup of water or Juice to drink

Vacuum Pump (\$150 from FJC)

Vacuum Flask + Stopper

Crush the can (Tub of water, Handle. Cans, Gloves)

Bunsen burner, or propane torch

Fire Extinguisher

Safety glasses

Magdeburg Sphere

Consumables

Marshmallows

Balloons

Paper cups

Pop cans

Straws

Air Pressure Summary

Atoms in a Box

Poster: Solid, Liquid, & Gas

What is air ?

What is a Force

Blow up a Balloon

Poster: $\text{Pressure} = F/A$

Step on cups

Bed of Nails

Marshmallow in a Flask

Crush the Can

Magdeburg Sphere.