

Properties of Air

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- **Air Takes Up Space**
- **Air Has Weight**
- **Air Has Pressure 15 Pounds per Square Inch at Earth's Surface**
- **Air Expands When Heated**
- **Air Contracts When Cooled**
- **Air in a High Pressure Area will Rush into a Low Pressure Area**

There are a series of experiments that can lead up to understanding air and air pressure. Ultimately, we can learn that when there is a change in the air pressure there will be a change in the weather.

What will be fun about these experiments that when we use probes, we can understand what is happening in experiments beyond what we are observing with our five senses. It helps us understand air and air pressure even more and how it is linked with weather changes.

Air Takes up Space
Experiment One
“Magic Air”

- Fill a small clear tub with water.
- Put a small piece of wood on the water.
- With a glass, make the piece of wood touch the bottom of the bowl without touching it.
Explain how this was done.

Air Takes Up Space
Experiment Two
“Staying Dry”

- Crumple up a piece of paper and place it at the bottom of a drinking glass.
- Turn the glass upside down (making sure the paper doesn't fall out).
- Put it open-mouth down into an ice-cream bucket.
- Pull it back up.
- Take the paper out.
What did you expect to happen?
Why were you able to do this?

Air Takes Up Space
Experiment Three
“Air Power”

- Get a juice bottle and put a funnel in its opening.
- Seal up the sides with clay so that no air can leak in.
- With a drinking glass, pour water in the funnel so that water is always in the funnel.
- After a few seconds what do you observe?
Why is this happening?
What conclusions can you say about this?

Air Has Weight
Experiment Four
“Tipping the Scale”

- Get a school balance.
- Put two full blown up balloons at each end of the balance.
- Make sure that the balance is even by adjusting the tare weight gauge.
- Get a pin and pop one of the balloons.
- Find all the pieces and put them back on the respective end.
What do you notice about the balance?
Why is it like this?
How can you explain this?

Air Has Weight
Experiment Five
“Down Draft”

- Put a stick on a table so that it hangs over the side.
- Hit it lightly with a book so you can see what would happen if you hit it hard.
- Put the stick back in the same spot.
- Lay one piece of newspaper over it making sure that the newspaper is completely spread flat on the stick.
- Hit the stick again very hard with a book.
 Explain what happened.
 Why do you suppose this happened?
 How can you explain this?

Air Has Pressure
Experiment Six
“And The Winner is....”

- Fill up a glass of water to the top.
- Put an index card on the open end.
- With the glass over a big bowl, carefully turn the glass upside down with your hand holding the card.
- Let go of the card.
 What happened when you let go of the card?
 Explain why it is doing this.
 What principle can you think of that supports this concept?

Air Has Pressure
Experiment Seven
“Case of the Leaky Can”

- Get a V-8 size can, and with a nail, put a hole near the bottom of the can.

- Put tape over the hole and put water in the can.

- Take the tape off.

What do you see happening?

- Put the tape back on and put more water in the can.

- Cut the mouth off of a balloon.

- Stretch the balloon over the top of the can.

What do you think will happen when the tape is taken off?

- Take the tape off.

What do you see happening now?

Explain why this is happening.

Air Has Pressure
Experiment Eight
“Path of Least Resistance”

- There is a bucket of water on the table in front of you.

- There is an empty bucket on the floor in front of you.

- Put one end of the hose that is on the table in the water.

- Draw water out of the bucket by sucking on the hose.

- As soon as the water gets to the crest of the hose, take your mouth from the hose and put the hose in the bucket on the floor.

What do you see happening?
Explain why this is happening.

- Now raise the hose higher than the upper bucket.
What happened now?
Explain why this happened.

Air Has Pressure
Experiment Nine*
“Air ‘Can’ Overcome”

- Put a little water into a pop can.
- Put the can into a saucepan on a heating unit.
- Set the CBL 2 to read the temperature and pressure probes.
- Put the temperature probe into the can that is in the pan.
- Watch the temperature of the heat in the can.
What do you see happening.
- Let it sit for a few minutes until you see steam coming out of the can.
- At this point put the pressure probe tube into the hot can with the temperature probe.
- Put clay around the probes where they enter the hole of the opening of the can so that the can is airtight.
- Take the can out and put it on the counter.
- Watch the can and the numbers of the temperature and pressure probes for a couple of minutes.
What do you see happening to the can?
Why do you think this is happening?

What do you see happening to the numbers?
Why do you think this is happening?
What does this tell you about air?

Air Expands and Rises When Heated
Experiment Ten
“Rising to the Top”

- Tie three strings on a dowel--one on the ends and one in the middle.
- Get two lunch sacks and tape each one to the ends of the strings located at either ends on the dowel.
- Open up both of the sacks.
- Position the middle string so as you hold on to it, the dowel will be straight and the sacks will be balanced.
- Light a candle.
- Hold it under one of the sacks far enough away so it doesn't start it on fire.

What do you observe?

Explain why this is happening.

Air Expands and Rises When Heated

Experiment Eleven*

“Air Outlet”

- Put a stopper with two open holes into the opening of an empty bottled-water container.
- Put a temperature probe into one of the holes.
- Put a pressure probe into the other hole.
- Set the CBL 2 to measure the temperature and the pressure probes.
- Put the bottle in a bowl of really hot water.
- Watch the temperature and pressure numbers for a couple of minutes

Explain what you happen to the numbers.

Explain why you think this happened.

Air Gathers and Sinks When Cooled

Experiment Twelve*

“Air Inlet”

- Put the bottle that is in the hot water with the temperature and pressure probes in it into a bowl of ice water.
- Watch the temperature and pressure numbers for a couple of minutes.

Explain what happened to the numbers.

Explain why you think this happened.

High Pressure Moves into a Low Pressure Area

Experiment Thirteen

“Message in a Bottle”

- Put water into a 9-inch balloon and fill up about the size of a hard boiled egg.
- Get a bottle with an opening that this balloon could barely not fit through.
- Lubricate the balloon with light cooking oil or even water.
- Drop a lighted piece of paper in the bottle.
- Put the balloon on the bottle’s opening
- Watch the egg carefully.
What did you happen to the egg?
Explain why this happened.

High Pressure Moves into a Low Pressure Area

Experiment Fourteen*

“The Disappearing Act”

- Get a pint-sized canning jar with a lid.
- Put a 1/4 inch hole in the lid.
- Put the tube of a pressure probe through the hole of the lid.
- Seal the opening where the tube is with clay.
- Set the CBL 2 to read the pressure probe.
- Put about 5 birthday candles in a ball of clay.
- Drop the clay with the candles in the jar.
- Light the candles with long matches.
- Quickly screw on the lid that has the pressure probe in it.

- Watch inside the bottle and the pressure probe reading.
 What do you see happening inside the jar?
 Why did this happen?
 What did you hear the lid do?
 Why did it do that?
 What else is strange about the lid?
 Explain why the lid is doing this.

High Pressure Moves into a Low Pressure Area

Experiment Fifteen*

“Rising to the Occasion”

- Get a flat, low-rimmed container like a cake pan.
- Put some water in it about at least one inch high.
- Put food coloring in the water.
- Put 5 candles in some clay.
- Put the clay, with the candles, at the bottom of the container with water.
- Make sure the water is not higher than the candles.
- Tape a pressure probe tube to the inside of a pint or quart jar.
- Set the CBL 2 to read the pressure probe.
- Light the candles.
- Put a pint or quart jar, open-mouth down, over the top of the candles so that it goes to the bottom of the container.
- Watch the inside of the jar and the pressure probe reading.
 What happened in the jar?
 Why do you suppose this happened?

What happened to the pressure inside the jar?
Why do you suppose this happened?

High Pressure Moves into a Low Pressure Area
Experiment Sixteen*
“Making a Cloud”

- Get a two-liter bottle and put about one inch of room temperature water into it.
- Light a match and put some smoke into the bottle (for water droplets to form around).
- Get a stopper that has three holes in it.
- Put a temperature probe into one of the holes.
- Put a pressure probe into the other hole.
- Put a ball needle in the third hole.
- Set the CBL 2 to measure the temperature and the pressure probes.
- Put the stopper into the opening of the two-liter bottle. Write down the reading of the pressure and the temperature.
- Attach the hand pump onto the ball needle. Put in four or five pumps of air.
 - What is happening to the pressure inside the bottle?
 - Why do you suppose this is happening?
 - What is happening to the temperature inside the bottle?
 - Why do you suppose this is happening?
- Now take the stopper off the bottle.
 - What happened inside the bottle?

Why do you suppose this is happened?

What happened to the pressure of the bottle?

Why do you suppose this happened?

What is happening to the temperature inside the bottle?

Why do you suppose this is happening?

- Put the stopper back on and repeat the experiment. Write down observations that you noticed about repeating the experiment.