Air Pressure Change And Its Influence On The Weather

If we didn't have air and water, we wouldn't have any weather. Water reacting to heat and cold causes the water cycle. Air reacting to heat and cold causes a change in air pressure. This change in air pressure is what makes the water cycle work and can cause all kinds of weather.

The experiments in this booklet will help you understand the properties of air and its influence on the water cycle and how it creates all kinds of weather.

Below are the concepts we will be learning about air.

1. **Air is a substance and therefore it takes up space.**
2. **Since air is a substance, it also has weight.**
3. **When air is piled on each other it causes pressure.**
4. **When air is heated it rises.**
5. **When air is cold it sinks.**
6. **Air pressure can change to a high or low pressure.**
7. **High pressure always flows into a low pressure area.**
8. **This pressure change in the air is what causes weather to happen.**

Concept #1:

Air is a substance. It takes up space.

Experiment #1 Magic Air

(student experiment)

1. Fill an ice cream bucket with water.
2. Put a small piece of wood on the water.
3. With a glass put the mouth of the bottle over the piece of wood and push the glass all the way down to the bottom of the bucket.
4. Explain what happened.

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5. Why did the wood do what it did?

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6. Draw a picture of what happened and label it.

Concept #1:

Air is a substance. It takes up space.

Experiment #2 Staying Dry

(student experiment)

1. Crumple up a piece of paper and place it at the bottom of a drinking glass.
2. Turn the glass upside down (making sure the paper doesn't fall out) and put it open-mouth down into an ice cream bucket.
3. Go all the way to the bottom move it around and then bring it up.
4. Explain what happened?

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5. Explain why this happened?

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6. Draw a picture of what happened and label it.

Concept #1:

Air is a substance. It takes up space.

Experiment #3 Air Power

(teacher demonstration only)

1. Get a pop bottle and put a funnel in its opening.
2. Seal up the sides with clay so that no air can leak out.
3. With a drinking glass, pour water into the funnel so that water is always in the funnel.
4. After a few seconds what do you observe?

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_____

5. Explain why this is happening.

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6. Draw a picture of what happened and label it.

Concept #2:

Air has weight.

Experiment #4 Tipping the Scale

(student experiment)

1. Put a deflated balloon on one side of a balance.
2. Weigh the balloon with something that is light like corn kernels or macaroni.
3. After it is weighed, blow up the balloon and put it back on the scale.
4. What do you notice about the scale?

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_____

5. Explain why the scale did this.

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6. Draw a picture of what happened and label it.

Concept #2:

Air has weight.

Experiment #5 Air Down Draft

(teacher demonstration only)

1. Put a paint stick on a table so that it hangs over the side of it.
2. Hit it with a book. What happened?

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3. Put the stick back in the same spot, but this time, put one piece of butcher paper over the stick. Make sure the paper is flat.
4. Hit the stick again with a book.
5. Explain what happened?

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6. Explain why the stick did this.

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7. Draw a picture of what happened and label it.

Concept #3:

The weight of air piled on each other causes air pressure 15 pounds of pressure on Earth's surface.

Experiment #6 Stream of Pressure

(student experiment)

1. In a 2-liter bottle, put four holes evenly apart down the side of the bottle.
2. Put tape over each of the holes. Fill up the bottle up with water to the top.
3. Take the piece of tape off the holes, one at a time, starting from the top.
4. Explain what you see happening.

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5. Explain why the streams of water did this.

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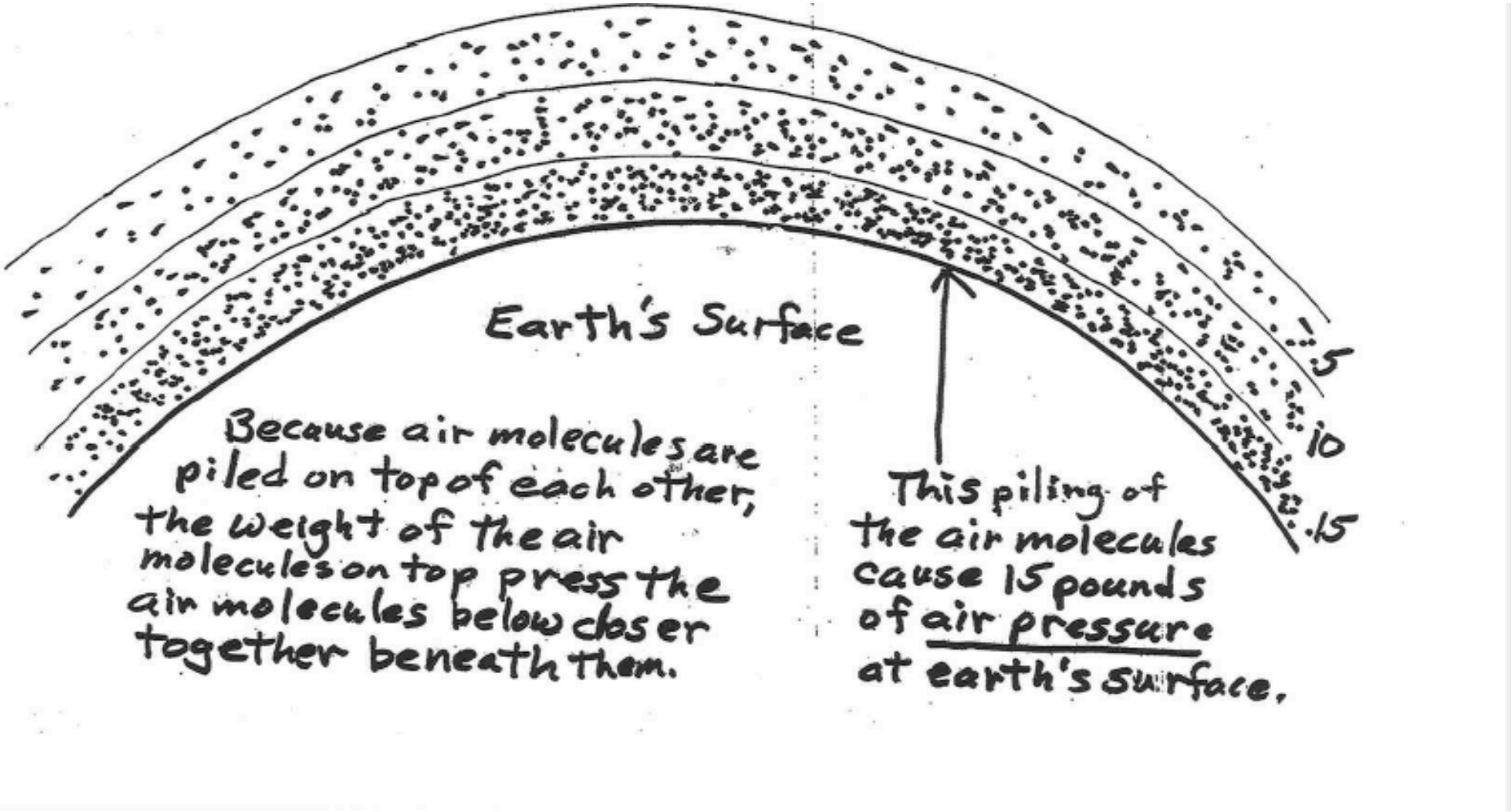
6. Draw a picture of what happened and label it.

Concept #3

The weight of air piled on each other causes air pressure 15 pounds of pressure on Earth's surface.

1. The picture below demonstrates how the air particles are piled on each other about 75 miles up into the air.
2. Notice that the air particles near the earth are closer together because of the weight of the air particles on top of them.
3. This causes 15 pounds of air pressure at the earth's surface since all the weight is on the air right next to the earth.
4. Notice the farther the air goes up the farther apart the air particles are since there is less weight above them less pressure on them. So as the air goes up, there is less air pressure until there is none at all.
5. Do experiment 6 "Streams of Water" to show what happens when water molecules are piled on each other from bottom to top



Concept #3:

The weight of air piled on each other causes air pressure 15 pounds of pressure on Earth's surface.

Experiment #7 And the Winner Is…..

(student experiment)

1. Fill up a glass of water to the top. Put a piece of cardstock on the open end of the glass.
2. With the glass over a big bowl carefully turn the glass upside down with your hand on the cardboard.
3. Let go of the cardboard.
4. Explained what happened?

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5. Why did this happen?

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6. Draw a picture of what happened and label it.

Concept #3:

The weight of air piled on each other causes air pressure 15 pounds of pressure on Earth's surface.

Experiment #8 The Case of the Leaky Can

(student experiment)

1. 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 then put water in the can to the near of the top.
2. Cut the mouthpiece off of a balloon. Now stretch the balloon over the top of the can.
3. Take the tape off. What do you see happening to the balloon and the water?

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4. Explain why this happened?

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5. Draw a picture of what happened and label it.

Concept #4 and 5:

Air separates and rises when heated. Air gathers and sinks when cooled.

Experiment #9 Air Outlet—Air Inlet

(student experiment)

1. Put a plastic bottle in very cold water (with ice) and place a balloon over the top of a plastic bottle.
2. Put the plastic bottle in hot water. Wait a couple of minutes.
3. Explain what happened to the balloon?

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4. Why did this happen to the balloon?

_____

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5. What can you say about air that gets hot?

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_____

6. Take the bottle out of the hot water and it put in the cold water.

7. Explain what happened to the balloon this time.

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8. Why did this happen to the balloon?

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9. What can you say about air that gets cold?

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10. Draw a picture of what happened and label it.

Concept #4 and 5:

Air separates and rises when heated. Air gathers and sinks when cooled.

Experiment #10 Too Much Hot Air

(teacher demonstration only)

1. Tie a string around the middle of a stick so that the stick is balanced when the string is held. Tape two sacks with strings at each end of the stick. Open the sacks.

2. While holding the sack, put a barbeque lighter under one of the sacks. What do you observe?

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3. Take the lighter away from the sack. What do you observe now?

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4. Explain why the sacks did what they did.

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5. Draw a picture of what happened and label it.

Concept #6

Air pressure can change to a high pressure or to a low pressure.

Experiment #11 Squeezing and Release

(student experiment)

1. Squeeze a plastic bottle (like a 12 oz pop bottle) until the two sides are really about an inch away from each other.
2. At this point have your partner put a balloon over the opening of the bottle. The balloon should just be hanging down the side of the bottle.
3. Let go of the bottle. Explain what happened to the balloon.

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4. Explain why you think the balloon did this.

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5. Push on the plastic bottle again until the two sides almost touch. Explain what happened to the balloon.

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6. Explain why you think the balloon did this.

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7. Draw a picture of this.

8. Concept #7:

Air pressure can change causing high air pressure to flow into a low pressure area.

Experiment #12 Message In A Bottle

(teacher demonstration only)

1. Get a hardboiled egg and a bottle with an opening that a shelled-egg could barely fit through.
2. Lubricate the egg with light cooking oil or water.
3. Put a lit match into the glass bottle.
4. Quickly place the tapered end of the egg in the mouth of the bottle.
5. Explain what happened?

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6. Explain why this happened.

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7. Draw a picture of what happened and label it.

Concept #7:

Air pressure can change causing high air pressure to flow into a low pressure area.

Experiment #13 Popping the Lid

(teacher demonstration only)

1. Get a pint-sized canning jar with a lid.
2. Put some birthday candles in some clay and place the clay at the bottom of the jar.
3. Light the candles and quickly screw the lid on the jar. Watch and listen to what happens.
4. Explain what you heard and saw.

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5. Explain why this happened.

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7. Draw a picture of what happened and label it.

Concept #7:

Air pressure can change causing high air pressure to flow into a low pressure area.

Experiment #14 Rising to the Occasion

(teacher demonstration only)

1. Get a flat low-rimmed container like a cake pan. Put some water in it about an inch deep. Put some food coloring in the water. (This is so you can see the water.)
2. Put some clay in the middle of the pan.
3. Put some birthday candles in the clay making sure the water is not higher than the candles.
4. Light the candles.
5. Put a wide-mouthed bottle over the candles into the water.
6. What is happening in the jar?

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7. Explain why this happened.

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8. Draw a picture of what happened and label it.

Concept #7:

Air pressure can change causing high air pressure to flow into a low pressure area.

Experiment #15 Air "can" overcome.

(teacher demonstration only)

1. Put water into a saucepan and put it on a heating unit.
2. Put a little water into a pop can and put the can into the saucepan.
3. Let the can sit for a few minutes until you see steam coming out of it.
4. Put some clay on top of the opening, making sure it is air tight.
5. Put the can on a hot pad on the counter.
6. Describe what you see happening to the can.

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7. Explain why this happened.

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8. Draw a picture of what happened and label it.

Concept #8:

If high pressure exists when hot air rises and water vapor is in the air and later a low pressure comes in, the low pressure will cause the air to get cold and the water vapor will condense into clouds.

Experiment #16 Making a Cloud in a Bottle

(student experiment)

1. Get a two-liter bottle and put two inches of luke-warm water into the bottle for evaporation.
2. Put some baby power in the bottle for dust.
3. Put a cork on the bottle with an inflation needle in it.
4. Put a ball pump on the needle.
5. With one student holding the cork, another student will put about five pumps of air into the bottle to create a high pressure.
6. Turn out the lights and turn the flashlights on and aim the light directly into the bottle keeping it there the whole time during the experiment.
7. Quickly take the cork off the bottle.
8. Explain what you see in the bottle.

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9. Explain why this happened.

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10. Put the cork back on and put five more pumps of air into the bottle.

11. Explain what happened in the bottle.

_____

12. Explain why this happened.

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13. Predict what will happen when you take the cork off the bottle again when there is high pressure inside the bottle.

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14. Draw a picture below of what happened and label it.

Concept #8
Winter Scenario Pattern of a Traditional Winter Storm*

Basic Weather Elements	Dropping Barometer	Low Barometer	Rising Barometer	High Barometer
Clouds	Cirrus clouds are spotted days earlier in the sky. As the barometer drops, high clouds will form.	Stratus clouds will move in and will stay as long as the barometer stays low.	Stratus clouds will break up then gather continually until the barometer is high.	Skies will clear. Occasional cumulus clouds will appear and disappear.
Wind Direction	The wind usually comes from the south.	The wind will come from the north.	The slight wind could continue to come from the north.	No wind at all or a northwesterly breeze will dominate.
Wind Speed	Wind speed will get stronger and stronger as the barometer keeps dropping.	Strong winds will prevail for a while but will turn light to moderate after the front passes.	The wind speed could be light to moderate.	The wind will be calm or light.
Temperature	The temperature will get warmer because of the south winds.	Temperature will be cooler or cold as long as the barometer is low.	The temperature will still be cooler or cold for a while more.	Will be a gradual warming trend as long as the high pressure is present.
Precipitation	None.	Rain or snow usually will come according to the air temperature.	Rain or snow will be off and on for a while.	None

Remember the barometer predicts what is going to happen in a day or two.
This is what you would expect to happen a day or two later at each of the barometer readings.

Can You Explain What Happened?
October 3rd Through October 9th

Date	Barometer Air Pressure	Thermometer Temperature	Anemometer Wind Speed	Weather Vane Wind Direction	Rain Gauge Rainfall	Ruler Snow fall
October 3	30.15	75 Degrees	10 mph	South	None	None
October 4	29.85	80 Degrees	20 mph	South	None	None
October 5	29.65	85 Degrees	30 mph	South	None	None
October 6	29.55	50 Degrees	20 mph	North	.76 inches	None
October 7	29.85	55 Degrees	10 mph	North	.5 inches	None
October 8	30.00	65 Degrees	5 mph	North	None	None
October 9	30.15	70 Degrees	5 mph	NW	None	None

1. What happened to he temperature when the barometer began to drop?

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2. Why did the temperature do this?

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3. What happened to he wind when the barometer began to drop?

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_____

4. Why did the wind do this?

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