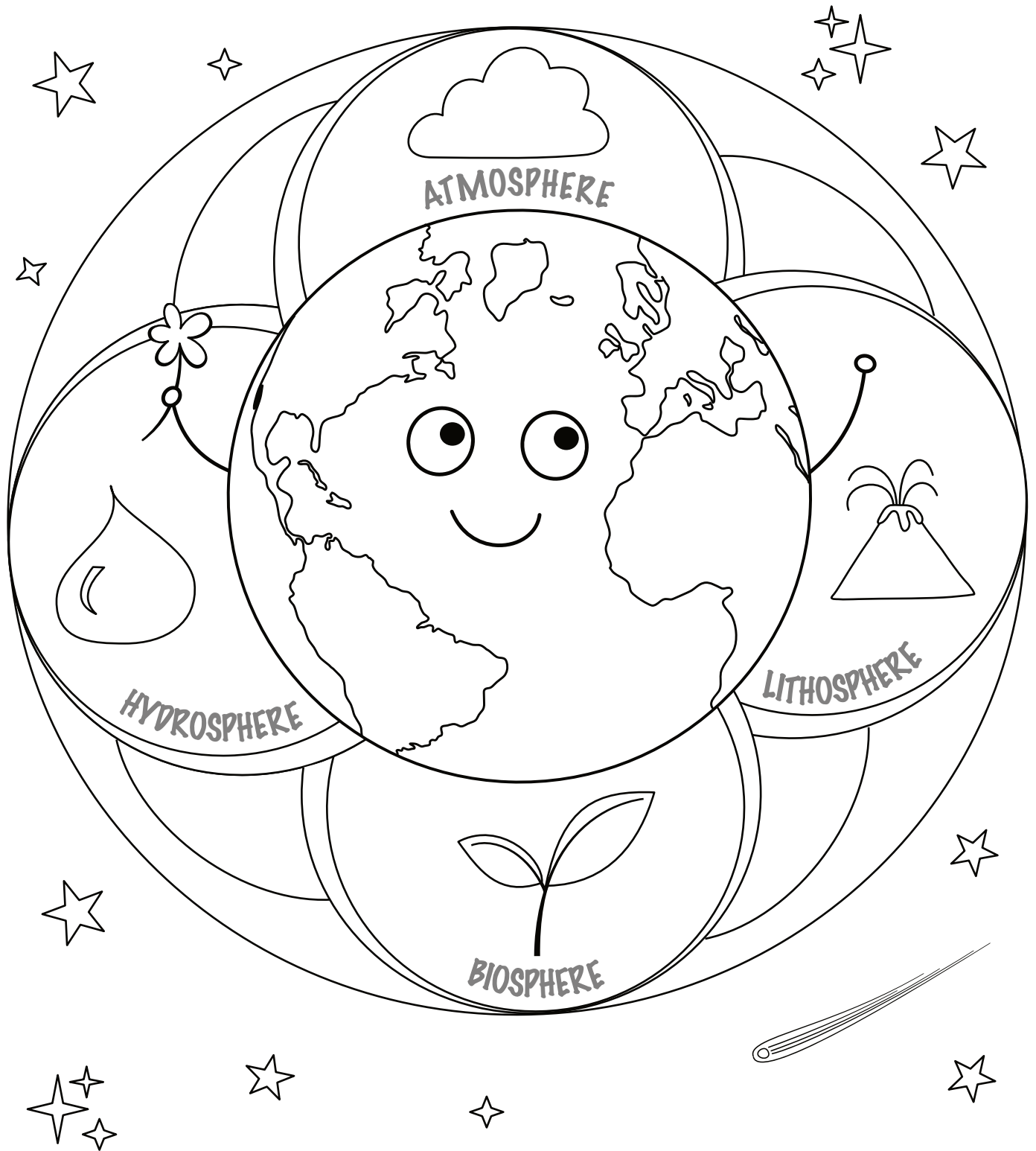


Earth Science



EARTH SCIENCE

~ SPRING 2021 ~

	Date	Topic	NGSS (if applicable)	Page(s)
Week 0	Monday, Jan 11- Friday, Jan 15	Watch the welcome video or join one of our meetups for a face-to-face orientation!		
Week 1	Monday, Jan 18	Holiday - no class		
	Wednesday, Jan 20	What are you breathing?		
	Friday, Jan 22	Art Project: Layers of the atmosphere		
Week 2	Monday, Jan 25	Could you live in a cloud?		
	Wednesday, Jan 27	Predicting weather	4-PS3-1	
	Friday, Jan 29	Science Activity: How do planes fly?	4-PS3-3	
Week 3	Monday, Feb 1	Severe storms		
	Wednesday, Feb 3	Global weather patterns		
	Friday, Feb 5	Gameshow review		
Week 4	Monday, Feb 8	Rainforest biomes	4-LS1-2, 5-ESS3-2	
	Wednesday, Feb 10	Desert biomes	4-LS1-2, 5-ESS3-2	
	Friday, Feb 12	Art Project: Climate Zone Quadramas		
Week 5	Monday, Feb 15	Holiday - no class		
	Wednesday, Feb 17	What caused the ice ages?		
	Friday, Feb 19	Science Activity: Mason Jar Biomes		
Week 6	Monday, Feb 22	The ozone hole		
	Wednesday, Feb 24	Fossil fuels		
	Friday, Feb 26	Gameshow review		
Week 7	Monday, Mar 1	The story of CO ₂		
	Wednesday, Mar 3	The future of climate change		
	Friday, Mar 5	Science Activity: spaghetti bridge	3-5-ETS1-1	
Week 8	Monday, Mar 8	Where do planets come from?	5-ESS1-1	
	Wednesday, Mar 10	Earth's structure	5-ESS1-2, 5-PS2-1	
	Friday, Mar 12	Art Project: Layers of Earth		
Week 9	Monday, Mar 15	How do volcanoes work?		
	Wednesday, Mar 17	Sedimentary rocks	4-ESS2-1	
	Friday, Mar 19	Gameshow review		
Week 10	Monday, Mar 22	Geologic time		
	Wednesday, Mar 24	How are fossils formed?		
	Friday, Mar 26	Science Activity: Candy Rock Cycle	4-ESS2-1	

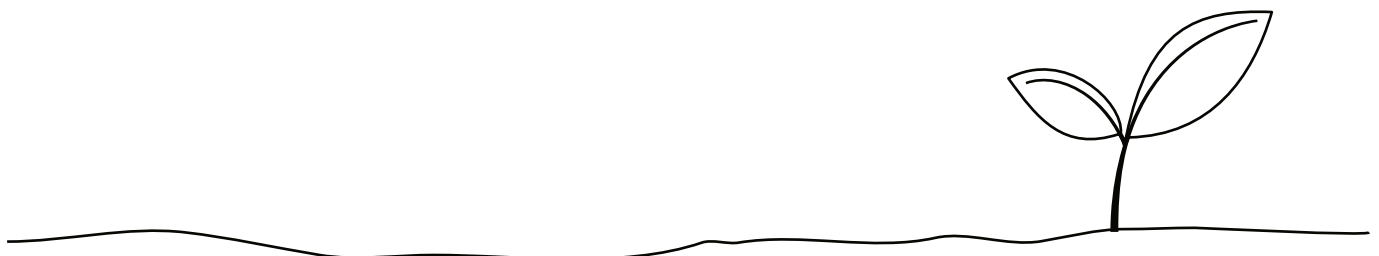


	Date	Topic	NGSS (if applicable)	Page(s)
Week 11	<i>Monday, Mar 29</i>	Spring Break		
	Wednesday, Mar 31			
	Friday, Apr 2			
Week 12	Monday, Apr 5	How to identify rocks		
	Wednesday, Apr 7	Spelunking for coral		
	Friday, Apr 9	Art Project: Moon Phase		
Week 13	Monday, Apr 12	Where is Earth's water?	5-ESS2-2	
	Wednesday, Apr 14	The strangest liquid		
	Friday, Apr 16	Science Activity: Waves	4-PS4-1, 4-PS4-2	
Week 14	Monday, Apr 19	Why are there tides?		
	Wednesday, Apr 21	Ocean currents		
	Friday, Apr 23	Gameshow Review		
Week 15	Monday, Apr 26	The strangest lakes		
	Wednesday, Apr 28	How rivers work		
	Friday, Apr 30	Art Project: Watershed Map	4-ESS2-2	
Week 16	Monday, May 3	Groundwater & Aquifers		
	Wednesday, May 5	Comparing 3 ecosystems	5-ESS2-1	
	Friday, May 7	Gameshow review		

Class is taught live on the above dates at 10:00-10:45 a.m. Pacific / 1:00-1:45 p.m. Eastern time on the Science Mom YouTube channel. The livestreams are only accessible to registered attendees and scholarship recipients. The replays and recordings of the lessons are freely available and can be found at <https://science.mom/earthscience>.

There are 5 art projects and 5 hands-on science activities that can be completed throughout this course. A complete supply list is available on the following page.

Have questions? Contact jenny@science.mom



Supply List for Friday Projects:

January 22 - Layers of Atmosphere

- Paper (cardstock preferred, but any type will work)
- Crayons
- Watercolors or markers
- Gluestick or tape
- Scissors
- Printed template (optional - found in the appendix of these notes)

January 29 - How do Planes Fly?

- Roll of tissue paper
- 3 ping pong balls
- 2 pencils OR a ruler OR another long straight object
- 4 Balloons
- String
- A wooden or paper “helicopter” toy (instructions in the appendix)
- A paper airplane (instructions in the appendix)
- Hair dryer (can substitute a straw if no hairdryer is available)

February 12 - Climate Zone Quadramas

- Cardstock
- Crayons or markers for coloring
- Scissors
- Gluestick or tape
- Printed template (found in the appendix)

Feb 19 - Mason Jar Biomes

- 2 mason jars and lids
- 1 disk of compressed coconut fiber OR 2 cups of potting soil
- ½ cup Gravel
- Food scraps from the kitchen
- 1 bright light that can be placed over one of the jars
- Clover OR alfalfa OR chia seeds

March 5 - Spaghetti Bridge

- A box of thin spaghetti noodles (angel hair and regular spaghetti also work)
- Tape OR Marshmallows
- String and a weight

March 12 - Layers of Earth

- Paper (cardstock preferred, but any type will work)
- Crayons
- Watercolors or markers
- Gluestick or tape
- Scissors
- Printed template (optional - found in the appendix)

March 26 - Candy Rock Cycle

- Skittles or other round candy with a marking on one side (m&ms are a good substitute)
- Starbursts or other chewy candy that has different colors and will soften in the microwave or oven
- Aluminum foil
- Knife or cheese grater
- A stove and pan or a candle and tongs

April 9 - Moon Phases

- Cardstock
- Crayons
- Watercolors or markers
- Printed template (found in the appendix)
- Sidewalk chalk

April 16 - Waves

- 1 lightweight blanket or sheet
- 3 pingpong balls
- 1 slinky

April 30 - Watershed Map

- Crayons or markers
- Printed Template (found in the appendix)

Please note: the supply list is subject to change! A finalized list will be posted on December 1, 2020 when the full notes are published.

Why Earth Science?

Why study Earth Science? Well, Earth is the only place in our solar system where we find **living things**. The animals, plants, fungi, and single-celled organisms that call Earth home have one important thing in common; they each live in and depend on these four spheres:



Atmosphere: all the air surrounding our planet



Lithosphere: all the rocks! The crust of our planet

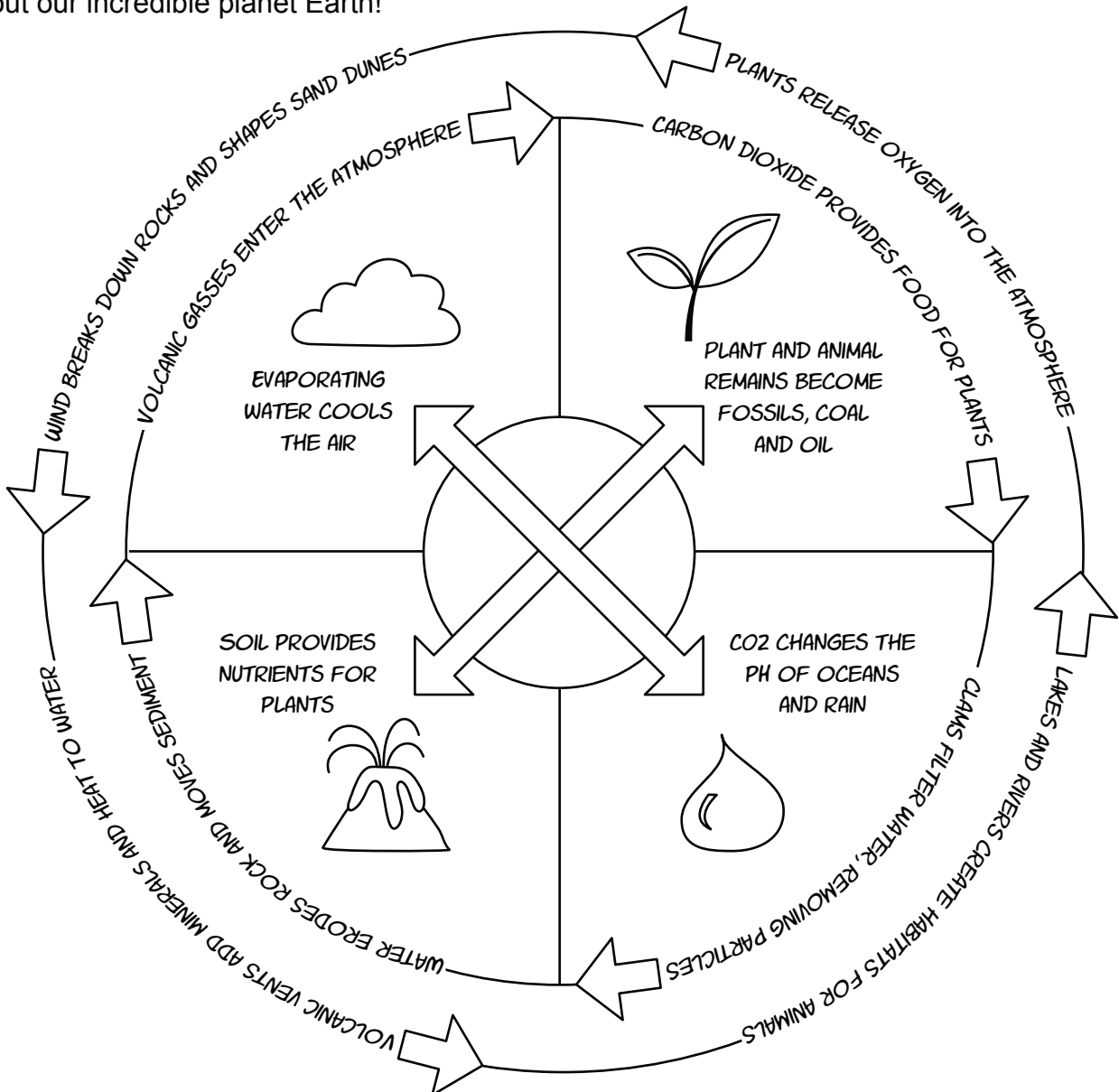


Biosphere: all the living things on planet Earth



Hydrosphere: The water on, under, and above the surface of our planet

Each of these spheres interacts with the others in fascinating ways, and the study of these spheres and their interactions is called *Earth Science*. In this course, we're going to focus our attention on the atmosphere, lithosphere, and hydrosphere. We can't wait to show you more about our incredible planet Earth!



The ATMOSPHERE

Have you ever felt sorry for a fish because it's trapped in a pond and can't walk around on land? Well, we live in air just like fish live in water, only we're too heavy to swim!

Just like a fish can't live without water, we can't live without air, which is a mixture of gases. The layer of gases surrounding a planet is called its atmosphere. Our atmosphere is important for more than breathing. It protects us from radiation, cycles nutrients and heat, and is the source of all our food.

Over the next several weeks, we'll learn exactly what it is that we're breathing and why it's so important for food, climate, weather, and life!

QUICK FACTS:

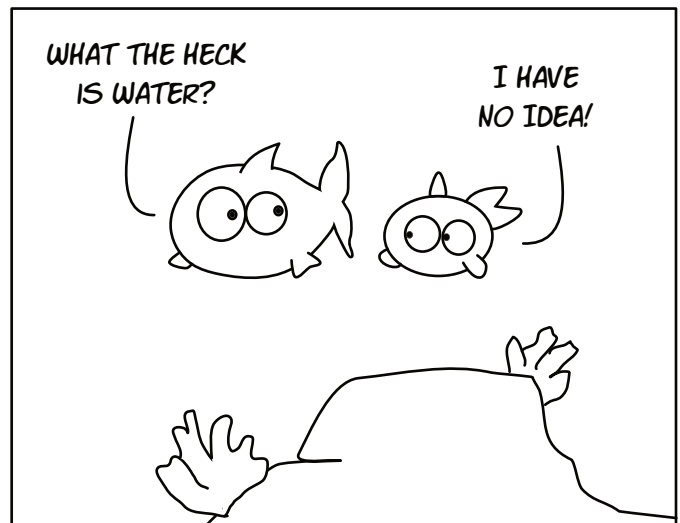
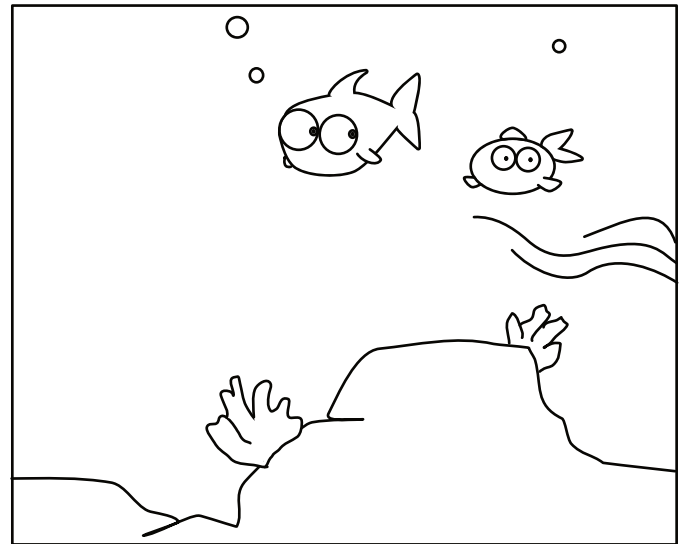
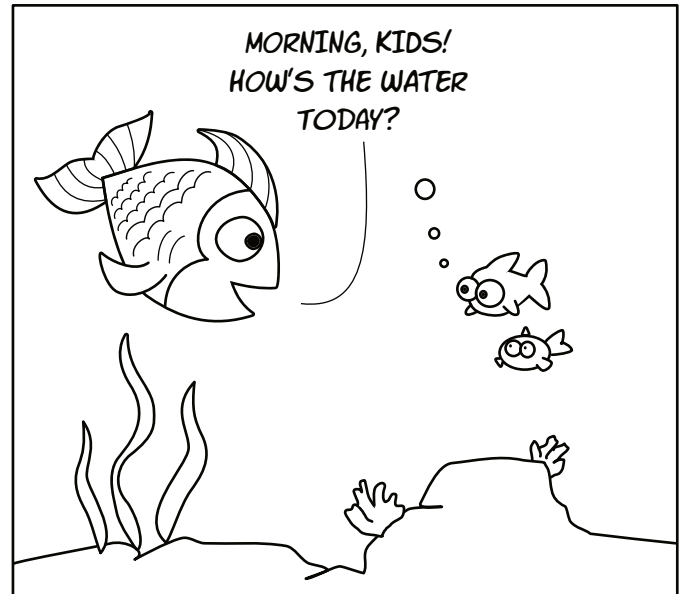
THE ATMOSPHERE IS MADE OF:

Nitrogen: 78%
Oxygen: 20.9%
Argon: 0.9%
Carbon Dioxide: 0.04%
Helium: 0.0005%
Methane: 0.0001%
Ozone: 0.00006%

At any given time there is a significant amount of **water vapor** in the air too. But since the amount of water is constantly changing, it isn't included in percentages of atmospheric gasses.

THE LAYERS ARE:

Troposphere: 1-12 km (1-7 miles)
Stratosphere: 12-50 km (7-31 miles)
Mesosphere: 50-80 km (31-50 miles)
Thermosphere: 80-700 km (50-440 miles)
Exosphere: 700-1,000 km (440-6,200 miles)



GASES of the ATMOSPHERE

Chemical
Formula

Name

YOUR
NOTES

Ar Argon

CH4 Methane

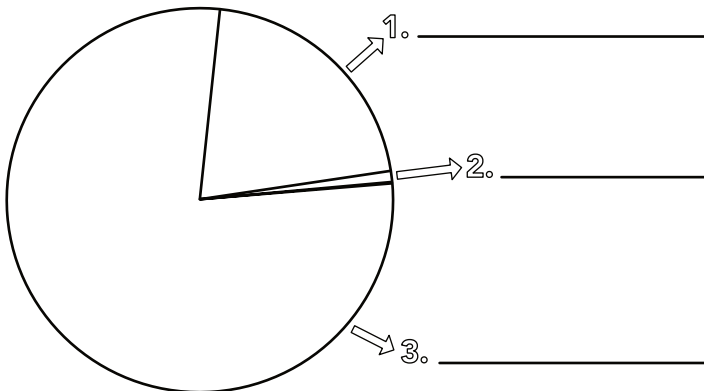
O2 Oxygen

CO2 Carbon Dioxide

N2 Nitrogen

H2O Water Vapor

The 3 most abundant gases in the atmosphere:

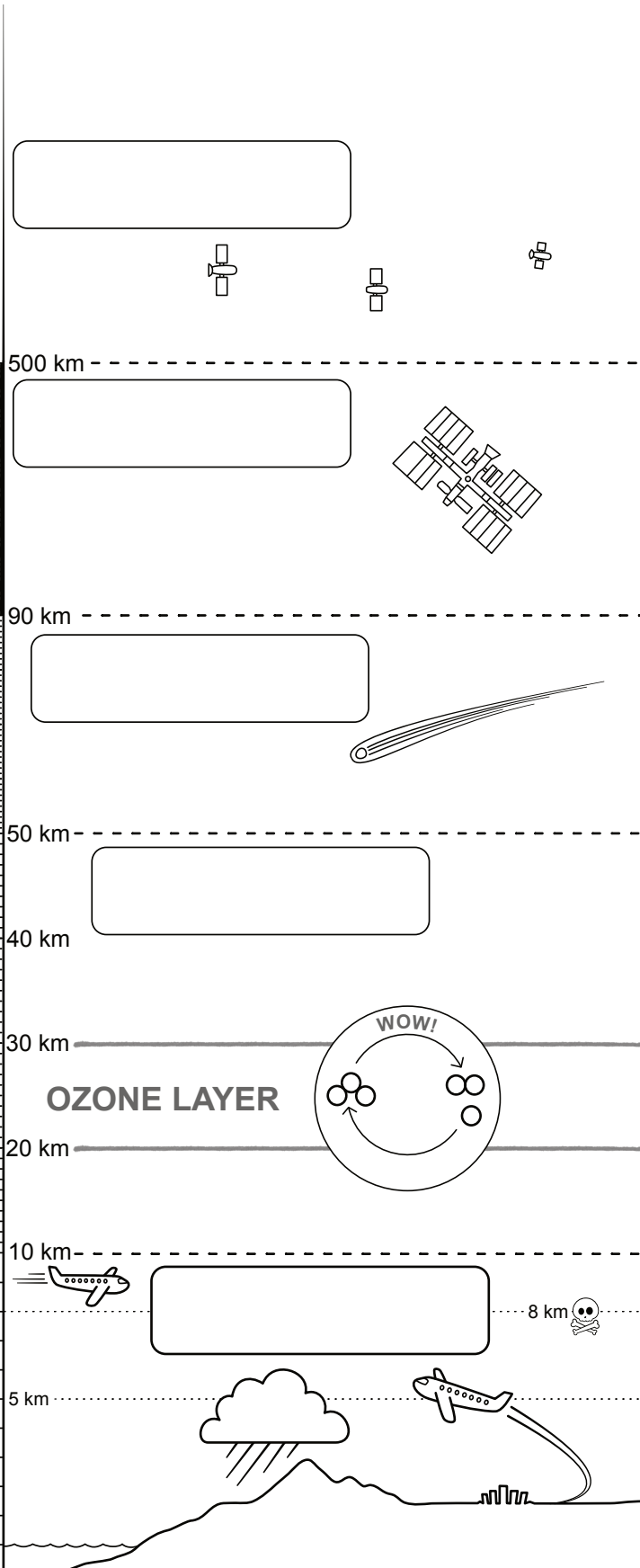


THE MOST IMPORTANT
GREENHOUSE GASES



SCIENCE MOM

LAYERS of the ATMOSPHERE



If our **EARTH** were the size of an **APPLE**

The **ATMOSPHERE** would only be as thick as **THE PEEL.**

COLOR ME RED WHERE THE AIR GETS WARMER AND BLUE WHERE THE AIR IS GETTING COLDER!

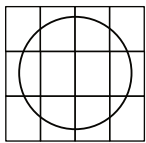
When _____ enter the atmosphere they burn up, creating shooting stars. This happens in the _____.

Ozone is O₃ a molecule that absorbs harmful UV light. The ozone layer is in the _____.

All of our breathable air is in the _____. People can adapt to live anywhere from sea level to ____ km above sea level.

How clouds are made

- Most clouds are made of incredibly small droplets of water.
- These droplets are between 0.001 mm and 0.05 mm in size.
- Raindrops are 0.05 mm and larger, which is MUCH bigger than a water droplet. If the circles you see all around these words were water droplets, then THIS would be the size of a raindrop.
- To draw a raindrop at this scale, you'd need 12 pieces of paper!



 = 1 PIECE OF PAPER

FILL IN THE BLANKS USING THESE WORDS:

gas	water	humidity	precipitation
float	condenses	merge	vapor

When water evaporates it turns into a _____ called _____. The amount of water vapor in the air is called the _____. When water _____ it changes from a gas into a liquid. Clouds are made from water droplets so small that they can _____ in air. If enough water droplets collide with each other, they can _____ to form a raindrop. Raindrops are too heavy to float, so they fall from the sky. This is called _____.

WATER DROPLETS

RAINDROP

THE WATER CYCLE SONG

Sung to the tune of La Cucaracha. Best when performed with hand actions!

Evaporation,

Raise hands in a wavy motion

Condensation,

Clap hands together up high

Precipitation's when it rains,

Bring hands down low

The water goes round

Move hands in a circle

From cloud to wet ground

Move hands in a circle

That's the water cycle song!

Clap three times when done!

CLOUD IN A BOTTLE DEMONSTRATION

Will the cloud appear or disappear?

Increasing the pressure makes the cloud _____.
Decreasing the pressure makes the cloud _____.

Label the arrows! Can you tell which one is evaporation? Which is condensation? Which is precipitation?

Types of clouds

CAN YOU USE THE CLUES
FROM THE PICTURE BELOW
TO FILL IN THE BLANKS
USING THESE WORDS?

stratus cumulus
nimbo alto cirrus

The names of clouds come from latin root words. In latin, the word _____ means rain. _____ means a heap or pile. _____ means to extend, spread out, or cover with a layer. _____ means high or upper air, and the word _____ means a lock of hair or a tuft of horsehair.

High Clouds

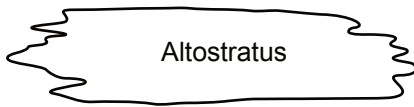
4,000 - 6,000 meters



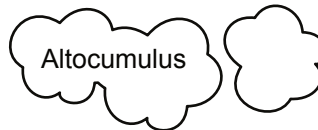
Cirrus

Middle Clouds

2,000 - 4,000 meters



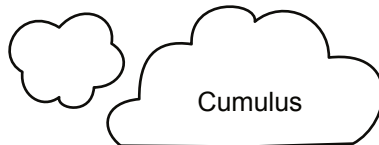
Altostratus



Altocumulus

Low Clouds

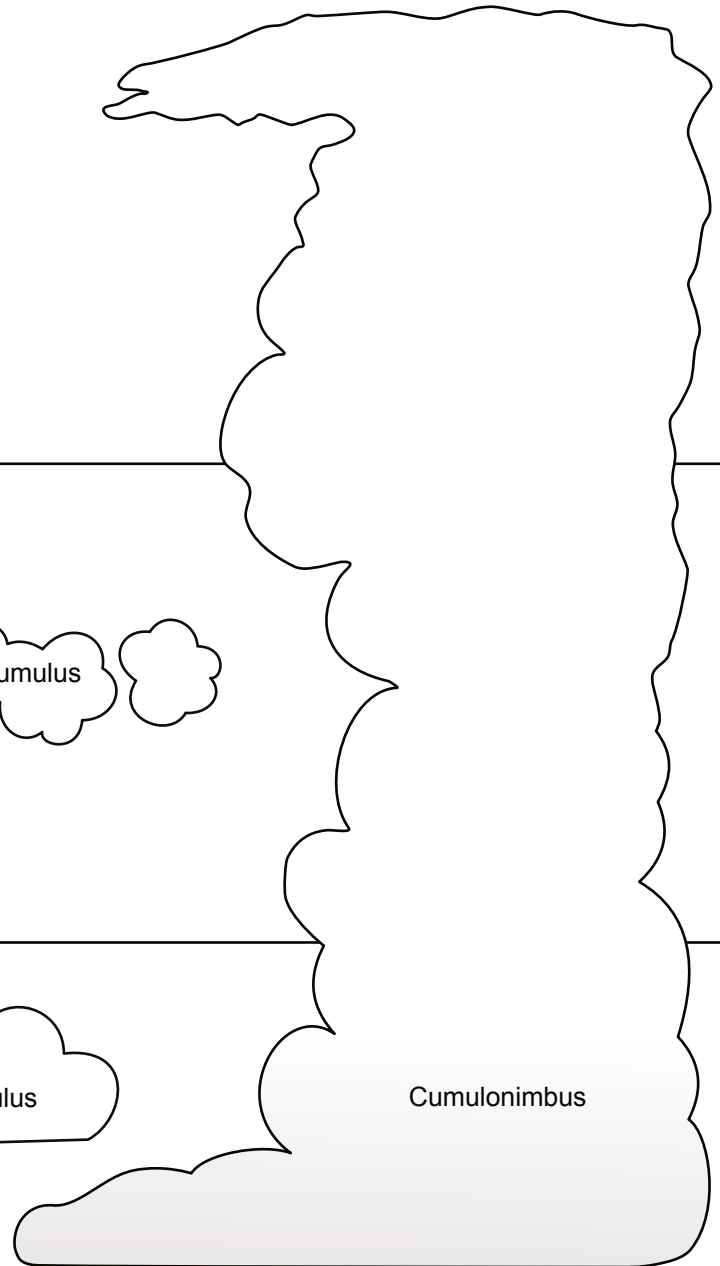
0 - 2,000 meters



Cumulus

Nimbostratus

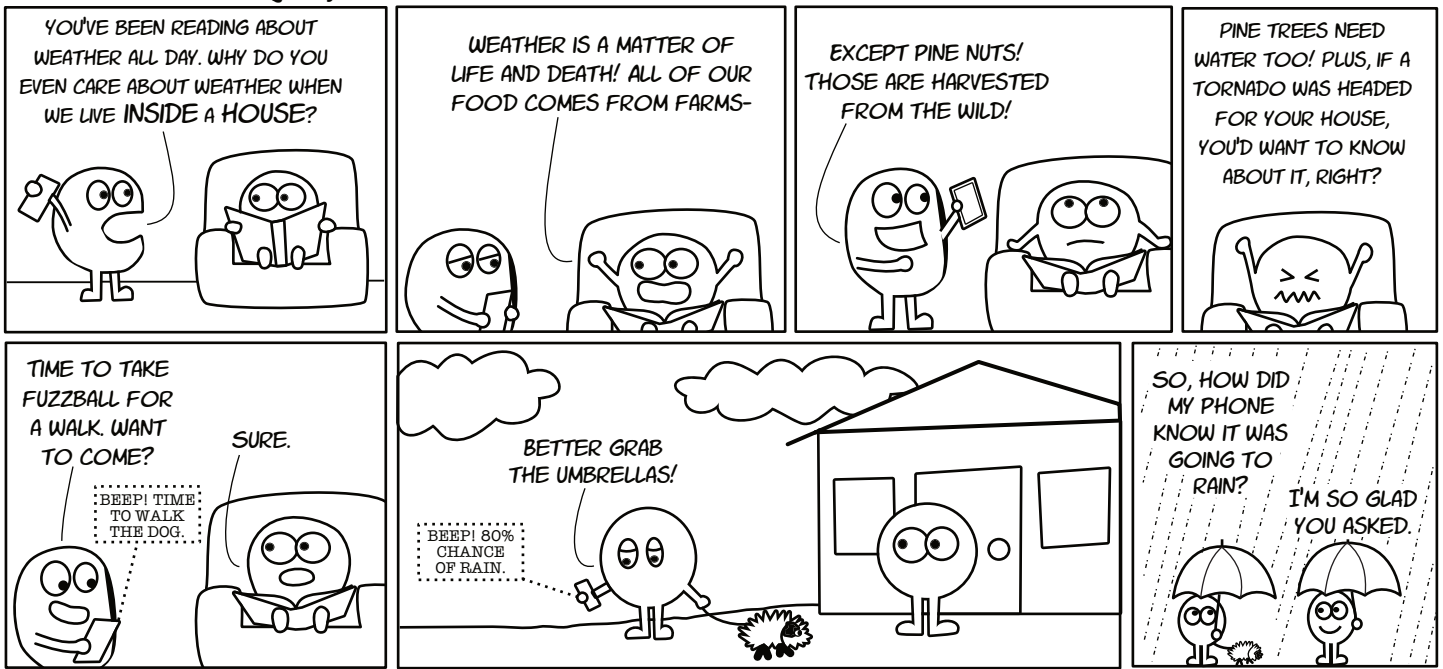
Stratus



Cumulonimbus



Two Globbs and a Dog - by Science Mom



YOUR DOODLE SPACE

Draw your favorite type of weather below, then see if a family member or friend can guess what it is! Is their favorite kind of weather the same as yours?

Your notes: _____

What types of measurements will you find with which type of weather? Take a guess by checking the boxes here, then spend some time observing the weather forecast and see if you notice a pattern!



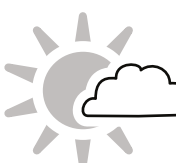
- ☐ HIGH PRESSURE
- ☐ LOW PRESSURE
- ☐ HIGH HUMIDITY
- ☐ LOW HUMIDITY



- ☐ HIGH PRESSURE
- ☐ LOW PRESSURE
- ☐ HIGH HUMIDITY
- ☐ LOW HUMIDITY



- ☐ HIGH PRESSURE
- ☐ LOW PRESSURE
- ☐ HIGH HUMIDITY
- ☐ LOW HUMIDITY



- ☐ HIGH PRESSURE
- ☐ LOW PRESSURE
- ☐ HIGH HUMIDITY
- ☐ LOW HUMIDITY

Making a Forecast

To predict the weather, you need to know where the wind is blowing from and what it's bringing with it. Scientists who study weather (meteorologists) make their predictions by measuring the cloud cover, temperature, humidity, barometric pressure, and wind.

If they gather this information for a large enough area, then they can use models to predict the weather for the next 10 days. But how do you measure the temperature over 500 miles of desert, or the wind that's blowing over an entire prairie?

There are two important ways scientists gather the information they need to predict the weather: from weather stations and satellites.

Then, once they have all of their data, they use computer models to predict what weather will happen next.

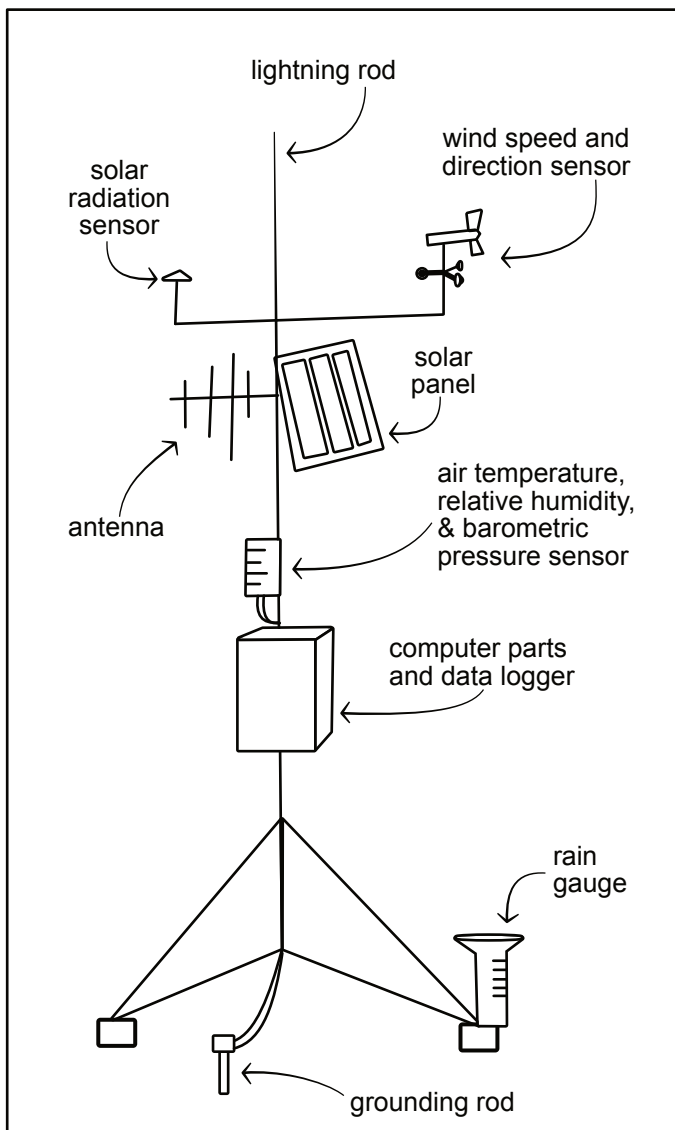
Whether or not the weather is fine,
the wether is staying outside.

BAAAAAA!



BELLWETHER: THE SHEEP THAT LEADS THE FLOCK AND WEARS A BELL AROUND ITS NECK. A TRENDSETTER.

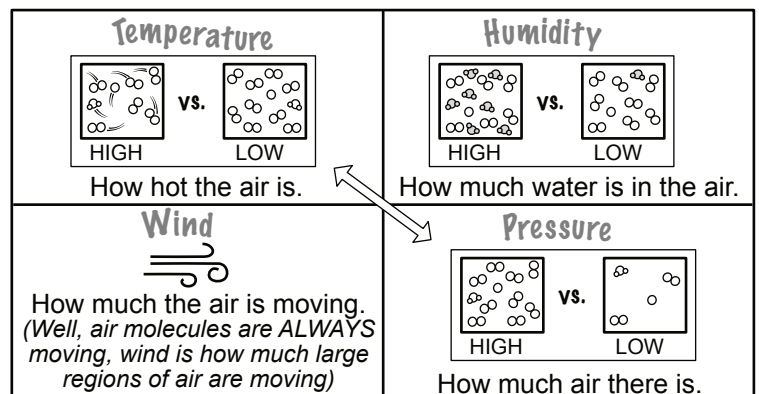
A MODERN WEATHER STATION



FILL IN THE BLANKS USING THESE WORDS:

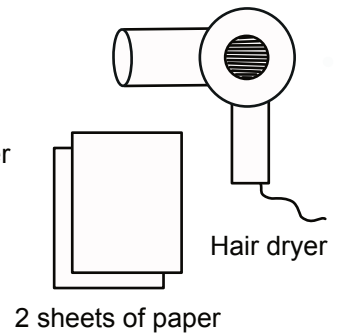
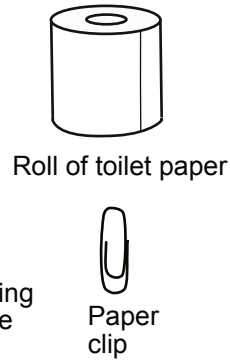
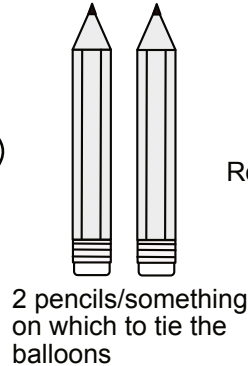
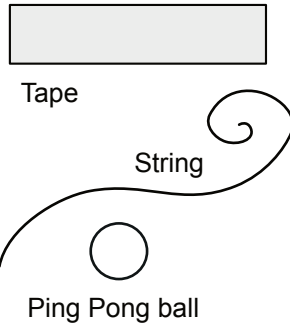
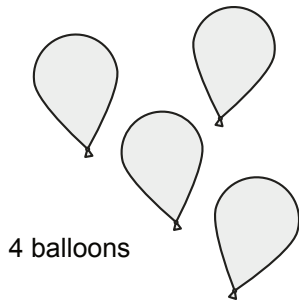
thermometer	anemometer	meter
barometer	hygrometer	

An _____ measures wind speed and direction. Air pressure is measured using a _____. To measure the temperature, use a _____. To measure humidity, a _____ is the tool you'll need. You might have noticed that each of these tools contain the word _____ which means "to measure." A good weather station will have all of these instruments, plus measure cloud cover and rainfall!



Hands-on Activity

MATERIALS:



What does wind do?

- 1: Blow up 2 balloons and tie them off
- 2: Attach string to each
- 3: Suspend the balloons so they are about 4 inches apart
- 4: Circle your prediction
- 5: Try it!
- 6: Draw your results

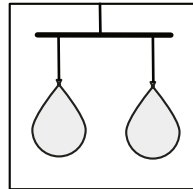
How did your predictions differ from your results?

Does air have weight?

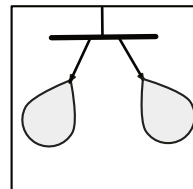
- 1: Attach 2 empty balloons to the pencil with tape
- 2: Suspend the pencil from string so that it is balanced
- 3: Carefully remove one balloon, blow it up and reattach it in the same place
- 4: Circle your prediction
- 5: Draw what happened

How did your predictions differ from your results?

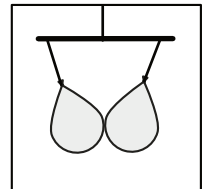
When the wind blows, will the balloons...



Stay the same?



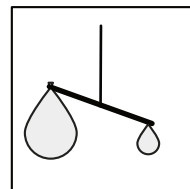
Push apart?



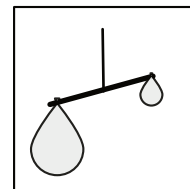
Push together?

Draw what you see!

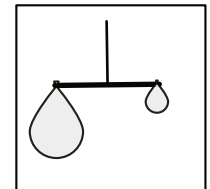
Will the inflated balloon be...



Lighter?



Heavier?



Weigh the same?

Draw what you see!

Helicopter vs Plane

- 1: Build your helicopter and plane. See appendix if you would like directions
- 2: Circle your prediction
- 3: Toss your helicopter and plane from a height
- 4: How do their flight patterns differ?
- 5: Draw your results

How did your predictions differ from your results?

Tissue Trouble

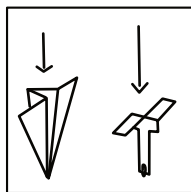
- 1: Circle your prediction
- 2: Hold a tissue roll so that it will unravel away from you
- 3: Use your breath to blow over the top of the roll
- 4: Draw your results
- 5: (Optional) Try it with the hair dryer!

How did your predictions differ from your results?

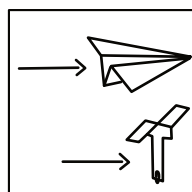
Flying Ping Pong Balls

- 1: Circle your prediction
- 2: Plug in your hair dryer and turn it on
- 3: Carefully place your ball over the air stream
- 4: What happens when you gently tip the dryer?
- 5: Draw what happened

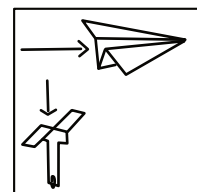
How did your predictions differ from your results?



Fall?



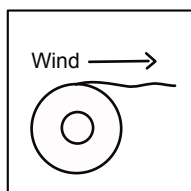
Glide?



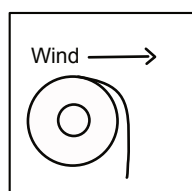
Differ?

Draw what you see!

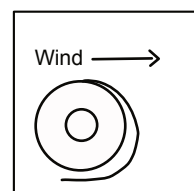
When you blow over the top of a tissue roll...



Lift up?



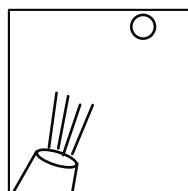
Stay the same?



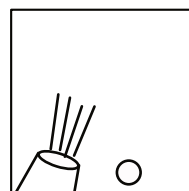
Curve around?

Draw what you see!

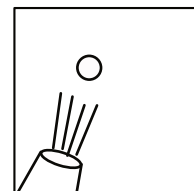
Will the ping pong ball...



Shoot into the air?



Fall to the ground?



Continue hovering?

Draw what you see!
