WATER CLASS

ACTIVITY GUIDE

STEP-BY-STEP INSTRUCTIONS

EXPERIMENTS OVERVIEW

EXPERIMENT 1

BUILD THE RAINBOW

Let’s learn how water moves through the water cycle (evaporation → clouds → rain → runoff)

1 - BUILD THE RAINBOW

SUPPLIES NEEDED

- Craft Mat
- Scissors
- Crayons
- Glue Stick
- Rainbow Popsicle Sticks
- Cotton Pads
- 1 Cardstock

1 - BUILD THE RAINBOW

STEPS

1. Place your cardstock on the craft mat.
2. Draw a big sun, cloud, and ocean using crayons.
3. Glue cotton pads at the top to make clouds- for this, it may be easier to put the glue on the cardstock and then stick your clouds on.
4. Use rainbow popsicle sticks to create a curved rainbow from the clouds to the land.
5. Label your diagram:
    a. Evaporation (water going up)
    b. Condensation (clouds forming)
    c. Precipitation (rain falling)
    d. Runoff (water moving to ocean)
6. Add arrows showing how water moves.
7. Put your name on it!

You might notice that the colors in a rainbow always appear to have an order (red, orange, yellow, green, blue, indigo, violet) because sunlight is made of all of these colors mixed together. When sunlight passes through raindrops, the water bends and splits the colors at different angles based on their wavelength, red bends the least (outside color) and violet bends the most (inside color).

This is the start of the story: water carries everything from land to the ocean.

“Where could pollution enter this system?”

EXPERIMENT 2

ANEMOMETER

Let’s measure wind speed!

2 - ANEMOMETER

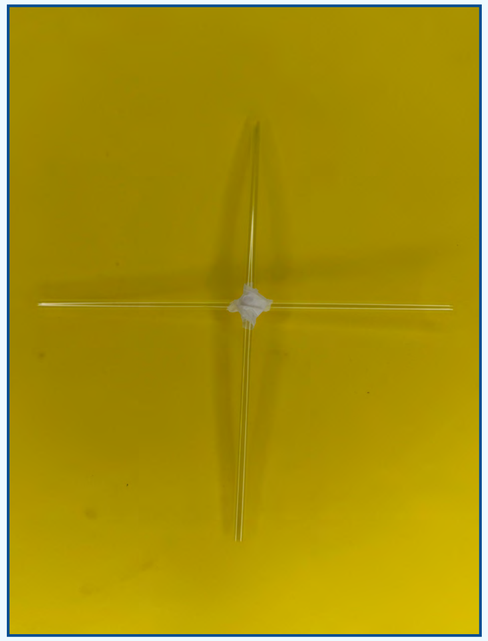
SUPPLIES NEEDED

- Craft Mat
- Scissors
- Crayons
- Tape
- 4 Small Cups (with blue tape)
- 1 Wooden Rod
- 1 Wrapped Blue Straw
- 2 Clear Straws
- Timer
- Binder Clip

2 - ANEMOMETER

STEP 1

Place straws in a cross shape (like a +) and tape them in the middle.

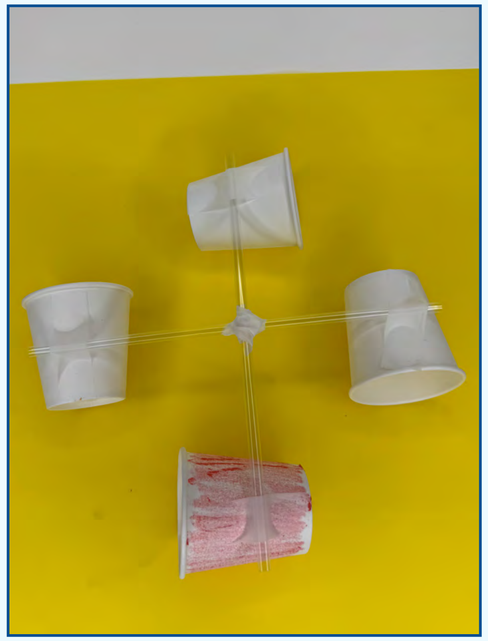


STEP 2

Take 4 small cups, color one of the cups with a bright color, write your name on another cup.

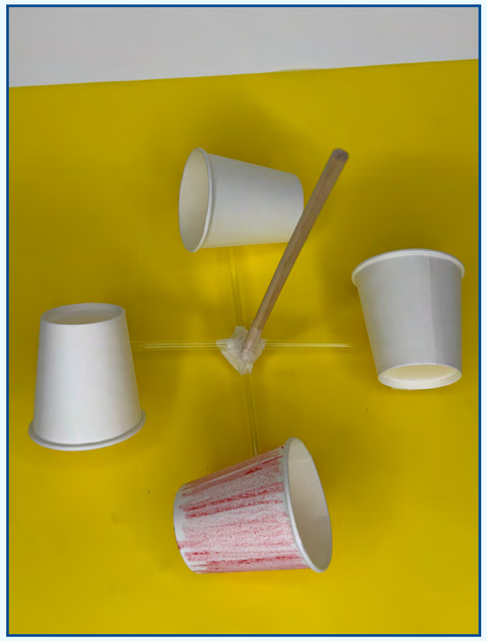
STEP 3

Use tape to attach the cups to the ends of a cross shape in the direction seen in the photo.



STEP 4

Tape the cross to the wooden rod.



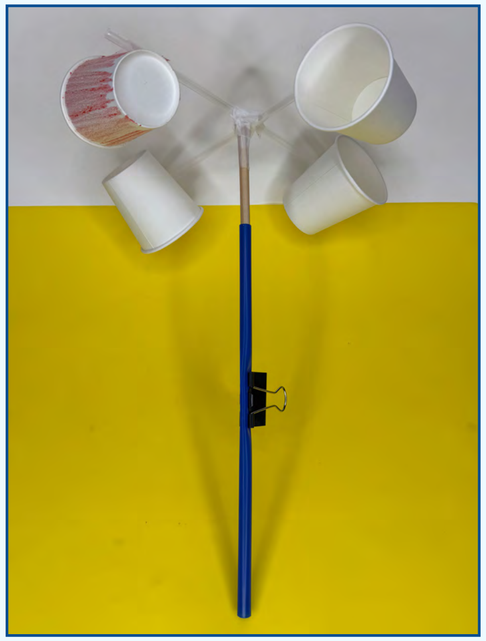
2 - ANEMOMETER

STEP 5

Clip the binder clip to the straw about half way up, pinching the straw as shown in the photo.

STEP 6

Place the bottom of the wooden rod into the straw so it can spin.



STEP 7

Make sure it spins freely.

STEP 8

Go outside and pick 3 different places or the same place at 3 different times.

If you can't go outside, you can blow on it.

STEP 9

Use a timer to count how many spins in 30 seconds (use 10 seconds if you are blowing on it).

2 - ANEMOMETER

Wind shapes landscapes, ocean currents, and helps cause upwelling, which brings nutrients to the ocean surface.

WIND SPEED ESTIMATES

For a 30 second timer:

1-5 Rotations = 3-14 ft per min

5-10 Rotations = 14-29 ft per min

10-30 Rotations = 29-86 ft per min

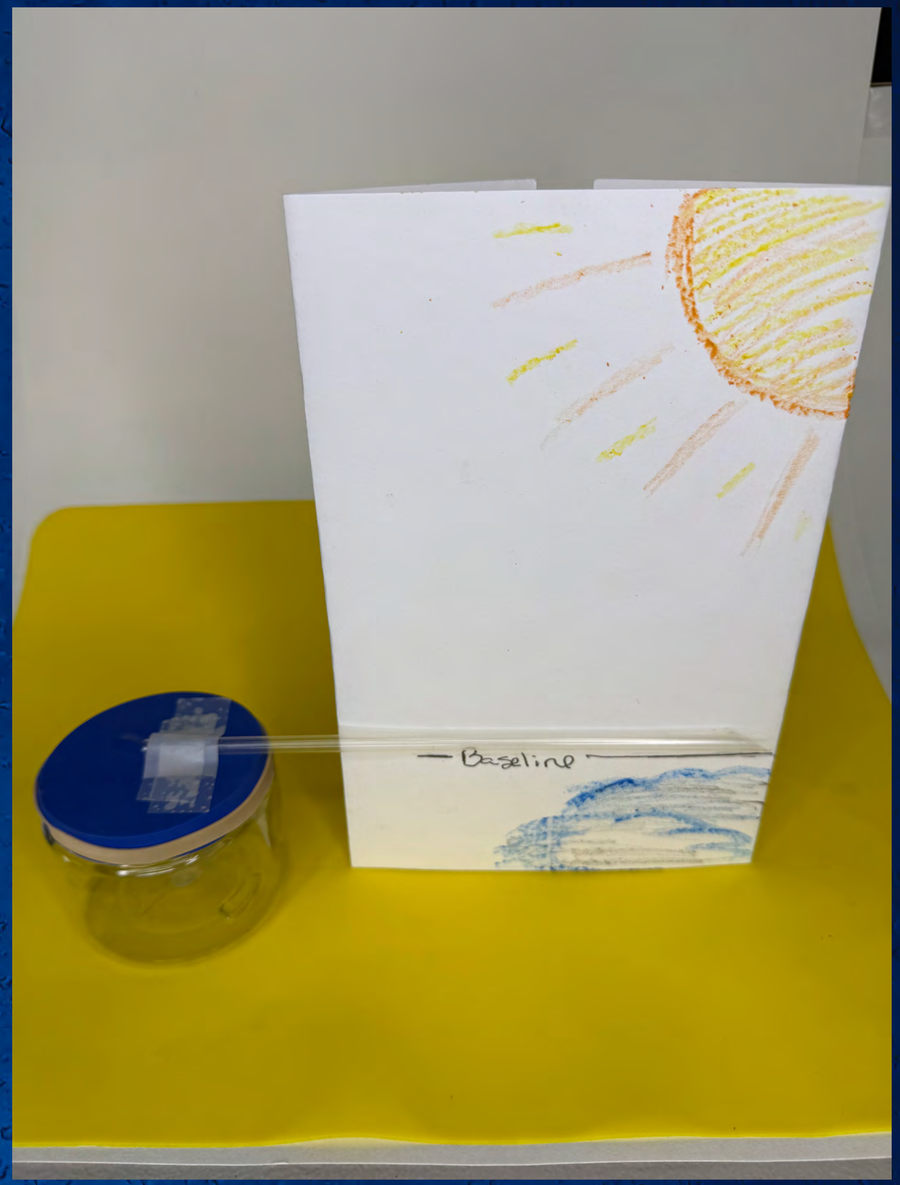
30-60 Rotations = 86-173 ft per min

LOCATION & TIME OF DAY	LENGTH OF TIME	NUMBER OF ROTATIONS	WIND SPEED ESTIMATE

EXPERIMENT 3

BAROMETER

Let’s find out how air pressure and weather are connected!



3 - BAROMETER

SUPPLIES NEEDED

- Craft Mat
- Scissors
- Crayons
- Tape
- 1 6oz Jar
- 1 Balloon
- 1 Rubber Band
- 1 Clear Straw
- Cardstock

3 - BAROMETER

STEP 1

Cut the neck off of the balloon.

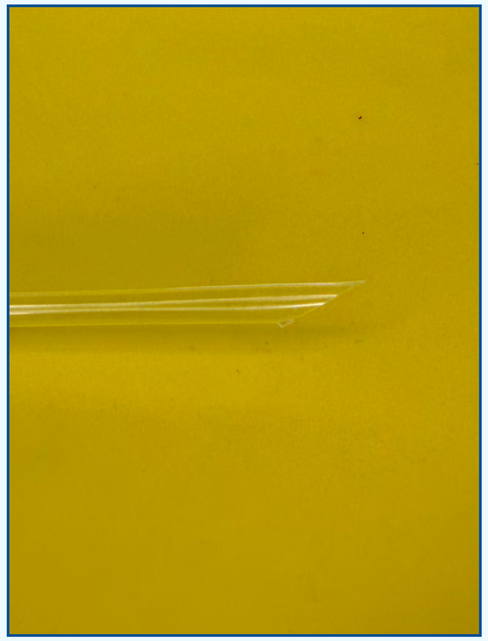
STEP 2

Stretch the balloon tightly over the top of the jar so there are no ripples.

Secure it with a rubber band.

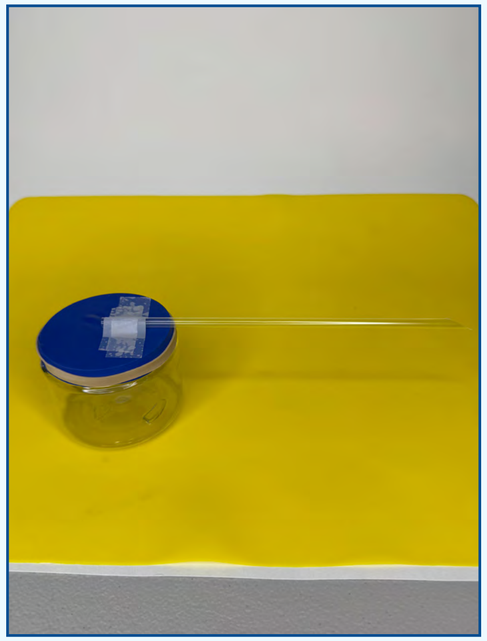
STEP 3

Cut the very end of the straw at a 45 degree angle so the very end is a pointer.



STEP 4

Tape (with 2 pieces) the straw across the top (like a pointer).



3 - BAROMETER

STEP 5

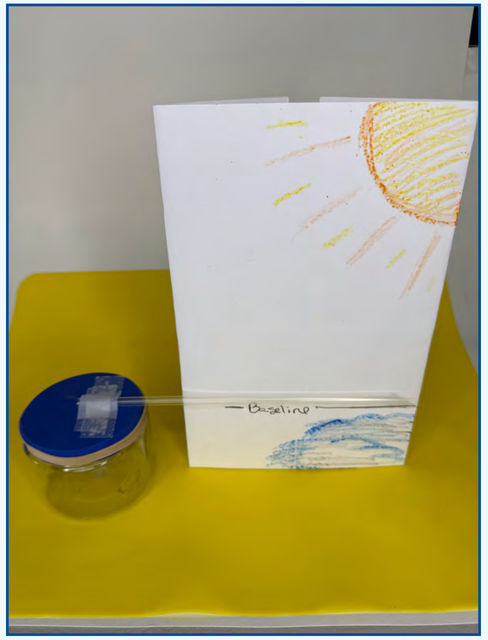
Place cardstock behind it and draw a scale.

STEP 6

Watch the straw – take note where the pointy end of the straw points to and what the weather and temperature are like. Either:

a. Place your barometer in 3 different locations and mark where the straw points at each location

b. Place your barometer in one place and check it 3 different times marking where the straw points at each time



3 - BAROMETER

HIGH PRESSURE

Balloon pushes down, straw rises.

LOW PRESSURE

Balloon dips, straw falls.

Low pressure systems create storms, wind, and ocean mixing.

TIME OF DAY OR LOCATION	READING	WHAT IS THE WEATHER LIKE?

EXPERIMENT 4

THERMOMETER

Let’s find out how temperature affects fluids and density!

4 - THERMOMETER

SUPPLIES NEEDED

- Craft Mat
- Crayons
- 1 – 16oz Bottle
- 1 Clear Straw
- Blue Dye
- Rubbing Alcohol Bottle (100mL)
- Block of Clay
- 8 oz Water

4 - THERMOMETER

STEP 1

Fill bottle halfway with water.

STEP 2

Add the entire bottle of rubbing alcohol.

STEP 3

Add 2 to 3 drops of Blue Dye.

Put the cap on the bottle and gently invert the bottle to mix the blue dye.

STEP 4

Remove cap and insert the straw into the bottle.

Seal around straw with clay. Ensure there are no leaks!

4 - THERMOMETER

STEP 5

Mark starting level on bottle.

STEP 6

Place in warm area.
Watch liquid rise.

STEP 7

Place in cool area.
Watch liquid fall.

STEP 8

Place thermometer in one place outside and check 3 times throughout the day, marking where the liquid is on your straw at each time

4 - THERMOMETER

TEMPERATURE CONTROLS

Air density → wind

Water density → ocean layers

REMEMBER

Warm air and water rises, cold air and water sinks.

TIME OF DAY	READING	WHAT IS THE WEATHER LIKE?

EXPERIMENT 5

DIY WATER FILTER

Let’s see how the Earth (and humans) clean water!

5 - DIY WATER FILTER

SUPPLIES NEEDED

- Craft Mat
- Scissors
- Crayons
- Tape
- Water Bottle that's provided
- 1 – 8oz Cup
- 6oz Water
- 1 Stir Stick
- Kitty Litter
- 3 Coffee Filters
- Gravel
- Aquarium Sand
- Activated Charcoal
- Alum

5 - DIY WATER FILTER

STEP 1

With scissors, carefully puncture your water bottle about half of the way from the bottom.

Cut the water bottle in half (hamburger style) starting where you punctured the bottle (use as funnel).

STEP 2

Put you finger in the middle of ONLY ONE (the rest are extra) coffee filter and wrap it around your finger.

Place coffee filter in the top half of the bottle (see photo).

Open coffee filter to line the bottle (making a cup inside the top of the water bottle).

STEP 3

Set the top of the bottle (your water filter) inverted into the bottom (where you will catch your filtered water).

STEP 4

Layer filter materials inside in the following order (choose your amounts):

- Activated charcoal (1/4–1/2 of the bag)
- Sand (1/4–1/2 of the bag)
- Gravel (entire bag)
- Alum (just a little scoop, ~1/2 Tbsp)

5 - DIY WATER FILTER

STEP 5

Mix dirty water using:

- Water + kitty litter + 1-2 drops of blue dye
- Then let the big particles fall and settle down to the bottom

STEP 6

Remove the cap.

STEP 7

Pour dirty water through the filter slowly so the clumps of kitty litter do not come out and make sure your dirty water goes inside the coffee filter and not in between the coffee filter and the bottle.

STEP 8

Observe how water changes.

5 - DIY WATER FILTER

Water looks cleaner, but is it fully safe?

The soil and rocks below us do a lot to treat stormwater but sometimes stormwater is diverted to pipes or cannot absorb into the ground. Not all pollution is removed before reaching the ocean.

This connects directly to:
→ runoff → pollutants → ecosystems

Our treatment plants take these processes further when treating our wastewater and treating water for drinking water by using advanced treatment which also removes harmful bacteria from water.

So…Would you drink this water you've filtered? Why or why not?

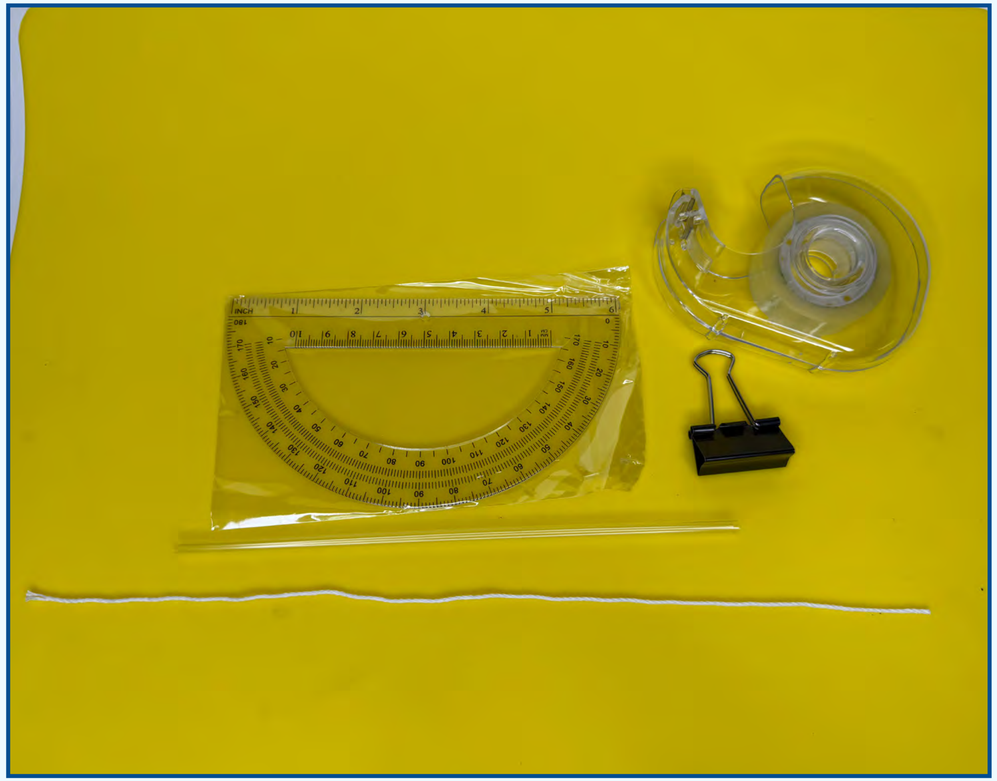
COLOR AND CLARITY OF DIRTY WATER	NOTES ON HOW YOU DESIGNED YOUR FILTER	COLOR AND CLARITY OF WATER AFTER GOING THROUGH YOUR FILTER

EXPERIMENT 6

CLINOMETER

Let’s measure angles and estimate the slope or height of something!

6 - CLINOMETER



SUPPLIES NEEDED

- Craft Mat
- Tape
- Protractor
- String
- 1 Clear Straw
- Binder Clip

6 - CLINOMETER

STEP 1

Place your protractor flat on the craft mat.

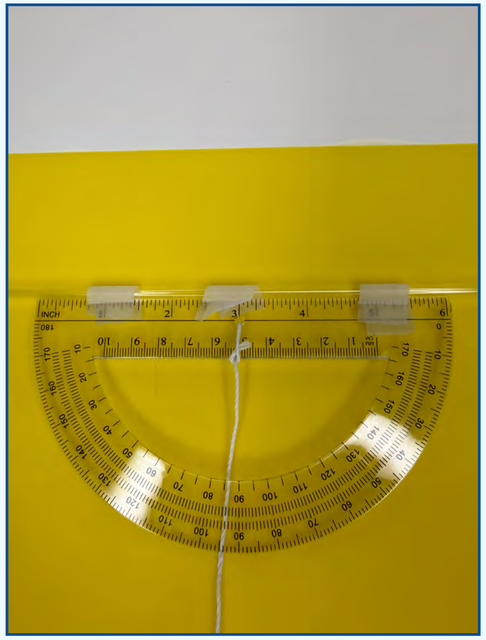
STEP 2

Tape the clear straw along the straight edge of the protractor.

This is what you will look through.

STEP 3

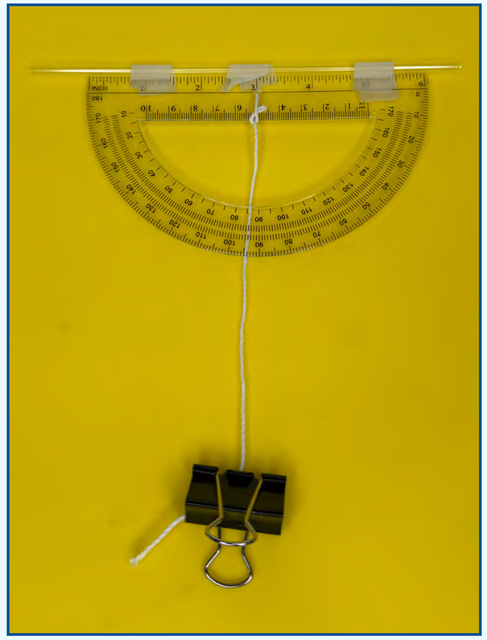
Tie one end of the string through the small hole in the middle of the protractor.



STEP 4

Attach the binder clip to the bottom end of the string.

This acts like a weight.



STEP 5

Hold the clinometer so the straw is level with your eye.

Look through the straw at the top of a tree, building, or wall.

Keep the clinometer steady and let the string hang straight down.

Read the number where the string crosses the protractor.

That is the angle.

Compare angles from different objects or from different distances.

6 - CLINOMETER

WHAT TO WATCH FOR

A taller object usually gives a bigger angle if you are standing close.

A steeper hill or slope means water will move faster downhill.

WHY IT MATTERS

Scientists use tools like this to understand slope, and slope helps predict:

- runoff speed
- erosion
- flooding
- where pollution may travel

Let's see what happens when we have:

- gentle slope
- steep slope

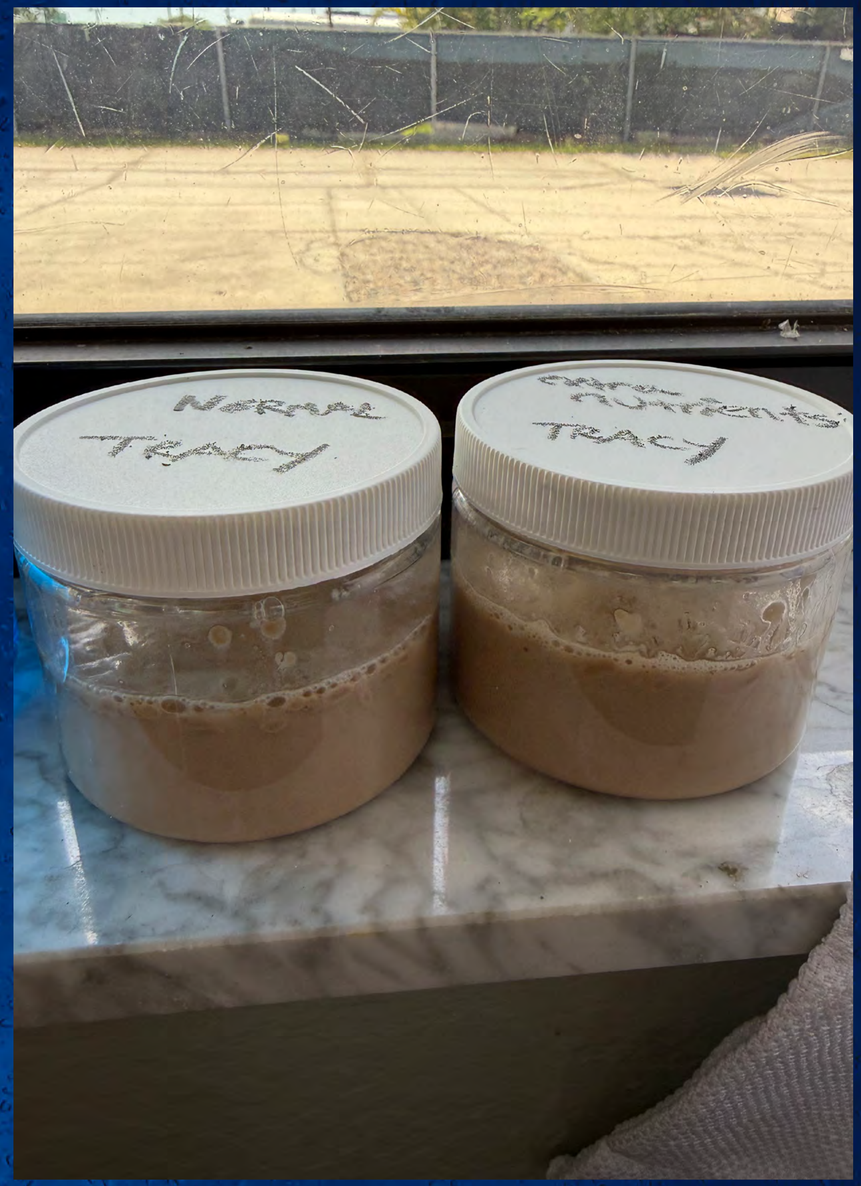
Which one would flood faster?

LOCATION	ANGLE	WOULD WATER FLOW FAST OR SLOW?

EXPERIMENT 7

ALGAE BLOOM

Learn how extra nutrients can help living things grow very fast!



7 - ALGAE BLOOM

SUPPLIES NEEDED

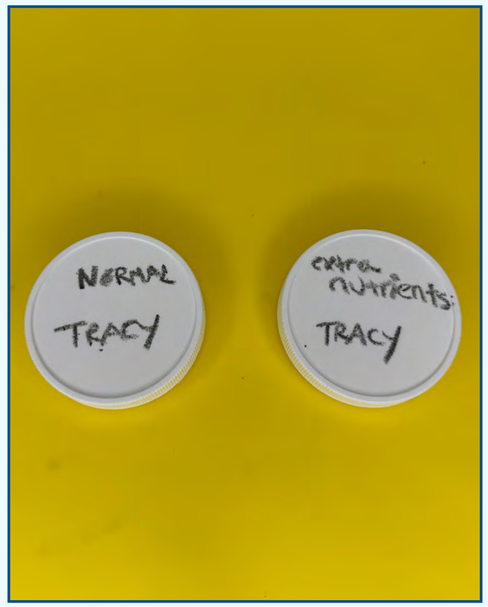
- Craft Mat
- Scissors
- Crayons
- 2 - 6oz Jars
- 8 oz Water
- 1 Yeast Packet
- 1 Plant Food Packet

7 - ALGAE BLOOM

STEP 1

Put the two jars on the craft mat.

Label one jar Normal and the other Extra Nutrients and put your name on them.



STEP 2

Pour the same amount of water into both jars.

STEP 3

Open the packet of yeast with scissors and pour 1/2 of the pouch into each cap, once about equal amount of yeast in each cap, then pour into each jar.

The yeast is acting as a fast-growing living thing, like algae.

STEP 4

Open the packet of plant food with scissors and pour half of the plant food only into the Extra Nutrients jar.

Cover each jar tightly.

7 - ALGAE BLOOM

STEP 5

GENTLY shake the jars.

STEP 6

Place both jars in the same warm spot.

Observe the jars over time.

STEP 7

Compare the jars after 5, 10, and 15 minutes.

STEP 8

After your last observation, unscrew the jars to release built up pressure and reseal the jars.

WHAT TO WATCH FOR

- The jar with extra nutrients may grow cloudier or more active faster.
- More nutrients often mean faster growth.

In the ocean, too many nutrients can help algae grow too fast and create an algae bloom.

Remember, this is a model, not real ocean algae.

TIME	WHAT DO YOU SEE?	WHAT ARE THE DIFFERENCES?

EXPERIMENT 8

ECOSYSTEM BALANCE

Let’s learn how ecosystems stay in balance and how changing one part can affect everything else.

8 - ECOSYSTEM BALANCE

SUPPLIES NEEDED

- Craft Mat
- Tape
- Glue stick
- 2 Jumbo Popsicle Sticks
- 4 Small Cups
- Wooden Triangle
- Marine Figures

8 - ECOSYSTEM BALANCE

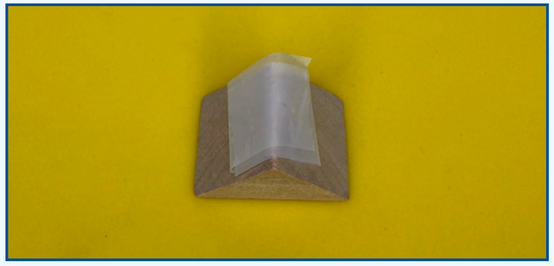
STEP 1

Cross the popsicle stick (like a +) and glue first, then tape them to stay together in the middle (see photo).

Tape one small cup on the end of each side of each popsicle stick (see photo).

STEP 2

Place the wooden triangle on the craft mat. Fold a piece of tape and place it on the pointy peak of the wooden triangle



STEP 3

Balance the middle of the jumbo popsicle stick cross across the top of the triangle.

8 - ECOSYSTEM BALANCE

STEP 4

Add marine figures to cups so the scale is balanced.

Talk about what the figures represent:

Algae, Fish, Sea Lions, Other Ocean Life.

STEP 5

Now remove one figure from one side.

Watch what happens to the balance.

STEP 6

Add too many figures to one side and observe again.

Try different combinations.

Talk about how changing one part of the ecosystem affects the whole system.

WHAT TO WATCH FOR

A balanced scale represents a balanced ecosystem.

When one side changes too much, the system tips.

Ocean ecosystems depend on:
Enough Food, Healthy Habitats, Balance Between Species

If one part changes, many other parts can change too.

What happens if fish disappear?

What happens if algae grow too much?

What happens if predators get sick?

SETUP	NOTES	TAKEAWAY

EXPERIMENT 9

CARTESIAN DIVER

Let’s learn how pressure can change whether something floats or sinks.

9 - CARTESIAN DIVER

SUPPLIES NEEDED

- Craft Mat
- Scissors
- 1 – 16oz Bottle
- Magic Jellyfish
- 16 oz Water
- Blue Dye

9 - CARTESIAN DIVER

STEP 1

Fill the 16oz bottle almost all the way with water.

Add one drop of blue dye.

STEP 2

Place the magic jellyfish into the bottle.

Make sure the jellyfish floats near the top.

STEP 3

Put the cap on the bottle tightly.

Hold the bottle with both hands.

Gently squeeze the bottle.

Watch the jellyfish sink.

Let go of the bottle.

Watch the jellyfish rise again.

WHAT TO WATCH FOR

Squeezing the bottle increases pressure.

Increased pressure changes the air inside the diver, making it sink.

When pressure is released, it floats again.

Pressure affects both air and water. It helps explain how fluids behave in science and nature.

What will happen before squeezing?

What will happen when pressure is released?

9.1

LEARN HOW TO READ A MAP

SUPPLIES NEEDED:

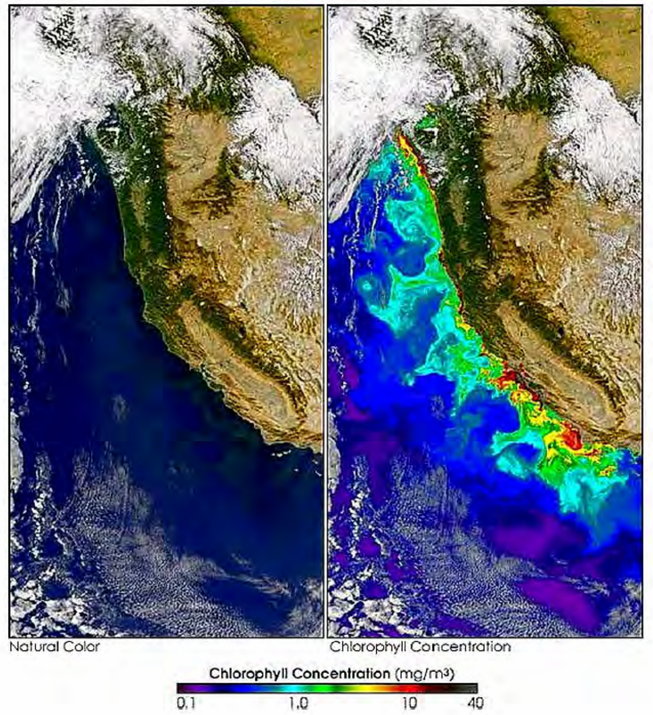
- Printed Satellites Map

WATER CLASS

SATELLITE MAP ACTIVITY

Learn How to Read a Map!

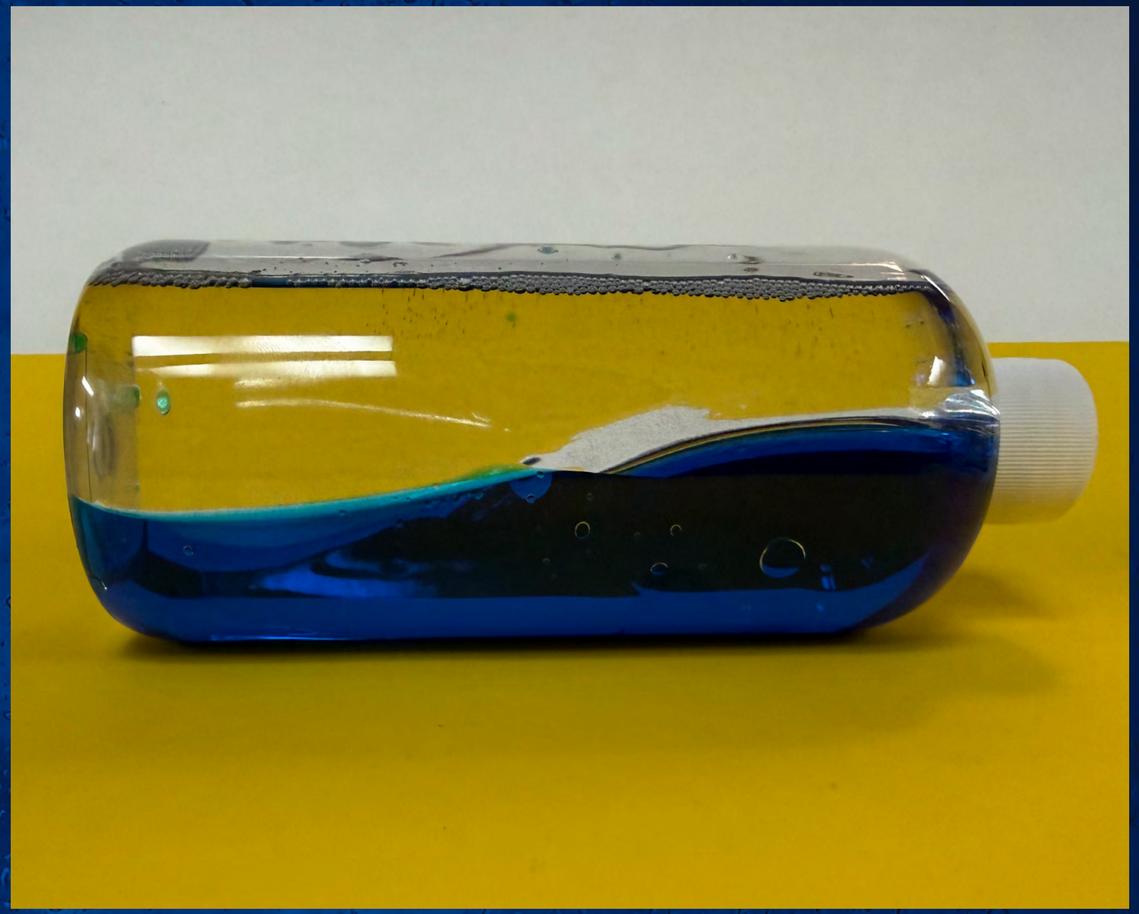
Step 1: Look at the **satellite image** of the ocean: Colors show what's happening in the ocean.



EXPERIMENT 10

WAVES IN A BOTTLE

Let’s see how waves move through water and how different liquids can form layers.



10 - WAVES IN A BOTTLE

SUPPLIES NEEDED

- Craft Mat
- 1 – 16oz Bottle
- Bottle of Baby Oil
- 8 oz Water
- Blue Dye

10 - WAVES IN A BOTTLE

STEP 1

Pour the entire bottle of baby oil into the bottle (fill about half way).

STEP 2

Slowly pour in the water until the bottle is nearly full.

Add a few drops of blue dye and swirl very gently so as to not mix the oil and water layer.

Put the cap on tightly.

STEP 3

If there was mixing of the oil and water layer, wait for the oil and water to separate.

10 - WAVES IN A BOTTLE

STEP 4

Hold the top of the bottle with one hand and the bottom of the bottle with the other and turn the bottle sideways.

STEP 5

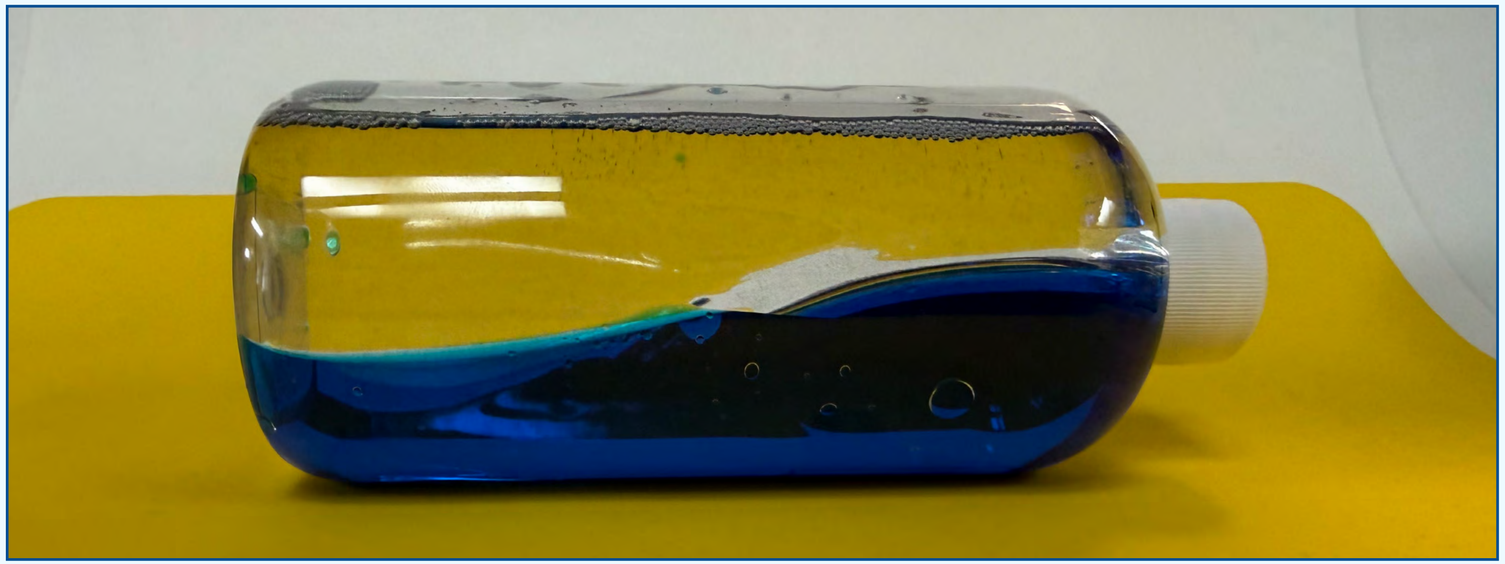
Gently rock the bottle back and forth.

Watch the waves move through the liquids.

Try making small waves.

Try making bigger waves.

Observe how the oil and water stay in layers.



WHAT TO WATCH FOR

- Water and oil do not mix well.
- The wave shape changes depending on how fast you move the bottle.
- Waves carry energy through water.

In the ocean, wind transfers energy to the water and creates waves.

Did the water move more with gentle rocking or fast rocking?

What do real ocean waves need in order to form?

WATER CLASS