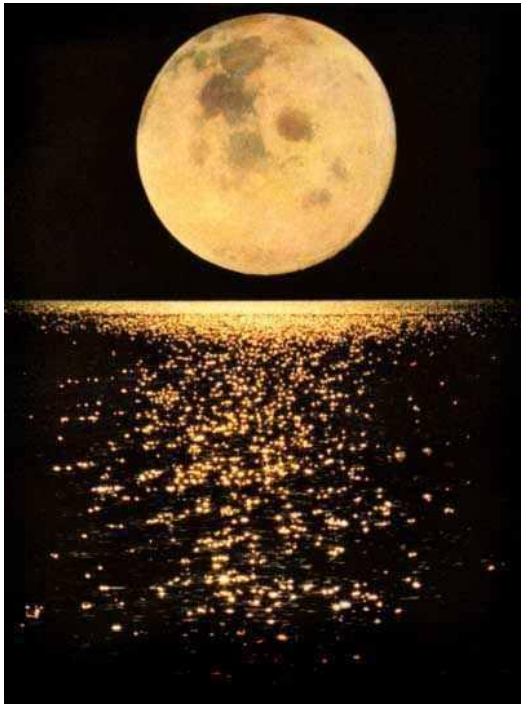
YouthCity!

Science, Engineering, Technology & Math

Water Wonders (Oceans)



What do you see?

Class Structure

Week #1: Intro to Oceans and Human Impact

- Discussion: what do we know about oceans?
- Ocean names game
- Globe toss activity
- Salt water tasting activity
- Human Impact discussion and activity
- Great Pacific Garbage Patch

Week #2: Ocean Geography and Plate Tectonics

- Discussion: what does the bottom of the ocean look like? Vocab
- Mariana Trench video
- Plate tectonic discussion
- Plate tectonic puzzle competition
- Clay formation and peer-teach

Week #3: Ocean Movement

- Discussion: how does the ocean move?
- Tides, waves and currents
- Make your own waves!

Week #4: Volcanoes, Earthquakes and Tsunamis

- Review plate boundaries
- Seismic wave activity
- Volcano videos
- Make a volcano!

Week #5: Ocean Zones

- Learn about each zone
- Do your own research!
- Create poster
- Penny activity, cold water activity

Week #6: Make Your Own Ocean Creature

Week #1: Introduction to Oceans and Human Impact

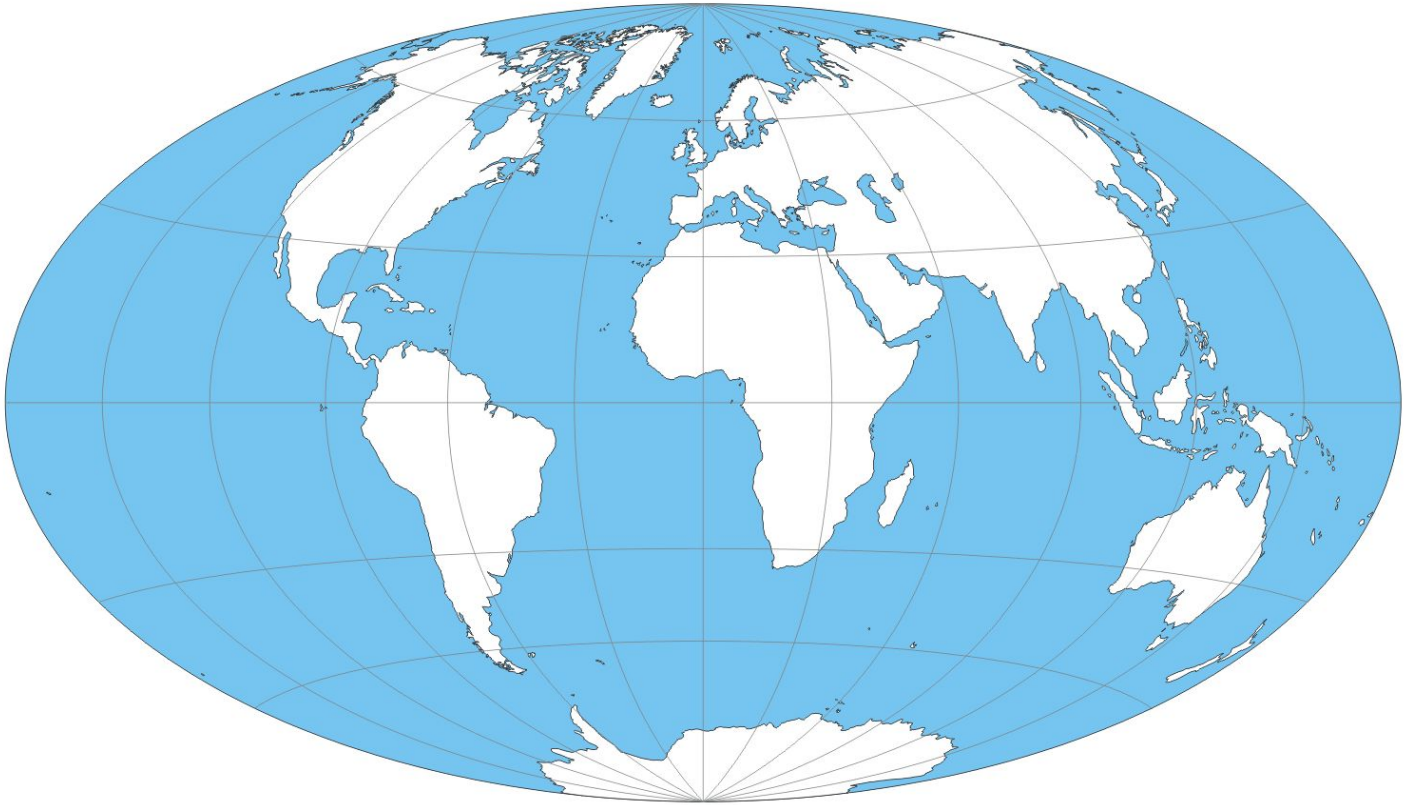
Let’s talk about the ocean!

Has anyone been to an ocean?

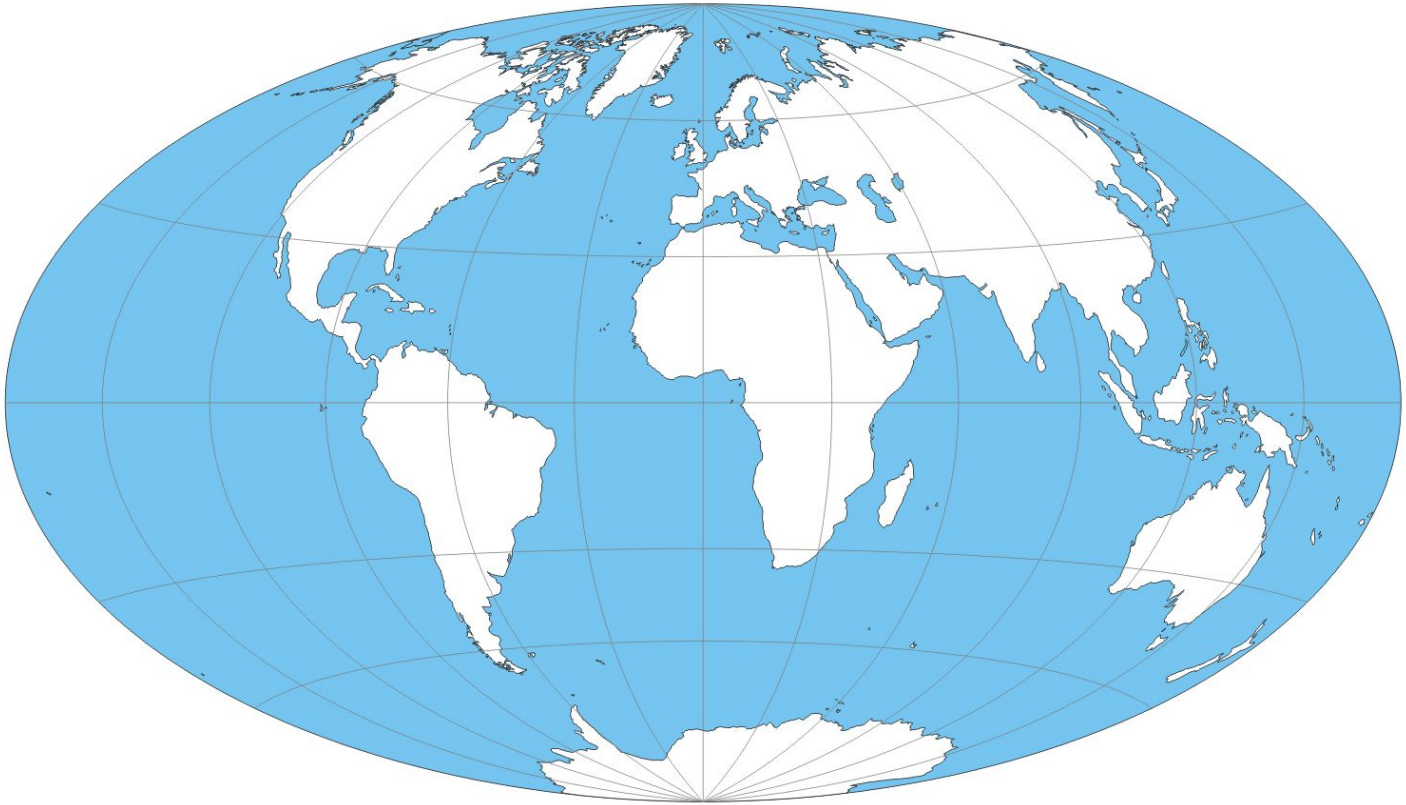
What did it look like?
Taste like?
Smell like?
Feel like?

What else do you know about the ocean?

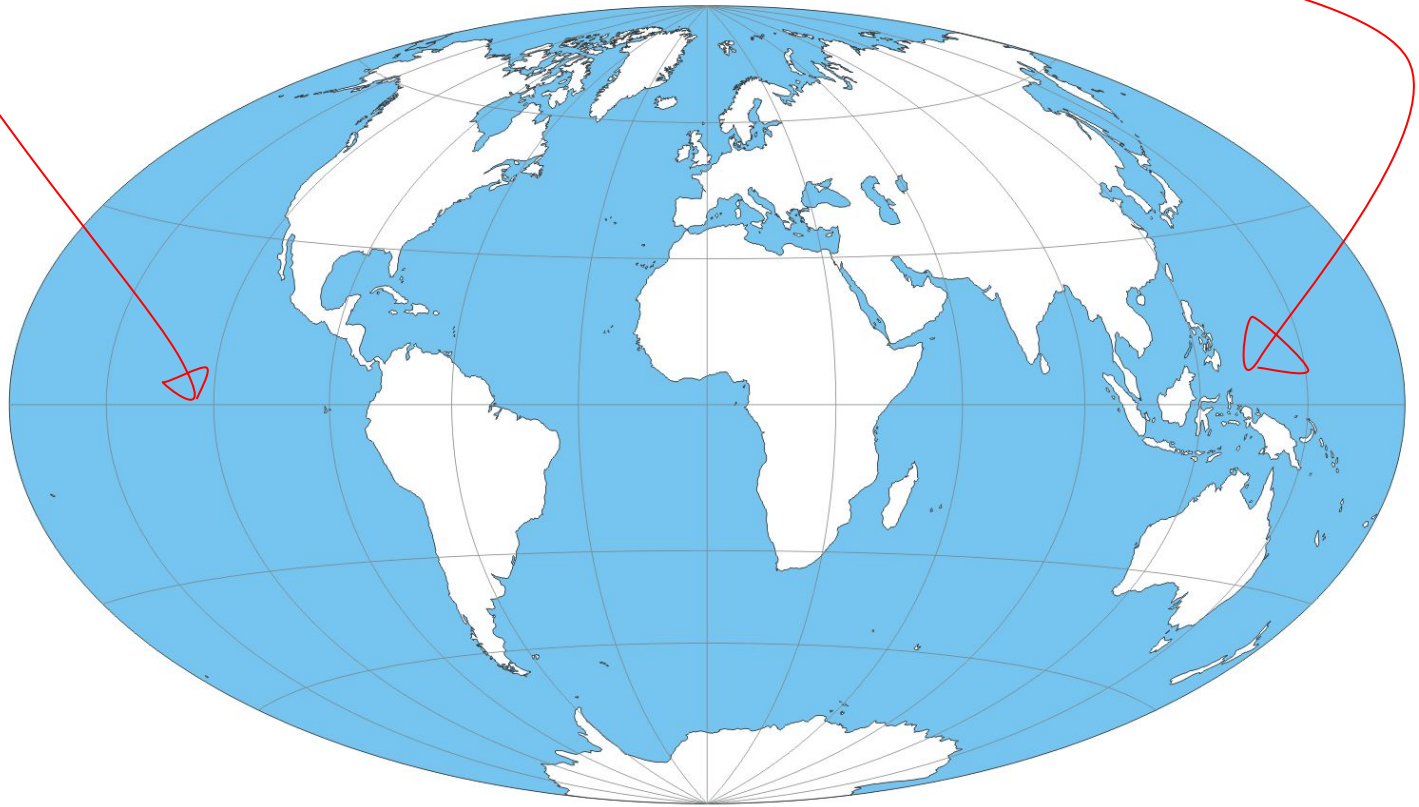
How many oceans do we have? Can you guess them?



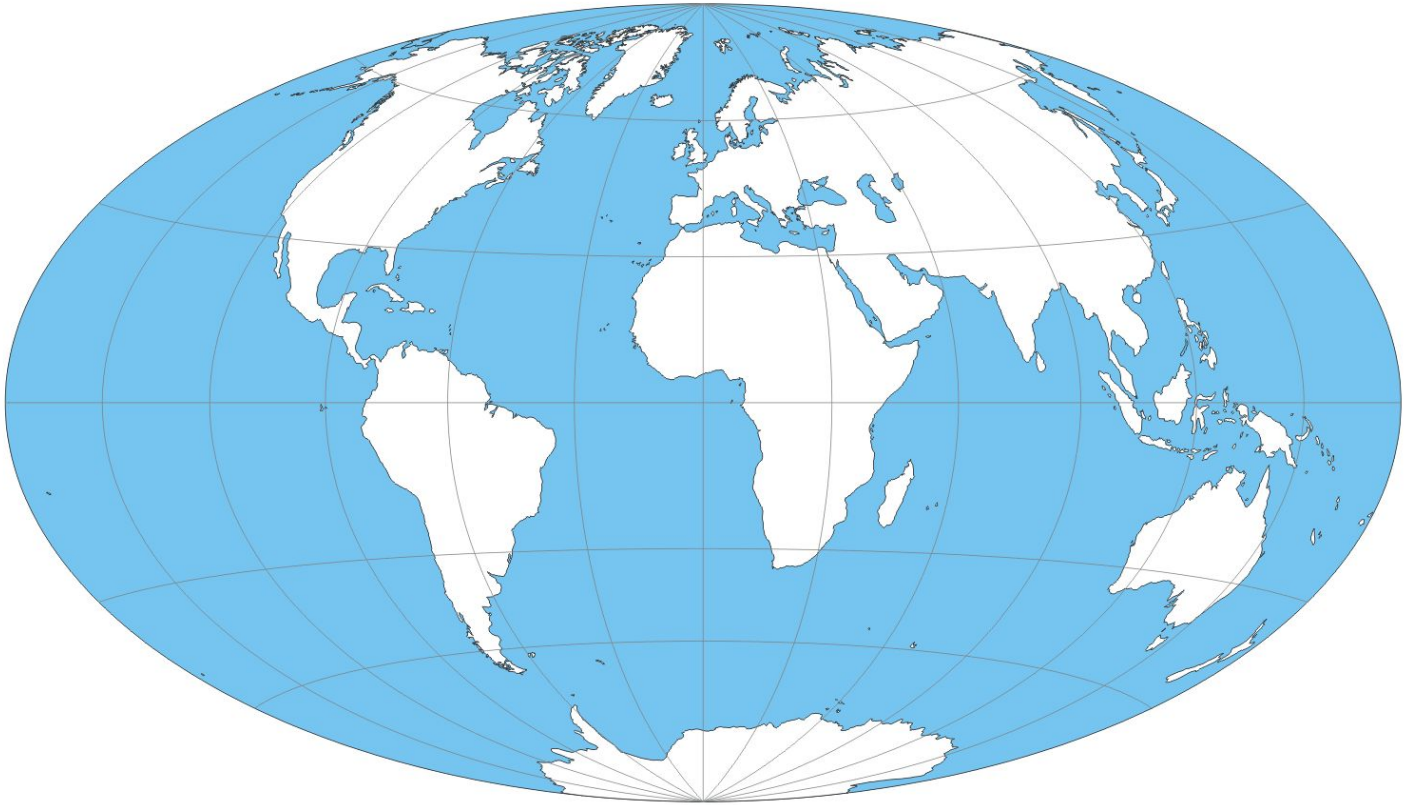
Pacific Ocean?



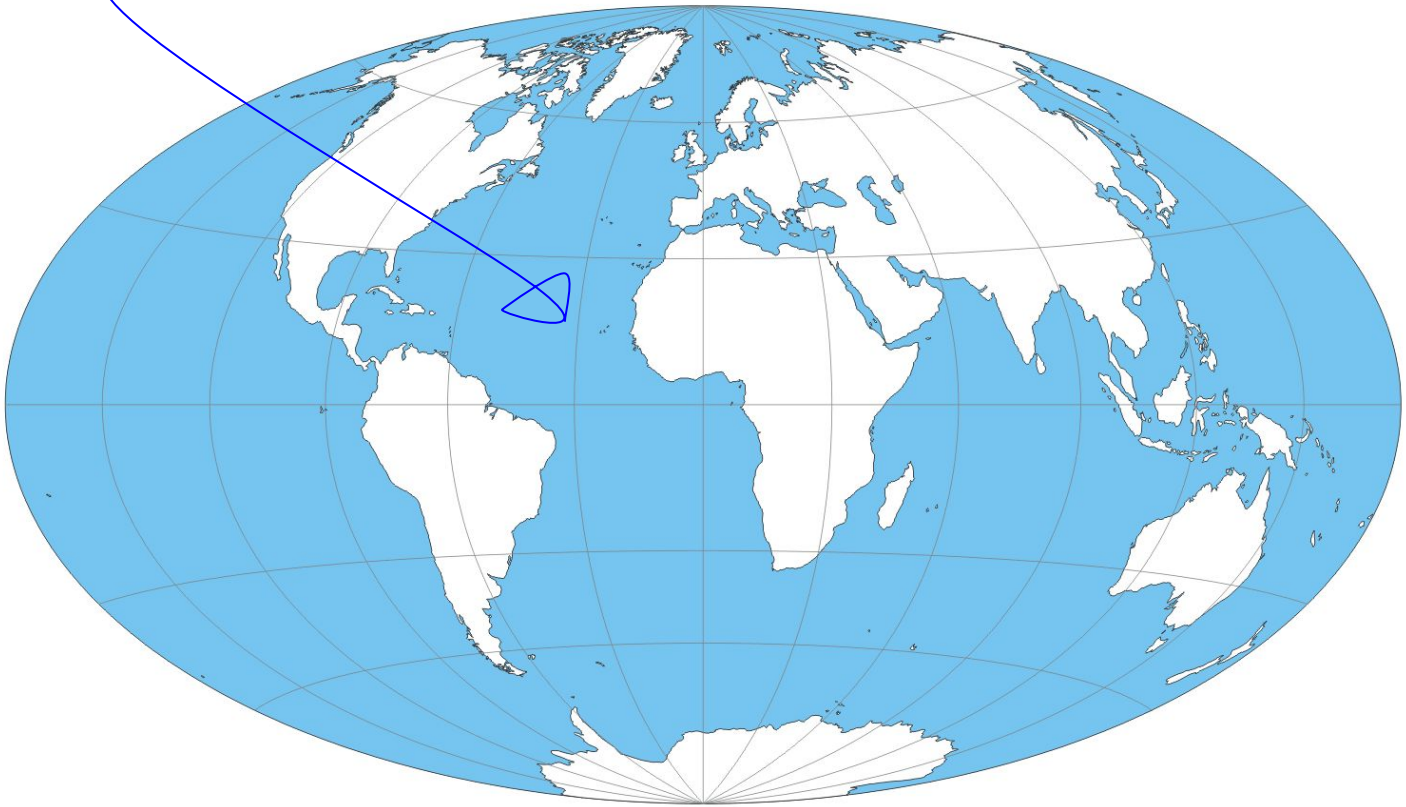
Pacific Ocean



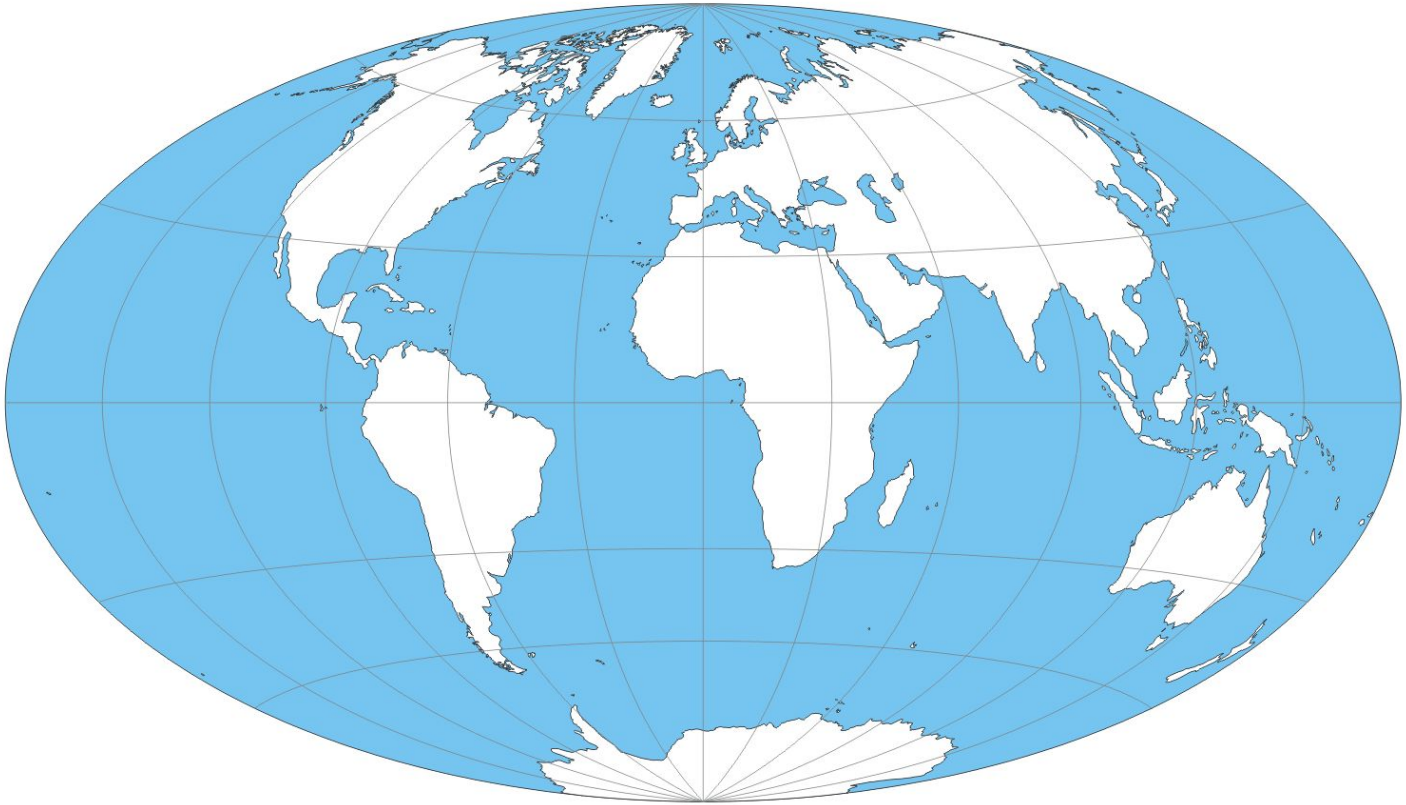
Atlantic Ocean?



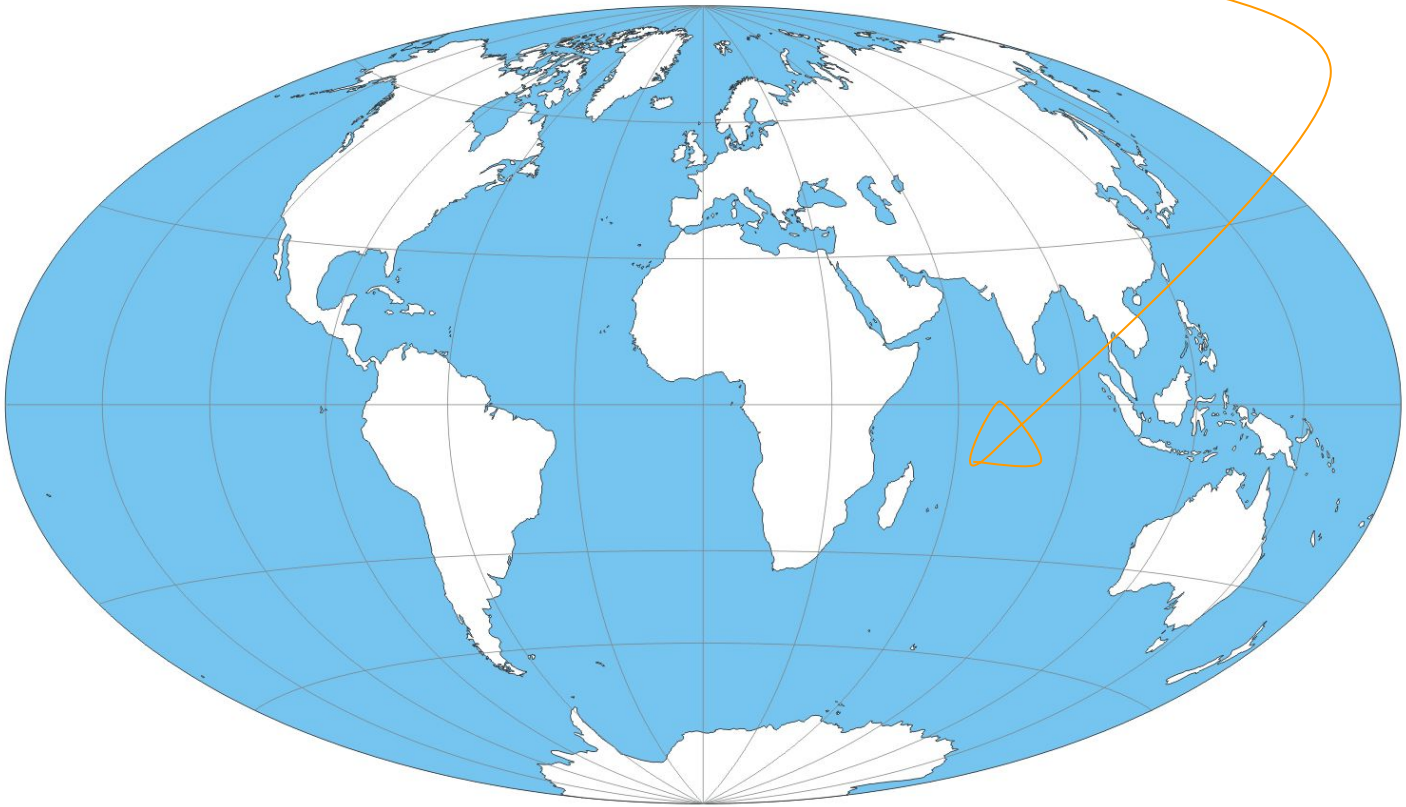
Atlantic Ocean



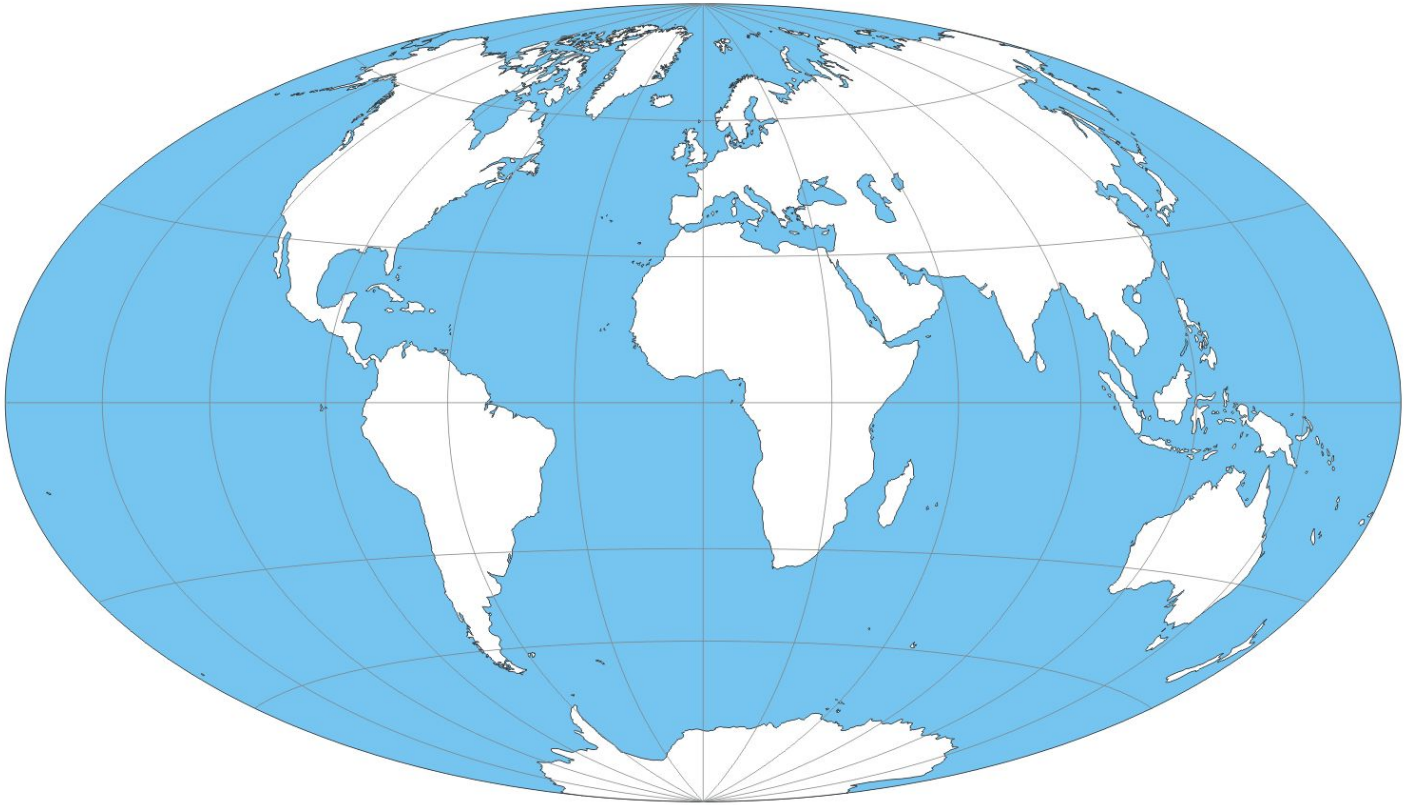
Indian Ocean?



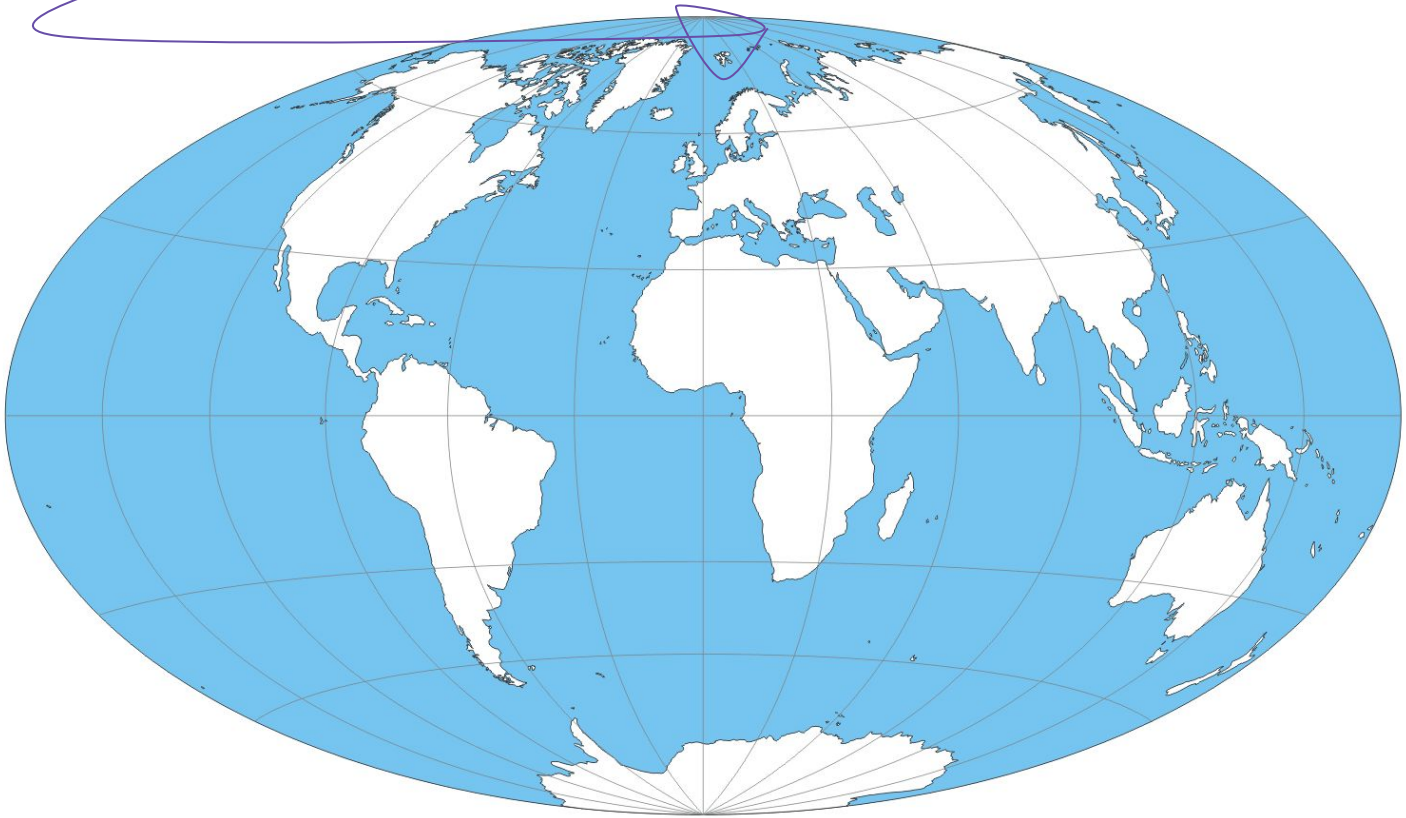
Indian Ocean



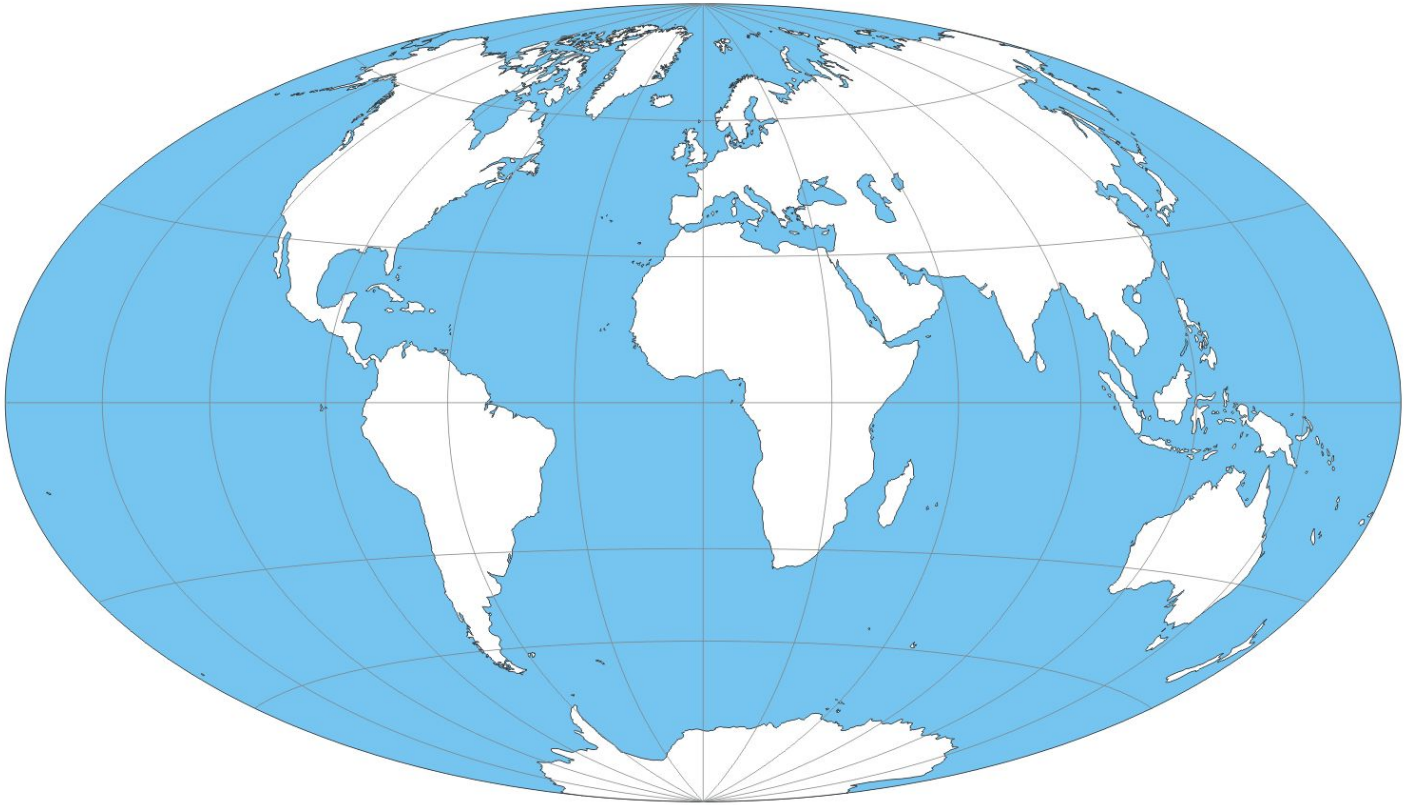
Arctic (Northern) Ocean?



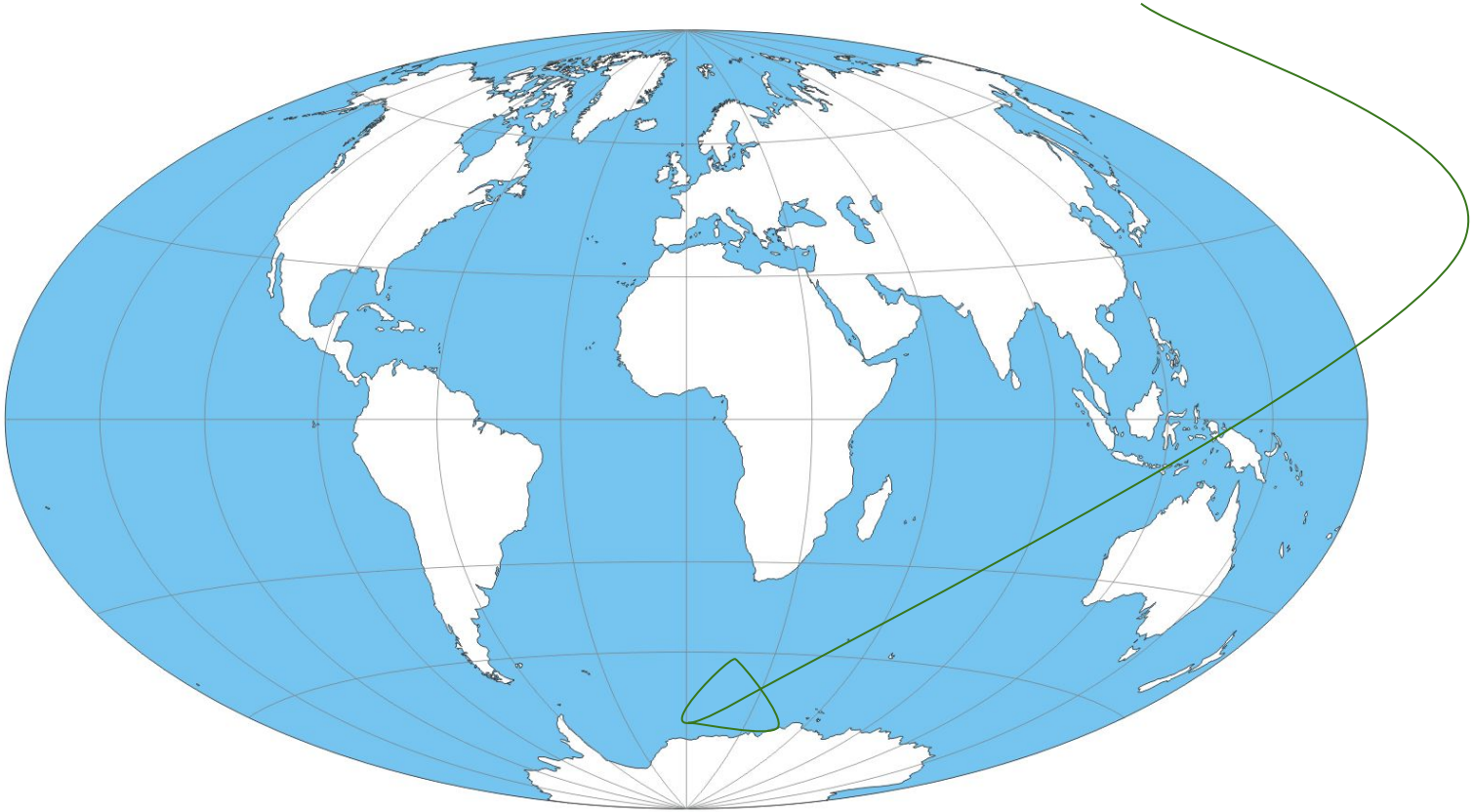
Arctic (Northern) Ocean

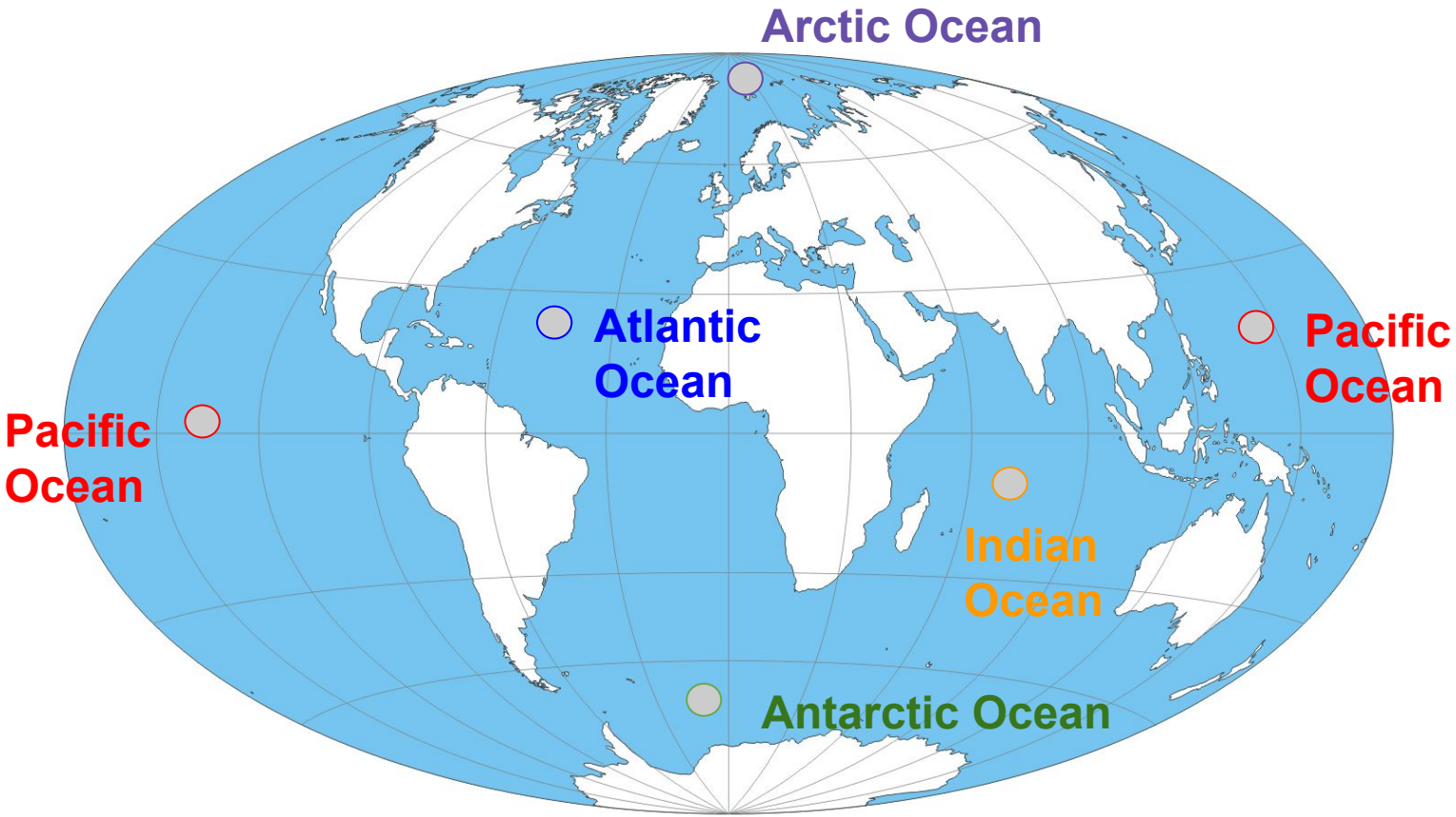


Antarctic (Southern) Ocean?



Antarctic (Southern) Ocean




Arctic Ocean
Atlantic Ocean
Pacific Ocean
Pacific Ocean
Indian Ocean
Antarctic Ocean

What percent of the world is land? What percent is ocean?

Activity: Show kids the inflated globe. Have kids write down an estimate (0% to 100%) of how much of the Earth's surface they think is covered by water. Select one kid to record results of the tosses on the frequency table chart paper. As a class, stand in a circle and take turns tossing the inflated globe to each other. As students catch the globe, have them state where each of their thumbs land (land/water, land/land, or water/water). Have the recorder place a tally mark on the appropriate side of the frequency table on the class chart paper. Once there is a total of 100 tally marks (50 tosses with 2 thumbs each), stop and add up the tallies for each category. Convert the totals to the percentage of water and land that compromises the Earth's surface. Share the actual percentages.

Surface	Tally	Frequency
Land		
Water		

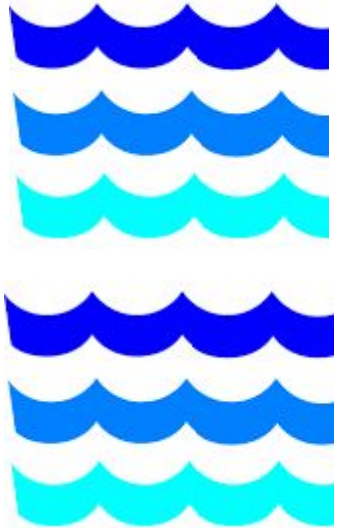
70%

30%

Seawater Tasting

+

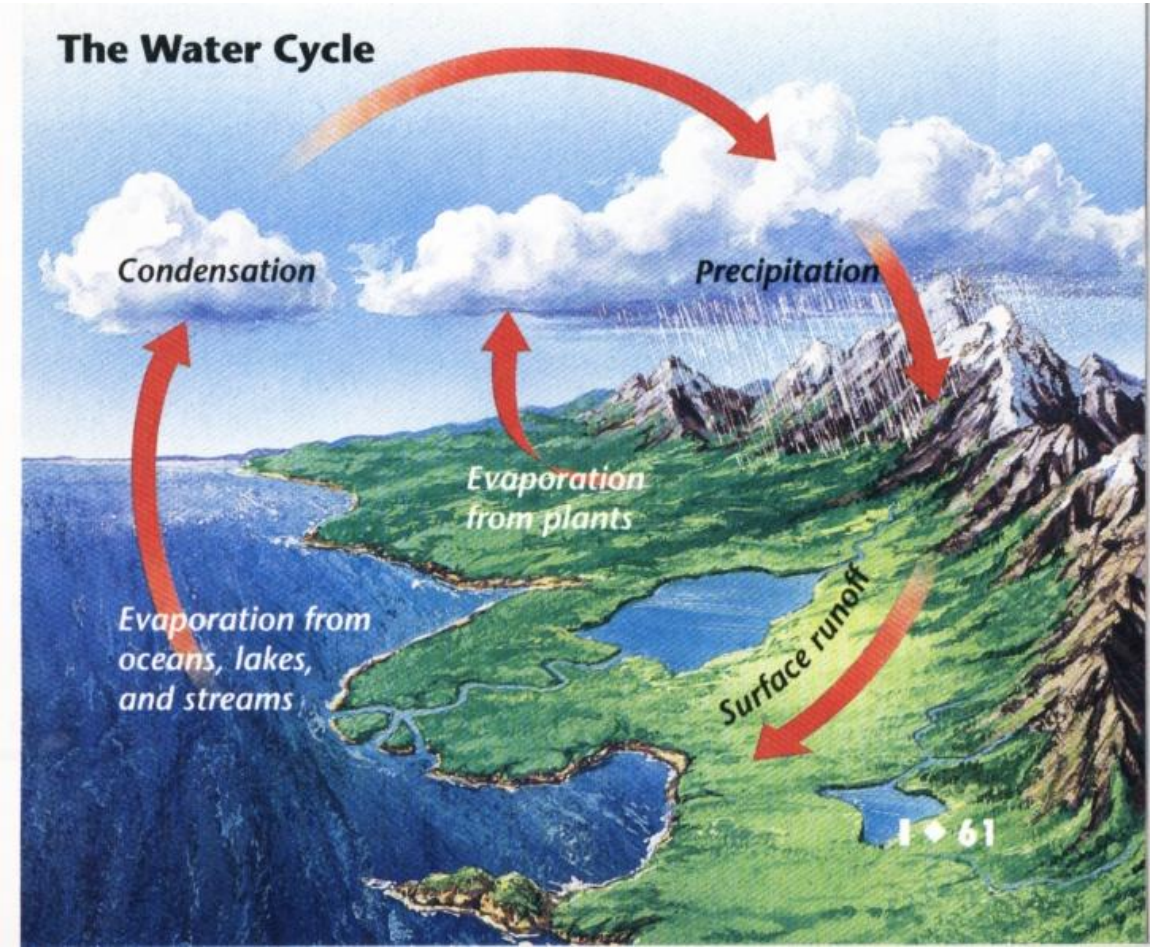
=

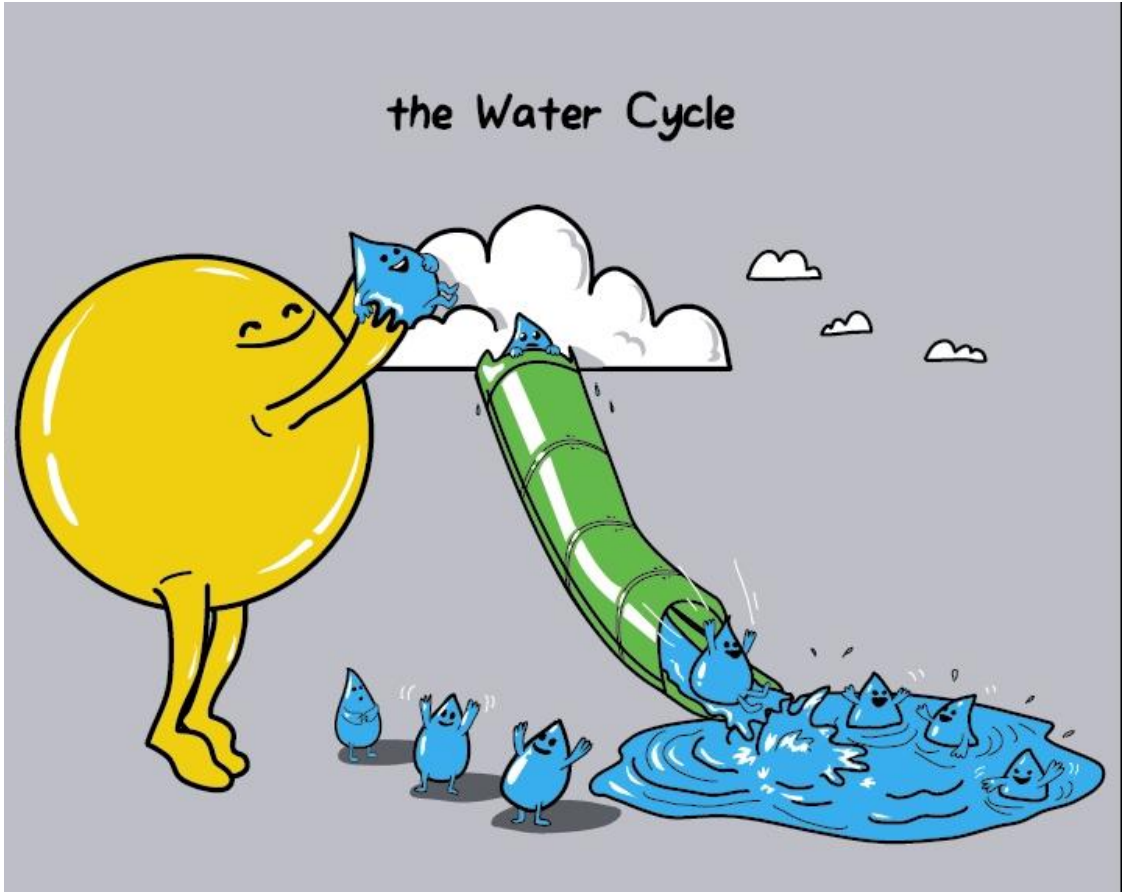


Activity: Measure 2 cups of drinking water and pour it into the pitcher. Measure ¼ teaspoon of sea salt and add it to the pitcher. Mix the water and salt until the salt has dissolved. Pour a little bit of the mixture into each kid's tasting cup. What two components make up ocean water?

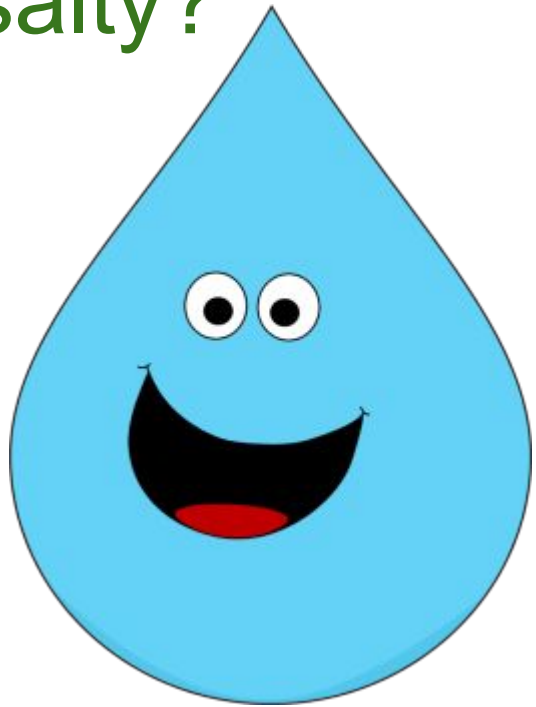
- <u>Salinity:</u> the saltiness or the dissolved salt content of water
- <u>Solvent:</u> the liquid that something is dissolved in
- <u>Solute:</u> something that is dissolved in a liquid

Only people who live close to the ocean are affected by it.


The Water Cycle
Condensation
Precipitation
Evaporation from plants
Evaporation from oceans, lakes, and streams
Surface runoff
61


the Water Cycle

If rain comes from the ocean, then why isn’t rain salty?



- <u>Natural Resource:</u> something that is found in nature that can be useful
- <u>Renewable Resource:</u> a natural resource that can be replenished by nature over time
- <u>Pollution:</u> unwanted, harmful things that contaminate the environment

The ocean is so big that people can take as much as they want from it and there will always be more.

Activity: Divide the kids into partners. Each set of partners gets a cup of fish. Within each partner, decide which person is partner A and which person is partner B. Divide the pile of fish into two equal piles. One half represents the resources the ocean currently has, such as fish. The other pile represents the resources the ocean will hold in the future as nature replenishes the natural resources (as fish reproduce, plants regrow, etc.) Person A will play the role of the human consumer and person B will play the role of nature.

Place the first pile on a sheet of paper labeled “nature.” Place the second pile on a sheet of paper labeled “ocean.” Person A will take 3 fish out of the “ocean” pile and move them off the paper. Person B will move 2 fish from the “nature” pile into the “ocean” pile. Continue moving fish until there are no fish left to move in one section and pile in another. Is the ocean a renewable resource?

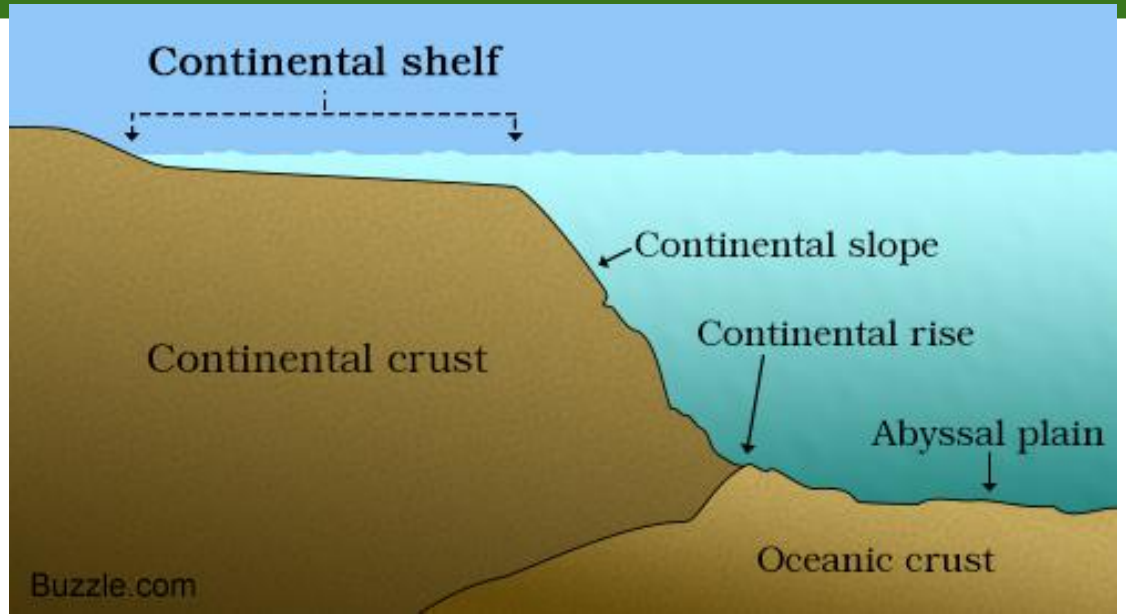
POLLUTION IN MY WATER?
WHY I OTTER!
memegenerator.net

Snapping turtle
June, 2000

What is the Great Pacific Garbage Patch? Do garbage islands exist?

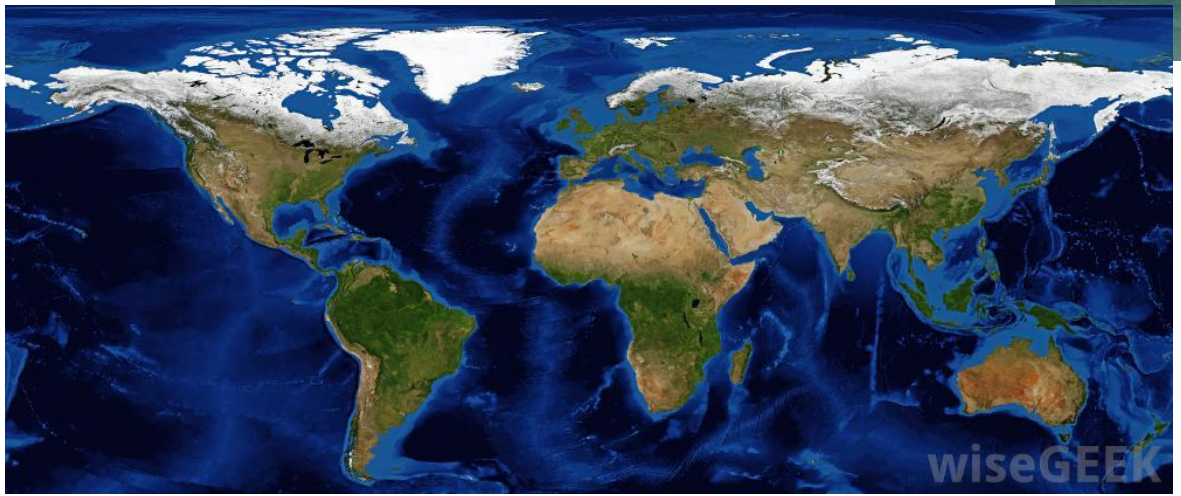
Week #2: Ocean Geography and Plate Tectonics

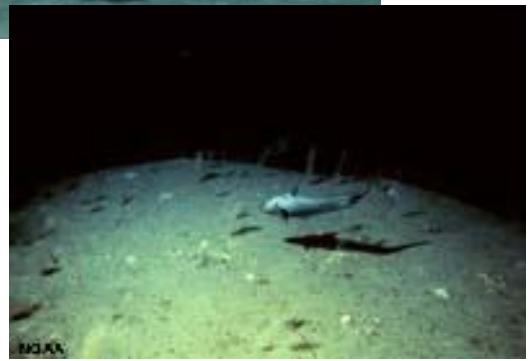
What does the bottom of the ocean look like?

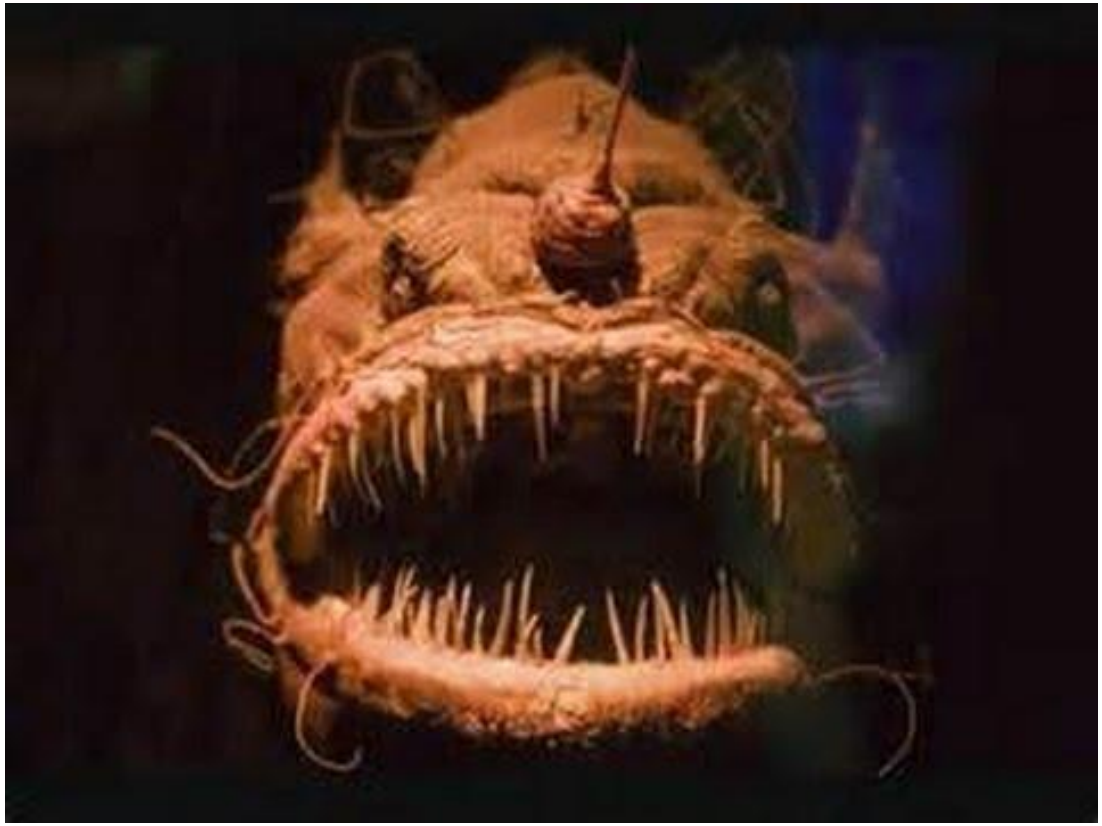


- Continental Shelf: the bottom of the ocean surrounding the main land (about 500 feet deep)
- Continental slope: the edge of the continental shelf where the ocean floor drops steeply
- Continental rise: the part of the ocean floor between the continental slope and the abyssal plain

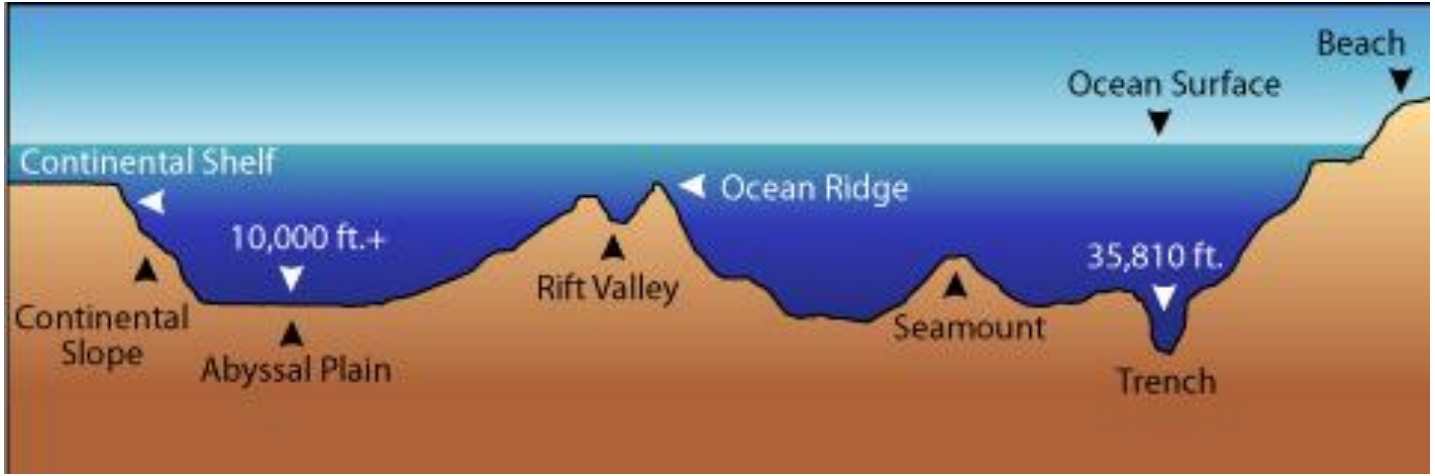
- <u>Abyssal plain:</u> flat ocean floor in the deepest part of the ocean. It is around 2,000-10,000 feet deep





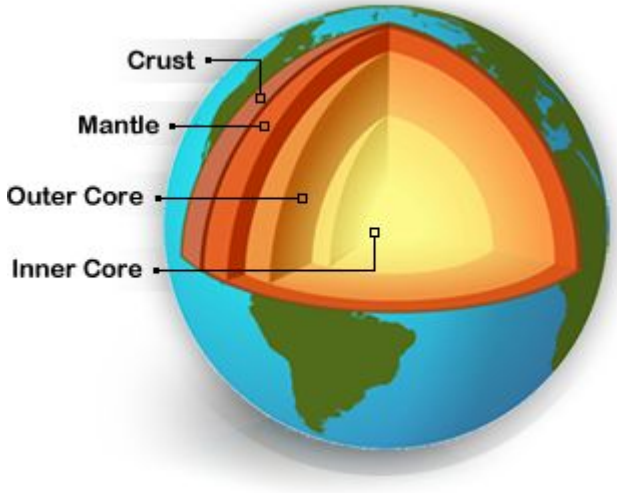


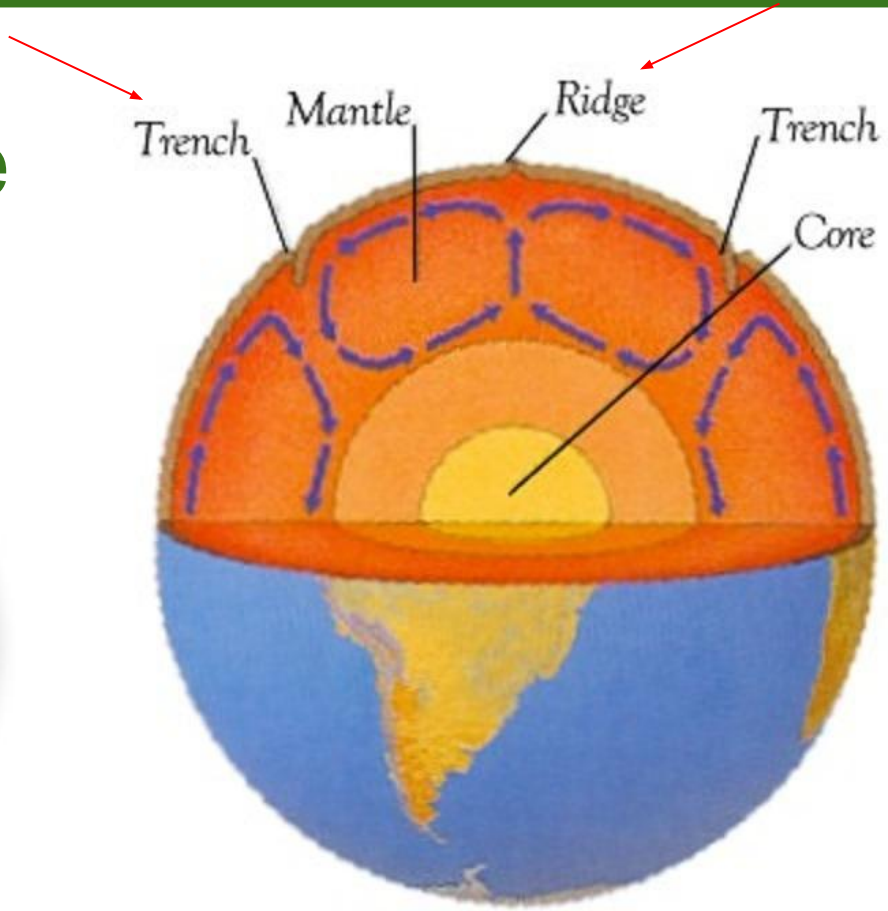
The deepest part of the ocean is in the Mariana Trench in the Pacific Ocean. It is about 6.8 miles deep!



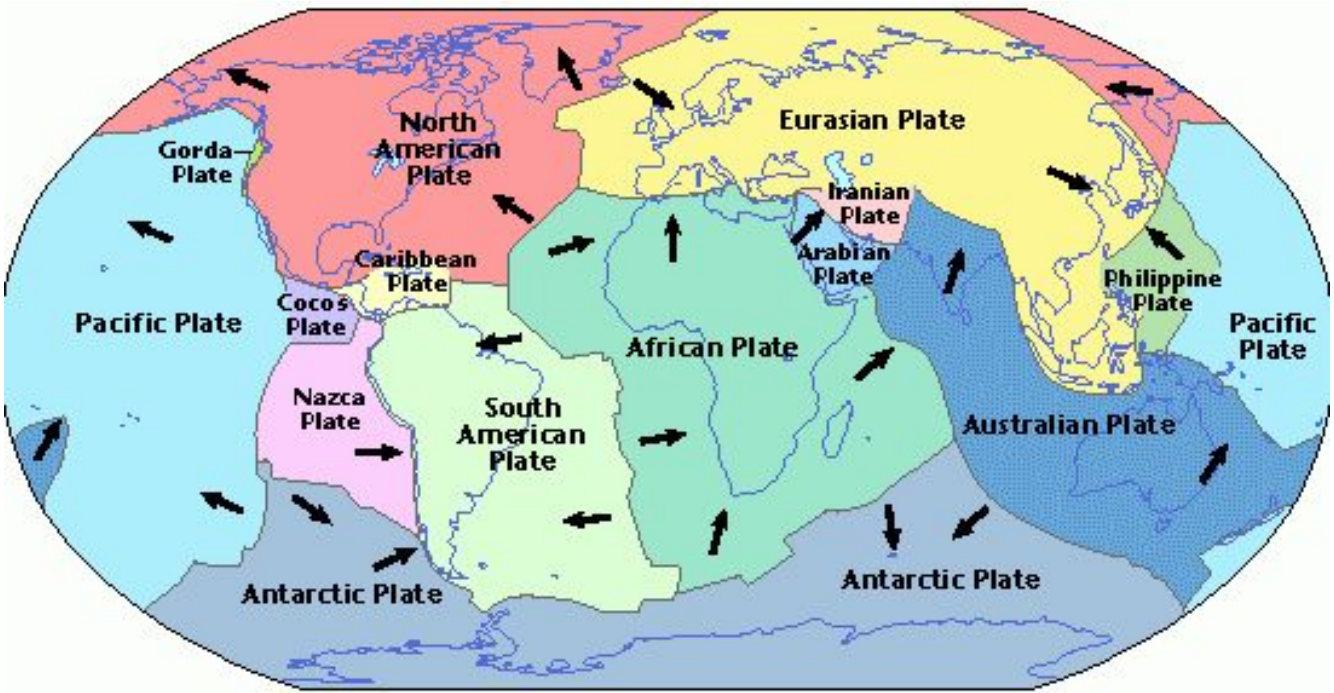
- <u>Ocean ridge:</u> a series of mountains that are underwater
- <u>Rift valley:</u> a narrow valley between two mountains
- <u>Seamount:</u> a tall mountain that is completely underwater
- <u>Oceanic trench:</u> a very deep gorge in the ocean floor. They are the deepest parts of the ocean.

What are plate tectonics?

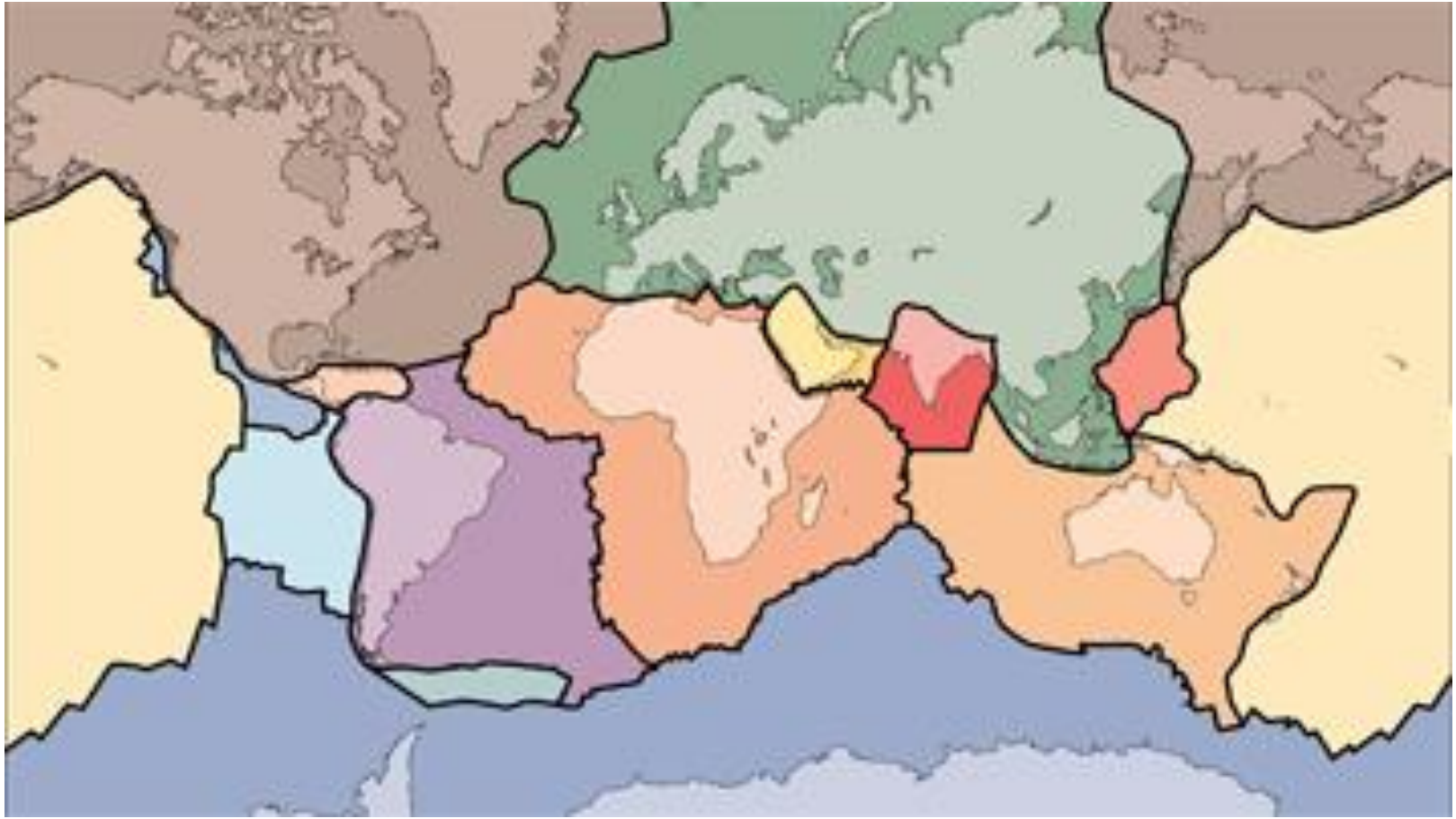




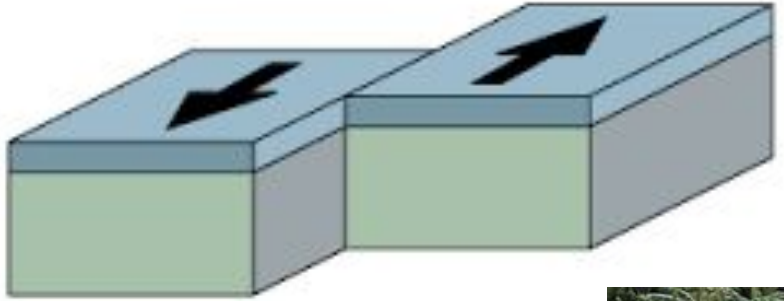
What plate do we live on? What plates are next to our plate?

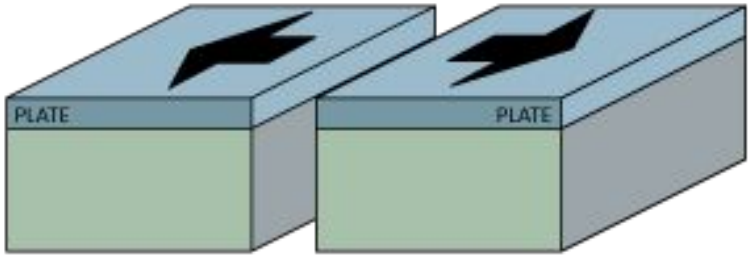


Activity: Each person will get a set of puzzle pieces. Each puzzle piece is a plate tectonic. Whoever puts the world together the fastest wins!

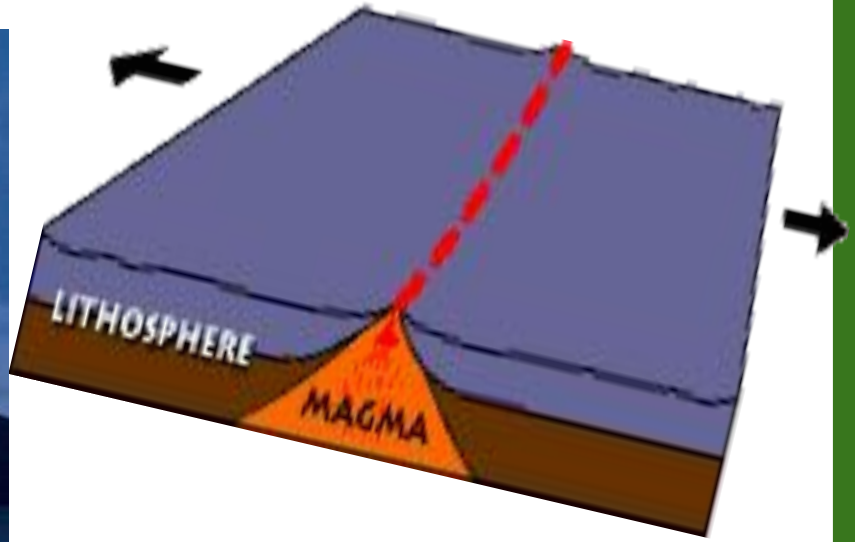


Transform Plate Boundary

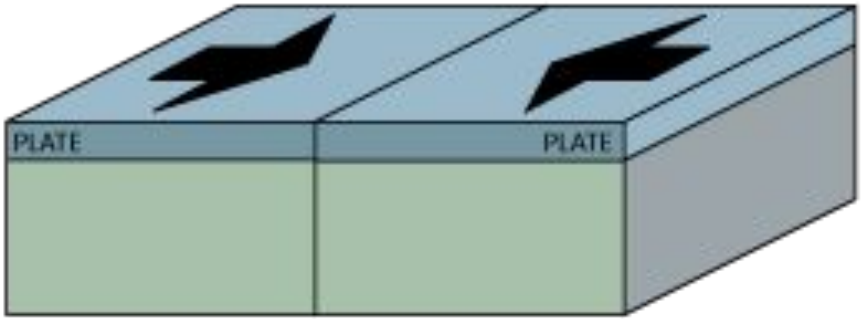




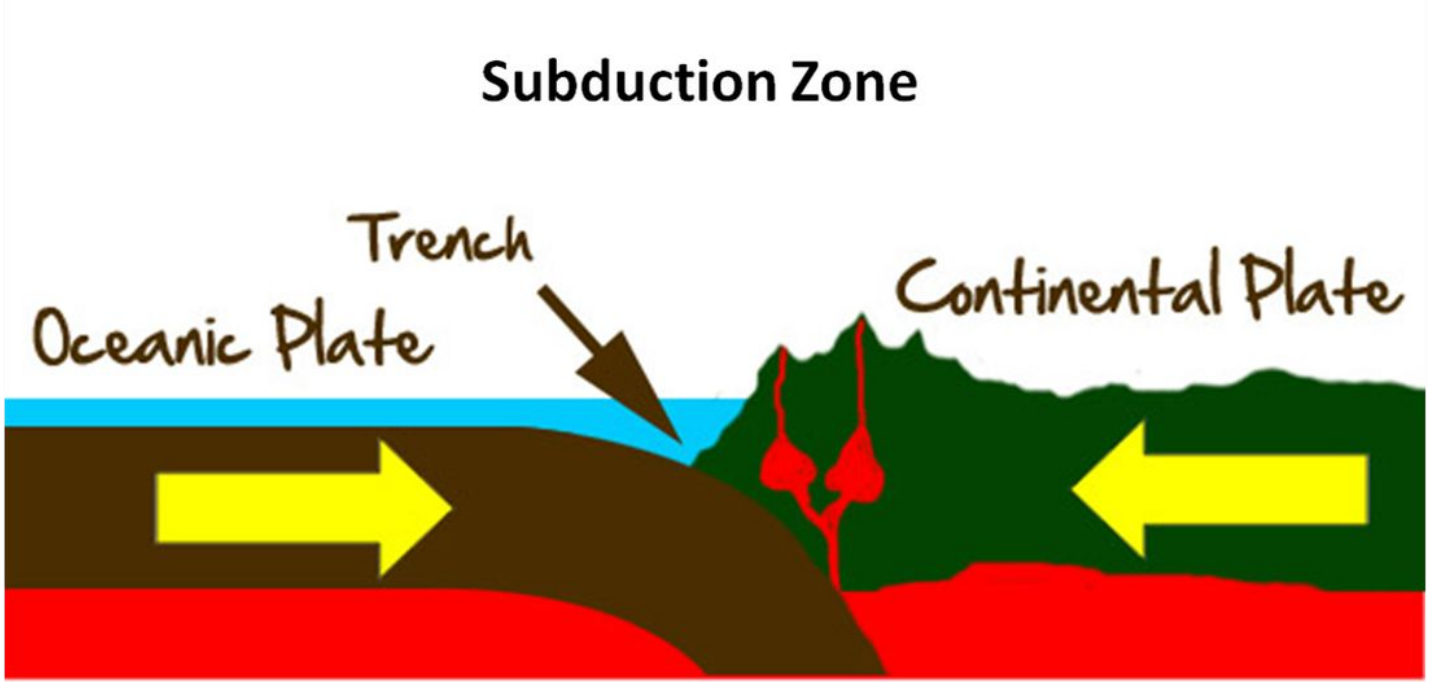
Divergent Plate Boundary



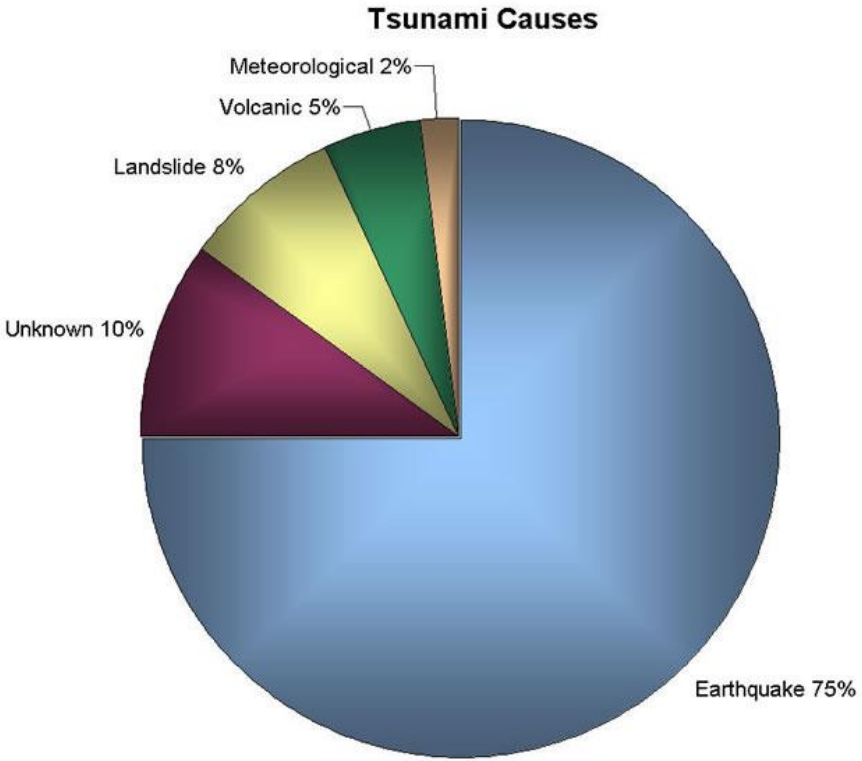
Convergent Plate Boundary (Constructive)



Convergent Plate Boundary (Destructive)



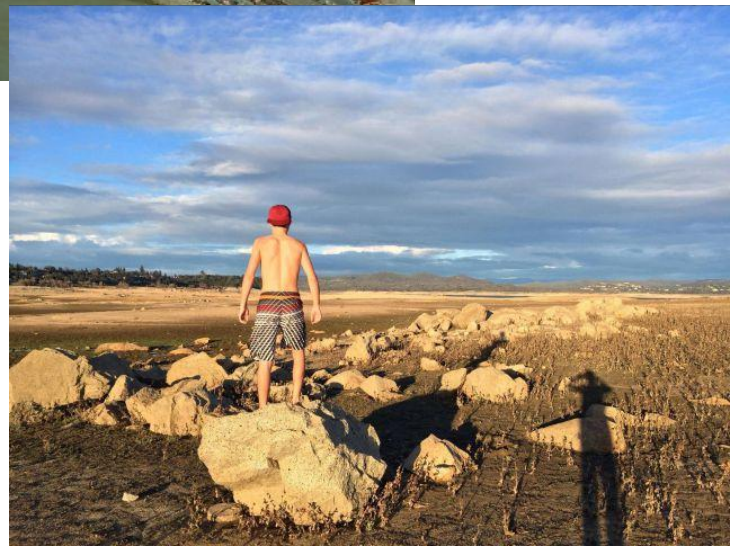
Tsunamis


Tsunami Causes
Meteorological 2%
Volcanic 5%
Landslide 8%
Unknown 10%
Earthquake 75%

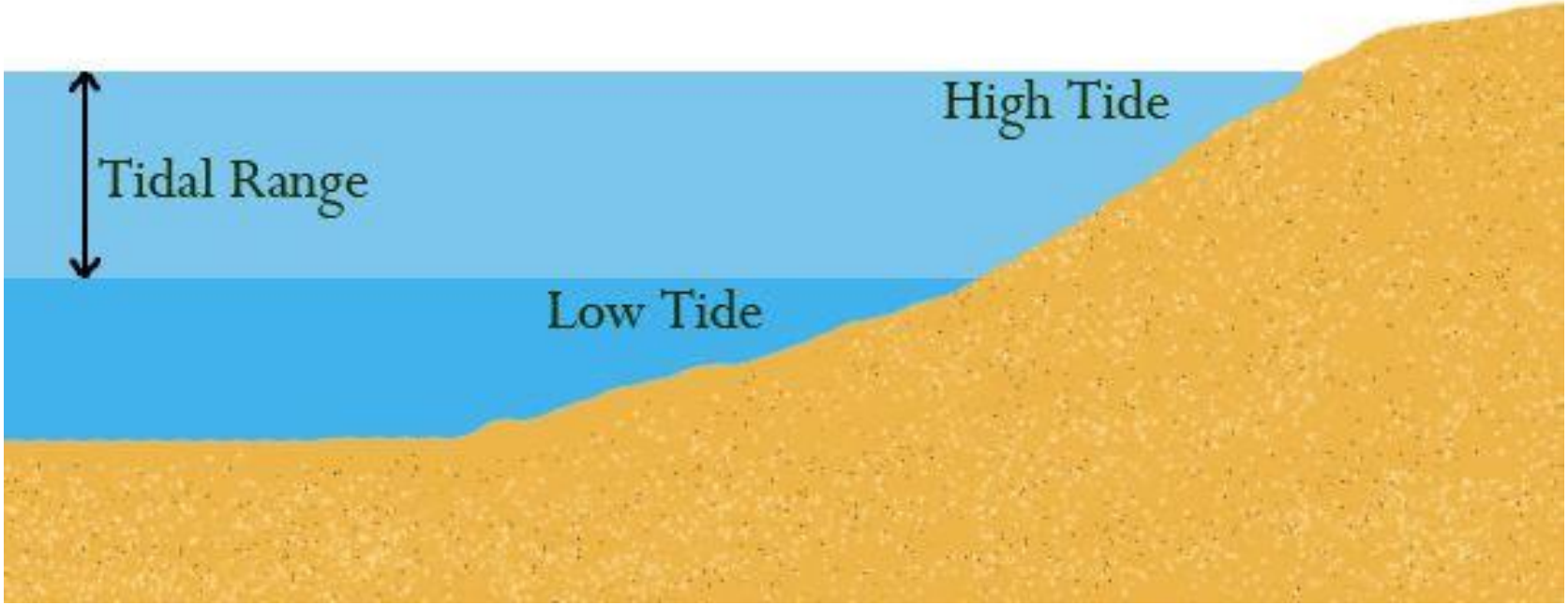
Activity: Each kid will get a ½ stick of clay. Flatten your clay into two flat pancakes. These will be your two plate tectonics. Using your “plates,” practice the movements of the different plate boundaries (Transverse, Divergent, Convergent (constructive), and Convergent (destructive). Also practice explaining what is happening as you move your plates. Then share what you know with a neighbor!

Week #3: Ocean Movement: Tides, Waves and Currents

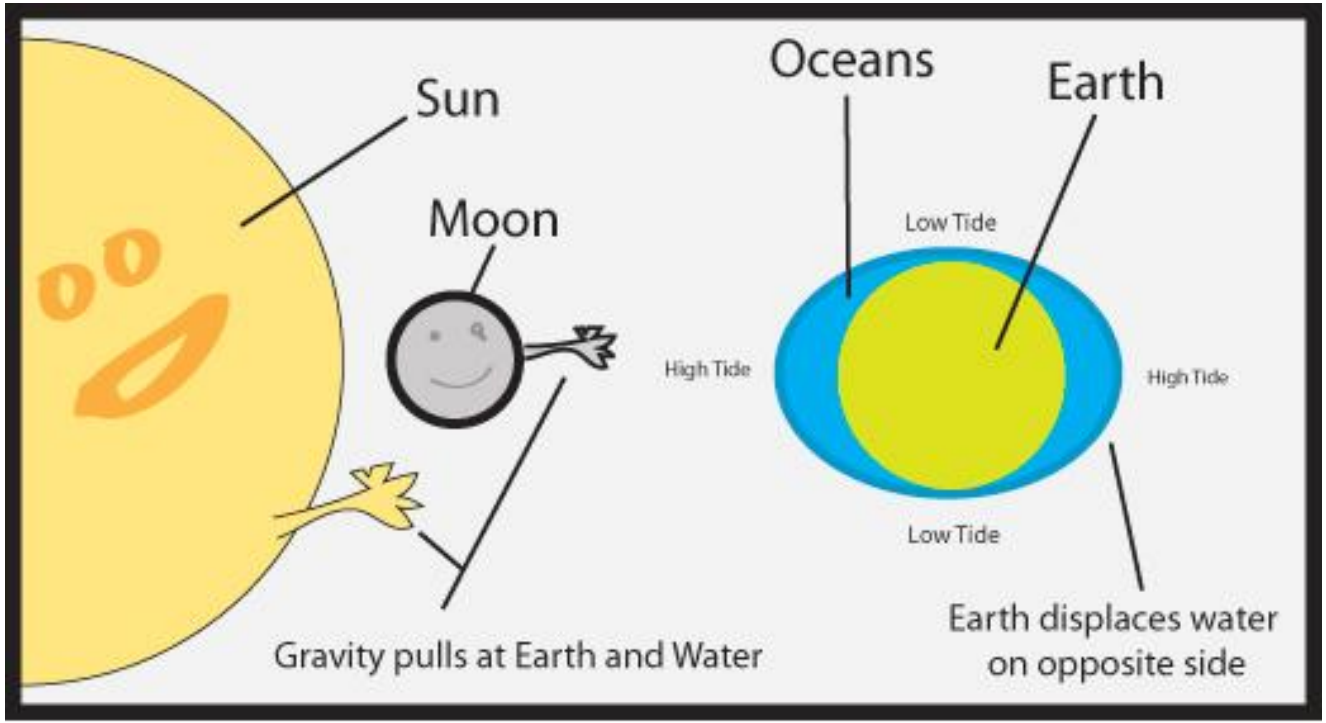
Why does the ocean move?



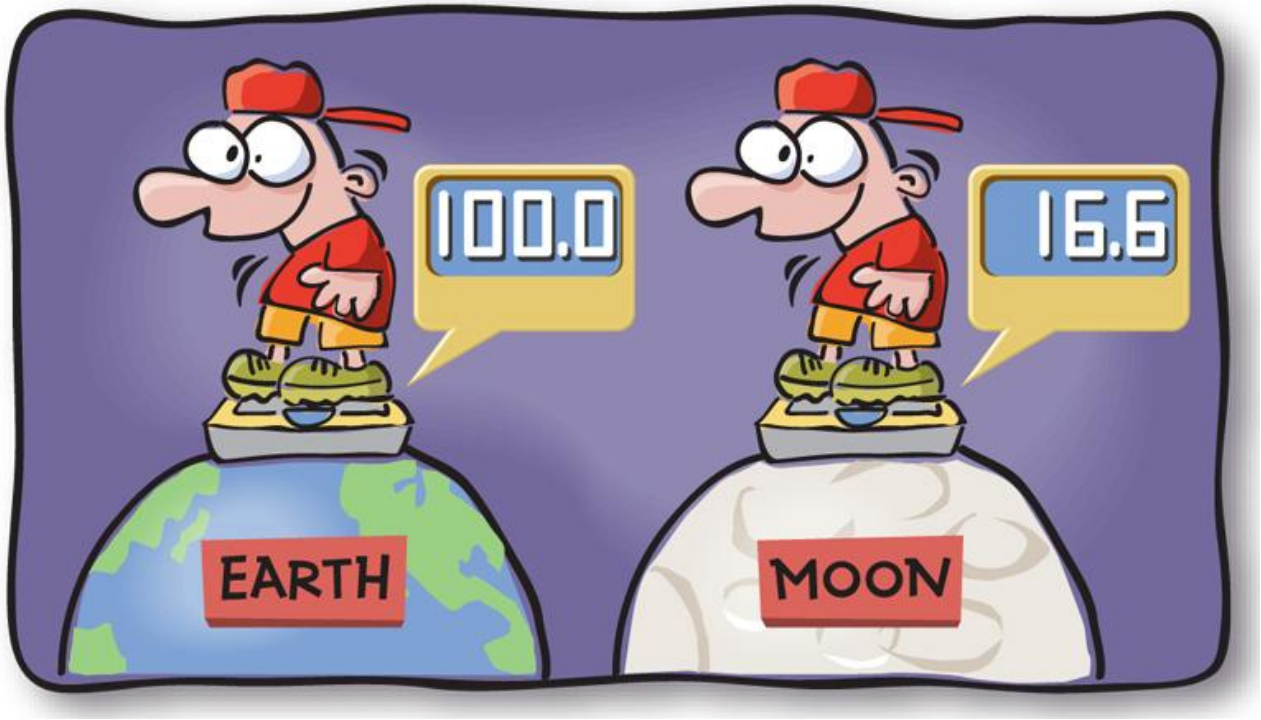
- <u>Ocean tide:</u> the rising and lowering of the surface of the water of the ocean



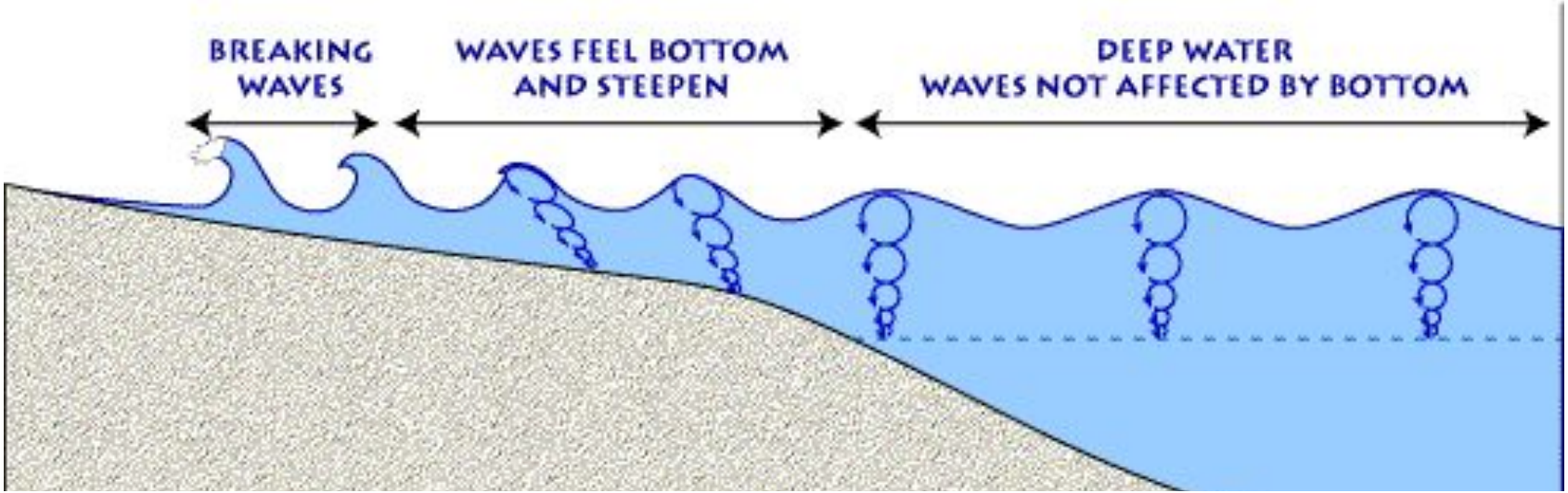
- <u>Gravity:</u> the forceful attraction that pulls your body down towards the center of the earth



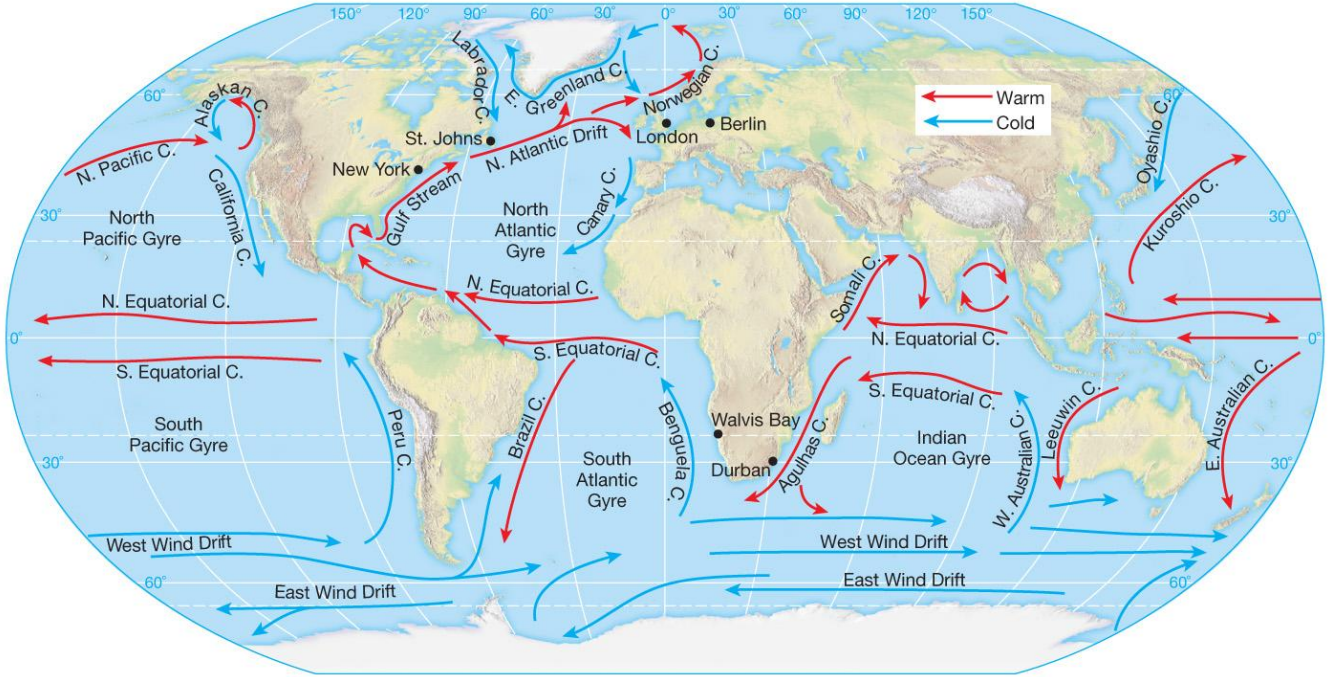
Why do you weigh less on the moon?



- <u>Wave:</u> a long body of water that arches and breaks on the shore



- <u>Ocean Current:</u> continuous, directed movement of ocean water



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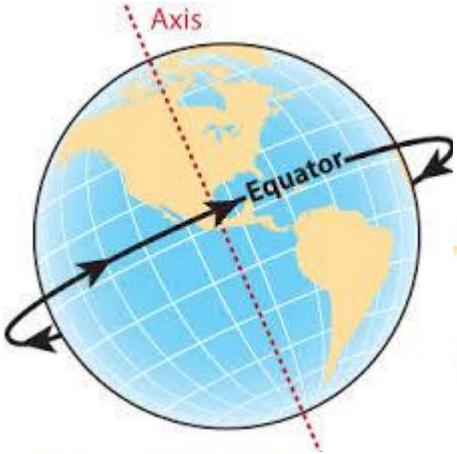
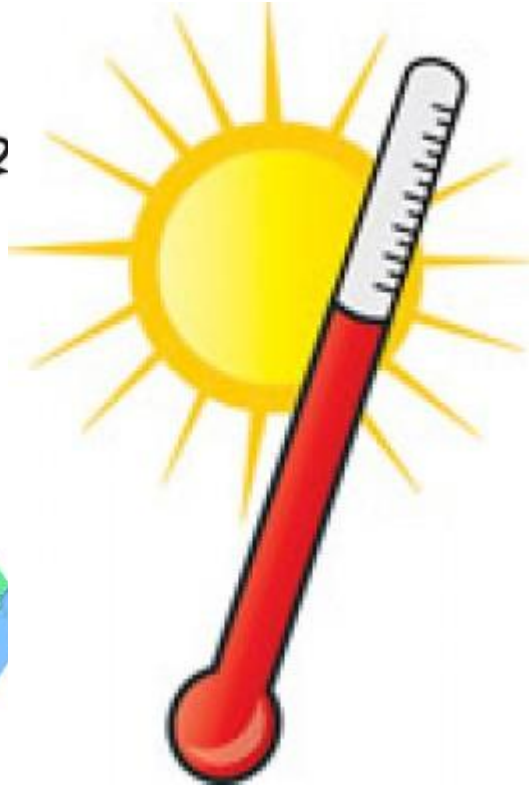
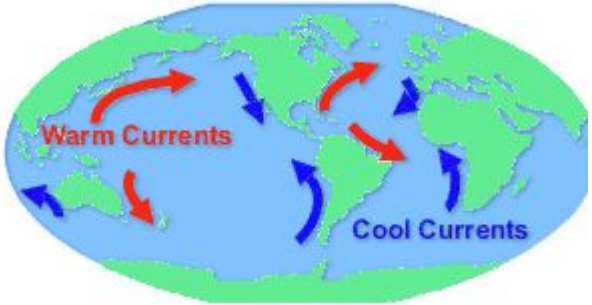
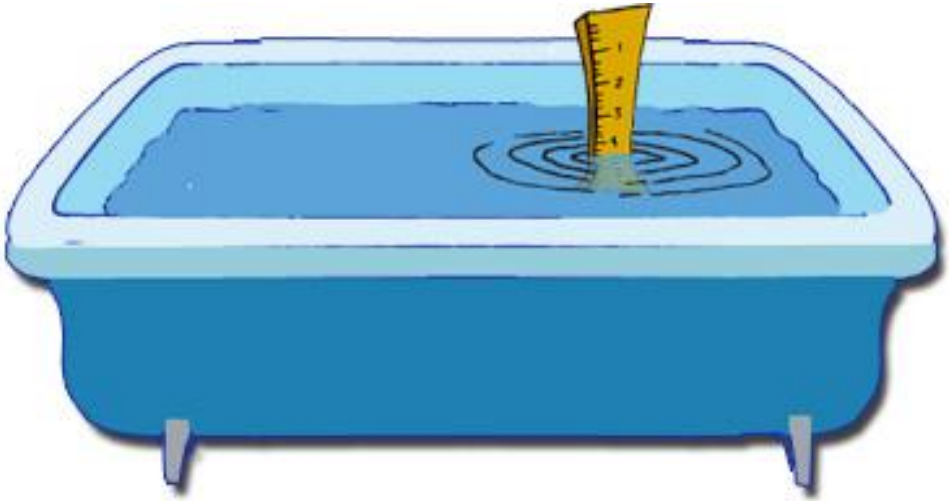
What causes ocean currents?



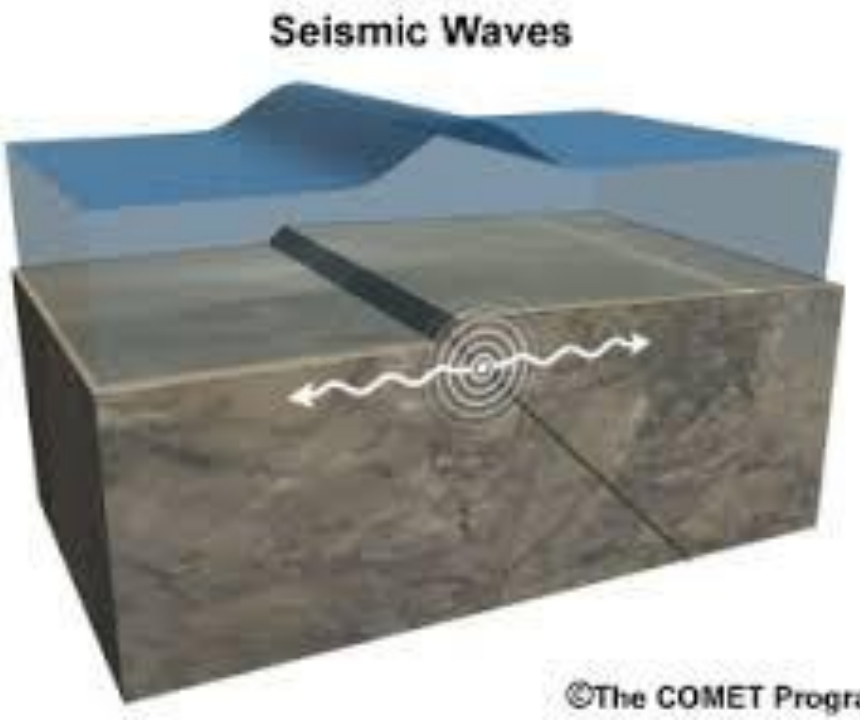




Activity: Kids will create waves in a tub of water using force from their hands to represent the movement generated by an earthquake or volcanic eruption. Then have them try dropping something into the water to simulate what a mudslide could cause. Use a ruler to measure the water level while it is calm and the water level at the top of a wave.



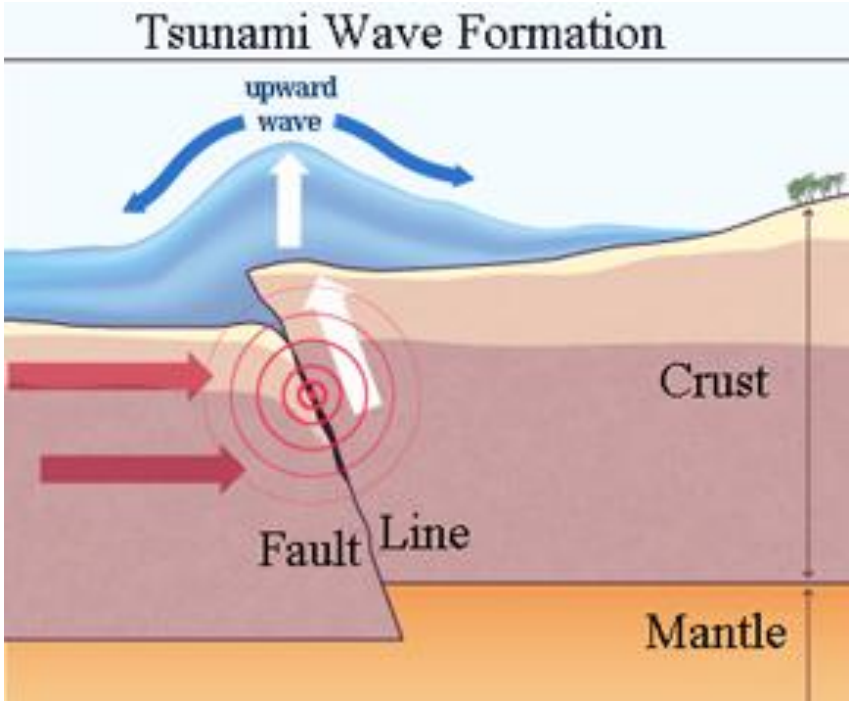
Week #4: Volcanoes, Earthquakes, and Tsunamis



- <u>Seismic Wave:</u> a wave of energy created by an earthquake that travels through the earth or along the earth's surface
- <u>Epicenter:</u> the center of the earthquake or where the earthquake originates

Activity: Break students into two groups. Have each group face the other group and line up shoulder to shoulder in a straight line with shoulders touching. Tell students they will demonstrate what happens to the Earth's surface at the epicenter of an earthquake. Pick one row of students to start with and gently push the first student's outward facing shoulder towards the other students in the line. Have the other group observe what happens. Repeat with the second group.

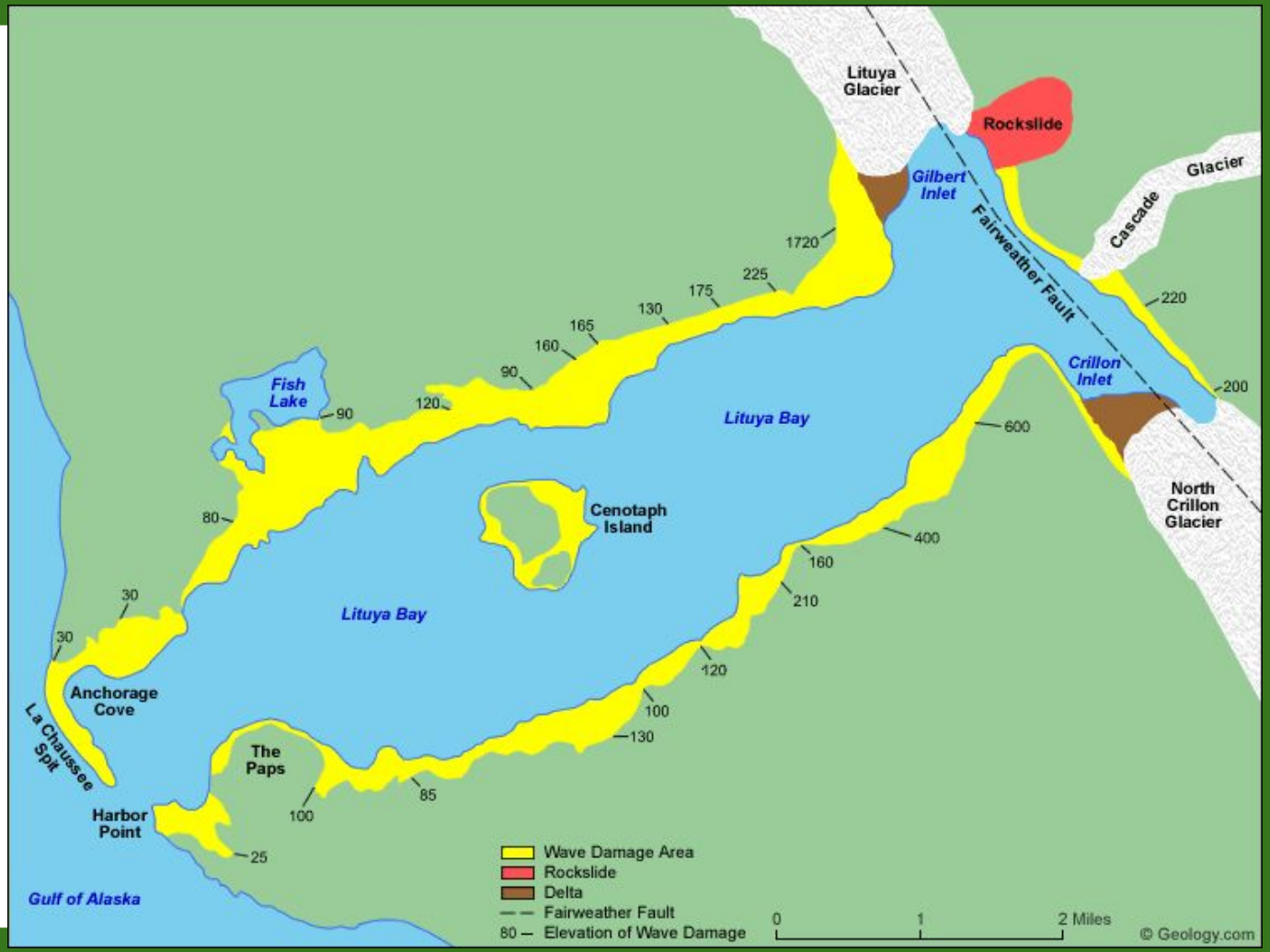
Earthquakes and Tsunamis



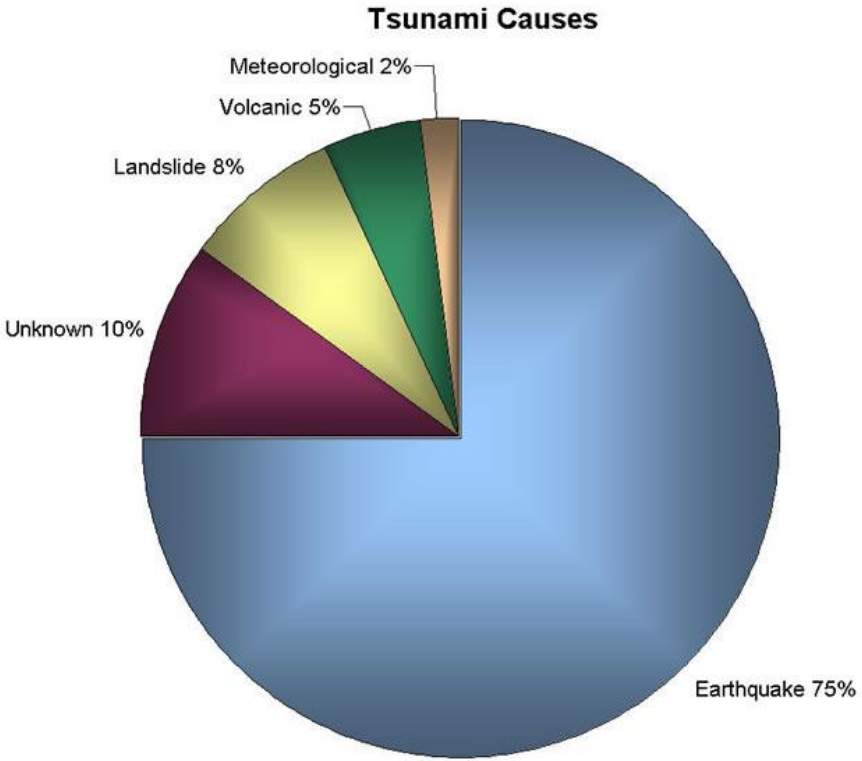
What is happening in this picture? What plate boundaries could cause a fault line to move?

Are all tsunamis caused by underwater earthquakes and plate boundaries?

The world's biggest tsunami occurred in Lituya Bay, Alaska. It was 1,720 feet tall and caused by a rock slide!



Tsunamis


Tsunami Causes
Meteorological 2%
Volcanic 5%
Landslide 8%
Unknown 10%
Earthquake 75%

Volcanoes

What causes volcanoes? Which plate boundary contributes to the formation of a volcano?

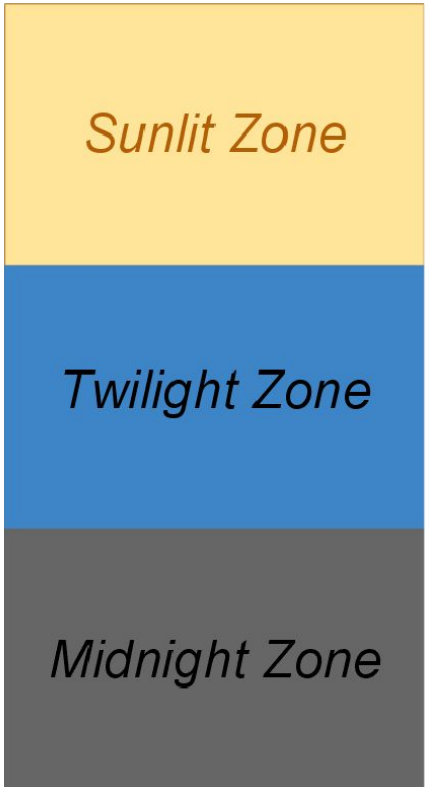
Are all volcanoes the same?

Let’s make volcanoes!

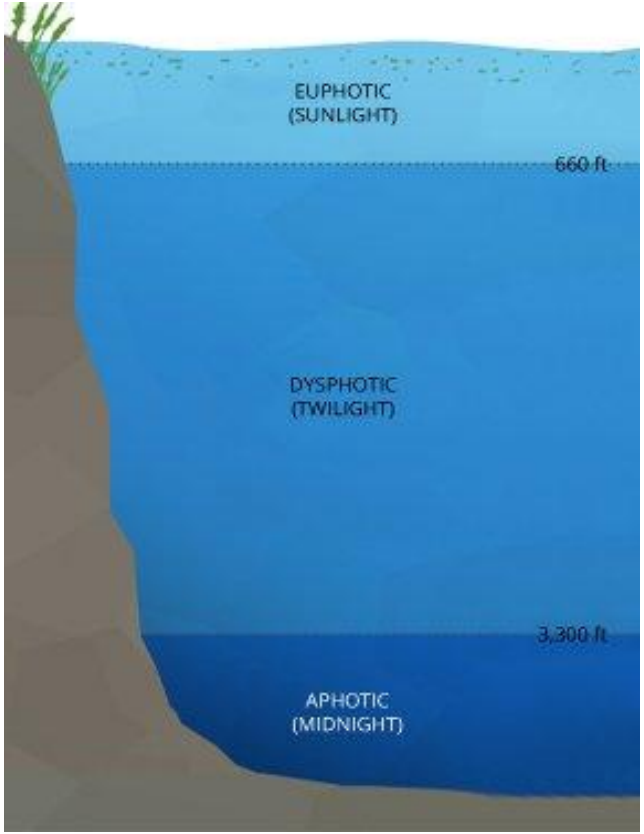
create-kids-crafts.com

Activity: Secure the empty 3 oz plastic cup to the center of the paper plate with a rolled piece of masking tape. The cup will be the opening in the volcano. Loosely drape the foil around the cup to create a mountain. Use the newsprint as stuffing under the foil to create a volcano around the cup, being sure not to cover the opening of the cup. The newsprint should be completely covered by the foil. If needed, use clear tape to secure the foil to the cup and to the base of the plate to insure the eruption won't leak under the foil. Measure one tablespoon of baking soda at the measuring station and place it into the center of the volcano. When you are ready, slowly add the vinegar (2 oz red vinegar) to your volcano.

Week #5: Ocean Zones

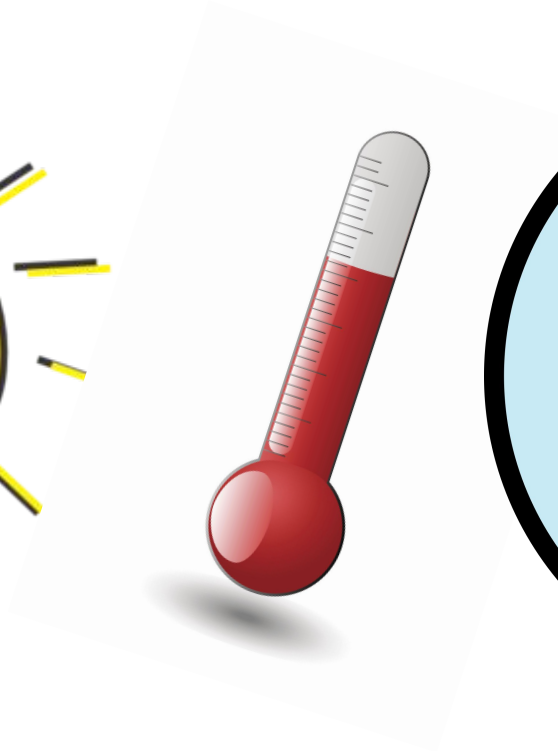


What are ocean zones?
Why isn't all of the ocean the same?

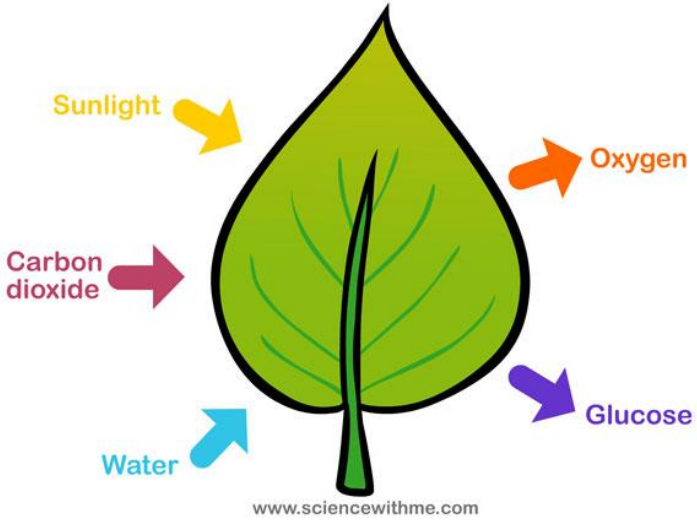


- Sunlight zone: the top layer of the ocean, closest to the surface
- Twilight zone: the middle layer of the ocean, between the Sunlight Zone and the Midnight Zone
- Midnight Zone: the bottom layer of the ocean

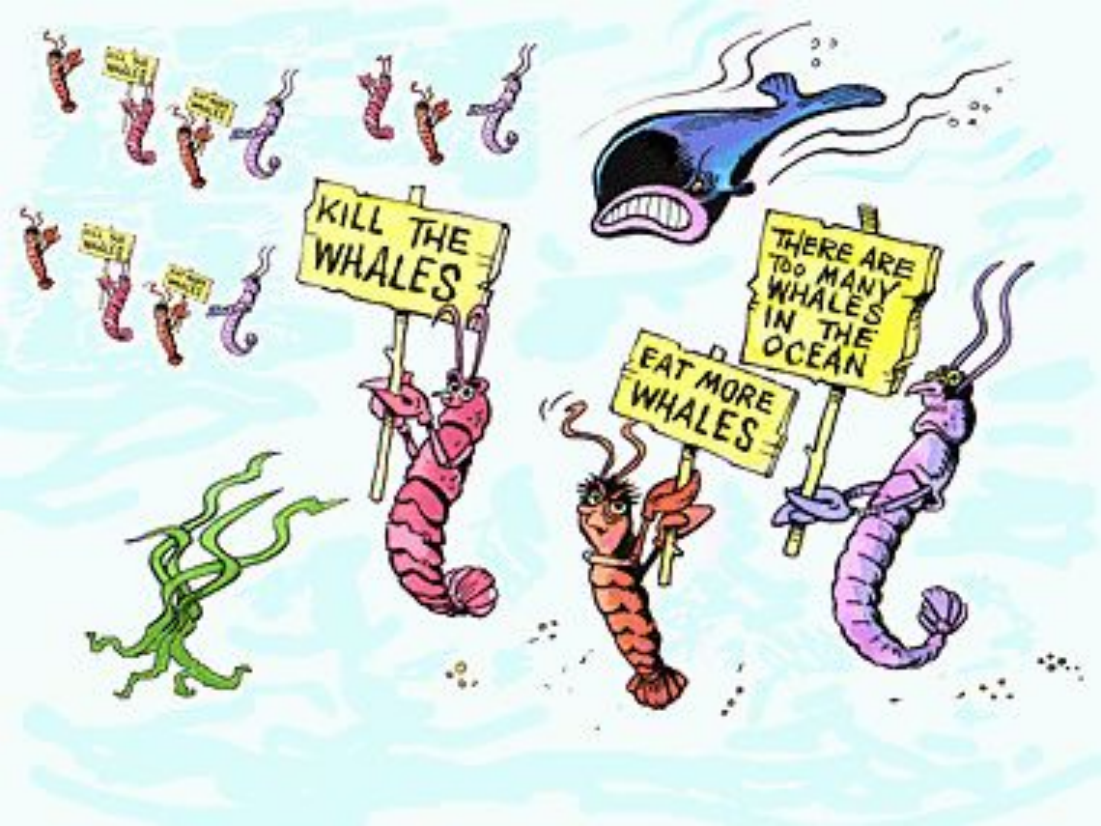
Why would organisms live in the Sunlight Zone?



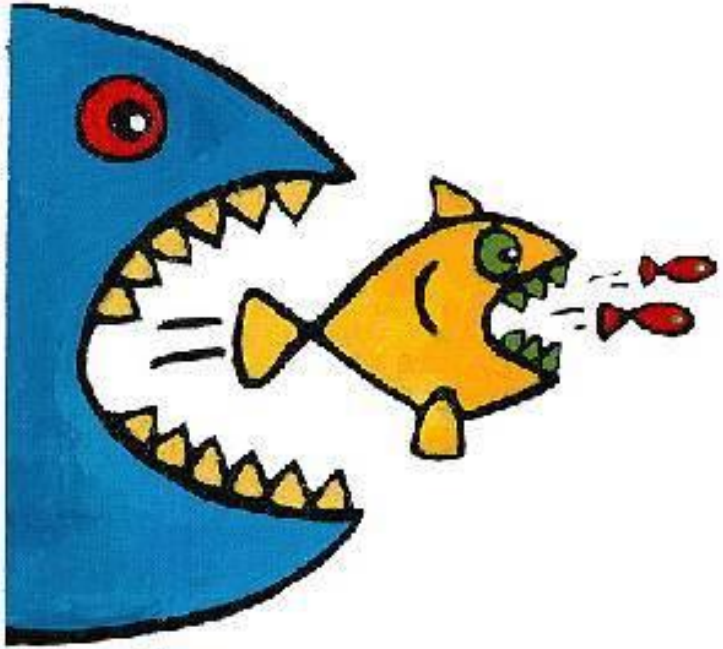
Why would organisms live in the Sunlight Zone?

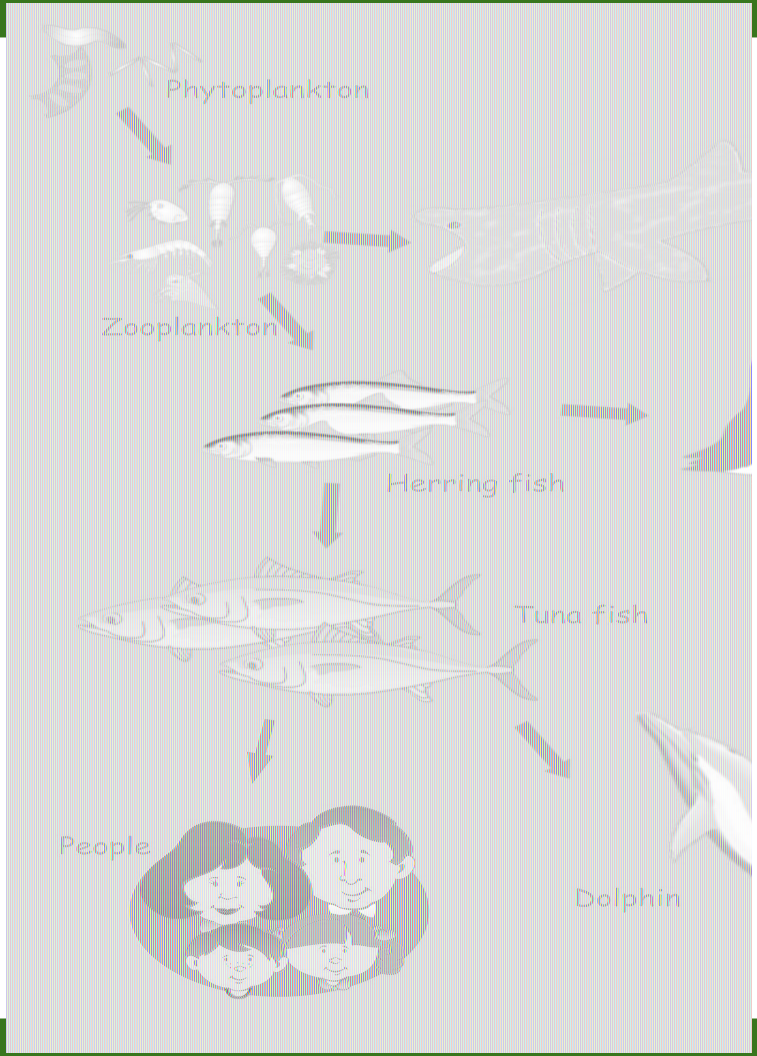


Why would organisms live in the Sunlight Zone?



Why would organisms live in the Sunlight Zone?





did you know?

- 90% of the ocean's creatures live in the Sunlight Zone.
- The zone goes from the surface of the water down about 660 feet.
- Most plants in this zone are phytoplankton, which are microscopic in size.
- The sunlight penetrates the water in this zone so photosynthesis can occur and plants can grow!

Sunlight Zone: Sea Turtle

- Sea turtles are only 2 inches long when they are born, but can grow to be 5 feet long.
- Sea turtles can hold their breath for hours at a time.
- Sea turtles lay 100-200 eggs at a time on the beach. When they hatch, the baby sea turtles must travel to the ocean.
- Sea turtles eat crab and jellyfish.
- Sharks eat sea turtles.

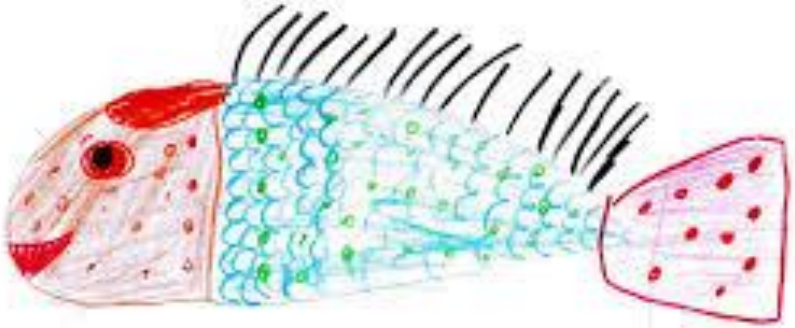
Why do Sea Turtles need to live in the Sunlight Zone?

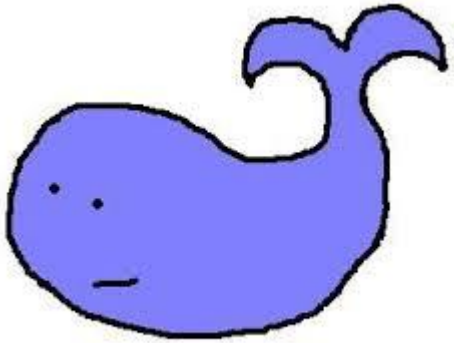
Sunlight Zone: Sea Lion

- Sharks and Orca Whales eat Sea Lions.
- Sea Lions eat fish and squid.
- When Sea Lions are born, they are about 2.5 feet long. Adult male Sea Lions can be 8 feet long!
- Sea Lions give birth on land.
- Sea Lions can hold their breath for 10 minutes!

Why do Sea Lions need to live in the Sunlight Zone?

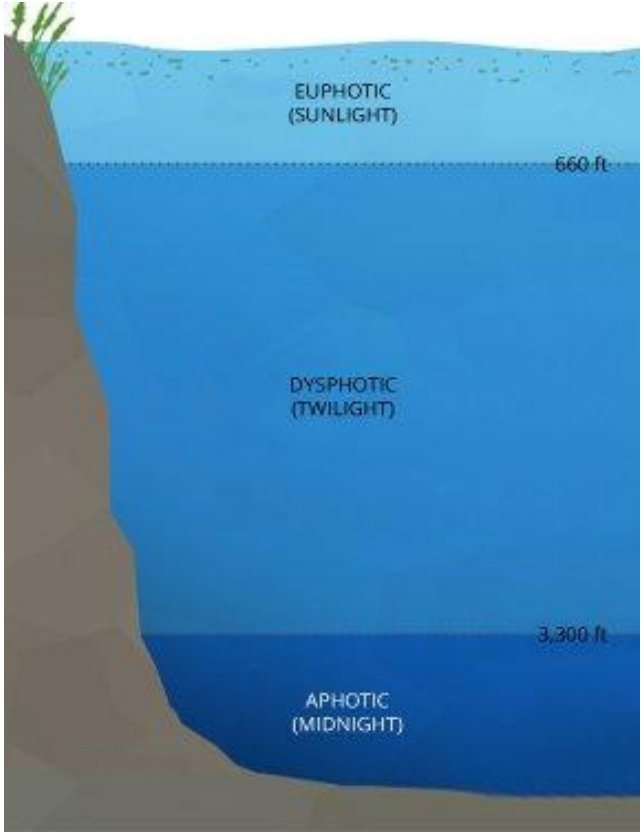
Activity: Now it’s your turn! Research 3 animals that live in the Sunlight Zone, draw/print a picture of them and write 2 facts about them!





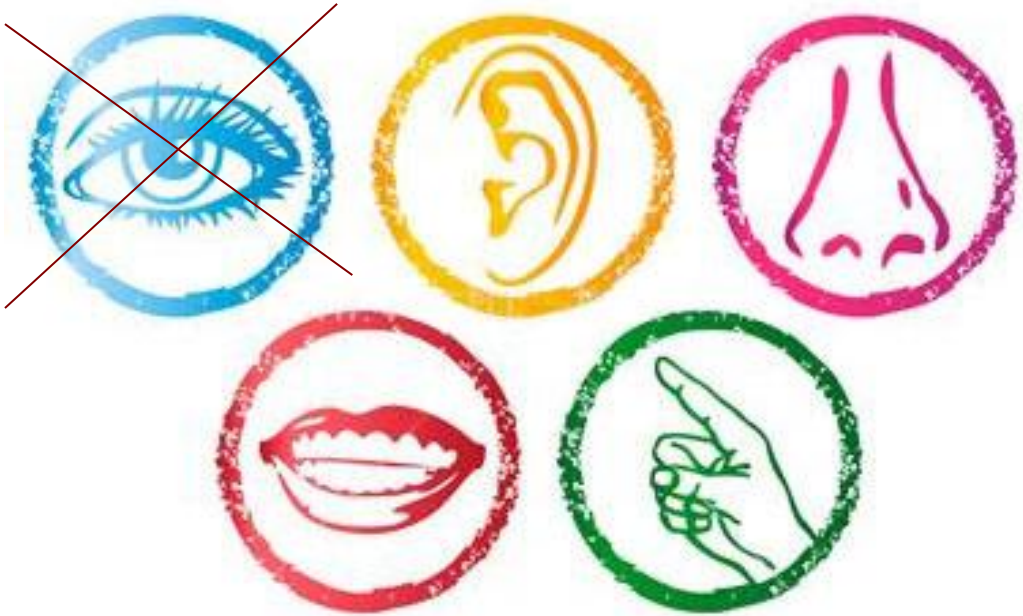
Activity: Ocean Zone Poster

- Collect one sheet of the three colors of construction paper for each student: black, light blue, and dark blue
- Tape the long edge of the papers together in this order from top to bottom: light-blue, dark-blue, and black to create the three zones. Put the tape only on the backside of the construction paper
- Measure 3-inches in from the left side and make a mark at the top of the paper. Fold the left-edge of the paper toward the front center at the mark. It will make a panel flap
- When the panel is folded closed, trace that edge with a pencil. This will show you how much of the poster is covered. You will record habitat information under the flap
- On the outside flap of the panel, label from top to bottom each of the three zones: Sunlit Zone, Twilight Zone, Midnight Zone
- Add information to the **Sunlit Zone** section of your poster under the flap.
- Using the white drawing paper draw and cut out pictures of creatures that would live in the **Sunlit Zone**. Include the name, and write a short description of each animal on a small piece of white paper. Glue the creatures and descriptions to the **Sunlit Zone** panel of the poster. Repeat for the other zones.



- Sunlight zone: the top layer of the ocean, closest to the surface
- Twilight zone: the middle layer of the ocean, between the Sunlight Zone and the Midnight Zone
- Midnight Zone: the bottom layer of the ocean

Why can some organisms live in the Twilight Zone and some can't?



did you know?

- The Twilight Zone goes from the end of the Sunlight Zone to 3,300 feet.
- There are no plants in the Twilight Zone because there is not enough light for photosynthesis to occur.
- Some organisms that live here are capable of bioluminescence, where they create their own light to attract prey or fend of predators.
- You can not swim in this zone without a special suit because the pressure is so high!

Activity: See how long it takes for a penny to fall through the ocean!

Materials:

- Graduated Cylinder (at least 12 inches)
- Penny
- Stopwatch (needs to measure up to a tenth of a second)
- Piece of paper
- Pencil
- Calculator

$$\frac{1 \text{ second}}{1 \text{ foot}} = \frac{X}{650 \text{ feet}}$$

X = 650 seconds
(about 11 minutes)

Directions:

1. Fill the graduated cylinder with 12 inches of water.
2. Have one kid drop the penny into the water at the exact moment someone else starts the stopwatch. Time how long it takes until the coin hits the bottom of the test tube.
3. Repeat the test five to ten times with different students and calculate the average time it takes the coin to fall.
4. As a class, based on how long it took the coin to fall the distance of the graduated cylinder, calculate how long it would take for the coin to pass through the Sunlight Zone (650 feet) and from the top of the Sunlight Zone to the end of the Twilight Zone (3300 feet).
5. Example to the right: if the coin took 1 second to fall 12 inches or 1 foot.

Sunlight Zone: Octopus

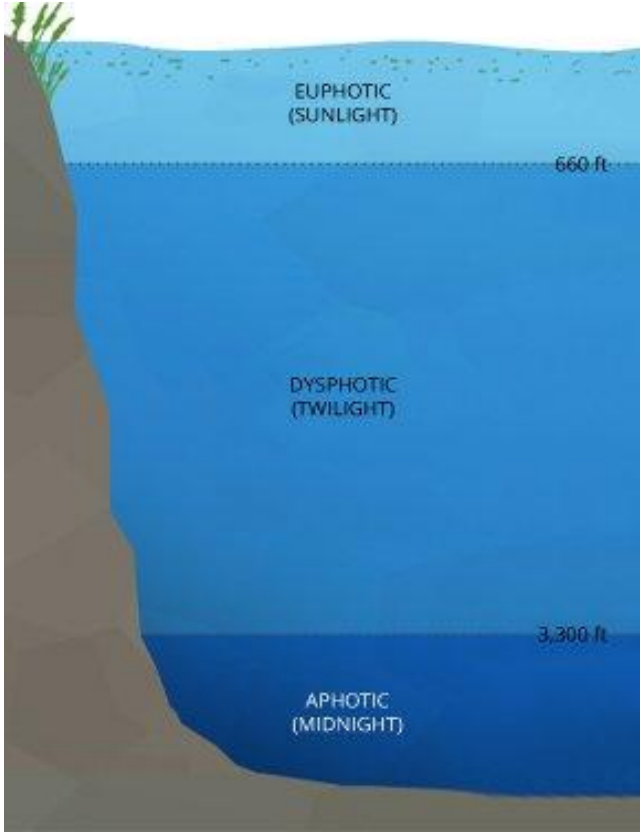
- Octopuses eat crab, shrimp and lobster without chewing. Large octopuses sometimes eat sharks!
- Seals and whales eat octopuses.
- Octopuses shoot out inky fluid when threatened to confuse the predator.
- Octopuses can change color to blend into the environment.
- Octopuses breathe through gills located in the middle of their eight legs.

Why do you think octopuses live in the Twilight Zone?

Activity: Now it’s your turn! Research 3 animals that live in the Twilight Zone, draw/print a picture of them and write 2 facts about them!

Activity: Ocean Zone Poster

- Collect one sheet of the three colors of construction paper for each student: black, light blue, and dark blue
- Tape the long edge of the papers together in this order from top to bottom: light-blue, dark-blue, and black to create the three zones. Put the tape only on the backside of the construction paper
- Measure 3-inches in from the left side and make a mark at the top of the paper. Fold the left-edge of the paper toward the front center at the mark. It will make a panel flap
- When the panel is folded closed, trace that edge with a pencil. This will show you how much of the poster is covered. You will record habitat information under the flap
- On the outside flap of the panel, label from top to bottom each of the three zones: Sunlit Zone, Twilight Zone, Midnight Zone
- Add information to the **Twilight Zone** section of your poster under the flap.
- Using the white drawing paper draw and cut out pictures of creatures that would live in the **Twilight Zone.** Include the name, and write a short description of each animal on a small piece of white paper. Glue the creatures and descriptions to the **Twilight Zone** panel of the poster. Repeat for the last zone.

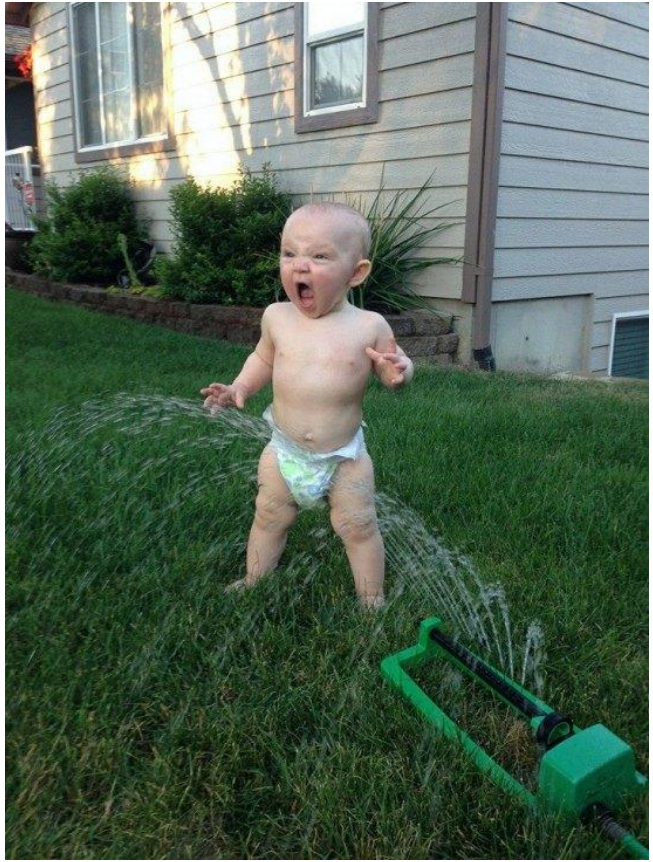


- Sunlight zone: the top layer of the ocean, closest to the surface
- Twilight zone: the middle layer of the ocean, between the Sunlight Zone and the Midnight Zone
- Midnight Zone: the bottom layer of the ocean

did you know?

- The Midnight Zone goes from 3,300 feet to 6,800 feet deep.
- Temperatures in the Midnight Zone are barely above freezing.
- Many creatures in this zone are blind because there is no reason to see because it is so dark!
- Creatures in this zone eat dead animals and plants that fall from the higher zones.

Activity: Freeze a bottle or bucket of water and then let it slowly melt. Before it all melts, have the kids put their hands or feet in it to feel how cold it is. Relate this to the temperature of the Midnight Zone (barely above freezing). How would you feel if you had to swim in this 24/7?



Let’s look at some deep sea creatures!

LOVE THE OCEAN

Activity: Ocean Zone Poster

- Collect one sheet of the three colors of construction paper for each student: black, light blue, and dark blue
- Tape the long edge of the papers together in this order from top to bottom: light-blue, dark-blue, and black to create the three zones. Put the tape only on the backside of the construction paper
- Measure 3-inches in from the left side and make a mark at the top of the paper. Fold the left-edge of the paper toward the front center at the mark. It will make a panel flap
- When the panel is folded closed, trace that edge with a pencil. This will show you how much of the poster is covered. You will record habitat information under the flap
- On the outside flap of the panel, label from top to bottom each of the three zones: Sunlit Zone, Twilight Zone, Midnight Zone
- Add information to the **Midnight** section of your poster under the flap.
- Using the white drawing paper draw and cut out pictures of creatures that would live in the **Midnight Zone**. Include the name, and write a short description of each animal on a small piece of white paper. Glue the creatures and descriptions to the **Midnight Zone** panel of the poster.

Week #6: Make Your Own Ocean Creature!

Questions For Your Creature!

- What is your creature called?
- What ocean zone does your creature live in? Why?
- What does your creature eat?
- How does your creature find/eat it’s food?
- Does anything eat your creature? If so, what?
- How does your creature travel/swim?
- How does your creature breathe?
- What else is interesting about your creature?

Additional Activities and Ideas...

Activity: Make ocean cookies! Make sure that about 70% of your cookie is blue!

Ingredients:

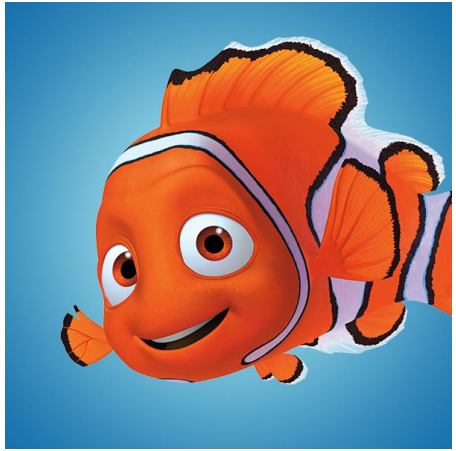
- 2 ¾ cup flour
- 1 ½ tsp baking soda
- 1 cup butter
- 1 ½ cup sugar
- 1 egg
- 1 tsp vanilla extract

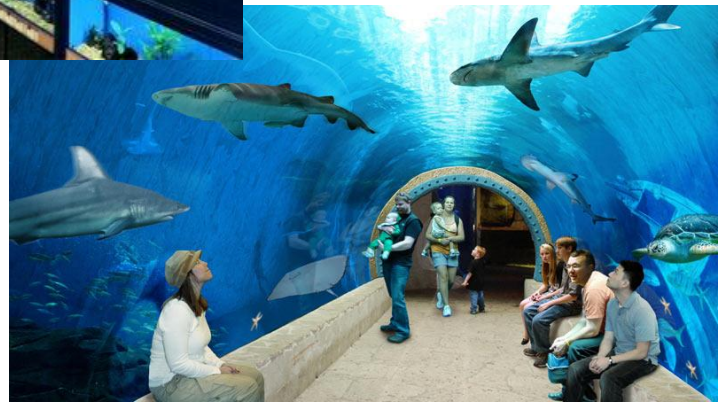
Directions:

1. Preheat oven to 375°F. In a bowl, mix flour and baking soda.
2. In a larger bowl, cream sugar and softened butter until smooth. Mix in the egg and vanilla extract. Blend in the dry ingredients slowly until combined. Hand roll into balls (teaspoon size) and place on an ungreased cookie sheet. (Before baking, let kids create their “earth” cookie with food coloring.)
3. Bake 8 - 10 minutes or until light golden brown.

Field Trip Ideas:

- Aquarium
- Zoo
- Petsmart
- Petco
- Watch ocean movie:
  - The Last Reef
  - Finding Nemo
  - The Little Mermaid
  - Free Willy
  - parts of Shark Week
- Great Salt Lake (next slide)





Great Salt Lake vs. the Ocean

Activity: Have kids split into two teams: The Salt Lake Team and The Ocean Team. Each team will have access to the internet if possible. The kids on each team will take turns with internet access but can receive help from their teammates. The teacher will ask a question and it is a race to see who can answer the question for their body of water first. The teacher will write the answers on the board so the kids will be able to compare the Salt Lake (a place they have more likely been to) to the ocean.

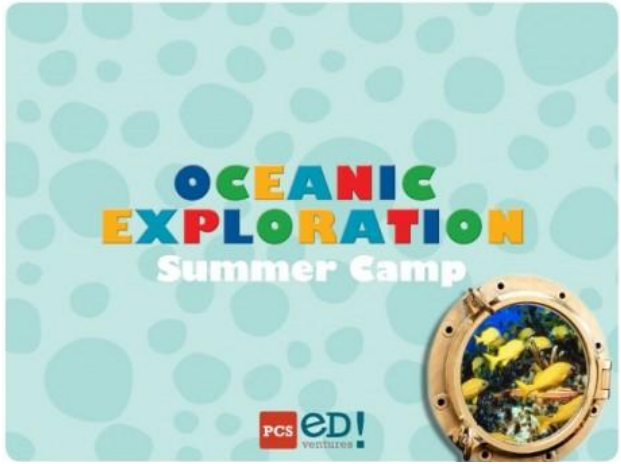
Questions: What is the sality? How many animal species live there? What is the deepest it gets? What is the average temperature? How many rivers flow into it? How many islands are in it? What is the biggest animal that lives in it?

Materials & Supplies

- Inflated Globe
- Calculator
- Measuring cup
- Salt
- Plastic cups
- Fish erasers
- Cardboard
- Scissors
- Playdough or clay
- Big, clear tub
- Ruler
- Aluminum Foil
- Paper plates
- Masking tape
- Baking soda
- Newspaper
- Red vinegar
- Computer/Laptop/iPad, etc.
- Construction paper
- Clear tape
- Graduated cylinder
- Penny
- Stopwatch
- Fun craft supplies
- Hot glue guns

Pro Tips by Jennifer

- Have a time where the kids can teach each other about what they learned that day.
- The kids loved when I let them research ocean animals of their choosing and could print pictures and write facts about them.
- Go to the aquarium if possible!
- Make it fun! If there was too much information that day, let the kids listen to the Little Mermaid soundtrack and draw ocean animals. Or, have a time where the class can look up and watch adorable ocean animal videos.
- The kids will try to learn more if they know they have to present the information later on to a classmate, another teacher, or at an event.
- Play quizzing games or around the world with ocean questions to help the kids learn and have extra motivation to learn.

Resources:

- https://www.youtube.com/watch?v=Nh6lkv1udb0
- https://www.youtube.com/watch?v=SIByysVyMrE
- https://www.youtube.com/watch?v=gRdP9_v3USU
- https://www.youtube.com/watch?v=e3J6ChmlHKQ