AT HOME SCIENTIST!

SHARKS

Sharks are amazing and often misunderstood creatures of the sea. Without them, the ocean food chain would be affected, and the balance of life in the ocean would be disrupted. Have you wondered what keeps sharks from sinking to the bottom of the ocean? They don't have lungs to fill with air, so why don't they sink? Try this and find out!

What you will need:

- Toilet paper roll
- Marker
- 3 pennies
- Balloon
- Vegetable oil
- Deep Clear Bowl
- Water
- Tape

Explore:

1. Using a marker, draw a shark horizontally on the toilet paper roll (or cut out a shark on paper and tape it on).
2. Tape 3 pennies, equally spaced, on the bottom of the toilet paper roll, when holding horizontally.
3. Fill the clear bowl with water.
4. Think: What's going to happen to the shark? Gently drop the shark in the water and watch him sink. Why did this happen?
5. Now, fill a balloon with vegetable oil, and tie closed (be careful not to spill the oil).
6. Place the balloon with the oil inside the toilet paper roll, evenly placed (not too crushed at one end or another). Try to secure with tape.
7. Observe: The roll feels much heavier now! Think: What's going to happen to the shark? Place the shark in the bowl of water. What happened?

Explain: Fish have swim bladders – gas filled sacs that can be inflated or deflated to allow the fish to change position in the water. Sharks do not have this! Sharks instead have a large and oily liver that accounts for as much as 30% of their body weight. Since oils and fats are less dense than water, the oil in the liver of the shark provides the buoyancy that the shark needs to keep from sinking.

Vocabulary:

Buoyancy: the ability or tendency to float in water, air, or another fluid.
Density: a measure of how compact the molecules of a substance are.

AT HOME SCIENTIST!

DEEP WATER CURRENTS

The ocean is a huge collection of motion! Waves and currents are constantly flowing, and are of various sizes. Currents keep nutrients moving throughout the water, which is important to ocean organisms. As currents move the warm and cold waters, it helps to regulate Earth's climate. Currents have many driving forces – let's investigate one!

What you will need:

- Glass pan (2 or more inches in depth)
- Tap water
- 2 ziploc bags (that can seal)
- 2 clothes pins
- Ice cubes
- Food coloring (contrasting colors such as red and blue)
- Rock (of medium size)
- Hot water

Explore:

1. Fill the glass pan ¾ full with tap water.
2. Place a rock in a plastic bag and fill the bag with hot water. Seal the bag, and use the clothes pin to clip it to one corner of the glass pan. *Be careful! If the pan is too full the water will overflow.
3. Fill another bag with ice cubes, and clip the bag to the opposite corner of the pan.
4. Add four drops of one food coloring to the water next to the bag of ice cubes. Then, add four drops of a different color of food coloring next to the bag of hot water.
5. Observe the food coloring for several minutes. Where did the water sink? In what direction did the color (current) flow along the bottom? Where did the water rise? Make a drawing of what you observed.

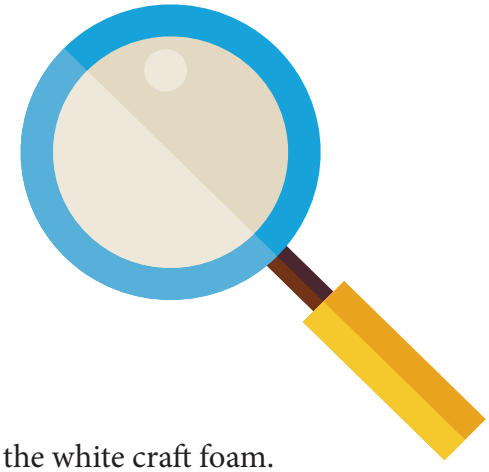
Explain: Many factors drive ocean currents; from wind, weather, and even the rotation of the earth. In this experiment, the temperature was the driving force. The coldest water is very dense, or heavy. This cold water sinks, and flows along the bottom towards the equatorial regions. This water then rises to replace the warm water that is moving away from these regions. Currents similar to this are moving throughout the earth's oceans. Have you ever heard of the Great Pacific Garbage Patch? This huge collection of debris the size of Texas (mainly plastics), has been formed as plastics and trash became trapped in the calm stable center of the circulating system.

Vocabulary:

Density: a measure of how compact the molecules of a substance are.

AT HOME SCIENTIST!
CAMOUFLAGE & 'COUNTER-SHADING'

Ocean animals have many adaptations! Some animals have special characteristics that allow them to survive in the deep ocean, such as large eyes, or bioluminescent lures. Others have ways of mimicking poisonous creatures to deter their predators. Have you ever wondered why animals like dolphins, penguins, or even stingrays have light colored bellies and darker colored backs? What kind of adaptation is this? Try this out and see for yourself!



What you will need:

- Mason jar – or any fairly large, clear jar (no lid necessary)
- Water
- Craft foam (1 sheet of black, 1 sheet of white)
- Glue stick
- Scissors
- Black construction paper

Explore:

1. Cut a 2" square out of the black foam, and a 2" square out of the white craft foam.
2. Glue them together and cut out an animal shape: penguin, fish, stingray – your choice!
3. Fill the jar halfway with water and place the shape, black side down on top of the water. Hold the jar under a light source (lamp, lightbulb, flashlight) and look at the shape from the bottom of the jar. It should be easy to see.
4. Turn the shape over, white side down. Look through the bottom of the jar again. It's much harder to see now because the light and the white color blend together.
5. Finally, place the jar on top of the black paper. The black paper represents the darkness of the deep ocean. Take a look from above the jar to see how the black side of the shape helps blend into the water from this angle!

Explain: Counter-shading is a type of camouflage that is used by ocean animals to help them blend in, hide from predators, but still be in plain sight. The underside is a light color, and the top would be darker. From underneath, a predator would look up at the light from the sun, and the light belly of the animal would help it "hide". From above, a predator sees the dark depths of the ocean. The darker colored back of the counter-shaded animal makes it almost invisible.

Vocabulary:

Counter-shading: A type of camouflage in which the animal displays a dark colored back and light colored underside to hide from predators.

Adaptation: A change in which an organism or a species becomes better suited to its environment.

AT HOME SCIENTIST!
OCEAN ACIDIFICATION!

We find acids in foods like lemons, or in condiments like vinegar. We may feel a slight burning sensation to our taste buds if we bite into something acidic (when is the last time you bit into a lemon!). But what happens when the ocean water gets acidic? Let's find out!

What you will need:

- Two mason jars, clean and empty jam jars, or clear glass jars
- Two similar seashells or pieces of seashells
- Tap water
- White vinegar

Explore:

1. Take two clean glasses or jam jars (no lids needed). Fill one with water and one with white vinegar. (The vinegar is our acid)
2. Find two similar pieces of seashell, e.g. from a mussel or cockle. Put one in water and one in vinegar.
3. Observe: what do you see happening immediately after placing the shells into each substance?
4. Leave the shells in their liquids for 24 hours.
5. Remove the two shells and compare – make a sketch of each result. Think: what might have happened?

*Substitution – if you don't have access to seashells, try doing this same experiment with two whole raw eggs! The shell of a chicken egg is made of calcium carbonate – the same substance that gives a seashell its rigid and hard surface. See what happens to the egg when left in vinegar over 24 hours, compared to the one in the tap water.

Explain: Scientists often take readings of the pH of the ocean water to find out if the conditions are healthy for the organisms that live there. If the water was found to be too acidic on the pH scale, this could spell trouble! When fossil fuels are burned, they produce carbon dioxide. The ocean absorbs some of that, and when dissolved in water, carbonic acid is formed. Carbonic acid, like the vinegar in this experiment, is an acid. Organisms such as sea snails, clams, mussels, corals, and even some plankton have shells or skeletons made of calcium carbonate. When acid levels are too high, the calcium carbonate shell begins to break down and disintegrate over time.

Vocabulary:

pH: A scale used to measure of the acidity or basicity of a liquid.
Carbonic Acid: An acid formed in solution when carbon dioxide is combined with water.

AT HOME SCIENTIST!
COASTAL EROSION & PLANT LIFE

Here in Florida, you may have noticed the bushy, green-leaved trees that line the shoreline. These trees are called mangroves. Mangroves are a protected species – which means you cannot cut them down without facing huge fines and penalties! Do you ever wonder why? Think about some reasons that the mangroves cannot be cleared away from the shore. Now, let's explore how plant life helps to fight erosion!

What you will need:

- 6 empty plastic 2 liter soda bottles (with the labels and caps removed) *this is a great way to re-use a plastic bottle!
- Scissors or a sharp knife (have your parents help with this part)
- 3 pieces of string (each about 45 cm long)
- Soil/dirt
- Small plant life (grasses, small flowers, etc.)
- Some rocks, leaves, and other ground material

Explore:

1. Cut the bottoms off of 3 bottles, creating 3, approximately 3 inch deep 'cups'.
2. Make a hole on opposite sides of each cup, and run a section of string through the holes and tie (creating a handle).
3. Holding three new empty soda bottles horizontally, cut the top sections off, creating boat-like shapes (see photo attached).
4. Fill one of these soda bottle "boats" with just soil, to the top of the opening.
5. Fill one of the soda bottles with soil, and ground material to the top of the opening.
6. Fill the last soda bottle with soil, and healthy plant life growing IN the soil (this may need to be set up in advance to allow the plant life to grow and the roots to set)
7. Set the soda bottles on a table, side by side, with the mouths of the bottles aligned with the edge of the table.
8. Hang the three cups from the mouths of the soda bottles
9. Now, pour water into each of the bottles with the soil, debris, and plant life.

*Note what the discharge that is collecting in the cups looks like – is it full of soil that has been eroded? Is it clear? Is it dirty? Discuss why you have observed what you have seen. How does this relate to the Florida mangrove, or other coastal plant life?

Explain: Coastal communities are especially vulnerable to erosion. Wind, waves, and other natural agents work to break apart the soil on a daily basis. Plant life, such as the mangrove trees along the coast line in Florida, is essential in fighting against erosion. The root systems of plants and trees work to hold the soil together, and keep it strong and steady against the elements. This is just another reason that plants and trees are great for the ecosystem!

Vocabulary:

Erosion: A gradual destruction of something by wind, water, or other natural agents.