Earth Science 11 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Block: \_\_\_\_\_\_\_\_\_\_

**Station One: Oceans and the Atmosphere (Connections to Weather)**

Big Idea: The distribution of water has a major influence on weather and climate.

Using the textbook, read *Tropical Cyclones* (Pg. 355) to answer the following questions;

1. Identify the three main stages of a tropical cyclone.

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1. **Describe** the changing wind systems that guide a tropical cyclone as it moves from the tropics to the midlatitudes

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1. Identify two conditions that must exist for a tropical cyclone to form.

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1. **Explain** what causes a cyclone to dissipate.

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**Extending:** Using your phones, research El Nino. **Describe** the connection between the ocean and atmosphere that causes El Nino to occur.

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**Station Two: Ocean Layering**

Read the information provided and create a diagram/drawing of the ocean layers and their properties. Bonus for adding depth/height comparisons (such as; landmarks, mountains, etc)

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**Station Three: Temperature Experiment**

Perform the experiment to answer the questions below (see experiment procedure at station)

1. Look at the containers from the side; draw a picture of what you see.

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1. Which is denser, cold water or warm water? Explain why.

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1. How does heat energy affect the movement of water molecules? (Hint: Compare boiling water to cool water.) When do you think it is easier for molecules to stay close together: when they move slowly or when they move quickly?

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1. Put a straw in the cold water; position your finger over the opening. When you life the straw above the surface, water should stay in the straw. Put the straw on the inside edge of the cup of hot water and slowly release the cold water. Where does it go?

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1. Write a hypothesis (using If…then…because… statement). If you float a blue ice cube in the warm water. What happens to the blue coloring as the ice melts?

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**Station Four: Salinity Experiment**

Materials:

Beakers (x2)

Salt

Hard Boiled Eggs (x2)

Food colouring

1. Fill two beakers with water. While stirring, add salt to one of the glasses until no more salt dissolves. Place a hard-boiled egg in each beaker. The egg should float in the salt water; if not, try adding more salt.
2. How does salt affect water density? (Hint: Which has more particles within the same amount of space, fresh water or water with salt added?) Explain using your observations from the experiment.

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1. Remove your eggs and add food colouring to your fresh water. Try to float fresh water on top of salt water. Be careful when pouring; try to flow the salt water gently over the salt water. **Describe** what happens to the fresh water. **Explain** why the fresh water was able to float on top of the salt water.

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**Answer the following question after completing *both* station 3 & 4.**

You have four water masses one with *cold salt water,* one with *warm salt water*, one with *cold fresh water,* and one with *warm fresh water*. Draw a diagram of what would happen if these masses were combined to form layers. Which would be at the top, which at the bottom. **Explain** you reasoning.

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**Station Three: Temperature Experiment**

Materials

Beakers (x2)

Very Cold Water

Warm Water

Blue Food colouring

Red Food colouring



Procedure

1. Collect Materials
2. Fill a beaker 1/3 with cold water and colour is blue
3. Fill a beaker 1/3 with warm water and colour it red
4. Gently tilt both beakers so that the liquids almost touch and then allow hot water to flow over cold.

**Ocean Layering**

With their exceptionally varied underwater geography the ocean basins support the life of almost 50% of all species on Earth and play a major role in weather and climate. Trenches and canyons deeper than the Grand Canyon, mountain ranges larger than the Himalayas, vast flat botoom valley, active volcanoes and smoker chimneys belching gas and particles from the Earth’s core are all part of the topography of the ocean. Of all of Earth’s complex ecosystems, the marine environment is the least explored and understood. Scientists estimate that 95% of the ocean remains uncharted.

The sun, a vital component of life for much of our planet, penetrates only the uppermost layers of the ocean. In deeper realms, scientists are studying ecosystems along the edges of continental plates. In the absence of sunlight, creatures live and grow using chemosynthesis, a process much like photosynthesis except that instead of sunlight, organisms are able to convert chemicals into life-supporting energy. Some thrive on gases spewing from hydrothermal vents along the plate boundaries of the ocean floor. The superheated water and gases are toxic for species above the surface of the ocean, yet crabs, tube worms and clams flourish in this extreme environment.

In the dark, open water of the ocean, phosphorescent creatures use light to capture prey and perhaps to communicate with one another in the dark. Fish, crabs, octopuses and other animals have adapted to an environment that is not only without light but is also under the extreme pressure of the billions of gallons of water above them.

Scientists have classified ocean basins into different zones, each with its own characteristics. The five zones are:

* **The sunlit or epipelagic zone** is the top layer of the ocean, extending from the surface to 660 feet (200m) below the surface. As the name suggests, this zone has the most visible light. Heat from the light contributes to the wide swings of temperature that can occur in this zone.
* **The twilight or mesopelagic zone** extends from 660 feet (200m) below the surface to 3,300 feet (1,000m). Only faint light can penetrate to this depth.
* **The dark or bathypelagic zone** reaches from 3,300 feet (1,00m) to 13,100 feet (4,000m). The only light visible in this zone is produced by the organisms that live there. Most of them are black or red in color because of the lack of light.
* **The abyssal or abyssopelagic zone** extends from 13,100 feet (4,000 m) to 19,700 feet (6,000m) and is sometimes called simply “the abyss.” The waters of the abyssal zone are near freezing, and there is no light at all. Very few creatures can make their homes in the extreme pressure of these depths, yet approximately three0quarters of the ocean floor is believed to be within this zone.
* **The trenches, or hadalpelagic zone,** are below the deepest depths of the abyssal zone, starting at 19,700 feet (6,000m). The deepest place in the ocean is believed to be in the Pacific Ocean’s Mariana Trench off the coast of Japan, at a depth of approximately 35,800 feet (10,911m). Despite the near-freezing temperatures and extreme pressure, life exists, even at the very bottom. Tiny plankton species were discovered in the Challenger Deep, the deepest point in the Mariana Trench, in 2005.

Depending on individual adaptations, marine species may move freely between zones. Each layer provides a different living environment influenced by sunlight, depth and hydrostatic pressure. The deeper an animal (or object) is, the more gallons of water are weighing down on it. Each gallon of water weighs 8.8 pounds (4 kg). The pressure generated by the accumulated weight of the water at a given depth is called the hydrostatic pressure.

We have only begun to explore and understand the ocean and the secrets it holds beneath its surface.

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