**Density, Temperature, and the Movement of the Oceans**

**Earth Science, Mr. Lanik**

As we have demonstrated, salt water is denser than fresh tap water. Since we know that the “saltiness” of the ocean changes from one location to another, we are faced with a question: *how do water density differences in the oceans affect our planet?*

Quick Review: What are TWO reasons why the “saltiness” of the ocean might change as you move from one location to another?

Thought Questions: Why do some objects/substances float in water, while other objects/substances sink? What makes an object float or sink?

Based on your response above, what do you think density has to do with floating and sinking?

**Demo #1: Do you think that a can of Mountain Dew will float in water?**

If yes, why? If no, why not?

What happens to a can of regular Mountain Dew in water? What happens to the can of diet Mountain Dew?

What is a possible explanation for this difference?

Question: How many grams of sugar are in a 12 oz can of Mountain Dew? \_\_\_\_\_\_

**Demo #2: Floating Thermometer**

Examine the tube of floating glass orbs. Why do you think that the orbs are near the top of the water column?

What do you think will happen in the tube if we place the bottom half of it in a tub of hot water? Why do you think this?

Observe what happens to the tube as it gets warmer. What is happening?

What is a possible explanation for what you see in the tube while it is getting warmer? Use your understanding of density in your response.

**Demo #3: When ice melts…**

If a block of ice containing food coloring is placed in a tank of water, the melting water can be seen moving through the water. Based on what you’ve learned so far about density, temperature, and water movement, what do you think will happen to the water that melts off of a block of ice that sits in a tank of room temperature water?

Now watch the ice in the tank of water. Patiently watch the path of the melted ice water as it moves away from the ice. Does it stay “together”, leaving parts of the tank free of dye while the dye moves through the water, does the dye just spread out evenly, everywhere at once throughout the tank, or does the dye not move through the water at all?

Use a colored pencil and the diagram of the water tank below to show what happens to the dye.

Why do you think that this happens?

Now watch as your teacher places dyed ice in the second tank of water. Again, watch the path of the dye/melt as it moves away from the ice. Does it stay “together”, leaving parts of the tank free of dye while the dye moves through the water, does the dye just spread out evenly-- going everywhere at once throughout the tank, or does the dye not move through the water at all?

Use a colored pencil and the diagram of the water tank below to show what happens to the dye.

Did the melting ice behave the same way in each of the two tanks?

What is a possible explanation for what you observed???

Based on these two demonstrations, answer the following questions:

a) What do you think happens in the ocean when cold from the Arctic moves into warm water from the tropics?

b) What do you think happens in the ocean when less salty water moves into more salty water?

**Demo #4: The Ocean is like a Giant Conveyor Belt**

Examine the tube apparatus. If water is placed in the tubes, it will be able to flow anywhere through the tubes. Each of the two standing tubes sits in a container. One of the containers holds ice water, and the other holds hot water.

Based on what you have learned so far about density, temperature, and water movement, what do you think will happen to the water in the tube apparatus?

Will the water stay at rest, or will it move as a result of the ice water/hot water?

If the water moves, will it move randomly through the apparatus, or will it create a current that flows?

If a current flows, what direction will it flow in? Why?

Watch carefully as Mr. L adds a different color of dye to each of the standing tubes. Sketch and label what you see using the diagram below.

Hot water

Ice water

Were your predictions about the movement of the water correct?

Work with a classmate to develop a scientific explanation for what you see happening in the tube apparatus. Use your understanding of density, temperature, and water movement to create your explanation.

Bring it all together now. Based on what you’ve learned in these demonstrations, what do differences in ocean temperature and ocean salinity create?