Lab: The Briny Deep

Name: _____ Period: _____

Introduction

Although not as visible as tides and waves, large movements of ocean water called upwellings, surface currents, and density currents have a powerful influence on our planet. Weather, climate, fishing, and animal migrations are all impacted by these circulation patterns. This activity will focus on the type of circulation known as "density currents".

Pre-Lab Questions

1. Match each type of current with its definition.

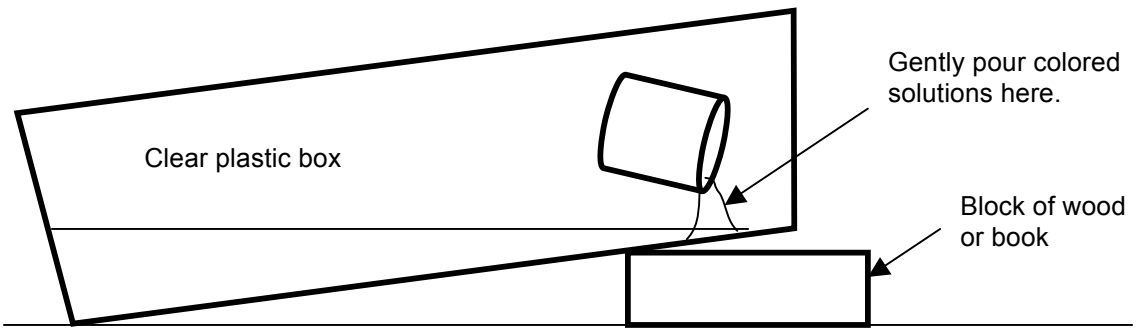
_____ Upwelling	A. a continuous flow of water along a constant path in the ocean
_____ Surface Currents	B. the movement of cold, deep water to the ocean surface
_____ Density Currents	C. the sinking of water that has become heavier than the surrounding water.

2. List the following materials from highest to lowest density: aluminum, gold, water, propane, lead, oxygen, mercury, and vegetable oil.

3. Everyone is familiar with the symbol ($^0/_0$), which means percent, or parts per _____. A similar symbol, ($^0/_{00}$), is used to indicate how salty a sample of water is. What does this symbol mean?

   It means parts per _____.

4. The salinity of Atlantic Ocean Water is 35 $^0/_{00}$. Therefore, 1000 g. of this water would include _____ g. of water and _____ g. of salt.



Instructions

1. Obtain a clear plastic box. Add 800 ml of room temperature water to the box. Use two hands to carry it back to your table because the boxes crack really easily. Set up the box as shown on the front of this sheet. You will also need a small beaker and a spoon. Let the water become calm, and try not to disturb it throughout the lab.

2. Put 30-40 ml of room temperature water into the small beaker. Add about half a spoon of salt and 2 drops of yellow food coloring. Stir the water until the salt dissolves.

3. **Carefully and slowly** pour the solution into the clear plastic box near the end that is propped up. Get down and look into the side of the box. Describe what happened.

   _____

   _____

4. Next, get 30-40 ml of really cold water. Add 2 drops of blue food coloring and stir. Do not pour it into the box yet. Predict what will happen when you pour it in.

   _____

   _____

5. **Carefully and slowly** pour the blue, cold water in. Describe what happened.

   _____

   _____

6. Refill your beaker with 30-40 ml of hot water. Add 2 drops of red food coloring. Predict what will happen when this is poured in.

   _____

   _____

7. **Carefully and slowly** pour the hot water in. Describe what happened.

   _____

   _____

8. From what you have learned so far, which has a higher density? Circle one.

   salty water freshwater

9. From what you've learned so far, which has a higher density? Circle one.

   warm water cold water

10. Use colored pencils (yellow, blue, red) to color the diagram on the front of this sheet to show what the layers looked like <u>after the hot, red water was poured in</u>.

11. Use two hands to carry your box of water to a sink. Dump it out. Rinse your small beaker and spoon off and put them back. Answer the follow-up questions on the next page.

Follow-Up Questions Use sentences to answer each question marked with an asterisk (*).

1. *How does evaporation from an ocean increase the salinity of the water that didn't evaporate? (p. 405-406)

2. *Why does the density of liquid water increase as it cools? (THINK! Hint: The molecules slow down.)

3. *Look at figure 15.7 on p. 432 and read the caption. When water on the surface freezes, why does this make water beneath the ice saltier?

4. *Why is the Mediterranean Sea so salty compared to the Atlantic? (Hint: It has to do with the Mediterranean climate.)

5. *Why is water around Antarctic more dense than other areas in the Atlantic? (Hint: It is not very salty.)

6. Look at the photo on page 409 and read the caption. Would it be easier for you to float in the Atlantic or the Mediterranean?

7. Look at figure 14.3 on p. 407 and read the caption. At which latitude is sea surface temperature the warmest?

8. What causes salinity of water near the equator to be fairly low (not as salty)? Circle one.

lots of rain lots of evaporation formation of ice snow/ice melting

9. *Why is the salinity fairly high around 30 degrees north and south of the equator? (p. 405)

10. *Look at figure 14.4 and read the caption. Explain why salinity near the poles increases in the winter and decreases in the summer? (p. 406 may help also)

11.*Explain why the salinity of parts of the Baltic Sea can drop below 10 ppt in the spring.

12. *The movement of cold water from the ocean depths to the surface is called "upwelling". Explain how wind causes upwelling to happen? (text page 431)

13. Regions of upwelling are typically good commercial fishing areas. What does upwelling bring to the surface, causing these to be good fishing areas? Circle one.

Algae (a.k.a. phytoplankton) fish oxygen nutrients plankton (includes zooplankton and phytoplankton)

14. *Explain what figure 15.6 on page 432 has to do with questions 12 and 13 above.