Unknown Densities: How Ocean Density Can Affect Weather/Climate

Geology Mr. Traeger

Name:_____ Period:_____ Date:_____

Purpose

The purpose of this activity is to become familiar with the concept of density and how it affects climate and weather. It also explains why the world went into deep freeze in the movie *The Day After Tomorrow*.

Materials

- 4-250 mL beakers, each filled with an unknown colored aqueous solution (red, blue, green, and yellow)
- Drinking straw (Use these to stir, NOT to taste!)
- Stirring rod
- plastic tongs
- 4 plastic colored strips, each colored red, white, yellow, and green

Part 1: Experiment Procedure/Questions

1. You have four solutions of unknown density and four strips of unknown density. Your job is to arrange the strips and the solutions in order from least dense to most dense.
2. Drop 1 of each strip into each solution. Note which strips float and which strips sink in each solution. Fill in the data chart below with the word ñfloatò or ñsink.òDO NOT mix the solutions! This will contaminate them and ruin the lab!

Plastic Strips	**Solutions**			
	Red	Blue	Green	Yellow
red				
white				
yellow				
green				

3. What is density? Explain both mathematically and conceptually.

Mathematical Definition of Density	Conceptual Definition of Density

4. What is the order of density of the strips from least dense to most dense? Name the color.

Least Dense Strip	Next Most Dense	Next Most Dense	Most Dense Strip

5. What is the order of density of the solutions from least dense to most dense? Name the color.

Least Dense Solution	Next Most Dense	Next Most Dense	Most Dense Solution

6. What are the specific gravities (densities) of each solution as recorded by Mr. T using the hydrometer?

Least Dense Solution	Next Most Dense	Next Most Dense	Most Dense Solution

7. What is different about each solution, besides the color?

Part 2: Density and Ocean Currents

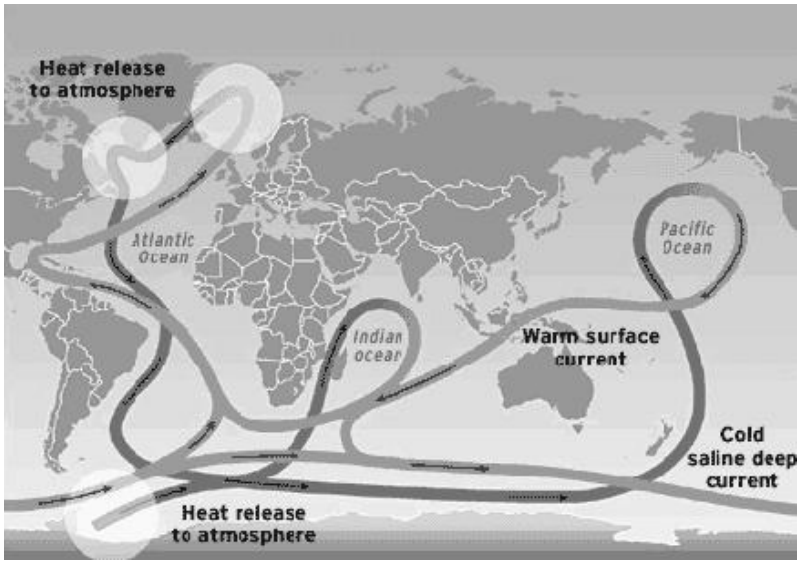
1. Fill in the following chart with the words ñsink,ò ñrise,ò ñreally sink,ò ñreally rise.ò

Warm water will	Cold water will	Salty water will	Fresh water will	Warm, Fresh Water will	Cold, Salty Water will

2. Seawater is cold *and* salty in the North Atlantic Ocean. Will the water rise or sink? Why?

3. Seawater is warm and somewhat salty in the oceans near the equator. Will the water rise or sink? Why?

4. The following is a map of the ocean conveyor belt showing how ocean currents flow according to density. Mark on the map where water will sink and where water will rise.



5. If glaciers melt due to global warming and too much fresh water is dumped in the North Atlantic Ocean, how will this affect the density of the water?

6. What will happen to our climate if the ocean conveyor belt stops and heat is not carried from the equator towards the poles? Will it become warmer or colder? Why?

7. Do you really think global warming could cause the Earth to go into deep freeze due to a shutdown of the ocean conveyor belt as seen in the movie *The Day After Tomorrow*?