

Name: _____

Period: ___ Date: _____

Salinity Lab: Layers in the Ocean

(Adapted from

https://www.st.nmfs.noaa.gov/Assets/Nemo/documents/lessons/Lesson_6/Lesson_6-Teacher's_Guide.pdf)

Background: The ocean is a solution made of water mixed with many different types of salt. The ocean is not one homogeneous solution where all of the water is the exact same temperature and exact same salinity. Temperature and salinity (the amount of dissolved salts in the water) affect the density of the water. There are parts of the ocean that have cooler water and some parts with warmer water. Likewise, certain parts of the ocean have higher salinity than others. Ocean salinity differs by small numbers, so oceanographers need to be accurate when measuring it. Changes in density caused by wind and currents at the surface affects the deep-ocean currents. Density ultimately affects the objects that exist in the water, such as whales, seaweed, and submarines. The higher the salinity, the more buoyant an object becomes (the more easily it floats). Therefore, salt waters are constantly trying to find their "place" in the ocean according to their salinity. Very salty water is denser, and will sink more, thus very salty water is found at the bottom. Less salty water is less dense and will float on top of the more dense salty water.

Objective: In this activity, you will conduct an experiment to see how temperature or salinity affects the density of ocean water.

Materials:

- 70ppt salt water solution (room temp) -- _____
- 35ppt salt water solution (room temp) -- _____
- 35ppt salt water solution (cold) -- _____
- 35ppt salt water solution (hot) -- _____
- Tap water
- 2 500mL beakers

Temperature Test

For this test, you will use hot and cool seawater solutions. Do you think the hot water will combine evenly with the cold seawater? How do you think they will react to one another? Write a hypothesis for how you think the temperature of the water affects the density.

Hypothesis:

Variables: identify the variables for your experiment.

Controlled variable: _____

Independent variable: _____

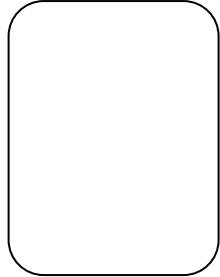
Dependent variable: _____

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Procedure:

1. Gently put a dropper-full of COLD 35ppt solution into the beaker.
2. Gently put a dropper-full of HOT 35ppt solution into your beaker. Record your observations.
3. Make a diagram of the beaker below and label with the layers:



Salinity Test

For this test, you will use a solution that has high salinity (much more salty) compared to our 35ppt solution. Which layer do you think will be on top – the high or low salinity water? Write a hypothesis to show how salinity of the water affects the density.

Hypothesis:

Variables: identify the variables for your experiment.

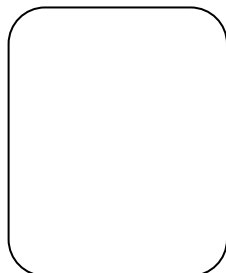
Controlled variable: _____

Independent variable: _____

Dependent variable: _____

Procedure:

1. Gently put a dropper-full of room temperature 35ppt solution into the beaker.
2. Gently put a dropper-full of 70ppt solution into the beaker. Record your observations.
3. Make a diagram of the beaker below and label with the layers:



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Discussion and Analysis Questions

1. What were your predictions for the temperature test? Was your hypothesis correct? Explain.
2. Describe your results of the temperature test, in terms of density. Which solution is denser? How does temperature affect the density of seawater?
3. What were your predictions for the salinity test? Was your hypothesis correct? Explain.
4. Describe your results of the salinity test, in terms of density. Which solution is denser? How does salinity affect density?
5. Table 1 lists the approximate surface water salinities at various latitudes in the Atlantic and Pacific Oceans, Using the data construct a **salinity curve** for each ocean on a separate sheet. Make sure to title your graph and label the axes. *Use different colored pencils for each ocean.*

Table 1: Approximate Surface Water Salinities

Latitude	Atlantic Ocean	Pacific Ocean
60°N	33.0	31.0
50°	33.7	32.5
40°	34.8	33.5
30°	36.7	34.2
20°	36.8	34.2
10°	36.0	34.4
0° (Equator)	35.0	34.3
10°	35.9	35.2
20°	36.7	35.6
30°	36.2	35.7
40°	35.3	35.0
50°	34.3	34.4
60°	33.9	34.0
60°S	33.0	31.0

6. At which latitudes are the highest surface salinities found? Suggest a reason why.
7. Of the 2 oceans, which has the higher average surface salinity?