(a two part activity)

Activity # 5 - Layering of Water

Concepts # 6, 7, 8, 9

#6 Water mixes or forms layers due to the amount of salinity.
#7 Water with the most dissolved salt tends to form the bottom layer (most dense).
#8 Water with the least dissolved salt usually forms the top layer.
#9 Density differences between two volumes of water can prevent them from mixing.

Objective:

Students will investigate what happens when ocean water, fresh water and/or brackish water meet.

- - - - - Part I - - - - -

Materials for part I:

- 4 glass jars
- 2 siphons (clear plastic tubes)
- 1 gal. fresh water
- 1 gal. fresh water with green food coloring
- 1 gal. salt water with 1 cup of kosher salt
- 1 gal. salt water with 1 cup of kosher salt and green food coloring

Procedures for part I:

1. Make the salt solutions the day before and allow to sit. Label each bottle.
2. Guide students to hypothesize regarding what could happen when salt water meets fresh water.
3. Fill one jar 1/3 full of clear fresh water. Fill a second jar with colored salt water. Start a siphon by filling a plastic tube with colored water and keeping the colored salt water solution jar higher than the fresh water jar. A colored salt solution layer will form on the bottom of the jar.
4. Fill one jar 1/3 full of clear salt water. Fill a siphon of the colored fresh water. Colored fresh water will layer at the top of the jar.
5. Record and discuss observations.

Evaluation for part I:

- How many layers formed? (2)
- Which layer is salty? (bottom)
- Are the layers completely separated? (no)
- What happened at the interface? (Mixing)
- Draw the results of the demonstration (Drawings here)

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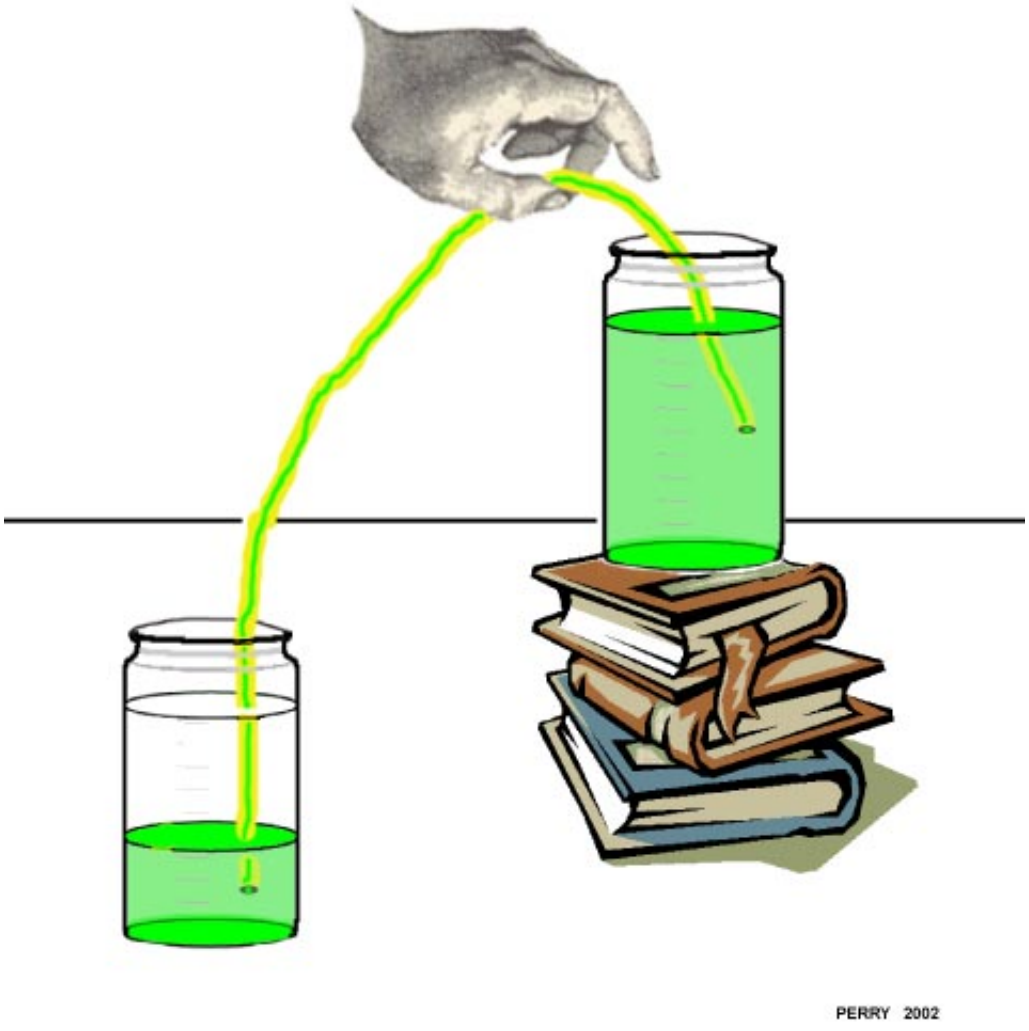

Siphoning colored salt water to bottom of freshwater jar.

- - - - - Part II - - - - -

Materials for part II:

- straw (clear plastic)
- clay
- eye droppers
- sheet of white paper
- towel
- waste cup
- 3 cups with solutions
- towel
- waste cup
- 3 cups with solutions
- kosher salt

Solutions

Ocean Water	Brackish Water	River Water
500 ml water	500 ml water	500 ml water
120 ml salt	40 ml salt	no salt
20 drops blue food coloring	20 drops red food coloring	20 drops green food coloring

Dissolve salt completely (sitting overnight)

Procedures for part II:

1. Place the plastic straw into the clay at an angle. Put the straw half-way through the clay.
2. You will now hypothesize which solution is fresh (river), which is salty (ocean), which is brackish (mixture). This is done by placing small amounts of each solution into the straw. In the correct order three distinct layers will be produced.
3. Write your hypothesis for each possible combination of colored solutions before you start. Record your observations after each trial.
4. Test your hypothesis by using an eye dropper to fill 1/3 of the straw with each solution. Place the white paper behind the straw to observe the solutions. Record your observations.
5. Empty the straw by picking up the whole assembly (do not take the straw out of the clay) and shaking the solution into the waste cup. Try your next hypothesis. When finished with your trials answer these questions.

Evaluation for part II:

- What is the order of the solutions that results with three distinct layers? (blue, red, green)
- Why did this result happen in that order? (The highest density on the bottom, lowest density on the top, and the mixture between the two.)
- In an estuary where the river meets the sea, where would the salinity of the water be the greatest? (near the bottom layer of the estuary)

Extensions:

- Visit an estuary and take salinity samples at different levels, places, and times of the day.
- Have a contest to see who can find out what kind of water they have in their jar. (The teacher fills the jars with 3 different kinds of solutions.) Students can not taste the water. They do some physical tests to determine which solution they have. Award prizes for right guesses. (Remember to label each jar with a # or letter and keep a record of the correct answers.)