Osmosis and Diffusion Lab

Background information:

Osmosis is a special case of diffusion. It occurs whenever water molecules diffuse from a region of higher concentration or density to a region of lower concentration across a selectively permeable cell membrane.

The swelling or shrinking of cells can damage them. Human cells are about 0.9% saline (salt water). Placing cells in distilled water (0% saline) causes water to diffuse into he cells and they burst. This is an example of a hypotonic solution. But if cells are placed in a solution that is higher saline, water will diffuse from the cells causing them to shrink. This hypertonic solution is caused by the need for the solutions to always be at equilibrium.

Drinking salt water normally quenches your thirst. But when you drink salt water it seems to make you more thirsty. The water in your mouth creates a situation in which the cells in your mouth are in hypertonic solution. In order to reach equilibrium, a net water movement out of the cells takes place. Now the cells have even less water than before, and you feel even more thirsty. Salt water not only dries out your mouth but the cells in your body too. As it enters your body, the cells near it release water to reach equilibrium with the surrounding fluid. The cells shrink and may become damaged. This is a condition called dehydration, or excessive water loss.

In order to make ocean (salt) water drinkable, a system has been devised to remove the salt. It is called distillation. What would happen if a fresh water fish had to live in salt water?

For most fish, they would die. Bur some, like eels and salmon, can move freely between the two at certain stages of their lives. To do this they have special mechanisms for excretion and absorption of salt water. If you put a freshwater fish into salt water, most fish would lose weight (from losing water from its body) and eventually die.
Approximately 2% of all 21,000 species of shih actually move from fresh water to salt water for from salt to fresh at some point in their lies, the move would kill any other fish. But even with these special varieties of fish, the move must be gradual so their bodies can adjust or they will die from the change.
Fish that can live in both salt and fresh water are called osmoregulators. Salmon is an example. They hatch in fresh water, swim to the ocean and spend most of their live there. They then swim back to their spawning grounds (where they hatched) to lay their own eggs. They go from fresh to salt water and back again. They regulate their salt intake through their kidneys and their gills. Excess water can be lost through the gills and excess salt can be lost through the kidneys.

Materials:

cm graph paper	Saline solution	Lab report
2 - Ziploc bags	Distilled water	Data table
2- insects/fish	Protocol	Graphs w/data sheets

Procedure:
Follow these steps for accuracy. Record all information in your typed lab report

1. Form a **hypothesis**
2. Measure and record length, width and mass of fish/insect (metric units) in a *data table*.
3. Trace outline of dry fish/insect on graph paper. Calculate and record the surface area.
4. Label Ziploc bags with a marker: one distilled solution and the other saline solution.
5. Place one fish/insect in a Ziploc bag labeled **Distilled Solution** ½ full of H_20.
6. Repeat the first 5 steps, except add 3 teaspoons of NaCl to the H_20. Label this bag **Saline Solution**.
7. Make observations and record data every day for two to three days.
8. Fill out data summary sheet
9. Create *bar or line graph* to show the change in mass, length, and area,
10. Calculate % change of fish/insects in both solutions

Calculating % change

$$\left(\frac{\text{Final mass} - \text{Initial mass}}{\text{Initial mass}} \right) \text{X } 100$$

Data Analysis Questions:

1. What happens when a freshwater fish is placed in saltwater?
2. How does the amount of salt affect the rate of growth of the fish?
3. How does temperature of water affect the growth of the fish?
4. What will happen if a fish soaked in salt water is placed in fresh water?
5. How do these experiences relate to real fish?
6. What would actually happen if a fresh water fish had to live in salt water?
7. What type of fish can migrate between both fresh water and salt water? Give at least 2 examples.