Name: _____ Date: _____ Period: _____

Ms. Randall Marine Science

Observing Osmosis

Introduction:

Molecules are in constant motion, and tend to move from areas of higher concentrations to lesser concentrations. **Diffusion** is defined as the movement of molecules from an area of *high concentration to an area of low concentration*. The *diffusion of water molecules* through a selectively permeable membrane is known as **osmosis**. **Selectively permeable** means that *some molecules can move through the membrane while others cannot*. Movement through membranes is called **transport**. Diffusion and osmosis are **passive forms of transport**; this means that *molecules do not need energy* to move areas of high concentration to areas of low concentration. **Active transport** *requires energy* to transport molecules from low concentration to high concentration. Osmosis is the movement (transport) of water (small dots) through a selectively permeable membrane from an area of high concentration to an area of low concentration. Gummy Bears are popular candies made of gelatin, starch, and sugar.

Question: How will soaking Gummy Bear candies in distilled water affect the size of the candy?

Prediction: (explain your prediction based on the background information):

_____

_____

Materials:

cup, distilled water, gummy bear, ruler, balance, wax paper, paper towel, calculator

Procedure:

1. Use the masking tape to label your cup with your names & class period.

2. Use the ruler to find the height & width of your candy bear.

3. Use a balance to find the mass of your candy bear.

    a. Use a piece of wax paper to protect the pan of the balance.

    b. Find the mass of the wax paper and record it in the data table.
    c. Find the mass of the candy bear and record it in the data table. Remember to subtract the mass of the wax paper.

4. Record descriptive observations about the candy bear.

5. Fill your beaker half way full with distilled water.

6. Put your candy bear in the water.

7. Set the beaker aside for one day.

8. After the candy bear has been in the distilled water overnight, gently take it out of the water and pat it dry. **Be very careful because the candy is now extremely breakable.**

9. Repeat steps 2 – 4 and record information in the data table.

Sketch the setup of your lab – the beaker, the water, the gummy bear.

Before soaking in water	After soaking in water

Data:

Before soaking in water	After soaking in water
Height	Height
Width	Width
Mass	Mass
Descriptive observations	Descriptive observations

Analyze your results:

% CHANGE IN HEIGHT =
(After soaking height – Before soaking height / Before soaking height) x 100

(_____ - _____ / _____) x 100 = _____%

% CHANGE IN WIDTH =
(After soaking width – Before soaking width / Before soaking width) x 100

(_____ - _____ / _____) x 100 = _____%

% CHANGE IN MASS =
(After soaking mass – Before soaking mass / Before soaking mass) x 100

(_____ - _____ / _____) x 100 = _____%

Conclusion questions:

1. Describe what happened to the candy after soaking in distilled water overnight?

_____

_____

2. Do you support OR refute your prediction? _____

3. Explain why you got these results. Use the terms: osmosis, diffusion/diffused, and explain the concentration gradient (high and low concentration)

_____

_____

Making Connections

(from http://www.marinebio.net/marinescience/02ocean/swcomposition.htm)

Variations occur in ocean salinity due to several factors. The most common factor is the relative amount of evaporation or precipitation in an area. If there is more evaporation than precipitation, then the **salinity increases** (since salt is not evaporated into the atmosphere). If there is more precipitation (rain) than evaporation, then the **salinity decreases.** Another factor that can change the salinity in the ocean is due to a very large river emptying into the ocean. The runoff from smallest streams and rivers is quickly mixed with ocean water by the currents and has little effect on salinity. But large rivers (like the Amazon River in South America) may make the ocean have little or no salt content for over a mile or more out to sea. The freezing and thawing of ice also affects salinity. The thawing of large icebergs (made of frozen fresh water and lacking any salt) will decrease the salinity while the actual freezing of seawater will increase the salinity temporarily.

When does salinity of water increase?

_____

When does salinity of water decrease?

_____

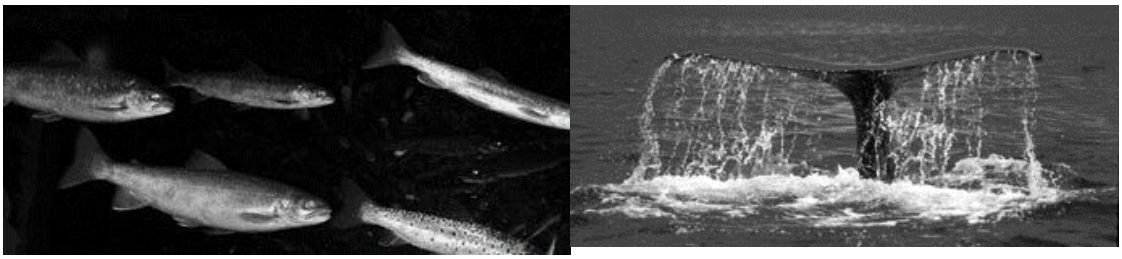
Many marine organisms are highly affected by changes in salinity. This is because of a process called osmosis which is the ability of water to move in and out of living cells, in response to a concentration of a dissolved material, until an equilibrium is reached. In general, the dissolved material does not easily cross the cell membrane so the water flows by osmosis to form equilibrium. Marine organisms respond to this as either being osmotic conformers or osmotic regulators.

Marine algae (left) and marine feather duster worms (right) are osmotic conformers.

Osmotic conformers have no mechanism to control osmosis and their cells are the same salt content as the liquid environment in which they are found (in the ocean this would be 35 o/oo salt). If a marine osmotic conformer were put in fresh water (no salt), osmosis would cause water to enter its cells (to form an equilibrium), eventually causing the cells to pop (lysis). If a marine osmotic conformer were put in super salty water (greater than 35 o/oo salt) then osmosis would cause the water inside the cells to move out, eventually causing the cells to dehydrate. These marine osmotic conformers include the marine plants and invertebrate animals which do not do well in areas without a normal salinity of 35 o/oo.

Describe **osmotic conformers**. How would they be affected if they were placed in a freshwater environment?

_____
_____
_____
_____
_____



Arctic charr fish (left) and humpback whales (right) are osmotic regulators.

Osmotic regulators have a variety of mechanisms to control osmosis and the salt content of their cells varies. It does not matter what the salt content is of the water surrounding a marine osmotic regulator, their mechanisms will prevent any drastic changes to the living cells. Marine osmotic regulators include most of the fish, reptiles, birds and mammals. These are the organisms that are most likely to migrate long distances where they may encounter *changes in salinity*.

An excellent example of this is the salmon fish. The fish is about 18 % salt so in seawater it tends to dehydrate and constantly drinks the seawater. Special cells on the gills excrete the salt so the fish can replace its lost water. When a salmon migrates to fresh water its cells start to take on water so the salmon stops drinking and its kidneys start working to produce large amounts of urine to expel the water.

Describe **osmotic regulators**. How are they adapted to both freshwater and saltwater environments?

_____
_____
_____
_____

Marine Life *examples*- Osmotic Conformers	Marine Life *examples*- Osmotic Regulators