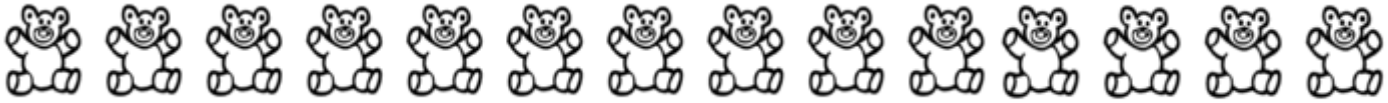
Name _____ Period ____ Date _____Points_____

Lab: Observing Osmosis in Gummi Bears

Haribo macht Kinder froh und Erwachsene ebenso!

Laboratory: Observing Osmosis in Gummy Bears (28 points)



Purpose: To investigate the movement of water into and out of a Gummi Bear (a gelatin polymer).

Problem: Where is the concentration of H_2O molecules highest, tap water, distilled water, salt water or gummi bears?

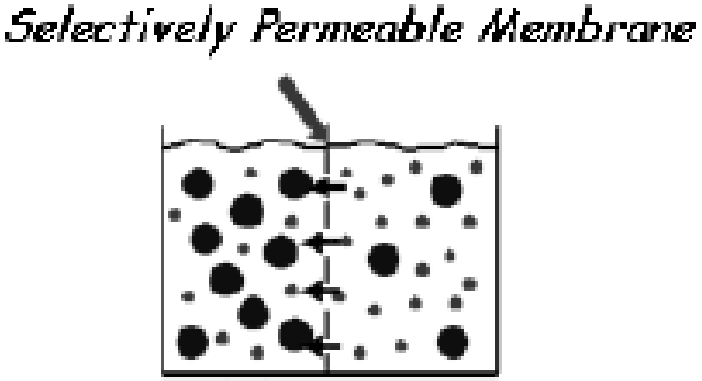
Background Information:

Gummy Bears are made of gelatin, starch, and sugar. Gelatin is a polymer (huge molecule made of many repeating units) that forms large three-dimensional matrices which give structural support to jellies and jams, and lots of other things that you use every day. (A matix is like a complex cage)

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 a membrane while others cannot.

Movement through membranes is called **transport**. Diffusion and osmosis are forms of **PASSIVE TRANSPORT**; this means that they do not need energy to move from 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.

Vocabulary:

1. **Concentration**

2. **Diffusion**

3. **Osmosis**

4. **Membrane**

5. **Selectively Permeable**

6. **Selectively Permeable Membrane**

7. **Transport**

8. **Active Transport**

9. **Passive Transport**

10. **Polymer**: A huge molecule made of many repeating units.

11. **Matrix**: A complex three dimensional a structure similar to a cage with many compartments.

Hypotheses: Circle your choices to create your hypotheses **(2 points)**

1. If the H_2O concentration in tap water is **(higher , lower)** than the H_2O concentration in a Gummi Bear, then Gummy Bears placed in tap water will **(increase, decrease, remain the same)** size. Circle your answer.

2. If the H_2O concentration in distilled water is **(higher , lower)** than the H_2O concentration in a Gummi Bear, then Gummy Bears placed in distilled water will **(increase, decrease, remain the same)** size. Circle your answer.

Materials: for pairs of students

- 2– 50 or 100 ml. beakers
- Masking tape
- permanent marker
- 2 – plastic forks or small sieves
- Waxed paper or paper plates
- 2 - Gummy Bears (different colors)
- distilled water
- tap water
- saturated salt solution (6 oz per cup)
- 2 - centimeter rulers

Safety Considerations:

There are no safety hazards with materials used in this experiment. The filters may become moldy after storage for several days or more. If that occurs, they should be disposed of in the trash.

Procedure:

1. Obtain two beakers, two different colored Gummy Bears and a ruler.
2. Label your beaker with a piece of masking tape (folded over)
3. Write your name and class period using a permanent marker.
4. Label one Beaker "TAP WATER" and the other "DISTILLED WATER".
5. Measure your bear (in cm) from top to bottom (length) and from side to side (width) and from front to back (height).
6. Record the dimensions in centimeters in the data table. Use decimals.
7. Find the mass of each bear. Record the mass in the data table in grams. Again, use decimals.
8. Place the bears in the beakers.
9. Cover one with distilled water. The bear should be completely covered – cup about half full.
10. Cover the other tap water. The bear should be completely covered – cup about half full.
11. Place the beakers on the counter away from direct sunlight.
12. Let them sit overnight.
13. On the next lab day, gently pour the water over a screen into a sink.
14. Catch each bear using a sieve, plastic fork or screen. Place on paper towel or waxed paper.
15. Measure the length, width, and height. Record.
16. Blot dry by placing bear on a paper towel.
17. BE CAREFUL not to break the bears, they are very fragile.
18. Find the mass of wax paper or screen used. Then place the dried bear on the paper or screen.
19. Carefully find the mass of the bears. Record
20. Place the bears back into their correct cups.
21. Cover the bears with saturated salt solution. The bear should be completely covered – cup about half full. Let them sit overnight.
22. The following day, find the dimensions of the bears and record. Find the mass of the bears and record.
23. Calculate the volumes (L × W × H).
    Round your answers to the nearest hundredth

Data Table for Volume: **(2 points)**

Dimensions	**Gummi Bear 1** (color: _____)			**Gummi Bear 2** (color:_____)		
	Initial *Before Soaking* (day 1)	**Final** *After tap water* (day 2)	**Final** *After salt water* (day 3)	**Initial** *Before soaking* (day 1)	**Final** *After distilled water* (day 2)	**Final** *After salt water* (day3)
Length (cm)						
Width (cm)						
Height (cm)						
Volume (cm^3) **L×W×H** =__cm^3						

Note: How many decimal places should you use for volume? _____

Data Table for Mass: **(2 points)**

Mass (grams)	**Gummi Bear 1** (color: _____)			**Gummi Bear 2** (color: _____)		
	Initial *Before Soaking* (day 1)	**Final** *After tap water* (day 2)	**Final** *After salt water* (day 3)	**Initial** *Before soaking* (day 1)	**Final** *After distilled water* (day 2)	**Final** *After salt water* (day3)
Gummi Bear mass						

Note: How many decimal places should you use for mass? _____

Analysis:

Calculate the percent changes in volume after each step of the experiment.
Our scales are accurate to 0.1 gram, therefore your calculations using mass should be **rounded to the nearest tenth or 0.1 gram**

% Change in mass =
(Final mass **-** Initial mass)/ Initial mass × 100 = _____ %

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

Data Table C: Place the percentages in the table below: (2 points)

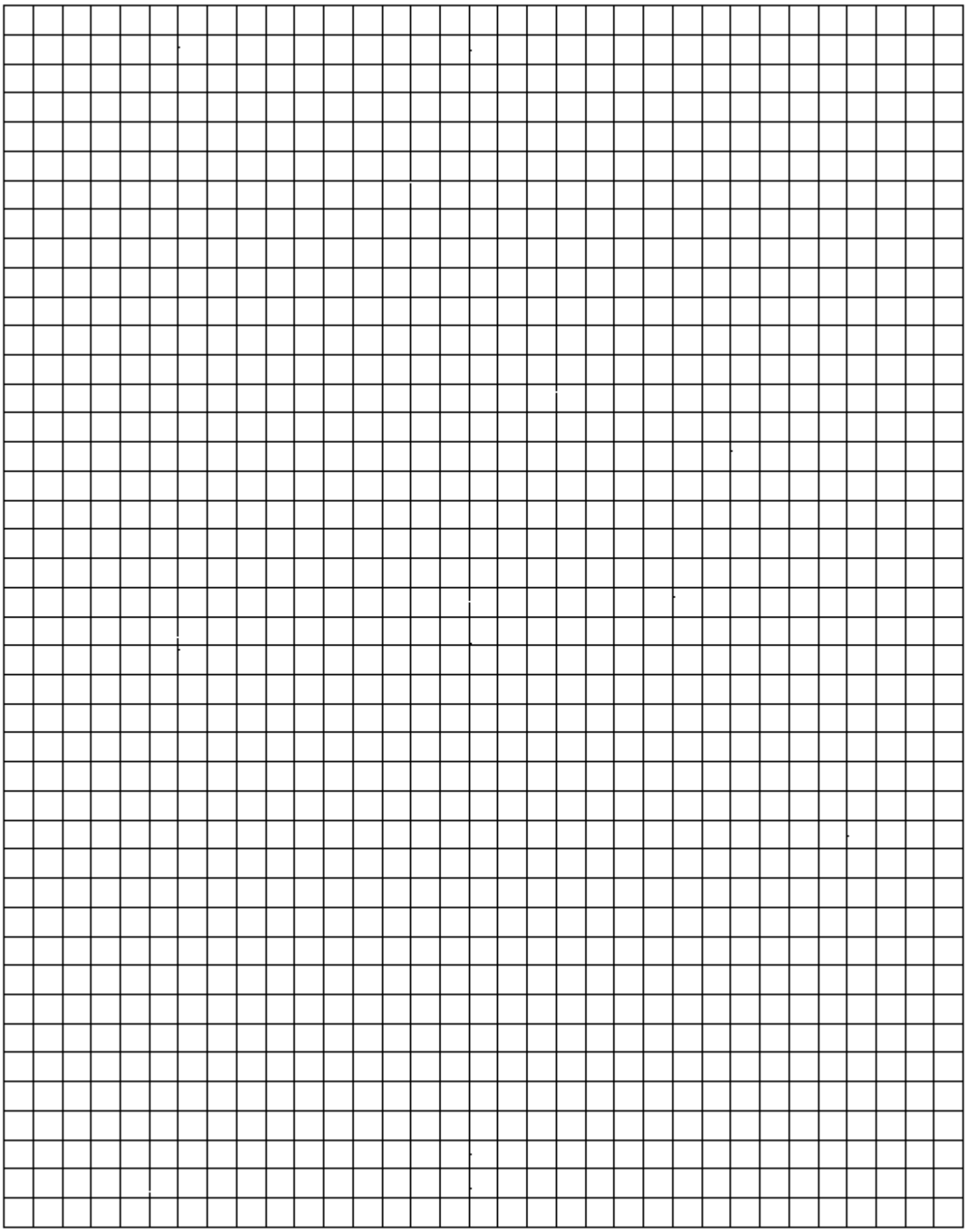
Gummi Bears	% Change in Water	% Change in Salt Water
Tap Water Bear		
Distilled Water Bear		

Make a BAR graph of the percent of change in mass. (6 points)

- Title the graph (what is being compared?)
- Label the axis.
- Place a scale on the vertical axis for percent change.
- Place the data for both bears on the same graph.
- Include a Key if needed.
- If you have a negative value for a percent change, start the vertical axis at a negative number. (For example: -50, -25, 0, 25, 50, 75, 100, etc.)
- An example of the horizontal axis is below (note : Δ is a symbol used to represent "change"):

Tap H_2O	Salt H_2O (tap H_2O bear)	Distilled H_2O	Salt H_2O (distilled H_2O bear)

Title: _____



KEY

Analysis questions: Answer the following using complete sentences. Be sure to **restate** the question in your answer!

3. What happened to the bears when placed in distilled water? Why? **(2 points)**

_____

_____

_____

_____

4. What happened to the bears when placed in tap water? Why? **(2 points)**

_____

_____

_____

_____

5. What happened to the bears when placed in salt water? Why? **(2 points)**

_____

_____

_____

_____

6. What do you think would have happened to the bears if, after the last day, they were again placed in distilled water? **(2 points)**

_____

_____

7. Conclusions: (6 points)

Write a paragraph which explains the results of this experiment using the concept of osmosis. Think about how much swelling can occur (equilibrium) **Include your specific data to explain your results and support conclusions**.