Research Experiences for Teachers (RET)
Center for Pre-College Programs
New Jersey Institute of Technology

MODULE TEMPLATE

MODULE TOPIC:
Osmosis & Diffusion

OBJECTIVE(S):
Students will be able to describe the Changes in cells and their environment.

LIST OF LESSONS:
Lesson #1: Investigating Osmosis & Diffusion.
Lesson #2: Are Fats insoluble in water? Identify insoluble fats.

LEARNING EXPERIENCE:
In this module students perform an experiment to develop an understanding of physical properties of fluid. Students create written conclusion and answer post lab questions based on experiment and data analysis.

STUDENT ASSESSMENT:
1. Students will create a written conclusion based on the data analysis.
2. Design a procedure to measure density of any liquid and compare the viscosity of polymer at various dilutions.
3. Respond to post lab questions.

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LESSONS.

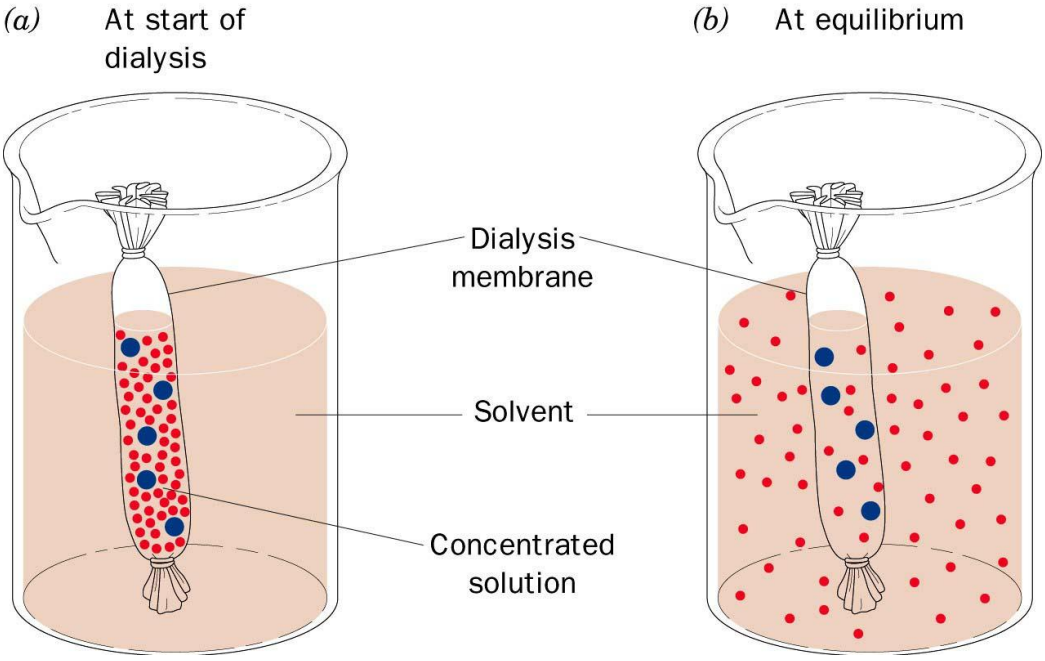
LESSON TOPIC:
Investigating Osmosis & Diffusion

RATIONALE:
Students will learn about how cells move molecules in and out through the cell through the cell membrane and interact with the environment.

STANDARD(S) & INDICATOR(S):
5.1.12.D.2. Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams.
5.3.12.A.3. Predict a cell's response in a given set of environmental conditions.

OBJECTIVE(S): Students will be able to:
- Model diffusion across the cell membrane.
- Describe the influence of solute concentration on osmosis.
- Describe the concept of water potential in relation to water movement into or out of the plant cells.

BACKGROUND INFORMATION:
Lesson Connection……..



Students' learning about osmosis and diffusion:

- Cell structure and function.
- Cells turn food into chemicals for energy
- Cells store and use energy for building materials, transport and controlling life processes.
- Cell permeability
- Cells need chemical compounds to perform functions and build structures.

MATERIALS:

- 250 ml beaker
- 1% Starch solution
- Potato
- 1" Dialysis Tubing
- String
- Iodine-Potassium Iodide Solution (IKI)
- 50 ml graduated cylinder
- Scale
- Paper towels

CLASSROOM ACTIVITY DESCRIPTION (LABORATORY/EXERCISES/PROBLEMS):

Procedure - Part A (Diffusion):

1. Measure out 10 g of starch on balance scale and add to 400 mL of water to create a 1% solution.
2. Measure out 150 g of sugar (sucrose) to 500 mL of water to create a 15% solution.
3. Place both solutions on hot plates add a magnetic stirring rod to stir fully for 8-10 minutes.
4. Cut 12 cm of dialysis tubing, fold and tie at bottom.
5. Add 15 mL of each solution to dialysis tubing, and fold and tie top.
6. Weigh and observe dialysis tubing.
7. Add water to a beaker until dialysis tubing is completely submerged, for us, 240 mL.
8. Add 12 drops of iodine to beaker.
9. Cover beaker with plastic bag and tie off top.
10. Observe and weigh tubing after 15 minutes.
11. Observe and weigh tubing after one day.
12. Cut tubing and take pH level.

Procedure - Part B (Osmosis):

1. Obtain a 30 cm strip of pre-soaked dialysis tubing
2. Record mass
3. Pour approximately 25 mL of the following solutions into each bag.
   Distilled water
   0.2 M sucrose
   0.4 M sucrose
   0.6 M sucrose

0.8 M sucrose
1.0 M sucrose

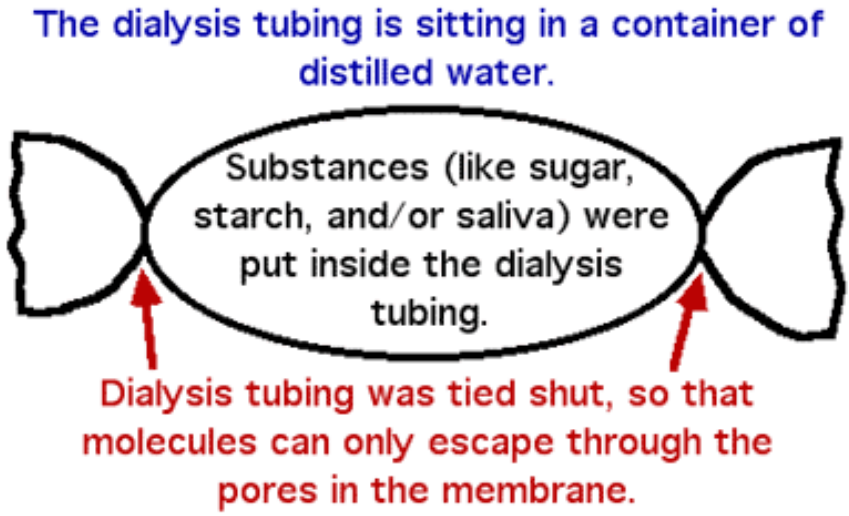
4. Remove most of the air from the bags by drawing the dialysis bag between two fingers. Tie off the other end of the bag, leaving sufficient space for the expansion.
5. Rinse each bag gently with distilled water to remove any sucrose spilled during filling.
6. Carefully blot the outside of each bag and record the initial mass of each bag in Table 1.2.
7. Fill six 250 mL beakers 2/3 full with distilled water.
8. Immerse each bag in one of the beakers of distilled water and label the beaker to indicate the molarity of the solution in the dialysis bag. Be sure to completely submerge each bag.
9. Let stand for 30 minutes, remove the bags from the water, blot and determine the mass of
10. Record your group's results in Table 1.2. Obtain data from the other lab groups
11. Graph the results for both your individual data and class average on the following graph.

Procedure - Part C (Determine water gradient in a potato):

1. Use cork borer to cut 5 potato cylinders. Cut each cylinder to a length of 3 cm
2. Determine mass of all 5 potato cylinders together.
3. Place cylinders in assigned solution
   Distilled water
   0.2 M sucrose
   0.4 M sucrose
   0.6 M sucrose
   0.8 M sucrose
   1.0 M sucrose
4. Let stand overnight
5. Record temperature, remove cylinders, and determine mass of all 5 cylinders
6. Determine percent change in mass
7. Graph class results

Classroom Activity Description #1

Note: The model membrane is dialysis tubing.



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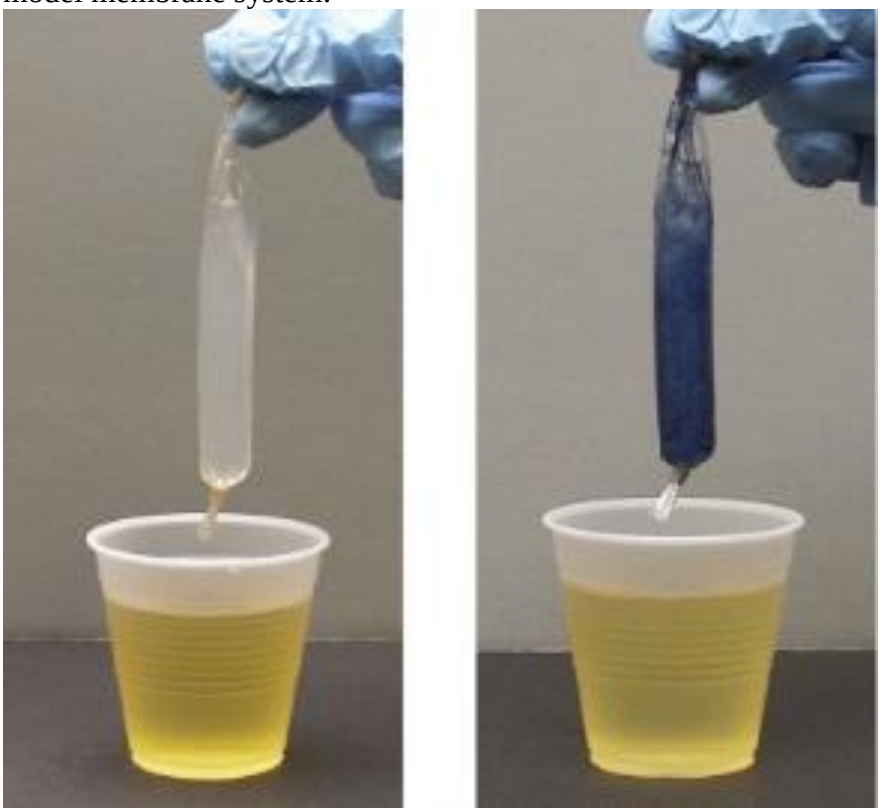
Classroom Activity Description #2

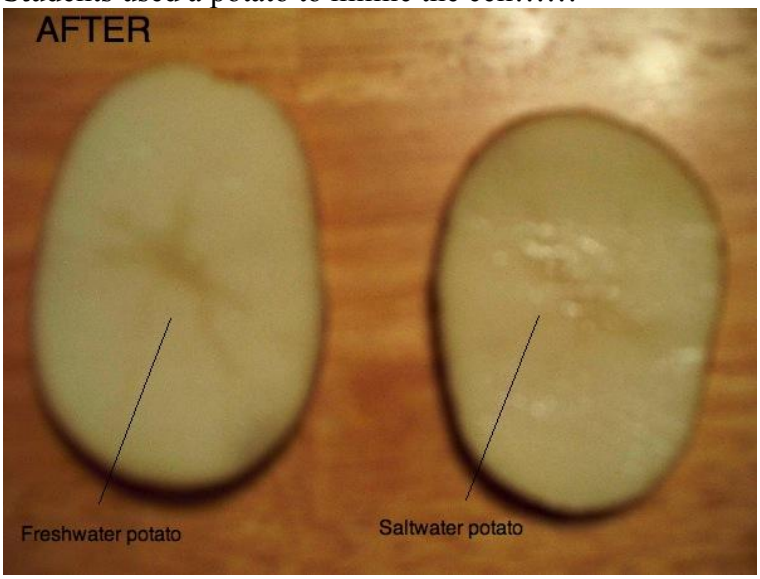
The purpose of this lab was to observe the acts of passive transport: diffusion and osmosis in a model membrane system.



Classroom Activity Description #3

Salt changes shape of cell?

Students used a potato to mimic the cell……



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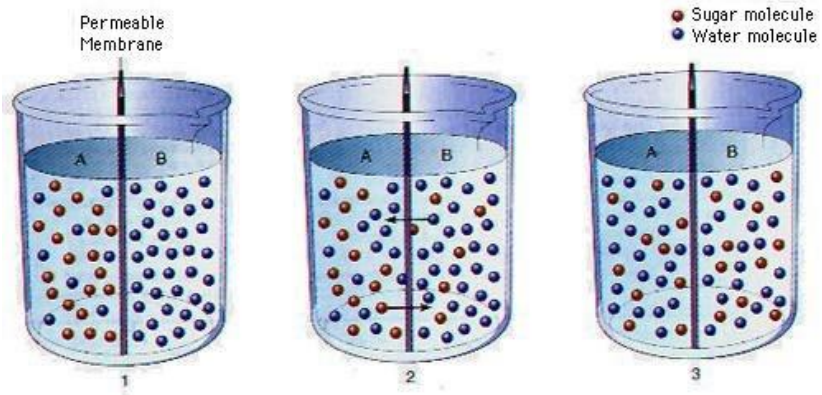
HANDOUTS

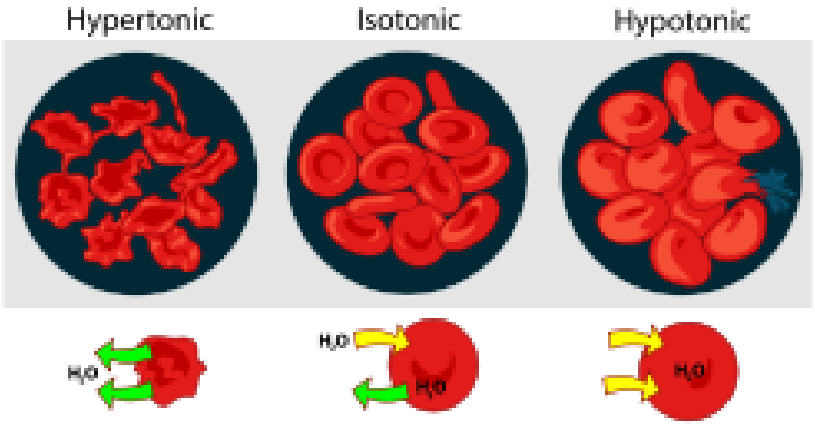
http://www.slideshare.net/ilanasaxe/diffusion-and-osmosis-student-handout
http://www.scribd.com/doc/6404537/AP-Biology-Lab-One-Osmosis-and-Diffusion
http://faculty.evansville.edu/be6/b1075/labpdf05/Lab3.pdf

SAMPLE QUESTIONS TO ELICIT CLASS DISCUSSION:

1. If you add food coloring to a hot beaker and cold beaker at the same time, what will happen? Why?
2. Can excessive NaCl change the shape of your cell?
3. Do sports drinks cause dehydration?
4. How does Osmosis play a role in the dehydration?



A=cell environment
B=Cell



ASSESSMENT

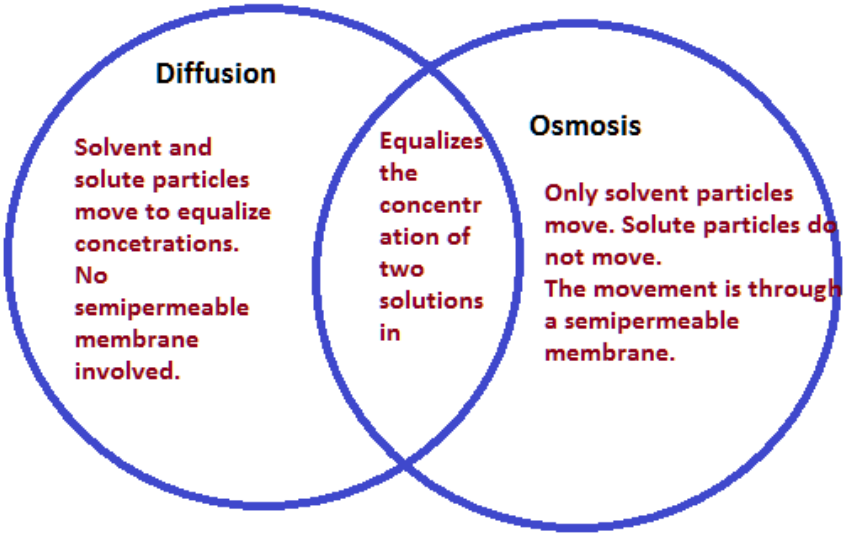
Students:

- Construct tables of data.
- Draw diagrams to display their results.
- Write a lab report.

HOMEWORK ACTIVITY/EXERCISES/PROBLEMS:

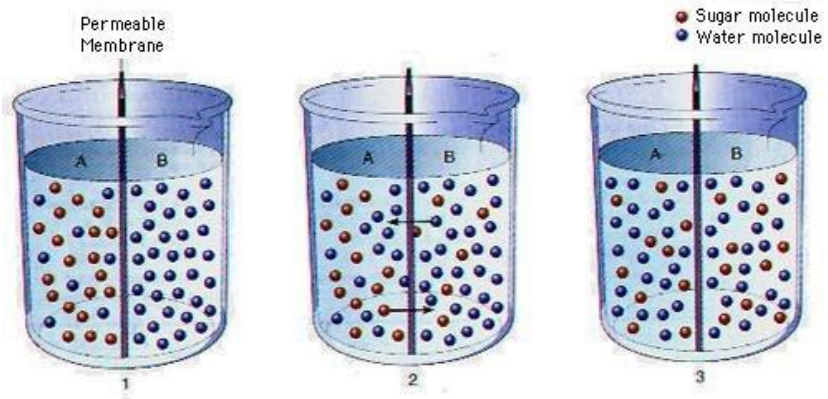
1. Students synthesize a lab report using scientific procedure including a written conclusion.
2. Respond to post lab questions.
3. Do Sports drinks cause more dehydration?

Big Picture:

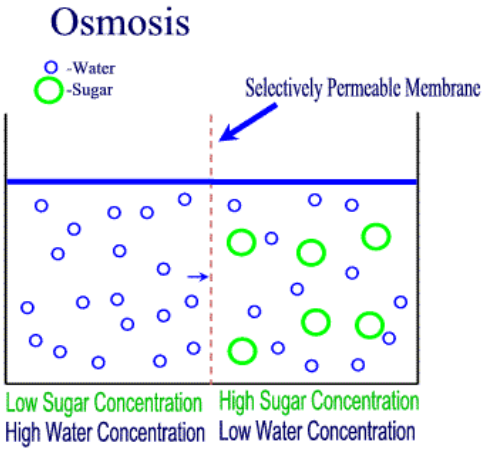


4. Compare and Contrast

Diffusion-Permeable membrane



Osmosis-Selectively Permeable membrane



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