AP BIOLOGY
Osmosis Diffusion Labs
Slide show by Kelly Riedell

LEARNING OBJECTIVE ENE-2.E Describe the mechanisms that organisms use to maintain solute and water balance.

ESSENTIAL KNOWLEDGE
ENE-2.E.1 Passive transport is the net movement of molecules from high concentration to low concentration without the direct input of metabolic energy.

LEARNING OBJECTIVE ENE-2.H Explain how concentration gradients affect the movement of molecules across membranes.

ESSENTIAL KNOWLEDGE ENE-2.H.1 External environments can be hypotonic, hypertonic or isotonic to internal environments of cells— a. Water moves by osmosis from areas of high water potential/low osmolarity/ low solute concentration to areas of low water potential/high osmolarity/high solute concentration.

SP 1.C Explain biological concepts, processes, and/or models in applied contexts

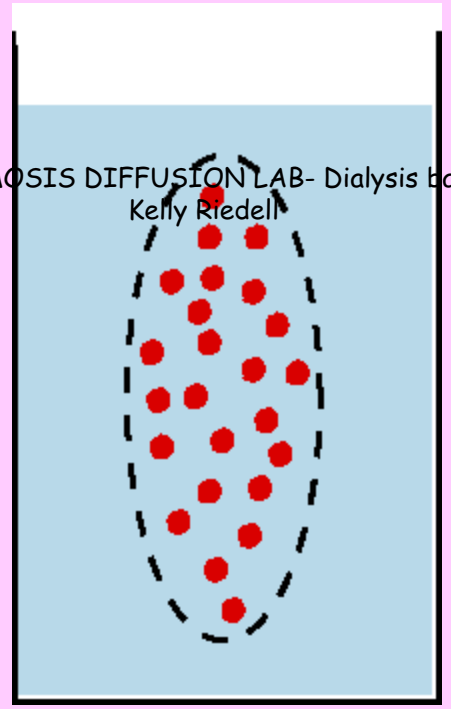
SP 3.A Identify or pose a testable question based on an observation, data, or a model.
SP 3.B State the null or alternative hypotheses, or predict the results of an experiment.
SP 3.C Identify experimental procedures that are aligned to the question, including a. Identifying dependent and independent variables. b. Identifying appropriate controls. c. Justifying appropriate controls.
SP 3.D Make observations, or collect data from representations of laboratory setups or results.
SP 3.E Propose a new/next investigation based on a. An evaluation of the evidence from an experiment. b. An evaluation of the design/methods.

SP 4.A Construct a graph, plot, or chart (Line).
a. Orientation b. Labeling c. Units d. Scaling e. Plotting f. Type g. Trend line
SP 4.B Describe data from a table or graph, including a. Identifying specific data points. b. Describing trends and/or patterns in the data. c. Describing relationships between variables.

SP 5.A Perform mathematical calculations, including a. Mathematical equations in the curriculum.

SP 6.A Make a scientific claim.
SP 6.B Support a claim with evidence from biological principles, concepts, processes, and/or data.
SP 6.C Provide reasoning to justify a claim by connecting evidence to biological theories.
SP 6.D Explain the relationship between experimental results and larger biological concepts, processes, or theories.

OSMOSIS & DIFFUSION LAB #1
Starch, Iodine, Glucose



Animation from: http://www.lionden.com/cell_animations.htm

SAFETY

- **DO NOT EAT OR DRINK ANYTHING IN LAB!**
- **IODINE IS POISONOUS**

- **WEAR AN APRON!**
  IODINE WILL STAIN YOUR SKIN AND CLOTHING

Image from: http://www.llnsciencepark.be/en2/images/caution.jpg

IODINE TEST for STARCH

Iodine turns BLUE-BLACK in the presence of starch.

http://faculty.ntcc.edu/mhearron/cell_chemistry.htm

DIP TEST FOR GLUCOSE

If glucose is present
strip will turn
from AQUA BLUE
to YUCKY GREENISH
BROWN

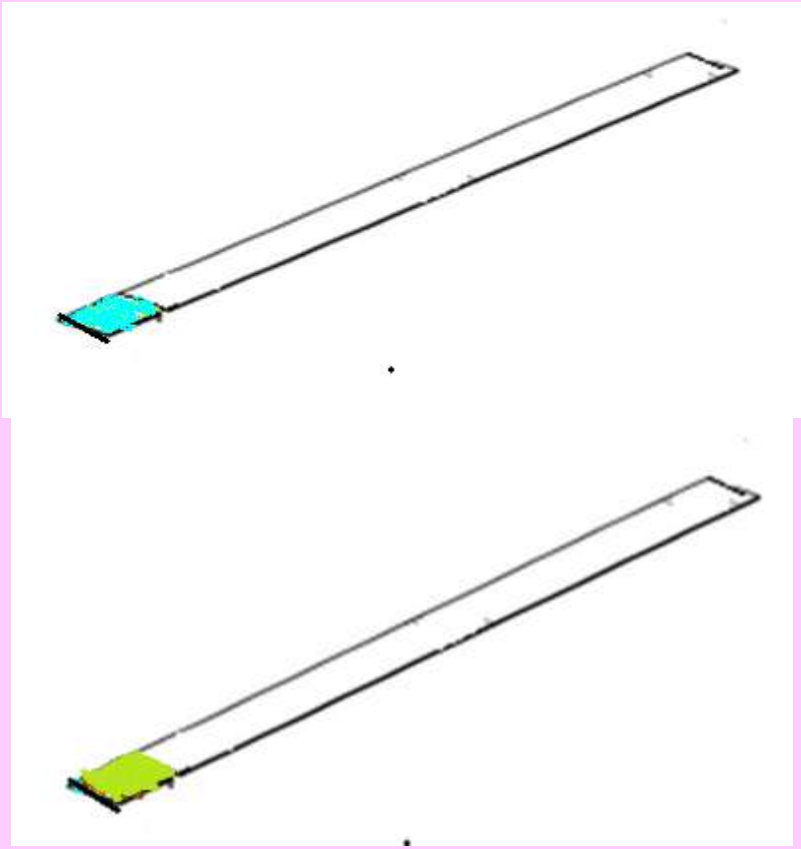


Image modified from: http://www.freepatentsonline.com/6531322.html

http://www.chemistryland.com/CHM107Lab/Lab5/Soil/Lab5Exp3Soil.html

STATION #1

1. **Write your names on the cup**

2. **Fill cup with 2/3 full with water**

3. **Your teacher tested the water for the presence of glucose. Make sure you marked the results on your lab sheet**

4. **Go to Station #2**

STATION #2

Image by Riedell

1. **Add 5 droppers (NOT DROPS!) of IODINE to water in your cup.**

Be careful!

IODINE IS POISONOUS!

It will stain your clothes!

It will stain your skin!

2. **Use a permanent marker to label the level of liquid in the cup.**
3. **Go to Station #3.**

STATION #3


http://www.beartoes.com/images/sink.jpg

1. Hold membrane bag UNDER RUNNING WATER and rub it with your fingers until it opens.

2. Run water THROUGH the INSIDE of the bag.

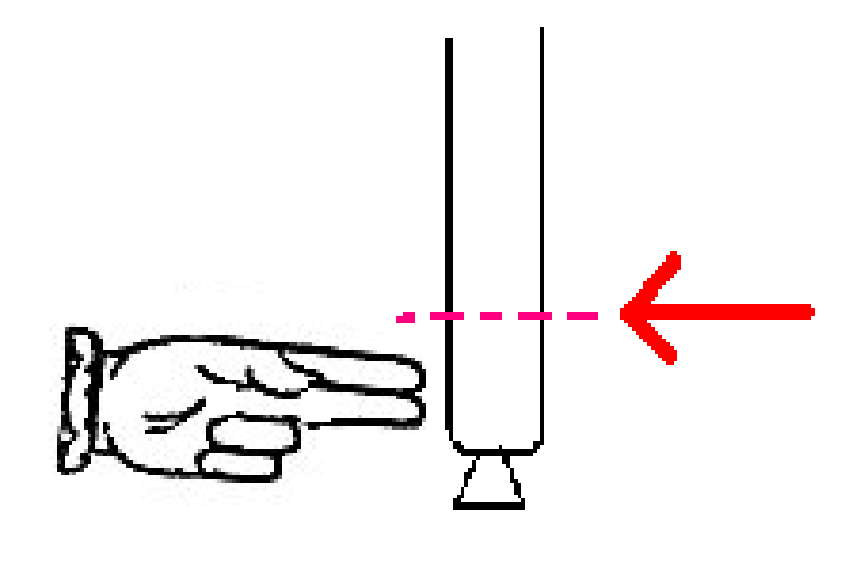
3. Tie a KNOT at ONE end of the bag.

4. Go to Station #4.

STATION #4

Image by Riedell

1. Make sure you have tied a knot in ONE end of the membrane bag.



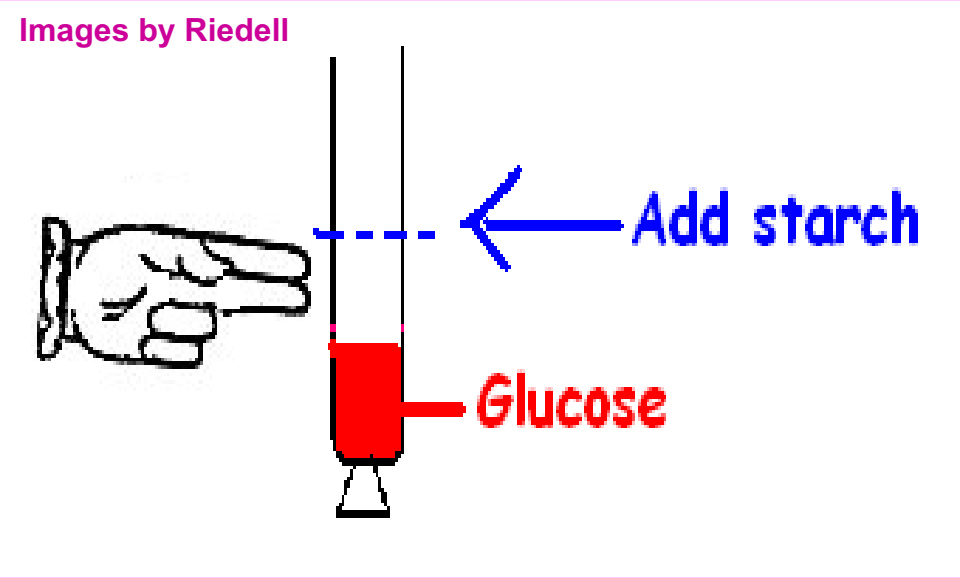
2. Fill bag with GLUCOSE
(use 2 fingers to determine how much to fill it)

3. Pinch end closed to keep from spilling

4. Go to Station #5.

STATION #5

Images by Riedell

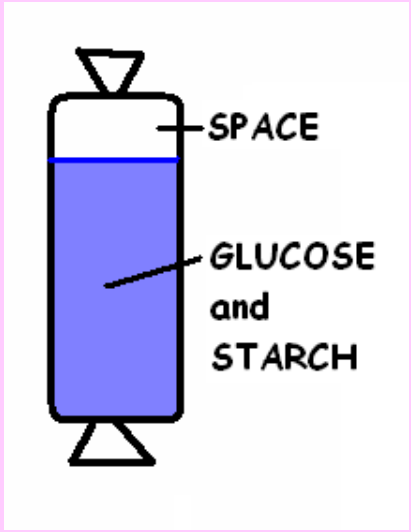


1. Add STARCH to the membrane bag on top of the glucose

(use 2 fingers to determine how much to fill it)

2. Squeeze out air space. Leave a little space at the end and tie a KNOT to seal the bag.

3. Go to Station #6.



STATION #6

1. **Take your MEMBRANE BAG to the SINK and RINSE IT ……really, really, really, really, really, really, really, really, really, (I mean it!) REALLLLLLLLY WELL.**

2. **Go to Station #7.**

Image by Riedell

STATION #7

1. USE A TOWEL TO DRY OFF YOUR MEMBRANE BAG WITH

2. Mass the bag and record in your BILL

3. Take bag & cup back to your table.

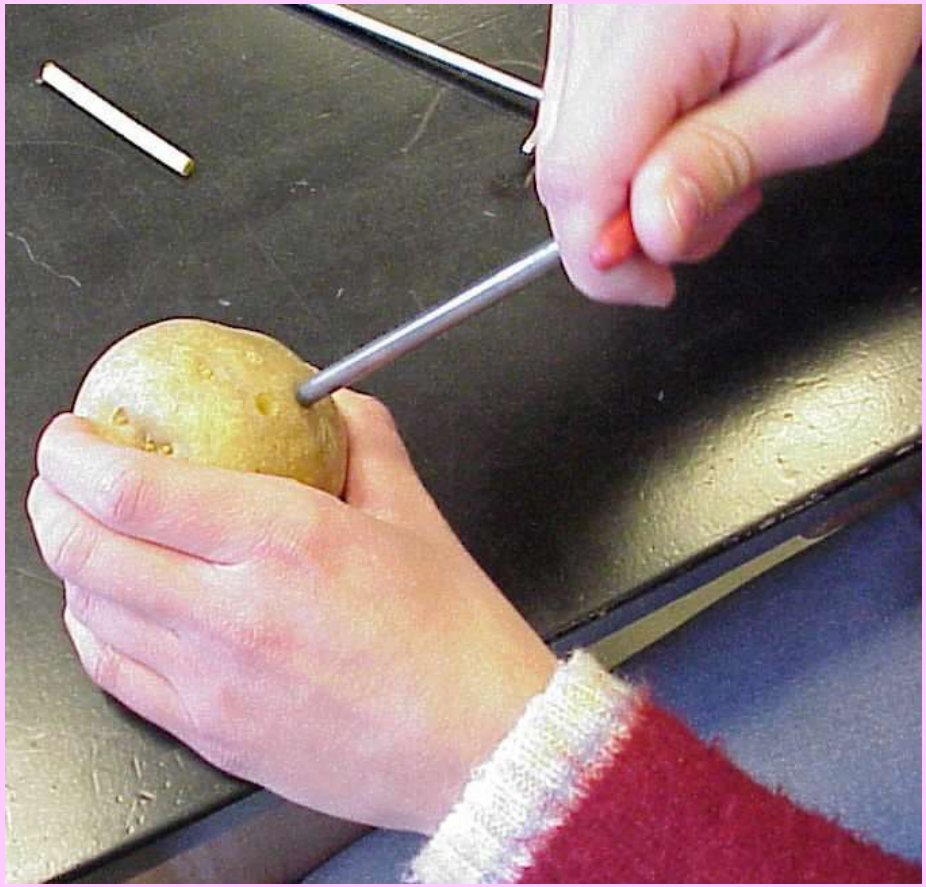
4. START EXPERIMENT by placing the membrane bag in the cup.

5. WAIT AND WATCH WHAT HAPPENS!

OSMOSIS & DIFFUSION
LAB #2- Potatoes

https://www.polyvore.com/cgi/img-thing?.out=jpg&size=l&tid=6678000

Cut 3 potato cores per cup



X 6 cups = 18 cores

Remove skins from tips

Cut to approximately the same size.

http://eve.kean.edu/~breid/plantlab2/potato1.jpg

https://sammisapbiologyblog.files.wordpress.com/2015/02/photo-2-7.jpg

Fill labeled cups with each with different concentration of sucrose

[1.0, 0.8, 0.6, 0.4, 0.2, 0.0 M]

https://sammisapbiologyblog.files.wordpress.com/2015/02/photo-2-7.jpg

Determine mass of each set of potato cores and record

Place in sugar solutions at same time.

Things to do today:

Mass your potato cores.

Set up dialysis bags.
SQUEEZE out air
& LEAVE ROOM for bag to expand
Remember: $\Psi = \Psi_s + \Psi_p$!!!!!

Mass bags.
Place in cups.

$$\% \text{ Change in mass} = \frac{\text{Final} - \text{Initial}}{\text{Initial}} \times 100$$

Why calculate % change in mass?

Why can't you just use mass of bags before and after?

OSMOSIS & DIFFUSION
LAB #3 – Dialysis tubing

Animation from: http://www.lionden.com/cell_animations.htm

The lab assistant made up the sucrose solutions but forgot to label the flasks.

Flasks c
1.0, 0.8 M

But you don't know which flask contains which concentration.

The UNKNOWN is a molar concentration between 1.0 – 0.2 M

http://clipart-library.com/clipart/2068364.htm

Design an experiment using dialysis tubing to determine the identity of the mystery solutions.

Which flask contains which sucrose concentration?

$$\% \text{ Change in mass} = \frac{\text{Final} - \text{Initial}}{\text{Initial}} \times 100$$

Why calculate % change in mass?

Why can't you just use mass of bags before and after?