Name:_____Date:_____

Lab: Analysis of the Wilted Plants

Introduction:

As part of their community service project, biology students took part in a school beautification project. For the project, students planted a variety of flowers and plants throughout the campus and along the road at school entrance. After planting the students noticed that no matter how much they watered the plants near the road they continued to appear wilted as if they were not getting any water.

The biology students became curious about why only the plants near the road were wilting even though all the plants where treated the same. After some discussion and brainstorming, students determined that something must be different in the soil of the plants next to the road. One student brought up that it was a snowy winter and that the salt that was put on the road may be causing the problem but they did not understand why. The students need your help in investigating and determining the cause of the dying plants.

Activity 1:

The students want to ensure the experiment that you do is controlled so the data can be compared to their experimental results. To be consistent, you will be using a red onion. The red onion was chosen by the students because it has naturally stained pink cells that can be easily seen under a microscope. In the red onion cell you should be able to easily see the cell wall, cell membrane and the nucleus. You will first view the cell under normal conditions so you can easily be compared to the results if a change occurs.

Hypothesis:

After viewing the cell under normal conditions, you will be adding salt water to the cell and determining the effects of the salt water on the cell.

Write your hypothesis as and "if-then" statement of the effects of the salt water on the cell:

_____

_____

The students would like you to follow the procedures below for the investigation. Be sure to read the procedures completely before beginning to ensure you understand the experiment and can produce valid results.

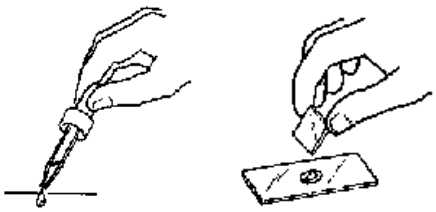
Materials:

Microscope, microscope slide with cover slips, paper towel, red onion, disposable pipettes (2), distilled or tap water, 20% salt solution.

Procedure:

Follow the instructions below to prepare a wet mount of the red onion cells. You are going to peel off the epidermis of the onion, it is the outer most layer that is purple.

1. Using the pipette place one or two drops of water on the slide.



2. Place the thin layer of the onion on the slide on the water and add the cover slip.
3. Observe under the microscope. Recall the proper techniques for using a microscope that were discussed in class previously. Start with the lowest magnification.

Describe the position of the cell membrane relative to the cell wall:

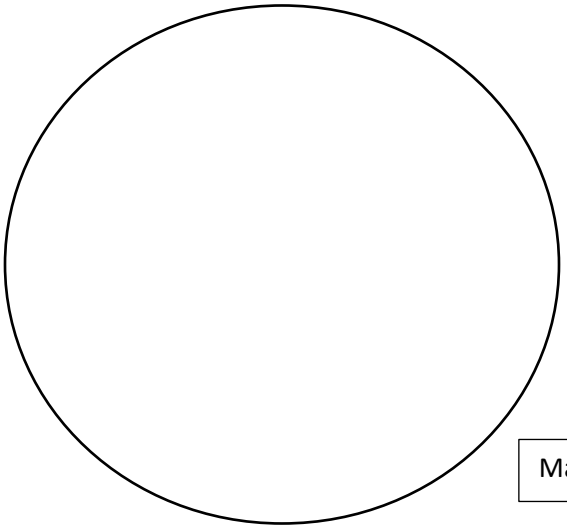
_____

_____

Create a sketch of what the cell looks like using HIGH POWER in the box below. Be sure to use the proper sketching protocol listed below.

- Draw on what you realistically see within the field of view.
- Give the diagram a title that is descriptive.
- All relevant parts are labeled to the right of the image. Lines do not cross. (cell membrane, cell wall, nucleus)
- Drawings are in pencil, labels are in blue or black ink.
- The magnification used is included.

Title:_____



Magnification:____x

4. Remove the slide from the microscope. Do not remove the coverslip or the red onion.

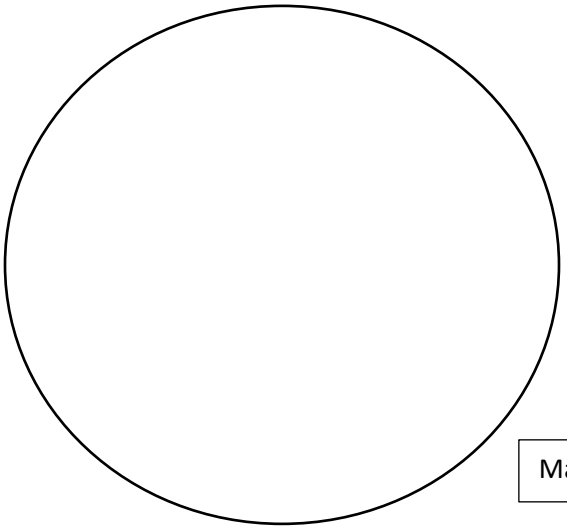
5. Using a new pipette place one or two drops of the 20% salt solution on the edge of the cover slip. Place the corner of the paper towel on the opposite end of the coverslip. The water will soak up into the paper towel and the salt solution will be drawn under the coverslip.
6. Repeat step 5, five more times to ensure the salt water is on the red onion cells.
7. Observe the red onion cell under the microscope. You may need to view the cells near the edge of the sample since they will have more direct exposure to the salt solution.

Describe the position of the cell membrane relative to the cell wall:

_____
_____
_____

Create a sketch of the cell using HIGH POWER in the box below. Be sure to use the proper sketching protocol.

Title:_____



Magnification:____x

8. Add a drop of tap water to the wet mount using the paper towel technique after you have completed your second sketch. You may need to repeat this procedure up to 5 times to observe a difference. Observe the appearance of the cells.

What happened to the cells after adding the tap water back to the wet mount?

_____
_____

Analysis of Results:

Contrast the location of the cell membrane in the normal cell (just water) versus the cell exposed to the salt solution.

_____
_____
_____
_____
_____

Explain what happened when the cells were exposed to the salt solution. Use biology vocabulary terms in your explanation.

_____
_____
_____
_____
_____

How might this experiment describe the problem the students are having with their plants growing next to the road?

_____
_____
_____
_____
_____

Part 2:

Like most good scientific experimentation, scientist do not rely on data from only one source when drawing a conclusion. The biology students do not want you to draw a conclusion about their wilted plants based off only one type of plant.

In part 2 of this investigation you will be investigating the effects of different salt concentrations on the mass of potatoes. To ensure all the results are valid and can be compared, the students want you to follow the same procedures that they are using.

Materials:

Graduated cylinder, 3 test tubes, ruler, balance, marker, plastic wrap, test tube rack, distilled water, 10% salt solution, 20% salt solution

Procedures:

1. Obtain 3 slices of potato that are about the same size from your teacher. Place them on a paper towel and label them A, B and C.
2. Dry the potatoes completely and record the mass of each potato to the nearest 0.1 g using a digital balance. Record your data in Table 1 under "Day 1"
3. Record your qualitative observations in Table 2. How does it look and feel? Is it turgid or flaccid?
4. Place each sample in a test tube labeled A, B and C.
5. In test tube A add distilled water until the potato is completely covered.
6. In test tube B add 10% salt solution until the potato is completely covered.
7. In test tube C add 20% salt solution until the potato is completely covered.
8. Cover each test tube with plastic wrap or parafilm.
9. Place your test tubes on a test tube rack and store them in a location designated by your teacher.
10. CLEAN UP! Before leaving the lab area have your teacher check your station.
11. Answer the day 1 questions.

Day 1 Questions.

1. What are your trying to figure out by performing this experimentation?

2. Write a hypothesis as and "if-then" statement about what you predict will happen to the potato as you increase or decrease salt concentration.

3. What is the independent variable in this experiment?_____
4. What is the dependent variable in this experiment? _____
5. What is the control in this experiment? _____
6. What are some things you kept constant? _____

Day 2:

1. Obtain your potato samples.
2. Remove them from the test tube. Be sure to keep track of which sample is A, B and C by using a labeled paper towel.
3. Dry the potatoes completely and record the mass of each potato to the nearest 0.1 g using a digital balance. Record your data in Table 1 under "Day 2"
4. Calculate the change in mass. (Day 2-Day1)=Change in Mass
5. Record your qualitative observations in Table 2. How does it look and feel? Is it turgid or flaccid?
6. Give the data table titles that use the independent and dependent variable.
7. Create a graph of the change in mass using the data from table 1.
8. Answer the remaining questions.

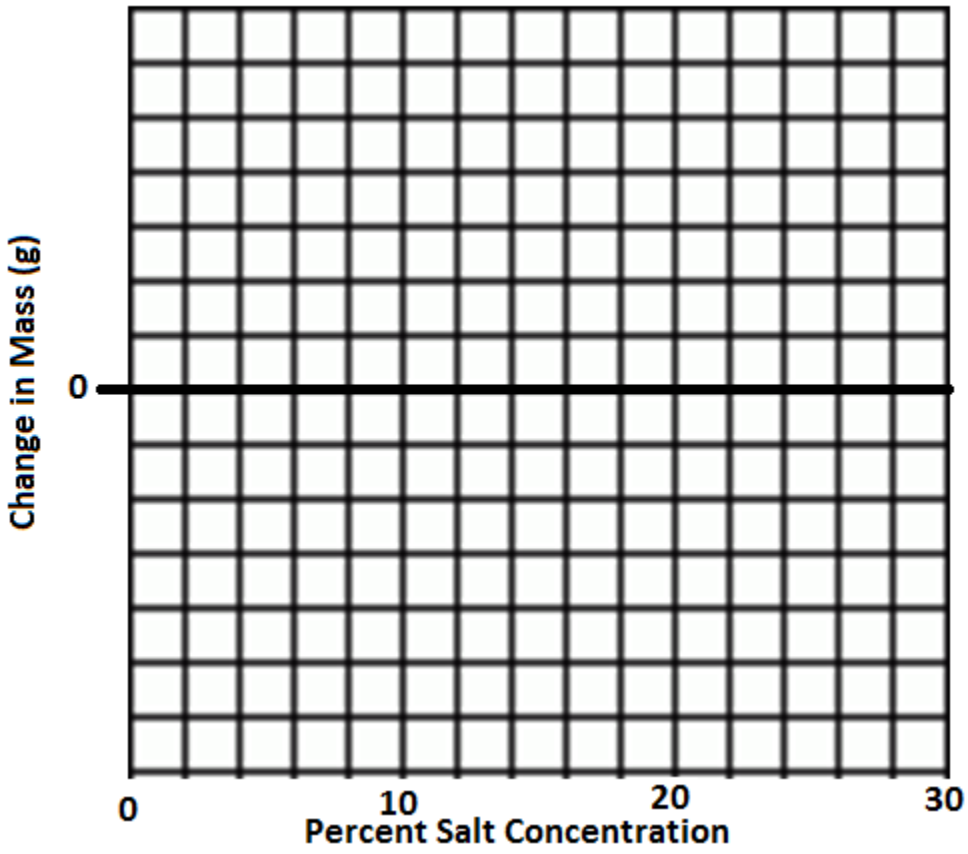
Table 1._____

	Sample A -0% salt			Sample B -10% salt			Sample C- 20% salt		
	Day 1	Day 2	Change in Mass	Day 1	Day 2	Change in Mass	Day 1	Day 2	Change in Mass
Mass (g)									

Table 2. _____

	Day 1-Observations	**Day 2 -Observations**
Sample A		
Sample B		
Sample C		

Graph 1._____



Day 2 Questions.

1. After analyzing the data, was your hypothesis proven to be true?

2. Was the potato Sample A in a hypertonic, hypotonic or isotonic environment? (Circle one)
    a. How do you know?

    b. Was it turgid or flaccid?

3. Was the Potato Sample B in a hypertonic, hypotonic or isotonic environment? (Circle one)
    a. How do you know?

    b. Was it turgid or flaccid?

4. **Was the Potato Sample C in a hypertonic, hypotonic or isotonic environment? (Circle one)**
    a. **How do you know?**

    b. **Was it turgid or flaccid?**

5. **Using your graph, at what salt concentration do you think the potatoes would be isotonic? Explain your answer.**

Teacher Notes:

To create a 20% salt solution, you could dissolve 20grams of salt into 100 ml of solution (for 100ml of solution) or 200 grams of salt into 1000ml (for a 1000ml solution).

To create a 10% salt solution, you could dissolve 10grams of salt into 100 ml of solution (for 100ml of solution) or 100 grams of salt into 1000ml (for a 1000ml solution).

Graphing Answer: For the graph, students should recognize that where their graph crosses the x-axis at 0 it is isotonic because there is no change in mass.

Note: This lesson is designed to integrate with the full curriculum USBiologyTeaching.Com.

U.S. BIOLOGY TEACHING
Save Time, Engage Students, Love Teaching