Biology
Core Experiment

Standard # 3520-01Students will understand the classification and function of cells. **Objective #** 3520-0202Explain how a cell functions as a cell. **ILOs:**Make observations and measurements. Identify variables and describe relationships between them. Plan controlled experiments. Collect and record data using procedures designed to minimize error. Analyze data and draw warranted inferences. Seek and weight evidence before drawing conclusions. Report results honestly. Include a full description of any negative findings. Construct tables, graphs, charts, and diagrams to describe and summarize data. Share results with others.	**Topic:** Cells 3520-01

Description of Activity

Activity Title: Why do they spray produce in the supermarket?

Activity Overview: After conducting and experiment to learn about he movement of water in and out of potato cells, students will develop a scientific experiment that tests their predictions about the practice of spraying water on vegetables in supermarkets.

Duration: The potato activity requires at least two days to run. Extensions may take up to five days.

Background Information

This lab is designed as an introduction to the principles of diffusion and osmosis. It is recommended that this activity be presented as an inquiry-based project. The students should have no prior instruction on the processes of diffusion and osmosis. Students should be encouraged to formulate their own ideas to explain their own observations. Teachers should avoid giving information or clues. The molarity of a solution is determined by the concentration of a substance dissolved in a solvent. The molecular weight of a substance measured in grams, when dissolved in a solvent and brought to a volume of one liter will produce a 1.0 Molar solution. Salt can be substituted for sucrose.

Teaching and Learning Strategies

In order to insure an inquiry approach to this activity, the teacher should not give any information regarding the processes of diffusion and osmosis prior to the skill development lab.

In the **Skill Builder section** of this activity the students will prepare potato cores for measurement of mass. Initial potato masses are recorded on a lab sheet. The potato cores will be placed in six different molar solutions of sucrose and in distilled water. The cores will be left in the solutions for a 24 hour period. Students will recover the cores and record the final mass. The students will perform mathematical computations to determine the positive or negative percent change in mass. Group data will be complied and class averages plotted on a graph. Students will interpret the data and draw inferences regarding their observations. It may be appropriate at this point to hold a class discussion which would allow students to figure out the processes of diffusion and osmosis.

In the **Inquiry portion** of this activity students will formulate hypotheses for the supermarket problem. Students will test their hypotheses by designing a controlled experiment. After receiving teacher approval of the experimental plan, students will conduct their experiments. Data will be collected and analyzed. Students will use these data to validate or reject their hypotheses. Groups will present their experimental plan and interpretation of the data to the class.

Development of Laboratory Skills and Tools (Skill Builder)

Student will need to be experienced in the use of a triple-beam or electronic balance.

You will find a Skill Builder activity titled "Why Did the Potatoes Change?" appended to this document. Use this activity to help students build the skills they will need for the more advanced inquiry-based activity.

Invitation to Learn (Inquiry)

After completing the Skill Builder activity found at the end of this document, students can be given the challenge to predict why it is a common practice to regularly spray water on the produce in a grocery store. They should back up their predictions with scientific investigation and documentation.

Materials, Facilities and Resources: (For the inquiry session)

water balances metric rulers cups or beakers markers several types of	plastic wrap mist bottles A regular classroom with a sink is adequate for this activity.	Balances can be obtained from scientific supply companies such as Carolina Biological Supply, Sargeant-Welch, Flinn, or Frey.

produce razor blades		

The following "Student Designed Experiment - Laboratory Report" may prove useful for students during the inquiry session.

Student Designed Experiment - LABORATORY REPORT

Name_____ Period _____

1.State the problem:

_____
_____
_____
_____

2.State your hypothesis:

_____
_____
_____
_____

3.Describe your procedure in detail and sketch your experimental setup:

_____
_____
_____
_____
_____
_____
_____
_____

4.List the materials you will use

_____
_____
_____
_____

5.Identify the control and variables for your experiment.

_____
_____
_____
_____

6.Results:
TABLE (If needed)

GRAPH

7.Analysis of data.

_____
_____
_____
_____
_____
_____
_____

8.Conclusion.

9.Were any problems encountered in carrying out the procedure?

10.Were any problems involved in taking data?

11.Did any ideas develop that can be used in future investigations?

Summary of Learning

1.According to the results of your experiment, which of the following solutions would be the best to hatch brine shrimp eggs in?
A.1% salt solution
B.5% salt solution
C.10% salt solution
D.20% salt solution

2.To make a 17% saline solution you need to mix **** grams of salt in **** liters of water.
A.0.17, 0.1
B.1.7, 0.5
C.17, 0.1
D.170, 1

3.Describe the advantage of brine shrimp being able to tolerate changes in salt concentration.
Skill Builder page 1

Why Did the Potatoes Change?

Name_____ Period_____

Introduction
Potatoes are the storage facility for potato plants. The plant makes sugar which is transported to the potato. In the potato sugar is converted to starch and stored in the millions of cells that make up the potato. These cells are normal plant cells with a cell wall and a plasma membrane. Things must be able to get in and out of the cell. Your investigation will raise questions about how this occurs.

Objectives
1]To determine how substances move in and out of cells.
2]To continue to develop problem solving skills.
3]To graph and analyze data and come to a conclusion about how things move in and out of cells.

Materials

distilled water 0.2, 0.4, 0.6, 0.8, and 1.0M solutions of sucrose	corers marker 6 cups or beakers plastic wrap	scalpel potatoes electronic scale or balance ruler

Procedure
1]With your partners obtain all materials except the electronic scale.
2]Use the coring device to cut plugs from the potato.
3]Use the scalpel to cut the potato cores into 4 to 6cm lengths. Prepare enough cores so that you have 4 cores for each cup.
4]Place 4 cores in each cup.
5]Weigh each of the cups with the cores. Now weigh a cup without cores. Subtract the weight of the cup from your weights to determine the weight of the cores. Record the initial weight of the

cores in each cup in Table 1 and on the cup!
6]Fill the cups with the 6 sucrose solutions assigned to your group. Mark the cups with a name, period, and sucrose concentration.
7]Set the cups on a counter and cover them with plastic wrap.
8]Leave the cores in these solutions overnight.
9]When you return, remove the cores from the solutions, dry them quickly with a paper towel. Weigh them again and record their final weights in Table 1.
10]Compute the percent change from beginning weight to ending weight for each solution. (This number may be a negative number!!)

Final weight - beginning weight _____ beginning weight	X 100=Percent Change

Skill Builder page 2

11]Title the graph. Label the x and y axes on the graph.
12]Graph the percent change values for the different sucrose solutions.

Table 1

Sucrose Solution	**Initial Mass**	**Final Mass**	**Percent Change in Mass**
#1			
#2			
#3			
#4			
#5			
#6			

GRAPH

Skill Builder page 3

Questions

1]Which sucrose solutions caused the potatoes to increase in mass?

_____
_____
_____
_____

2]Which sucrose solutions caused the potatoes to decrease in mass?

_____
_____
_____
_____

3]Which sucrose solutions caused no change in the mass of the potatoes?

_____
_____
_____
_____

4]What caused the potatoes to change in mass?

_____

5]Why is it important for plants to have access to water?