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Unit Plan/Lesson 1
Biol 351

Abstract: During the lesson the students will determine the optimum salinity for brine shrimp hatching. They will be able to directly see the effects that the environment has on an organism's survival. The students will make daily observations and record their observations on a data sheet, and they will be instructed in the scientific process. The students will learn what makes an ecosystem and how organisms in the ecosystem are interdependent on one another for survival.

Grade level: 9-12th

Utah Core Curriculum Standards:

Standard: 3600-01: Students will investigate biological systems and summarize relationships between systems.

Objective 3600-0101: Analyze the functioning of a biological system.

- Identify biotic and abiotic factors in a system.
- Relate the effects of organisms on the environment, and the effects of the environment on organisms.
- Compare and contrast various relationships of organisms in a system.

Terminology:

- Salinity- The percent of salt in solution.
- Brine shrimp cysts- Encapsulated, dormant brine shrimp babies.
- Organism- A single form of life (plant, animal, etc.)
- Ecosystem- A structure in which plants and animals interact within the same environment.

Intended Learning Outcomes:

- The student will observe, compare and contrast different environmental conditions.
- The student will observe the effects of environmental conditions on the reproduction rates of organisms.
- The students will predict the outcome of the different environmental conditions on the organism.
- The student will learn about the Great Salt Lake ecosystem and how the organisms are interrelated in the ecosystem.

Introduction:

This research project was focused on the salinity at which brine shrimp hatch the best. It was found that the hatch rate was the most successful at 2.5% salinity. This lesson will focus on the results of our research, the salinities of the Great Salt Lake, the surrounding area, and how the different organisms interact in the Great Salt Lake ecosystem.

Materials:

- Distilled water
- Plain salt (not iodized)
- Brine shrimp cysts
- Plastic cups
- Lids or plastic wrap to cover plastic cups
- Rubber bands
- Toothpicks
- Graduated cylinder
- Pipettes (at least 5)
- Ruler
- Electronic scale or balance
- Microscope or handheld lenses

Note: Brine shrimp cysts can be purchased through the Barten Company; their e-mail address is: barten@compuserve.com

Procedures:

1. Count and label 25 plastic cups, label five cups at each percentage: 0%, 2.5%, 5%, 10% and 15%.
2. Weigh the appropriate amount of salt for each salinity, and place the salt in a cup labeled for that salinity.

0%= no salt

2.5%= 4.38 g NaCl

5%= 8.75 g NaCl

10%= 17.5 g NaCl

15%= 26.25 g NaCl

3. Using a graduated cylinder, measure out 175 mL of distilled water and add it to each cup, stir the solution to make sure that all of the salt is dissolved.
4. Using a ruler mark 4-5 millimeters on the thick/flat end of a toothpick.
5. Using the marked toothpicks measure 4-5 mm of brine shrimp cysts, and add them to each cup.
6. Cover each cup with plastic wrap, held tight with a rubber band (this is to eliminate evaporation and maintain salinity).
7. About three days after the experiment was begun, perform a volumetric count and redo the count everyday thereafter, for approximately one week.
 - a) When performing a volumetric count use a pipette that has mL marks, if this is not available measure 1mL in a graduated cylinder, pipette the water into the pipette and then mark the 1mL line with a permanent marker.
 - b) Using the 1mL pipette, stir a cup containing the brine shrimp cysts (to get them into suspension) pipette 1mL of solution and slowly empty the contents into a petri-dish.
 - c) Count the number of hatchlings, and record your data. Counting may be aided by a dissecting microscope or hand lenses.
 - d) Repeat b and c for the remaining 24 cups.
8. To get an approximate number of hatchlings multiply the number counted by the total volume in each cup, which is approximately 175.
 - a) This is the number of hatchlings per cup at the salinity measured (record your data).

Prior Assessment:

Our prior assessment will consist of a discussion in which we ask the students the following questions, which they will answer by raising their hands. We may also give them a worksheet that has the questions on it so that they can take notes.

1. What lives in the Great Salt Lake?
2. What life conditions would an organism in this type of environment face?

3. What adaptations must animals have living in high salinities?
4. What are the requirements for life?

Lesson Plan

1. Allow the students 10 minutes to answer the pre-assessment questions.
2. Set up research project (see procedures), inform the students about the research that will be done and ask students to make predictions about the results.
3. Talk about the research project and the known results.
4. Talk about the varying salinities of the Great Salt Lake and how animals adapt to these conditions.
5. Talk about the food web of the Great Salt Lake including the surrounding playa. Discuss the organisms that play the largest roles in the ecosystem. This discussion will include brine shrimp, what they eat and what eats them. Mention the flamingos at the zoo and talk about why they are pink.
6. Discuss the adaptations that an organism living in the high salt concentrations of the Great Salt Lake must have or develop, also discuss the desert areas around the lake, and the organisms that inhabit the region.

Post Assessment:

1. Have students draw a food web of the Great Salt Lake.
2. Have students do a crossword puzzle that asks questions about the Great Salt Lake and what they have learned.
3. Have the students write up a lab report.

Lab Report Guidelines

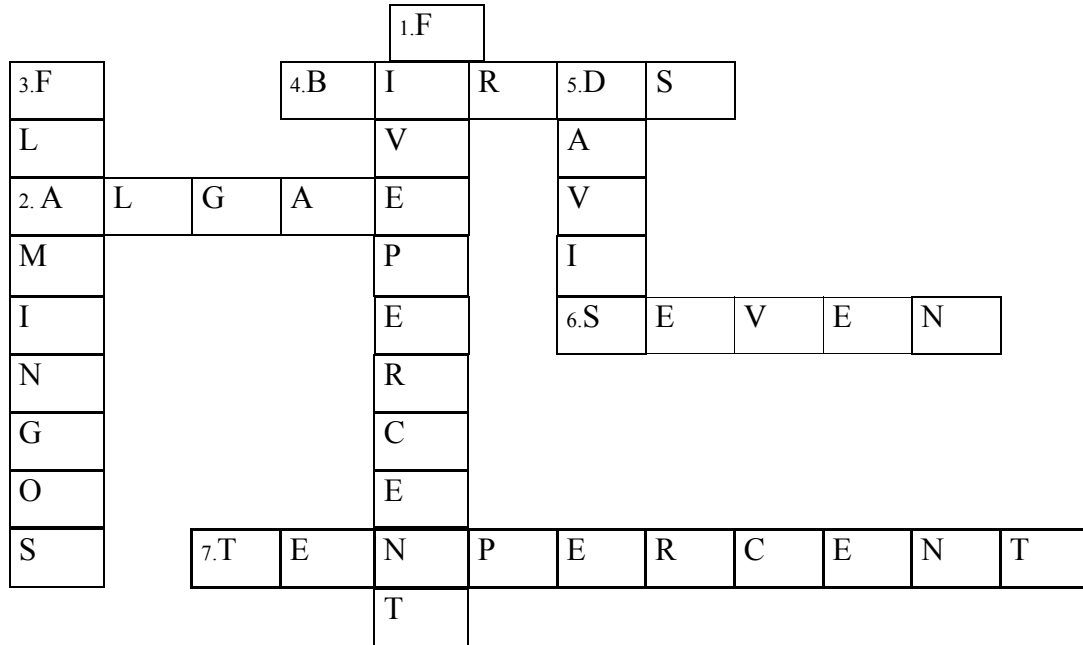
The lab report must contain each of the following sections to be considered for full credit:

- PURPOSE-A statement in which the intent of the experiment is described.
- HYPOTHESIS- A preliminary prediction about what the results are expected to be.
- MATERIALS-A list of the items that are necessary to perform the experiment.
- METHODS-A step by step approach to how the experiment was completed.
- RESULTS-This section must include all recorded data, including pictures and graphs, when applicable.
- DISCUSSION-Talk about your results and any conclusions that were made during the experiment.

Prior Assessment Notes for Unit on Brine Shrimp and Salinity

1. What is an ecosystem?
2. What types of animals do you think live in and around the Great Salt Lake?
3. What life conditions would these organisms face?
4. How do you think all of these organisms are interrelated?
5. What adaptations would animals have for living in high salinities?
6. What are the requirements for life?

Post assessment-Crossword Puzzle



Across

2. What do brine shrimp eat?
4. What eats brine shrimp?
6. What is the salinity of the area of the Great Salt Lake that brine shrimp live in?
7. What salinity do brine shrimp grow best in?

Down

1. What is the salinity that brine shrimp hatch best in?
3. These animals are pink because they eat brine shrimp.
5. Where is the Great Salt Lake?

Answers

five percent algae birds flamingos Davis county seven percent ten percent

POST-ASSESSMENT

Draw a diagram of the food web including the following organisms:

BACTERIA
BRINE SHRIMP
BRINE FLIES
ALGAE
FISH
GRASSHOPPERS
SPIDERS
BIRDS
VOLES/SMALL MAMMALS
SALT GRASS
PICKLEWEED

Grading Criteria:

Crossword puzzle-

Did the student get the correct answers on the puzzle? Calculate the percentage of correct answers.

Food web-

Is the food web complete?

Did the students use all of the organisms listed in the assignment.

Is the diagram neat and orderly?

Lab report-

Participation, observation and evidence of thought are evident from the lab report.

All of the listed criteria are met.