

Biology

End of Year Cornerstone Assessment

The Cornerstone Assessments were developed with support through the VDOE Mathematics and Science Partnership Grant Program NCLB Title II, Part B program by high school teachers as a part of the Old Dominion University Learning Enhanced through the Nature of Science (LENS) project.

2012 – 2013

This assessment consists of two parts.

DIRECTIONS to provide to read to students:

Today you will be taking the Biology End of Year Cornerstone Assessment to find out your skills in scientific investigation, data analysis and interpretation, and scientific reasoning. Read each question carefully and provide your *best* answer or response.

Record your answers directly on the spaces provided in the assessment. Be sure your work and responses are legible.

Teacher Name: _____

Biology End of Year Cornerstone Assessment: Part A – Experimental Design

Directions: Read the paragraph below and respond to questions 1 - 7.

Alex’s biology class is studying the effect of salinity (amount of salt) of water on the behavior of aquatic organisms. Specifically, the students want to investigate the effect of salinity on the rate of movement in *Artemia*. *Artemia*, commonly known as brine shrimp, are small aquatic crustaceans that live in saline aquatic environments. Although *Artemia* are small, they can easily be seen with the naked eye (without a microscope). Design an appropriate experiment to test the effect of salinity on the rate of movement of *Artemia* by responding to questions 1 through 7. The rate of movement is determined by how far the *Artemia* travel over time.

The following materials are available for use in your experimental design:

<ul style="list-style-type: none">• <i>Artemia</i> – unlimited supply• Petri dishes to hold <i>Artemia</i>• 0% saline solution• 10% saline solution• 20% saline solution• 30% saline solution• 40% saline solution	<ul style="list-style-type: none">• Timer• Paper and pencil• Grid paper that fits under petri dishes (2mm x 2mm grids marked off that can be seen through the petri dish)• Graduated cylinder 10ml• Pipet to transfer <i>Artemia</i>
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1. State an appropriate **hypothesis**. Explain your reasoning.

2. What is the **independent variable** in your experimental design? Explain your choice.

3. What is the **dependent variable** in your experimental design? Explain your choice.

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Biology End of Year Cornerstone Assessment: Part B – Data Analysis and Scientific Reasoning

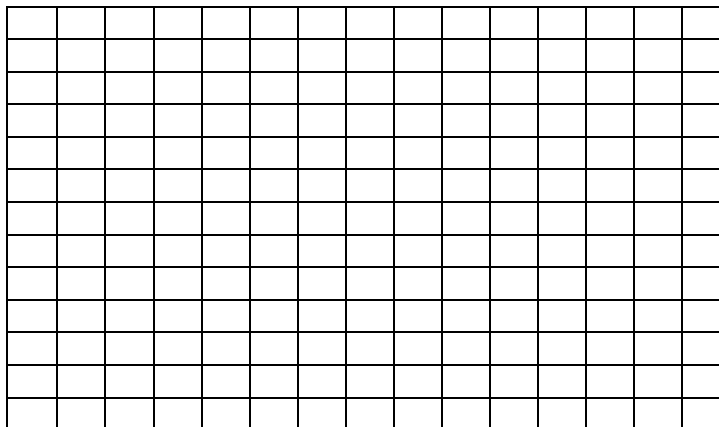
Directions: Review the information and data table presented below. Answer questions 1 through 11 that follow the information and the data table.

An experiment was set up to test the effect of changing pH concentrations on the rate of movement of *Artemia*. Students hypothesized that the higher pH levels would increase the rate of movement of the *Artemia*. The students placed the *Artemia* in petri dishes with 2 mm x 2 mm grids marked off on the bottom of the dishes. The students calculated how fast the *Artemia* traveled in each pH (4-9) solution by counting the number of squares on the grid that the *Artemia* crossed per second of timing.

The data collected from their experiment is presented below:

pH of Water	Rate of Movement of <i>Artemia</i> (squares per second)
4	1
5	5
6	10
7	20
8	20
9	25

1. Using the grid below, create a line graph based on the above data.



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2. What was the **independent variable** in the experiment? Explain your choice.

3. What was the **dependent variable** in the experiment? Explain your choice.

4. At what pH level(s) did the *Artemia* exhibit the highest rate of movement?

5. What do you think would happen to the rate of movement if the *Artemia* were placed in a solution with a pH of 10? Explain your reasoning.

6. What do you think would happen to the rate of movement if the *Artemia* were placed in a solution with a pH of 3? Explain your reasoning.

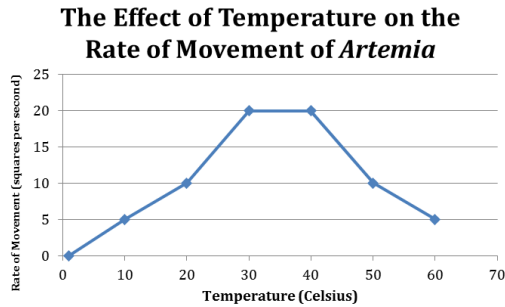
7. What conclusion(s) can you make based on the results (data) from the experiment?

8. Describe a way in which this experiment could be improved to further explore the effect of the pH of solution on the rate of movement of the *Artemia*.

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9. Describe what happens to the rate of movement of the *Artemia* as the pH of the solution they are placed in changes.

The graph below shows the effect of temperature on the rate of movement of *Artemia*.



10. At what temperature(s) did the *Artemia* move the fastest?

11. Why do you think the rate of movement of an organism changes when the temperature of their environment changes? Explain your reasoning.
