The Brine Shrimp Project

Purpose:

To design and conduct a laboratory investigation to determine how different factors may affect the hatching and development of brine shrimp eggs.

Introduction:

The Brine Shrimp Project is an investigation in which you and your partner will gather and analyze data about how different factors may affect the hatching and development of brine shrimp. In addition, all students will have the opportunity to design an experiment, conduct an investigation using the scientific method, analyze the results and share the results with the rest of the class in the form of an oral report. Students will also be required to write a formal laboratory report using the format we discussed the first day of class.

Brine Shrimp Facts

Classification:

Kingdom Animalia

Phylum Arthropoda

Class Crustacea

The common brine shrimp (artemia) are closely related to zooplankton such as Daphnia and are often used as live food for aquariums. The artemia life cycle begins by the hatching of dormant cysts which are encased embryos that are metabolically inactive. The cysts can remain dormant for many years as long as they are kept dry. When the cysts are placed in salt water, they are rehydrated and resume their development.

After 15 or 20 hours at 25 degrees C (77 degrees F), the cysts burst and the embryo leaves the shell. For the first few hours, the embryo hangs beneath the cyst shell, still enclosed in the hatching membrane. The embryo will grow and progress through 15 molts before reaching adulthood in approximately 8 days. Adult artemia average about 8mm long, but can reach lengths of 20 mm under ideal conditions.

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Other variables of importance are pH, light and oxygen. A pH of 7.5-8.5 is optimal, and can be lowered with muriatic acid or increased with baking soda. A minimum amount of light is necessary for hatching and is beneficial for increased adult growth.

Two liter soda bottles with the tops cut off and filled with tap water make great hatching containers. To the bottle filled with water add 10 to 20 grams of salt without iodine and a pinch of sodium bicarbonate (baking soda).

Feeding the brine shrimp is necessary, if the culture is to be used for several days. A solution of baker's yeast and fish tank water to form a milky solution is an ideal food for the growing brine shrimp. The brine shrimp culture only needs a few drops of the yeast solution as they are not big eaters and overfeeding can foul the culture. The yeast solution can be placed in a dropper bottle and stored in the refrigerator.

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Day 1

Please pick your partner. Please see me when you have completed this information.

Your Name

_____

Partner's Name

_____

Review: the section in your textbook on the scientific method and processes of science

1. Describe the six steps of the scientific method. Discuss the importance of each step.

a.

b.

c.

d.

e.

f.

2. Define hypothesis.

3. What is the function of a control in an experiment?

4. Why is it important to keep careful records when doing an experiment?

Project Suggestions:

Brine Shrimp Eggs

1. Does temperature affect the rate at which brine shrimp eggs hatch?
2. Do different concentrations of salt affect the rate at which brine shrimp hatch?
3. Does increased acidity (acid rain) affect the hatching rate of the brine shrimp?
4. Do increased amounts of light increase or decrease hatching rates?
5. Do pollutants (oil, etc.) have an effect on hatching rates?

Live Brine Shrimp

The same problems may be investigated using live brine shrimp, but determinations can be made on mortality rates.

1. What amounts of food are optimal for brine shrimp survival?
2. What is the optimal salt concentration for brine shrimp survival?
3. Can brine shrimp survive at temperatures which are less than optimal (storage in the refrigerator, etc.)?

Day 1

With your partner brainstorm 3 problems you would like to investigate.

1.

2.

3.

Oral presentation to the rest of class on the three problems you selected and ways in which you would carry out the investigation.

Day 1

List three additional problems presented by other teams which might be of interest to you and your partner.

1.

2.

3.

Day 1

Select a problem.

State the problem you and your partner would like to investigate.

Day 1

Write a hypothesis.

Write a hypothesis related to the problem. Remember, a hypothesis is a tentative solution to the problem. A hypothesis may be written as an if this happens, then this will happen. Example-If brine shrimp eggs are exposed to excess salt concentration, then the rate of hatching will decrease.

Day 1

Title of your project.

The title should be specific and relate to the problem and the hypothesis.

Day 2

Design the investigation.

The design of your investigation should:

-relate to the problem and the hypothesis

-test only a single variable

-describe the procedure

-list materials and equipment needed

-identify possible sources of error.

-include a design drawing

I need a shopping list at the end of the day.

Approval of design _____ Date _____

Day 3

Set up the Experiment

Determine any problems which may be encountered and correct them at this time.

List any sources of error which may be encountered.

Day 4

First Data Collection

Record the data you collect in the form of a data table.

Day 5

Second Data Collection

Day 6

Third Data Collection

Day 7

Fourth Data Collection

Day 7

Analyze the data.

Does the data support your hypothesis? Draw conclusions based on your data. Discuss possible sources of error. Graph your data on a separate piece of graph paper.

Day 7

Formal Laboratory Report

Write your rough draft of your laboratory in the form which we discussed the first day of class. The report should then be typed and double spaced with the appropriate headings.

Day 7

Oral Presentation

Develop a written outline or plan for your oral presentation.

The oral presentation will be presented on our scheduled final exam day.

	Activity	Possible Score	Your Score
Day 1	Review	9	_____
	3 Problems to Investigate	3	_____
	Oral Presentation	6	_____
	3 Additional Problems	3	_____
	Select a Problem	3	_____
	Hypothesis	3	_____
	Title of Project	3	_____
	Teamwork	5	_____
	Total	35	_____

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Day 2	**Design the Investigation**	
Materials	**5**	_____
Description	**5**	_____
Possible Sources of Error	**5**	_____
Design Drawing	**10**	_____
Teamwork	**5**	_____
Total	**30**	_____

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Day 3		
Set up the Experiment	**10**	_____
Correct Problems	**5**	_____
Sources of Error	**5**	_____
Teamwork	**5**	_____
Total	**25**	_____

Day 4		
First Data Collection	**10**	_____

	Data Tables w/ Title	**5**	**_____**
	Proper Labels on Tables	**5**	**_____**
	Sufficient Data	**5**	**_____**
	Teamwork	**5**	**_____**
	Total	**30**	**_____**

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Day 5	**Second Data Collection**	**10**	**_____**
	Data Tables w/ Title	**5**	**_____**
	Proper Labels on Tables	**5**	**_____**
	Sufficient Data	**5**	**_____**
	Teamwork	**5**	**_____**
	Total	**30**	**_____**

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Day 6	**Third Data Collection**	**10**	**_____**
	Data Tables w/ Title	**5**	**_____**
	Proper Labels on Tables	**5**	**_____**
	Sufficient Data	**5**	**_____**
	Teamwork	**5**	**_____**
	Total	**30**	**_____**

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Day 7	**Fourth Data Collection**	**10**	**_____**
	Data Tables w/ Title	**5**	**_____**
	Proper Labels on Tables	**5**	**_____**
	Sufficient Data	**5**	**_____**
	Teamwork	**5**	**_____**
	Total	**30**	**_____**

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Day 7	**Analyze the Data**	**5**	**_____**
	Conclusions	**5**	**_____**

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Graphs	**5**	_____
Title	**1**	_____
Proper Labels	**2**	_____
Proper Size	**2**	_____
Teamwork	**5**	_____
Total	**25**	_____

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Individual Formal Laboratory Report

Typed and Double Spaced	**10**	_____
Title	**2**	_____
Hypothesis	**2**	_____
List of Materials	**6**	_____
Procedure Step by Step	**10**	_____
4 Data Tables	**20**	_____
Analysis and Conclusions	**5**	_____
Total	**50**	_____

Oral Presentation

Problem Stated	**2**	_____
Hypothesis Stated	**3**	_____
Design Described	**5**	_____
Sources of Error Discussed	**3**	_____
Data Presented	**2**	_____
Graph Discussed	**2**	_____
Conclusions Presented	**3**	_____
Teamwork	**5**	_____
Total	**25**	_____

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Total # of Points	**310**	_____

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Extra Credit for Posters, Diagrams, etc.	**25**	**_____**
Total # of Points w/ Extra Credit		**_____**
Letter Grade		**_____**

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