

Artemia salina **Teacher Resource**

Grade Level 5-12

Objectives

1. The student will identify the impact of temperature on a brine shrimp's life cycle.
2. The student will record how hatching rates are a function of temperature or salinity by designing an experiment.
3. The student will demonstrate the use of 21st century technology with a document camera.
4. The student will be able to collect and analyze data.

National Standards

NS.5-8.1 ; NS.9-12.1	Science as Inquiry
NS.5-8.3 ; NS.9-12.3	Life Science
NS.5-8.4 ; NS.9-12.4	Earth and Space Science
NS.5-8.5 ; NS.9-12.5	Science & Technology
NT.K-12.1	Basic Operations and Concepts
NT.K-12.3	Technology Productivity Tools
NT.K-12.6	Technology Problem-Solving & Decision-Making Tools

Teacher Background Information

Artemia brine shrimp are crustaceans that are easy to use, and multiply rapidly for the classroom laboratory. This *Artemia* brine shrimp lab consists of a period of 2 weeks in order for hatching to occur. This lab is perfectly suited for an ecology or biology course. *Artemia* needs a necessary food source in order to develop. Natural seawater or saltwater is adequate with a supply of commercial food such as *Liquifry* from a biological supply store or a local aquatic pet store. Once the culture is set up, make sure to allow plenty of sunlight for algae to photosynthesize.

Artemia salina belongs to the phylum Arthropoda and appears to not have changed for the last 100 million years. *Artemia*'s segmented body has a pair of jointed appendages on each

individual segment. *Artemia* has a head, thorax, and abdomen region. When increasing in size, *Artemia* must molt its exoskeleton about every 2 to 4 days. Most people refer to them as brine shrimp or “sea monkeys.” Very few crustaceans can live in waters that have more salt content than the sea, but *Artemia* is the most successful. *Artemia* live in salt lakes and are very rarely found in the open sea. High concentrations of salt will give the *Artemia* a red appearance on their exoskeleton. Females grow slightly larger than male *Artemia*. To distinguish, females have two large lateral egg sacs while males have overdeveloped antennae. The eggs of *Artemia* hatch into free-living larvae and will continue to grow through a molting process until they reach the average adult stage with at least 20 segments.

MATERIALS

Document Camera or Underwater Camera

Electronic Balance

Personal Computer

Interactive White Board/Projector

Artemia salina Brine Shrimp Eggs

3 Aquariums or Large Clear Beakers/Jars

Seawater (Saltwater)

Air Pump

Dechlorinating Agent

Flexible Tubing (10ft)

Hydrometer

Liquifry (food source)

Thermometer or Temperature Gauge

PROCEDURE

Activity 1 *Set Up for Each Aquarium*

1. Place a layer of sand or gravel on the bottom of the tanks, jars, or aquariums.
2. Place Natural Seawater or Saltwater into the aquariums.

3. The water temperature in each aquarium should be set to 30°C, 20°C, and 5°C.
4. Add *Liquifry* to the aquariums.
5. Allow access of sunlight or a light source to the aquariums for optimal algae growth.
6. Allow aquariums to sit over the weekend or 2 days to allow for temperature to stabilize and algae growth to occur.

Activity 2 *Temperature & Hatching Rates*

1. Place the *Artemia* eggs in each aquarium.
2. Have the students set up the document cameras on the eggs in each aquarium.
3. Open the computer and choose to time-lapse record.
4. Choose the frames per second and start recording.
5. Once hatching is complete; stop recording.
 - a. The eggs at 30°C should hatch after 24 hours.
 - b. The eggs at 20°C should hatch after 50 hours.
 - c. The eggs at 5°C will probably not hatch after 100 hours; however, these eggs are still viable. To show the students that they will hatch raise the temperature to about 15°C and the hatching should occur.

Activity 3 *Salt Concentration & Hatching Rates*

1. Divide class into 10 lab groups.
2. Assign each group a glass beaker, #1-10.
3. Have each group fill their assigned numbered beaker with 100mL tap water.
4. Display the table below and have each group weigh the salt to add in their beaker.

Beaker	Salt (grams)
1	0
2	1
3	2
4	3
5	4

6	5
7	6
8	7
9	8

5. After salt has been added, have students weigh and place 3 grams of *Artemia salina* for each beaker.
6. Have students cover each beaker with plastic to inhibit the evaporation of the water.
7. Set the beakers in a well-lit area so they all have equal amounts of light.
8. Set up each group's document camera on the eggs to their assigned beaker.
9. Open the computer and choose to time-lapse record.
10. Choose the frames per second and start recording.
11. Once hatching is complete; stop recording. It usually will take at least 24 hours.

DISCUSSION QUESTIONS

1. Have students construct a data table. They could measure the salinity, any temperature change, or the amount of *Artemia* that have hatched.
2. What are the dependent variables of the experiment?
3. How will you keep these variables constant?
4. What is the independent variable?
5. How will you measure the outcome of your experiment?
6. What would happen to the hatching rate of *Artemia* if you increased the temperature? If it decreased?
7. What would happen to the hatching rate of *Artemia* if you increased salinity? If it decreased?
8. Under what conditions would be the best environment for hatching?

PRESENTATION

Have students prepare a lab report including the data, images, and video to give a presentation on the interactive white board or projector for the class.

EXTENSION

- Egg Survival at Different Temperatures
 - ✓ Place batches of eggs at different temperatures (-30°C to 100°C) for 10 minutes and then place the eggs in room temperature water to see if hatching occurs and the egg is viable.