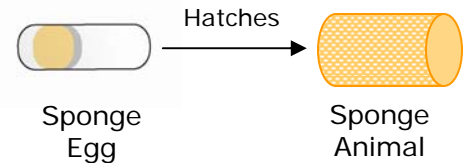




Experimenting: Factors that Affect Sponge Egg Hatching

Introduction:

Imagine you are a researcher who works in a lab studying egg hatching in a species of sponges. Your lab kit contains simulated sponge eggs (small sponges enclosed in gelatin capsules). When these eggs are placed in water, the gelatin capsule dissolves allowing the eggs to hatch and a sponge “animal” to emerge. You have been asked to conduct an experiment to determine how water temperature affects the time required for sponge eggs to hatch.



Part 1: How does water temperature affect sponge egg hatching?

A. Think About Your Experiment

1. State the purpose for your experiment.

2. What do you predict will happen to sponge egg hatching if the water temperature is increased? Complete the two statements below.

- I predict that increasing the water temperature will _____ (affect or effect) the time required for sponge eggs to hatch by _____ (increasing/decreasing/not changing) the hatching time.
- I predict that the _____ (affect or effect) of increasing the water temperature will be to _____ (increase/decrease/not change) sponge egg hatching time.

Affect is a VERB
Example: How do you think the rain will affect Tina’s hair?

Effect is a NOUN
Example: The effect of the rain was that Tina’s hair got frizzy.

3. State the **hypothesis** that you will be testing as an “If...(you do this).....then...(this will happen).....” statement.

Hypothesis:
The prediction that could be tested in an experiment.

The hypothesis is stated as an “Ifthen.....” statement.

B. Set Up Your Experiment

Sponge eggs have been shown to hatch in plastic cups containing water. You will hatch sponge eggs in plastic cups containing water at different temperatures.

4. Your lab kit contains three cups (A, B, and C). The chart below shows what you should put into each of the cups. Be certain to use the **°C scale** on the thermometer to measure the water temperature.

Safety warning: Do NOT use boiling water. Even hot water from the tap may burn you. Be careful when handling the hot tap water.

Label on the cup	Put into the cup
A	240 ml of 25 °C tap water
B	240 ml of 35 °C tap water
C	240 ml of 45 °C tap water

5. Record the temperature of the water in each cup in the Column of Data Table 1.

Data Table 1: The Effect of Temperature on Time Required for Hatching

Column 1 Independent Variable	Column 2 Dependent Variable
Water Temperature (°C)	Average time (minutes) required for sponge eggs to hatch

6. At the same time, drop **three** sponge eggs into each of the cups.
7. Use a clock or watch to record the start time: _____ (or use a timer).
8. Gently stir the sponge eggs in the water. Observe the sponge eggs in all three cups (A, B, and C). Record the time when each sponge egg hatches on the lines below.
- Note: If it takes more than 15 minutes for the sponge eggs to hatch, you should record the time required to hatch as 15 minutes.*

A _____ B _____ C _____

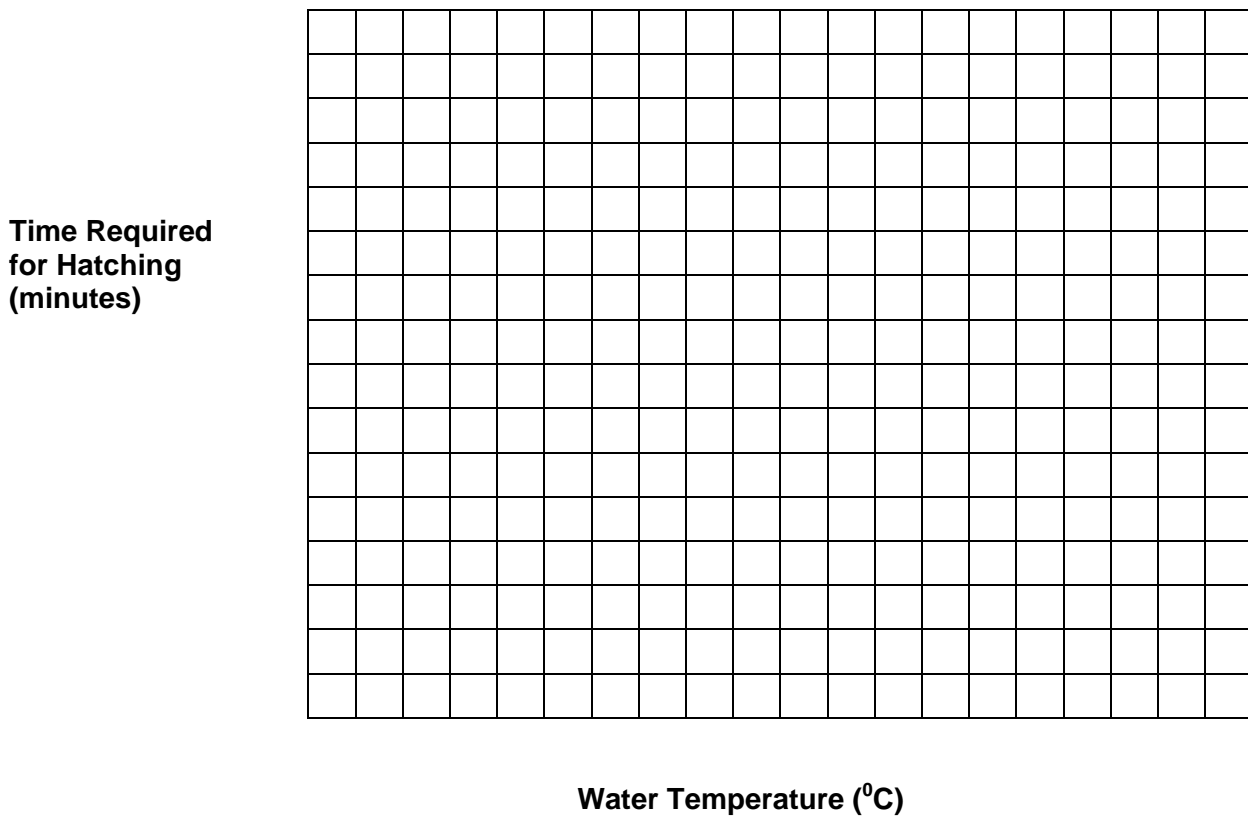
9. Calculate the average time (minutes) required for sponge egg hatching in each of the cups. Record the average time (minutes) in Column 2 of Data Table 1 above.
10. Discard sponges in the trash. Pour the water down the drain. Dry and save the cups and the thermometer for use in Part 2.

C. Graph the Data from Your Experiment

Graphs can be used to summarize the data from an experiment. Prepare a line graph on the grid below to summarize the effect of temperature on the time required for sponge eggs to hatch.

11. Label the horizontal axis (“Water Temperature”) with the appropriate units of measurement, at even intervals along the axis. Label the vertical axis (“Time Required for Hatching”) with the appropriate units of measurement, at even intervals along the axis.
12. Plot your data as points on the graph. Surround each point with a small circle (○) and connect the points with a line as shown here: ○—○

Graph 1: The Effect of Temperature on Time Required for Sponge Egg Hatching



D. Analyze Your Experiment

Independent variable (or manipulated variable) is the variable (factor) you changed in the experiment. The independent variable is chosen before you conduct the experiment.

Dependent variable (or responding variable) is the variable that may change as a result of the independent variable. The dependent variable is the data that is observed and measured in an experiment.

Controlled variables (or constants) are factors that are kept the same in the experiment, so that the experiment is a fair test.

13. What is the **independent variable** for this experiment?

Go back to Graph 1 and write the words “independent variable” on the correct axis of the graph.

14. What is the **dependent variable** for this experiment?

Go back to Graph 1 and write the words “dependent variable” on the correct axis of the graph.

15. List two **controlled variables** – factors that were kept the same in all three cups used in your experiment.

16. State one conclusion you can draw based on the information in your graph.

17. Does the data from this experiment support your hypothesis? Explain why or why not?

Part 2: Testing an Advertising Claim

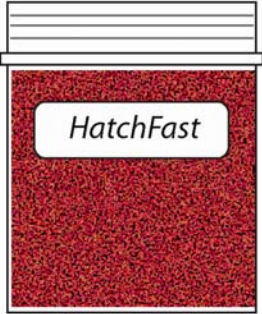
A. Conducting a Controlled Experiment

The advertisement below claims that adding one or more level spoonfuls of *HatchFast* to the water will decrease the time needed for sponge eggs to hatch.

HatchFast
Speeds up sponge egg hatching!

Bored by waiting for sponge eggs to hatch in cool aquarium water? Try *HatchFast*, the miracle hatching chemical.

- Just one level spoonful of *HatchFast* mixed with 35 °C tap water reduces hatch time.
- Adding even more *HatchFast* really speeds up egg hatching!



In this activity, you will design and conduct a controlled experiment to test the company's claim that adding *HatchFast* to 35 °C tap water decreases the time needed for sponge eggs to hatch.

A **controlled experiment** compares the results obtained from an **experimental group** with the results from a **control group**. In a controlled experiment, the control and experimental group are identical except for the one variable (the independent variable) whose effect is being tested.

Your lab kit for Part 2 contains the materials shown at the right that you will use for this experiment.

In your lab kit are these materials:

- 9 sponge eggs
- 3 plastic stirrers
- 1 bag of *HatchFast*
- 1 small measuring spoon

You should use the thermometer and three cups (A, B, and C) that you saved from Part 1.

1. What is the purpose for the experiment that you have been asked to design?

2. What is your **hypothesis** for the experiment? Express your hypothesis as an “If...then...” statement.

3. What is the **independent variable** for your experiment? Include the units of measurement in your answer.

4. What is the **dependent variable** for your experiment? Include the units of measurement in parentheses.

5. What is the **control group** for your experiment?

6. What are the **experimental groups** for your experiment?

7. How should the control group and the experimental groups for your experiment be treated differently?

8. How many experimental groups will you have for your experiment?

9. List two **controlled variables** that you should keep the same (constant) in the control and experimental groups.

10. Write a procedure to describe how you will set up your experiment. Include information on how many cups will be used in your experiment and what will be put into each cup. *Hint: You might want to refer to the procedure from Part 1 of this lab, and modify the procedure so it is appropriate for the purpose of your experiment.*

11. Explain how you will collect data during your experiment.

12. Construct an appropriate data table with title and column headings that you will use to record the data from your experiment.

Data Table 2: *(title)*

Column 1 Independent Variable	Column 2 Dependent Variable

13. Set up and conduct your experiment. Record the data from your experiment in your data table.

14. When you have completed your experiment, discard the sponges in the trash and pour the liquid down the drain.

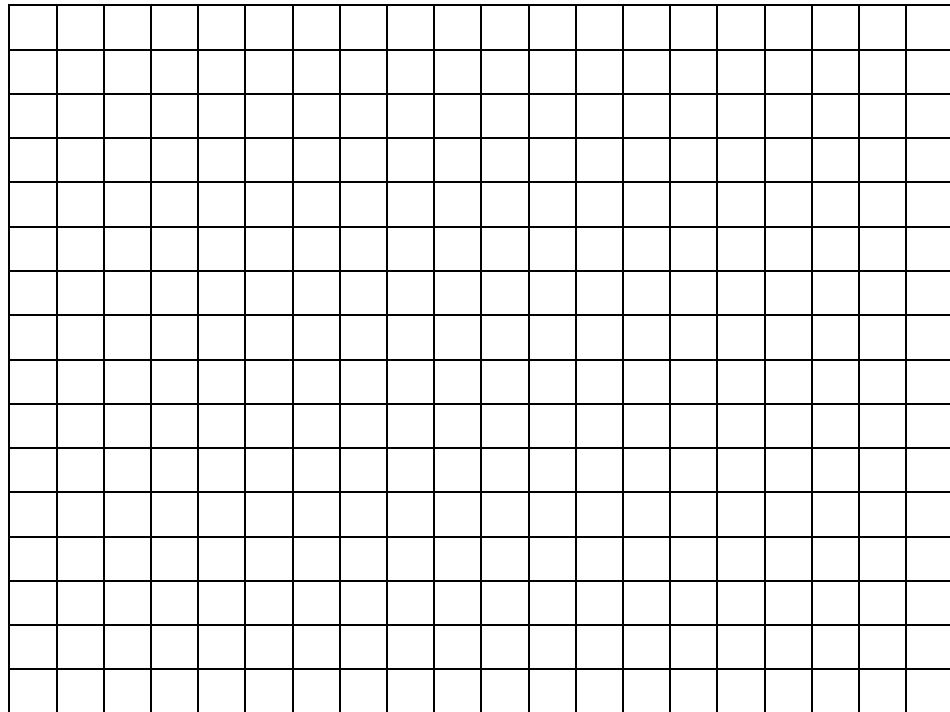


B. Graphing the Data from Your Experiment

15. Prepare a line graph to summarize the results of your experiment.

- Write a title for your graph.
- Label the horizontal and vertical axes. Include appropriate measurement units.
- Write “Independent Variable” on the correct axis and write “Dependent Variable” on the correct axis.
- Mark an appropriate scale on each axis.
- Plot your data on the graph, surround each point with a small circle (○) and connect the points with a line as shown here: ○—○

Graph 2: *(title)*



C. Analyzing Your Experiment

16. What conclusions can you draw based on the results of your experiment?

17. Do the results of your experiment support the advertising claim that *HatchFast* speeds up hatching of Sponge eggs? Explain why or why not.

18. Describe two specific ways the design of your experiment could be improved to increase the likelihood that other students would get similar results and draw the same conclusion.
