

# Experimenting: Factors that Affect Sponge Egg Hatching

## Teacher Information



just add students™

### Summary

In Part 1, students conduct a controlled experiment to determine the effect of temperature on the hatching of sponge eggs (gel capsules that dissolve in water to release small sponge “animals”). In Part 2, students design and conduct their own experiment to test the claim that using *HatchFast* speeds up sponge egg hatching.

### Core Concepts

- State hypotheses
- Test a hypothesis by designing a simple controlled experiment that includes control and experimental groups
- Identify independent variables, dependent variables, and constants
- Choose appropriate sample size (or repeated trials)
- Organize results using appropriate data tables and graphs
- Identify potential sources of error/limitation of experiments
- Draw conclusions related to the hypothesis and experimental results

### Time Required

- Part 1: Two 40-minute class periods
- Part 2: Two 40-minute class periods

### Kit contains

- 18 sponge eggs (gel capsules containing sponge “eggs”)
- 3 cups labeled A, B, and C
- 4 plastic stirrers
- 1 Celsius thermometer
- 1 bag of *HatchFast*
- Small spoon

### Teacher Provides

- Access to 25°, 35°, and 45° C tap water
- Calculator
- Clock with a second hand

**Warning: Choking Hazard** This Science Take-Out kit contains small parts. Do not allow children under the age of seven to have access to any kit components.

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## Notes

Celsius temperature measurements should be used in this activity. To save class time, consider setting up buckets of 25°, 35°, and 45° C water for use by the class. These temperatures were chosen because they are safe for students to handle and generally result in sponge egg hatching within 15 minutes.

## Reusing *Sponge Egg Hatching* kits

Teachers should instruct students on handling clean-up and return of the re-usable kit materials. For example, Teachers might provide the following information for students:

Discard	Rinse with water and dry with paper towel	Return to kit
<ul style="list-style-type: none"><li>Used “sponge animals”</li></ul>	<ul style="list-style-type: none"><li>Plastic cups</li><li>Stirrers</li><li>Thermometer</li></ul>	<ul style="list-style-type: none"><li>Plastic cups (rinsed and dried)</li><li>Stirrers (rinsed and dried)</li><li>Thermometer (rinsed and dried)</li><li>Small spoon</li><li>Bag of <i>HatchFast</i></li></ul>

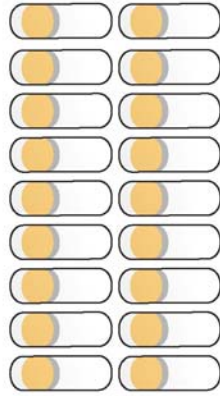
Refills for *Sponge Egg Hatching* kits are available at [www.sciencetakeout.com](http://www.sciencetakeout.com). The **10 Kit Refill Pack** includes the following materials:

- Instructions and Quick Guide for refilling kits
- 180 sponge eggs
- *HatchFast*

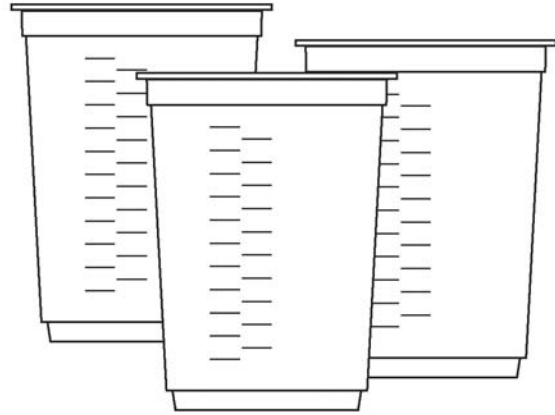
# Kit Contents Quick Guide



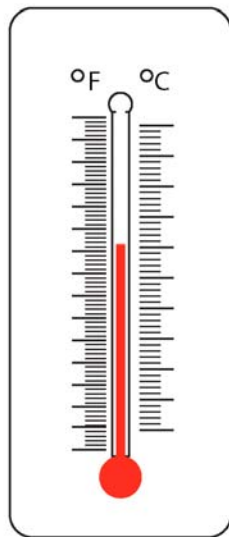
Stirrer



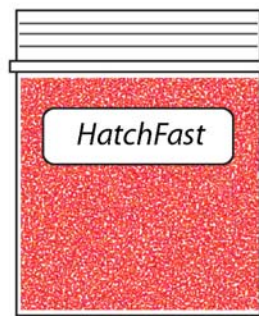
Sponge eggs



Measuring cups



Thermometer



Spoon

Copyright

## Read these instructions before using Science Take-Out kits

### Parental or Adult Supervision Required

This kit should be used only under the supervision of an adult who is committed to ensuring that the safety precautions below, and in the specific laboratory activity, are followed.

### Safety Goggles and Gloves Strongly Recommended

We encourage students to adopt safe lab practices, and wear safety goggles and gloves when performing laboratory activities involving chemicals. Safety goggles and gloves are not provided in Science Take-Out kits. They may be purchased from a local hardware store or pharmacy.

### Warning: Choking and Chemical Hazard

Science Take-Out kits contain small parts that could pose a choking hazard and chemicals that could be hazardous if ingested. Do not allow children under the age of seven to have access to any kit components. Material Safety Data Sheets (MSDS) provide specific safety information regarding the chemical contents of the kits. MSDS information for each kit is provided in the accompanying teacher instructions.

### Chemicals Used in Science Take-Out Kits

Every effort has been made to reduce the use of hazardous chemicals in Science Take-Out kits. Most kits contain common household chemicals or chemicals that pose little or no risk.

### General Safety Precautions

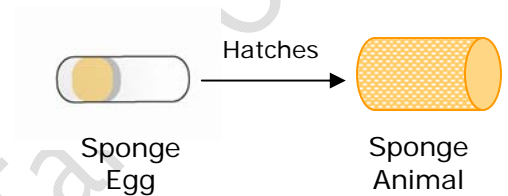
1. Work in a clean, uncluttered area. Cover the work area to protect the work surface.
2. Read and follow all instructions carefully.
3. Pay particular attention to following the specific safety precautions included in the kit activity instructions.
4. Goggles and gloves should be worn while performing experiments using chemicals.
5. Do not use the contents of this kit for any other purpose beyond those described in the kit instructions.
6. Do not leave experiment parts or kits where they could be used inappropriately by others.
7. Never taste or ingest any chemicals provided in the kit – they may be toxic.
8. Do not eat, drink, apply make-up or contact lenses while performing experiments.
9. Wash your hands before and after performing experiments.
10. Chemicals used in Science Take-Out experiments may stain or damage skin, clothing or work surfaces. If spills occur, wash the area immediately and thoroughly.
11. At the end of the experiment, return ALL kit components to the kit plastic bag. Dispose of the plastic bag and contents in your regular household trash.

*No blood or body fluids from humans or animals are used in Science Take-Out kits. Chemical mixtures are substituted as simulations of these substances.*

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

#### **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.

#### **Hypothesis:**

The prediction that could be tested in an experiment.

The hypothesis is stated as an “If ....then.....” 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
<b>Water Temperature (°C)</b>	<b>Average time (minutes) required for sponge eggs to hatch</b>
<b>25</b>	
<b>35</b>	
<b>45</b>	

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.

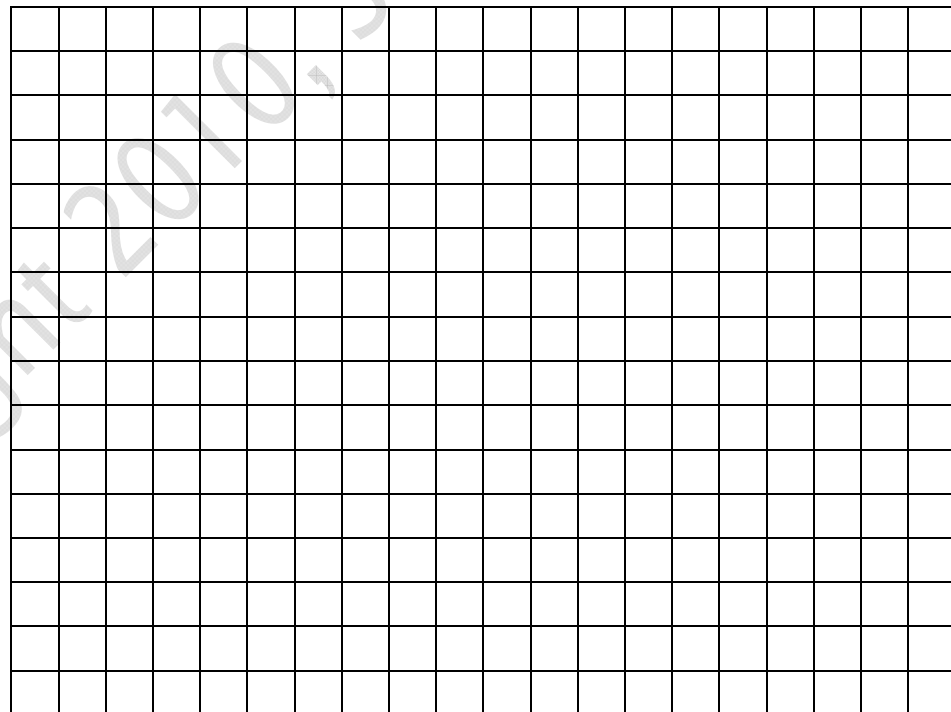
**C. Graph the Data from Your Experiment**

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**

**Time Required  
for Hatching  
(minutes)**



**Water Temperature (°C)**

## 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

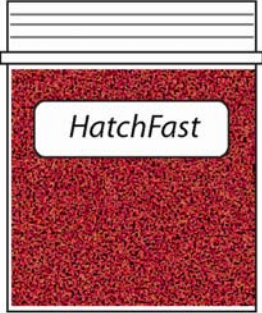
### A. Conducting a Controlled Experiment

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)**

<b>Column 1</b> Independent Variable	<b>Column 2</b> Dependent Variable

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

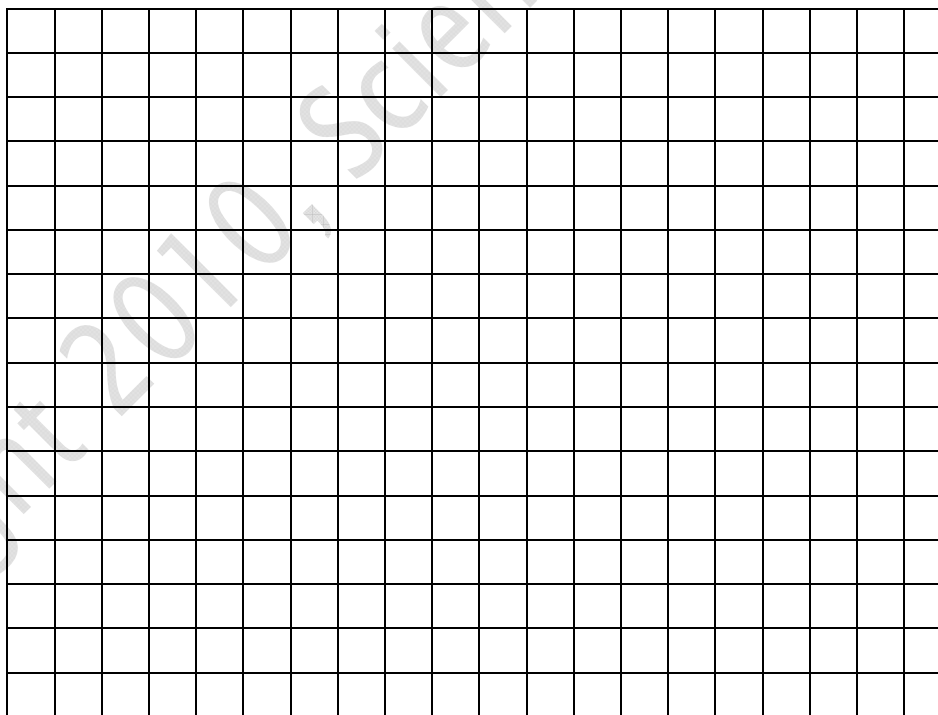
14. When you have completed your experiment, discard the sponges in the trash and pour the liquid down the drain.

## 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.

# MATERIAL SAFETY DATA SHEET

## 1. PRODUCT AND COMPANY IDENTIFICATION

Product Names (as printed on the label): HatchFast

Product identities: Colored table sugar

Distributor: Science Take-Out, P.O. Box 205 Pittsford, NY 14534

Telephone number for information: (585)764-5400

Date of this MSDS: 6/14/10

Medical emergency phone number (Chemtrec): (800) 424-9300

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

Sucrose (99.99%): CAS No: 57-50-1

Food coloring (0.01%)

OSHA PEL: TWA – none estab. STEL – none estab.

ACGIH TLV: TWA – none estab. STEL – none estab.

NIOSH REL: TWA – none estab. STEL – none estab.

NIOSH ILDH: none estab.

## 3. HAZARDS IDENTIFICATION – for all pH buffer products

### EMERGENCY OVERVIEW

Do not ingest. Avoid skin and eye contact. Avoid exposure to vapor or mists.

### Potential Health Effects

EYES: May cause irritation. SKIN: May cause irritation.

INHALATION: may cause minor respiratory irritation INGESTION: Information not available

## 4. FIRST AID MEASURES – for all pH buffer products

EYES - Flush with water for at least 15 minutes, raising and lowering eyelids occasionally. Get medical attention if irritation persists.

SKIN - Thoroughly wash exposed area. Get medical attention if irritation persists.

INGESTION - Do not induce vomiting. If conscious, give plenty of water and call a physician or poison control center. Never give anything by mouth to an unconscious person.

INHALATION: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid if cough or other symptoms appear.

## 5. FIRE FIGHTING MEASURES

NFPA Rating: Health: 1 Fire: 1 Reactivity: 0

Extinguisher Media: Any means suitable for extinguishing surrounding fire

Special Firefighting Procedures: Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: No data available

## 6. SPILL PROCEDURES

Ventilate area of spill. Clean-up personnel should wear proper protective equipment and clothing. Vacuum or sweep up spilled material and containerize for disposal.

## 7. HANDLING AND STORAGE

Store in a cool dry place. This Material is not considered hazardous. Handle using safe laboratory practices.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Engineering Controls:** Use adequate ventilation to keep airborne concentrations low.

## Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Sucrose	10 mg/m <sup>3</sup> TWA	10 mg/m <sup>3</sup> TWA (total dust); 5 mg/m <sup>3</sup> TWA (respirable dust)	15 mg/m <sup>3</sup> TWA (total dust); 5 mg/m <sup>3</sup> TWA (respirable fraction)

OSHA Vacated PELs: Sucrose: 15 mg/m<sup>3</sup> TWA (total dust); 5 mg/m<sup>3</sup> TWA (respirable fraction)

## Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to minimize contact with skin.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149.

Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Solid

Appearance: white

Odor: odorless

pH: Not available.

Vapor Pressure: Not available

Vapor Density: Not available.

Evaporation Rate: Not available.

Viscosity: Not available.

Boiling Point: Not available.

Freezing/Melting Point: 190 - 192 deg C

Decomposition Temperature: 190 - 192 deg C

Solubility: 1970 G/L WATER (15°C)

Specific Gravity/Density: Not available.

Molecular Formula: C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>

Molecular Weight: 342.29

## 10. STABILITY AND REACTIVITY

Stability: Stable

Materials to Avoid: strong oxidizers

Hazardous Polymerization: has not been reported

Conditions to avoid: dust generation, excessive heat

Hazardous Decomposition Products: carbon dioxide, carbon monoxide

## 11. TOXICOLOGICAL INFORMATION

LD50/LC50 (CAS# 57-50-1): Oral, rat: LD50 = 29700 mg/kg;

Carcinogenicity (CAS# 57-50-1): Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found

Teratogenicity: No information found

Reproductive Effects: No information found

Mutagenicity: No information found

Neurotoxicity: No info. found

## 12. ECOLOGICAL INFORMATION

No ecological data available

## 13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods: Dispose in accordance with all applicable Federal, State and Local regulations.

Always contact a permitted waste disposer (TSD) to assure compliance.

## 14. TRANSPORTATION INFORMATION

D.O.T. SHIPPING NAME: Not regulated

## 15. REGULATORY INFORMATION

EPA regulations: RCRA Hazardous waste number (40 CFR 261.33) – not listed

RCRS Hazardous waste classification (40 CFR 261) – not classified

SARA Toxic Chemical (40 CFR 372.65) – not listed

SARA EHS (Extremely Hazardous Substance (40 CFR 355) – not listed

OSHA regulations: Air Contaminant (29 CFR 1910.1000) – not listed

## 16. ADDITIONAL INFORMATION

The information provided in this Material Safety Data Sheet represents data from the manufacturer and/or vendor and is accurate to the best of our knowledge. By providing this information, Science Take-Out LLC makes no guarantee or warranty, expressed or implied, concerning the safe use, storage, handling, precautions, and/or disposal of the products covered or the accuracy of the information contained in this fact sheet. It is the responsibility of the user to comply with local, state, and federal laws and regulations concerning the safe use, storage, handling, precautions, and/or disposal of products covered in this fact sheet.