

Name:

Date:

Class:

Student Worksheet

Pre-Activity

Why do you think it feels colder stepping on the tiles of a bathroom floor than on a mat?



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Activity

Specific Heat Capacity Experiment: Part 1

Materials science involves investigating the unique properties of substances, such as boiling point, freezing point, and elasticity. In this activity, you will act as materials engineers conducting research on heat transfer. Your task is to heat two substances—water and oil—and record their temperatures every 30 seconds for 5 minutes. By analyzing the data, you will determine which substance has the greater specific heat capacity. Best of luck with your experiment!

Materials

• 2 200 mL beakers	• 1 hot plate
• 1 cup of vegetable oil	• 1 thermometer
• 1 cup of water	• 1 pair of oven mitts
• 1 timer or stopwatch	• eye protection for each student

Procedure

1. Add 1 cup of water to beaker #1.
2. Put beaker on hot plate and heat water to a boil.
3. As the water heats, take the appropriate measurements outlined in the worksheet.
4. Add 1 cup of oil to beaker #2.
5. Put beaker on hot plate and heat oil to a boil.
6. As the oil heats, take the appropriate measurements outlined in the worksheet.

Complete the tables below for each substance.

Water

Time (s)	0	30	60	90	120	150	180	210	240	270	300
Temp (°F)											

Vegetable oil

Time (s)	0	30	60	90	120	150	180	210	240	270	300
Temp (°F)											

Engineers use specific heat capacity when determining which materials to use in the construction of buildings, rockets, and even car engines. This activity will allow you to understand why certain materials are more efficient because of specific heat capacity.

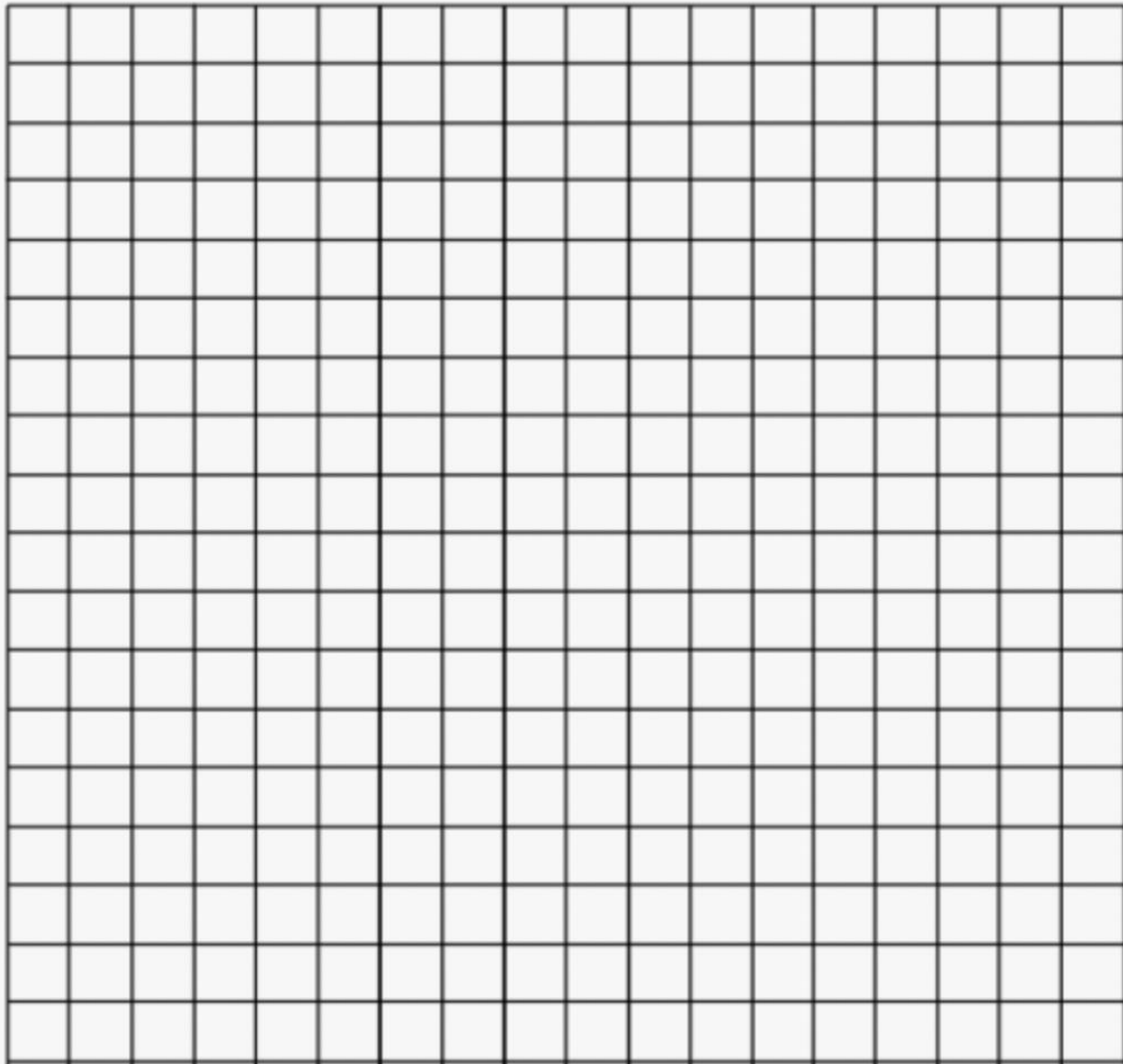
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Specific Heat Capacity Experiment: Part 2

Using the data gathered in the tables prior, graph the lines that represent each of the substances using different colors. To receive full credit, your graph must include a title, have axes clearly labeled, have graphs clearly labeled, and have numbers on your axes.



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Analysis

Using the data from your specific heat capacity experiment conducted with your teammates, answer the following questions.

1. What are some trends you observe looking at your graph?

2. Which substance heated up quicker? Use data from your graph to justify your answer.

Specific heat energy is the quantity of heat required to raise the temperature of one gram of a substance by one degree Celsius. As engineers, it is important to know the difference between high specific heat vs. low specific heat. Substances with high specific heat will take longer to heat up; in other words, they will require more energy to heat them up. By contrast, low specific heat means that a substance will heat up faster.

3. Which of the two substances has a higher specific heat capacity? Explain your answer.

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Reflection Writing Prompt

1. In 7-10 sentences, explain why it feels colder touching a doorknob vs. the wall of your classroom.

2. When would an engineer need to know the specific heat of a material? Give an example.

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Extension

1. For this extension, you will be solving for the heat energy added to both water and oil. Will the numbers be the same or different? Why?

2. Look up the specific heat for water and oil. Write it down below.

Specific heat of water = _____ Specific heat of oil = _____

3. Looking at your data from the table, solve for the change in temperature for both water and oil.

ΔT of water = _____ ΔT oil = _____

4. Solve for Heat (Q) using the formula $Q=mc\Delta T$ for water and oil below.

Water:	Oil:

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5. Were the heat values you solved for the same? _____

6. If yes, explain why. If not, explain why not.

7. Why is it important to repeat an experiment many times in science?

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