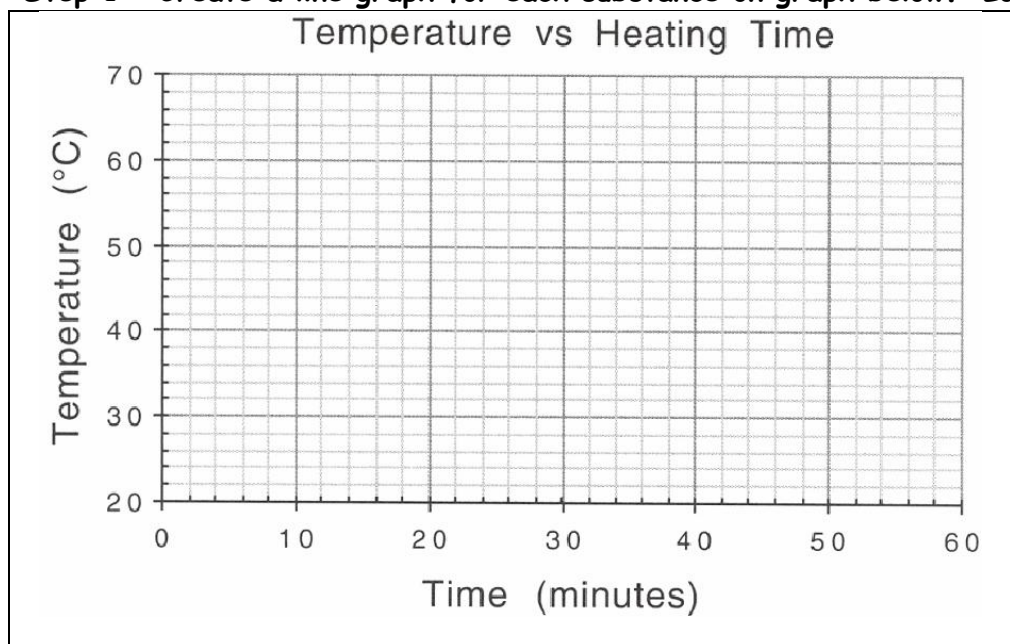


Worksheet- Introduction to Specific Heat Capacities

Heating substances in the sun: The following table shows the temperature after 10.0 g of 4 different substances have been in direct sunlight for up to 60 minutes.

Time (minutes)	Air ($^{\circ}\text{C}$)	Water ($^{\circ}\text{C}$)	Sand ($^{\circ}\text{C}$)	Metal ($^{\circ}\text{C}$)
0 (initial)	25°C	25°C	25°C	25°C
15.0 min	28.9°C	26.2°C	30°C	35°C
30.0 min	32.5°C	27.5°C	35°C	45°C
45.0 min	36.2°C	28.8°C	40°C	55°C
60.0 min	40°C	30°C	45°C	65°C

Step 1: Create a line graph for each substance on graph below. Label the substances.



Step 2: Answer questions

1. Order the substances based on the time required to heat them from :

slowest



fastest

2. Which do you think will cool the fastest? Explain

3. When you boil water in a pot on the stove, which heats faster, the metal or the water? Explain.

4. Why do you think different substances heat up and cool down at different rates?

*****Specific heat capacity = the amount of heat needed to raise the temperature of 1 g of a substance by 1 degree. *****

5. Based on the definition above, which of the 4 substances do you think has:

a) the highest specific heat capacity?

b) the lowest heat capacity?

6. Here are the heat capacities of the four substances: $4.18 \text{ J/g } ^{\circ}\text{C}$, $1.00 \text{ J/g } ^{\circ}\text{C}$, $0.80 \text{ J/g } ^{\circ}\text{C}$, & $0.60 \text{ J/g } ^{\circ}\text{C}$. **Match & then label each substance with its specific heat capacity on the graph.**

7. If something has a **high specific heat capacity** will it take a lot of heat or a little heat to change its temperature? Explain. (careful! Use the definition, your graph, and the data from #6)

8. Assuming they both start at the same temperature, which will heat up faster, a swimming pool or a bath tub? Explain your thinking.

Worksheet- Calculations involving Specific Heat

- For $q = m \cdot c \cdot \Delta T$: identify each variables by name & the units associated with it.
- Heat is not the same as temperature, yet they are related. Explain how they differ from each other.

a. Perform calculations using: ($q = m \cdot c \cdot \Delta T$)

1. Gold has a specific heat of $0.129 \text{ J}/(\text{g} \times ^\circ\text{C})$. How many joules of heat energy are required to raise the temperature of 15 grams of gold from $22 \text{ }^\circ\text{C}$ to $85 \text{ }^\circ\text{C}$?

Endothermic or exothermic?

3. If the temperature of 34.4 g of ethanol increases from $25 \text{ }^\circ\text{C}$ to $78.8 \text{ }^\circ\text{C}$, how much heat has been absorbed by the ethanol? The specific heat of ethanol is $2.44 \text{ J}/(\text{g} \times ^\circ\text{C})$

Endothermic or exothermic?

5. Copper has a specific heat of $0.385 \text{ J}/(\text{g} \times ^\circ\text{C})$. A piece of copper absorbs 5000 J of energy and undergoes a temperature change from $100 \text{ }^\circ\text{C}$ to $200 \text{ }^\circ\text{C}$. What is the mass of the piece of copper?

Endothermic or exothermic?

7. A 40 g sample of water absorbs 500 Joules of energy. How much did the water temperature change? The specific heat of water (liquid) is $4.18 \text{ J}/(\text{g} \times ^\circ\text{C})$.

Endothermic or exothermic?

b. Determine if it's endothermic or exothermic

2. An unknown substance with a mass of 100 grams absorbs 1000 J while undergoing a temperature increase of $15 \text{ }^\circ\text{C}$. What is the specific heat of the substance?

Endothermic or exothermic?

4. Graphite has a specific heat of $0.709 \text{ J}/(\text{g} \times ^\circ\text{C})$. If a 25 gram piece of graphite is cooled from $35 \text{ }^\circ\text{C}$ to $18 \text{ }^\circ\text{C}$, how much energy was lost by the graphite?

Endothermic or exothermic?

6. 45 grams of an unknown substance undergoes a temperature increase of $38 \text{ }^\circ\text{C}$ after absorbing 4172.4 Joules. What is the specific heat of the substance? **Look at the table on page 513 of your book, and identify the substance.**

Endothermic or exothermic?

8. If 335 g of water at $65.5 \text{ }^\circ\text{C}$ loses 9750 J of heat, what is the final temperature of the water? Liquid water has a specific heat of $4.18 \text{ J}/(\text{g} \times ^\circ\text{C})$.

Endothermic or exothermic?