Introduction to Specific Heat Virtual Lab

Objective: Analyze 6 different substances and determine how Cp affects an object’s ability to absorb/release energy.

Specific heat (also called specific heat capacity) is the amount of thermal (heat) energy required to raise the temperature of 1.0 g of a substance by 1.0°C. In other words, it is how much heat (thermal energy) is needed to increase the temperature of an object.

The specific heat values for substances are determined by experimentally determining the amount of heat transferred by a substance of known mass as its temperature rises or falls. Specific heat is important because it lets us determine how much heat is transferred during a chemical change.

Using a virtual lab, we are going to determine which substances have higher and lower specific heat and how that affects their temperature. Six different substances (wood, copper, glass, silver, sodium, and water) are represented; each absorbs energy when heated with a bunsen burner flame.

Hypothesis: Predict which substance (wood, copper, glass, silver, sodium, or water) has the highest specific heat and the lowest specific heat.

HIGHEST = ___________________________  LOWEST = ___________________________

Explain your reasoning:

When an object is heated or cooled, its temperature change (ΔT) depends on three things:

- The mass of the material (m), usually measured in grams
- The amount of heat transferred to or from the object (ΔH), usually measured in Joules
- The specific heat (specific heat capacity - Cp) of the material (ie. what it is made of)

As we have done previously, calculating Enthalpy (ΔH) uses the equation below:

\[ ΔH = m \Delta T \times Cp \]

As with any algebraic equation, the equation can be reconfigured to solve for Cp. Rewrite the equation below after solving for Cp

\[ Cp = \]

You will be using this formula to solve for Cp of the substances in our virtual lab!
Instructions:
1. Go to the following website:
http://employees.oneonta.edu/viningwj/sims/specific_heat_s.html
2. Select your first material (Wood)
3. Select 10.00 g for Block Mass
4. Select the quantity of heat to be transferred by adjusting the flame time from 1 to 5 seconds using the “Flame Duration” scroll bar.
   For every second, 50 joules of energy are transferred.
   \((50 \text{ joules} \times \# \text{ of seconds} = \text{total heat transferred})\)
5. Click on the Heat button to light the Bunsen burner and begin the experiment.
6. Observe the initial and final temperatures for each substance and record the results.
7. Click on the Reset button to begin a new experiment by changing the Material to the next substance.

Record all data and summarize the results of your experiment in the data table below:

<table>
<thead>
<tr>
<th>Substance</th>
<th>Weight of substance (g)</th>
<th>Quantity of Heat transferred (J)</th>
<th>Initial Temperature (degrees C)</th>
<th>Final Temperature (degrees C)</th>
<th>Change in Temperature (degrees C)</th>
<th>Specific Heat (J/g*C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood</td>
<td>10</td>
<td>250</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Copper</td>
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<tr>
<td>Glass</td>
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<tr>
<td>Silver</td>
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<tr>
<td>Sodium</td>
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<tr>
<td>Water</td>
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</tr>
</tbody>
</table>

Calculating Specific Heat: Show your calculations for the 5 samples below.

Copper: 
Wood: 

Glass: 
Water: 

Silver: 
Sodium: 

Analysis:

1. List the substances in order of highest specific heat to lowest specific heat.

2. Explain if your results support your original predictions for highest or lowest specific heat?