## Exp 04: States of Matter

## Part A: Heating Curve of Water

Your first goal in todays experiment is to collect data to calculate a heating curve for water.

Use it to determine the heat used to boil your sample of water.

## Part C: Heat of Fusion of Water

Your second goal in todays experiment is determine the heat of fusion for water.
The heat gained per gram of melting ice.


## Exp 04: States of Matter

## Part A: Heating Curve of Water

Your first goal in todays experiment is to collect data to calculate a heating curve for water.

Use it to determine the heat used to boil your sample of water.

- Measure about 100 mL of water in a graduated cylinder, record it's volume.
- Place the water in a 250 mL beaker.
- Attach a thermometer via a ring stand and clamp, so that the thermometer is not touching the bottom of the water.
- Record the temperature at 1 min increments.
- Begin heating the water until it boils.
- Continue to collect data for 1-4 minutes after heating.
- Your calculations for this part will be developing a heating curve from this data. (there are no calculations)
- Include the heating curve as your conclusion for this experiment.



## Exp 04: States of Matter

## Part A: Heating Curve of Water

Your first goal in todays experiment is to collect data to calculate a heating curve for water.

Use it to determine the heat used to boil your sample of water.

## Calculations

- Prepare a graph of your data, plotting temperature against time.
- Label the parts of the graph that represent the liquid state of the water and the boiling process (which involves two states of matter).
- Find the plateau on the graph that indicates the boiling point of water, determine what the boiling point of water is for your experiment.
- Calculate the temperature change for the cool water to reach the boiling point.
- Using the volume you measured and the density of water as a conversion factor, determine the mass of water in this experiment.
- Using the specific heat of water ( $1.00 \mathrm{cal} / \mathrm{g}^{\circ} \mathrm{C}$ ) and the specific heat equation to determine the heat needed to boil the water in your experiment.

$\mathrm{q}=\mathrm{m} \cdot \mathrm{Cs} \cdot \Delta \mathrm{T}$



## Exp 04: States of Matter

Part C: Heat of Fusion of Water
Your second goal in todays experiment is determine the heat of fusion for water.

The heat gained per gram of melting ice.

1. Record the weight of an empty styrofoam cup.
2. Add 100 mL of water, record weight.
3. Record the initial temperature.
4. Add 2-3 ice cubes, stir vigorously.
a. Record the temperature of the water.
5. Repeat step 4 until the temperature drops to between 2 and $3{ }^{\circ} \mathrm{C}$ (not lower).
6. If any ice cubes are not melted, remove them.
7. Reweigh the cup with water.


## Exp 04: States of Matter

Part C: Heat of Fusion of Water
Your second goal in todays experiment is determine the heat of fusion for water.

The heat gained per gram of melting ice.
Calculations

1. The weight of the styrofoam cup with water and melted ice, less the weight of the cup with the initial water is the mass of ice melted.
2. The weight of the styrofoam cup with initial water, less the weight of the cup alone is the mass of water heated.
3. The change in water temperature is the final temperature of water, minus the initial temperature.
4. The heat lost from the water is calculated by the heat capacity equation.
5. The heat gained by the ice is related to the mass melted by the heat of fusion.
6. Find the heat of fusion of water.
7. Report the heat of fusion of water in your conclusions.


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-\underline{q}_{\mathrm{WATER}}=\underline{q}_{\mathrm{ICE}}
$$

$\mathrm{q}=\mathrm{m} \cdot \mathrm{Cs} \cdot \Delta \mathrm{T}$
$\mathrm{Cs}_{\text {water }}$ is $1.00 \mathrm{cal} / \mathrm{g}^{\circ} \mathrm{C}$
$\mathrm{m}_{\text {water }}$
$\mathrm{m}_{\text {ice }}$
$\Delta \mathrm{T}=\mathrm{T}_{\mathrm{F}}-\mathrm{T}_{\mathrm{I}}$

## Questions?



