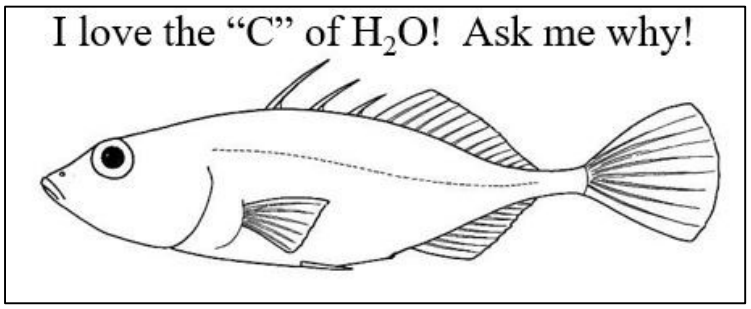
The "C" of "Cu" Lab

your name



Objective: to measure the specific heat of copper (the C of Cu) and then compare your measurement to the actual value, which is 0.391 J/g·K.

Background: According to the Law of Conservation of Energy: Energy cannot be created or destroyed in a chemical reaction, or in a physical change, but it can be transferred. We will use this fact about the transfer of energy to experimentally measure the C of Cu.

Procedure: Obtain a hunk of copper metal, which you mass dry before you heat it up in a beaker of tap water until it is boiling. Once the water boils, it will stay in the boiling water for 7 minutes longer. You will measure the temperature of this boiling water - and copper will be the same temperature.
(the water will transfer the heat, or kinetic energy into copper).

You need to set up a device to measure the heat gain by water. In a large Styrofoam cup, measure the exact mass of *about* 50 mL of deionized water. Get the smaller sized "top" cup and thermometer in place and measure the starting temperature to the tenth of a degree. Then bring Styrofoam cups near to the boiling water containing the hot copper. Using tongs, carefully put the copper into the Styrofoam cup, close top and gently swirl. Measure the HOTTEST temperature the water in the Styrofoam cup reaches

Turn off the Bunsen burner, put the boiling water on the tabletop, then pour the water down the drain. This beaker needs to be washed with soap and water, when COOL. Put all equipment back to the side of the room. Put scales away too. Wipe up and clean up station, put your stuff away.

Part I of the Data Table (temperature data on next page)	
Mass of cup	grams
Mass cup & water	grams
Mass deionized the water only	grams
Mass of the copper	grams

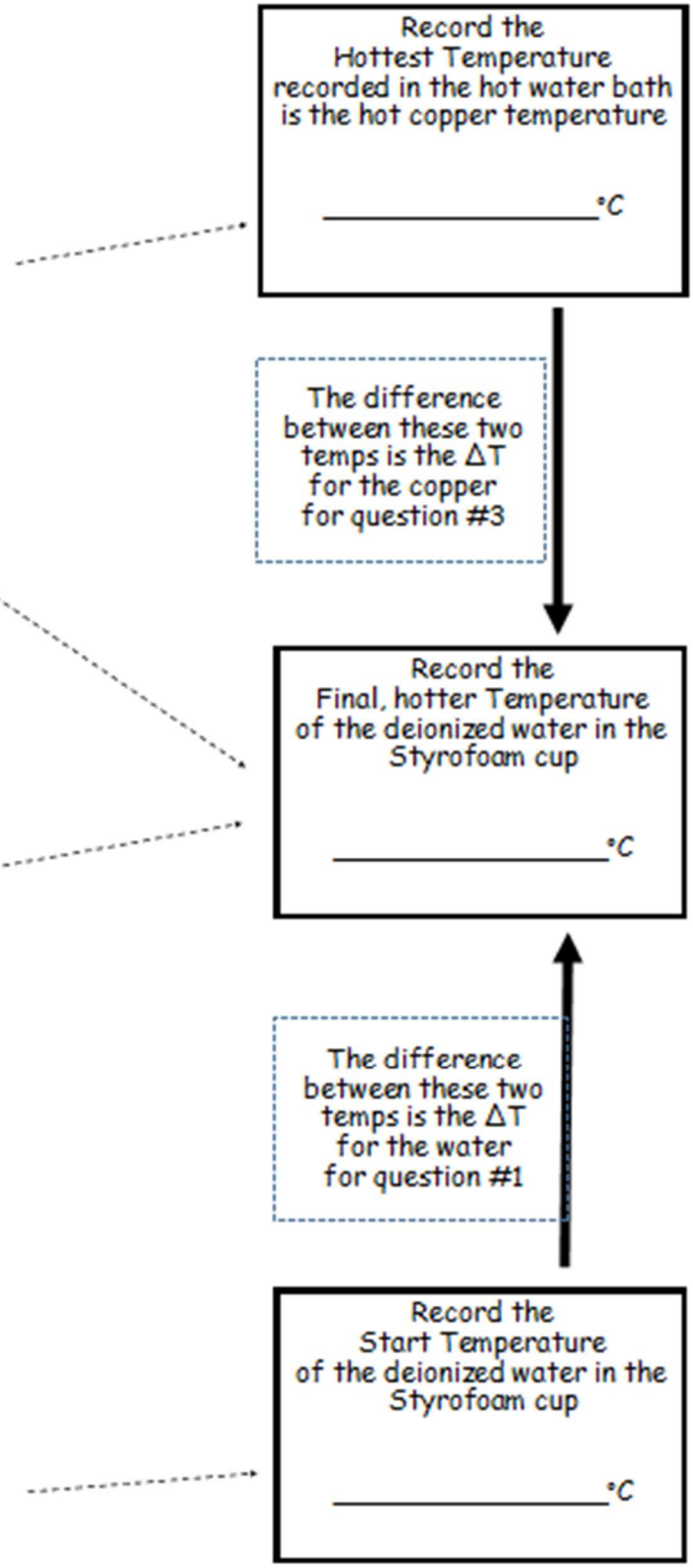
There are ONLY 3 Temperatures, but
we use the temperature in the middle twice.

Hottest Temperature of the Day is the
Boiling water bat.
This is our HOT COPPER TEMPERATURE
which is *about* 104°C
(measure to the nearest 10th of a degree!)

The Copper is put into the Styrofoam cup
and although the water heats up which we will
get to below, it actually "cools down"
the copper simultaneously.
To get this "cold copper" temperature, we use
the SAME TEMP as the "hot water"
temperature.

The water in the Styrofoam cup heats up
when the energy is transferred to
the water from the superheated copper.
Energy moves from copper into the water.

The coldest Temperature in our lab is the
starting temperature of the water in the
Styrofoam cup.
It's about room temp since it's been sitting in
the room for days.
It will get heated up by *about* 5°C
by the hot copper.



The “LUCKY 7” - "C" of "Cu" Calculations -
(that’s 6 “ ” ’s in one short sentence, “wow!” - now it’s 8!)

1 Determine the heat gain in joules by the water in your sample [3 points]

2 Explain where this heat gain by the water comes from [3 points]

3 Calculate the specific heat of copper, show all work. [3 points]

4 Determine your percent error actual “C” vs. calculated “C”. (show all work). [3 points]

5 On another day, in a different room, unrelated to the work above, if you happen to have 125,200 Joules of energy, how many grams of ice can you phase change into water at the melting point. [1 point]

6 If you didn't melt that ice above, but instead used your 125,200 J to heat water from 315.5 to 328.5 Kelvin, how many grams of water could you warm up with that exact amount of energy? [1 point]

7 Finally, if you took that same amount of energy, 125,200 Joules, how much water could you vaporize into steam at 373 Kelvin? [1 point]

This lab report requires...	this material	points
cover page	title and intro sentence	1 + 1 = 2
2	The Lucky 7 calculations above	3 + 3 + 3 + 3 + 2 + 2 + 2 = 18
conclusion	Detail the point of this lab and tell how you set it up. State and Explain the Law of Conservation of Energy. Write the three thermochemistry formulas and tell what each letter or symbol means. Draw a simple heating curve for water with points ABCDEF and for each of the 5 line segments tell what formula and what constants you would use to move from point to point.	5
report due on: _____ 40 minutes lab time		25 total