The "C" of "Cu" name: ______________________________

Objective: to measure the specific heat of copper and then compare it to the actual value, which is 0.39 J/g·K.

Background: Heat is never lost, but it can be transferred. In this lab heat will be transferred from hot copper to cool water. The Joules of energy gained by the water will be equal to the joules of energy heat lost by the copper. According to the Law of Conservation of Energy, no energy will be lost.

By calculating the heat gained by the water will allow us to determine how many Joules were lost by the copper. Using the basic heat formula we can then determine the specific heat constant of copper. Finally we will compare that measured "C" to the known specific heat capacity constant for copper.

Procedure: Measure out a half test tube of copper pellets (about 45-55 g), which you will heat up in a boiling tap water bath. After 6-7 minutes in the boiling water, the temperature of the water and copper will be the same (the water will transfer the kinetic energy into copper). Keep Track of Temperatures on the next page.

You need to set up a device to measure heat gain by water. In a large Styrofoam cup, measure the exact mass of *about* 50 mL of deionized water. Get the top cup and thermometer in place and measure the starting temperature to the tenth of a degree. Then bring cups to the hot copper. Carefully shoot the copper into the cup, close top and gently swirl. Measure the HOTTEST water temperature.

When done with experiment: spill out water into sink, save copper in beaker provided by the teacher. 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 one in the middle twice.

Hottest Temperature of the Day is the Boiling water bath, Which is our HOT COPPER TEMPERATURE which is likely *about* 103°C
(but to the nearest 10th of a degree!)

Record the
Hottest Temperature
recorded in the hot water bath
is the hot copper temperature

________________°C

This is the ΔT
for the copper
for question #3

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.

Record the
Final, hotter Temperature
of the deionized water in the
Styrofoam cup

________________°C

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.

This is the ΔT
for the water
for question #1

The coldest Temperature in our lab is the start temp for the Water in the Styrofoam cup, which is about room temp since it's deionized and been sitting in the room for days. It will be heated up *about* 5°C by the hot copper.

Record the
Start Temperature
of the deionized water in the
Styrofoam cup

________________°C

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]

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

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

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

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 (no ΔT)? [1]

6 If you didn't melt that ice 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]

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

This lab report requires...	this material	worth these points
cover page	title and intro sentence	1 + 1 = 2
2	Lucky 7 calculations	3 + 3 + 3 + 3 + 2 + 2 + 2 = 18
conclusion	Detail the point of this lab, mention how you set it up, explain the Law of Conservation of Energy, why there are only 3 temperatures even though there is a ΔT for copper and another ΔT for the water. Write the three thermochem formulas and tell what each letter or symbol means. Finally, draw a simple heating curve for water with points ABCDEF and tell for each segment what formula you would use to move from point to point.	5
report due on: ___________________ 40 minutes lab time		25 total