

Name: _____

Experiment 1: Investigating the Specific heat of Water

Aim:

Materials:

- Calorimeter
- Thermometer
- Stopwatch
- 2 Multimeters
- Styrofoam Cup
- Balance Scale
- Lid
- Power Pack

Method:

1. Write your method in this space:

2. Draw a circuit diagram of the setup in the space below:

Name: _____

3. Place your results in the following table. To complete the last row of the table perform the following calculation using the values within each column.

$$E = V.I.t$$

where $E =$ Energy in Joules

$V =$ Voltage in Volts

$I =$ Current in Amps

$t =$ Time in Seconds

Time (s)	30	60	90	120	150	180
Temperature Rise($^{\circ}$ C)						
Voltage (V)						
Current (A)						
Energy (J)						

Mass of water = _____

Starting Temperature = _____

Discussion:

Plot a graph of ΔT (Change in temperature) on the x-axis against E (Energy transferred) y-axis

Name: _____

1. What type of relationship exists between Energy and Temperature?

Why do you think we use a polystyrene cup?

2. What we are investigating is the specific heat of water. This measures how much energy is required to change the temperature of water. This follows the relationship:

$$Q = m.c.\Delta T$$

Where Q = Energy in Joules

m = Mass of the substance in kg

c = Specific heat of the substance in $J.kg^{-1}K^{-1}$

ΔT = Change in temperature in K

Based on this relationship we can calculate the specific heat of water by using the gradient from our plot in question.

- a. Calculate the gradient from your plot

- b. From our equation above the gradient represents the value m.c so we need to divide our value for the gradient by the mass of the water to get our specific heat. Work that out below:

Name: _____

Questions:

Use the table below to answer the following problems:

Substance	water	aluminium	iron	copper	lead	Concrete	Cotton
Specific heat capacity (J/kg°C)	4200	900	390	490	130	3400	1400

1. How much energy is needed to heat up 1kg of water by 15°C?

2. How much energy would be needed to raise the temperature of a 5kg block of concrete by 10°C?

3. Can you calculate the energy needed to increase the temperature of 100kg of iron by 40°C?

Extension questions

1. A 20kg concrete block is at 20°C and is heated to 65°C. What is the energy used to heat this block?

2. A 250g copper pipe is heated from 10°C to 31°C. What is the energy needed to heat the pipe?

3. Can you rearrange the equation to calculate the temperature difference?

4. What will be the temperature change if you used 1125J of energy to heat a block of iron weighing 0.5kg?
