**LAB 3 - Specific Heat Capacity Name: ………………………………**

**Objective**

The objective of this experiment is to measure the specific heat capacities of different metals.

**Theory**

Equal masses of different substances require different amounts of thermal energy to raise the temperature by the same amount. This is quantified by the term specific heat capacity, *c*. It is defined as the amount of energy required to heat 1.0 kg of mass by 1 °C. As it is way to difficult to measure a 1.0 °C temperature rise we use maths instead.

The power rating of the heater is determined by multiplying the current by the voltage. Multiply this by the time (usually 5 mins = 300 sec) then we have the energy supplied to the heater.

$$Q=IVt$$

The specific heat capacity is then determined by:

$$c= \frac{Q}{m∆T}$$

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| **Method*** Pre-heat the immersion heater. It gets very hot, so use tongs to move it around.
* Ensure that the substance being heated is very well insulated. The more the better. Including above and below.
* Set up the apparatus as shown. If using water, measure out exactly 1000 ml and keep the heater from touching the sides – use a clamp stand.
* Record the initial temperature.
* Start the timer.
* Record the mean values of the current and voltage (they may fluctuate a bit)
* At 5 mins, turn off the heater and record the temperature. If using water, stir the water first.
* Take a photo of one of the experiments and add labels or a caption (2 marks)
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**WARNING: When using water – use a clamp stand to support the wires so that the heater does not rest on or against the glass.**

**Data** (10 marks)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Text book value!** | **4182** | **900** | **450** | **830** | **382** |
| **Specific heat capacity (J/kg°C)** |  |  |  |  |  |
| **Temp increase****(°C)** |  |  |  |  |  |
| **Temp after** **(°C)** |  |  |  |  |  |
| **Temp before****(°C)** |  |  |  |  |  |
| **Energy** **(J)** |  |  |  |  |  |
| **Current** **(A)** |  |  |  |  |  |
| **Voltage** **(V)** |  |  |  |  |  |
| **Substance** | **Water** | **Aluminium** | **Steel** | **Sand** | **Copper** |

**Conclusion and Evaluation:**

1. Which substance was the easiest to heat up? (1)

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1. Which substance was the hardest to heat up? (1)

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1. Why is it important to insulate the substance? (1)

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1. Did the pattern of your results match the textbook values? If not, were they too low or too high? Explain possible reasons for this. (3)

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1. What do you think that the implications are for in Bermuda due to the large difference in specific heat capacities for sand and water? (2)

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Total 20 Marks