**COMET BAY COLLEGE**

**Physics - Unit 1 - Task 5**

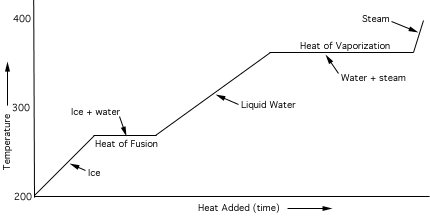
**Independent Investigation Validation**

**Name: SOLUTIONS Total Marks /29**

**Measuring Specific Heat Capacity of Metal**

**Aim:** To calculate a value for the specific heat capacity (c) of a select metal by utilising the Law of Conservation of Energy and comparing this with the theoretical values of the select metal.

**Question 1:** Explain the following by referring to the graph below;

[](http://www.google.com.au/url?sa=i&rct=j&q=&esrc=s&frm=1&source=imgres&cd=&ved=0ahUKEwjj0uTs0KHPAhXGJJQKHYXnAhoQjRwIBw&url=http://pudap.com/heating-curve-of-water/&psig=AFQjCNEr2DIybJ8B8nM7_ztuXhBa7RKd_g&ust=1474587554602946)

1. Why is the liquid water slope on the graph not as steep as the ice slope or the steam slope? (2 marks)
2. Why is the heat of fusion line on the graph shorter than the heat of vaporisation?

(2 marks)

**Question 2:** Discuss one valid point on the theory you researched about “the Law of Conservation of Energy”. For example, the accuracy of using this method, or the principles behind the theory that makes this experiment an acceptable method of calculating specific heat capacity, or any other valid point you discussed in the take home component that relates to the theory behind this method and the requirements to running this experiment. Use of key scientific words are important. (4 marks)

1 mark – valid theory 
2 marks – well explained explanation
1 mark – key scientific words


**Question 3:** With the method that you ran, was there any procedure that you would change to improve the experiment. This can be based on the research you conducted or the experiment itself. List 2 and explain why. (6 marks)

1 mark each – valid change 
2 marks each – well explained explanation
1 mark each – partially explained
• Do not run at horizontal
• g is based on l and T, not m.
• one oscillation is back and forth


Two friends from Warnbro High, Joe and Raishel, were asked to measure the mass of a specific metal using the relationship they had learnt about conservation of energy and temperature. They have approached you to help them, since you have already completed a similar experiment. The next few pages are part of **their** assignment.

**Background:** The principle behind the specific heat capacity of a particular material is that it remains constant regardless of any other factors changing in the experiment.

**Aim:** To find the mass of a sample of Lead using the Law of Conservation of Energy.

**Material:**

* Unknown mass of Lead
* Styrofoam cup with a tight-fitting insulating lid
* two thermometers (one 0- 100°C and one 0-50 °C)
* test tube (large)
* beaker (250 mL)
* Bunsen, tripod and gauze mat
* test tube holder
* cool water (about 50 mL)

**Method:**

1. Set up equipment as shown in Figure 1.



**Figure 1: Equipment used to measure the temperature change of the Lead.**

1. Measure the temperature of the water in the Styrofoam cup and record the result.
2. Heat the Lead sample (pellets) to 50oC on the Bunsen Burner. When the pellets are held at this temperature for 15 minutes, transfer them quickly to the Styrofoam cup.
3. Put the lid on the Styrofoam cup and stir regularly. Record the maximum temperature the thermometer records.
4. Repeat the process at varying other temperatures.

**Results:**

The teacher at Warnbro knew the students could not get the pellets heated to temperatures that would see the Lead in liquid form. Also, Lead in gaseous form is highly toxic. So he gave them a graph with the relevant results for this region.

**Question 4:**

Use the graph above answer the following;

1. Given that cliquid = 1400 J kg-1 K-1, what is the mass of the lead used in this experiment? Show parameters. (3 marks)
2. What is the Power of the heat source used to heat the Lead if it took 0.1132 hours to move from 327.5oC to 1749oC? (4 marks)
3. Calculate the latent heat of fusion of the Lead. (2 marks)

**Question 5:**

The teacher from Warnbro is being harassed by his students. They all want to know if the masses they are calculating are close. He tells them that the generally accepted value for the Lead pellets is m = 3 × 10-1 kg. Calculate the percentage error between the value you obtained and the accepted value. (2 marks)

**Percentage Error**

**%error = Practical result – Theoretical results × 100**

**Theoretical result**

**%error = 6.04 x 1024 – 5.97 × 1024 × 100 (1 mark)**

**5.97 × 1024**

**%error = 1.17 % (1 mark)**

**Question 6:**

Write a discussion, excluding any reference to a hypothesis or variables, because you did not write one. (6 marks)

* **Summary of results (1 mark)**
* **(including numerical values) (1 mark)**
* **(including percentage error) (1 mark)**
* **Discusses 3 variables that created errors. (1 mark each)**
* **Method of improving/removing errors is clear and does not include vague environmental factors or personal factors**

**(-1 for every method not mentioned or that is not vague)**

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