Name _____

Experiment 2.2 Calorimetry

Purpose To measure the specific heat capacity of a metal object

Method

1. Heat ¾ beaker of water on a burner
2. Weigh the metal object to the nearest gram (m_{metal})
3. Place the metal object in the water on the burner
4. Place one styrofoam cup within another to make a calorimeter
5. Weigh the empty calorimeter ($m_{calorimeter}$)
6. ¾ fill the calorimeter with tap water
7. Weigh the calorimeter with the water ($m_{calorimeter + water}$)
8. Measure the temperature of the water in the calorimeter ($T_{initial}$)
9. When the water in the beaker boils, use tongs to remove the object and carefully place in the calorimeter
10. Note the maximum temperature of the calorimeter water as it heats up from the object (T_{final})

Results

m_{metal} = _____ g

$m_{calorimeter}$ = _____ g

$m_{calorimeter + water}$ = _____ g

$T_{initial}$ = _____ °C

T_{final} = _____ °C

Calculation

1. Find ΔT_{water} using $\Delta T = T_{final} - T_{initial}$

ΔT = _____ - _____

ΔT = _____ °C

2. Find ΔT_{metal} using $\Delta T = T_{final} - T_{initial}$. Remember the object started in boiling water at 100 °C, and cooled to the same T_{final} for water

ΔT = _____ - _____

ΔT = _____ °C

3. Mass of the water in the calorimeter
   $m_{water} = m_{calorimeter+water} - m_{calorimeter}$

   m_{water} = _____ g - _____ g

   m_{water} = _____ g

4. Energy absorbed by the water from the cooling metal object:
   $q = mc\Delta T$

   $q_{water} = m_{water} \times c_{water} \times \Delta T_{water}$ and (c_{water} = 4.184 J/g°C)

   q_{water} = _____ g x _____ J/g°C x _____ °C

   q_{water} = _____ J

5. Energy lost by the metal is absorbed by the water and calorimeter:
   $-q_{metal} = q_{water} + q_{calorimeter}$
   And $q_{calorimeter}$ is negligeable (i.e. 0)
   So: $-q_{metal} = q_{water}$
   Or: $q_{metal} = -q_{water}$

   So: q_{metal} = - _____ J
6. $q = mc\Delta T$
   and we need to find out what c_{metal} is so we need to rearrange the formula so it reads c_{metal} = …

   a. Divide both sides of $q = mc\Delta T$ by $m\Delta T$
   b. Cancel the $(m\Delta T) / (m\Delta T)$ on the right hand side to leave c

   $$c = \frac{q_{metal}}{m_{metal}\Delta T_{metal}}$$

   Now use the values you calculated and measured in this rearranged formula:

   c = _____ J/g°C

   x

   Caluclate the answer:

   c = _____ J/g°C

Finally, round to the same number of figures as the measurement with the least number of significant figures

c = _____ J/g°C

Conclusion

The Specific heat capacity of the metal object was _____ J/g°C