**Specific Heats Worksheet**

**Introduction:**

The heat, Q, required to change the temperature of a material from an initial temperature, Ti, to a final temperature, Tf, is given by the formula:

Q = m \* c \* (Tf - Ti) (1).

In Formula 1, “m” is the mass of the object and “c” is the specific heat of the material. If Q is greater than zero, energy must be put into the material to raise its temperature. For Q less than zero, heat is lost by the material to its surroundings.

When two objects of different temperatures (one “hot” and one “cold”) are placed in contact with one another, heat is transferred so that the temperature of the two objects reaches equilibrium. Assuming no heat is lost to the surroundings, the following relation must be true:

∑ Q = Qh + Qc = 0 (2).

Or equivalently:

Qc = -Qh (3).

If the temperatures, masses, and one specific heat of a sample are known, then the specific heat of the second material may be determined. This is often a useful property when identifying unknown materials.

**Data:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sample** | **Mass of Sample** | **Mass of Water** | **Initial Temp. of Sample** | **Initial Temp. of Water**  (Twi) | **Final Temp.**  (Tf) |
| Sample A |  |  |  |  |  |
| Sample B |  |  |  |  |  |
| Sample C |  |  |  |  |  |

Table 1

**Calculations and Questions:**

1. Calculate the specific heat of each of your samples using Formulas 1-3 and record the values in Table 2:

|  |  |  |
| --- | --- | --- |
| **Sample** | **Specific Heat** | **Material** |
| Sample A |  |  |
| Sample B |  |  |
| Sample C |  |  |

Table 2

1. Using the information provided by your instructor, try to determine what material makes up each sample. Record your predictions in Table 2.
2. Ask your instructor if you have correctly identified your samples. Were your predictions correct?
3. How did the specific heats you calculated differ from the standard values for your material?
4. List reasons your specific heats may be different from the standard values, including limitations in the experimental setup.
5. How would you improve the experiment to achieve better results?
6. To be safely eaten, pork must be cooked to 160° F (71° C). Assuming each rock in the Imu is .5 kg with a specific heat of 1.0 kJ/Kg\*°C, and that the pig weighs 35 kg with a specific heat of 2.75 kJ/Kg\*°C, calculate the number of rocks required for the pig to reach a safe eating temperature. (Assume the starting temperature of the pig is 20° C and the rocks are all heated to 250° C).

Answer:

mass of rocks = 27.4 kg; minimum number of rocks = 55