Homework Check: Specific Heat Capacity Name _____

Show work for all problems!

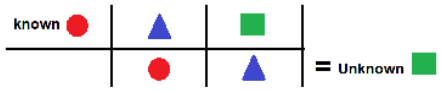
$Q = m \cdot s \cdot (T_f - T_i)$ means Heat Energy = mass · specific heat · temp change

1. Determine the specific heat of a substance that absorbs 2700 joules of heat when a sample of 100.0 g of the substance increases in temperature from 10.0 °C to 70.0°C? Then determine its identity from the table.

Substance	Specific Heat Capacity (in J/gC)
Aluminum	0.902
Copper	0.398
Water	4.184
Iron	0.45
Ammonia	4.7

$$s = \frac{Q}{m\,(Tf - Ti)} = \frac{2700\ J}{(100.0g)(70 - 10℃)} = 0.450\ \text{J/g°C} \rightarrow \text{Iron}$$

2. Convert the units of energy below using the following conversion: **4.184 Joules = 1 calorie**. Show your work!!!



$$19.0\ \text{Joules} \left| \frac{1\ \text{cal}}{4.184\ \text{Joules}} \right| = 4.54\ \text{cal}$$

Calculator = 4.541108987 cal

$$350\ \text{cal} \left| \frac{4.184\ \text{Joules}}{1\ \text{cal}} \right| = 1500\ \text{J}$$

Calculator = 1464.4 J

3. If 200.0 grams of water is to be heated from 24.0 °C to 100.0°C to make a cup of tea, how much heat must be added? The specific heat of water is 4.18 J/g °C

$$Q = m \cdot s \cdot (Tf - Ti) = (200\ g)(4.18\ \text{J/g °C})(100.0 - 24.0\ °C) = 63596.8\ \text{J} \rightarrow 63600\ \text{J or } 63.6\ \text{kJ}$$

4. The specific heat capacity of silver is 0.056 **cal**/g °C. How much will the temperature change if 55.00 g of the metal absorbs 47.3 **calories** of heat?

$$\Delta T = \frac{Q}{s \cdot m} = \frac{47.3\ cal}{\left(0.056 \frac{cal}{g℃}\right)(55.00\ g)} = 15\ ℃$$

5. Granite has a specific heat of 800.0 J/g·°C. What mass of granite is needed to store 150,000 J of heat if the temperature of the granite is to be increased by 15.5°C?

$$mass = \frac{Q}{s \cdot \Delta T} = \frac{150{,}000\ J}{\left(800 \frac{J}{g℃}\right)(15.5\ ℃)} = 12\ g$$

Homework Check: Specific Heat Capacity Name _____

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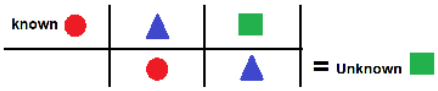
$Q = m \cdot s \cdot (T_f - T_i)$ means Heat Energy = mass · specific heat · temp change

1. Determine the specific heat of a substance that absorbs 4127 joules of heat when a sample of 75 g of the substance increases in temperature from 22 °C to 83°C? Then determine its identity from the table.

Substance	Specific Heat Capacity (in J/gC)
Aluminum	0.902
Copper	0.398
Water	4.184
Iron	0.45
Ammonia	4.7

$$s = \frac{Q}{m\,(Tf - Ti)} = \frac{4127\,J}{(75\,g)(83 - 22\,°C)} = 0.902\ \text{J/g°C} \rightarrow \textbf{Aluminum}$$

2. Convert the units of energy below using the following conversion: **4.184 Joules = 1 calorie**. Show your work!!!



$$\frac{750\ \text{cal}}{} \left| \frac{4.184\ \text{Joules}}{1\ \text{cal}} \right| = 3100\ \text{J}$$

Calculator = 3138 J

$$\frac{98.0\ \text{J}}{} \left| \frac{1\ \text{cal}}{4.184\ \text{Joules}} \right| = 23.4\ \text{cal}$$

Calculator = 23.42256214 J

3. A sample of 100.0 mL of water at 37°C is cooled until its temperature is 4.0 °C. If the specific heat of water is 4.18 J/g °C, calculate the amount of heat energy released to cause this drop in temperature.

$$Q = m \cdot s \cdot (Tf - Ti) = (100.0\ g)(4.18\ \text{J/g °C})(4.0 - 37\ °C) = -13807.2\ \text{J} \rightarrow -14000\ \text{J or } -14\ \text{kJ}$$

4. A total of 32.9 **calories** of heat are absorbed as 58.3 g of lead. How much did the temperature change if the specific heat of lead is 0.0305 **cal**/g °C?

$$\Delta T = \frac{Q}{s \cdot m} = \frac{32.9\ cal}{\left(0.0305\,\frac{cal}{g°C}\right)(58.3\ g)} = 38.1\ °C$$

6. Tin has a specific heat of 0.2274 J/g °C. What mass of tin is required to store 37,000 J of heat if the temperature of the tin is increased by 75.0°C?

$$mass = \frac{Q}{s \cdot \Delta T} = \frac{37{,}000\ J}{\left(0.2274\,\frac{J}{g°C}\right)(75.0\ °C)} = 2169.451774\ g \rightarrow 2200\ \text{g}$$