Calculating Thermal Energy **Name**_____

Q = Thermal energy (J) *m = mass* *T = temperature (°C)* *c_p = Specific Heat (J/kg)*

Table of Specific Heats

Substance	Specific Heat (J/g°C)
Water	4.184
Wood	1.760
Graphite	0.710
Glass	0.664
Iron	0.450
Ethanol	2.46
Aluminum	0.9

$$Q = mc\Delta T \qquad m = \frac{Q}{c\Delta T}$$

$$c = \frac{Q}{m\Delta T} \qquad \Delta T = \frac{Q}{mc}$$

1. What is the change in the thermal energy of 100 grams of water if its temperature increases from 15°C to 20°C?

2. What is the mass of a pane of glass that changed temperature by ten degrees Celsius and has a change in thermal energy of –13,280.0 Joules?

3. If 500 grams of graphite and 500 grams of Iron both have an initial temperature of 10°C and both have an increase in thermal energy of 7000 J, which will have the higher final temperature?

4. If 225 grams of wood with an initial temperature of 40°C has a change in thermal energy of 1.98×10^6 J, what is the final temperature of the wood?

5. A 2.5 kg sample of a substance was heated from 113°C to 289°C. The substance absorbed 0.45 kJ of heat. What is the specific heat of this substance? *(Convert kg to grams and kJ to J first.)*

6. The specific heat of aluminum is 0.897 J/(g·K). If a 22.6 g sample of aluminum is heated from 183 K to 244 K, then how much heat will the aluminum absorb? *(Remember that we can use °C or K because a Δ in 1 degree of either scale is the same change.)*

7. 1.3 kg of a substance is heated from 269 K to 325 K and is found to have absorbed 45 J of heat. What is the specific heat of this substance? *(Convert kg to grams first.)*

8. The specific heat of mercury is 0.140 J/(g·K). If 450 J of energy is added to 43 g of mercury at 315 K, what will the final temperature of the mercury be?

9. A 40.0 g sample of ethanol releases 2952 J as it cools from 50.0 °C. Calculate the final temperature of the ethanol.

10. Calculate the heat change associated with cooling a 350.0 g aluminum bar from 70.0°C to 25.0°C. Is the change endothermic or exothermic? Why?

11. Calculate the specific heat capacity (c_p) of copper given that 204.75 J of energy raises the temperature of 15.0 g of copper from 25°C to 60°C.