Name: _____ Date: _____

CONTENT 9.1

9.1 Using the Heat Equation

READ

You can solve real-world heat and temperature problems using the following equation:

HEAT EQUATION

$$E = mC_p(T_2 - T_1)$$

Heat energy (J) — E; *Mass* (kg) — m; *Specific heat* ($\frac{J}{kg°C}$) — C_p; *Change in temperature* (°C) — $(T_2 - T_1)$

Below is a table that provides the specific heat of six everyday materials.

Material	Specific Heat (J/kg °C)	Material	Specific Heat (J/kg °C)
water (pure)	4,184	concrete	880
aluminum	897	gold	129
silver	235	wood	1,700

EXAMPLE

- How much heat does it take to raise the temperature of 10 kg of water by 10 °C?

  Solution:

  Find the specific heat of water from the table above: 4,184 J/kg °C. Plug the values into the equation.

$$\text{Thermal Energy (J)} = 10 \text{ kg} \times 10 \text{ °C} \times 4{,}184 \text{ J/kg} \bullet \text{°C}$$
$$= 418{,}400 \text{ joules}$$

PRACTICE

Use the specific heat table to answer the following questions. Don't forget to show your work.

1. How much heat does it take to raise the temperature of 0.10 kg of gold by 25 °C?
2. How much heat does it take to raise the temperature of 0.10 kg of silver by 25 °C?
3. How much heat does it take to raise the temperature of 0.10 kg of aluminum by 25 °C?
4. Which one of the three materials above would cool down fastest after the heat was applied? Explain.
5. A coffee maker heats 2 kg of water from 15 °C to 100 °C. How much thermal energy was required?
6. The Sun warms a 100-kg slab of concrete from 20 °C to 25 °C. How much thermal energy did it absorb?
7. 5,000 joules of thermal energy were applied to 1-kg aluminum bar. What was the temperature increase?
8. In the 1920's, many American homes did not have hot running water from the tap. Bath water was heated on the stove and poured into a basin. How much thermal energy would it take to heat 30 kg of water from 15 °C to a comfortable bath temperature of 50 °C?