

CALCULATING HEAT IN CALORIES A

Temperature is measured in degrees Celsius ($^{\circ}\text{C}$). Heat is *not* measured in degrees Celsius. Heat is measured in calories (cal). The calorie is the unit of heat in the metric system.

One calorie is the amount of heat needed to raise the temperature of 1 g of water 1°C . For instance, it takes 1 cal of heat to raise the temperature of 1 g of water from 25°C to 26°C .

1. Calculate the number of calories needed to

	Calories (cal)
a. Raise the temperature of 1 g of water 1°C .	1
b. Raise the temperature of 2 g of water 1°C .	2
c. Raise the temperature of 2 g of water 2°C .	4
d. Raise the temperature of 10 g of water 1°C .	10
e. Raise the temperature of 1 g of water 70°C .	70
f. Raise the temperature of 100 g of water 5°C .	500
g. Raise the temperature of 450 g of water 3°C .	1350
h. Raise the temperature of 16 g of water 62°C .	992

2. Billy mixed 40 g of 60°C water with 60 g of 25°C water. The final temperature was 39°C .

- a. Calculate the change of temperature (ΔT) for the hot water.

$$\Delta T = T_f - T_i \quad \Delta T = T_f - T_i = 39^{\circ}\text{C} - 60^{\circ}\text{C} = -21^{\circ}\text{C}$$

- b. Calculate the amount of heat (calories) transferred *from* the hot water.

calories = mass of hot water \times change of temperature of hot water

$$\text{cal} = m \times \Delta T = 40 \text{ g} \times -21^{\circ}\text{C} = -840 \text{ cal}$$

- c. Calculate the amount of heat transferred *to* the cold water.

$$\text{cal} = m \times \Delta T \quad \Delta T = T_f - T_i = 39^{\circ}\text{C} - 25^{\circ}\text{C} = 14^{\circ}\text{C}$$

$$\text{cal} = m \times \Delta T = 60 \text{ g} \times 14^{\circ}\text{C} = 840 \text{ cal}$$

- d. Compare the amount of heat transferred *from* the hot water and the amount of heat transferred *to* the cold water.

same