CONCEPT: HEAT CAPACITY

- As you heat an object its temperature increases because heat is _____ proportional to its temperature change.

Heat–Temperature Relationship

$q \propto$

EXAMPLE: If the temperature of a water bath goes from 25 K to 50 K, what can be said about the amount of heat?

a) It will double b) It will remain the same c) It will be halved d) It will triple

Molar & Specific Heat Capacity

- **Heat Capacity** (__): The amount of heat required to change the temperature of a weighted substance.
  - □ **Specific Heat Capacity** (__): Amount of heat required to change the temperature of 1 g of substance by 1 K.
  - □ **Molar Heat Capacity** (__): Amount of heat required to change the temperature of 1 mole of substance by 1 K.

Heat Capacities

Molar Heat Capacity

$$\_\_ = \frac{q}{\bullet \triangle T}$$

- □ ____ = Molar heat capacity in $\frac{J}{mol \bullet °C}$
- □ q = heat
- □ T = Temperature in °C
- □ ____ = moles

Specific Heat Capacity

$$\_\_ = \frac{q}{\bullet \triangle T}$$

- □ ____ = Specific heat capacity in $\frac{J}{g \bullet °C}$
- □ q = heat
- □ T = Temperature in °C
- □ ____ = grams

EXAMPLE: If 15.7 g of silver raises its temperature by 17.2 °C when it absorbs 6845.5 J, what is its molar heat capacity?

CONCEPT: HEAT CAPACITY

Rearranged Specific Heat Formula

● By rearranging the *specific heat capacity* given above we can solve for the amount of heat _____ or _____.

Specific Heat Capacity Formula

$$q = mc\triangle T$$

EXAMPLE: How much heat (in kJ) is released when 120.0 g H_2O goes from 90 ºC to 45 ºC? The specific heat capacity of H_2O is 4.184 J / g • ºC.

PRACTICE: A sample of copper absorbs 3.53 kJ of heat, which increases the temperature by 25 ºC, determine the mass (in kg) of the copper sample if the specific heat capacity of copper is 0.385 J / g • ºC.

CONCEPT: HEAT CAPACITY

PRACTICE: Based on their given specific heat capacities which compound would show the greatest temperature change upon absorbing 25.0 J of heat?

a) 250.0 g Al b) 250.0 g Cu c) 250.0 g ethanol d) 250.0 g wood

Specific Heat Capacities

Substances	Specific Heat Capacity C (J / g · °C)
Elements	
Aluminum, Al	0.900
Copper, Cu	0.385
Compounds	
Ethanol, C_2H_5OH	2.460
Materials	
Wood	1.760

PRACTICE: 50.00 g of heated metal ore is placed into an insulated beaker containing 822.5 g of water. Once the metal heats up the final temperature of the water is 32.08 ºC. If the metal gains 14.55 kJ of energy, what is the initial temperature of the water? The specific heat capacity of copper is 4.184 J / g • ºC.