Calorimetry

- measuring heat changes using the mass, specific heat capacity & temperature change of a substance

$$q = C m \Delta T$$

- q: heat (J)
- C: specific heat ($\frac{J}{g^\circ C}$)
- m: mass (g)
- ΔT: change in temp. (°C)

$\Delta T = T_f - T_i$

also, $T - T_0$, $T_2 - T_1$, $T' - T$

→ the higher the specific heat, the more energy it can absorb without raising the temp.

p. 299, #1:

When 435 J of heat is added to 3.4 g of olive oil at 21 °C, the temperature increases to 85 °C. What is the specific heat of olive oil?

q T_f m T_i

$q = C m \Delta T$

$T_f - T_i = 85^\circ C - 21^\circ C$

$\Delta T = 64^\circ C$

~~$435 = x \cdot 3.4 \cdot 64$~~

$$\frac{q}{m \Delta T} = \frac{C m \Delta T}{m \Delta T}$$

$$C = \frac{q}{m \Delta T} = \frac{435\ J}{(3.4\ g)(64^\circ C)}$$

$$= 1.99\ \frac{J}{g^\circ C}$$

p. 299, #2: m q
A 1.55-g piece of stainless steel absorbs 141 J of heat when its temperature increases by 178 °C. What is the specific heat of the stainless steel?
ΔT C

$q = C m \Delta T$

$C = \frac{q}{m\Delta T}$

$C = \frac{q}{m\Delta T} = \frac{141\ J}{(1.55\ g)(178\ ^\circ C)} = 0.511\ J/g\cdot{}^\circ C$

p. 299, #3:
How much heat is required to raise the temperature of 250.0 g of mercury by 52 °C?
q m ΔT

$C_{Hg} = 0.14\ J/g\cdot{}^\circ C$

$q = C m \Delta T$

$= (0.14\ J/g\cdot{}^\circ C)(250.0\ g)(52\ ^\circ C)$

$= 1820\ J$

p. 299, #9:
Using calories, calculate how much heat 32.0 g of water absorbs when it is heated from 25.0 °C to 80.0 °C. How many Joules is this?

p. 299, #10:
How many kilojoules of heat are absorbed when 1.00 L of water is heated from 18 °C to 85 °C?