## Answer on Question #52634, Physics, Other

An ice chest at a beach party contains 12 cans of soda at 2.69 °C. Each can of soda has a mass of 0.35 kg and a specific heat capacity of 3800 J/(kg C°). Someone adds a 6.05-kg watermelon at 24.1 °C to the chest. The specific heat capacity of watermelon is nearly the same as that of water. Ignore the specific heat capacity of the chest and determine the final temperature T of the soda and watermelon in degrees Celsius.

**Solution:**

Suppose that temperature of the watermelon is $T_1$, and of the soda is $T_2$.

After mixing, the watermelon has cooled to a temperature $T_c$, and soda reached a temperature $T_c$.

The quantity of heat from watermelon:

$$Q_1 = c_1 m_1 (T_1 - T_c)$$

The sode will get heat from the watermelon:

$$Q_2 = c_2 m_2 (T_c - T_2)$$

Since heat does not disappear, and transferred from one liquid to another:

$$Q_1 = Q_2$$

$$c_1 m_1 (T_1 - T_c) = c_2 m_2 (T_c - T_2)$$

$$c_1 m_1 T_1 - c_1 m_1 T_c = c_2 m_2 T_c - c_2 m_2 T_2$$

$$c_1 m_1 T_1 + c_2 m_2 T_2 = c_2 m_2 T_c + c_1 m_1 T_c$$

$$T_c = \frac{c_1 m_1 T_1 + c_2 m_2 T_2}{c_1 m_1 + c_2 m_2}$$

Specific heat capacity of watermelon (water) = 4200 J/(kg C°)

$$T_c = \frac{4200 * 6.05 * 24.1 + 3800 * 12 * 0.35 * 2.69}{4200 * 6.05 + 3800 * 12 * 0.35} = 15.84 \text{ °C}$$

**Answer:** 15.84 °C