

Question #76678, Physics / Other

What is the final temperature of 100g of water at -15°C added to a styrofoam cup filled with 220 g of water at 32°C ?

Solution

The constants:

Specific heat capacity of water = $4,187 \text{ J/kgK}$

Specific heat capacity of ice = $2,108 \text{ J/kgK}$

Specific heat of fusion of water = 334 kJ/kg

The maximum heat that can be released by water cooling down to 0°C is

$$Q_1 = CM\Delta T = 4,187 \times 0.220 \times 32 = 29,476.5 \text{ J}$$

The heat required to warm up the ice to 0°C is

$$Q_2 = CM\Delta T = 4,187 \times 0.100 \times 15 = 6,280.5 \text{ J}$$

$$\Delta Q = Q_1 - Q_2 = 23,196 \text{ J}$$

The amount of heat ΔQ will be spent to melt the ice.

The amount of ice that will be melt is

$$m = \frac{23,196}{334,000} = 0.069 \text{ kg} = 69 \text{ g}$$

Answer: the final temperature is 0°C , 69 g of ice will melt.

Answer provided by <https://www.AssignmentExpert.com>