Answer on Question 68285, Physics / Molecular Physics | Thermodynamics

Question:

If a freezer cools $200\ g$ of water from $20°C$ to its freezing point in 10 minutes, how much heat is removed per minute from the water?

Solution:

We can find how much heat is removed from the water during the freezing from the formula:

$$Q = mc\Delta t,$$

here, $m = 0.2\ kg$ is the mass of the water, $c = 4200\ J/kg \cdot °C$ is the specific heat capacity of the water and Δt is the change in the temperature.

Then, we get:

$$Q = mc\Delta t = 0.2\ kg \cdot 4200\ \frac{J}{kg \cdot °C} \cdot (20°C - 0°C) = 16800\ J \approx 17000\ J.$$

Finally, we can find how much heat is removed per minute from the water:

$$Q_{per\ minute} = \frac{Q}{10\ min} = \frac{17000\ J}{10\ min} = 1700\ \frac{J}{min}.$$

Answer:

$$Q_{per\ minute} = 1700\ \frac{J}{min}.$$