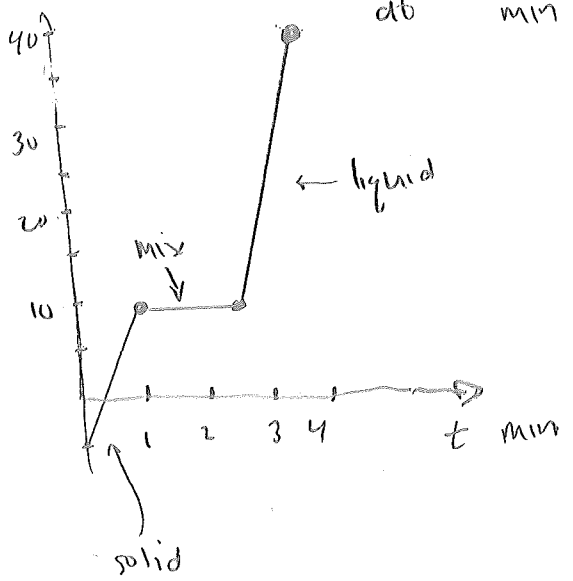
Physics 161 HW 1 solutions

17.44



$m = 500\ g$.

$\frac{dQ}{dt} = \frac{10\ kJ}{min}$

(b) $mc_s\Delta T = Q \qquad Q = \frac{dQ}{dt}\cdot\Delta t$

$$c_s = \frac{10\ \frac{kJ}{min}\cdot 1\ min}{500\ g\cdot 15^\circ C} = 1.33\ \frac{J}{gK}$$

$$mc_\ell\Delta T = Q = \frac{dQ}{dt}\cdot\Delta t$$

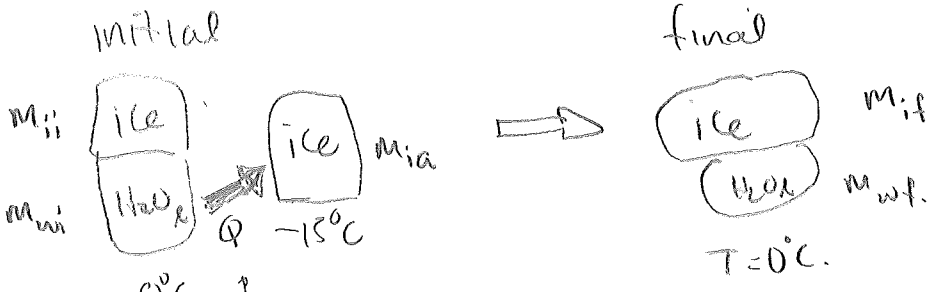
$$c_\ell = \frac{10\ \frac{kJ}{min}\cdot 1.5\ min}{500\ g\cdot 30^\circ C} = 1\ J/gK.$$

(a) $mL_f = Q = \frac{dQ}{dt}\cdot\Delta t$

$$L_f = \frac{10\ \frac{kJ}{min}\cdot 1.5\ min}{500\ g} = 30\ J/g.$$

17.104 a) Total ice < total mass, so ice & water are in eqm

$T_f = 0^\circ C$.



this heat transfer will freeze m_f of the initial water.

$$m_{if} = m_{ii} + m_{ia} + m_f = 778\ g.\ (\text{given})$$

also $m_f L_f = Q$ = heat to bring added ice to 0°C. $= m_{ia} c_i \Delta T$

$L_f = 334\ J/g$ $c_i = 2.1\ J/gK$, so $334\cdot m_f = m_{ia}\cdot 2.1\cdot 15$

with $m_{ii} = 450\ g$, (initial ice) and $m_{if} = 778\ g$, 2 eqn in 2 unknowns

Find $m_{ia} = 300\ g$.