17/1105 (a) Mcsteam = 0.04 kg, T = 100°C
        Mwater = 0.2 kg, T = 50°C
heat is removed:
Qsteam = Mcsteam L
        = -0.04 kg x 2.256 x 10^5 J/kg = -9.024 x 10^4 J
The positive heat gained by water is
Q = MC ΔT
    = 0.2 kg x 4.19 J/kg°C x (100°C - 50°C)
    = 4.19 x 10^5 J
And the final temperature is 100°C.
(b) m = \frac{Q}{L} = \frac{4.19 x 10^5 J}{2.256 x 10^5 J/kg} = 0.186 kg
H2O: 0.186 kg + 0.02 kg = 0.21 kg
steam: 0.04 kg - 0.186 kg = 0.0214 kg

17.113 (a) When the temperature is 4°C, the surface of the lake cools and
sink because water is most dense at 4°C. When the temp.
drops below 4°C, the water at the surface becomes less dense
than water below it and will not sink again. When the temp.
is at 0°C, the surface of lake gets freeze and remains colder
than the bottom temp. And the bottom will remains at 4°C
for a long time.

(b) \frac{dQ}{dt} = \frac{kA (T_H - T_c)}{h}
    h: the thickness of ice
    t: time
\frac{dQ}{dt} = \rho L \frac{dV}{dt} = \rho L A \frac{dh}{dt}
\rho L A \frac{dh}{dt} = \frac{kA (T_H - T_c)}{h} = \frac{kA \Delta T}{h}
\frac{dh}{h} = \frac{kA \Delta T}{L \rho} dt
\int_0^h \frac{dh}{h} = \int_0^t \frac{kA \Delta T}{L \rho} dt
\frac{1}{2} h^2 = \frac{kA \Delta T t}{L \rho}
\frac{1}{2} h^2 = \frac{2kA \Delta T h}{L \rho}
(c) \( \Delta T = 10^\circ C \)

\[
t = \frac{h^2 P L t}{2 K A T} = \frac{(0.05m)^2 \times (920kg/m^3) \times (3.3 \times 10^5 J/kg)}{2 \times (1.6 \text{ W/m.k}) \times 10^\circ C}
\]

\[
\approx 6.0 \times 10^5
\]

(d) \( t = 1.54 \times 10^6 \text{ sec} \)

It would not likely to occur.