7. First find the heat that must be removed to (1) cool the water to 0°C, (2) freeze it, and then (3) cool the ice to –20°C.

$Q_1 = mc_{water}\,\Delta T = 1.20$ kg × 4.186 kJ/(kg·K) × (–20.0°C) = –100.46 kJ.
$Q_2 = -mL_f = 1.20$ kg × 333.7 kJ/kg = –400.44 kJ.
$Q_3 = mc_{ice}\,\Delta T = 1.20$ kg × 2.10 kJ/(kg·K) × (–20.0°C) = –50.4 kJ.
$Q_1 + Q_2 + Q_3 = -551$ kJ. This is the total heat removed so $Q_c = 551.3$ kJ. (Remember our convention that Qc is positive.)

It's reversible so the total entropy change of the environment is zero:
$\Sigma\,\Delta S = Q_H/T_H - Q_c/T_c = 0$. Solving,
$Q_H = Q_cT_h/T_c$.

Conservation of energy (1st law):
$W = Q_H - Q_C = Q_c\,T_h/T_c - Q_c = Q_c(T_h/T_c - 1) = 551.3$ kJ × [(293.15 K)/(253.15 K) – 1]
= 87.1 kJ.

Alternative solution: Use the efficiency. Because it is reversible,
$e = W/Q_H = 1 - T_c/T_h$
Solving for Q_H: $Q_H = W/(1 - T_c/T_h)$
Substitute into the 1st law: $W = Q_H - Q_C = W/(1 - T_c/T_h) - Q_C$
Solve for W: $W[1 - 1/(1 - T_c/T_h)] = -Q_C$
$W = -Q_C/[1 - 1/(1 - T_c/T_h)]$
This simplified algebraically to $W = Q_c(T_h/T_c - 1)$, as above.