From “Heat”:

17. How much energy is need to raise 50 kg of water from 45° C to 80°C?

$Q = m c_p \Delta T$

$= 50(4186)(80-45)$

$= 50(4186)(35) \quad = 7.3 \times 10^6 \text{ J}$

From “Latent Heat”:

15. How much heat is released when 35 kg of water freezes?

$Q = mL_f = 35(-3.33 \times 10^5)$

$= -1.16 \times 10^7 \text{ J}$

17. 10 kg of steam at 110°C is cooled to water at 80°C.

A. Write Ti and Tf for this situation on the diagram below.

B. Find ΔT for each temperature change.

C. Calculate the individual Q’s and add them to find Q_{total}.

$T_i = 110°$

steam: $Q = mc_{psteam}\Delta T = 10(2010)(-10)$

$\Delta T = -10° \quad = -2.01 \times 10^5 \text{ J}$

100°C

$Q = mL_v = 10(-2.26E6) = -2.26 \times 10^7 \text{ J}$

100°C

$T_f = 80°C$

water: $Q = mc_{pwater}\Delta T = 10(4186)(-20°) =$

$\Delta T = -20° \quad -8.37 \times 10^5 \text{ J}$

0°C

$Q = mL_f$

total $= -2.36 \times 10^7 \text{ J}$

0°C

ice: $Q = mc_{pice}\Delta T$