(1) ethanol

$Q = m \cdot \Delta T \cdot c_p$

heat required $= Q = m \cdot \Delta T \cdot c_p$

$Q = (193)(16)(2.46\ J/g^\circ C)$

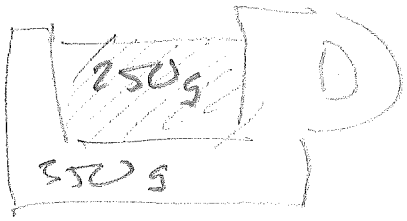
$\boxed{Q = 7,597.}$

(2) Aluminum $Q = m \cdot \Delta T \cdot c_p$

$9612_J = (120)(40^\circ C)\, c_p$

$\boxed{c_p = .89 \frac{J}{g \cdot ^\circ C}}$

(4) Coffee up



Heat to warm up $Q = m \cdot \Delta T \cdot c_p$

$Q = (350g)(30^\circ C)(1.34\ J/g^\circ C)$

$\rightarrow Q = 14,070$

Heat lost by H2O $Q = m \cdot \Delta T \cdot c_p$

$-14,070 = (250)(35 - T_0)\, 4.2\ J/g^\circ C$

$\boxed{T_0 = 48.4^\circ C}$

(3) Lead $Q = m \cdot \Delta T \cdot c_p$

$Q = (2.4\,g)(22.5 - 37.2)(0.129\ J/g\cdot C)$

$\boxed{Q = -4.55\ \text{Joules}}$

(5) ice into water!

① → ice melts $Q_1 = 55\,g\,(334\ J/g) = 18,365\ J$

② → ice water warms $Q_2 = m \Delta T \cdot c_p$

③ → hot water cools $Q_3 = m \Delta T\, c_p$

Ice water warms. $Q_2 = m \Delta T \cdot c_p$

$Q_2 = (55)(T_f - 0^\circ)\ 4.2\ J/g\cdot C$

↑ unknown

Hot water cools.

$Q_3 = m \cdot \Delta T \cdot c_p = (500)(T_f - 50^\circ C)(4.2\ J/g\cdot C)$

$\overset{+}{Q_1} + \overset{+}{Q_2} + \overset{-}{Q_3} = 0$

$(18,365\ J) + (55)(T_f - 0)(4.2) + (500)(T_f - 50)4.2 = 0$

$\boxed{T_f = 43^\circ C}$

(6) Candle wax @ 50°C $\Delta H_{fus} = 200\ J/g$

$Q = (100\ g)(200\ J/g) = 20{,}000\ Joules$

water cooling $= Q = m \cdot \Delta T \cdot c_p$

$-20{,}000\ J = 50\ g \cdot \Delta T \cdot 4.2$

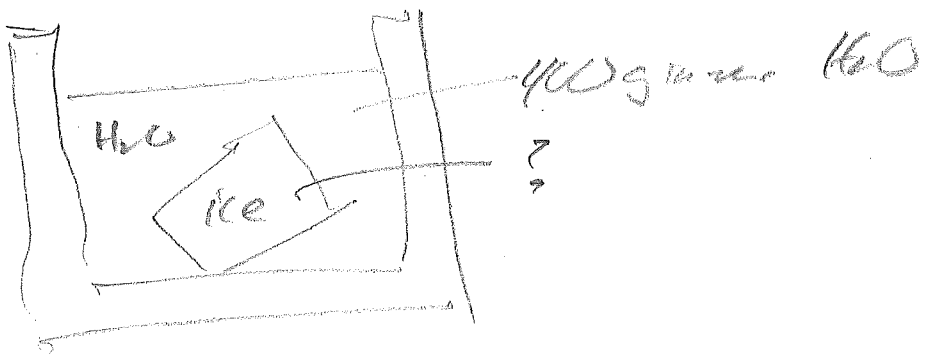
$\therefore \Delta T = 9.5°C$

WATER cools by

$\therefore$ $100°C \rightarrow 90.5°C$

(7)

(4) ice into water.



(1) - 400g of H_2O cools

(2) Ice melts to form 0°C H_2O

So 400g of H_2O cooling from 60°C → 40°C

$$Q = m \cdot \Delta T \cdot c_p$$

$$Q = 400\,(40-60)\,4.2 = -33{,}600\,J$$

Heat lost this time (2) things.. melt ice + heat that water

Heat lost by water (Q_1) cooling + heat needed (Q_2) to melt ice + heat needed to warm (Q_3) water..

$$Q_1 + Q_2 + Q_3 = 0$$

$$(-33{,}600\,J) + H_{fus} \cdot m_{ice} + Q_3 = 0$$

$$+(m_{ice} \cdot 343\,J/g) + (m_{ice})(40)(4.2\,J/g) = 0$$

$$\therefore m_{ice} = 64.5\,g$$