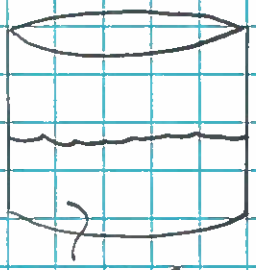
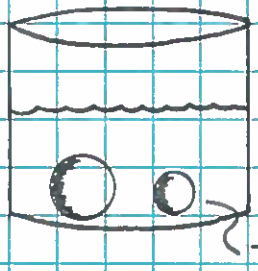
Initial

Alum. Copper

$M_A = 10\,g$, $T_A = 200°C$; $M_C = 20\,g$, T_C



Final



$T_f = 25°C$

Alcohol, $V = 50\,cm^3 = 50 \times 10^{-6}\,m^3$ at $T = 15°C$

$\rho = 790\ kg/m^3$

$m = \rho V = 0.0395\ kg$

Q_{net} = Heat lost by Alum + Heat lost by Copper + Heat gained by Alcohol. $= 0$

So:

$$0 = M_A c_A \Delta T_A + M_c c_c \Delta T_c + M c \Delta T$$

$$= M_A c_A (T_f - T_A) + M_c c_c \Delta T_c + M c (T_f - T)$$

So,

$$\Delta T_c = -\frac{M_A c_A (T_f - T_A) - M c (T_f - T)}{M_c c_c}$$

where:

$$c_A = 900 \frac{J}{kg\,K} \; ; \; c_c = 385 \frac{J}{kg\,K}$$

$$c = 2400 \frac{J}{kg\,K} \quad \text{(alcohol)}$$

So:

$$\Delta T_c = 81.43°C = T_f - T_c$$

$$\therefore \quad T_c = T_f - 81.43 = -56.43°C$$