1)

$m_m = 0.4 \text{ kg}$ $m_w = 0.45 g$

$C_m = ?$ $C_w = 4190 \ J/kg \cdot K°$

$\Delta T_m = 40 - 130 = -90°$ $\Delta T_w = 40 - 15 = 25°$

$mC\Delta T_{water} + mc\Delta T_{cup} = \emptyset$

$0.4 \ kg \ (C)(-90) + 0.45 (4190)(25) = \emptyset$

$-36 \ c + 47137.5 = \emptyset$

$47,137.5 = 36 c$

$\boxed{C = 1,309 \ J/kg \cdot K°}$

copper   water   glass

2) $mC\Delta T + mC\Delta T + nc\Delta T = \emptyset$

$0.125 (385)(T_f - 345°C) + 0.565 (4190)(T_f - 20) + 0.05 (840)(T_f - 20) = \emptyset$

$48.125 \ T_f - 16,603 + 2367 T_f - 47,347 + 42 T_f - 840 = \emptyset$

$2457.125 T_f = 64,790$

$\boxed{T_f = 26.4°C}$

$\Delta L = L_0 \alpha \Delta T$

$0.0006 = 2(\alpha)(20°C)$

$\alpha = \dfrac{0.0006}{40}$

$\boxed{\alpha = 0.000015 = 1.5 \times 10^{-5}}$

4) $40.1\,cm + \Delta l_b + 79.7\,cm + \Delta l_a = 120\,cm$

$40.1 + 40.1(2.0\times10^{-5})(T_f - 0) + 79.7 + 79.7(2.4\times10^{-5})(T_f - 0) = 120\,cm$

$40.1 + 0.0008\,T_f + 79.7 + 0.0019\,T_f = 120$

$(0.0008 + 0.0019)\,T_f = 0.6$

$$T_f = \frac{0.6}{0.0027}$$

$$\boxed{T_f = 221.8\,°C}$$

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5) $P_i = 101\,kPa = 1\,atm$ $P_f = 20\,kPa = 0.198\,atm$

$V_i = 12.0\,m^3 = 12,000\,L$ $V_f = ?$

$T_i = 22°C = 295\,K$ $T_f = -30°C = 243\,K$

$n = ?$ $n = G$

$$n = \frac{PV}{RT} = \frac{1(12,000)}{(0.08205)(295)} \quad 495\,mol$$

$$V_f = \frac{nRT}{P} \quad \frac{495(0.08205)(243)}{0.198} \quad 49,849\,L$$

$$\frac{2\,mol}{1\,L} = \boxed{49.1\,L} \quad \frac{49,849\,L}{1,884\,L}$$

6) $m = 905g$ $K_t = \frac{1}{2}mv^2$

$v = 1629$

$$K_t = \frac{1}{2}(0.905)(1629)^2$$

$$K_t = 1,200,772 \text{ J}$$

$$\frac{472 \text{ J}}{1 kg \cdot k^\circ} = \frac{? \text{ J}}{0.905 kg \cdot 15^\circ} \qquad 427 \text{ J to raise meteor } 1^\circ k$$

$$\frac{1,200,772 \text{ J}}{427 \text{ J}/^\circ k} = \boxed{2811^\circ C}$$

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7) $\Delta U = Q - W$ $\qquad Q = 1450 \text{ J}$

$$6 \times 10^4 = 60,000$$
$$\cancel{60,000} = 60 \text{ kPa}$$

$$\Delta U = Q - P\Delta V$$

$$\Delta U = 1450 \text{ J} - 60,000 \text{?}(0.07 - 0.02 m^3)$$

$$\Delta U = 1450 - 3000$$

$$\boxed{\Delta U = -1550 \text{ J}}$$

8) $P = 3.3$ atm $n = \dfrac{PV}{RT} = \dfrac{3.3\,(3.2)}{0.082057\,(330)}$

$V = 3.2$ L

$n = ?$

$R = 0.082057\ \dfrac{L \cdot atm}{mol \cdot K}$ $n = 0.3899$ mol

$T = 330^\circ K$ $= 2.348 \times 10^{23}$ molecules

$\boxed{= 7.877\,g}$

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9) $n = 5 \times 10^{-3}$ mol $P = \dfrac{nRT}{V}$

$A = B$

$T = 2926^\circ K$ $= \dfrac{(5 \times 10^{-3})(0.082057)(2926)}{0.3\,L}$

$P = ?$

$V = 300\,cm^3 = 0.0003\,m^3 = 0.3\,L$ $\boxed{P = 4.001\ atm}$

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10)