

362

$$\textcircled{41} \Delta V = V_0 \beta \Delta T$$

$$\Delta V_w = 400 \text{ mL} (210 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}) (25.6 \text{ } ^\circ\text{C})$$

$$= \underline{2.1504}$$

$$\Delta V_g = 400 \text{ mL} (9 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}) (25.6 \text{ } ^\circ\text{C})$$

$$= \underline{0.09216}$$

$$V_{\text{spilt}} = \Delta V_w - \Delta V_g$$

$$= \underline{2 \text{ mL}}$$

$$\textcircled{42}$$

$$\Delta V_g = V_0 \beta \Delta T$$

$$= 45725 \text{ L} (950 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}) \left(\begin{array}{l} T_2 - T_1 \\ -120 - 28.0 \\ -40.0 \text{ } ^\circ\text{C} \end{array} \right)$$

$$= - \underline{1737.55}$$

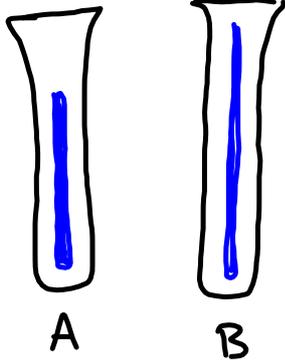
$$= 45725$$

$$- 1737.55$$

$$\hline 43987.45$$

$$\underline{43987 \text{ L}}$$

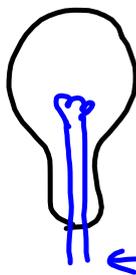
(72)



water in both expands.
tube b, being hard
glass, doesn't expand
as much.

This makes the level
appear higher

(73)



glass

glass $= 27 \times 10^{-6}$ platinum $= 27 \times 10^{-6}$ copper $\rightarrow 49 \times 10^{-6}$

← wire

when the β 's are
equal they expand
at the same
rate \therefore a tight
seal is formed
at all temps

(94)

$$\Delta L = ?$$

$$L_0 = 2.00 \text{ m}$$

$$\alpha = 17 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}$$

$$\left. \begin{array}{l} T_1 = 23^\circ\text{C} \\ T_2 = 978^\circ\text{C} \end{array} \right\} \Delta T = 955^\circ\text{C}$$

$$\begin{aligned} \Delta L &= 2.00 \text{ m} \times 17 \times 10^{-6} \text{ } ^\circ\text{C}^{-1} \times 955^\circ\text{C} \\ &= 0.03247 \text{ m} \\ &= \underline{3.25 \text{ cm}} \end{aligned}$$

(95)

$$V_0 = 1.0 \text{ m}^3$$

$$\beta_c = 36 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}$$

$$\Delta T = 45^\circ\text{C}$$

$$\begin{aligned} \Delta V &= V_0 \beta \Delta T \\ &= 1.0 \text{ m}^3 \cdot 36 \times 10^{-6} \text{ } ^\circ\text{C}^{-1} \cdot 45^\circ\text{C} \\ &= 1.62 \times 10^{-3} \text{ m}^3 \\ &= \underline{1.6 \times 10^{-3} \text{ m}^3} \end{aligned}$$

(96)

$$L_0 = 1.2250 \text{ cm}$$

$$\Delta L = -0.0020 \text{ cm}$$

$$\alpha = 12 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}$$

$$T_1 = 20^\circ\text{C}$$

$$T_2 = ?$$

$$\begin{aligned} T_2 &= \frac{\Delta L}{\alpha L_0} + T_1 \\ &= \frac{-0.0020 \text{ cm}}{(1.2250 \text{ cm} \cdot 12 \times 10^{-6} \text{ } ^\circ\text{C}^{-1})} + 20^\circ\text{C} \\ &= -116^\circ\text{C} \end{aligned}$$

(97)

$$V_0 = \pi r^2 \times h$$

$$= 3.14 \times (1000\text{m})^2 \times 5000\text{m}$$

$$= 15.71\text{m}^3$$

$$\left. \begin{array}{l} T_1 = 10.0^\circ\text{C} \\ T_2 = 40.0^\circ\text{C} \end{array} \right\} 30.0^\circ\text{C}$$

$$\beta_M = 1100 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}$$

$$\beta_S = 35 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}$$

$$\Delta V_M = 15.71 \text{ m}^3 \times 1100 \times 10^{-6} \times 30$$

$$= 0.518 \text{ m}^3$$

$$\Delta V_S = 15.71 \times 35 \times 10^{-6} \times 30$$

$$= 0.0165 \text{ m}^3$$

$$\Delta V_M - \Delta V_S =$$

$$0.518 \text{ m}^3$$

$$- 0.0165 \text{ m}^3$$

$$\hline 0.501 \text{ m}^3$$

(98)

$$\left. \begin{array}{l} T_1 = 11^\circ\text{C} \\ T_2 = 580^\circ\text{C} \end{array} \right\} \Delta T = 569^\circ\text{C}$$

$$V_0 = 1.78 \text{ cm}^3$$

$$\Delta V = ?$$

$$\beta_{Al} = 75 \times 10^{-6} \text{ } ^\circ\text{C}^{-1}$$

$$\Delta V = 1.78 \text{ cm}^3 \times 75 \times 10^{-6} \text{ } ^\circ\text{C}^{-1} \times 569^\circ\text{C}$$

$$= 0.0759615$$

$$= 0.0760 \text{ cm}^3$$