Practice Questions: Thermal Expansion

39. $L_0 = 3.66\ m$
$T_1 = -28°C$
$T_2 = 39°C$
$\Delta L = ?$
from tables $\alpha = 25 \times 10^{-6}\ °C^{-1}$

$\Delta L = \alpha L_0 \Delta T$
$= (25 \times 10^{-6}\ °C^{-1})(3.66\ m)(39°C - (-28°C))$
$= 0.0061\ m = \boxed{6.1\ mm}$

40. $L_0 = 11.5\ cm$
$T_1 = 22°C$
$T_2 = 1221°C$
$\Delta L = ?$ and $L_{new} = ?$
from tables $\alpha = 12 \times 10^{-6}\ °C^{-1}$

$\Delta L = \alpha L_0 \Delta T$
$= (12 \times 10^{-6}\ °C^{-1})(11.5\ cm)(1221°C - 22°C)$
$= 0.1654\ cm$

so new length is $L_{New} = L_0 + \Delta L = 11.5cm + 0.1654cm = \boxed{11.7\ cm}$

41. $\Delta V = V_0 \beta \Delta T$

$\Delta V_W = (400\ mL)(210 \times 10^{-6}\ °C^{-1})(30.0°C - 4.4°C) = 2.1504\ mL$

$\Delta V_G = (400\ mL)(9 \times 10^{-6}\ °C^{-1})(30.0°C - 4.4°C) = 0.09216\ mL$

$V_{spill} = \Delta V_W - \Delta V_G = \boxed{2\ mL}$

42. $\Delta V = V_0 \beta \Delta T$
$= (45\ 725\ L)(950 \times 10^{-6}\ °C^{-1})(-12.0°C - 28.0°C)$
$= -1737.55\ L$

$V_{delivered} = V_0 - \Delta V = 45\ 725\ L - 1737.55\ L = \boxed{43987\ L}$