A gas-filled weather balloon with a volume of 39.9 L is released at sea-level, where the prevailing conditions are 756.0 torr and 24.4 C. The balloon can expand to a maximum volume of 900 L. If the balloon rises to an altitude at which the temperature is -7.3 C and the pressure is 0.061 atm, what will the volume of the balloon be?

Solution:

Let:

$V1 = 39.9L$

$T1 = 24.4℃ = 273.15 + 24.4 = 297.55K$

$P1 = 756\ torr$

$Vmax = 900L$

$T2 = -7.3℃ = 273.15 + (-7.3) = 265.85K$

$P2 = 0.061\ atm = 0.061 * 760 = 46.36\ torr$

$V2 - ?$

$\frac{P1*V1}{T1} = \frac{P2*V2}{T2}$

$V2 = \frac{P1*V1}{T1} * \frac{T2}{P2} = \frac{P1*V1*T2}{P2*T1}$

$V2 = \frac{756*39.9*265.85}{46.36*297.55} = 581.34L$

Answer: 581.34 L