A balloon contains 46.3 L of Helium at 42 oC, and 2.01 atm is released into the air. At a certain altitude, the temperature falls to 21 oC, and the pressure falls to 0.25 atm. What is the volume of the balloon under these conditions?

A. 3.5 L

B. 35.0 L

C. 347.5 L

D. 3475.0 L

E. None of the Above

## Solution:

Consider 2 state of the thermodynamic system:

1). $V_1$ = 46.3L;

$T_1$ = 42◦C = 315.15K;

$P_1$ = 2.01atm.

2). $V_2$ is unknown;

$T_2$ = 21◦C = 294.15K;

$P_2$ = 0.25atm.

According to Ideal gas law:

$$V_2 = \frac{nRT_2}{P_2} = \frac{P_1V_1RT_2}{RT_1P_2} = \frac{P_1V_1T_2}{T_1P_2} = \frac{2.01atm \times 46.3L \times 294.15K}{315.15K \times 0.25atm} = 347.5L$$

**Answer:** C. 347.5 L.