Question

The volume of a hot air balloon is 150 m^3 and the pressure is the same as the pressure of the atmosphere surrounding it, that is 1.00 atm. What is the temperature of the air in the balloon if its STP volume is 120 m^3 ?

Given

$V = 150$ m^3
$V_o = 120$ m^3
$p = p_o = 1.00$ atm
$T_o = 273$ K
$T = ?$

Solution

According to the equation of state of ideal gas

$$\frac{p \cdot V}{T} = \frac{p_o \cdot V_o}{T_o}$$

Hence

$$T = \frac{p \cdot V \cdot T_o}{p_o \cdot V_o}$$

Substituting the known values into the last equation we have

$$T = \frac{1.00 \cdot 150 \cdot 273}{1.00 \cdot 120} = 341\,K = 68^o C$$

Answer: 68°C