Answer on Question #72386-Physics-Other

An automobile tire has a volume of 988 in^3 and contains air at a gauge pressure of 24 lb/in^2(psi) when the temperature is -2.6 ℃. Find the temperature of air in the tire when its volume increases to 1020 in^3 and its gauge pressure becomes 26.9 lb/in^2.

Solution

For the ideal gas we have:

$$\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2}$$

$$T_2 = T_1 \left(\frac{p_2}{p_1}\right)\left(\frac{V_2}{V_1}\right)$$

$$T_2 = (273.15 - 2.6)\left(\frac{26.9}{24}\right)\left(\frac{1020}{988}\right) = 313.06\ K.$$

The temperature of air in the tire when its volume increases to 1020 in^3 and its gauge pressure becomes 26.9 lb/in^2 is

$$t_2 = 313.06 - 273.15 = 39.9℃$$

Answer: 39.9℃.

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