Task:
if the balloon full of gas that you produced were brought out into a cold day (-20C) and put under 3.5 atm of pressure, what would the new volume be?

Solution:

The relationship among the pressure, temperature, and volume of an enclosed gas is described by the combined gas law

According to the Combined gas Law, if the amount of gas is constant

$P_1 \cdot V_1 / T_1 = P_2 \cdot V_2 / T_2$

P_1 – the initial pressure (atm)
V_1 – the initial volume (L)
T_1 – the initial temperature (°C)
P_2 – the new pressure (atm)
V_2 – the new volume (L)
T_2 – the new temperature (°C)

There is no initial volume, pressure and temperature given. Let's think that we have SATP: the initial pressure is 1 atm, the initial temperature is 298 K.

Let's convert Celsius grads to Kelvins
T(K) = 273 + T (°C)
T_2 = 273 + (-20) = 253K

The new volume is
$V_2 = P_1 \cdot V_1 \cdot T_2 / T_1 \cdot P_2$

$V_2 = 1 \cdot V_1 \cdot 225 / 298 \cdot 3.5 = 0.216V_1$

Answer: $V_2 = 0.216 \cdot V_1$

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