A sample of argon gas is sealed in a container. The volume of the container is doubled. If the pressure remains constant, what happens to the absolute temperature?

Solution.

$$V_2 = 2V_1, P_2 = P_1;$$

$$T_1 - ?$$

Clapeyron Equation:

$$P_1V_1 = \frac{m_1}{M}RT_1.$$

P_1 – the pressure of the argon gas;
V_1 - the volume the container;
m_1 - the mass of the argon gas;
M - the molar mass of the argon gas;
R – the gas constant;
T_1 - the absolute temperature.

Clapeyron Equation after doubling of the volume:

$$P_2V_2 = \frac{m_2}{M}RT_2;$$

A sample of argon gas is sealed then the mass is the same:

$$m_2 = m_1.$$

The pressure remains constant:

$$P_2 = P_1.$$

The volume of the container is doubled:

$$V_2 = 2V_1.$$

$$P_1 2V_1 = \frac{m_1}{M}RT_2.$$

First equation: $P_1V_1 = \frac{m_1}{M}RT_1$.

Second equation: $P_1 2V_1 = \frac{m_1}{M}RT_2$.

Divide second equation by first equation:

$$\frac{T_2}{T_1} = 2;$$

$$T_2 = 2T_1.$$

Answer: The absolute temperature is doubled: $T_2 = 2T_1$.