Gas laws: Gay-Lussac's law

Recall that in Boyle's law, T is kept constant:

$$T = const \quad \Rightarrow \quad p \cdot V = const$$

In Gay-Lussac's law, V is kept constant:

$$\mathrm{V} = const \quad \Rightarrow \quad \frac{p}{T} = const$$

Other ways of writing Gay-Lussac's law :

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

$$\frac{p_2}{p_1} = \frac{T_2}{T_1} = \frac{t_2 + 273}{t_1 + 273}$$

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Problem 1.
A cylinder is filled with gas. The pressure inside is $10\ 000\ Pa$, and the temperature is $20\ ℃$. We increase the temperature to $100\ ℃$. What happens to the pressure inside the cylinder? Calculate the new pressure.

Problem 2.
A gas has an initial pressure of $100\ kPa$, a volume of $100\ cm^3$, and a temperature of $27\ ℃$. First, the gas is compressed at constant temperature, so its volume decreases by a factor of two. Then, the volume of the container is fixed, and it is cooled down to $-123\ ℃$ using liquid nitrogen. Find the final pressure of the gas.

Problem 3.
The pressure of air in a bottle at $7\ ℃$ is equal to the atmospheric pressure of $100\ kPa$. How much does the temperature of the bottle need to increase so that a cork closing the bottle will be pushed out? Without heating, the cork could be pulled out by a force of $10\ N$. The cross-sectional area of the cork is $2\ cm^2$.

Hint: Remember that the cork is also experiencing pressure from the atmosphere.