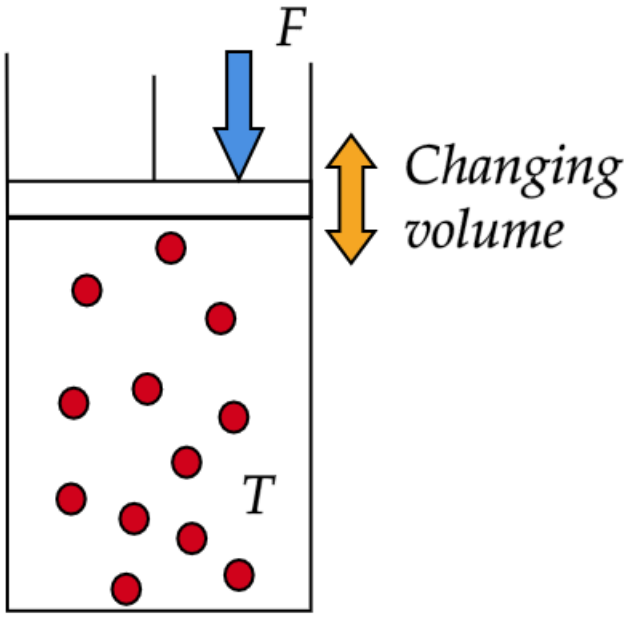
Gas laws: Boyle's law

We will discuss three gas laws that describe the relations between T, V, and p.



In Boyle's law, T is kept constant:

$$T = const$$

$$p \cdot V = const$$

Another way of writing Boyle's law:

$$p_1 \cdot V_1 = p_2 \cdot V_2$$

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Problem 1.
A cylinder with a piston is filled with gas. The pressure inside is $1000\ Pa$. We push the piston inside the cylinder and decrease the volume of the gas two times. Find the new pressure if the temperature of the cylinder is kept constant.

Problem 2.
A cylinder with a piston is filled with gas at a pressure $100\ 000\ Pa$. Again, the temperature of the cylinder is kept constant. The pressure inside the cylinder equals the pressure outside the cylinder, so the piston does not move. The volume of the gas inside the cylinder is $1000\ cm^3$. We put a $10\ kg$ stone on the piston. The piston moves down and stops, compressing the gas in the cylinder. Find the new volume of the gas if the area of the piston is $10\ cm^2$.

Problem 3*.
To make the volume of a gas in a cylinder under a piston 3 times smaller, one must place a block of mass m on the piston. What is the mass of another block one needs to add to this one so that the volume becomes 4 times smaller? The temperature is kept constant.