

STP most commonly is used when performing calculations on gases, such as gas density. The standard temperature is 273 K (0° Celsius) and the standard pressure is 1 atm or 101.3 kPa pressure. At STP, one mole of gas occupies 22.4 L of volume (molar volume).

This task can be solved by using ideal gas law.

The ideal gas law is the equation of state of a hypothetical ideal gas. It is a good approximation to the behaviour of many gases under many conditions, although it has several limitations. The ideal gas law is often introduced in its common form:

$$PV = nRT$$

where P is the pressure of the gas, V is the volume of the gas, n is the amount of substance of gas (also known as number of moles), T is the temperature of the gas and R is the ideal, or universal, gas constant.

So it is one amount of gas under different conditions.

$$P_1V_1 = nRT_1 \text{ and,}$$

$$P_2V_2 = nRT_2$$

If R is constant and n is too:

$$P_1V_1 / T_1 = nR \text{ and,}$$

$$P_2V_2 / T_2 = nR, \text{ so}$$

$$P_1V_1 / T_1 = P_2V_2 / T_2$$

Given:

$$T_1 = 29 \text{ C} = 302\text{K}$$

$$T_2 = 273\text{K}$$

$$P_1 = 0.53 \text{ atm}$$

$$P_2 = 1 \text{ atm}$$

$$V_1 = 39 \text{ ml} = 0.039\text{L}$$

$$P_1V_1T_2 = P_2V_2T_1$$

$$V_2 = P_1V_1T_2 / T_1P_2$$

$$V_2 = 0.53 * 0.039 * 302 / 273 = \mathbf{0,023 \text{ L or } 23 \text{ mL}}$$