

12 • The Gas Laws

PRESSURE UNITS

$$1 \text{ atm} = 760 \text{ mmHg} = 760 \text{ torr} = 101.3 \text{ kPa} = 14.7 \text{ psi}$$

Background:

Pressure is defined as Force / Area such as pounds per square inch (psi).

The weight of air pushing down per square inch is 14.7 pounds per square inch or **14.7 psi**.

A barometer can be used to measure pressure. A column of mercury (Hg) that is 0.760 meter (760 mm) tall has the same weight as a column of air from sea level to the edge of the stratosphere. The height of this column is a good measure of air pressure... **760 mmHg**.

Evangelista Torricelli did a lot of experiments with pressure and so 1 mmHg is also called 1 torr. So, air pressure has a value of **760 torr**. This amount of pressure is also called **1 atm** (one atmosphere) because it IS the atmosphere.

In metric units, pressure is Newtons (force) per square meter (area). One Newton is not very much pressure... about the weight of a small apple (get it... apple... Newton)... and if that force is exerted over a square meter, the amount of pressure is very small and called a pascal (Pa). It is more useful to talk of kilopascals (kPa) which would be the weight of 1000 small apples exerted over a square meter. Air pressure is equal to **101.3 kPa**.

Since each of these values (see the top of the page) represent the same amount of pressure, any two of them can be used as a conversion factor. You can convert one pressure unit into another.

Example:

<p>What is 515 mmHg in kPa?</p> $515 \text{ mmHg} \times \frac{101.3 \text{ kPa}}{760 \text{ mmHg}} = 68.6440789 \text{ kPa} = 68.4 \text{ kPa}$

Problems:

- 745 mmHg into psi
- 727 mmHg into kPa
- 52.5 kPa into atm
- 0.729 atm into mmHg
- 522 torr into kPa
- 1.10 atm into psi
800. mmHg into atm
- 125 kPa into torr