

Properties of Gases

1. Gases are fluids
2. Gases have low density
3. Gases are highly compressible
4. Gases completely fill a container



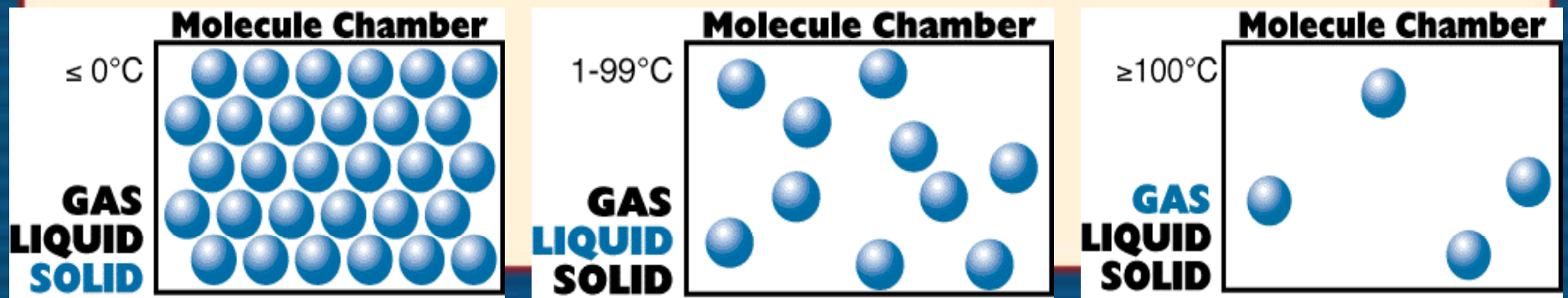
1. Gases are fluids

Gases are considered fluids. People often use the word fluid to mean “liquid,” however the word fluid actually means, “any substance that can flow.”



2. Gases have low density

Gases have much lower density than liquids and solids. Because of the large distances between gas particles, most of the volume occupied by a gas is empty space.



3. Gases are highly compressible

Since the space between the molecules is great, a gas can be forced to occupy a much smaller space by applying pressure. Solids and liquids require a great amount of pressure in order to compress.



4. Gases completely fill a container

A solid has a certain shape and volume. A liquid has a certain volume and takes the shape of the container that holds it. A gas takes both the shape and the volume of the container that holds it.



Pressure

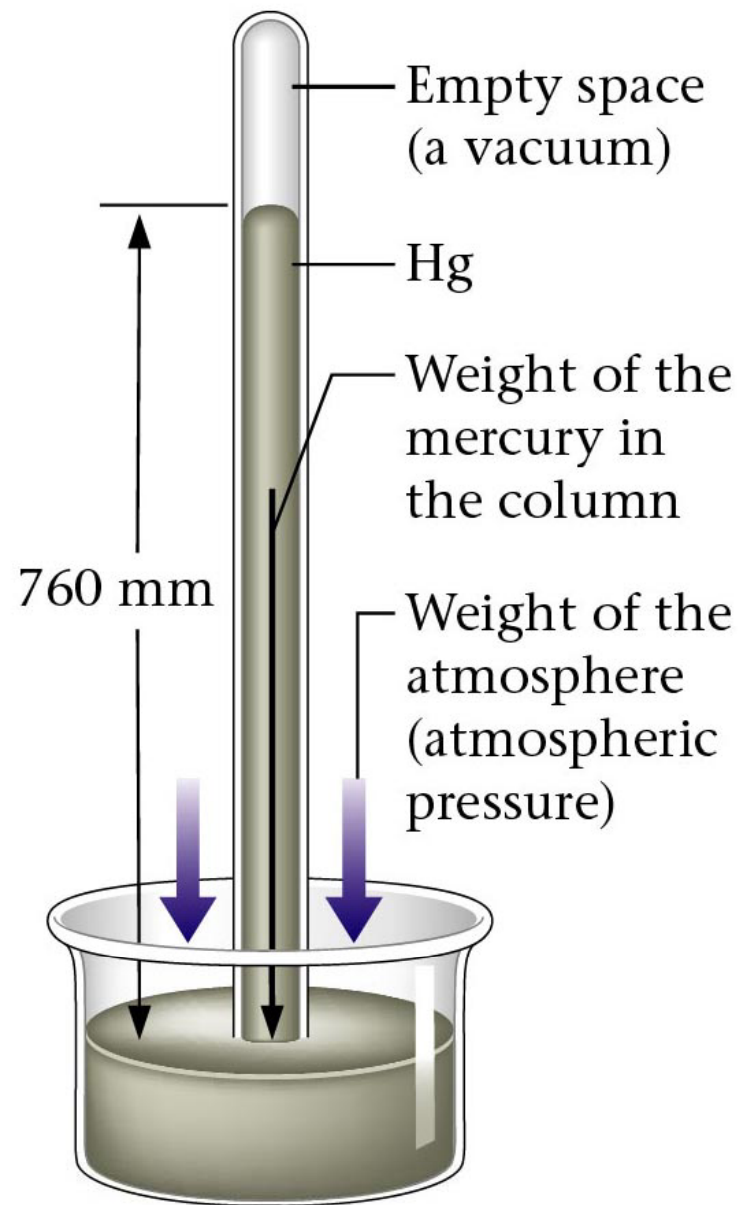
Gases have mass

Pressure defined as “force divided by area”

Table 1 Pressure Units

Unit	Abbreviation	Equivalent number of pascals
Atmosphere	atm	1 atm = 101 325 Pa
Bar	bar	1 bar = 100 025 Pa
Millimeter of mercury	mm Hg	1 mm Hg = 133.322 Pa
Pascal	Pa	1
Pounds per square inch	psi	1 psi = $6.892\ 86 \times 10^{-3}$ Pa
Torr	torr	1 torr = 133.322 Pa

Figure 13.2:
A glass tube
is filled with
mercury and
inverted in a
dish of
mercury at
sea level.



Kinetic-molecular theory

Used to predict how gases behave

Postulates of the Kinetic Molecular Theory of Gases

1. Gases consist of tiny particles (atoms or molecules).
2. These particles are so small, compared with the distances between them, that the volume (size) of the individual particles can be assumed to be negligible (zero).
3. The particles are in constant random motion, colliding with the walls of the container. These collisions with the walls cause the pressure exerted by the gas.
4. The particles are assumed not to attract or to repel each other.
5. The average kinetic energy of the gas particles is directly proportional to the Kelvin temperature of the gas.