# Gases

**Brownian motion** was the first proposal that all particles travel in straight-line,

zig-zag motion.

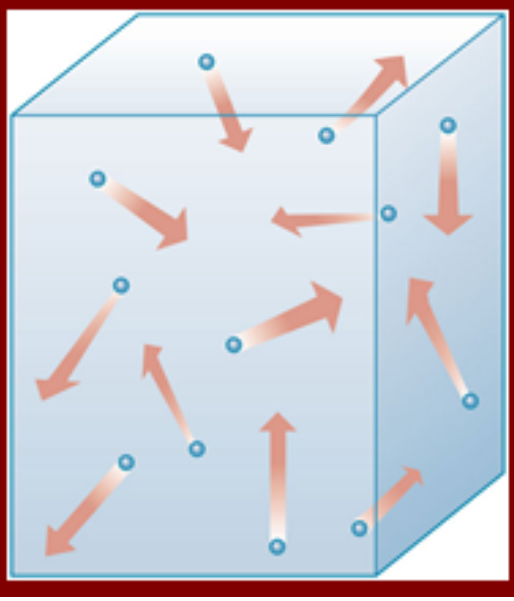
This is one of the theories that lead to the **Kinetic Molecular Theory**.

- All matter is made of tiny particles.
- Particles of matter are in constant motion.
- There are spaces between all particles.
- There are attractions between all particles of matter.

- Most of the properties of gases can be explained by the KMT. Using the properties of a gas we can provide an empirical definition:

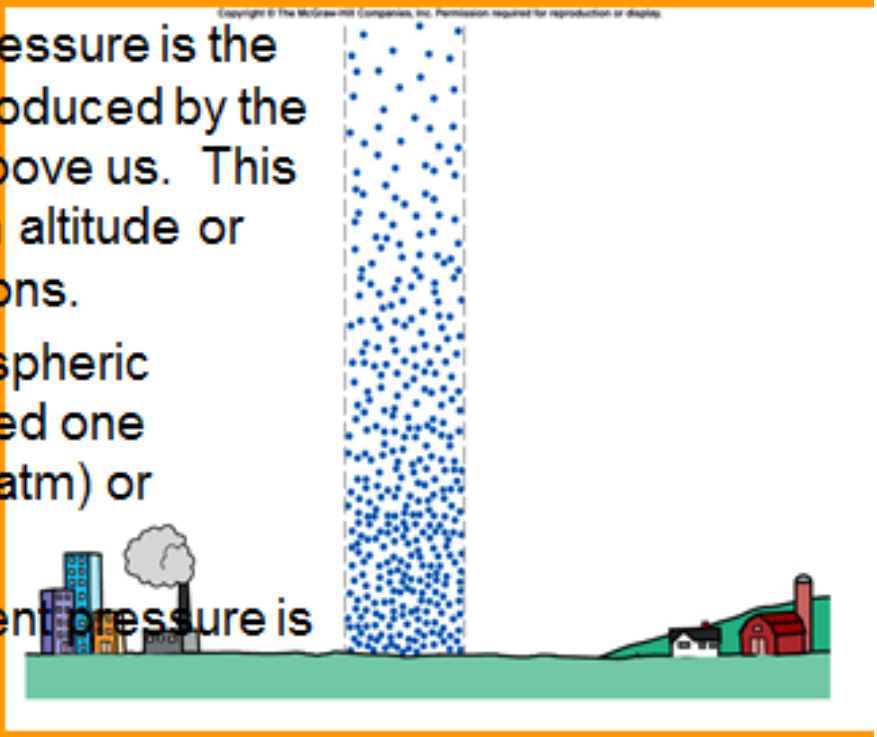
- Gases always fill their container.
- They are highly compressible.
- They diffuse rapidly.
- Temperature affects pressure and volume.

- Pressure is a force over a specific area. Units would be Newton/meter$^2$ ,which is also a **Pa**scal.
- Pascal is a small pressure so typically we use **K**ilo**pa**scals as our unit of pressure. The pressure inside a container is caused by the particles colliding with the inside walls of the container.
- Factors that affect pressure, such as particle size, mass or speed, can all be quantitatively measured and then mathematically related.

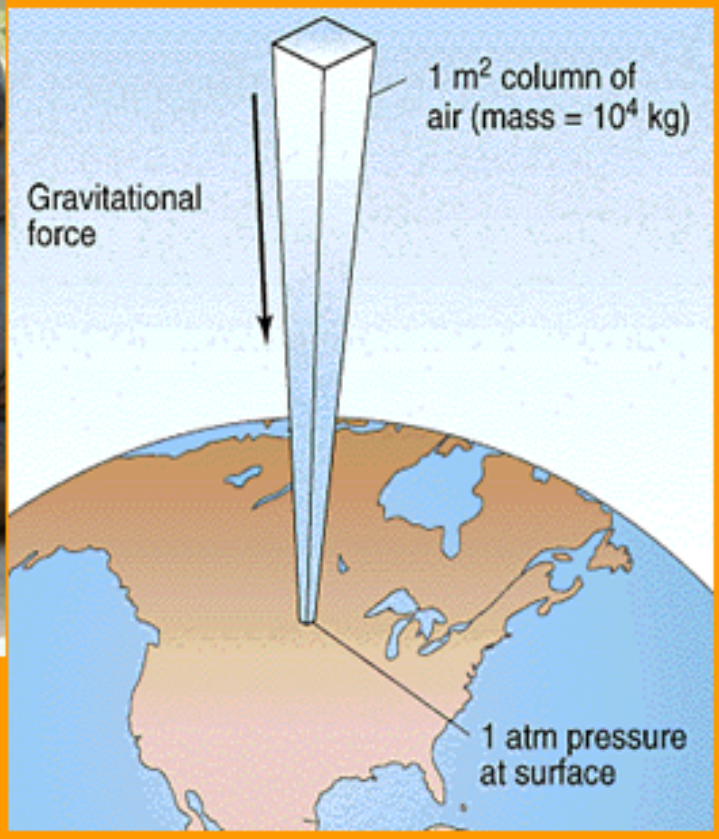


# Atmospheric Pressure

- Atmospheric pressure is the natural force produced by the column of air above us. This will change with altitude or climatic conditions.
- Standard atmospheric pressure is called one atmosphere (1 atm) or 101.325 kPa.
- Standard ambient pressure is 100 kPa.



You've got an elephant worth of air on you right now!!!



# Pressure

1 atm = 760 mm Hg = 101.325 kPa

100 kPa = 750 mm Hg

100 kPa = ? atm

$$100\ \text{kPa} \times \frac{1\ \text{atm}}{101.325\ \text{kPa}} = 0.9869\ \text{atm}$$

## COMMUNICATION example 1

Standard ambient pressure is defined as 100 kPa. Convert this value to the corresponding values in atmospheres and millimetres of mercury.

### Solution

$$100\ \text{kPa} \times \frac{1\ \text{atm}}{101.325\ \text{kPa}} = 0.987\ \text{atm}$$

$$100\ \text{kPa} \times \frac{760\ \text{mm Hg}}{101.325\ \text{kPa}} = 750\ \text{mm Hg}$$

# Tempurature

0°C = 273.15 K ← Kalvin (absolute Temperature)

-273.15°C = 0 K

25°C = 298.15 K

°C + 273.15 = K

- P. 150 # 1, 2, 4
- P. 154 # 11, 12 & 13
- P. 152 # 7 & 8
- P. 156 # 15 & 16