

Question:

A balloon has mass, so why doesn't a helium balloon fall to the floor? Is there a force pushing up on the balloon?

Cork floating in water

As I accelerate across the room, which way will the cork move?

- In the same direction as the acceleration
- In the direction opposite the acceleration

Air

- Pressure
 - The average force exerted on each unit of surface area

Air

- Pressure
- Density
 - How much mass is contained in each unit of volume

Air

- Pressure
- Density
- Temperature
 - Kelvin - absolute temperature scale
 - The zero of temperature is where there is no internal kinetic energy

Air

$\text{Pressure} \propto \text{Density} \cdot \text{Absolute temperature}$

- Doesn't work for comparing two gases yet
- Only for independent particles

Archimedes' Principle

An object immersed in fluid experience an upward buoyant force equal to the weight of the displaced fluid

- Because gravity causes pressure to decrease as you go up
- The buoyant force depends on the fluids weight not the objects

Cork floating in water

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Ideal gas law

Pressure $\propto$ Boltzmann constant $\cdot$ Particle density $\cdot$ Absolute temperature

- Only for independent particles
- Real particles do interact somewhat