

### 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

Pressure  $\propto$  Density  $\cdot$  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

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

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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