Physical Principals

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Temperature

- Absolute 0
  - No kinetic energy
- Water- Freezing / Boiling
  - Kelvin
  - Celsius
  - Fahrenheit

Heat Transfer

- Conduction
  - Direct contact
- Convection
  - Mixing (contact) of molecules at different temperatures
- Radiation
  - (no direct physical contact) Transfer of energy
- Evaporation/Condensation
  - Transfer of energy with a change of state

Liquid Properties

- Archimedes' Principle
  - Buoyancy is dependant upon the force of pressure from below a submerged object.
- Viscosity
  - Force opposing a fluid's flow
- Cohesion
  - Attractive force of like molecules
- Adhesion
  - Attractive force for between different molecules

Liquid Properties

- Surface Tension
  - Force exerted at the liquid surface

$$\text{Laplace Law } P = \frac{4ST}{r}$$

- Evaporation / Vapor pressure / Humidity

Density

- Mass of a substance to it's volume
  - Mass = Gram-molecular weight (GMW)
  - Volume = grams/liter

GMW = sum of atomic weights in molecule

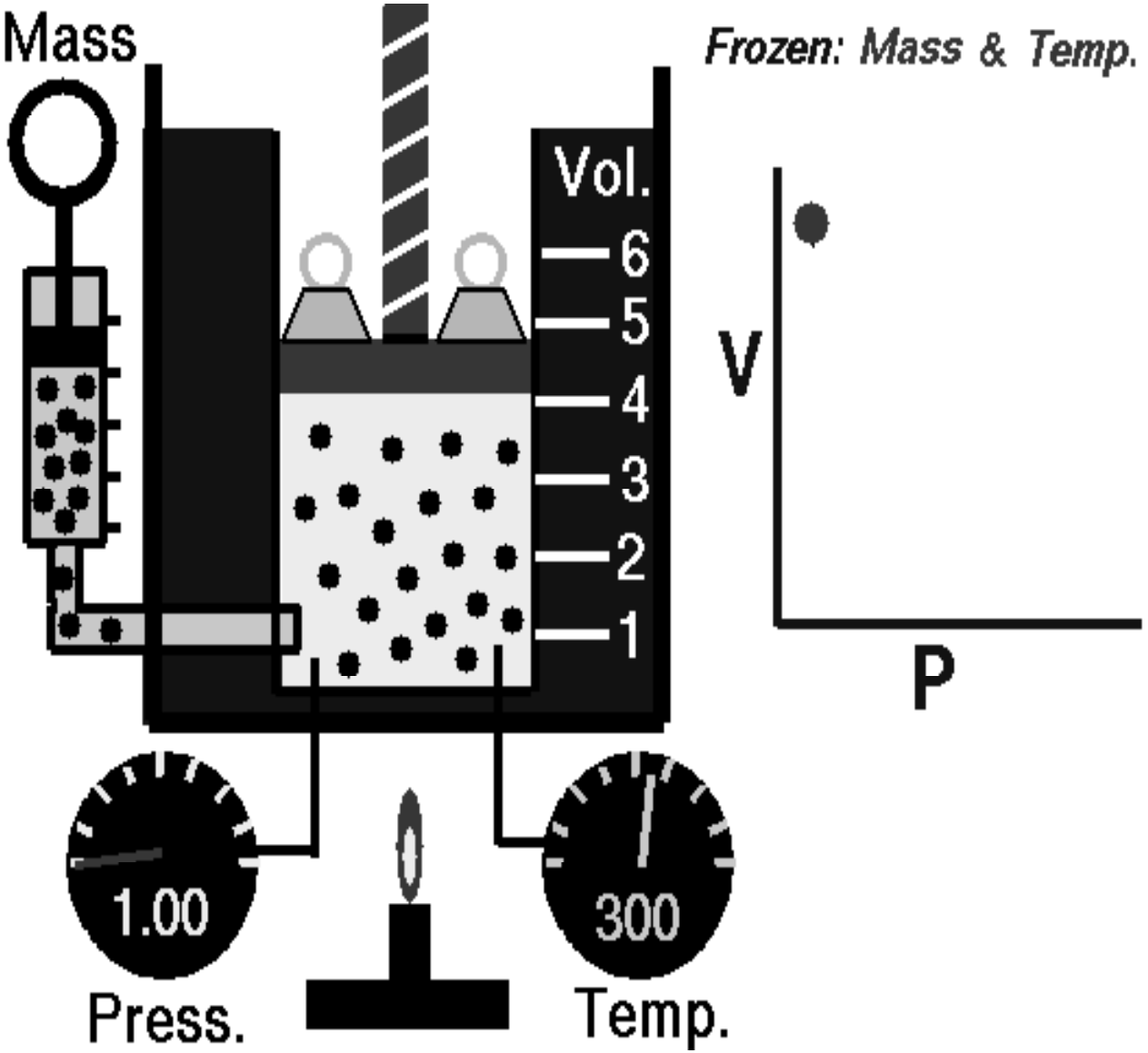
$$\text{Density} = \frac{\text{GMW}}{22.4\text{L}}$$

Avogadro's Law: 1 GMW (mole) of any gas occupies 22.4L @ 0C

Gas Laws - Boyle's Law

- Constant: Mass, Temperature
  - Volume of a gas varies inversely with it's pressure

$P_1 \times V_1 = P_2 \times V_2$



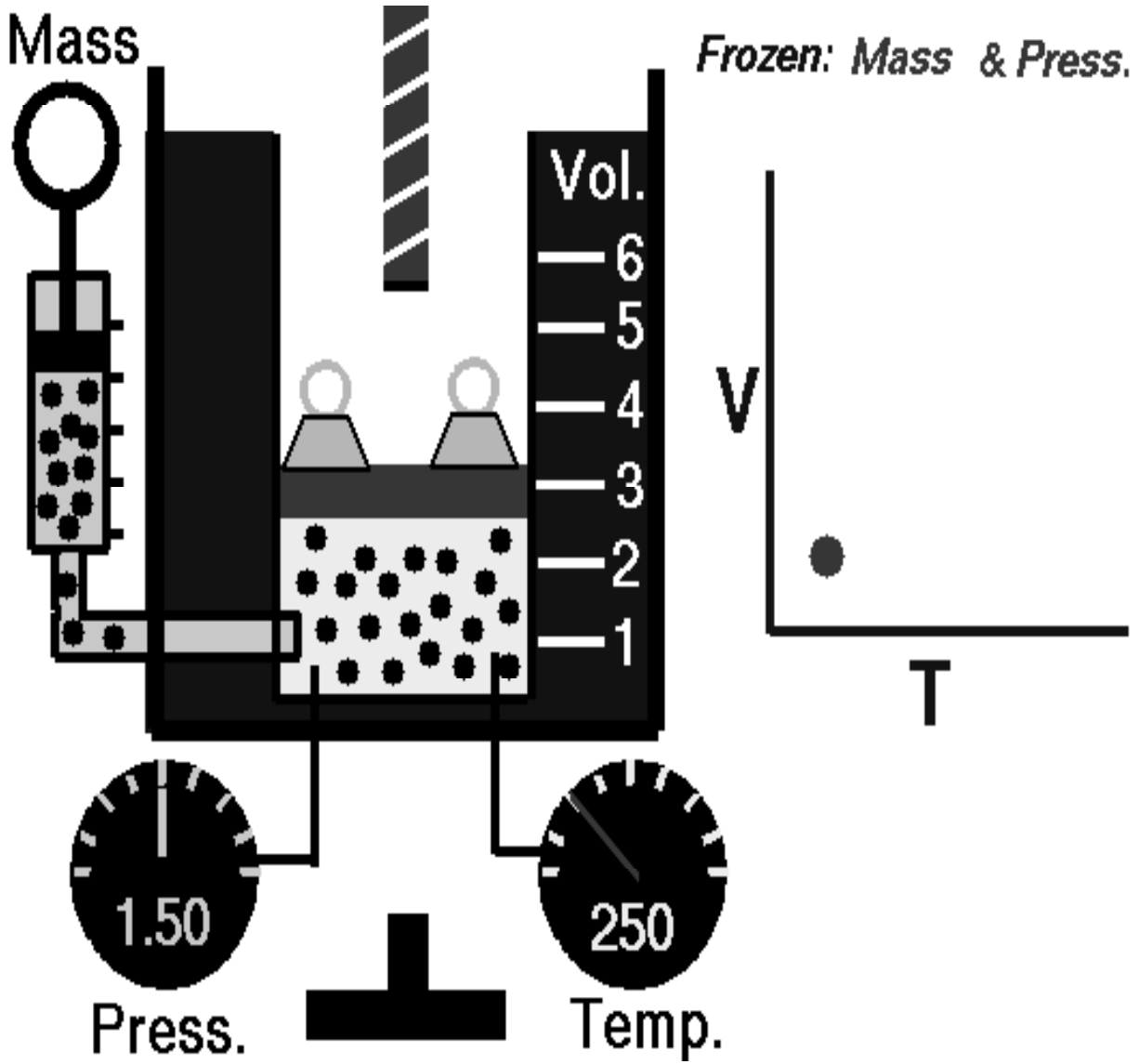
Application:

- A snorkel diver is preparing to descend a freshwater pond to depth of 66ft. At sea level, his lungs contain about 3000ml. Of air. As he descends below the surface of the water, what will happen to the gas volume in his lungs as he descends to 33 ft and then to 66 ft. below the surface of the pond?

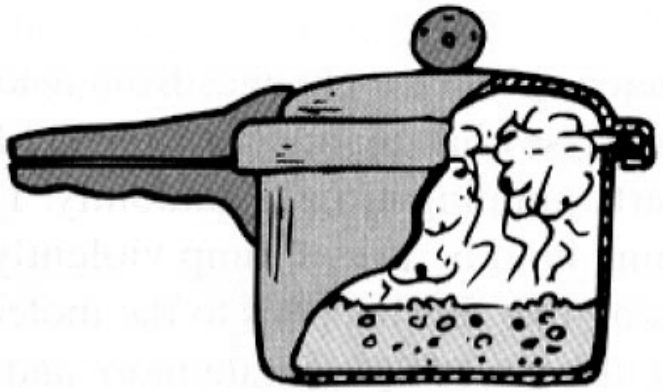
Gas Laws - Charles' Law

- Constant: Mass, Pressure
  - Volume of gas varies directly with temp change

$$\frac{V1}{T1} = \frac{V2}{T2}$$



Gas Laws



- Gay-Lussac's law
  - Constant: Mass, Volume
  - Pressure varies directly with absolute temperature

Application:

- An alarm signals that there is a fire in the basement of the hospital. Although the fire is confined to an area that is approximately 300 ft. from the room where the compressed gas cylinders are stored, you are asked to move the cylinders to a safer location. Why is it necessary to move the cylinders?

Combined Gas Laws

- When dealing with pressure, volume, and temperature, it is common for more than one variable to change.

$$\frac{P1 \times V1}{T1} = \frac{P2 \times V2}{T2}$$

- http://littleshop.physics.colostate.edu/Videos/Pressure/GallonDrum/GallonDrum.html