CONCEPT: CHEMISTRY GAS LAWS

- **Chemistry Gas Laws** are laws that relate together the pressure, volume and temperature of a gas.
  - □ The *Ideal Gas Law* can be used to determine them.

Chemistry Gas Laws

Ideal Gas Law

$PV = nRT$

Variable Relationships

Be Great At Chemistry

- □ **B** = Boyle's Law = _____ & _____ variables
- □ **G** = Gay Lussac's Law = _____ & _____ variables
- □ **A** = Avogadro's Law = _____ & _____ variables
- □ **C** = Charles' Law = _____ & _____ variables

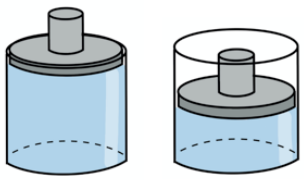
- **Boyle's Law:** states that V and P are _____ proportional at constant n and T.
  - □ Named after Robert Boyle, illustrates how the volume of a container is greatly affected by pressure changes.

Boyle's Law

Volume–Pressure Relationship

$V \propto$ ☐ [n and T are fixed]

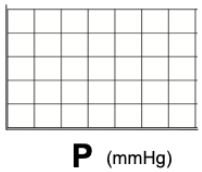
Variables



Volume _____ _____

Pressure _____ _____

V vs. P Plot



Adjusted Formula

- □ ____ = Initial Pressure
- □ ____ = Initial Volume
- □ ____ = Final Pressure
- □ ____ = Final Volume

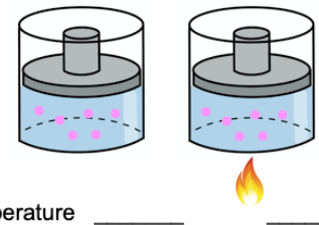
- **Gay-Lussac's Law** (Amonton's Law): states that P and T are _____ proportional at constant n and V.
  - □ As temperature ⇧ gas particles collide with the walls more rapidly, which _____ the pressure.
  - □ All Gas Law calculations must use the SI unit for temperature in _____.

Gay–Lussac's Law

Pressure–Temperature Relationship

$P \propto$ ☐ [n and V are fixed]

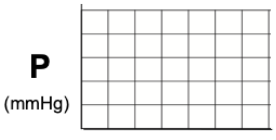
Variables



Temperature _____ _____

Pressure _____ _____

P vs. T Plot



Adjusted Formula

- □ ____ = Initial Pressure
- □ ____ = Initial Temperature
- □ ____ = Final Pressure
- □ ____ = Final Temperature

CONCEPT: CHEMISTRY GAS LAWS

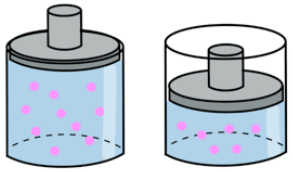
- **Avogadro's Law:** states that V and n are _____ proportional at constant P and T.
  - □ Named after Amedeo Avogadro, shows volumes of gases are connected to their number of molecules.

Avogadro's Law

Volume–moles Relationship

$V \propto$ [ ] [P and T are fixed]

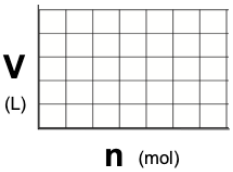
Variables



Volume _____ _____

moles _____ _____

V vs. n Plot



Adjusted Formula

□ ____ = Initial moles
□ ____ = Initial Volume
□ ____ = Final moles
□ ____ = Final Volume

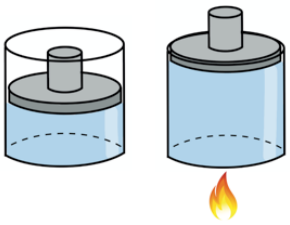
- **Charles's Law**: states that V and T are _____ proportional at constant n and P.
  - □ Named after Jacques Charles, illustrates how the volume of a container is greatly affected by temperature.

Charles' Law

Volume–Temperature Relationship

$V \propto$ [ ] [n and P are fixed]

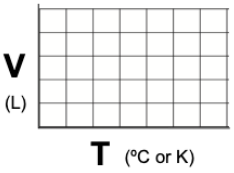
Variables



Volume _____ _____

Temperature _____ _____

V vs. T Plot



Adjusted Formula

□ ____ = Initial Volume
□ ____ = Initial Temperature
□ ____ = Final Volume
□ ____ = Final Temperature

EXAMPLE: A 10.0 L cylinder with a movable piston contains 10.0 g of xenon gas. When an additional 10.0 g of xenon gas are added the volume increases. Which Chemistry Gas Law can be used to justify this result?

a) Charles's Law b) Avogadro's Law c) Gay-Lussac's Law d) Boyle's Law

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PRACTICE: A 10.0 L cylinder with a movable piston exerts 3.00 atm of pressure. What will happen to the pressure if the volume of the container increases to 20.0 L?

a) It will double b) It will decrease by half c) It will increase slightly d) No change

PRACTICE: A sealed container with a movable piston contains a gas with a pressure of 1380 torr, a volume of 820 mL and a temperature of 31°C. What would the volume be if the new pressure is now 2.83 atm, while the temperature decreased to 25°C?