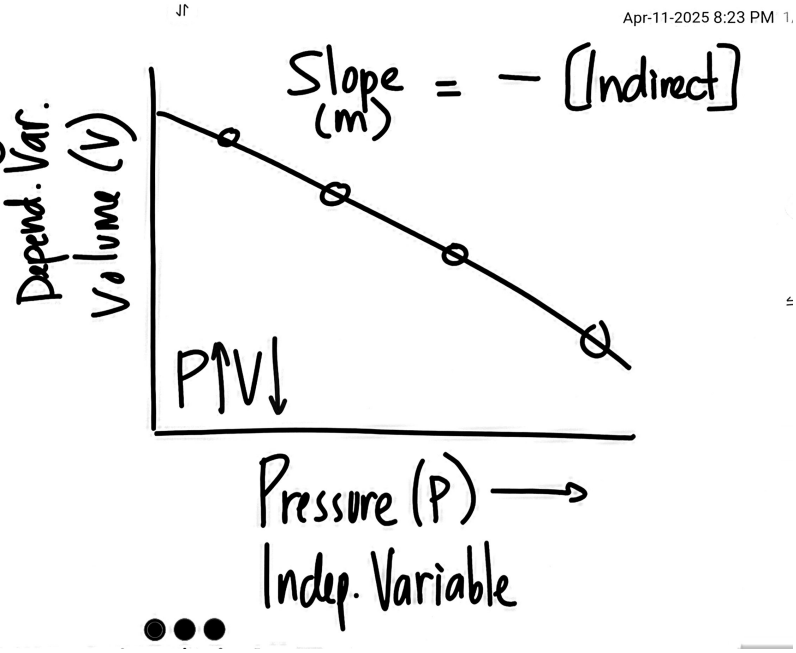
Boyle's Law

Indirect Relationship between P and V

$$P_1 V_1 = P_2 V_2$$

P↑V↓ P↓V↑

Constant T



Charles' Law

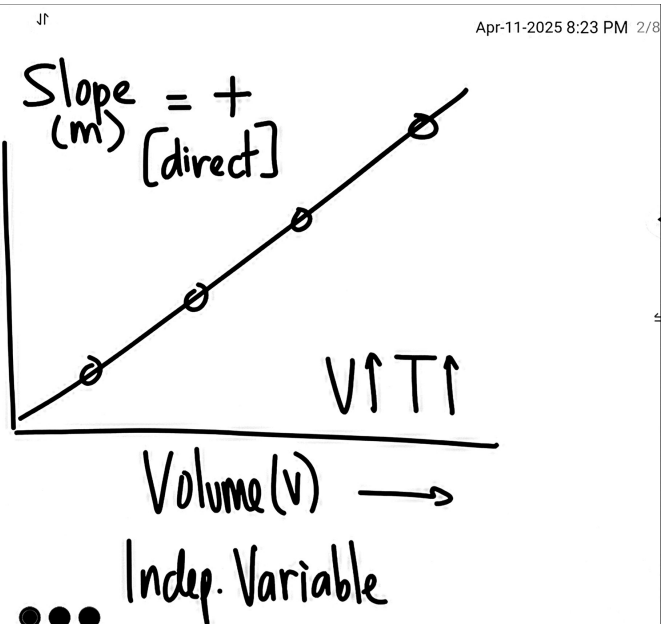
Direct Relationship between V and T

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$V_1 T_2 = V_2 T_1$$

Constant P

V↑T↑
V↓T↓



Gay-Lussac's Law

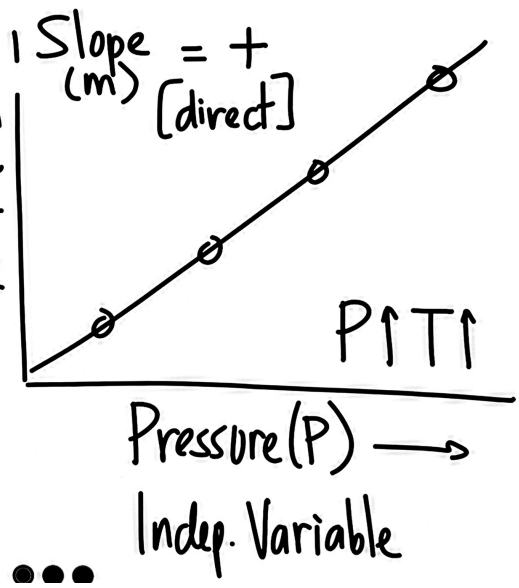
Direct Relationship between P and T

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

$$P_1 T_2 = P_2 T_1$$

Constant V

P↑T↑
P↓T↓



Comparing Gas Laws

Boyle's Law

P and V, constant T

$P_1V_1 = P_2V_2$

P↓V↑ | P↑V↓

Indirect Rel.

Charles' Law

V and T, constant P

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

V↑T↑ | V↓T↓

Direct Rel.

Gay-Lussac's Law

P and T, Constant V

$\frac{P_1}{T_1} = \frac{P_2}{T_2}$

P↑T↑ | P↓T↓

Direct Rel.

Boyle's Law

$$P_1 = \frac{P_2 V_2}{V_1}$$

$$V_1 = \frac{P_2 V_2}{P_1}$$

$$P_2 = \frac{P_1 V_1}{V_2}$$

$$V_2 = \frac{P_1 V_1}{P_2}$$

Charles' Law

$$V_1 = \frac{V_2 T_1}{T_2}$$

$$T_1 = \frac{V_1 T_2}{V_2}$$

$$V_2 = \frac{V_1 T_2}{T_1}$$

$$T_2 = \frac{V_2 T_1}{V_1}$$

Gay-Lussac's Law

$$P_1 = \frac{P_2 T_1}{T_2}$$

$$T_1 = \frac{P_1 T_2}{P_2}$$

$$P_2 = \frac{P_1 T_2}{T_1}$$

$$T_2 = \frac{P_2 T_1}{P_1}$$

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Boyle's Law Example

$$P_1 V_1 = P_2 V_2$$

$$\frac{P_1 V_1}{V_2} = \frac{P_2 \cancel{V_2}}{\cancel{V_2}}$$

$$P_2 = \frac{P_1 V_1}{V_2}$$

$P_1 = 2.93\text{atm}$ $V_1 = 3.96\text{L}$

$P_2 = \_\_\text{atm}$ $V_2 = 2.14\text{L}$

$$P_2 = \frac{2.93\text{atm} \cdot 3.96\text{K}}{2.14\text{K}}$$

$$= 5.42\text{atm}$$

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Charles' Law Example

$V_1 = \_\_\_ L \quad T_1 = 134.49\ k$

$V_2 = 81.34 L \quad T_2 = 374.12\ k$

$\frac{V_1}{T_1} = \frac{V_2}{T_2} \quad V_1 T_2 = V_2 T_1$

$\frac{V_1 T_2}{T_2} = \frac{V_2 T_1}{T_2}$

$V_1 = \frac{V_2 T_1}{T_2}$

$V_1 = \frac{81.34 L \cdot 134.49 K}{374.12 K}$

$= 35.76 L$

Gay-Lussac's Example

$P_1 = 5.38 atm \quad T_1 = \_\_\_ k$

$P_2 = 6.84 atm \quad T_2 = 643.58 k$

$\frac{P_1}{T_1} = \frac{P_2}{T_2} \quad P_1 T_2 = P_2 T_1$

$\frac{P_1 T_2}{P_2} = \frac{P_2 T_1}{P_2}$

$T_1 = \frac{P_1 T_2}{P_2}$

$T_1 = \frac{5.38 atm \cdot 643.58 K}{6.84 atm}$

$= 506.21 K$