

Noteset 7B (Part 2) - In Class Noteset

Fundamental Gas Laws

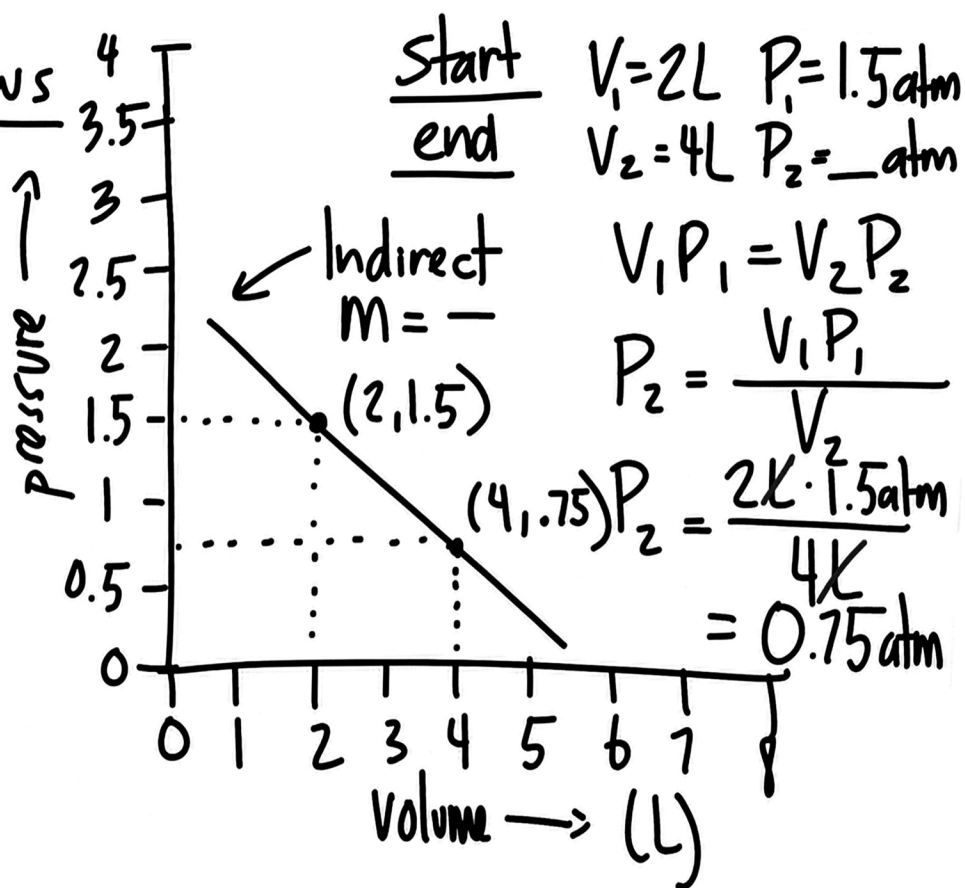
Fundamental Gas Laws

Boyle's Law

Indirect Relation.

$$V \cdot P = k$$

$$\underbrace{V_1 P_1}_{\text{start}} = \underbrace{V_2 P_2}_{\text{end}}$$



Fundamental Gas Laws

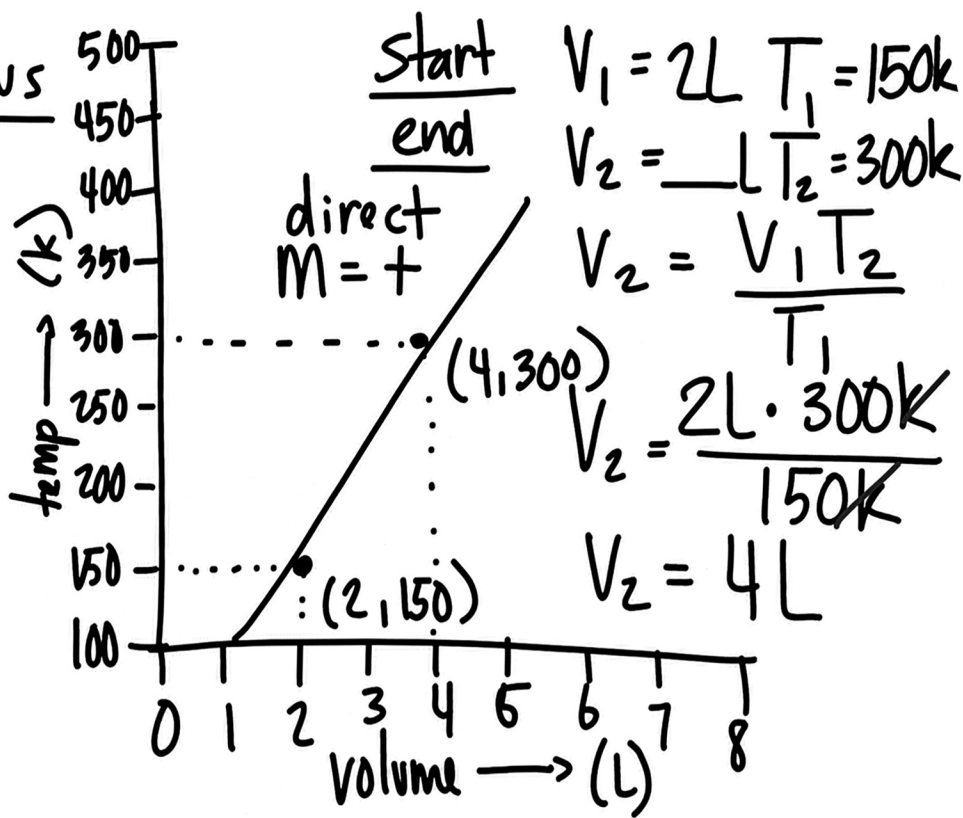
Charles' Law

Direct Relation.

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

cross multiply

$$V_1 T_2 = V_2 T_1$$



Fundamental Gas Laws

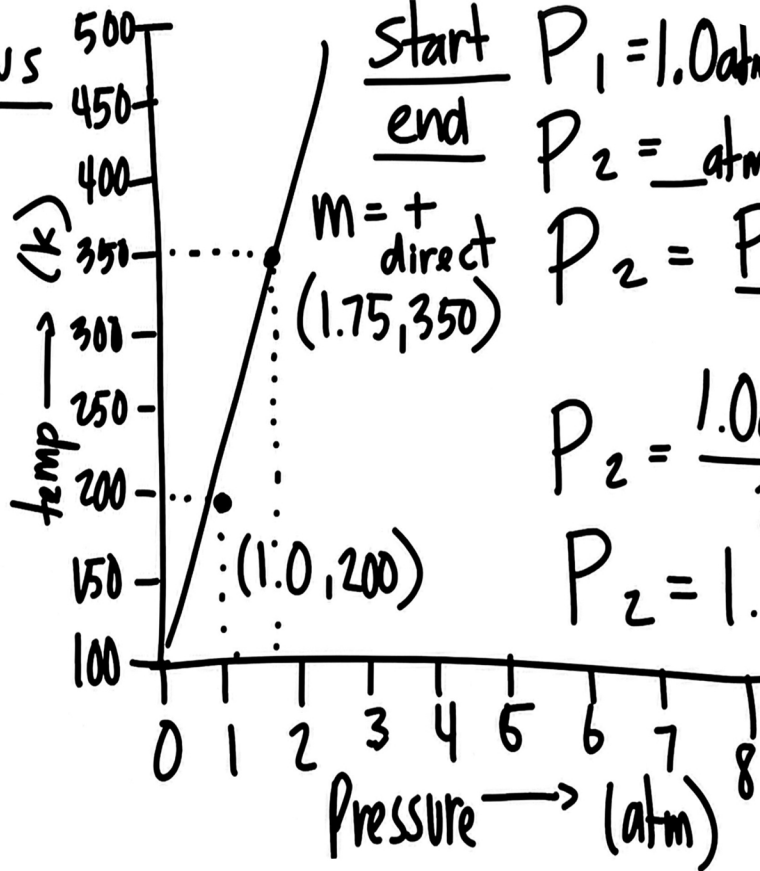
Gay-Lussac's Law

Direct Relation.

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

cross multiply

$$P_1 T_2 = P_2 T_1$$



$$P_1 = 1.0 \text{ atm } T_1 = 200 \text{ K}$$

$$P_2 = \text{ atm } T_2 = 350 \text{ K}$$

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

$$P_2 = \frac{1.0 \text{ atm} \cdot 350 \text{ K}}{200 \text{ K}}$$

$$P_2 = 1.75 \text{ atm}$$

Fundamental gas laws

Boyle's Law

$$V_1 P_1 = V_2 P_2$$

Solve for V_1

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

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

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

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

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

Fundamental gas laws

Boyle's Law

$$P_1 = 3.49 \text{ atm}$$

$$V_1 = 2.58 \text{ L}$$

$$P_2 = 5.28 \text{ atm}$$

$$V_2 = \underline{\hspace{2cm}} \text{ L}$$

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

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

$$V_2 = \frac{2.58 \text{ L} \cdot 3.49 \text{ atm}}{5.28 \text{ atm}}$$

$$\underline{V_2 = 1.71 \text{ L}}$$

Charles' Law

$$V_1 T_2 = V_2 T_1$$

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

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

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

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

Gay-Lussac's Law

$$P_1 T_2 = P_2 T_1$$

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

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

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

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

Charles' Law

$$V_1 = 9.54 \text{ L}$$

$$T_1 = \text{---} \text{ K}$$

$$V_2 = 7.45 \text{ L}$$

$$T_2 = 472.4 \text{ K}$$

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

$$T_1 = \frac{V_1 T_2}{V_2} = \frac{9.54 \cancel{\text{L}} \cdot 472.4 \text{ K}}{7.45 \cancel{\text{L}}}$$

$$T_1 = \underline{604.93 \text{ K}}$$

Gay-Lussac's Law

$$P_1 = 3.88 \text{ atm}$$

$$T_1 = 606.42 \text{ K}$$

$$P_2 = 8.91 \text{ atm}$$

$$T_2 = \text{---} \text{ K}$$

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

$$T_2 = \frac{P_2 T_1}{P_1} = \frac{8.91 \text{ atm} \cdot 606.42 \text{ K}}{3.88 \text{ atm}}$$

$$\underline{T_2 = 1392.58 \text{ K}}$$