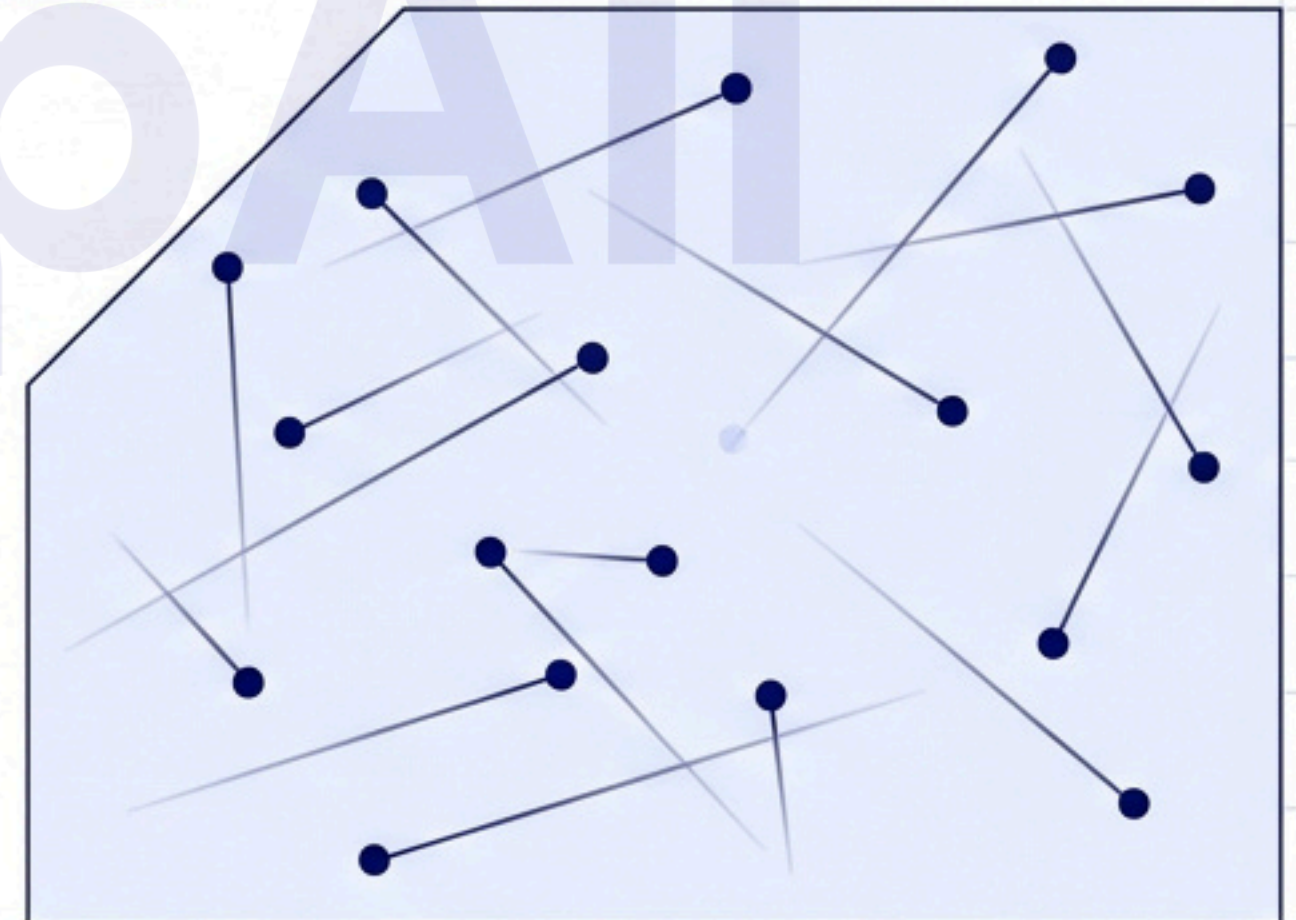


Behaviour Of Gases

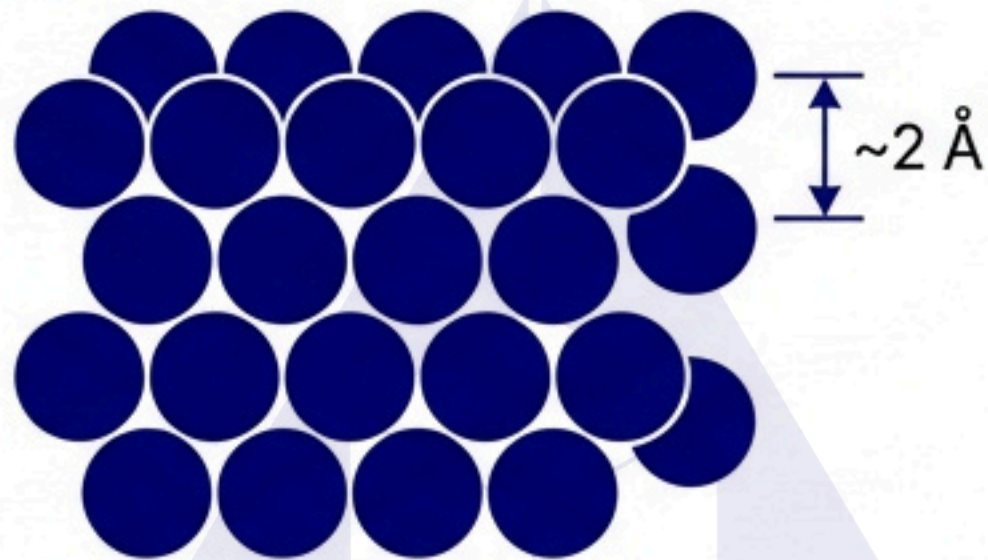
Understanding pressure, volume, and temperature relations for NEET & JEE

Discover why gases follow simple laws and how to master the Ideal Gas Equation through visual analysis.

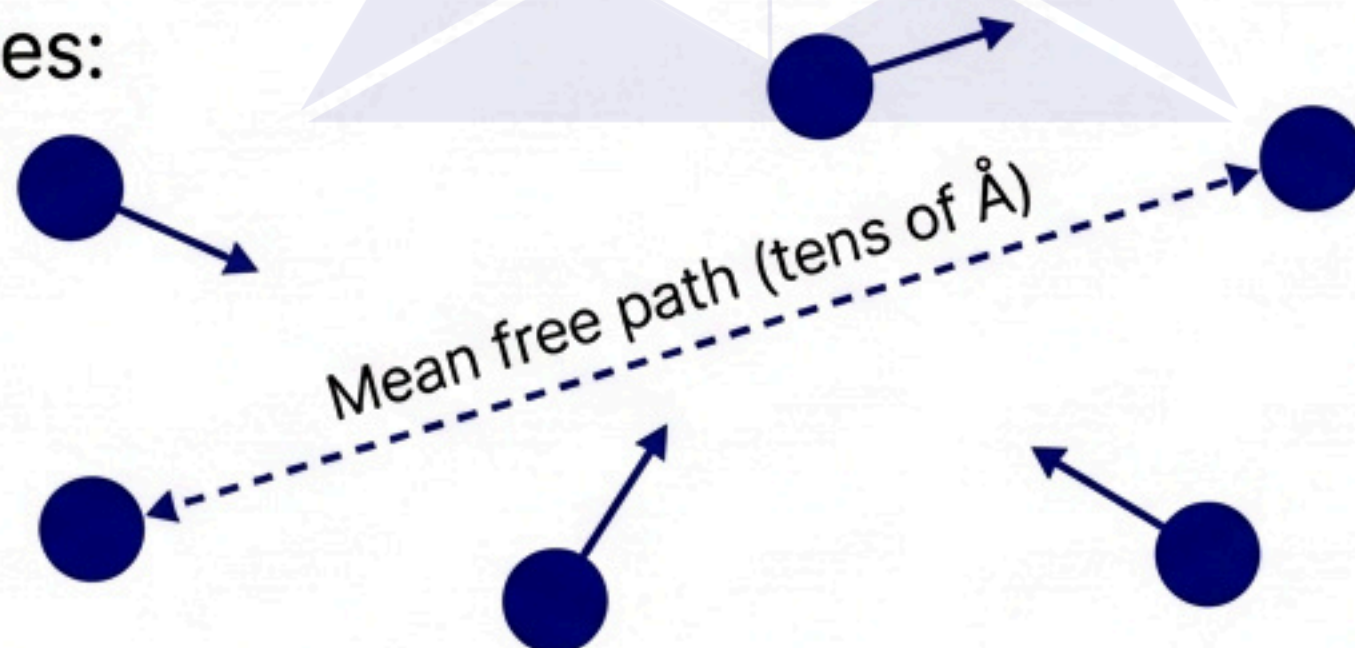


Why Are Gas Laws So Simple?

Solids/Liquids:



Gases:



- Gases consist of rapidly moving atoms or molecules.
- Because molecules are far apart, mutual interactions are negligible.
- Without complex intermolecular forces, gases obey simple, predictable macroscopic laws relating Pressure (P), Volume (V), and Temperature (T).

The Ideal Gas Equation

$$PV = \mu RT$$

P = Pressure | V = Volume | T = Absolute Temp (Kelvin)
 μ = Number of moles | R = Universal Gas Constant ($8.314 \text{ J mol}^{-1} \text{ K}^{-1}$)

With Molecule Count:

$$PV = N k_B T$$

With Number Density:

$$P = k_B n T$$

(k_B = Boltzmann constant, $1.38 \times 10^{-23} \text{ J K}^{-1}$)



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$$E=mc^2$$



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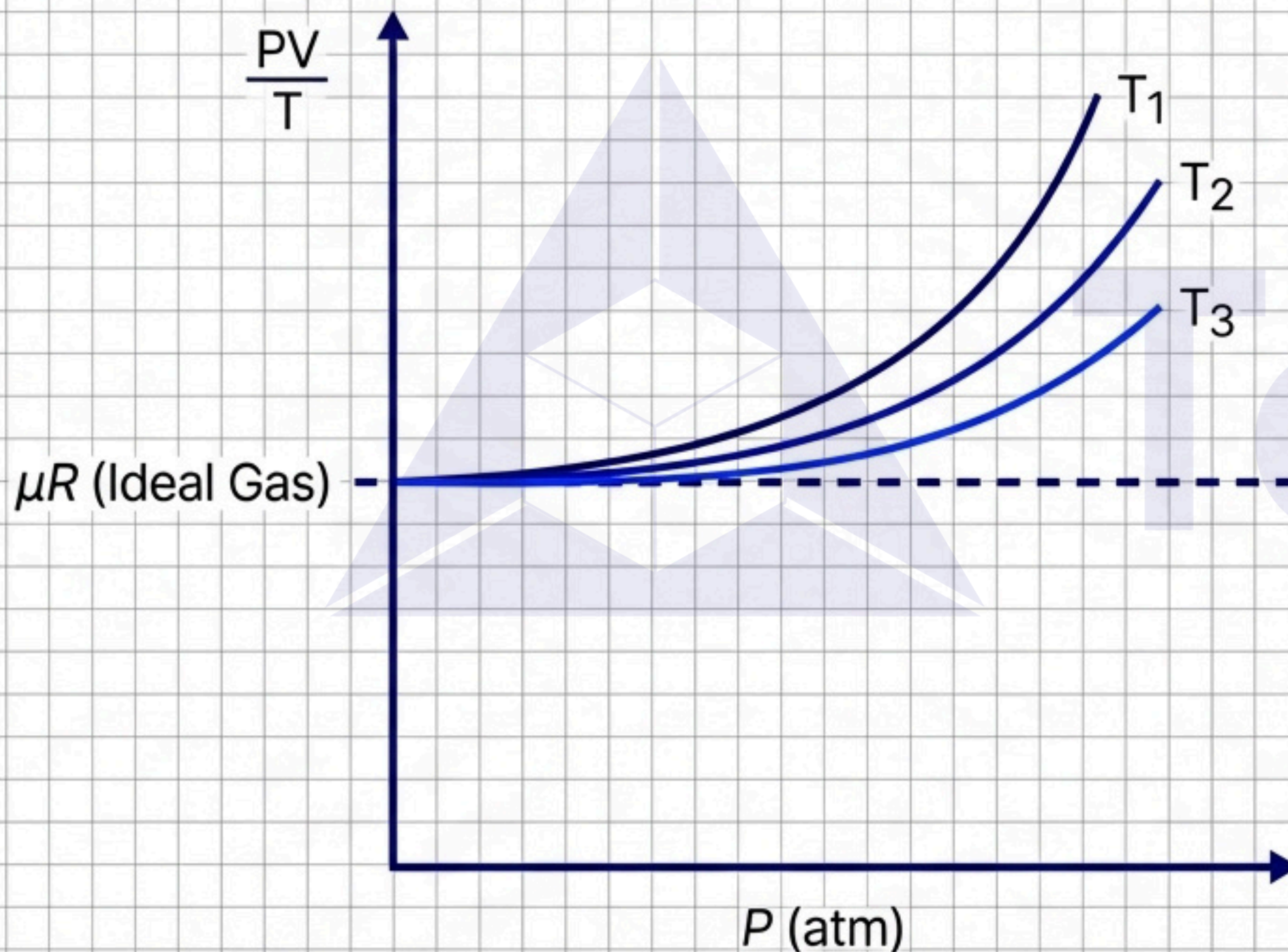
Key Highlights

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- » Track Your Performance Smarter



FIGURE 12.1 | GRAPHICAL ANALYSIS

Real Gases Approach Ideal Behaviour

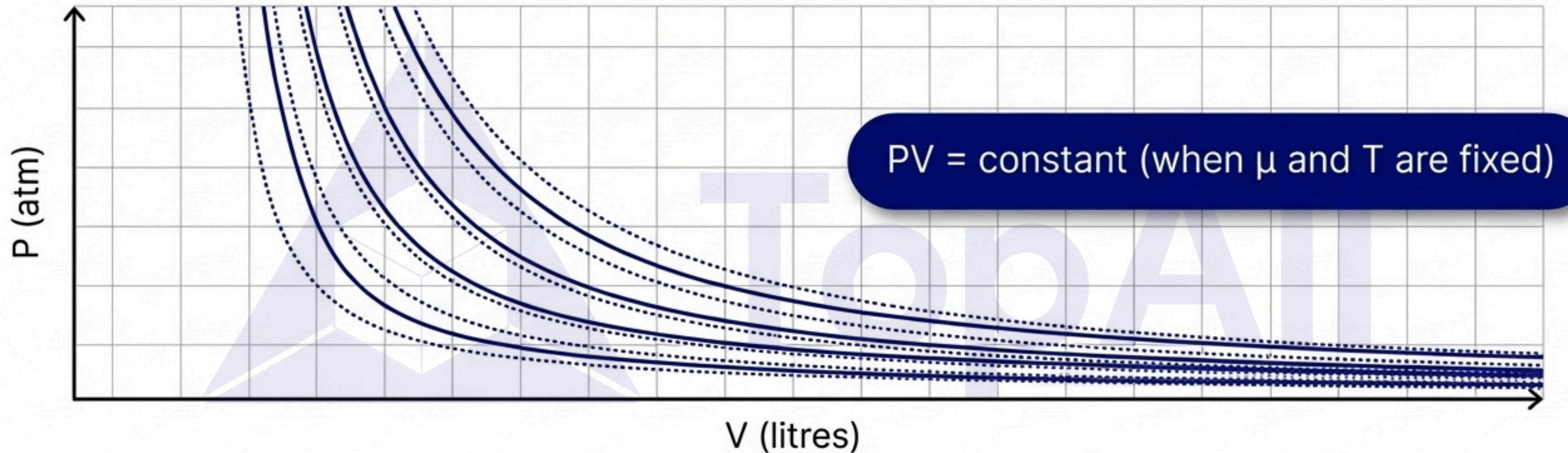


💡 EXAM TIP

- Rule: No real gas is perfectly ideal.
- Condition: Real gases approach ideal behavior exclusively at LOW pressures and HIGH temperatures.
- Reason: Molecules are forced far apart, rendering mutual interactions negligible.

FIGURE 12.2 | ISOTHERMAL RELATION

Pressure Varies Inversely With Volume

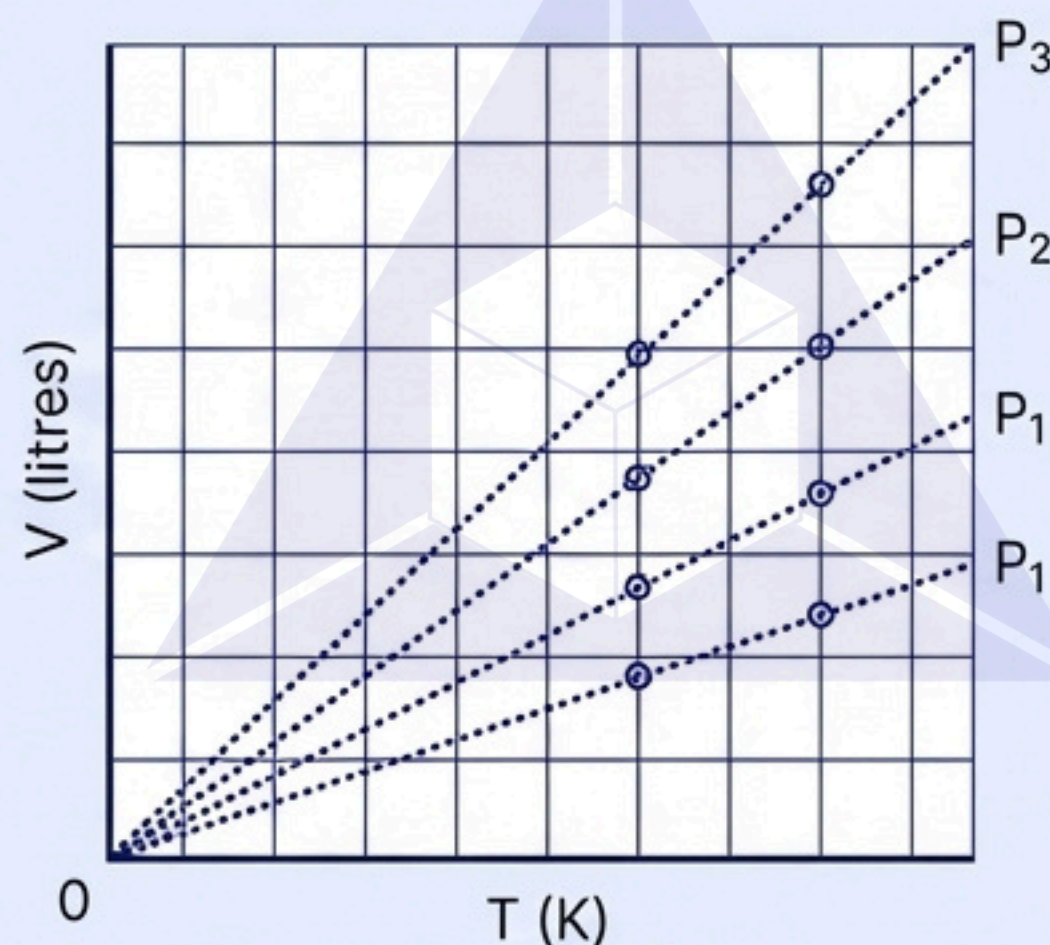


- Derived simply by fixing μ and T in the Ideal Gas Equation.
- Notice that experimental agreement (solid vs. dotted lines) is strongest at higher temperatures and lower pressures.

FIGURE 12.3 & EQUATION 12.9

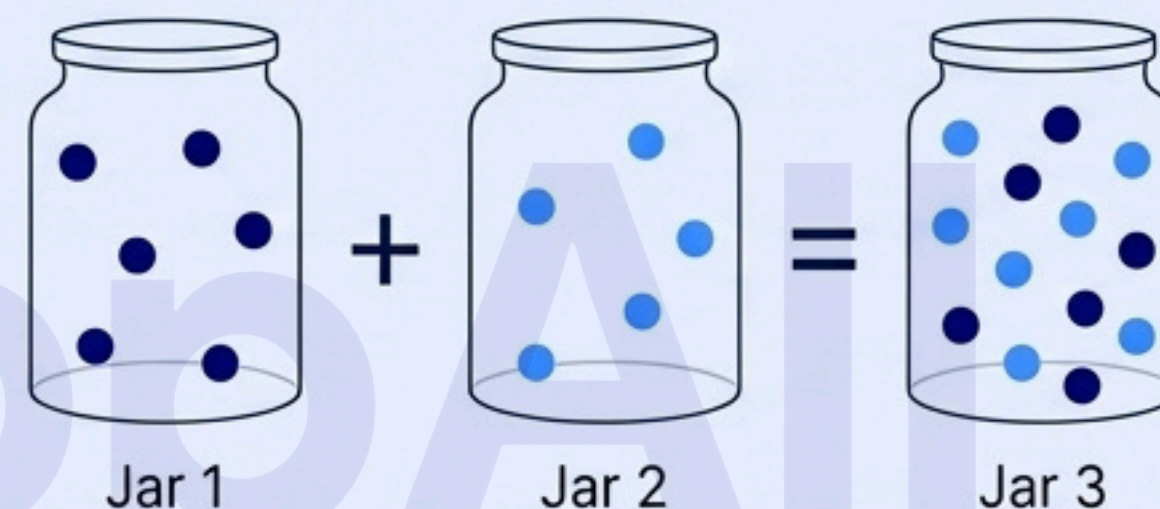
Charles' Law & Dalton's Law

Lock Pressure (P)



$$V \propto T$$

Mix Ideal Gases



$$P_1 + P_2 = P_{\text{total}}$$

For non-interacting ideal gases, the total pressure is the exact sum of the partial pressures each gas would exert if alone.

$$P = P_1 + P_2 + P_3 + \dots$$

Master The Behaviour Of Gases

- ✓ **The Master Equation:** $PV = \mu RT$ connects macroscopic variables (P , V , T) to the amount of substance (μ).
- ✓ **Ideal vs. Real:** Real gases behave like ideal gases only at low pressures and high temperatures.
- ✓ **Derived Laws:** Fixing variables in the master equation instantly gives Boyle's Law ($PV = \text{const}$), Charles' Law ($V \propto T$), and Dalton's Law ($P_{\text{total}} = \sum P_i$).



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