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$V \propto n$ $T, P =$ constant

$V = kn$

$V = \left(\frac{T}{P} R\right) n$

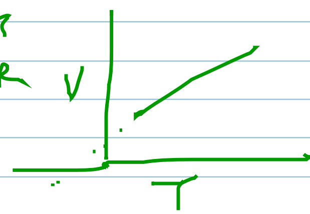
$PV = nRT$ IDEAL GAS LAW

---

constants: n, P $\frac{V}{T} =$ constant   DIRECT

Charles' Law $V = kT$ LINEAR

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$ when n, P constant $y = mx$



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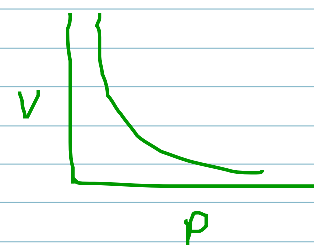
constant: n, T $PV =$ constant

Boyle's Law   INVERSE

$P_1 V_1 = P_2 V_2$ at const n, T



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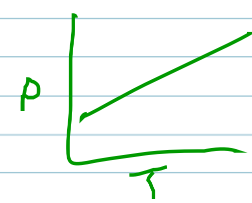
constant: n, V $\frac{P}{T} =$ constant

Gay-Lussac's Law $P = kT$ Linear DIRECT

$\frac{P_1}{T_1} = \frac{P_2}{T_2}$ @ const n, V



$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$ combined gas law

$V \propto n \quad T, P = \text{constant}$

$V = kn$

$V = \left(\frac{T}{P} R\right) n$

$\boxed{PV = nRT}$ IDEAL GAS LAW

---

constants: n, P

Charles' Law

$\frac{V}{T}$ = constant

DIRECT

LINEAR

$V = kT$

$y = mx$

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$ when n, P constant

---

constant: n, T

Boyle's Law

PV = constant

INVERSE

$P_1 V_1 = P_2 V_2$ at const n, T

---

constant: n, V

Gay-Lussac's Law

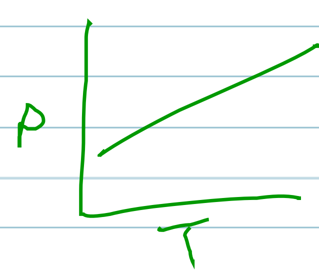
$\frac{P}{T}$ = constant

$P = kT$

LINEAR

DIRECT

$\frac{P_1}{T_1} = \frac{P_2}{T_2}$ @ const n, V



$$\boxed{\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}}$$

combined gas law

MAXWELL DISTRIBUTION CURVES

$KE = \frac{1}{2}mv^2$ $T \propto \frac{1}{2}m\bar{v}^2$ ← average

$KE \times 2 \Rightarrow T \times 2$; $T = 0$ Kelvin, $KE \Rightarrow$ minimum

- as the T of the sample increases, the average speed of the particles increases and the distribution of speeds increases as well

Graham's Law of effusion (leaking) and diffusion (mixing)

→ the gas with the smaller M_m will effuse or diffuse more quickly (same T, P)

REAL vs. IDEAL GASES
(NO IMF's)

gases behave ideally if P ↓ 5atm and T not too low

T ↓ ⇒ particles moving slower ⇒ IMF's are stronger

$P_{REAL} < P_{IDEAL}$ ⇒ IMF's are pulling molecules away from container sides

each molecule of a gas takes up space: available volume < container volume