

GAS LAWS:

Gas Law	Equation	Type of Relationship	CHANGING Conditions	CONSTANT Conditions	Notes
Boyle's	$P_1V_1 = P_2V_2$	Indirect	Pressure & Volume	Temperature & moles	V_1 & V_2 and P_1 & P_2 must be in the <i>same</i> units
Gay-Lussec's	$\frac{P_1}{T_1} = \frac{P_2}{T_2}$	Direct	Pressure & Temperature	Volume & moles	P_1 & P_2 must be in the <i>same</i> units; T_1 & T_2 must be in K
Charles's	$\frac{V_1}{T_1} = \frac{V_2}{T_2}$	Direct	Volume & Temperature	Pressure & moles	V_1 & V_2 must be in the <i>same</i> units; T_1 & T_2 must be in K
Combined	$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$	Combined	Pressure, Volume, & Temperature	moles	V_1 & V_2 and P_1 & P_2 must be in the <i>same</i> units; T_1 & T_2 must be in K
Avogadro's	$\frac{V_1}{n_1} = \frac{V_2}{n_2}$	Direct	Volume & moles	Pressure & Temperature	V_1 & V_2 must be in the <i>same</i> units
Ideal	$PV = nRT$	Combined	N/A	R-value	T <i>must</i> be in K; The value of R depends on the units used for P and V (see bottom table)
Dalton's (Partial Pressures)	$P_{\text{total}} = P_A + P_B + \dots$	Direct	N/A	N/A	All P must be in the <i>same</i> units

NOTE: with *indirect* relationships, as one quantity increases, the other decreases;

with *direct* relationships, as one quantity increases, the other also increases, and vice versa;

with *combined* relationships, there is a combination of indirect and direct relationships.

UNITS:

Condition	Variable	Units	Conversions
Pressure	P	atm mm Hg torr Pa	1 atm = 760 mm Hg = 760 torr = 101326 Pa = 101.326 kPa
Volume	V	L m^3	1 L = 0.001 m^3
Temperature	T	K $^{\circ}\text{C}$	1 K = 273.15 + $^{\circ}\text{C}$
Moles	n	mol	Use atomic masses in periodic table to convert from grams to moles
Gas Constant	R	(see table below)	(see table below)

THE GAS CONSTANT (R):

Units for P	Units for V	Values of R
atm	L	0.08205746
torr / mmHg	L	62.3636711
atm	m^3	8.20746×10^{-5}
Pa	m^3	8.31446218

STP:

Standard Temperature: 273.15 K

Standard Pressure: 1 atm

Volume: 22.4 L/mole at STP

