Some of Robert Boyle's original data (1662) for air

Atmospheric pressure was found to support a column of mercury $29\frac{2}{16}$ inches high.

The data below describe air trapped in the closed end of a J-tube compressed by mercury.

(1) Difference in Hg levels, in inches	(2) Difference in Hg levels plus atmospheric pressure; measures **pressure** of gas	(3) Length of the air column (in arbitrary units); proportional to its **volume**	(4) Product of columns (2) and (3): proportional to **PV**
0	$29\frac{2}{16}$	12	349.5
$6\frac{3}{16}$	$35\frac{5}{16}$	10	353.1
$15\frac{1}{16}$	$44\frac{3}{16}$	8	353.5
$29\frac{11}{16}$	$58\frac{13}{16}$	6	352.9
$41\frac{9}{16}$	$70\frac{11}{16}$	5	353.4
$88\frac{7}{16}$	$117\frac{9}{16}$	3	352.7

20th century data for 1.00000 mole of gas at 0.000°C

CO_2		**O_2**	
P (atm)	**PV (L·atm)**	**P (atm)**	**PV (L·atm)**
1.00000	22.2643	1.00000	22.3939
0.66667	22.3148	0.75000	22.3987
0.50000	22.3397	0.50000	22.4045
0.33333	22.3654	0.25000	22.4096
0.25000	22.3775		
0.16667	22.3897		

The density (ρ = rho) of methane gas (CH_4) as a function of pressure at 0°C

Pressure: P (atm)	1.00000	0.75000	0.50000	0.25000
Density: ρ (g/L)	0.71707	0.53745	0.35808	0.17893
Ratio (ρ/P) (g/L·atm)	0.71707	0.71660	0.71616	0.71572

Note that the ratio ρ/P is not exactly constant, as it would be for an ideal gas. The variation in (ρ/P), while very small, is significant. The ratio ρ/P decreases continuously as P decreases. The value of ρ/P found by extrapolating back to the limit of zero P is the ideal gas law value. That extrapolated ideal gas law value gives the most accurate molecular weight M when using the formula $M = w/n = wRT/PV = RT(\rho/P)$, derived from the ideal gas law.