## Experimental Gas Laws

$$
\begin{aligned}
& \text { Boyle's Law }: \\
& P V=\text { const } \quad \text { (when } \quad T=\text { const })
\end{aligned}
$$




## Combined Gas Law

## $P V=n R T$

```
\(\mathrm{n}[\mathrm{mol}]=\frac{\mathrm{m}}{\mu}-\) quantity of substance (number of moles)
\(m[\mathrm{~g}]-\) Mass of gas
\(\mu\left[\frac{\mathrm{g}}{\mathrm{mol}}\right]-\) Molar Mass (molecular weight from periodic table)
\(\mathrm{P}[\mathrm{Pa}]\)-Pressure; \(\quad V\left[m^{3}\right]\) - Volume
The formula also works if we switch to more convenient units : \(\mathrm{P}[\mathrm{kPa}]\) and \(V[l]\) \(R \approx 8.3 \frac{\mathrm{~J}}{\mathrm{~mol} \cdot \mathrm{~K}}\) is called Universal Gas Constant.
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$$
T[K] \approx T^{0} C+273.15
$$

## Homework

## Problem 1

It is widely known that 1 mole of any gas occupies the same volume at normal conditions (atmospheric pressure, $\mathrm{P}=101 \mathrm{kPa}$ and room temperature $\mathrm{T}=20^{\circ} \mathrm{C}$ ). Starting with unified gas law, find this pressure (in liters).

## Problem 2

1 gram of air contains approximately 0.23 g of Oxygen $\left(\mathrm{O}_{2}\right), 0.755 \mathrm{~g}$ of Nitrogen $\left(\mathrm{N}_{2}\right)$,


