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Ideal Gas Formulas

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List of 8 Ideal Gas Formulas

Ideal Gas 🔗

1) Degree of Freedom given Molar Internal Energy of Ideal Gas 🔗

Open Calculator 🔗

fx $$F = 2 \cdot \frac{U}{N_{moles} \cdot [R] \cdot T_g}$$

ex $$0.024255 = 2 \cdot \frac{121J}{4 \cdot [R] \cdot 300K}$$

2) Ideal Gas Law for Calculating Pressure 🔗

Open Calculator 🔗

fx $$P_{ideal} = [R] \cdot \frac{T_g}{V_{Total}}$$

ex $$39.59268Pa = [R] \cdot \frac{300K}{63m^3}$$

3) Ideal Gas Law for Calculating Volume 🔗

Open Calculator 🔗

fx $$V_{ideal} = [R] \cdot \frac{T_g}{P}$$

ex $$2.771488m^3 = [R] \cdot \frac{300K}{900Pa}$$

4) Isothermal Compression of Ideal Gas

fx **Open Calculator**

$$W_{\text{Iso T}} = N_{\text{moles}} \cdot [R] \cdot T_g \cdot 2.303 \cdot \log 10 \left(\frac{V_f}{V_i} \right)$$

ex $1667.058J = 4 \cdot [R] \cdot 300K \cdot 2.303 \cdot \log 10 \left(\frac{13m^3}{11m^3} \right)$

5) Molar Internal Energy of Ideal Gas

Open Calculator

fx $U_{\text{molar}} = \dfrac{F \cdot [R] \cdot T_g}{2}$

ex $3741.508J = \dfrac{3 \cdot [R] \cdot 300K}{2}$

6) Molar Internal Energy of Ideal Gas given Boltzmann Constant

Open Calculator

fx $U = \dfrac{F \cdot N_{\text{moles}} \cdot [\text{BoltZ}] \cdot T_g}{2}$

ex $2.5E^-20J = \dfrac{3 \cdot 4 \cdot [\text{BoltZ}] \cdot 300K}{2}$

7) Number of Moles given Internal Energy of Ideal Gas ↗

Open Calculator ↗

fx $$N_{\text{moles}} = 2 \cdot \frac{U}{F \cdot [\text{BoltZ}] \cdot T_g}$$

ex $$1.9E^\wedge 22 = 2 \cdot \frac{121J}{3 \cdot [\text{BoltZ}] \cdot 300K}$$

8) Temperature of Ideal Gas given its Internal Energy ↗

Open Calculator ↗

fx $$T_g = 2 \cdot \frac{U}{F \cdot N_{\text{moles}} \cdot [\text{BoltZ}]}$$

ex $$1.5E^\wedge 24K = 2 \cdot \frac{121J}{3 \cdot 4 \cdot [\text{BoltZ}]}$$

Variables Used

- **F** Degree of Freedom
- **N$_{moles}$** Number of Moles
- **P** Total Pressure of Ideal Gas *(Pascal)*
- **P$_{ideal}$** Ideal Gas Law for Calculating Pressure *(Pascal)*
- **T$_g$** Temperature of Gas *(Kelvin)*
- **U** Internal Energy *(Joule)*
- **U$_{molar}$** Molar Internal Energy of Ideal gas *(Joule)*
- **V$_f$** Final Volume of System *(Cubic Meter)*
- **V$_i$** Initial Volume of System *(Cubic Meter)*
- **V$_{ideal}$** Ideal Gas Law for Calculating Volume *(Cubic Meter)*
- **V$_{Total}$** Total Volume of System *(Cubic Meter)*
- **W$_{Iso\ T}$** Isothermal Work *(Joule)*

Constants, Functions, Measurements used

- Constant: **[BoltZ]**, 1.38064852E-23
  Boltzmann constant

- Constant: **[R]**, 8.31446261815324
  Universal gas constant

- Function: **log10**, log10(Number)
  The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.

- Measurement: **Temperature** in Kelvin (K)
  Temperature Unit Conversion 🡕

- Measurement: **Volume** in Cubic Meter (m³)
  Volume Unit Conversion 🡕

- Measurement: **Pressure** in Pascal (Pa)
  Pressure Unit Conversion 🡕

- Measurement: **Energy** in Joule (J)
  Energy Unit Conversion 🡕

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