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# Ideal Gas Law Formulas

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# List of 25 Ideal Gas Law Formulas

## Ideal Gas Law

### 1) Amount of Gas taken by Ideal Gas Law

$$\text{fx } m_{\text{gas}} = \frac{M_{\text{molar}} \cdot P_{\text{gas}} \cdot V}{[R] \cdot T_{\text{gas}}}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b\_img.jpg\)](#)

$$\text{ex } 44.00674\text{g} = \frac{44.01\text{g/mol} \cdot 101325\text{Pa} \cdot 22.4\text{L}}{[R] \cdot 273\text{K}}$$

### 2) Density of Gas by Ideal Gas law

$$\text{fx } \rho_{\text{gas}} = \frac{P_{\text{gas}} \cdot M_{\text{molar}}}{[R] \cdot T_{\text{gas}}}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d\_img.jpg\)](#)

$$\text{ex } 1.964586\text{g/L} = \frac{101325\text{Pa} \cdot 44.01\text{g/mol}}{[R] \cdot 273\text{K}}$$

### 3) Final Density of Gas by Ideal Gas Law

$$\text{fx } d_f = \frac{\frac{P_{\text{fin}}}{T_2}}{\frac{P_i}{d_i \cdot T_1}}$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d\_img.jpg\)](#)

$$\text{ex } 0.701363\text{g/L} = \frac{\frac{13\text{Pa}}{313\text{K}}}{\frac{21\text{Pa}}{1.19\text{g/L} \cdot 298\text{K}}}$$



#### 4) Final Pressure of Gas by Ideal Gas Law

$$fx \quad P_{fin} = \left( \frac{P_i \cdot V_i}{T_1} \right) \cdot \left( \frac{T_2}{V_2} \right)$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235\_img.jpg\)](#)

$$ex \quad 13.00205Pa = \left( \frac{21Pa \cdot 11.2L}{298K} \right) \cdot \left( \frac{313K}{19L} \right)$$

#### 5) Final Pressure of gas given Density

$$fx \quad P_{fin} = \left( \frac{P_i}{d_i \cdot T_1} \right) \cdot (d_f \cdot T_2)$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0\_img.jpg\)](#)

$$ex \quad 13.0118Pa = \left( \frac{21Pa}{1.19g/L \cdot 298K} \right) \cdot (0.702g/L \cdot 313K)$$

#### 6) Final Temperature of Gas by Ideal Gas Law

$$fx \quad T_2 = \frac{P_{fin} \cdot V_2}{\frac{P_i \cdot V_i}{T_1}}$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f\_img.jpg\)](#)

$$ex \quad 312.9507K = \frac{13Pa \cdot 19L}{\frac{21Pa \cdot 11.2L}{298K}}$$



## 7) Final Temperature of Gas given Density

[Open Calculator !\[\]\(dfbd6b3763a6d1d9afaa974f64e2e4b5\_img.jpg\)](#)

$$\text{fx } T_2 = \frac{\frac{P_{\text{fin}}}{d_f}}{\frac{P_i}{d_i \cdot T_1}}$$

$$\text{ex } 312.716\text{K} = \frac{\frac{13\text{Pa}}{0.702\text{g/L}}}{\frac{21\text{Pa}}{1.19\text{g/L} \cdot 298\text{K}}}$$

## 8) Final Volume of Gas by Ideal Gas Law

[Open Calculator !\[\]\(ec9132f1d27c8919987d92907322654d\_img.jpg\)](#)

$$\text{fx } V_2 = \left( \frac{P_i \cdot V_i}{T_1} \right) \cdot \left( \frac{T_2}{P_{\text{fin}}} \right)$$

$$\text{ex } 19.00299\text{L} = \left( \frac{21\text{Pa} \cdot 11.2\text{L}}{298\text{K}} \right) \cdot \left( \frac{313\text{K}}{13\text{Pa}} \right)$$

## 9) Initial Density of Gas by Ideal Gas Law

[Open Calculator !\[\]\(758ebdf4629c903da74c2e079717ae32\_img.jpg\)](#)

$$\text{fx } d_i = \frac{\frac{P_i}{T_1}}{\frac{P_{\text{fin}}}{d_f \cdot T_2}}$$

$$\text{ex } 1.191081\text{g/L} = \frac{\frac{21\text{Pa}}{298\text{K}}}{\frac{13\text{Pa}}{0.702\text{g/L} \cdot 313\text{K}}}$$



10) Initial Pressure of Gas by Ideal Gas Law 

$$fx \quad P_i = \left( \frac{P_{fin} \cdot V_2}{T_2} \right) \cdot \left( \frac{T_1}{V_i} \right)$$

Open Calculator 

$$ex \quad 20.99669Pa = \left( \frac{13Pa \cdot 19L}{313K} \right) \cdot \left( \frac{298K}{11.2L} \right)$$

11) Initial Pressure of Gas given Density 

$$fx \quad P_i = \left( \frac{P_{fin}}{d_f \cdot T_2} \right) \cdot (d_i \cdot T_1)$$

Open Calculator 

$$ex \quad 20.98095Pa = \left( \frac{13Pa}{0.702g/L \cdot 313K} \right) \cdot (1.19g/L \cdot 298K)$$


12) Initial Temperature of Gas by Ideal Gas law 

$$fx \quad T_1 = \frac{P_i \cdot V_i}{\frac{P_{fin} \cdot V_2}{T_2}}$$

Open Calculator 

$$ex \quad 298.047K = \frac{21Pa \cdot 11.2L}{\frac{13Pa \cdot 19L}{313K}}$$



13) Initial Temperature of Gas given Density [Open Calculator](#) 

$$\text{fx } T_1 = \frac{\frac{P_i}{d_i}}{\frac{P_{fin}}{d_f \cdot T_2}}$$

$$\text{ex } 298.2706\text{K} = \frac{\frac{21\text{Pa}}{1.19\text{g/L}}}{\frac{13\text{Pa}}{0.702\text{g/L} \cdot 313\text{K}}}$$

14) Initial Volume of Gas by Ideal Gas Law [Open Calculator](#) 

$$\text{fx } V_i = \left( \frac{P_{fin} \cdot V_2}{T_2} \right) \cdot \left( \frac{T_1}{P_i} \right)$$

$$\text{ex } 11.19824\text{L} = \left( \frac{13\text{Pa} \cdot 19\text{L}}{313\text{K}} \right) \cdot \left( \frac{298\text{K}}{21\text{Pa}} \right)$$

15) Molecular Weight of Gas by Ideal Gas Law [Open Calculator](#) 

$$\text{fx } M_{\text{molar}} = \frac{m_{\text{gas}} \cdot [R] \cdot T_{\text{gas}}}{P_{\text{gas}} \cdot V}$$

$$\text{ex } 44.00326\text{g/mol} = \frac{44\text{g} \cdot [R] \cdot 273\text{K}}{101325\text{Pa} \cdot 22.4\text{L}}$$



16) Molecular Weight of Gas given Density by Ideal Gas Law 

$$\text{fx } M_{\text{molar}} = \frac{\rho_{\text{gas}} \cdot [R] \cdot T_{\text{gas}}}{P_{\text{gas}}}$$

Open Calculator 

$$\text{ex } 43.90726\text{g/mol} = \frac{1.96\text{g/L} \cdot [R] \cdot 273\text{K}}{101325\text{Pa}}$$

17) Number of Moles of Gas by Ideal Gas Law 

$$\text{fx } N_{\text{moles}} = \frac{P_{\text{gas}} \cdot V}{[R] \cdot T_{\text{gas}}}$$

Open Calculator 

$$\text{ex } 0.999926 = \frac{101325\text{Pa} \cdot 22.4\text{L}}{[R] \cdot 273\text{K}}$$

18) Pressure by Ideal Gas Law 

$$\text{fx } P_{\text{gas}} = \frac{N_{\text{moles}} \cdot [R] \cdot T_{\text{gas}}}{V}$$

Open Calculator 

$$\text{ex } 100319.2\text{Pa} = \frac{0.99 \cdot [R] \cdot 273\text{K}}{22.4\text{L}}$$

19) Pressure of Gas given Density by Ideal Gas law 

$$\text{fx } P_{\text{gas}} = \frac{\rho_{\text{gas}} \cdot [R] \cdot T_{\text{gas}}}{M_{\text{molar}}}$$

Open Calculator 

$$\text{ex } 101088.4\text{Pa} = \frac{1.96\text{g/L} \cdot [R] \cdot 273\text{K}}{44.01\text{g/mol}}$$



## 20) Pressure of Gas given Molecular Weight of Gas by Ideal Gas law

[Open Calculator !\[\]\(3d8c13c92b853674f749aac6fa869926\_img.jpg\)](#)

$$fx \quad P_{\text{gas}} = \frac{\left(\frac{m_{\text{gas}}}{M_{\text{molar}}}\right) \cdot [R] \cdot T_{\text{gas}}}{V}$$

$$ex \quad 101309.5\text{Pa} = \frac{\left(\frac{44\text{g}}{44.01\text{g/mol}}\right) \cdot [R] \cdot 273\text{K}}{22.4\text{L}}$$

## 21) Temperature of Gas by Ideal Gas Law

[Open Calculator !\[\]\(17acf1afa8cdf0b67c53d4865a5ed469\_img.jpg\)](#)

$$fx \quad T_{\text{gas}} = \frac{P_{\text{gas}} \cdot V}{N_{\text{moles}} \cdot [R]}$$

$$ex \quad 275.7371\text{K} = \frac{101325\text{Pa} \cdot 22.4\text{L}}{0.99 \cdot [R]}$$

## 22) Temperature of Gas given Density by Ideal Gas Law

[Open Calculator !\[\]\(d8ab143e904bfa3467271eec5af75a9b\_img.jpg\)](#)

$$fx \quad T_{\text{gas}} = \frac{P_{\text{gas}} \cdot M_{\text{molar}}}{[R] \cdot \rho_{\text{gas}}}$$

$$ex \quad 273.6388\text{K} = \frac{101325\text{Pa} \cdot 44.01\text{g/mol}}{[R] \cdot 1.96\text{g/L}}$$





23) Temperature of Gas given Molecular Weight of Gas by Ideal Gas law 

$$\text{fx } T_{\text{gas}} = \frac{P_{\text{gas}} \cdot V}{\left(\frac{m_{\text{gas}}}{M_{\text{molar}}}\right) \cdot [R]}$$

Open Calculator 

$$\text{ex } 273.0418\text{K} = \frac{101325\text{Pa} \cdot 22.4\text{L}}{\left(\frac{44\text{g}}{44.01\text{g/mol}}\right) \cdot [R]}$$

24) Volume of Gas from Ideal Gas Law 

$$\text{fx } V = \frac{N_{\text{moles}} \cdot [R] \cdot T_{\text{gas}}}{P_{\text{gas}}}$$

Open Calculator 

$$\text{ex } 22.17764\text{L} = \frac{0.99 \cdot [R] \cdot 273\text{K}}{101325\text{Pa}}$$

25) Volume of Gas given Molecular Weight of Gas by Ideal Gas Law 

$$\text{fx } V = \frac{\left(\frac{m_{\text{gas}}}{M_{\text{molar}}}\right) \cdot [R] \cdot T_{\text{gas}}}{P_{\text{gas}}}$$

Open Calculator 

$$\text{ex } 22.39657\text{L} = \frac{\left(\frac{44\text{g}}{44.01\text{g/mol}}\right) \cdot [R] \cdot 273\text{K}}{101325\text{Pa}}$$









## Variables Used

- $d_f$  Final Density of Gas (Gram per Liter)
- $d_i$  Initial Density of Gas (Gram per Liter)
- $m_{\text{gas}}$  Mass of Gas (Gram)
- $M_{\text{molar}}$  Molar Mass (Gram Per Mole)
- $N_{\text{moles}}$  Number of Moles
- $P_{\text{fin}}$  Final Pressure of Gas (Pascal)
- $P_{\text{gas}}$  Pressure of Gas (Pascal)
- $P_i$  Initial Pressure of Gas (Pascal)
- $T_1$  Initial Temperature of Gas for Ideal Gas (Kelvin)
- $T_2$  Final Temperature of Gas for Ideal Gas (Kelvin)
- $T_{\text{gas}}$  Temperature of Gas (Kelvin)
- $V$  Volume of Gas (Liter)
- $V_2$  Final Volume of Gas for Ideal Gas (Liter)
- $V_i$  Initial Volume of Gas (Liter)
- $\rho_{\text{gas}}$  Density of Gas (Gram per Liter)



## Constants, Functions, Measurements used

- **Constant:** **[R]**, 8.31446261815324 Joule / Kelvin \* Mole  
*Universal gas constant*
- **Measurement:** **Weight** in Gram (g)  
*Weight Unit Conversion* 
- **Measurement:** **Temperature** in Kelvin (K)  
*Temperature Unit Conversion* 
- **Measurement:** **Volume** in Liter (L)  
*Volume Unit Conversion* 
- **Measurement:** **Pressure** in Pascal (Pa)  
*Pressure Unit Conversion* 
- **Measurement:** **Density** in Gram per Liter (g/L)  
*Density Unit Conversion* 
- **Measurement:** **Molar Mass** in Gram Per Mole (g/mol)  
*Molar Mass Unit Conversion* 



## Check other formula lists

- [Avogadro's Law Formulas](#) 
- [Boyle's Law Formulas](#) 
- [Charle's Law Formulas](#) 
- [Dalton's Law Formulas](#) 
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