PIB Formulas... 1/11





PIB Formulas

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Examples!

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List of 18 PIB Formulas

PIB 🗗

1) Force by Gas Molecule on Wall of Box

 $\mathbf{F}_{ ext{wall}} = rac{ ext{m} \cdot (ext{u})^2}{ ext{L}}$

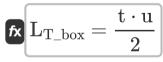
 $ext{ex} 0.03 ext{N} = rac{0.2 ext{g} \cdot (15 ext{m/s})^2}{1500 ext{mm}}$

2) Length of Box given Force

 $\left| \mathrm{L}_{\mathrm{F}} = rac{\mathrm{m} \cdot \left(\mathrm{u}
ight)^2}{\mathrm{F}}
ight|$

ex $18 \text{mm} = \frac{0.2 \text{g} \cdot (15 \text{m/s})^2}{2.5 \text{N}}$

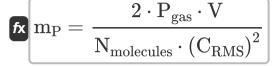
3) Length of Rectangular Box given Time of Collision



= $150000 \mathrm{mm} = \frac{20 \mathrm{s} \cdot 15 \mathrm{m/s}}{2}$



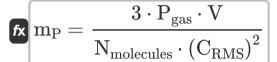
4) Mass of Each Gas Molecule in 2D Box given Pressure



Open Calculator 🗗

$$oxed{ex} 0.000963 ext{g} = rac{2 \cdot 0.215 ext{Pa} \cdot 22.4 ext{L}}{100 \cdot \left(10 ext{m/s}
ight)^2}$$

5) Mass of Each Gas Molecule in 3D Box given Pressure



Open Calculator

6) Mass of Gas Molecule given Force

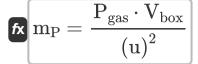
$$\mathbf{m}_{\mathrm{F}} = rac{\mathrm{F} \cdot \mathrm{L}}{\left(\mathrm{u}
ight)^2}$$

Open Calculator 🖸

$$extbf{ex} 16.66667 ext{g} = rac{2.5 ext{N} \cdot 1500 ext{mm}}{\left(15 ext{m/s}
ight)^2}$$



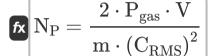
7) Mass of Gas Molecule in 1D given Pressure



Open Calculator

 $oxed{ex} 0.003822 ext{g} = rac{0.215 ext{Pa} \cdot 4 ext{L}}{\left(15 ext{m/s}
ight)^2}$

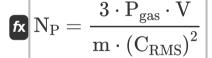
8) Number of Gas Molecules in 2D Box given Pressure



Open Calculator

 $oxed{ex} 0.4816 = rac{2 \cdot 0.215 ext{Pa} \cdot 22.4 ext{L}}{0.2 ext{g} \cdot \left(10 ext{m/s}
ight)^2}$

9) Number of Gas Molecules in 3D Box given Pressure



Open Calculator 🗗

 $0.7224 = rac{3 \cdot 0.215 ext{Pa} \cdot 22.4 ext{L}}{0.2 ext{g} \cdot \left(10 ext{m/s}
ight)^2}$



10) Number of Moles given Kinetic Energy

 $N_{ ext{KE}} = \left(rac{2}{3}
ight) \cdot \left(rac{ ext{KE}}{ ext{[R]} \cdot ext{T}}
ight)$

Open Calculator 2

11) Number of Moles of Gas 1 given Kinetic Energy of both Gases

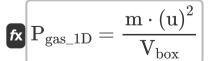
 $\left| \mathbf{N}_{\mathrm{moles_KE}} = \left(rac{\mathrm{KE}_1}{\mathrm{KE}_2}
ight) \cdot \mathrm{n}_2 \cdot \left(rac{\mathrm{T}_2}{\mathrm{T}_1}
ight)
ight|$

Open Calculator

12) Number of Moles of Gas 2 given Kinetic Energy of both Gases

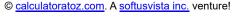
 $N_{
m moles_KE} = n_1 \cdot \left(rac{{
m KE}_2}{{
m KE}_1}
ight) \cdot \left(rac{{
m T}_1}{{
m T}_2}
ight)$ Open Calculator 🚰

13) Pressure Exerted by Single Gas Molecule in 1D 💪



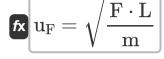
Open Calculator

 $11.25 \text{Pa} = \frac{0.2 \text{g} \cdot (15 \text{m/s})^2}{47}$





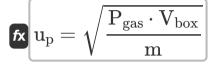
14) Speed of Gas Molecule given Force



Open Calculator

ex $136.9306 \mathrm{m/s} = \sqrt{\frac{2.5 \mathrm{N} \cdot 1500 \mathrm{mm}}{0.2 \mathrm{g}}}$

15) Speed of Gas Molecule in 1D given Pressure



Open Calculator

 $2.073644 ext{m/s} = \sqrt{rac{0.215 ext{Pa} \cdot 4 ext{L}}{0.2 ext{g}}}$

16) Speed of Particle in 3D Box

$$\mathbf{x} = \frac{2 \cdot \mathbf{L}}{\mathbf{t}}$$

Open Calculator

 $\boxed{0.15 \mathrm{m/s} = \frac{2 \cdot 1500 \mathrm{mm}}{20 \mathrm{s}}}$



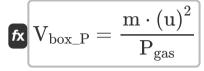
17) Time between Collisions of Particle and Walls

 $\mathbf{f}_{\mathrm{col}} = rac{2 \cdot \mathrm{L}}{\mathrm{u}}$

Open Calculator 🗗

 $\boxed{\textbf{ex}} 0.2 \text{s} = \frac{2 \cdot 1500 \text{mm}}{15 \text{m/s}}$

18) Volume of Box having Gas Molecule given Pressure



Open Calculator 🖸

 $ext{ex} 209.3023 ext{L} = rac{0.2 ext{g} \cdot (15 ext{m/s})^2}{0.215 ext{Pa}}$



PIB Formulas... 8/11

Variables Used

- C_{RMS} Root Mean Square Speed (Meter per Second)
- F Force (Newton)
- **F**_{wall} Force on a wall (Newton)
- KE Kinetic Energy (Joule)
- KE₁ Kinetic Energy of Gas 1 (Joule)
- KE₂ Kinetic Energy of Gas 2 (Joule)
- L Length of Rectangular Section (Millimeter)
- LF Length of Rectangular box (Millimeter)
- L_{T box} Length of Rectangular box given T (Millimeter)
- m Mass per Molecule (Gram)
- m_F Mass per Molecule given F (Gram)
- mp Mass per Molecule given P (Gram)
- n₁ Number of Moles of Gas 1 (Mole)
- n₂ Number of Moles of Gas 2 (Mole)
- N_{KE} Number of Moles given KE
- N_{molecules} Number of Molecules
- N_{moles KE} Number of Moles given KE of Two Gases
- Np Number of Molecules given P
- P_{qas} Pressure of Gas (Pascal)
- Pgas 1D Pressure of Gas in 1D (Pascal)
- t Time between Collision (Second)





PIB Formulas... 9/11

- **T** Temperature (Kelvin)
- T₁ Temperature of Gas 1 (Kelvin)
- T₂ Temperature of Gas 2 (Kelvin)
- t_{col} Time of Collision (Second)
- **u** Speed of Particle (Meter per Second)
- u_{3D} Speed of Particle given in 3D (Meter per Second)
- UF Speed of Particle given F (Meter per Second)
- u_p Speed of Particle given P (Meter per Second)
- **V** Volume of Gas (*Liter*)
- **V**_{box} Volume of Rectangular Box (*Liter*)
- V_{box P} Volume of Rectangular Box given P (*Liter*)





PIB Formulas... 10/11

Constants, Functions, Measurements used

- Constant: [R], 8.31446261815324 Joule / Kelvin * Mole Universal gas constant
- Function: sqrt, sqrt(Number)
 Square root function
- Measurement: Length in Millimeter (mm)
 Length Unit Conversion
- Measurement: Weight in Gram (g)
 Weight Unit Conversion
- Measurement: Time in Second (s)
 Time Unit Conversion
- Measurement: Temperature in Kelvin (K)
 Temperature Unit Conversion
- Measurement: Amount of Substance in Mole (mol)

 Amount of Substance Unit Conversion
- Measurement: Volume in Liter (L)
 Volume Unit Conversion
- Measurement: Pressure in Pascal (Pa)
 Pressure Unit Conversion
- Measurement: Speed in Meter per Second (m/s)
 Speed Unit Conversion
- Measurement: Energy in Joule (J)

 Energy Unit Conversion
- Measurement: Force in Newton (N)
 Force Unit Conversion





PIB Formulas... 11/11

Check other formula lists

- Acentric Factor Formulas
- Average Velocity of Gas
 Formulas
- Average velocity of gas and Acentric factor Formulas
- Compressibility Formulas
- Density of Gas Formulas
- Equipartition Principle and Heat Capacity Formulas
- Important formulae on 1D Formulas
- Important formulae on 2D Formulas
- Important formulae on Equipartition Principle and Heat Capacity Formulas

- Inversion Temperature
 Formulas
- Kinetic Energy of Gas
- Mean Square Speed of Gas Formulas
- Molar Mass of Gas Formulas
- Most Probable Velocity of Gas Formulas
- PIB Formulas
- Pressure of Gas Formulas
- RMS Velocity Formulas
- Temperature of Gas Formulas
- Van der Waals Constant Formulas
- Volume of Gas Formulas

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