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PIB Formulas

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List of 18 PIB Formulas

PIB

1) Force by Gas Molecule on Wall of Box

Open Calculator

fx $$F_{wall} = \frac{m \cdot (u)^2}{L}$$

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

2) Length of Box given Force

Open Calculator

fx $$L_F = \frac{m \cdot (u)^2}{F}$$

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

3) Length of Rectangular Box given Time of Collision

Open Calculator

fx $$L_{T\_box} = \frac{t \cdot u}{2}$$

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

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

Open Calculator

fx $$m_P = \frac{2 \cdot P_{gas} \cdot V}{N_{molecules} \cdot (C_{RMS})^2}$$

ex $$0.000963\text{g} = \frac{2 \cdot 0.215\text{Pa} \cdot 22.4\text{L}}{100 \cdot (10\text{m/s})^2}$$

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

Open Calculator

fx $$m_P = \frac{3 \cdot P_{gas} \cdot V}{N_{molecules} \cdot (C_{RMS})^2}$$

ex $$0.001445\text{g} = \frac{3 \cdot 0.215\text{Pa} \cdot 22.4\text{L}}{100 \cdot (10\text{m/s})^2}$$

6) Mass of Gas Molecule given Force

Open Calculator

fx $$m_F = \frac{F \cdot L}{(u)^2}$$

ex $$16.66667\text{g} = \frac{2.5\text{N} \cdot 1500\text{mm}}{(15\text{m/s})^2}$$

7) Mass of Gas Molecule in 1D given Pressure

Open Calculator

fx $$m_P = \frac{P_{gas} \cdot V_{box}}{(u)^2}$$

ex $$0.003822\text{g} = \frac{0.215\text{Pa} \cdot 4\text{L}}{(15\text{m/s})^2}$$

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

Open Calculator

fx $$N_P = \frac{2 \cdot P_{gas} \cdot V}{m \cdot (C_{RMS})^2}$$

ex $$0.4816 = \frac{2 \cdot 0.215\text{Pa} \cdot 22.4\text{L}}{0.2\text{g} \cdot (10\text{m/s})^2}$$

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

Open Calculator

fx $$N_P = \frac{3 \cdot P_{gas} \cdot V}{m \cdot (C_{RMS})^2}$$

ex $$0.7224 = \frac{3 \cdot 0.215\text{Pa} \cdot 22.4\text{L}}{0.2\text{g} \cdot (10\text{m/s})^2}$$

10) Number of Moles given Kinetic Energy

Open Calculator

fx $$N_{KE} = \left(\frac{2}{3}\right) \cdot \left(\frac{KE}{[R] \cdot T}\right)$$

ex $$0.037733 = \left(\frac{2}{3}\right) \cdot \left(\frac{40J}{[R] \cdot 85K}\right)$$

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

Open Calculator

fx $$N_{moles\_KE} = \left(\frac{KE_1}{KE_2}\right) \cdot n_2 \cdot \left(\frac{T_2}{T_1}\right)$$

ex $$4.2 = \left(\frac{120J}{60J}\right) \cdot 3mol \cdot \left(\frac{140K}{200K}\right)$$

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

Open Calculator

fx $$N_{moles\_KE} = n_1 \cdot \left(\frac{KE_2}{KE_1}\right) \cdot \left(\frac{T_1}{T_2}\right)$$

ex $$4.285714 = 6mol \cdot \left(\frac{60J}{120J}\right) \cdot \left(\frac{200K}{140K}\right)$$

13) Pressure Exerted by Single Gas Molecule in 1D

Open Calculator

fx $$P_{gas\_1D} = \frac{m \cdot (u)^2}{V_{box}}$$

ex $$11.25Pa = \frac{0.2g \cdot (15m/s)^2}{4L}$$

14) Speed of Gas Molecule given Force

Open Calculator

fx $$u_F = \sqrt{\frac{F \cdot L}{m}}$$

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

15) Speed of Gas Molecule in 1D given Pressure

Open Calculator

fx $$u_p = \sqrt{\frac{P_{gas} \cdot V_{box}}{m}}$$

ex $$2.073644\text{m/s} = \sqrt{\frac{0.215\text{Pa} \cdot 4\text{L}}{0.2\text{g}}}$$

16) Speed of Particle in 3D Box

Open Calculator

fx $$u_{3D} = \frac{2 \cdot L}{t}$$

ex $$0.15\text{m/s} = \frac{2 \cdot 1500\text{mm}}{20\text{s}}$$

17) Time between Collisions of Particle and Walls

Open Calculator

fx $$t_{col} = \frac{2 \cdot L}{u}$$

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

18) Volume of Box having Gas Molecule given Pressure

Open Calculator

fx $$V_{box\_P} = \frac{m \cdot (u)^2}{P_{gas}}$$

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

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)*
- KE_1 Kinetic Energy of Gas 1 *(Joule)*
- KE_2 Kinetic Energy of Gas 2 *(Joule)*
- L Length of Rectangular Section *(Millimeter)*
- L_F 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)*
- m_P Mass per Molecule given P *(Gram)*
- n_1 Number of Moles of Gas 1 *(Mole)*
- n_2 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
- N_P Number of Molecules given P
- P_{gas} Pressure of Gas *(Pascal)*
- P_{gas_1D} Pressure of Gas in 1D *(Pascal)*
- t Time between Collision *(Second)*

- **T** Temperature *(Kelvin)*
- T_1 Temperature of Gas 1 *(Kelvin)*
- T_2 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)*
- u_F 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)*

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

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
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- Inversion Temperature Formulas
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- Molar Mass of Gas Formulas
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- PIB Formulas
- Pressure of Gas Formulas
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- Temperature of Gas Formulas
- Van der Waals Constant Formulas
- Volume of Gas Formulas

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