Important Formulae on 1D Formulas PDF

Formulas
Examples
with Units

List of 15
Important Formulae on 1D Formulas

1) Mean Square Speed of Gas Molecule given Pressure and Volume of Gas in 1D Formula

Evaluate Formula

Formula

$$V_{RMS} = \frac{P_{gas} \cdot V}{N_{molecules} \cdot m}$$

Example with Units

$$0.4816\,\text{m/s} = \frac{0.215\,\text{Pa} \cdot 22.4\,\text{L}}{100 \cdot 0.1\,\text{g}}$$

2) Molar Mass given Most probable Speed and Temperature Formula

Evaluate Formula

Formula

$$M_{P\_V} = \frac{2 \cdot [R] \cdot T_g}{\left(C_{mp}\right)^2}$$

Example with Units

$$1247.1694\,\text{g/mol} = \frac{2 \cdot 8.3145 \cdot 30\,\text{K}}{\left(20\,\text{m/s}\right)^2}$$

3) Molar Mass of Gas given Average Velocity, Pressure, and Volume Formula

Evaluate Formula

Formula

$$M_{AV\_P} = \frac{8 \cdot P_{gas} \cdot V}{\pi \cdot \left(\left(C_{av}\right)^2\right)}$$

Example with Units

$$0.4906\,\text{g/mol} = \frac{8 \cdot 0.215\,\text{Pa} \cdot 22.4\,\text{L}}{3.1416 \cdot \left(\left(5\,\text{m/s}\right)^2\right)}$$

4) Molar Mass of gas given most probable Speed, Pressure and Volume Formula

Evaluate Formula

Formula

$$M_{S\_P} = \frac{2 \cdot P_{gas} \cdot V}{\left(C_{mp}\right)^2}$$

Example with Units

$$0.0241\,\text{g/mol} = \frac{2 \cdot 0.215\,\text{Pa} \cdot 22.4\,\text{L}}{\left(20\,\text{m/s}\right)^2}$$

5) Molar Mass of Gas given Root Mean Square Speed and Pressure Formula

Evaluate Formula

Formula

$$M_{S\_V} = \frac{3 \cdot P_{gas} \cdot V}{\left(C_{RMS}\right)^2}$$

Example with Units

$$0.1445\,\text{g/mol} = \frac{3 \cdot 0.215\,\text{Pa} \cdot 22.4\,\text{L}}{\left(10\,\text{m/s}\right)^2}$$

6) Molar Mass of Gas given Root Mean Square Speed and Pressure in 2D Formula

Evaluate Formula

Formula

$$M_{S\_V} = \frac{2 \cdot P_{gas} \cdot V}{\left(C_{RMS}\right)^2}$$

Example with Units

$$0.0963\,\text{g/mol} = \frac{2 \cdot 0.215\,\text{Pa} \cdot 22.4\,\text{L}}{\left(10\,\text{m/s}\right)^2}$$

7) Molar Mass of Gas given Temperature and Average Velocity in 1D Formula

Evaluate Formula

Formula

$$M_{AV\_T} = \frac{\pi \cdot [R] \cdot T_g}{2 \cdot \left(C_{av}\right)^2}$$

Example with Units

$$15672.3928\,\text{g/mol} = \frac{3.1416 \cdot 8.3145 \cdot 30\,\text{K}}{2 \cdot \left(5\,\text{m/s}\right)^2}$$

8) Most Probable Velocity of Gas given Pressure and Density Formula

Evaluate Formula

Formula

$$C_{P\_D} = \sqrt{\frac{2 \cdot P_{gas}}{\rho_{gas}}}$$

Example with Units

$$18.3286\,\text{m/s} = \sqrt{\frac{2 \cdot 0.215\,\text{Pa}}{0.00128\,\text{kg/m}^3}}$$

9) Most Probable Velocity of Gas given Pressure and Volume Formula

Evaluate Formula

Formula

$$C_{P\_V} = \sqrt{\frac{2 \cdot P_{gas} \cdot V}{M_{molar}}}$$

Example with Units

$$0.4678\,\text{m/s} = \sqrt{\frac{2 \cdot 0.215\,\text{Pa} \cdot 22.4\,\text{L}}{44.01\,\text{g/mol}}}$$

10) Most Probable Velocity of Gas given RMS Velocity Formula

Evaluate Formula

Formula

$$C_{mp\_RMS} = \left(0.8166 \cdot C_{RMS}\right)$$

Example with Units

$$8.166\,\text{m/s} = \left(0.8166 \cdot 10\,\text{m/s}\right)$$

11) Most Probable Velocity of Gas given Temperature Formula

Evaluate Formula

Formula

$$C_T = \sqrt{\frac{2 \cdot [R] \cdot T_g}{M_{molar}}}$$

Example with Units

$$106.4675\,\text{m/s} = \sqrt{\frac{2 \cdot 8.3145 \cdot 30\,\text{K}}{44.01\,\text{g/mol}}}$$

12) Pressure of Gas given Average Velocity and Density Formula

Evaluate Formula

Formula

$$P_{AV\_D} = \frac{\rho_{gas} \cdot \pi \cdot \left(\left(C_{av}\right)^2\right)}{8}$$

Example with Units

$$0.0126\,\text{Pa} = \frac{0.00128\,\text{kg/m}^3 \cdot 3.1416 \cdot \left(\left(5\,\text{m/s}\right)^2\right)}{8}$$

13) Pressure of Gas given Average Velocity and Volume Formula

Evaluate Formula

Formula

$$P_{AV\_V} = \frac{M_{molar} \cdot \pi \cdot \left(\left(C_{av} \right)^2 \right)}{8 \cdot V_g}$$

Example with Units

$$19.2458\,\text{Pa} = \frac{44.01\,\text{g/mol} \cdot 3.1416 \cdot \left(\left(5\,\text{m/s} \right)^2 \right)}{8 \cdot 22.45\,\text{L}}$$

14) Pressure of Gas given most probable Speed and Density Formula

Evaluate Formula

Formula

$$P_{CMS\_D} = \frac{\rho_{gas} \cdot \left(\left(C_{mp} \right)^2 \right)}{2}$$

Example with Units

$$0.256\,\text{Pa} = \frac{0.00128\,\text{kg/m}^3 \cdot \left(\left(20\,\text{m/s} \right)^2 \right)}{2}$$

15) Pressure of Gas given most probable Speed and Volume Formula

Evaluate Formula

Formula

$$P_{CMS\_V} = \frac{M_{molar} \cdot \left(C_{mp} \right)^2}{2 \cdot V_g}$$

Example with Units

$$392.0713\,\text{Pa} = \frac{44.01\,\text{g/mol} \cdot \left(20\,\text{m/s} \right)^2}{2 \cdot 22.45\,\text{L}}$$

Variables used in list of Important Formulae on 1D above

- C_{av} Average Velocity of Gas *(Meter per Second)*
- C_{mp} Most Probable Velocity *(Meter per Second)*
- C_{mp_RMS} Most Probable Velocity given RMS *(Meter per Second)*
- C_{P_D} Most Probable Velocity given P and D *(Meter per Second)*
- C_{P_V} Most Probable Velocity given P and V *(Meter per Second)*
- C_{RMS} Root Mean Square Speed *(Meter per Second)*
- C_T Most Probable Velocity given T *(Meter per Second)*
- **m** Mass of Each Molecule *(Gram)*
- M_{AV_P} Molar Mass given AV and P *(Gram Per Mole)*
- M_{AV_T} Molar Mass given AV and T *(Gram Per Mole)*
- M_{molar} Molar Mass *(Gram Per Mole)*
- M_{P_V} Molar Mass given V and P *(Gram Per Mole)*
- M_{S_P} Molar Mass given S and P *(Gram Per Mole)*
- M_{S_V} Molar Mass given S and V *(Gram Per Mole)*
- $N_{molecules}$ Number of Molecules
- P_{AV_D} Pressure of Gas given AV and D *(Pascal)*
- P_{AV_V} Pressure of Gas given AV and V *(Pascal)*
- P_{CMS_D} Pressure of Gas given CMS and D *(Pascal)*
- P_{CMS_V} Pressure of Gas given CMS and V *(Pascal)*
- P_{gas} Pressure of Gas *(Pascal)*
- T_g Temperature of Gas *(Kelvin)*
- **V** Volume of Gas *(Liter)*
- V_g Volume of Gas for 1D and 2D *(Liter)*

Constants, Functions, Measurements used in list of Important Formulae on 1D above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- constant(s): **[R]**, 8.31446261815324 *Universal gas constant*
- Functions: **sqrt**, sqrt(Number) *A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.*
- 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: **Speed** in Meter per Second (m/s) *Speed Unit Conversion*
- Measurement: **Density** in Kilogram per Cubic Meter (kg/m³) *Density Unit Conversion*
- Measurement: **Molar Mass** in Gram Per Mole (g/mol) *Molar Mass Unit Conversion*

- V_{RMS} Root Mean Square of Speed *(Meter per Second)*
- ρ_{gas} Density of Gas *(Kilogram per Cubic Meter)*

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