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Important formulae on 1D Formulas

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List of 15 Important formulae on 1D Formulas

Important formulae on 1D

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

Open Calculator

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

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

2) Molar Mass given Most probable Speed and Temperature

Open Calculator

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

ex $$1247.169\text{g/mol} = \frac{2 \cdot [R] \cdot 30\text{K}}{(20\text{m/s})^2}$$

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

Open Calculator

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

ex $$0.490554\text{g/mol} = \frac{8 \cdot 0.215\text{Pa} \cdot 22.4\text{L}}{\pi \cdot \left((5\text{m/s})^2\right)}$$

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

Open Calculator

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

ex $$0.02408\text{g/mol} = \frac{2 \cdot 0.215\text{Pa} \cdot 22.4\text{L}}{(20\text{m/s})^2}$$

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

Open Calculator

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

ex $$0.14448\text{g/mol} = \frac{3 \cdot 0.215\text{Pa} \cdot 22.4\text{L}}{(10\text{m/s})^2}$$

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

Open Calculator

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

ex $$0.09632\text{g/mol} = \frac{2 \cdot 0.215\text{Pa} \cdot 22.4\text{L}}{(10\text{m/s})^2}$$

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

Open Calculator

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

ex $$15672.39\text{g/mol} = \frac{\pi \cdot [R] \cdot 30\text{K}}{2 \cdot (5\text{m/s})^2}$$

8) Most Probable Velocity of Gas given Pressure and Density

Open Calculator

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

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

9) Most Probable Velocity of Gas given Pressure and Volume

Open Calculator

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

ex $$0.467824\text{m/s} = \sqrt{\frac{2 \cdot 0.215\text{Pa} \cdot 22.4\text{L}}{44.01\text{g/mol}}}$$

10) Most Probable Velocity of Gas given RMS Velocity

Open Calculator

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

ex $$8.166\text{m/s} = (0.8166 \cdot 10\text{m/s})$$

11) Most Probable Velocity of Gas given Temperature

Open Calculator

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

ex $$106.4675\text{m/s} = \sqrt{\frac{2 \cdot [R] \cdot 30\text{K}}{44.01\text{g/mol}}}$$

12) Pressure of Gas given Average Velocity and Density

Open Calculator

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

ex $$0.012566\text{Pa} = \frac{0.00128\text{kg/m}^3 \cdot \pi \cdot \left((5\text{m/s})^2\right)}{8}$$

13) Pressure of Gas given Average Velocity and Volume

Open Calculator

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

$$19.24575\text{Pa} = \frac{44.01\text{g/mol} \cdot \pi \cdot \left((5\text{m/s})^2 \right)}{8 \cdot 22.45\text{L}}$$

14) Pressure of Gas given most probable Speed and Density

Open Calculator

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

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

15) Pressure of Gas given most probable Speed and Volume

Open Calculator

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

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

Variables Used

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

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Constant: **[R]**, 8.31446261815324 Joule / Kelvin * Mole
  Universal gas constant
- Function: **sqrt**, sqrt(Number)
  Square root function
- 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

Check other formula lists

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