Important Average velocity of gas and Acentric factor Formulas PDF

Formulas
Examples
with Units

List of 11
Important Average velocity of gas and Acentric factor Formulas

1) Acentric Factor Formula

Evaluate Formula

Formula

$$\omega_{vp} = -\log10\left(Pr^{saturated}\right) - 1$$

Example with Units

$$-1.7076 = -\log10\left(5.1\,\text{Pa}\right) - 1$$

2) Acentric Factor given Actual and Critical Saturation Vapor Pressure Formula

Evaluate Formula

Formula

$$\omega_{vp} = -\log10\left(\frac{P^{saturated}}{Pc^{saturation}}\right) - 1$$

Example with Units

$$-1.4559 = -\log10\left(\frac{6\,\text{Pa}}{2.1\,\text{Pa}}\right) - 1$$

3) Average Velocity of Gas given Pressure and Density Formula

Evaluate Formula

Formula

$$v_{avg\_P\_D} = \sqrt{\frac{8 \cdot P_{gas}}{\pi \cdot \rho_{gas}}}$$

Example with Units

$$20.6816\,\text{m/s} = \sqrt{\frac{8 \cdot 0.215\,\text{Pa}}{3.1416 \cdot 0.00128\,\text{kg/m}^3}}$$

4) Average Velocity of Gas given Pressure and Density in 2D Formula

Evaluate Formula

Formula

$$v_{avg\_P\_D} = \sqrt{\frac{\pi \cdot P_{gas}}{2 \cdot \rho_{gas}}}$$

Example with Units

$$16.2433\,\text{m/s} = \sqrt{\frac{3.1416 \cdot 0.215\,\text{Pa}}{2 \cdot 0.00128\,\text{kg/m}^3}}$$

5) Average Velocity of Gas given Pressure and Volume Formula

Evaluate Formula

Formula

$$v_{avg\_P\_V} = \sqrt{\frac{8 \cdot P_{gas} \cdot V}{\pi \cdot M_{molar}}}$$

Example with Units

$$0.5279\,\text{m/s} = \sqrt{\frac{8 \cdot 0.215\,\text{Pa} \cdot 22.4\,\text{L}}{3.1416 \cdot 44.01\,\text{g/mol}}}$$

6) Average Velocity of Gas given Pressure and Volume in 2D Formula

Evaluate Formula

Formula

$$v_{avg\_P\_V} = \sqrt{\frac{\pi \cdot P_{gas} \cdot V}{2 \cdot M_{molar}}}$$

Example with Units

$$0.4146\,\text{m/s} = \sqrt{\frac{3.1416 \cdot 0.215\,\text{Pa} \cdot 22.4\,\text{L}}{2 \cdot 44.01\,\text{g/mol}}}$$

7) Average Velocity of Gas given Root Mean Square Speed Formula

Evaluate Formula

Formula

$$v_{avg\_RMS} = \left(0.9213 \cdot C_{RMS\_speed}\right)$$

Example with Units

$$9.6736\,\text{m/s} = \left(0.9213 \cdot 10.5\,\text{m/s}\right)$$

8) Average Velocity of Gas given Root Mean Square Speed in 2D Formula

Evaluate Formula

Formula

$$v_{avg\_RMS} = \left(0.8862 \cdot C_{RMS\_speed}\right)$$

Example with Units

$$9.3051\,\text{m/s} = \left(0.8862 \cdot 10.5\,\text{m/s}\right)$$

9) Average Velocity of Gas given Temperature Formula

Evaluate Formula

Formula

$$C_{av} = \sqrt{\frac{8 \cdot [R] \cdot T_g}{\pi \cdot M_{molar}}}$$

Example with Units

$$120.1357\,\text{m/s} = \sqrt{\frac{8 \cdot 8.3145 \cdot 30\,\text{K}}{3.1416 \cdot 44.01\,\text{g/mol}}}$$

10) Average Velocity of Gas given Temperature in 2D Formula

Evaluate Formula

Formula

$$v_{avg\_T} = \sqrt{\frac{\pi \cdot [R] \cdot T_g}{2 \cdot M_{molar}}}$$

Example with Units

$$94.3544\,\text{m/s} = \sqrt{\frac{3.1416 \cdot 8.3145 \cdot 30\,\text{K}}{2 \cdot 44.01\,\text{g/mol}}}$$

11) Terminal Velocity given Angular Velocity Formula

Evaluate Formula

Formula

$$v_{ter} = \frac{m \cdot r_m \cdot \left(\omega\right)^2}{6 \cdot \pi \cdot \mu \cdot r_0}$$

Example with Units

$$0.0006\,\text{m/s} = \frac{1.1\,\text{kg} \cdot 2.2\,\text{m} \cdot \left(2\,\text{rad/s}\right)^2}{6 \cdot 3.1416 \cdot 80\,\text{N*s/m}^2 \cdot 10\,\text{m}}$$

Variables used in list of Average velocity of gas and Acentric factor Formulas above

- C_{av} Average Velocity of Gas *(Meter per Second)*
- C_{RMS_speed} Root Mean Square of Speed *(Meter per Second)*
- **m** Mass of Particle *(Kilogram)*
- M_{molar} Molar Mass *(Gram Per Mole)*
- P_{gas} Pressure of Gas *(Pascal)*
- $P^{saturated}$ Saturation Vapour Pressure *(Pascal)*
- $Pc^{saturation}$ Critical saturation vapour pressure *(Pascal)*
- $Pr^{saturated}$ Reduced saturation vapour pressure *(Pascal)*
- r_0 Radius of Spherical Particle *(Meter)*
- r_m Radius of molecule *(Meter)*
- T_g Temperature of Gas *(Kelvin)*
- **V** Volume of Gas *(Liter)*
- $v_{avg\_P\_D}$ Average Velocity given P and D *(Meter per Second)*
- $v_{avg\_P\_V}$ Average Velocity given P and V *(Meter per Second)*
- v_{avg_RMS} Average Velocity given RMS *(Meter per Second)*
- v_{avg_T} Average Velocity given Temperature *(Meter per Second)*
- v_{ter} Terminal Velocity given Angular Velocity *(Meter per Second)*
- **μ** Dynamic Viscosity *(Newton Second per Square Meter)*
- ρ_{gas} Density of Gas *(Kilogram per Cubic Meter)*
- **ω** Angular Velocity *(Radian per Second)*
- ω_{vp} Acentric Factor VP

Constants, Functions, Measurements used in list of Average velocity of gas and Acentric factor Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- constant(s): **[R]**, 8.31446261815324 *Universal gas constant*
- Functions: **log10**, log10(Number) *The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.*
- 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: **Length** in Meter (m) *Length Unit Conversion*
- Measurement: **Weight** in Kilogram (kg) *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: **Dynamic Viscosity** in Newton Second per Square Meter (N*s/m²) *Dynamic Viscosity Unit Conversion*
- Measurement: **Angular Velocity** in Radian per Second (rad/s) *Angular Velocity 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*

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