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Elements of Kinetic Theory Formulas

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List of 15 Elements of Kinetic Theory Formulas

Elements of Kinetic Theory

1) Emissivity per Unit Mole

Open Calculator

fx $$\varepsilon_{trans} = \frac{3}{2} \cdot [BoltZ] \cdot T_g$$

ex $$6.2E\hat{}\text{-}21J/mol = \frac{3}{2} \cdot [BoltZ] \cdot 300K$$

2) Kinetic Energy per Mole

Open Calculator

fx $$Etrans = \frac{3}{2} \cdot p \cdot V$$

ex $$24J/mol = \frac{3}{2} \cdot 640Pa \cdot 25L$$

3) Kinetic Energy per Mole using Molar Volume

Open Calculator

fx $$Etrans = \frac{3}{2} \cdot p \cdot V_m$$

ex $$24J/mol = \frac{3}{2} \cdot 640Pa \cdot 0.025m^3/mol$$

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4) Kinetic Energy per Mole using Temperature of Gas

Open Calculator

fx $$\text{Etrans} = \frac{3}{2} \cdot \text{R} \cdot \text{T}_\text{g}$$

ex $$24.75\text{J/mol} = \frac{3}{2} \cdot 0.055\text{J/(kg*K)} \cdot 300\text{K}$$

5) Mean Free Path of Single-Species Gas

Open Calculator

fx $$\lambda = \frac{1}{\sqrt{2} \cdot \text{n} \cdot \pi \cdot \text{d}^2}$$

ex $$0.000156\text{m} = \frac{1}{\sqrt{2} \cdot 10/\text{m}^3 \cdot \pi \cdot (12\text{m})^2}$$

6) Mean Free Path using Number Density

Open Calculator

fx $$\lambda = \frac{1}{\text{n} \cdot \pi \cdot \text{d}^2}$$

ex $$0.000221\text{m} = \frac{1}{10/\text{m}^3 \cdot \pi \cdot (12\text{m})^2}$$

7) Molar Volume using Kinetic Energy per Mole

Open Calculator

fx $$\text{V}_\text{m} = \frac{2}{3} \cdot \frac{\text{Etrans}}{\text{p}}$$

ex $$0.025\text{m}^3\text{/mol} = \frac{2}{3} \cdot \frac{24\text{J/mol}}{640\text{Pa}}$$

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8) Number Density

Open Calculator

fx $$n = \frac{P_{gas}}{[BoltZ] \cdot T_g}$$

ex $$10.14016/m^3 = \frac{4.2E\hat{}\text{-}20Pa}{[BoltZ] \cdot 300K}$$

9) Pressure of Gas using Number Density

Open Calculator

fx $$P_{gas} = n \cdot [BoltZ] \cdot T_g$$

ex $$4.1E\hat{}\text{-}20Pa = 10/m^3 \cdot [BoltZ] \cdot 300K$$

10) Pressure using Kinetic Energy per Mole

Open Calculator

fx $$p = \frac{2}{3} \cdot \frac{Etrans}{V}$$

ex $$640Pa = \frac{2}{3} \cdot \frac{24J/mol}{25L}$$

11) Pressure using Molar Volume

Open Calculator

fx $$p = \frac{2}{3} \cdot \frac{Etrans}{V_m}$$

ex $$640Pa = \frac{2}{3} \cdot \frac{24J/mol}{0.025m^3/mol}$$

12) Specific Gas Constant using Kinetic Energy per Mole

Open Calculator

fx $$R = \frac{2}{3} \cdot \frac{Etrans}{T_g}$$

ex $$0.053333\text{J/(kg*K)} = \frac{2}{3} \cdot \frac{24\text{J/mol}}{300\text{K}}$$

13) Temperature of Gas using Emissivity per Unit Mole

Open Calculator

fx $$T_g = \frac{2}{3} \cdot \frac{\varepsilon_{trans}}{[BoltZ]}$$

ex $$299.3762\text{K} = \frac{2}{3} \cdot \frac{6.2\text{e-}21\text{J/mol}}{[BoltZ]}$$

14) Temperature of Gas using Kinetic Energy per Mole

Open Calculator

fx $$T_g = \frac{2}{3} \cdot \frac{Etrans}{R}$$

ex $$290.9091\text{K} = \frac{2}{3} \cdot \frac{24\text{J/mol}}{0.055\text{J/(kg*K)}}$$

15) Volume of Gas

Open Calculator

fx $$V = \frac{2}{3} \cdot \frac{E_{trans}}{p}$$

ex $$25.78125\text{L} = \frac{2}{3} \cdot \frac{24.75\text{J/mol}}{640\text{Pa}}$$

Variables Used

- **d** Distance between Two Bodies *(Meter)*
- **E_{trans}** Total Kinetic Energy per Mole *(Joule Per Mole)*
- **Etrans** Kinetic Energy per Mole *(Joule Per Mole)*
- **n** Number Density *(1 per Cubic Meter)*
- **p** Pressure *(Pascal)*
- **P_{gas}** Pressure of Gas *(Pascal)*
- **R** Specific Gas Constant *(Joule per Kilogram per K)*
- **T_g** Temperature of Gas *(Kelvin)*
- **V** Volume of Gas *(Liter)*
- **V_m** Molar Volume using Kinetic Energy *(Cubic Meter per Mole)*
- **ε_{trans}** Emissivity per unit Mole *(Joule Per Mole)*
- **λ** Mean Free Path of Molecule *(Meter)*

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Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Constant: **[BoltZ]**, 1.38064852E-23 Joule/Kelvin
  Boltzmann constant
- Function: **sqrt**, sqrt(Number)
  Square root function
- Measurement: **Length** in Meter (m)
  Length 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: **Wavelength** in Meter (m)
  Wavelength Unit Conversion
- Measurement: **Specific Heat Capacity** in Joule per Kilogram per K (J/(kg*K))
  Specific Heat Capacity Unit Conversion
- Measurement: **Molar Magnetic Susceptibility** in Cubic Meter per Mole (m^3/mol)
  Molar Magnetic Susceptibility Unit Conversion
- Measurement: **Energy Per Mole** in Joule Per Mole (J/mol)
  Energy Per Mole Unit Conversion
- Measurement: **Number Density** in 1 per Cubic Meter ($1/m^3$)
  Number Density Unit Conversion

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