# Important Elements of Kinetic Theory Formulas PDF

Formulas
Examples
with Units

## List of 15
### Important Elements of Kinetic Theory Formulas

### 1) Emissivity per Unit Mole Formula

Evaluate Formula

Formula

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

Example with Units

$$6.2E\text{-}21\,\text{J/mol} = \frac{3}{2} \cdot 1.4E\text{-}23\,\text{J/K} \cdot 300\,\text{K}$$

### 2) Kinetic Energy per Mole Formula

Evaluate Formula

Formula

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

Example with Units

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

### 3) Kinetic Energy per Mole using Molar Volume Formula

Evaluate Formula

Formula

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

Example with Units

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

### 4) Kinetic Energy per Mole using Temperature of Gas Formula

Evaluate Formula

Formula

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

Example with Units

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

### 5) Mean Free Path of Single-Species Gas Formula

Evaluate Formula

Formula

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

Example with Units

$$0.0002\,\text{m} = \frac{1}{\sqrt{2} \cdot 10\,\text{1/m}^3 \cdot 3.1416 \cdot 12\,\text{m}^2}$$

### 6) Mean Free Path using Number Density Formula

Evaluate Formula

Formula

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

Example with Units

$$0.0002\,\text{m} = \frac{1}{10\,\text{1/m}^3 \cdot 3.1416 \cdot 12\,\text{m}^2}$$

## 7) Molar Volume using Kinetic Energy per Mole Formula

Evaluate Formula

Formula

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

Example with Units

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

## 8) Number Density Formula

Evaluate Formula

Formula

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

Example with Units

$$10.1402\,1/\text{m}^3 = \frac{4.2\text{E-}20\,\text{Pa}}{1.4\text{E-}23\,\text{J/K} \cdot 300\,\text{K}}$$

## 9) Pressure of Gas using Number Density Formula

Evaluate Formula

Formula

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

Example with Units

$$4.1\text{E-}20\,\text{Pa} = 10\,1/\text{m}^3 \cdot 1.4\text{E-}23\,\text{J/K} \cdot 300\,\text{K}$$

## 10) Pressure using Kinetic Energy per Mole Formula

Evaluate Formula

Formula

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

Example with Units

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

## 11) Pressure using Molar Volume Formula

Evaluate Formula

Formula

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

Example with Units

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

## 12) Specific Gas Constant using Kinetic Energy per Mole Formula

Evaluate Formula

Formula

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

Example with Units

$$0.0533\,\text{J/(kg*K)} = \frac{2}{3} \cdot \frac{24\,\text{J/mol}}{300\,\text{K}}$$

## 13) Temperature of Gas using Emissivity per Unit Mole Formula

Evaluate Formula

Formula

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

Example with Units

$$299.3762\,\text{K} = \frac{2}{3} \cdot \frac{6.2\text{e-}21\,\text{J/mol}}{1.4\text{E-}23\,\text{J/K}}$$

## 14) Temperature of Gas using Kinetic Energy per Mole Formula

Evaluate Formula

Formula

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

Example with Units

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

## 15) Volume of Gas Formula

Evaluate Formula

**Formula**

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

**Example with Units**

$$25.7812\,\text{L} = \frac{2}{3} \cdot \frac{24.75\,\text{J/mol}}{640\,\text{Pa}}$$

## Variables used in list of Elements of Kinetic Theory Formulas above

- **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)*
- $\varepsilon_{trans}$ Emissivity per unit Mole *(Joule Per Mole)*
- **λ** Mean Free Path of Molecule *(Meter)*

## Constants, Functions, Measurements used in list of Elements of Kinetic Theory Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- constant(s): **[BoltZ]**, 1.38064852E-23 *Boltzmann 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: **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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