Important Formulas on Bohr's Atomic Model PDF

Formulas
Examples
with Units

List of 12
Important Formulas on Bohr's Atomic Model

1) Angular Momentum using Radius of Orbit Formula

Evaluate Formula

Formula

$$L_{RO} = M \cdot v \cdot r_{orbit}$$

Example with Units

$$3.4E\text{-}31\ \text{kg*m}^2/\text{s} = 34\ \text{Dalton} \cdot 60\ \text{m/s} \cdot 100\ \text{nm}$$

2) Atomic Mass Formula

Evaluate Formula

Formula

$$M = m_p + m_n$$

Example with Units

$$22\ \text{Dalton} = 6\ \text{Dalton} + 16\ \text{Dalton}$$

3) Change in Wave Number of Moving Particle Formula

Evaluate Formula

Formula

$$N_{wave} = 1.097 \cdot 10^7 \cdot \frac{\left(n_f\right)^2 - \left(n_i\right)^2}{\left(n_f^2\right) \cdot \left(n_i^2\right)}$$

Example

$$88445.4523 = 1.097 \cdot 10^7 \cdot \frac{\left(9\right)^2 - \left(7\right)^2}{\left(9^2\right) \cdot \left(7^2\right)}$$

4) Energy of Electron in Final Orbit Formula

Evaluate Formula

Formula

$$E_{orbit} = \left(- \left(\frac{[Rydberg]}{n_f^2} \right) \right)$$

Example with Units

$$-8.5E+23\ \text{eV} = \left(- \left(\frac{1.1E+7\ 1/\text{m}}{9^2} \right) \right)$$

5) Energy of Electron in Initial Orbit Formula

Evaluate Formula

Formula

$$E_{orbit} = \left(- \left(\frac{[Rydberg]}{n_{initial}^2} \right) \right)$$

Example with Units

$$-7.6E+24\ \text{eV} = \left(- \left(\frac{1.1E+7\ 1/\text{m}}{3^2} \right) \right)$$

6) Internal Energy of Ideal Gas using Law of Equipartition Energy Formula

Evaluate Formula

Formula

$$U_{EP} = \left(\frac{F}{2} \right) \cdot N_{moles} \cdot [R] \cdot T_g$$

Example with Units

$$3554.4328\ \text{J/mol} = \left(\frac{5}{2} \right) \cdot 2 \cdot 8.3145 \cdot 85.5\ \text{K}$$

7) Number of Electrons in nth Shell Formula

Evaluate Formula

Formula

$$N_{Electron} = \left(2 \cdot \left(n_{quantum}^{2}\right)\right)$$

Example

$$128 = \left(2 \cdot \left(8^{2}\right)\right)$$

8) Number of Orbitals in nth Shell Formula

Evaluate Formula

Formula

$$N = \left(n_{quantum}^{2}\right)$$

Example

$$64 = \left(8^{2}\right)$$

9) Orbital Frequency of Electron Formula

Evaluate Formula

Formula

$$f_{orbital} = \frac{1}{T}$$

Example with Units

$$0.0011\,\text{Hz} = \frac{1}{875\,\text{s}}$$

10) Radius of Bohr's Orbit Formula

Evaluate Formula

Formula

$$r_{orbit\_AN} = \frac{\left(n_{quantum}^{2}\right) \cdot \left([hP]^{2}\right)}{4 \cdot \left(\pi^{2}\right) \cdot [Mass\text{-}e] \cdot [Coulomb] \cdot Z \cdot \left([Charge\text{-}e]^{2}\right)}$$

Example with Units

$$0.1992\,\text{nm} = \frac{\left(8^{2}\right) \cdot \left(6.6E\text{-}34^{2}\right)}{4 \cdot \left(3.1416^{2}\right) \cdot 9.1E\text{-}31\,\text{kg} \cdot 9E{+}9 \cdot 17 \cdot \left(1.6E\text{-}19\,\text{C}^{2}\right)}$$

11) Radius of Bohr's Orbit given Atomic Number Formula

Evaluate Formula

Formula

$$r_{orbit\_AN} = \frac{\left(\frac{0.529}{10000000000}\right) \cdot \left(n_{quantum}^{2}\right)}{Z}$$

Example with Units

$$0.1992\,\text{nm} = \frac{\left(\frac{0.529}{10000000000}\right) \cdot \left(8^{2}\right)}{17}$$

12) Velocity of Electron given Time Period of Electron Formula

Evaluate Formula

Formula

$$v_{electron} = \frac{2 \cdot \pi \cdot r_{orbit}}{T}$$

Example with Units

$$7.2E\text{-}10\,\text{m/s} = \frac{2 \cdot 3.1416 \cdot 100\,\text{nm}}{875\,\text{s}}$$

Variables used in list of Important Formulas on Bohr's Atomic Model above

- E_{orbit} Energy of Electron in Orbit *(Electron-Volt)*
- **F** Degree of Freedom
- $f_{orbital}$ Orbital Frequency *(Hertz)*
- L_{RO} Angular Momentum using Radius Orbit *(Kilogram Square Meter per Second)*
- **M** Atomic Mass *(Dalton)*
- m_n Total Mass of Neutron *(Dalton)*
- m_p Total Mass of Proton *(Dalton)*
- **N** Number of Orbitals in nth Shell
- $N_{Electron}$ Number of Electrons in nth Shell
- n_f Final Quantum Number
- n_i Initial Quantum Number
- $n_{initial}$ Initial Orbit
- N_{moles} Number of Moles
- $n_{quantum}$ Quantum Number
- N_{wave} Wave Number of moving Particle
- r_{orbit} Radius of Orbit *(Nanometer)*
- r_{orbit_AN} Radius of Orbit given AN *(Nanometer)*
- **T** Time Period of Electron *(Second)*
- T_g Temperature of Gas *(Kelvin)*
- U_{EP} Internal Molar Energy given EP *(Joule Per Mole)*
- **v** Velocity *(Meter per Second)*
- $v_{electron}$ Velocity of Electron given Time *(Meter per Second)*
- **Z** Atomic Number

Constants, Functions, Measurements used in list of Important Formulas on Bohr's Atomic Model above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- constant(s): **[Charge-e]**, 1.60217662E-19 *Charge of electron*
- constant(s): **[Coulomb]**, 8.9875E+9 *Coulomb constant*
- constant(s): **[Mass-e]**, 9.10938356E-31 *Mass of electron*
- constant(s): **[hP]**, 6.626070040E-34 *Planck constant*
- constant(s): **[Rydberg]**, 10973731.6 *Rydberg Constant*
- constant(s): **[R]**, 8.31446261815324 *Universal gas constant*
- Measurement: **Length** in Nanometer (nm) *Length Unit Conversion*
- Measurement: **Weight** in Dalton (Dalton) *Weight Unit Conversion*
- Measurement: **Time** in Second (s) *Time Unit Conversion*
- Measurement: **Temperature** in Kelvin (K) *Temperature Unit Conversion*
- Measurement: **Speed** in Meter per Second (m/s) *Speed Unit Conversion*
- Measurement: **Energy** in Electron-Volt (eV) *Energy Unit Conversion*
- Measurement: **Frequency** in Hertz (Hz) *Frequency Unit Conversion*
- Measurement: **Angular Momentum** in Kilogram Square Meter per Second (kg*m²/s) *Angular Momentum Unit Conversion*
- Measurement: **Energy Per Mole** in Joule Per Mole (J/mol) *Energy Per Mole Unit Conversion*

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