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Important Formulas on Bohr's Atomic Model

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List of 12 Important Formulas on Bohr's Atomic Model

Important Formulas on Bohr's Atomic Model

1) Angular Momentum using Radius of Orbit

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

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

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

2) Atomic Mass

$$fx \quad M = m_p + m_n$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$ex \quad 22Dalton = 6Dalton + 16Dalton$$

3) Change in Wave Number of Moving Particle

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

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$ex \quad 88445.45 = 1.097 \cdot 10^7 \cdot \frac{(9)^2 - (7)^2}{((9)^2) \cdot ((7)^2)}$$



4) Energy of Electron in Final Orbit

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

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$\text{ex } -8.5 \text{E}^{\wedge} 23 \text{eV} = \left(- \left(\frac{[\text{Rydberg}]}{(9)^2} \right) \right)$$

5) Energy of Electron in Initial Orbit

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

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$\text{ex } -7.6 \text{E}^{\wedge} 24 \text{eV} = \left(- \left(\frac{[\text{Rydberg}]}{(3)^2} \right) \right)$$

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

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

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$\text{ex } 3554.433 \text{J/mol} = \left(\frac{5}{2} \right) \cdot 2 \cdot [R] \cdot 85.5 \text{K}$$

7) Number of Electrons in nth Shell

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

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

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




8) Number of Orbitals in nth Shell 

$$\text{fx } N = (n_{\text{quantum}}^2)$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

$$\text{ex } 64 = ((8)^2)$$

9) Orbital Frequency of Electron 

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

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)

$$\text{ex } 0.001143\text{Hz} = \frac{1}{875\text{s}}$$

10) Radius of Bohr's Orbit 

fx

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

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

$$\text{ex } 0.19922\text{nm} = \frac{((8)^2) \cdot ([hP]^2)}{4 \cdot (\pi^2) \cdot [\text{Mass-e}] \cdot [\text{Coulomb}] \cdot 17 \cdot ([\text{Charge-e}]^2)}$$




11) Radius of Bohr's Orbit given Atomic Number 

$$\text{fx } r_{\text{orbit_AN}} = \frac{\left(\frac{0.529}{10000000000}\right) \cdot (n_{\text{quantum}}^2)}{Z}$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

$$\text{ex } 0.199153\text{nm} = \frac{\left(\frac{0.529}{10000000000}\right) \cdot ((8)^2)}{17}$$

12) Velocity of Electron given Time Period of Electron 

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

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

$$\text{ex } 7.2\text{E}^{-10}\text{m/s} = \frac{2 \cdot \pi \cdot 100\text{nm}}{875\text{s}}$$



Variables Used







- **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*)
- **$r_{\text{orbit_AN}}$** 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







- **Constant:** **pi**, 3.14159265358979323846264338327950288
Archimedes' constant
- **Constant:** **[Charge-e]**, 1.60217662E-19 Coulomb
Charge of electron
- **Constant:** **[Coulomb]**, 8.9875517923E9 Newton * Meter ^2 / Coulomb ^2
Coulomb constant
- **Constant:** **[Mass-e]**, 9.10938356E-31 Kilogram
Mass of electron
- **Constant:** **[hP]**, 6.626070040E-34 Kilogram Meter² / Second
Planck constant
- **Constant:** **[Rydberg]**, 10973731.6 / Meter
Rydberg Constant
- **Constant:** **[R]**, 8.31446261815324 Joule / Kelvin * Mole
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 ($\text{kg}\cdot\text{m}^2/\text{s}$)
Angular Momentum Unit Conversion 
- **Measurement: Energy Per Mole** in Joule Per Mole (J/mol)
Energy Per Mole Unit Conversion 



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