Important Mulliken's Electronegativity Formulas PDF

Formulas
Examples
with Units

List of 9
Important Mulliken's Electronegativity Formulas

1) Covalent Radius given Mulliken's Electronegativity Formula

Evaluate Formula

Formula

$$r_{covalent} = \sqrt{\frac{0.359 \cdot Z}{\left(0.336 \cdot X_M\right) - 0.2 - 0.744}}$$

Example with Units

$$1.1798\,\text{A} = \sqrt{\frac{0.359 \cdot 25}{\left(0.336 \cdot 22\,\text{J}\right) - 0.2 - 0.744}}$$

2) Effective Nuclear Charge given Mulliken's Electronegativity Formula

Evaluate Formula

Formula

$$Z = \frac{\left(\left(0.336 \cdot X_M\right) - 0.2 - 0.744\right) \cdot \left(r_{covalent}^{\,2}\right)}{0.359}$$

Example with Units

$$25.0089 = \frac{\left(\left(0.336 \cdot 22\,\text{J}\right) - 0.2 - 0.744\right) \cdot \left(1.18\,\text{A}^{\,2}\right)}{0.359}$$

3) Electron Affinity of element using Mulliken's Electronegativity Formula

Evaluate Formula

Formula

$$E.A = \left(2 \cdot X_M\right) - IE$$

Example with Units

$$16.8\,\text{J} = \left(2 \cdot 22\,\text{J}\right) - 27.2\,\text{J}$$

4) Ionization Energy of element using Mulliken's Electronegativity Formula

Evaluate Formula

Formula

$$IE = \left(2 \cdot X_M\right) - E.A$$

Example with Units

$$26.9\,\text{J} = \left(2 \cdot 22\,\text{J}\right) - 17.1\,\text{J}$$

5) Mulliken's Electronegativity from Allred Rochow's Electronegativity Formula

Evaluate Formula

Formula

$$X_M = \frac{X_{A.R} + 0.744 + 0.2}{0.336}$$

Example with Units

$$22.1548\,\text{J} = \frac{6.5\,\text{J} + 0.744 + 0.2}{0.336}$$

6) Mulliken's Electronegativity from Pauling's Electronegativity Formula

Evaluate Formula

Formula

$$X_M = \frac{X_P + 0.2}{0.336}$$

Example with Units

$$22.1429\,\text{J} = \frac{7.24\,\text{J} + 0.2}{0.336}$$

7) Mulliken's Electronegativity given Bond Energies Formula

Evaluate Formula

Formula

$$X_M = \frac{\sqrt{E_{(A\text{-}B)} - \sqrt{E_{A\text{-}A} \cdot E_{B\text{-}B}}} + 0.2}{0.336}$$

Example with Units

$$22.1047\,\text{J} = \frac{\sqrt{75.47\,\text{J} - \sqrt{20\,\text{J} \cdot 27\,\text{J}}} + 0.2}{0.336}$$

8) Mulliken's Electronegativity given Effective Nuclear Charge and Covalent Radius Formula

Evaluate Formula

Formula

$$X_M = \frac{\left(\frac{0.359 \cdot Z}{r_{covalent}^2}\right) + 0.744 + 0.2}{0.336}$$

Example with Units

$$21.9932\,\text{J} = \frac{\left(\frac{0.359 \cdot 25}{1.18\,\text{A}^2}\right) + 0.744 + 0.2}{0.336}$$

9) Mulliken's Electronegativity of Element Formula

Evaluate Formula

Formula

$$X_M = 0.5 \cdot (IE + E.A)$$

Example with Units

$$22.15\,\text{J} = 0.5 \cdot (27.2\,\text{J} + 17.1\,\text{J})$$

Variables used in list of Mulliken's Electronegativity Formulas above

- $E_{(A-B)}$ Actual Bond Energy given Electronegativity *(Joule)*
- E_{A-A} Bond Energy of A_2 Molecule *(Joule)*
- E_{B-B} Bond Energy of B_2 Molecule *(Joule)*
- **E.A** Electron Affinity *(Joule)*
- **IE** Ionization Energy *(Joule)*
- $r_{covalent}$ Covalent Radius *(Angstrom)*
- $X_{A.R}$ Allred-Rochow's Electronegativity *(Joule)*
- X_M Mulliken's Electronegativity *(Joule)*
- X_P Pauling's Electronegativity *(Joule)*
- **Z** Effective Nuclear Charge

Constants, Functions, Measurements used in list of Mulliken's Electronegativity Formulas above

- 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 Angstrom (A)
  Length Unit Conversion
- Measurement: **Energy** in Joule (J)
  Energy Unit Conversion

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