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Electronegativity Formulas

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List of 36 Electronegativity Formulas

Electronegativity ⌁

1) 100 percent Covalent Bond Energy as Arithmetic Mean ⌁

fx $\mathrm{E_{A\text{-}B(cov)}} = 0.5 \cdot (\mathrm{E_{A\text{-}A}} + \mathrm{E_{B\text{-}B}})$

Open Calculator ⌁

ex $23.5J = 0.5 \cdot (20J + 27J)$

2) 100 percent Covalent Bond Energy as Geometric Mean ⌁

fx $\mathrm{E_{A\text{-}B(cov)}} = \sqrt{\mathrm{E_{A\text{-}A}} \cdot \mathrm{E_{B\text{-}B}}}$

Open Calculator ⌁

ex $23.2379J = \sqrt{20J \cdot 27J}$

3) 100 percent Covalent Bond Energy given Covalent Ionic Resonance Energy ⌁

fx $\mathrm{E_{A\text{-}B(cov)}} = \mathrm{E_{A\text{-}B}} - \Delta$

Open Calculator ⌁

ex $23.4J = 28.4J - 5J$

4) Actual Bond Energy given Covalent Ionic Resonance Energy ⌁

fx $\mathrm{E_{A\text{-}B}} = \Delta + \mathrm{E_{A\text{-}B(cov)}}$

Open Calculator ⌁

ex $28.35J = 5J + 23.35J$

5) Covalent Ionic Resonance Energy 🔗

fx $\Delta = E_{A\text{-}B} - E_{A\text{-}B(cov)}$

Open Calculator 🔗

ex $5.05J = 28.4J - 23.35J$

6) Covalent Ionic Resonance Energy using Bond Energies 🔗

fx $\Delta = E_{A\text{-}B} - \sqrt{E_{A\text{-}A} \cdot E_{B\text{-}B}}$

Open Calculator 🔗

ex $5.1621J = 28.4J - \sqrt{20J \cdot 27J}$

7) Fractional Charge 🔗

fx $\delta = \dfrac{\mu}{e \cdot d}$

Open Calculator 🔗

ex $0.208333 = \dfrac{10E\hat{\ }\text{-}18stC*cm}{4.8E\hat{\ }\text{-}10stC \cdot 10A}$

Allred Rochow's Electronegativity 🔗

8) Allred Rochow's Electronegativity from Mulliken's Electronegativity 🔗

fx $X_{A.R} = (0.336 \cdot X_M) - 0.2 - 0.744$

Open Calculator 🔗

ex $6.448J = (0.336 \cdot 22J) - 0.2 - 0.744$

9) Allred Rochow's Electronegativity from Pauling's Electronegativity ⬀

Open Calculator ⬀

fx $X_{A.R} = X_P - 0.744$

ex $6.496J = 7.24J - 0.744$

10) Allred Rochow's Electronegativity given IE and EA ⬀

Open Calculator ⬀

fx

$$X_{A.R} = ((0.336 \cdot 0.5) \cdot (IE + E.A)) - 0.2 - 0.744$$

ex $6.4984J = ((0.336 \cdot 0.5) \cdot (27.2J + 17.1J)) - 0.2 - 0.744$

11) Allred Rochow's Electronegativity of Element ⬀

Open Calculator ⬀

fx $X_{A.R} = \dfrac{0.359 \cdot Z}{r_{covalent}^2}$

ex $6.445705J = \dfrac{0.359 \cdot 25}{(1.18A)^2}$

12) Allred Rochow's Electronegativity using Bond Energies ⬀

Open Calculator ⬀

fx $X_{A.R} = \sqrt{E_{(A\text{-}B)}} - \sqrt{E_{A\text{-}A} \cdot E_{B\text{-}B}} - 0.744$

ex $6.483178J = \sqrt{75.47J} - \sqrt{20J \cdot 27J} - 0.744$

13) Covalent Radius from Allred Rochow's Electronegativity ⤢

Open Calculator ⤢

fx $$r_{covalent} = \sqrt{\frac{0.359 \cdot Z}{X_{A.R}}}$$

ex $$1.175061A = \sqrt{\frac{0.359 \cdot 25}{6.5J}}$$

14) Effective Nuclear Charge from Allred Rochow's Electronegativity ⤢

Open Calculator ⤢

fx $$Z = \frac{X_{A.R} \cdot r_{covalent} \cdot r_{covalent}}{0.359}$$

ex $$25.21058 = \frac{6.5J \cdot 1.18A \cdot 1.18A}{0.359}$$

15) Electron Affinity of Element using Allred Rochow's Electronegativity ⤢

Open Calculator ⤢

fx $$E.A = \left((X_{A.R} + 0.744 + 0.2) \cdot \left(\frac{2}{0.336} \right) \right) - IE$$

ex $$17.10952J = \left((6.5J + 0.744 + 0.2) \cdot \left(\frac{2}{0.336} \right) \right) - 27.2J$$

16) Ionization Energy using Allred Rochow's Electronegativity ⤢

fx   **Open Calculator** ⤢

$$IE = \left((X_{A.R} + 0.744 + 0.2) \cdot \left(\frac{2}{0.336} \right) \right) - E.A$$

ex $27.20952J = \left((6.5J + 0.744 + 0.2) \cdot \left(\frac{2}{0.336} \right) \right) - 17.1J$

Mulliken's Electronegativity ⤢

17) Covalent Radius given Mulliken's Electronegativity ⤢

fx $r_{covalent} = \sqrt{\dfrac{0.359 \cdot Z}{(0.336 \cdot X_M) - 0.2 - 0.744}}$ **Open Calculator** ⤢

ex $1.17979A = \sqrt{\dfrac{0.359 \cdot 25}{(0.336 \cdot 22J) - 0.2 - 0.744}}$

18) Effective Nuclear Charge given Mulliken's Electronegativity ⤢

fx   **Open Calculator** ⤢

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

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

19) Electron Affinity of element using Mulliken's Electronegativity ↗

fx $\mathrm{E.A} = (2 \cdot \mathrm{X_M}) - \mathrm{IE}$

ex $16.8\mathrm{J} = (2 \cdot 22\mathrm{J}) - 27.2\mathrm{J}$

20) Ionization Energy of element using Mulliken's Electronegativity ↗

fx $\mathrm{IE} = (2 \cdot \mathrm{X_M}) - \mathrm{E.A}$

ex $26.9\mathrm{J} = (2 \cdot 22\mathrm{J}) - 17.1\mathrm{J}$

21) Mulliken's Electronegativity from Allred Rochow's Electronegativity ↗

fx $\mathrm{X_M} = \dfrac{\mathrm{X_{A.R}} + 0.744 + 0.2}{0.336}$

ex $22.15476\mathrm{J} = \dfrac{6.5\mathrm{J} + 0.744 + 0.2}{0.336}$

22) Mulliken's Electronegativity from Pauling's Electronegativity ↗

fx $\mathrm{X_M} = \dfrac{\mathrm{X_P} + 0.2}{0.336}$

ex $22.14286\mathrm{J} = \dfrac{7.24\mathrm{J} + 0.2}{0.336}$

23) Mulliken's Electronegativity given Bond Energies ⌖

Open Calculator ⌖

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

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

24) Mulliken's Electronegativity given Effective Nuclear Charge and Covalent Radius ⌖

Open Calculator ⌖

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

$$ex \quad 21.99317J = \frac{\left(\frac{0.359 \cdot 25}{(1.18A)^2}\right) + 0.744 + 0.2}{0.336}$$

25) Mulliken's Electronegativity of Element ⌖

Open Calculator ⌖

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

$$ex \quad 22.15J = 0.5 \cdot (27.2J + 17.1J)$$

Pauling's Electronegativity 🡕

26) Covalent Ionic Resonance Energy using Pauling's Electronegativity 🡕

Open Calculator 🡕

fx $\Delta_p = X_P^2$

ex $52.4176J = (7.24J)^2$

27) Covalent Radius given Pauling's Electronegativity 🡕

Open Calculator 🡕

fx $r_{covalent} = \sqrt{\dfrac{0.359 \cdot Z}{X_P - 0.744}}$

ex $1.175423A = \sqrt{\dfrac{0.359 \cdot 25}{7.24J - 0.744}}$

28) Effective Nuclear Charge given Pauling's Electronegativity 🡕

Open Calculator 🡕

fx $Z = \dfrac{(X_P - 0.744) \cdot \left(r_{covalent}^2\right)}{0.359}$

ex $25.19507 = \dfrac{(7.24J - 0.744) \cdot \left((1.18A)^2\right)}{0.359}$

29) Electron Affinity of element using Pauling's Electronegativity ⤴

Open Calculator ⤴

fx $\text{E.A} = \left((X_P + 0.2) \cdot \left(\dfrac{2}{0.336} \right) \right) - \text{IE}$

ex $17.08571\text{J} = \left((7.24\text{J} + 0.2) \cdot \left(\dfrac{2}{0.336} \right) \right) - 27.2\text{J}$

30) Ionization Energy of Element using Pauling's Electronegativity ⤴

Open Calculator ⤴

fx $\text{IE} = \left((X_P + 0.2) \cdot \left(\dfrac{2}{0.336} \right) \right) - \text{E.A}$

ex $27.18571\text{J} = \left((7.24\text{J} + 0.2) \cdot \left(\dfrac{2}{0.336} \right) \right) - 17.1\text{J}$

31) Pauling's Electronegativity from Allred Rochow's Electronegativity ⤴

Open Calculator ⤴

fx $X_P = X_{A.R} + 0.744$

ex $7.244\text{J} = 6.5\text{J} + 0.744$

32) Pauling's Electronegativity from Mulliken's Electronegativity ⤴

Open Calculator ⤴

fx $X_P = (0.336 \cdot X_M) - 0.2$

ex $7.192\text{J} = (0.336 \cdot 22\text{J}) - 0.2$

33) Pauling's Electronegativity given Bond Energies ⚟

fx $$X_P = \sqrt{E_{(A\text{-}B)} - \left(\sqrt{E_{A\text{-}A} \cdot E_{B\text{-}B}}\right)}$$

Open Calculator ⚟

ex $$7.227178J = \sqrt{75.47J - \left(\sqrt{20J \cdot 27J}\right)}$$

34) Pauling's Electronegativity given Effective Nuclear Charge and Covalent Radius ⚟

fx $$X_P = \left(\frac{0.359 \cdot Z}{r_{\text{covalent}}^2}\right) + 0.744$$

Open Calculator ⚟

ex $$7.189705J = \left(\frac{0.359 \cdot 25}{(1.18A)^2}\right) + 0.744$$

35) Pauling's Electronegativity given IE and EA ⚟

fx $$X_p = \left(\left(\frac{0.336}{0.5}\right) \cdot (IE + E.A)\right) - 0.2$$

Open Calculator ⚟

ex $$29.5696J = \left(\left(\frac{0.336}{0.5}\right) \cdot (27.2J + 17.1J)\right) - 0.2$$

36) Pauling's Electronegativity given Individual Electronegativities ⚟

fx $$X = |X_A - X_B|$$

Open Calculator ⚟

ex $$0.2J = |3.6J - 3.8J|$$

Variables Used

- **d** Bond Length of Diatomic Molecule *(Angstrom)*
- **e** Charge of electron in Statcoulomb *(Statcoulomb)*
- **$E_{(A-B)}$** Actual Bond Energy given Electronegativity *(Joule)*
- **E_{A-A}** Bond Energy of A_2 Molecule *(Joule)*
- **E_{A-B}** Actual Bond Energy *(Joule)*
- **$E_{A-B(cov)}$** 100% Covalent Bond Energy *(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** X_p given Individual Electronegativities *(Joule)*
- **X_A** Electronegativity of Element A *(Joule)*
- **$X_{A.R}$** Allred-Rochow's Electronegativity *(Joule)*
- **X_B** Electronegativity of Element B *(Joule)*
- **X_M** Mulliken's Electronegativity *(Joule)*
- **X_p** Pauling's Electronegativity given I.E and E.A *(Joule)*
- **X_P** Pauling's Electronegativity *(Joule)*
- **Z** Effective Nuclear Charge
- **δ** Charge Fraction
- **Δ** Covalent Ionic Resonance Energy *(Joule)*
- **$Δ_p$** Covalent Ionic Resonance Energy for X_p *(Joule)*
- **μ** Dipole Moment *(Statcoulomb Centimeter)*

Constants, Functions, Measurements used

- Function: **abs**, abs(Number)
  Absolut value function

- Function: **sqrt**, sqrt(Number)
  Square root function

- Measurement: **Length** in Angstrom (A)
  Length Unit Conversion 🡕

- Measurement: **Energy** in Joule (J)
  Energy Unit Conversion 🡕

- Measurement: **Electric Charge** in Statcoulomb (stC)
  Electric Charge Unit Conversion 🡕

- Measurement: **Electric Dipole Moment** in Statcoulomb Centimeter (stC*cm)
  Electric Dipole Moment Unit Conversion 🡕

Check other formula lists

- **Covalent Bonding Formulas** ↗
- **Ionic Bonding Formulas** ↗
- **Electronegativity Formulas** ↗

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