

# What is Electronegativity?

## Worksheet

Electronegativity is how strongly an atom attracts electrons in a bond, measured on the Pauling scale (0–4). Fluorine (4.0) is the most electronegative; cesium (0.7) is least. Electronegativity differences predict bond type:  $>2.0$  = ionic,  $0.5$ – $2.0$  = polar covalent,  $<0.5$  = nonpolar covalent.

$$\text{Pauling EN} = (\text{I.E.} + \text{E.A.}) / 2 \text{ (conceptual)}$$

EN = Electronegativity (Pauling) (0–4 scale)

I.E. = Ionization energy (eV)

E.A. = Electron affinity (eV)

$\Delta\text{EN}$  = Electronegativity difference in bond (used to predict polarity)

## Questions

1. Electronegativity measures...

- A) The energy to remove an electron from an atom
- B) The ability to attract electrons in a bond
- C) The number of valence electrons
- D) The size of an atom

2. Bond in H-Cl: H = 2.1, Cl = 3.0.  $\Delta\text{EN}$  = ?

- A) 0.0 (nonpolar)
- B) 0.9 (polar covalent)
- C) 2.1 (ionic)
- D) 1.5 (polar covalent)

3. Which bond is most polar?

- A) H-H (0.0)
- B) C-C (0.0)
- C) H-F (1.9)
- D) C-H (0.4)

4. Electronegativity trend down a group...

- A) Increases (more attraction)
- B) Decreases (less attraction)
- C) Stays constant
- D) Oscillates

5. Determine bond type in HF. Use Pauling electronegativities: H = 2.1, F = 4.0.

6. Classify the C-C bond in ethane ( $\text{CH}_3\text{-CH}_3$ ). C = 2.6.

7. Classify the Na-Cl bond. Na = 0.9, Cl = 3.0.

8. Define: What is electronegativity?

9. Define: Which element is most electronegative?

10. Define: How does  $\Delta\text{EN}$  predict bond type?

## Answer Key

1. B) The ability to attract electrons in a bond — EN is the relative attraction for electrons in a chemical bond, not a property of isolated atoms.
2. B) 0.9 (polar covalent) —  $\Delta EN = |3.0 - 2.1| = 0.9$ , which is 0.5–2.0 range → polar covalent bond.
3. C) H-F (1.9) — H-F has the largest  $\Delta EN$  (1.9) — strongest electron attraction by F → most polar.
4. B) Decreases (less attraction) — Down a group, valence electrons are farther from nucleus → weaker attraction in bonds → lower EN.
5.  $\Delta EN = |4.0 - 2.1| = 1.9$  Since  $1.5 < \Delta EN < 2.0$ , HF is a POLAR COVALENT bond. F attracts the shared electron pair strongly → bond is polarized (H is  $\delta+$ , F is  $\delta-$ ).
6.  $\Delta EN = |2.6 - 2.6| = 0$  Since  $\Delta EN \approx 0 (< 0.5)$ , C-C is a NONPOLAR COVALENT bond. Electron density is equally shared — no polarity.
7.  $\Delta EN = |3.0 - 0.9| = 2.1$  Since  $\Delta EN > 2.0$ , Na-Cl is an IONIC bond. Cl strongly attracts electron → electron transfers from Na to Cl →  $\text{Na}^+$  and  $\text{Cl}^-$  ions.
8. The relative ability of an atom to attract electrons in a chemical bond (Pauling scale: 0–4).
9. Fluorine (F = 4.0 on Pauling scale) — it attracts electrons most strongly in bonds.
10.  $\Delta EN > 2.0$ : ionic. 0.5–2.0: polar covalent.  $< 0.5$ : nonpolar covalent.

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