What is Electron Affinity?

Worksheet

Electron affinity (EA) is the energy released when one electron is added to a neutral atom: A(g) + e A(g). Usually negative (energy released); higher magnitude means stronger attraction to electrons. Halogens have the highest EA; noble gases have very low EA.

EA = Energy released when electron added

Questions

1. Electron affinity is defined as

A) Energy to remove an electron
B) Energy released when an electron is added
C) The number of electrons in an atom
D) The attraction between nucleus and electrons

2. Which element has the highest electron affinity?

A) Chlorine (Cl)
B) Fluorine (F)
C) Iodine (I)
D) Bromine (Br)

3. Noble gas electron affinity is positive because

A) They have empty orbitals
B) Energy must be supplied to add an electron
C) They are the most reactive elements
D) They repel all electrons

4. Why is Cl electron affinity (349 kJ/mol) higher than Br (325 kJ/mol)?

A) Br is more reactive
B) Cl is smaller, closer attraction
C) Br has more protons
D) Cl is a noble gas

5. Fluorine (F) has electron affinity of 328 kJ/mol. What does this mean?

6. Compare electron affinity: Cl (349 kJ/mol) vs Br (325 kJ/mol). Why is Cl higher?

7. Noble gas (He) has EA of 48 kJ/mol (negative!). What does negative mean?

8. Define: What is electron affinity?

9. Define: Why is electron affinity usually negative in value?

10. Define: Which elements have the highest electron affinity?

Answer Key

1. B) Energy released when an electron is added - EA = energy change when A(g) + e A(g), typically released.

2. B) Fluorine (F) - Fluorine - smallest halogen, strongest nuclear attraction, most eager to complete its octet.

3. B) Energy must be supplied to add an electron - Noble gas core is stable; adding an electron is unfavorable, requires energy input.

4. B) Cl is smaller, closer attraction - Cl is in period 3, Br in period 4 - smaller size means added electron is closer to nucleus.

5. F + e F releases 328 kJ/mol of energy. Fluorine strongly attracts electrons - it's the most electronegative element. This high EA makes F a powerful oxidizing agent.

6. Cl is smaller than Br (period 3 vs period 4). The added electron is closer to the nucleus in Cl. Closer attraction higher energy release higher EA magnitude.

7. Energy must be SUPPLIED to add an electron to He. He is stable with full 1s shell - adding an electron is unfavorable. Negative EA means the atom resists accepting electrons.

8. The energy released (or required) when an electron is added to a neutral atom: A(g) + e A(g).

9. Negative sign indicates energy is released (favorable). Positive EA (rare) means energy is required (unfavorable, like noble gases).

10. Halogens (Group 17) - especially F and Cl. They need just one more electron to complete their octet.