



*Answer the questions below then check your answers.*

1. Which of the following best describes a covalent bond?
  - a) Transfer of electrons from one atom to another
  - b) Sharing of electron pairs between atoms
  - c) Attraction between oppositely charged ions
  - d) Attraction between atoms with high electronegativity
  
2. A polar covalent bond is formed when:
  - a) Two atoms share electrons equally
  - b) Two atoms share electrons unequally
  - c) Electrons are transferred completely from one atom to another
  - d) Two atoms have the same electronegativity
  
3. Which element has the highest electronegativity?
  - a) Hydrogen
  - b) Oxygen
  - c) Fluorine
  - d) Chlorine

4. Electronegativity tends to increase:

- a) Down a group in the periodic table    b) Across a period from left to right  
c) In metals    d) As atomic radius increases

5. Match the term with its correct definition:

Term
Covalent bond
Polar covalent bond
Electronegativity
Ionisation energy

Definition
The ability of an atom to attract electrons in a chemical bond
The energy required to remove an electron from an atom
A type of bond where electrons are shared unequally between atoms
A type of bond where electrons are shared equally between atoms

6. Define electronegativity.

7. Explain the difference between a covalent bond and a polar covalent bond.

8. List the factors that affect the electronegativity of an element.

9. Fill in the Gaps below to complete the sentences:

As you move across a period from left to right, electronegativity \_\_\_\_\_  
because the number of protons \_\_\_\_\_ and the atomic radius  
\_\_\_\_\_.

b. As you move down a group in the periodic table, electronegativity  
\_\_\_\_\_ because the atomic radius \_\_\_\_\_ and the shielding  
effect \_\_\_\_\_.

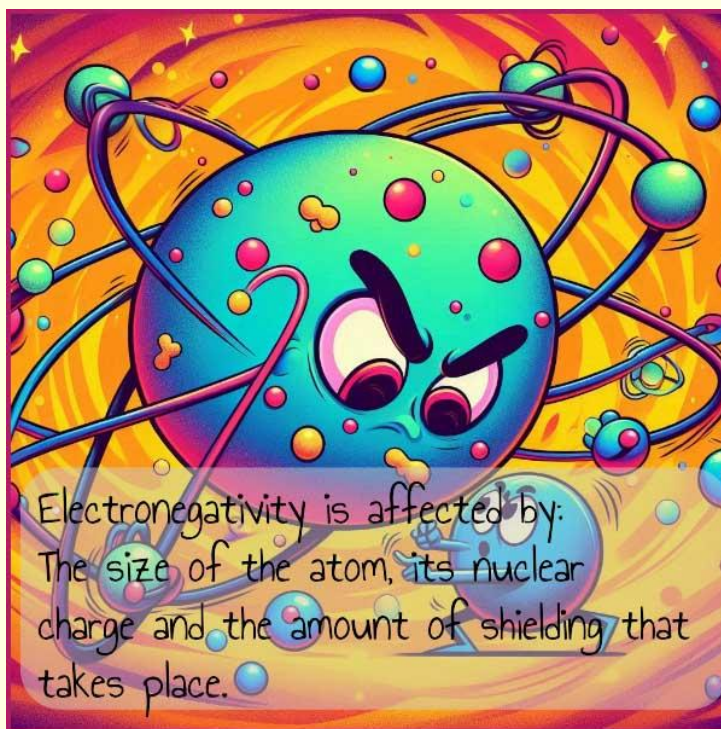
10. What type of bond forms between two identical non-metal atoms?

11. Which element has the lowest electronegativity?

12. In a polar covalent bond between hydrogen and chlorine, which atom will have a partial negative charge?

13. Why does electronegativity decrease down a group in the periodic table?

14. Explain why fluorine is more electronegative than carbon.



15. Compare the electronegativity trends across a period and down a group in the periodic table.

16. How does the difference in electronegativity between two bonded atoms determine the polarity of the bond?

17. Describe the concept of electronegativity and discuss the factors that influence it.
18. Explain why polar covalent bonds form and give an example.
19. Discuss the trend in electronegativity across Period 3 of the periodic table and down Group 7, including reasons for these trends.

## Answers

1. Which of the following best describes a covalent bond?

- a) Transfer of electrons from one atom to another
- b) Sharing of electron pairs between atoms
- c) Attraction between oppositely charged ions
- d) Attraction between atoms with high electronegativity

Answer: b) Sharing of electron pairs between atoms

2. A polar covalent bond is formed when:

- a) Two atoms share electrons equally
- b) Two atoms share electrons unequally
- c) Electrons are transferred completely from one atom to another
- d) Two atoms have the same electronegativity

Answer: b) Two atoms share electrons unequally

3. Which element has the highest electronegativity?

- a) Hydrogen
- b) Oxygen
- c) Fluorine
- d) Chlorine

Answer: c) Fluorine

4. Electronegativity tends to increase:

- a) Down a group in the periodic table    b) Across a period from left to right  
c) In metals    d) As atomic radius increases

Answer: b) Across a period from left to right

5. Match the term with its correct definition:

Term	Definition
Covalent bond	The ability of an atom to attract electrons in a chemical bond
Polar covalent bond	The energy required to remove an electron from an atom
Electronegativity	A type of bond where electrons are shared unequally between atoms
Ionisation energy	A type of bond where electrons are shared equally between atoms

6. Define electronegativity.

Answer: Electronegativity is the ability of an atom to attract electrons towards itself in a chemical bond.

7. Explain the difference between a covalent bond and a polar covalent bond.

*Answer: A covalent bond involves the equal sharing of electron pairs between atoms, whereas a polar covalent bond involves the unequal sharing of electrons due to differences in electronegativity between the bonded atoms, leading to a partial positive charge on one atom and a partial negative charge on the other.*

8. List the factors that affect the electronegativity of an element.

*Answer: Factors affecting electronegativity include atomic radius, nuclear charge, and the shielding effect. Generally, smaller atoms with higher nuclear charge and less shielding have higher electronegativity.*

9. Fill in the Gaps below to complete the sentences:

As you move across a period from left to right, electronegativity \_\_\_\_\_ because the number of protons \_\_\_\_\_ and the atomic radius \_\_\_\_\_ .

*Answer: increases, increases, decreases*

b. As you move down a group in the periodic table, electronegativity \_\_\_\_\_ because the atomic radius \_\_\_\_\_ and the shielding effect \_\_\_\_\_ .

*Answer: decreases, increases, increases*

10. What type of bond forms between two identical non-metal atoms?

*Answer: Covalent bond*

11. Which element has the lowest electronegativity?

*Answer: Francium*



12. In a polar covalent bond between hydrogen and chlorine, which atom will have a partial negative charge?

Answer: Chlorine

13. Why does electronegativity decrease down a group in the periodic table?

Answer: Electronegativity decreases down a group because the atomic radius increases, resulting in greater distance between the nucleus and the valence electrons, and increased shielding from inner electron shells reduces the effective nuclear charge experienced by the valence electrons.

14. Explain why fluorine is more electronegative than carbon.

Answer: Fluorine is more electronegative than carbon because it has a smaller atomic radius and a higher nuclear charge, allowing it to attract bonding electrons more effectively than carbon.

15. Compare the electronegativity trends across a period and down a group in the periodic table.

Answer: Across a period from left to right, electronegativity increases due to increasing nuclear charge and decreasing atomic radius, leading to a stronger attraction for bonding electrons. Down a group, electronegativity decreases because the atomic radius increases, and the shielding effect becomes more pronounced, reducing the effective nuclear charge on bonding electrons.

16. How does the difference in electronegativity between two bonded atoms determine the polarity of the bond?

Answer: The difference in electronegativity between two bonded atoms determines the polarity of the bond by creating a dipole moment. If the difference is significant, the bond is polar covalent, with the more electronegative atom attracting electrons more strongly and gaining a partial



negative charge, while the less electronegative atom gains a partial positive charge. If the difference is minimal, the bond is nonpolar covalent.

17. Describe the concept of electronegativity and discuss the factors that influence it.

Answer: Electronegativity is the ability of an atom to attract electrons in a chemical bond. Factors influencing electronegativity include:

Atomic radius: Smaller atoms have higher electronegativity due to closer proximity of bonding electrons to the nucleus.

Nuclear charge: Higher nuclear charge increases electronegativity as the nucleus can attract electrons more strongly.

Shielding effect: More inner electron shells reduce the effective nuclear charge on the valence electrons, decreasing electronegativity. Electronegativity generally increases across a period due to increasing nuclear charge and decreases down a group due to increasing atomic radius and shielding.

18. Explain why polar covalent bonds form and give an example.

Answer: Polar covalent bonds form when two atoms with different electronegativities share electrons unequally. The more electronegative atom attracts the shared electrons more strongly, creating a partial negative charge on that atom and a partial positive charge on the less electronegative atom. A possible example is the bond between hydrogen and oxygen in a water molecule ( $\text{H}_2\text{O}$ ). Oxygen is more electronegative than hydrogen, so the electrons are drawn closer to the oxygen atom, making it partially negative and the hydrogen atoms partially positive.

19. Discuss the trend in electronegativity across Period 3 of the periodic table and down Group 7, including reasons for these trends.

Answer: Across Period 3, electronegativity increases from sodium (Na) to chlorine (Cl). This increase is due to the rising nuclear charge, which enhances the nucleus's ability to attract bonding electrons. Additionally, the atomic radius decreases across the period, reducing the distance between the nucleus and the valence electrons, further increasing the effective nuclear charge.

Down Group 7, electronegativity decreases from fluorine (F) to iodine (I). Although the nuclear charge increases down the group, the effect is offset by the increasing atomic radius and the added inner electron shells, which increase the shielding effect. The increased distance between the nucleus and the bonding electrons, combined with more significant electron shielding, reduces the nucleus's ability to attract bonding electrons effectively, leading to a decrease in electronegativity.