

# What are Lewis Dot Structures?

## Worksheet

A Lewis structure uses dots around an element's symbol to represent valence electrons. Lines or pairs of dots between atoms show covalent bonds; lone pairs appear as pairs of dots around an atom. They show both bonding and non-bonding electrons.

### Questions

1. How many valence electrons does carbon have?  
A) 2  
B) 4  
C) 6  
D) 8
2. In the Lewis structure of O, how many lone pairs are on each oxygen?  
A) 0  
B) 1  
C) 2  
D) 3
3. A triple bond in Lewis notation means  
A) 3 electrons shared  
B) 3 electron pairs shared  
C) 3 atoms bonded  
D) 3 bonds total
4. What is the octet rule?  
A) Atoms must have 8 protons  
B) Atoms tend to have 8 valence electrons  
C) Bonds must be 8 times stronger  
D) Molecules have 8 atoms maximum
5. Draw the Lewis structure of HO (water).
6. Draw the Lewis structure of CH (methane).
7. Draw the Lewis structure of N (nitrogen gas).
8. Define: What do dots represent in a Lewis structure?
9. Define: What does a line between atoms represent?
10. Define: What are lone pairs?

## Answer Key

1. B) 4 - Carbon is in group 14, so it has 4 valence electrons in its outer shell.
2. C) 2 - O has a double bond (2 pairs shared) and each O retains 2 lone pairs:  $\text{:O}=\text{O:}$
3. B) 3 electron pairs shared - Triple bond =  $\text{NN} = 3$  pairs of electrons (6 electrons) shared between the atoms.
4. B) Atoms tend to have 8 valence electrons - The octet rule states that main-group atoms tend to gain, lose, or share electrons to achieve 8 valence electrons (a stable octet).
5. Oxygen has 6 valence electrons, each H has 1. Total =  $6 + 1 + 1 = 8$  electrons (4 pairs). O in center, bonded to 2 H atoms (2 bonding pairs). Oxygen keeps 2 lone pairs. Structure: H-O-H with 2 dots on oxygen.
6. Carbon has 4 valence electrons, each H has 1. Total =  $4 + 4(1) = 8$  electrons (4 pairs). C in center bonded to 4 H atoms. All 4 pairs are bonding pairs; no lone pairs on C. Structure: carbon surrounded by 4 hydrogens.
7. Each N has 5 valence electrons. Total =  $5 + 5 = 10$  electrons (5 pairs). N atoms triple bonded ( $\text{NN}$ ) = 3 bonding pairs + 2 lone pairs. Structure:  $\text{N}::\text{N}$  with one lone pair on each N.
8. Valence electrons. Each dot is one electron; pairs of dots represent a pair of electrons.
9. A covalent bond. A single line = 1 shared pair (2e); double line = 2 pairs (4e); triple line = 3 pairs (6e).
10. Pairs of electrons on an atom that are NOT involved in bonding. They appear as dots around the atom.

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