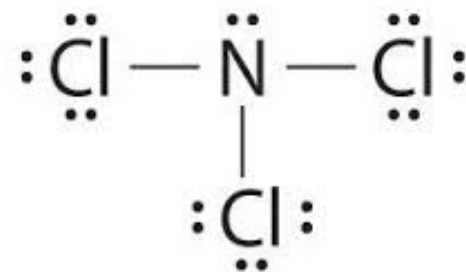


Lewis Structures

- ◆ aka Lewis dot diagrams, electron dot diagrams, etc.
- ◆ Used to represent atoms and covalent compounds
- ◆ **Lewis Structures:**
 - ◆ drawings in which the element's symbol represents an atom's nucleus + core electrons, while dots represent valence electrons
- ◆ What are the **valence electrons**?
 - ◆ The outermost s & p electrons



Drawing Lewis Structures

Example: phosphorus

1. Determine the symbol
2. Determine the number of valence electrons
3. Place the dots, equal to the number of valence electrons, around the symbol. Place one on each side before pairing.



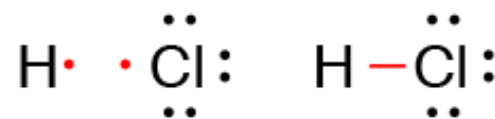
5



Try a few on your own! carbon, argon, nitrogen

unshared/lone pair: pair of valence electrons not involved in bonding to other atoms (2 dots)

single bond: covalent bond where 2 electrons are shared (1 line)



double bond: share 4 electrons (2 lines)



triple bond: share 6 electrons (3 lines)



Tips for Drawing Lewis Structures

1. Pick a central atom or atoms - the least electronegative atom (except for H); usually the one there's only one of
2. Add up the total number of valence electrons
3. Connect atoms with single bonds, then place electrons (dots) around atoms so that the octet rule is met (exceptions include H and B, which are stable with 2 and 6 valence electrons respectively)
4. Count up the electrons represented. If necessary, replace lone pairs with double or triple bonds to make it "work"!

Example: methane, CH₄

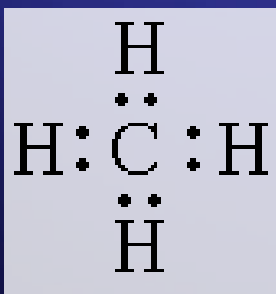
1. Carbon will be the center atom, as there is only one.
2. Valence electron total:

C = 4 valence electron

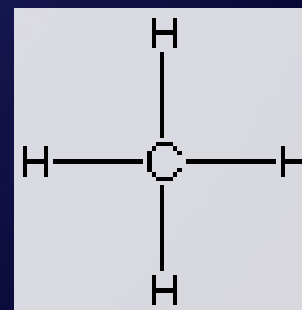
H = 1 valence electron × 4 atoms = 4

8 total

3. Arrange the atoms and their valence electrons so that the octet rule is followed.



Replace shared pairs with lines →



Note!

- ◆ If you're drawing the Lewis structure for a polyatomic ion, add electrons if negative or subtract electrons if positive
- ◆ Ex. CO_3^{2-} has 24 electrons (4 for C, 18 for O, and 2 for the negative charge)

Try these Lewis structures!

1. nitrogen tribromide
2. water
3. silicon tetrafluoride
4. carbon dioxide
5. formaldehyde (CH_2O)
6. borane (BH_3)
7. ethylene (C_2H_4)