

Lewis Structures



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Lewis structures are representations of molecules showing all electrons, bonding and nonbonding.

Writing Lewis Structures

1. you must know the order in which the atoms are connected

This is normally determined by experiment and is referred to as the *constitution* of a molecule

Writing Lewis Structures

1. you must know the order in which the atoms are connected



the molecular formula
gives no clue to the
constitution

Writing Lewis Structures

1. you must know the order in which the atoms are connected

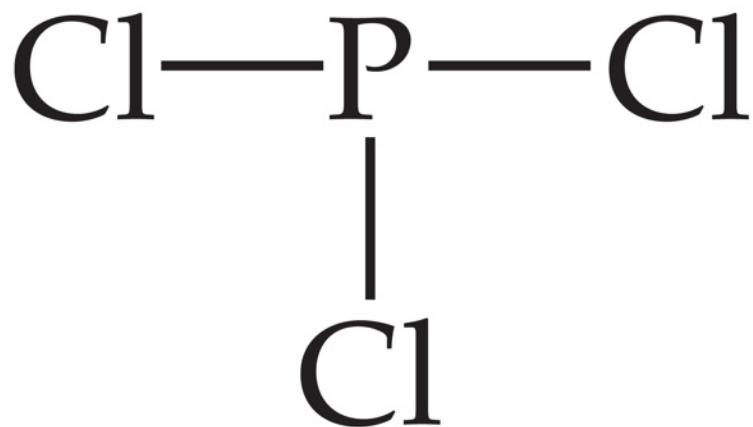
Cl P Cl

Cl

in simple structures the central atom is the *least* electronegative element.

excluding Hydrogen

Writing Lewis Structures

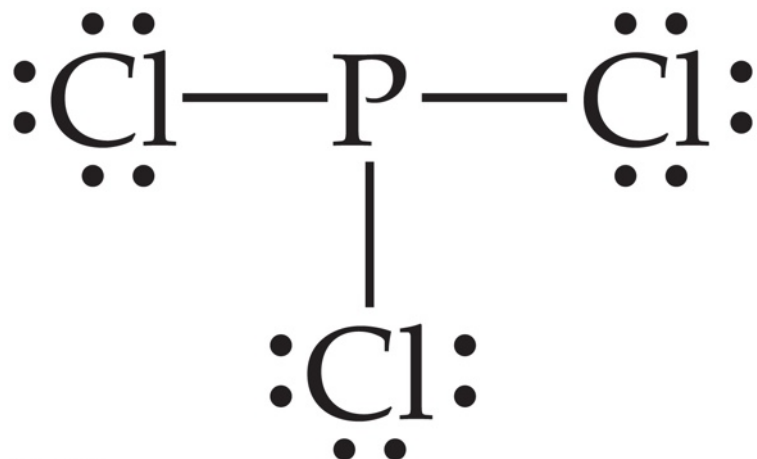


3. write out the constitution in a form that shows the covalent bonds and subtract the number of electrons in covalent bonds from the total

Keep track of the electrons:

$$26 - 6 = 20$$

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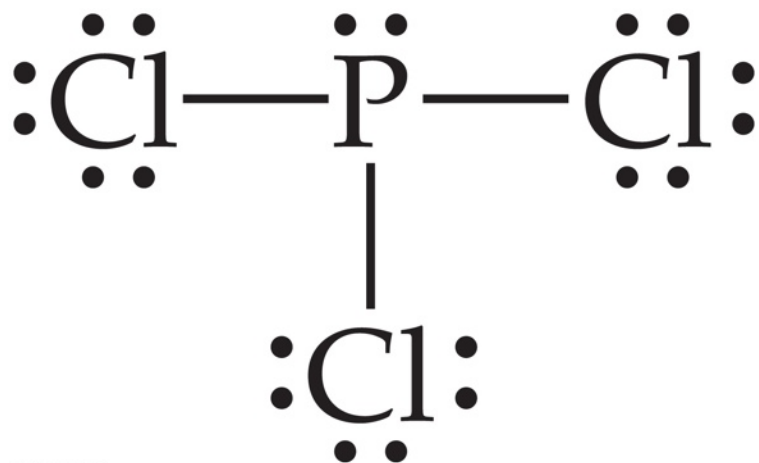


4. Fill the octets of the more electronegative atoms first.

Keep track of the electrons:

$$26 - 6 = 20; 20 - 18 = 2$$

Writing Lewis Structures



5. Fill the octets of the less electronegative atoms.

Keep track of the electrons:

$$26 - 6 = 20; 20 - 18 = 2; 2 - 2 = 0$$

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6. If you run out of electrons before the central atom has an octet...

...form multiple bonds until it does.



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7. Then assign formal charges.

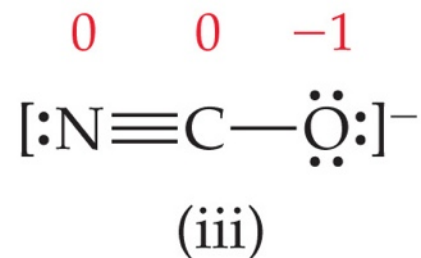
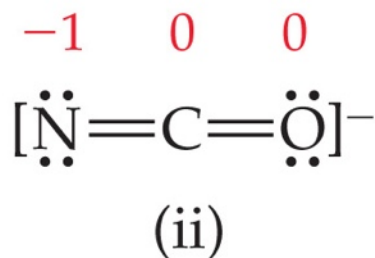
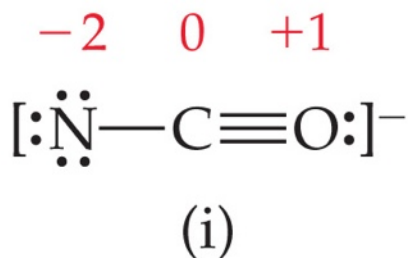
- For each atom, count the electrons in lone pairs and half the electrons it shares with other atoms.
- Subtract that from the number of valence electrons for that atom: the difference is its **formal charge**.

	$\ddot{\text{O}}=\text{C}=\ddot{\text{O}}$	$:\ddot{\text{O}}-\text{C}\equiv\text{O}:$
Valence electrons:	6 4 6	6 4 6
-(Electrons assigned to atom):	6 4 6	7 4 5
Formal charge:	0 0 0	-1 0 +1

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Writing Lewis Structures

- The best Lewis structure...
 - ...is the one with the fewest charges.
 - ...puts a negative charge on the most electronegative atom.



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