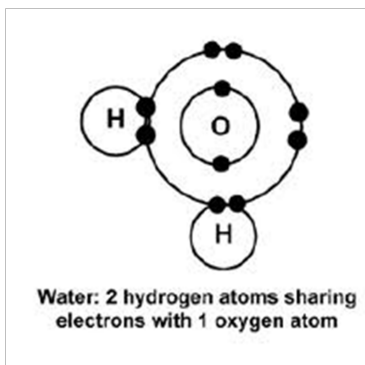


6.1 Covalent Bonds



Oct 14-10:35 AM

1. Review!

Draw the electron dot (Lewis) structure for carbon.



Draw the electron dot (Lewis) structure of hydrogen.



Oct 6-6:47 AM

Covalent Bonds

Covalent Bonds form in non-ionic compounds where pairs of electrons are shared, not lost or gained. Atoms gain stability (won't react) by following the octet rule - having eight valence electrons.

Molecule: A group of covalently-bonded elements. (Ionic compounds = formula unit)

2. Example: How many electrons gained in:

O?	Cl?	P?
2	1	3

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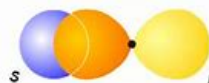
Single Bonds (Called sigma (σ) bonds)

Bonds form when **two** valence electrons (V. E.) pair up between atoms.

This happens when two s-orbitals overlap:



or one s and one p orbital overlap



or two p-orbitals overlap.



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Double & Triple (pi (π)) Bonds

Double bond involves two pairs of electrons.

Ex.: oxygen O_2 .



Note: Electrons shift to be symmetric.

Triple bonds involve three pairs of electrons.

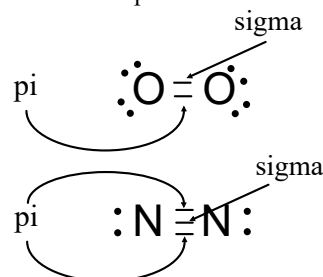
Ex.: nitrogen N_2 .



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Identifying Bonds

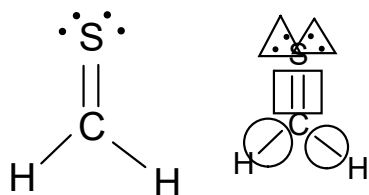
In double/triple bonds, first bond is a sigma; subsequent bonds are pi bonds.



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3. Guided Example: Covalent Bonds

Circle the single bonds, box the double bonds, and put a triangle around the lone pairs of electrons.



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Diatomic Molecules

Elements can form covalent bonds with themselves.

(P. 3 in Resources)

Hydrogen = H₂

Nitrogen = N₂

Oxygen = O₂

Fluorine = F₂

Chlorine = Cl₂

Bromine = Br₂

Iodine = I₂ Memorize them!

A mnemonic: "Gen-u-ine" – elements ending in "gen" or "ine" are diatomic.

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Simple Lewis (Electron Dot) Structures

Molecules can be drawn, showing bonds.

Simple Process (gets more complex later):

1. Draw each atom - singleton ones in the middle.
2. Draw valence electrons on atoms.
3. Join atoms so that they share electrons forming an octet (H has 2 only).
4. Redraw molecules symmetrically.

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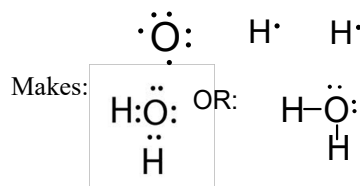
4. Water Lewis Structure Example

Ex: Water: H₂O

Which is central? Oxygen

How many V. E. for oxygen and hydrogen?

Oxygen = 6 V. E. Hydrogen = 1 V. E.



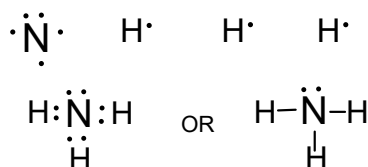
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5. Ammonia Lewis Structure Example

Ammonia, NH₃

Valence electrons?

How many does each element need?



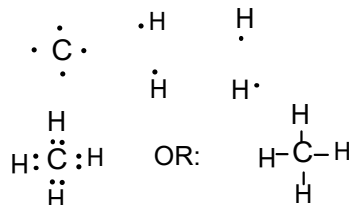
Note: non-bonding electrons must be shown!

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6. Methane Example

Methane: CH₄

You try! Connect atoms to form electron pairs.



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Bond Strength

The shorter the bond, the stronger it is.

The more bonds present, the shorter they are (think grappling hooks).

Ex: O_2 (1.21×10^{-12} m) and N_2 (1.11×10^{-12} m)



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Energy

Energy change occurs when bonds break or form.

Bond dissociation energy – Energy needed to break bonds.

Bond formation energy – Energy released when forming bonds.

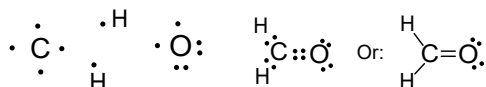
Endothermic Reaction – more energy required to break bonds than released during bond formation.

Exothermic Reaction – more energy released during bond formation than needed for bond breaking.

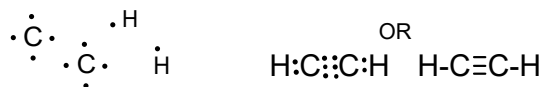
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7. Doozie Examples

Double bond example, formaldehyde: CH_2O .



Triple bond example, acetylene: C_2H_2 .



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Homework

Read 8.1 & 8.2 in your book
6.1 Problems in your Booklet
Due: Next Class

Nov 1-9:24 PM