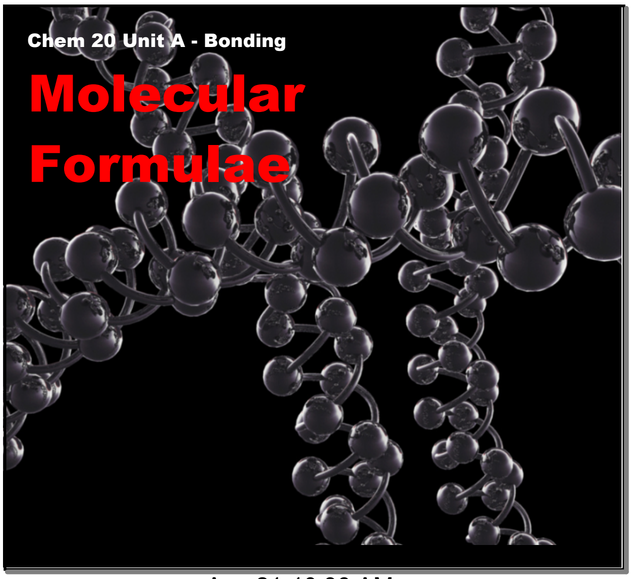


Aug 21-10:36 AM

POS Checklist:

You will...

- ☐ relate electron pairing to multiple covalent bonds.
- ☐ draw electron dot diagrams of atoms and molecules, writing structural formulas for molecular substances and using Lewis structures to predict bonding in simple molecules.
- ☐ illustrate, by drawing or building models, the structure of simple molecular substances.

Aug 21-10:39 AM

Review: Draw LDD for the following atoms:

a) oxygen

By mass, oxygen is the third most abundant element in the universe and the most abundant element in the earth's crust.

b) nitrogen

Liquid nitrogen boils at -197°C and is used as a cryogenic and to make ice cream at the TWOS.

c) chlorine

Chlorine gas was first used as a chemical weapon in WW1 and later used in the Iraq war.

Aug 21-6:47 PM

Recall that the formulas ionic compounds were expressed as whole number ratios:

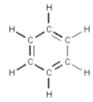
ex) $MgCl_{2(s)}$ = a 1 : 2 ratio of Mg to Cl

Molecular compounds can not be expressed this way, because even the same ratio of elements can produce many different molecules.

ex) $C_2H_{2(g)}$ = a 1 : 1 ratio, forms acetylene (ethylene) $H-C\equiv C-H$

AND

$C_6H_{6(l)}$ = a 1 : 1 ratio, forms benzene

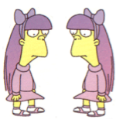


Aug 21-6:59 PM

So, we can use our knowledge of Lewis Dot Diagrams and what we know about bonding so far to work out the structure of some common molecules.

Aug 22-8:50 AM

Diatomic Elements



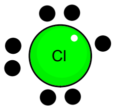
You may have noticed some elements travel in pairs. For example, we write:

$H_{2(g)}$ hydrogen	$F_{2(g)}$ $Cl_{2(g)}$
$O_{2(g)}$ oxygen	$Br_{2(l)}$ $I_{2(l)}$ the halogen group
$N_{2(g)}$ nitrogen	the diatomic elements

These elements are said to be diatomic and occur in pairs in nature. But why does this occur?

Aug 21-7:03 PM

Let's look at the LDD for a single chlorine atom, taken from a flask of chlorine gas:



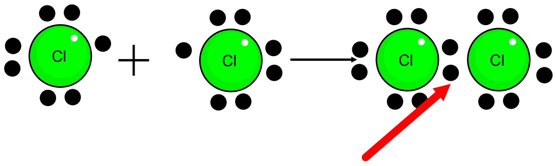
There are 7 valence electrons. This is not very stable.

An atom missing a valence electron would really like to fill up that last orbital to achieve stability.

But where could the extra electron come from?

Sep 19-8:38 PM

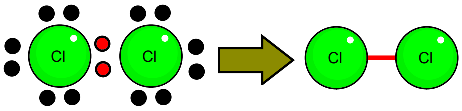
The extra electron can come from another chlorine atom.



Because each chlorine atom has the same electronegativity, the atoms share the bonding electrons equally and a covalent bond is formed.

Aug 21-7:16 PM

We simplify this diagram even more by drawing in a line to represent the bonding electrons.

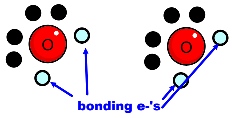


This is called a structural diagram.

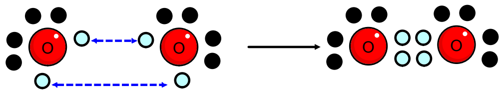
The black line represents a chemical bond. Both nuclei have an equal attraction towards the shared e-'s, and the e-'s hold the atoms together.

Now, let's make structural diagram for another diatomic molecule, oxygen.

Sep 19-8:42 PM



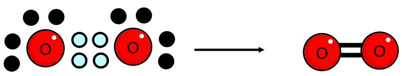
We know the oxygen atom has six valence electrons. Two of those electrons are bonding electrons.



In the case of oxygen, each of the bonding electrons will form a bond. We will have a double bond holding oxygen together.

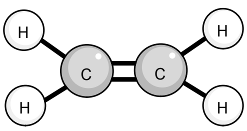
Sep 19-8:45 PM

Double Bonds



The double bond allows oxygen to fill all its valence orbitals.

Ethylene, found in human hormones, is another example of a double-bonded molecule.

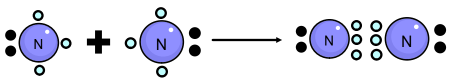


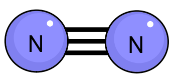
$C_2H_{4(g)}$

Sep 19-8:50 PM

Triple Bonds

Other compounds form three sets of bonds to fill their valence orbitals:





Nitrogen is a triple-bonded molecule.

H≡CN **hydrogen cyanide is another example of a triple bond.**

Aug 21-7:33 PM

tomic Elements

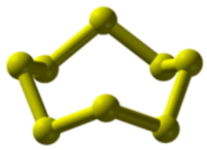
nown experimentally that element

orms the polyatomic molecule P_4

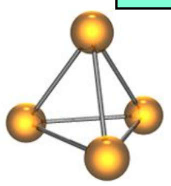
$S_{8(s)}$.

Challenge: Using LDD, draw a possible structu

$S_{8(s)}$ and $P_{4(s)}$.



There are 30 allotropes of sulphur, with $S_{8(s)}$ being most common. $S_{7(s)}$ and $S_{6(s)}$ can also be formed.



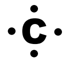
White phosphorus is one allotrope of $P_{4(s)}$.

Aug 22-8:25 AM

Steps to Drawing Lewis Formulas

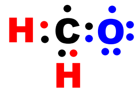
ex) Determine the Lewis formula for methylaldehyde (also called formaldehyde), $CH_2O_{(l)}$.

Step 1: Draw the LDD for the central atom. This is usually the atom with the largest bonding capacity (the most unpaired e-'s).

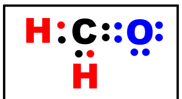


carbon has a bonding capacity of 4.

Step 2: Draw in the peripheral atoms and pair any lone electrons.



Step 3: Add in double bonds only when needed to make complete octets.



Aug 22-9:25 AM

Practice: Draw LDD and structural diagrams for each molecule.

a) $HF_{(g)}$

d) $CS_{2(l)}$

b) carbon tetrafluoride

e) $CN^{-}_{(aq)}$

c) $CH_3F_{(g)}$

f) carbonate ion

Sep 19-8:54 PM

Weirdos

- some molecules do not follow these guidelines:

boron trihydride
(does not follow octet rule)

nitrogen monoxide
(has one unpaired electron)

Aug 22-9:08 AM

Predicting Molecular Formulas

Predict the simplest molecular formula and write the product of each reaction. Show LDD and structural diagrams.

a) $I_{2(s)}$ + $Br_{2(l)}$

c) $O_{2(g)}$ + $Cl_{2(g)}$

b) $P_{4(s)}$ + $Cl_{2(g)}$

HINTS

- Look to build simplest molecules possible
- use the fewest molecules possible
-use the fewest double/ triple bonds possible

Sep 19-8:59 PM

Page 90 #1-6

Sep 19-9:10 PM