Chapter 8:Covalent Bonding

Molecules and Molecular Compounds

- most of the elements are ionic solids or noble gases at room temperature
- recall that metals and non-metals (left and right side of the periodic table) combine to form ionic compounds
- these ionic bonds form when electrons physically transfer from one atom to the other

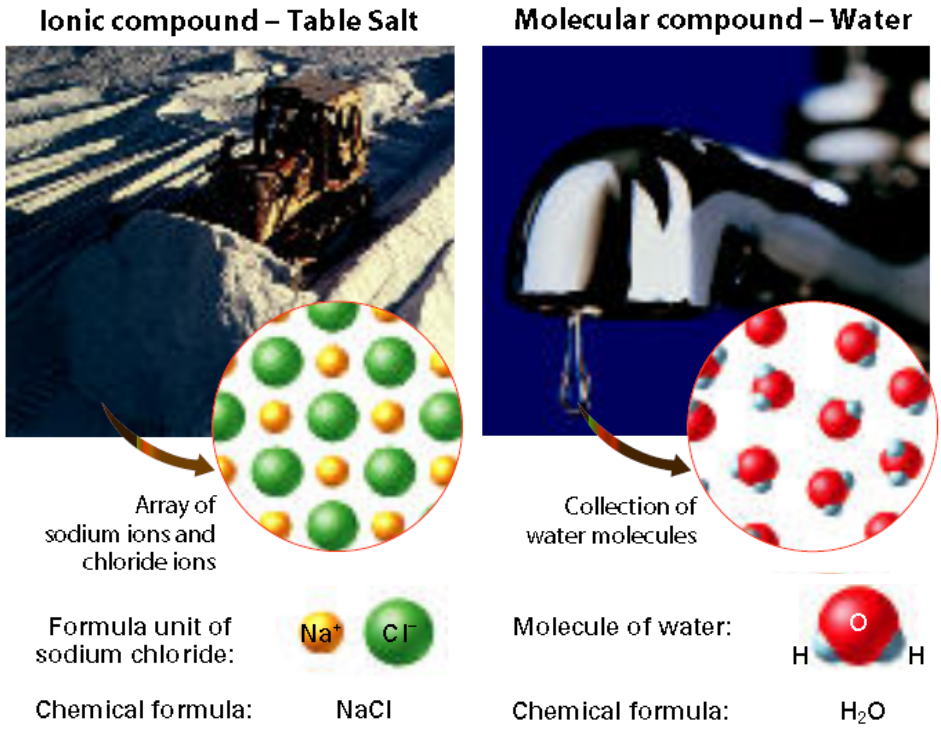
Covalent Bonds

- sometimes electrons are not completely transferred between atoms bonding but are 'shared'
- similar to a 'tug of war' between the atoms that are bonding for the electrons involved in the compound
- some elements form 'diatomic' molecules, that is 2 atoms of the element bonded as a molecule

  Ex. Oxygen (O_2), Nitrogen (N_2)

Molecular Compounds

- tend to have relatively low melting points and boiling points
- molecular compounds tend to form from combinations of two or more non-metals

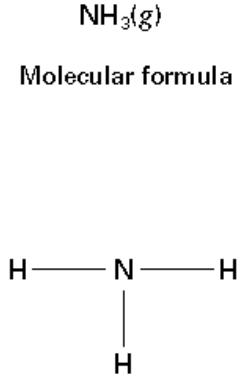


Different Representations of Molecular Compounds

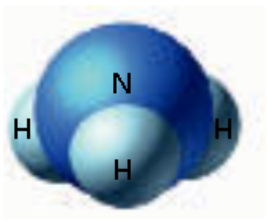
Ammonia

$NH_3(g)$

Molecular formula



Structural formula



Space-filling molecular model

Perspective drawing

Ball-and-stick molecular model

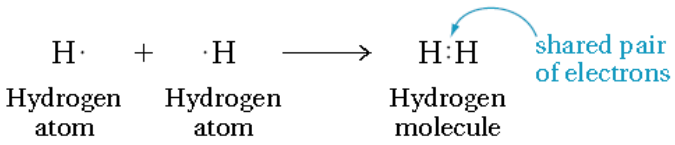
Section 8.2-The Nature of Covalent Bonding

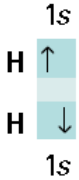
The Octet Rule in Covalent Bonding

- in covalent bonds, electron ***sharing*** usually occurs so that atoms attain the electron configuration of noble gases.

Single Covalent Bonds

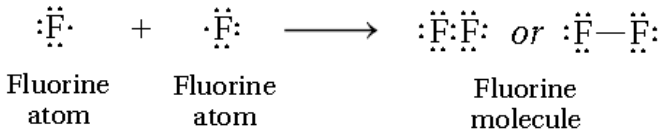
- hydrogen gas consists of a diatomic molecule of 2 hydrogen atoms sharing a pair of electrons in a single covalent bond.

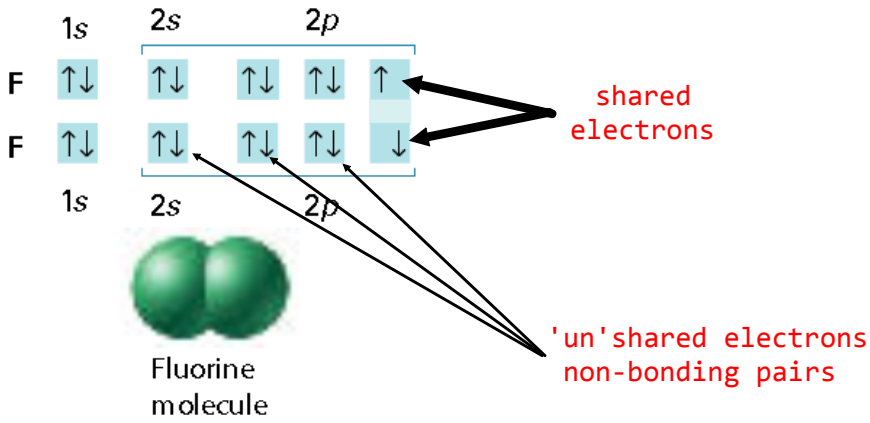




Hydrogen molecule

- Halogens of Group 7A, also form diatomic molecules





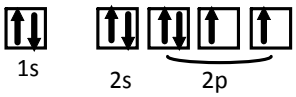
- Electron dot diagrams can be used to help determine the number of covalent bonds and their shape.

Examples:

Oxygen

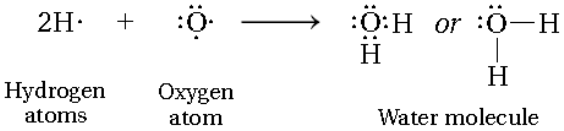
Electron Configuration $1s^2 2s^2 2p^4$

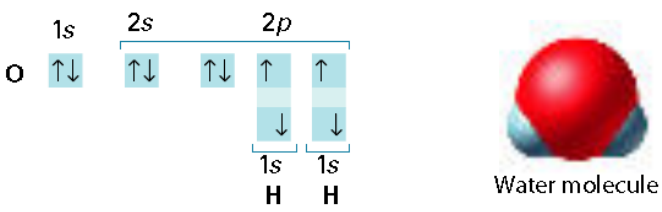
Aufbau Diagram



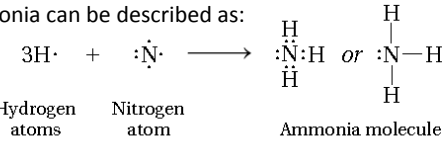
Electron Dot Diagram

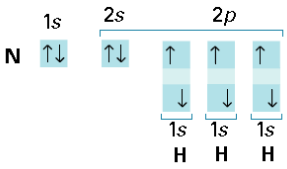
Therefore, the water molecule can be shown to be:





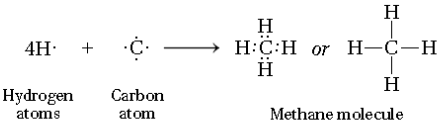
Similarily, ammonia can be described as:

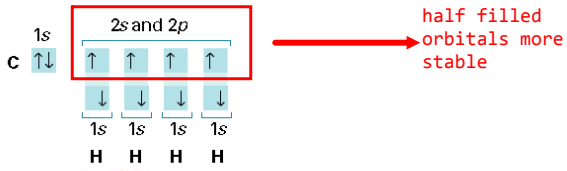




Ammonia molecule

And methane:





Methane molecule

Homework
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