Covalent Bonding

Covalent Bonding

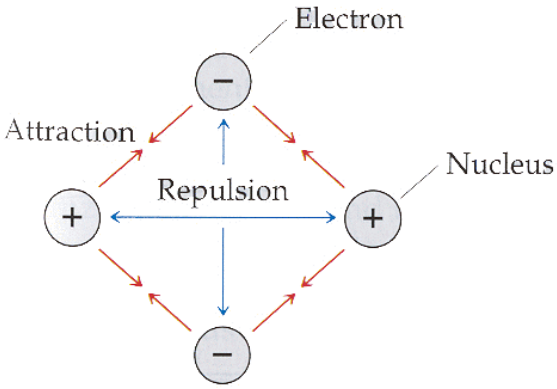
In Comparison

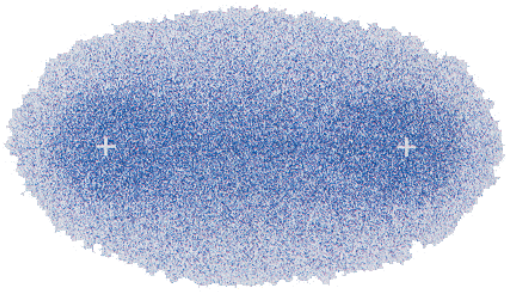
- Ionicly bonded substances tend to be....
  - Solids at room temperature
  - Crystalline
    - Flat surfaces
    - Sharp edges
  - Brittle
  - Break smoothly leaving flat surfaces
  - High melting points
  - Why?
- Covalently bonded substances tend to be....
  - Solids, liquids, or gases
  - Low melting points
  - Vaporize easily
  - Ductile
  - Malleable
  - Why?

Covalent Bonding

How Does It Work?

- Covalent bonds are created when atoms **share** valence electron
- Why does sharing electrons, which are all negatively charged, create a net attractive force between the atoms?





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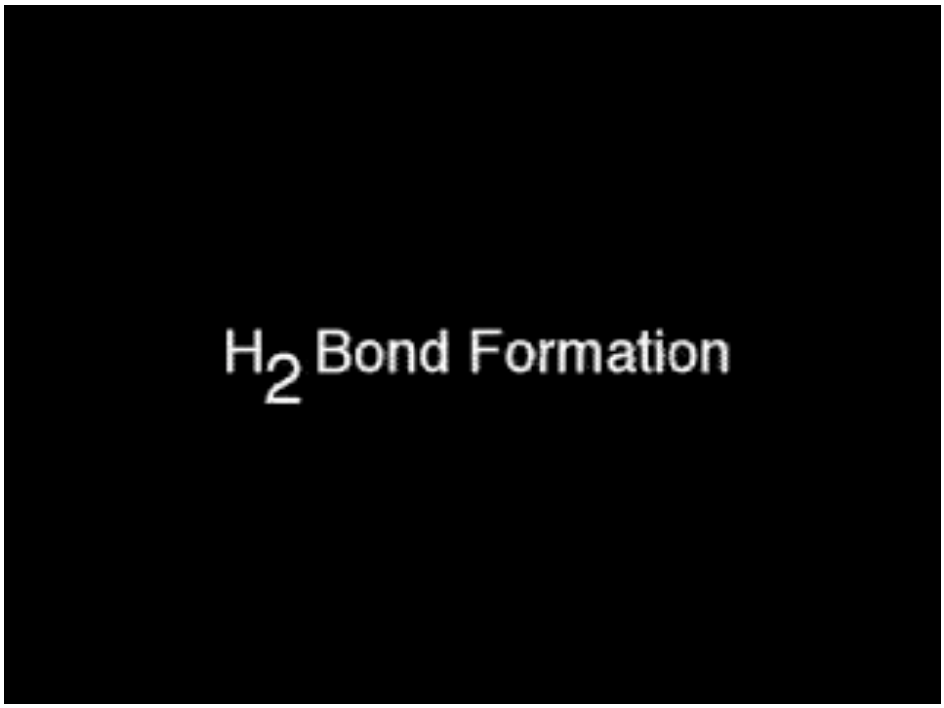

Covalent Bonding

Lewis Dot Molecular Structures

- Several important points
  - The central atom tends to be the one with the most bonding sites
  - Chemical formulas are often written in the order the atoms bond
  - More complex molecules are often written with the central atoms followed by the atoms bonded to them
    - $CH_3CH_2CH_2OH$
  - Begin by using single bonds, then work to complete octets with multiple bonds if necessary
    - Hydrogen only gets one bond and is never in the middle
    - Halogen must be filled with unbounded electrons
- Draw carbon dioxide

Covalent Bonding

Formal Charge in Carbon Dioxide

- To determine which is correct, some general rules
  - When several Lewis dot structures are possible, the most stable one will be that in which
    - The atoms have the smallest formal charges
    - Any negative formal charge resides on the more electronegative element

Covalent Bonding

Formal Charge

- Calculating formal charge
  - Formal charge is a comparison of an atom's electron structure when bonded in a molecule with its unbonded electron structure.
  - To calculate formal charge
    - Each unbonded electron counts as one
    - Each bonded electron pair counts as one
- FC = unbonded score - bonded score

Covalent Bonding

Homework

- 8.34
- 8.37
  - a) What is meant by the term electronegativity?
  - b) On the Pauling scale what is the range of electronegativity values (see you "good" periodic table)?
  - c) Which element has the greatest electronegativity?
  - d) Which element has the smallest electronegativity?
- 8.43 / 8.47
- 8.49
  - a) When taking about atoms in a Lewis structure, what is meant by the term formal charge?
  - b) Does the form; charge of an atom represent the actual charge on that atom? Explain.
  - c) How does the formal charge of an atom in a Lewis structure differ from the oxidation number of the atom?
- 8.52 / 8.53