

IV. How are Atoms held together in a Covalent Bond? (Lesson 3 pages 139-140)

A. Covalent Bond: chemical **bond** formed when 2 atoms **share** electrons (e^-) between two or more **non-metals**

B. Electron Sharing

- The **attraction** between the shared e^- and p^+ in the **nucleus** of each atom hold the atom together in a **covalent** bond.

C. Covalent Bonds

- Form **single**, **double**, and **triple** bonds by sharing one or more pairs of e^- . (see p. 140)
- Single = **1 pair** (2 electrons)
- Double = **2 pair** (4 electrons)
- Triple = **3 pair** (6 electrons)

V. What are properties of molecular compounds? (Lesson 3 p. 141)

A. Molecular Compound

- **Compounds** made of molecules.
- The atoms in this compound are covalently bonded.
- **ionic** compounds are made up of CHARGED ions and do not form molecules.
- **Molecular** Compound Example: Sugar: $C_{12}H_{22}O_{11}$

B. Poor Conductivity

- **Molecular** compounds do not **conduct** electric current.
- Even in **liquids** they are poor conductors.

C. Low Melting and Boiling Points

- **Forces** between molecules weaker than **ions**.
- Needs less heat than **ionic** to separate and change from solid to liquid.

VI. How Do Bonded Atoms Become Partially Charged? (Lesson 3 p. 143-145)

- A. **Atoms** of some elements pull more **strongly** on the shared e^- of a covalent bonds than do atoms of other elements.
- As a result the e^- are shared **unequally**.
 - This can cause atoms to have a slight electric charge. (not neutral)
 - These charges are not as strong as the charges on ions.
- B. Non-Polar Bonds
- Non polar Bond: a **covalent** bond in which e^- are shared **equally**. (CH_4 , CO, CO_2)
- C. Polar Bond: a **covalent** bond in which electrons are shared **unequally**. (H_2O)
- D. Polar Bonds in Molecules.
- A molecule is **polar** if it has a **positively** charged end and a **negatively** charged end. (think of polar opposites)
- E. Attractions Between Molecules
- Polar molecules are **connected** to each other by **weak** attractions they are called Vanderwaals Forces.
 - Vanderwaals forces pull **water** molecules toward each other.
- *water on string demo*
- F. The **melting** point and boiling point of **H_2O** (polar) is much **higher** than the melting point and boiling point of (non-polar) O_2 .

VII. What is the Structure of a Metal Crystal? p. 146-147

A. Metal atoms lose e^- easily because they do not hold onto their valence e^- very strongly.

- Most metals are crystalline solids.
- A metal crystal is composed of closely packed positive metal ions.

B. Metallic Bonds: an attraction between a positive metal ion and the e^- surrounding it.

VIII. What are Properties of Metals?

(Lesson 4 Pages 148-151)

A. Metallic bonding (the behavior of valence electrons) is the reason for the common physical properties of metals such as:

Shiny(luster), malleability, ductility, electrical and thermal conductivity

B. Luster- valence e^- causes the light to be reflected!

Euler's Disk Demo*

B1. Malleability and ductility - metals act this way b/c the positive metal ions are attracted to the loose e^- all around them

C. Thermal Conductivity - metals
conduct heat easily b/c the valence
 e^- within a metal are free to move.

Ring and Sphere Demo

D. Electrical Conductivity - metals
conduct electric current easily b/c
the valence e^- in a metal can move
freely among the atoms.

E. Alloy- mixture made of 2 or more elements, at least one of which is a metal.

- Usually stronger
- Less reactive/less rust
- Most metallic objects are made of alloys
- Iron is usually combined w/other metals to make steel.