

Opening Activity: Use your periodic table

1. How many protons are in an atom of Carbon?
2. How many electrons are in an atom of Carbon?
3. How many neutrons are in an atom of Carbon?
4. Draw an atom of Carbon →→→→→→→→→→→→

Latin Root Word:

Review of Old Information:

Log on to the following website to complete the Web Quest.

<http://www.qacps.k12.md.us/qhs/teachers/WeedonD/Atoms%20page%202.htm>

1. The basic unit of all matter is the _____.
2. All atoms are made of three types of particles _____, _____, and _____.
3. The _____ is used to identify an atom.
4. Protons are found in the _____ of atoms. They have a _____ charge.
5. How can you calculate the number of protons in an atom?

6. How big are protons compared to electrons?

7. Where are neutrons found in an atom?

8. How can you calculate the number of neutrons in an atom?

9. What is the charge on an electron? _____
10. How can you calculate the number of electrons in an atom?

11. An atom can gain or lose electrons to become an _____.
12. A sodium atom has _____ protons and _____ electrons and a sodium ion would have _____ protons and _____ electrons.
13. The removal of an electron results in a _____ charge.
14. THINK!! If 2 electrons were removed from magnesium, what would the charge on magnesium be? _____

New Information:

Yesterday you learned about the composition of the many different atoms that exist in nature. However, most of these atoms do not exist in a natural state on their own, but use chemical bonds to combine with atoms of other elements. Today you will examine the nature of bonding beginning on page 33 of the textbook:

Notes:

Compounds

● Compound - 2 or more _____ chemically.

● Ex. Water, table salt

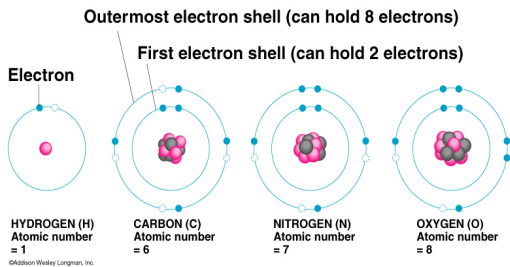
FIRST SHELL								Hydrogen ${}_1\text{H}$	Helium ${}_2\text{He}$
SECOND SHELL	Lithium ${}_3\text{Li}$	Beryllium ${}_4\text{Be}$	Boron ${}_5\text{B}$	Carbon ${}_6\text{C}$	Nitrogen ${}_7\text{N}$	Oxygen ${}_8\text{O}$	Fluorine ${}_9\text{F}$	Neon ${}_{10}\text{Ne}$	
THIRD SHELL	Sodium ${}_{11}\text{Na}$	Magnesium ${}_{12}\text{Mg}$	Aluminum ${}_{13}\text{Al}$	Silicon ${}_{14}\text{Si}$	Phosphorus ${}_{15}\text{P}$	Sulfur ${}_{16}\text{S}$	Chlorine ${}_{17}\text{Cl}$	Argon ${}_{18}\text{Ar}$	

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Why are electrons important?

1) Elements have different _____ configurations

- different electron configurations mean different levels of _____



Electron (Lewis) Dot Structures

Symbols of atoms with dots to represent the valence-shell electrons

Chemical bonds: an attempt to fill electron _____

X would be the electron dot formula for

X would be the electron dot formula for

IONIC BOND

bond formed between two _____ by the transfer of electrons

Ion = an atom with a charge (+ or -)

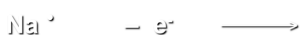
Formation of Ions from Metals

Ionic compounds result when _____ react with _____

Metals _____ electrons to match the number of valence electrons of their nearest noble gas

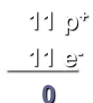
Positive ions form when the number of _____ are _____ than the number of protons

Sodium atom



Sodium ion

2-8 (= Ne)



A. Number of valence electrons in aluminum

- 1) $1 e^{-}$ 2) $2 e^{-}$ 3) $3 e^{-}$

B. Change in electrons for octet

- 1) lose $3 e^{-}$ 2) gain $3 e^{-}$ 3) gain $5 e^{-}$

C. Ionic charge of aluminum

- 1) 3^{-} 2) 5^{-} 3) 3^{+}

Ions from nonmetals

In ionic compounds, nonmetals in 15, 16, and 17 _____ electrons from metals

Nonmetal add _____ to achieve the octet arrangement

Nonmetal ionic charge: 3-, 2-, or 1-

In ionic compounds, nonmetals in 15, 16, and 17 gain electrons from metals

Nonmetal add electrons to achieve the octet arrangement

Nonmetal ionic charge:

3-, 2-, or 1-

Overall: Ionic bonding

Between atoms of _____ and _____

Bond formed by _____ of electrons

Examples; NaCl, CaCl₂, K₂O

COVALENT BOND

bond formed by the _____ of electrons

Overall: Covalent Bonding

Between _____ elements of similar electronegativity.

Formed by _____ electron pairs

Examples; O₂, CO₂, C₂H₆, H₂O

Non Polar Covalent Bond: _____

Polar Covalent Bond: _____

Draw Water...

Isotopes

An isotope is an atom of the _____ element with a different number of _____

Isotopes have different _____ but the # of protons are the same

Because they have the same number of electrons, all isotopes of an element have the same chemical properties.

Isotope Example Carbon 12

6
C
Carbon
12

Protons = 6

Electrons = 6

Neutrons = 12-6 = 6

Isotope Example Carbon 14

6
C
Carbon
14

Protons = 6

Electrons = 6

Neutrons = 14-6 = 8

NOTE:

chemical properties



Go to: http://www.teachersdomain.org/asset/lps07_int_ionicbonding/

1. Describe what happens when two negatively charged particles interact with one another. (you can draw a diagram to help illustrate your ideas)
2. When will oppositely charged atoms stick together?
3. A. What is an ion? (Look this up online)

B. What is a cation and where can you find it on the periodic table?

C. What is an anion and where can you find it on the periodic table?
4. Take a look at the ionic bond formed between Sodium and Chlorine atoms.
 - a. Draw each atom below as it looks like in NaCl on the website.

 - b. Label the Na and Cl as either + or -. And label each as either Cation or Anion.

5. Describe how ionic compounds form crystals:

COVALENT BONDS Go to: http://www.teachersdomain.org/asset/lsp07_int_covalentbond/

1. If an atom, such as hydrogen, is able to form a covalent bond, describe what happens when the electron shells of two atoms overlap:

a. What happens when the two atoms are fairly close?

b. What happens when the two atoms are TOO close?

2. What does the nucleus of an atom want to do to its own electrons?

3. What does the nucleus of one atom want to do to the electrons of a nearby atom?

4. Are the atoms really “sharing” electrons?

5. What type of atoms form covalent bonds?

6. Draw a graph showing the change in potential energy when atoms form covalent bonds.



7. What happens to the stability of atoms when they form covalent bonds?

8. A line can be used to represent a covalent bond between two atoms. Diagram pairs of atoms that can form double bonds

9. Can every atom form each of these kinds of bonds?

Activity: pg. 33 in textbook

Substances made up of combined atoms of two or more elements are called _____.

Why do different elements combine to form compounds?

“Stable” atoms and compounds have an outermost energy level that is completely filled. These energy levels are filled with which particle: protons, neutrons, or electrons (circle one).

Complete the table below comparing the different types of chemical bonds:

Type of Bond	Electrons “Shared” or “Donated”	Example of Molecule
Covalent		
Ionic		

Now, get out the periodic table you received yesterday in class.

Notice that each column, or group, has a Roman numeral followed by a letter. Now focus ONLY on the columns with Roman numerals that have the letter “A” after them. This is your main block of elements found in living things. There are several important trends in chemical bonding that can be learned from studying these groups of elements.

1. The Roman numerals refer to the number of valence electrons that exist in the outermost energy level of the atom of that element.
2. TRUE or FALSE An atom with a full outermost energy level is a stable atom.
3. With the exception of hydrogen (which only has two electrons), how many electrons to the elements in this main block need to have a FULL outermost energy level? _____
4. Elements in certain groups will typically bond with other groups of elements to form compounds that are stable.

5. Group 1 elements like sodium (Na) will typically form a bond with a group 7 element like chlorine (Cl) to become stable ($1 + 7 = 8$). This can also occur between group 2 and group 6 elements.
6. When the metals from group 1 and group 2 combine with the non-metals of group 6 and group 7, they typically form an IONIC bond.
7. Therefore, when the non-metals of groups 3 through 7 combine with each other they typically form a _____ bond (where electrons are shared).
8. TRUE or FALSE A group 8 element like neon needs to bond to other elements to be stable.

9. What is the term for the electrons occupying the outermost energy level of an atom? _____

10. Why do atoms form molecules?

11. Compare ionic and covalent bonding.

12. In general, what determines whether atoms will form chemical bonds?

13. What type of bonding (Ionic or Covalent) would be expected between the following atoms?

Na and Cl _____

C and O _____

Mg and Br _____

14. Determine the number of valence electrons in an atom of each of the following elements:

H _____ F _____ Mg _____ O _____ Al _____ N _____ C _____

15. Summarize what you know about bonding so far. (This should be a at least 3 logical sentences.)
