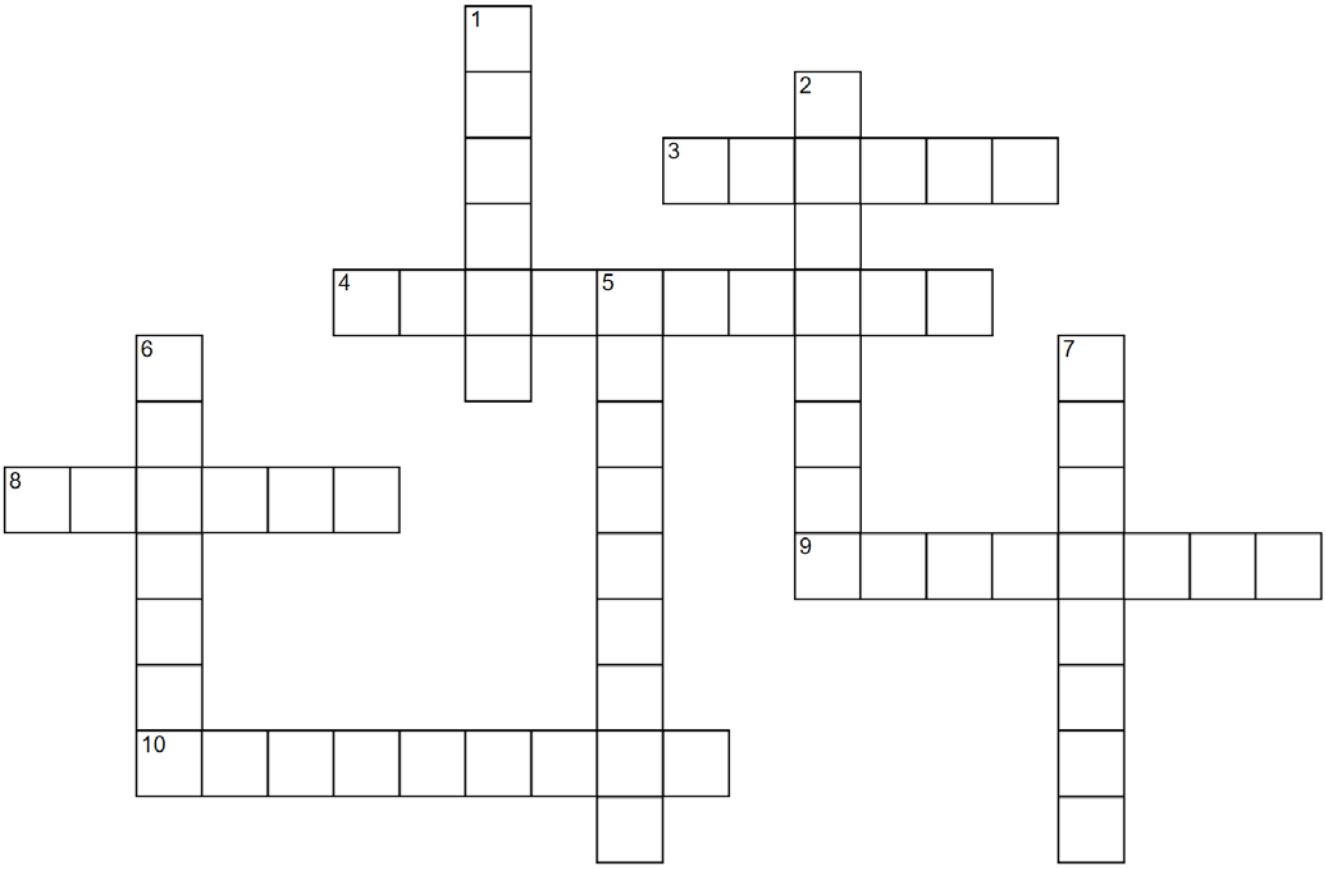
North Hunterdon/Voorhees Biology Summer Assignment

Name _____

CHEMICAL SYMBOLS

A chemical symbol is a shorthand method of representing an element. Instead of writing out the name of an element, we represent an element name with one or two letters. Below is a list symbols for some common elements. Complete the crossword puzzle using the names that match the symbols.

ACROSS		DOWN	
3	O	1	C
4	P	2	H
8	S	5	K
9	N	6	Ca
10	Mg	7	Cl

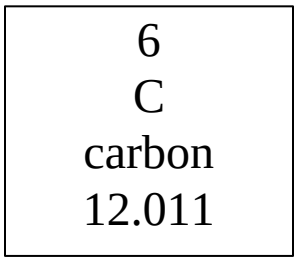


Parts of the Atom

Fill in the following table about the parts of the atom.

PART OF THE ATOM	ELECTRIC CHARGE	LOCATION IN ATOM
proton		
neutron		
electron		

Here's how to predict the structure of any element on the periodic table. For example, look at carbon:



←atomic number: This is the number of protons (also the number of electrons)
←chemical symbol: This is an abbreviation for the element.
←element name: This is the name of the element.
←atomic mass: This number (rounded off) tells you the number of protons *plus* the number of neutrons. (Electrons are too small to be included.)

To find the number of protons, look at the atomic number:

Example for carbon: Atomic number: 6 Number of protons: 6

me

Example for carbon: Atomic mass: 12 (rounded) Number of neutrons: 12 – 6 = 6

To find the number of electrons, look at the atomic number:

Example for carbon: Atomic number: 6 Number of electrons: 6

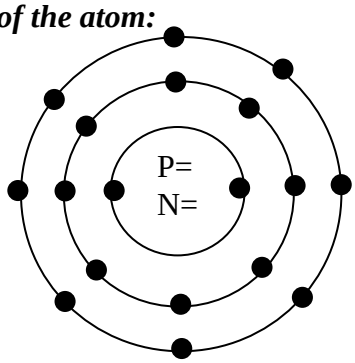
Complete the table for the elements with atomic numbers 1-10.

ELEMENT NAME	ATOMIC NUMBER	ATOMIC MASS	PROTONS	NEUTRONS	ELECTRONS
Hydrogen					
Carbon					
Nitrogen					
Oxygen					

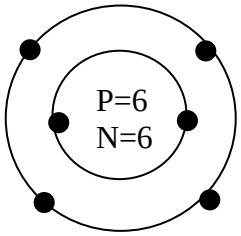
Here's how to draw an atom of any element using the Bohr model of the atom:

Protons and neutrons go in the nucleus (center).
Electrons go in energy levels of the electron cloud.
The first energy level only holds up to 2 electrons.
The second energy level holds up to 8 electrons.
The third energy level holds up to 8 electrons.
The fourth energy level will hold 18.

Example:



Example for carbon: 6 electrons total
First 2 electrons in the 1st energy level
Next 4 electrons in the 2nd energy level



The electrons in the outermost energy level are called valence electrons (V.E.)
Example for carbon: 2nd energy level is the outermost energy level used by carbon
Carbon has 4 valence electrons

Draw a picture of an atom for each of the first ten elements and write the number of valence electrons.

1. hydrogen V.E._____ 2. carbon V.E._____ 3. oxygen V.E._____

Elements and Compounds

Look at the following examples:

C is the elemental form of carbon
H_2 is the elemental form of hydrogen
O_2 is the elemental form of oxygen
$C_6H_{12}O_6$ is a compound (glucose) formed from the elements carbon, hydrogen and oxygen

1. What do the elements carbon, hydrogen and oxygen have in common?

2. How is $C_6H_{12}O_6$ different from carbon, hydrogen and oxygen?

An **element** is a pure chemical substance made of same type of atom. A **compound** contains atoms of different **elements** chemically combined together in a fixed ratio. **Compounds** contain different **elements** in a fixed ratio arranged in a defined manner through chemical bonds.

Classify each formula below as an element or a compound:

1. N _____ 2. NaCl _____

3. H_2O _____ 4. CO_2 _____

Bonding

A **chemical bond** is an electrical force linking atoms together.

Let's take a closer look at the elements in each compound to see what makes a compound IONIC:

NaCl (Sodium Chloride)
MgO (Magnesium Oxide)
Li_2O (Lithium Oxide)
$CaCl_2$ (Calcium Chloride)

Look on the periodic table. What side of the periodic table do you find the FIRST element in each compound?

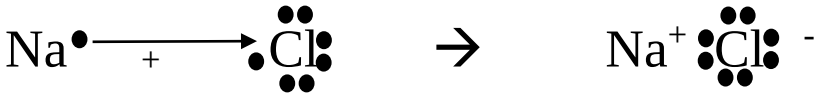
Look on the periodic table. What side of the periodic table do you find the SECOND element in each compound?

Generally speaking, when a _____ and a _____ come together, they make an ionic bond.
(Word Bank: metal, nonmetal, metalloid)

Look at the following compounds formed by ionic bonds.

Key: ● = electron





Describe the movement of electrons during the formation of each of the compounds above.

What happens to the Na atom during the formation of NaCl?

In your own words, define a covalent bond.

Let's take a closer look at the elements in each compound to see what makes a compound COVALENT:

CO (carbon monoxide)
CH_4 (methane)
SiO_2 (silicon dioxide)
CO_2 (carbon dioxide)

Look on the periodic table. What side of the periodic table do you find the FIRST element in each compound?

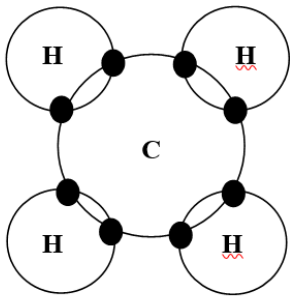
Look on the periodic table. What side of the periodic table do you find the SECOND element in each compound?

Generally speaking, when a _____ and a _____ come together, they make a covalent bond. (Word Bank: metal, nonmetal, metalloid)

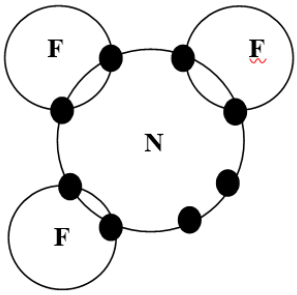
Look at the models of covalently bonded molecules:

Key: ● = electron

CH_4 (methane)



NF_3 (nitrogen trifluoride)

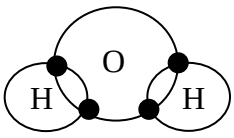


Describe how the electrons are arranged in each molecule:

In your own words, define a covalent bond.

THE STRUCTURE OF WATER - H_2O

Look at Model 1 of a water molecule below:

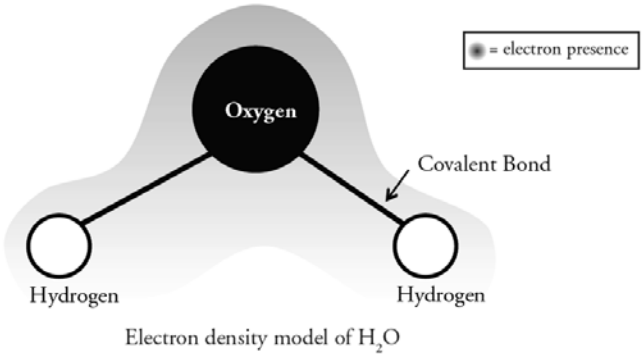


Model 1

1. The structure of water is key to its special properties. Water is made up of one atom of _____ and two atoms of _____

2. By looking at the model of a water molecule above, predict the type of bond that holds the atoms together. _____

Look at Model 2 of a water molecule showing the electron density:



Electron density model of H_2O

3. What is the charge of an electron?

4. The shading around the molecule represents the relative density of electrons shared by the atoms. What does this indicate about the density of electrons around the oxygen atom as compared to the density of electrons around the hydrogen atoms?

5. Where is the majority of negative charge on the water molecule?