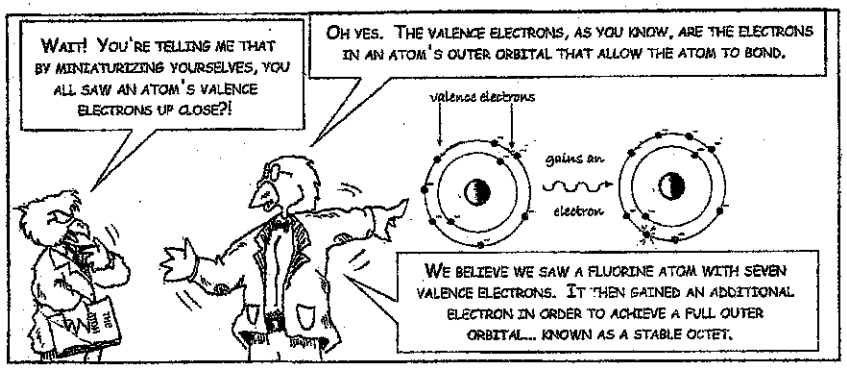
DR. BIRDLEY INVESTIGATES — INTRODUCING ATOMIC STRUCTURE

NAME:_____

CLASS:_____ DATE:_____

Mini-Comic: Valence Electrons

Directions: Read the panels in the space below and answer the questions that follow.



1. Where are valence electrons located?

2. What is the function of a valence electron?

3. Why did the Fluorine atom "want" to gain a valence electron?

4. What is a stable octet?

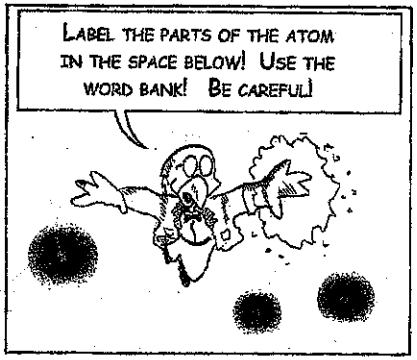
5. Based on the illustration of the atom on the right, what is the maximum number of electrons that the outer orbital can hold?

6. How about the inner orbital?

DR. BIRDLEY INVESTIGATES — THE PARTS OF THE ATOM

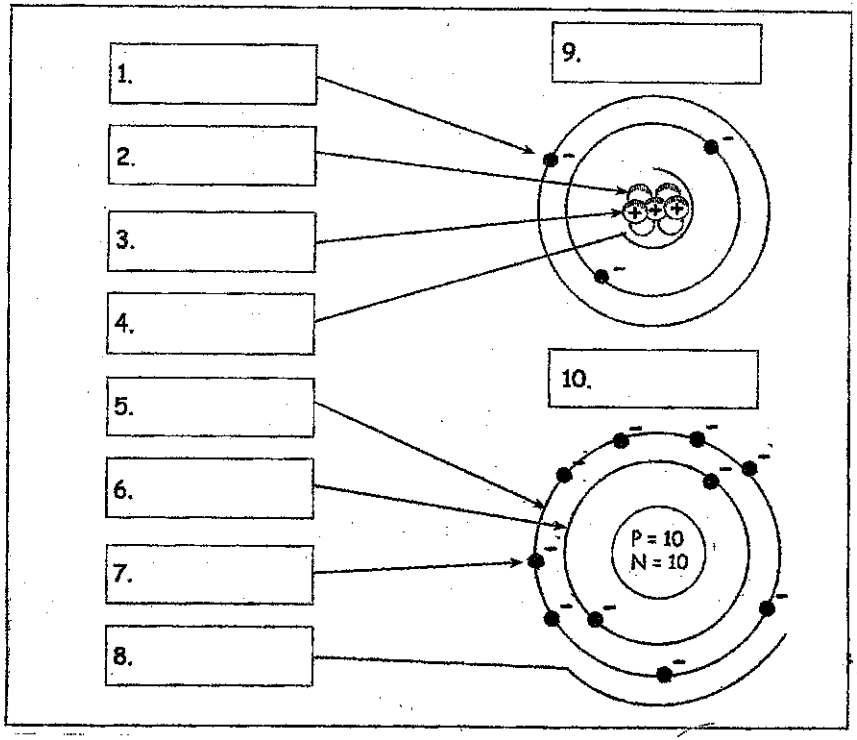
NAME:_____

CLASS:_____ DATE:_____



WORD BANK

NUCLEUS	INNER ORBITAL
PROTON	OUTER ORBITAL
NEUTRON	STABLE OCTET
ELECTRON	LITHIUM
VALENCE ELECTRON	NEON



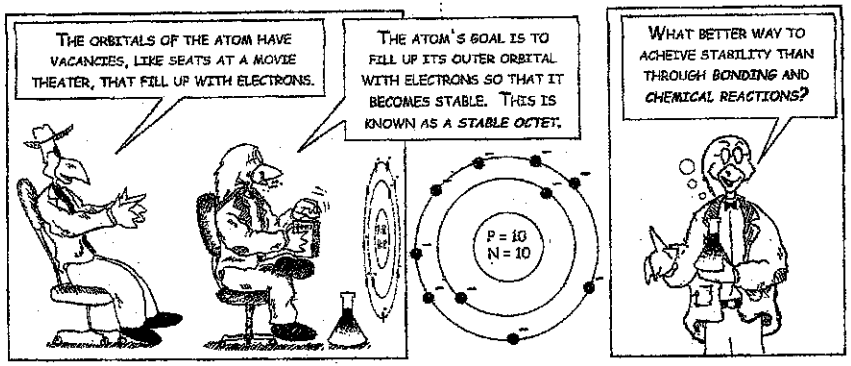
DR. BIRDLEY INVESTIGATES ATOMIC STRUCTURE

NAME:_____

CLASS:_____ DATE:_____

PANEL REVIEW: THE STABLE OCTET

Directions: Read the panels in the space below and answer the questions that follow.



1. Identify the atom above. Why does it have a stable octet?

2. Based on the diagram, what is the maximum capacity for the inner orbital? The outer orbital?

3. Atoms can achieve a stability by gaining or losing electrons. Under each atom, list the number of electrons it would need to gain or lose in order to achieve a stable octet.

Carbon Nitrogen Oxygen Fluorine Sodium Magnesium Aluminum

a._____ b._____ c._____ d._____ e._____ f._____ g._____

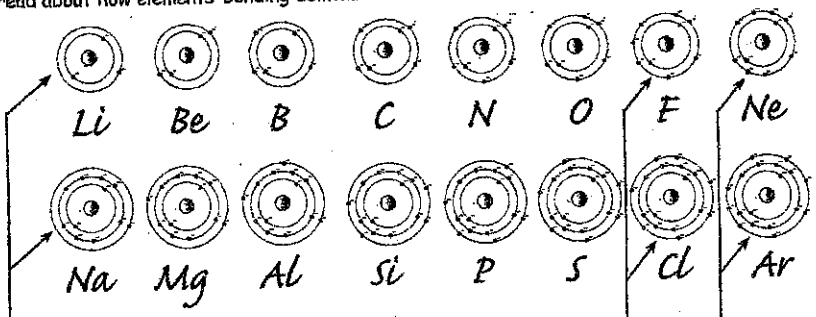
DR. BIRDLEY INVESTIGATES PERIODICITY

NAME:_____

CLASS:_____ DATE:_____

Background: A Periodic Pattern

In the cartoon, Christina shows Bohr models for two periods in the periodic table. The pattern in each period is the same: the number of valence electrons increases from left to right. This is important because the number of electrons determines bonding. Look at the diagram below and read about how elements' bonding demonstrates some of their bonding properties.



Both Lithium (Li) and Sodium (Na) have only one valence electron and BADLY want to give it up so they can have a full outer shell. As a result, they will bond with elements that want to take electrons . . . such as Chlorine (Cl).

Chlorine (Cl) and Fluorine (F) have seven valence electrons. Atoms become much more stable when they lose or gain an electron to create a full valence shell, so they will bond with elements such as Sodium or Magnesium that tend to give up valence electrons.

Because Argon and Neon have full outer shells, they do not want to bond with any elements. As you can see, each one has eight valence electrons.

1. How are Lithium and Sodium similar?_____

_____

_____

2. Why would a Sodium atom readily bond with Chlorine atom?_____

_____

_____

DR. BIRDLEY INVESTIGATES FIELDS OF SCIENCE

NAME:_____

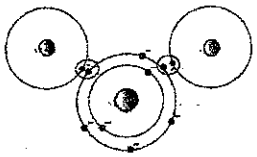
CLASS:_____ DATE:_____

BACKGROUND: IONIC AND COVALENT BONDING

An atom will form bonds to achieve a full outer shell of electrons. This may involve sharing, donating, or accepting electrons. To learn more about how this works, read about two types of bonds below:

COVALENT BONDS

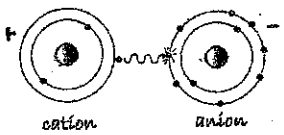
Covalent bonds involve two atoms sharing electrons. They usually occur between two non-metals. When carbon, oxygen, and hydrogen bond together, many of their bonds are covalent. The water molecule pictured below is held together by covalent bonds.



Because each atom still has equal numbers of protons and electrons, atoms that are covalently bonded do not have significant charges. Notice that the atoms are using electrons in their outer shell to bond.

IONIC BONDS

Ionic bonds involve one atom giving one or more electrons to a receiving atom. An atom becomes an ion when it has unequal numbers of protons and electrons. There are two types: anions and cations. Look at the picture below that depicts Lithium bonding to Fluorine:



Because the "donor" atom loses an electron, it develops a positive charge and becomes a cation. Because the "accepter" atom gains an electron, it develops a negative charge and becomes an anion.

1. What is the difference between an ionic and covalent bond?

2. Why does lithium take on a positive charge when it bonds to Fluorine? Why does Fluorine take on a negative charge?

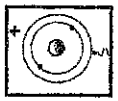
DR. BIRDLEY INVESTIGATES ATOMIC BONDING

Name:_____

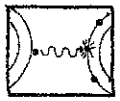
Class:_____ Date:_____

Vocabulary & Practice Problems

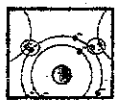
Directions: Use the following underlined words in sentences that convey their meaning.



1. An ion is a charged atom. Ions have unequal numbers of protons and electrons. Use the word ion in a sentence.



2. An ionic bond occurs when an element (usually a metal) donates electron(s) to a non-metal element. Use ionic bond in a sentence.



3. A covalent bond involves the sharing of electrons between two non-metal elements. Use the term covalent in a sentence.

4. Identify each molecule as ionic (I) or covalent (C).

a. __H_2O b. __LiF c. __$CaCl_2$ d. __CH_4

e. __$MgCl_2$ f. __NaCl g. __H_2SO_4 h. __$AlCl_3$

5. The charge of an atom is equal to the number of electrons it gains or loses.

If calcium loses two electrons, what is its charge? _____

If chlorine gains one electron, what is its charge? _____

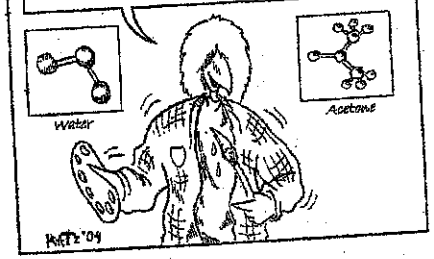
DR. BIRDLEY INVESTIGATES

MOLECULES & FORMULAS

NAME:_____

CLASS:_____ DATE:_____

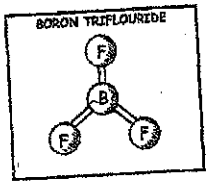
WRITE THE FORMULA THAT SHOWS THE *CORRECT NUMBER OF ATOMS* UNDER EACH MOLECULE. USE THE FORMULA BANK!



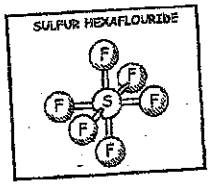
FORMULA BANK

CH_4	CO_2	BF_3	$C_2H_2Br_2$
H_2O	SF_6	CH_2O	C_4H_{10}
H_2SO_4	CH_4O	C_2H_6	C_6H_6
H_3PO_4	$C_2H_4O_2$	C_3H_6O	NH_3

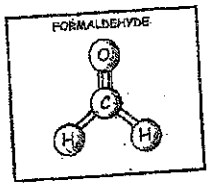
NOTE: FOUR FORMULAS ARE NOT USED!



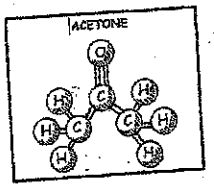
1._____



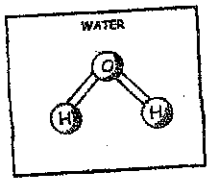
2._____



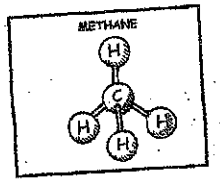
3._____



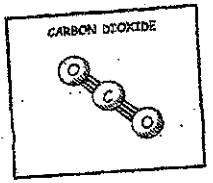
4._____



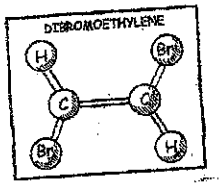
5._____



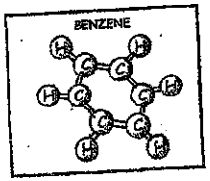
6._____



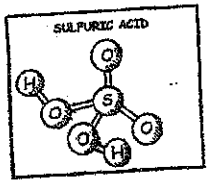
7._____



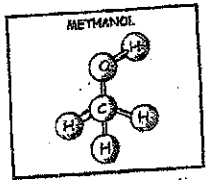
8._____



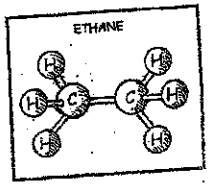
9._____



10._____



11._____



12._____

DR. BIRDLEY INVESTIGATES

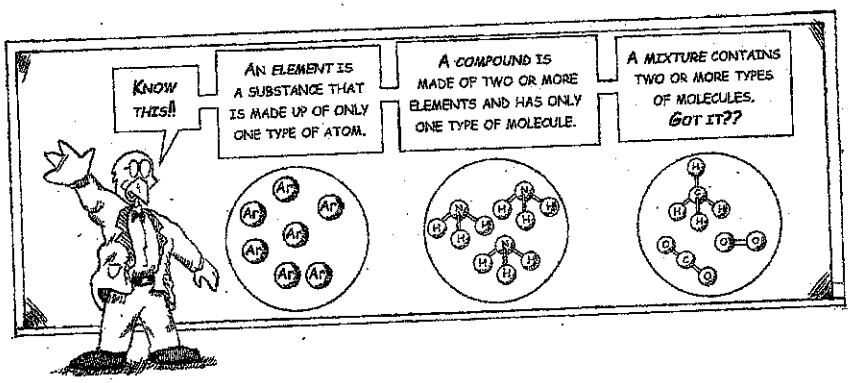
ELEMENTS, COMPOUNDS, AND MIXTURES

NAME:_____

CLASS:_____ DATE:_____

MINI-COMIC: COMPOSITION OF MATTER

Directions: Review the panel in the space below and answer the questions that follow.



1. What is the difference between a compound and an element?

2. What is the difference between a compound and a mixture?

3. Can mixtures be represented by formulas? Why or why not?

4. Is the mixture shown a solid, liquid, or gas? How do you know?

5. List all the elements shown in the mini-comic above.