

Forming Compounds and Identifying Ions

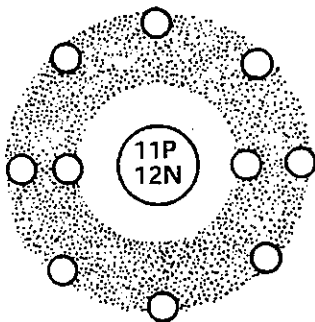
I. Use the vocabulary terms below to complete each sentence.

compound	element	ions	mixture	molecule
chemical reaction	chemical properties	oxidation number	atom	

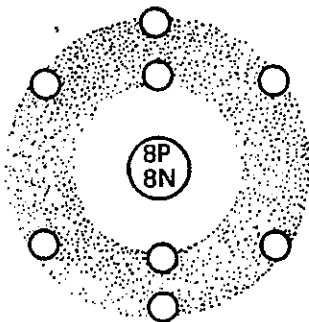
1. All matter is made up of tiny particles called _____, which in turn are made up of protons, neutrons and electrons.
2. An _____ is matter that is made up of only one type of atom.
3. The components of a _____ may be separated by physical means, such as evaporation, filtering, etc. Salt water and iced tea are both examples of this type of matter.
4. Electrically charged atoms, such as Na^{1+} and Cl^{1-} , are called _____.
5. A _____ is a substance that has different properties from the elements that are in it. An example would be table salt, which is formed by the bonding of Na (a reactive metal) with Cl (a poisonous gas).
6. An element's _____ refers to the number of electrons it either gains or loses when forming bonds with other elements. It is written as a + or - number.
7. Atoms of elements join together to form compounds during a _____.
8. The _____ of an element determine how the element will change when it reacts with another element.
9. The smallest particle of a compound is called a _____.

II. Identify the two atoms below that are ions and the one atom that is neutral. Label them with their charges (+, -, 0).

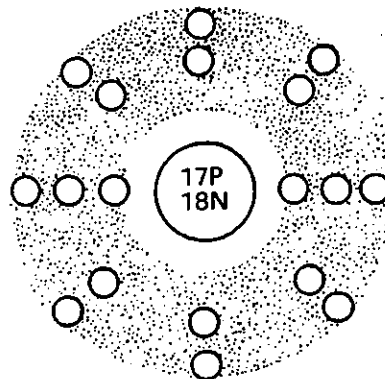
11 protons
12 neutrons
10 electrons



8 protons
8 neutrons
8 electrons



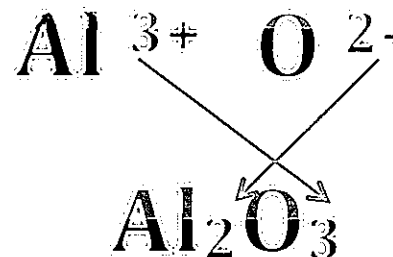
17 protons
18 neutrons
18 electrons



III. Making Compounds (criss cross method).

1. Fill in the blanks to complete the paragraph on **oxidation number**:

Oxidation number is the number of _____ an atom loses or _____ when forming bonds. A positive "+" number means the atoms _____ electrons, while a negative "-" number means the atoms _____ electrons. Metals tend to have _____ oxidation numbers because they _____ electrons. Nonmetals tend to have _____ oxidation numbers because they usually _____ electrons.



2. Use the "criss cross" method to form compounds. Use the example to help you.

Remember the charges must cancel each other out! 2 Aluminum atoms bond with 3 Oxygen atoms to form neutral Aluminum Oxide.

Try these! Remember to treat polyatomic ions (like SO_4 , CO_3 , etc.) as one unit separated by ().

Na and Cl		Al and Br		Li and S		B and O		Mg and P	
Ion Na ¹⁺	Ion Cl ¹⁻	Ion Al ³⁺	Ion Br ¹⁻	Ion Li ¹⁺	Ion S ²⁻	Ion B ³⁺	Ion O ²⁻	Ion Mg ²⁺	Ion P ³⁻
Compound		Compound		Compound		Compound		Compound	

K and CO ₃		Al and SO ₄		Fe and NO ₃		Zn and OH		NH ₄ and PO ₄	
Ion K ¹⁺	Ion CO ₃ ¹⁻	Ion Al ³⁺	Ion SO ₄ ²⁻	Ion Fe ³⁺	Ion NO ₃ ¹⁻	Ion Zn ²⁺	Ion OH ¹⁻	Ion NH ₄ ¹⁺	Ion PO ₄ ³⁻
Compound		Compound		Compound		Compound		Compound	

IV. More fun with forming compounds!

When a chemical formula for a compound is written correctly, it shows the number of each type of atom in the compound. For example, CO_2 has 1 atom of carbon bonded to 2 atoms of oxygen. These numbers are called subscripts, and they are determined by the bonding between the atoms.

The table on the next page shows 2 columns of elements. The elements on the left usually lose electrons when they form compounds, while the elements on the right usually gain them. The columns next to the elements list the number of valence (outer) electrons. Use this information to determine the charge on the ion after the exchange of electrons. In the last column, show how the positive and negative ions would combine to form a neutral compound. The first example is done for you. Use the "criss cross" method above.

*Remember: atoms with 1, 2 or 3 valence electrons usually lose them and form positive ions. Atoms with 5, 6, or 7 valence electrons usually gain the electrons needed to reach 8 and form negative ions. Also, atoms with 4 valence electrons can go either way, while atoms with 8 valence electrons usually do not form bonds. (Helium is a pesky exception- it is full and "happy" with only 2 electrons, not 8).

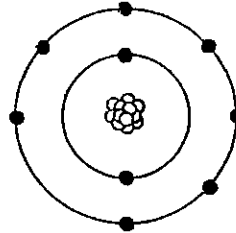
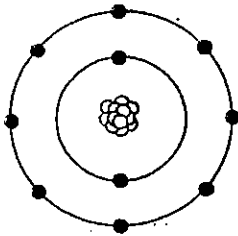
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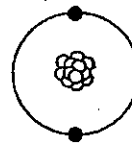
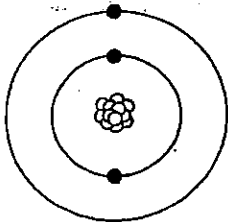
Element	Valence e ⁻	Charge on ion	Element	Valence e ⁻	Charge on ion	Formula when combined
Sodium	1	1 ⁺	Oxygen	6	2 ⁻	Na ₂ O
Aluminum	3		Fluorine	7		
Calcium	2		Phosphorus	5		
Beryllium	2		Sulfur	6		
Carbon	4		Chlorine	7		
Silicon	4		Neon	8		

V. Making Predictions. Look at the diagrams and state whether each atom will gain electrons, lose electrons, or fail to react chemically. Extra bonus points if you can correctly identify each element!



1. _____

2. _____



3. _____

4. _____

