Simple Chemistry

by Elizabeth R. Kellerman

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The activities in this book explain elementary concepts in the study of chemistry, including atomic symbols and structure, matter, compounds and mixtures, acids and bases, solvents and solutions, oxidation, and gases.

General background information, suggested activities, questions for discussion, and answers are included.

Encourage students to keep completed pages in a folder or notebook for further reference and review.

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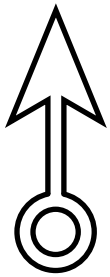
History of Chemistry

In very early times, people learned how to produce chemical changes. They made these changes work for them long before it was understood why the changes took place. For example, metalsmiths knew how to extract metals from ores. They knew how to combine metals to make jewelry and weapons. People knew how to make alcoholic beverages from fruits and grains. Glassmakers were able to combine and heat substances in order to form them into delicate glass vases and ornaments. All of these skills required the control of chemical changes, but people did not yet understand why the changes occurred.



17th Century symbol for Iron

As long as 3000 years ago, people in different countries began developing theories about the nature of the world around them.

They did not, however, have enough knowledge to test their ideas. Early Chinese scholars suggested that all things were made of earth, fire, metal, water, and wood. The Greeks thought everything was made of only four elements: earth, fire, water, and air.

One of the earliest forms of chemistry was alchemy. During the Middle Ages, alchemists spent much of their time trying to turn metals of low value, such as iron and lead, into gold. Although none of them ever achieved that miraculous change, alchemists did make some worthwhile contributions to early chemical knowledge.

Robert Boyle, who lived in the 1600s, is usually considered the first real chemist. He understood that theories should be backed by careful experimentation. In the 1800s, John Dalton of England thought that each element was made of a different kind of atom.

In 1814, Jon Berzelius introduced a system of abbreviations for the elements which is still in use today. The symbol was determined by using the first letter of the element plus another letter or letters from the Latin name. Thus, **O** stands for oxygen, **Al** for aluminum, and **Fe** (ferrum) for iron.

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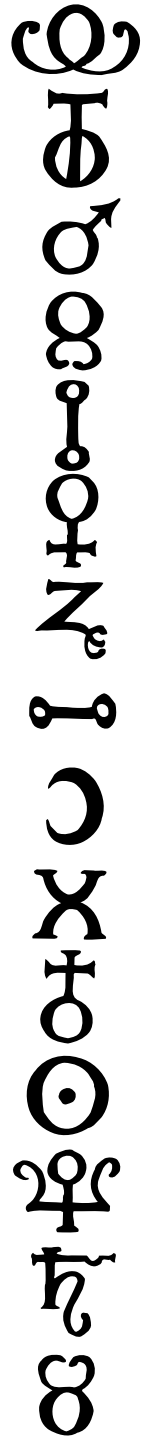
Examples of Atomic Symbols

Element	Atomic number	Alchemist's symbol	Modern symbol	Name from which symbol is derived
Sulfur	16		S	**S**ulfur
Manganese	25		Mn	**M**a**n**ganese
Iron	26		Fe	**Fe**rrum
Cobalt	27		Co	**Co**balt
Nickel	28		Ni	**Ni**ckel
Copper	29		Cu	**Cu**prum
Zinc	30		Zn	**Zi**n**c**
Arsenic	33		As	A**rs**enic
Silver	47		Ag	A**rg**entium
Tin	50		Sn	**S**ta**n**num
Antimony	51		Sb	**S**ti**b**ium
Gold	79		Au	**Au**rum
Mercury	80		Hg	**H**ydrar**g**yrum
Lead	82		Pb	**P**lum**b**um
Bismuth	83		Bi	**Bi**smuth

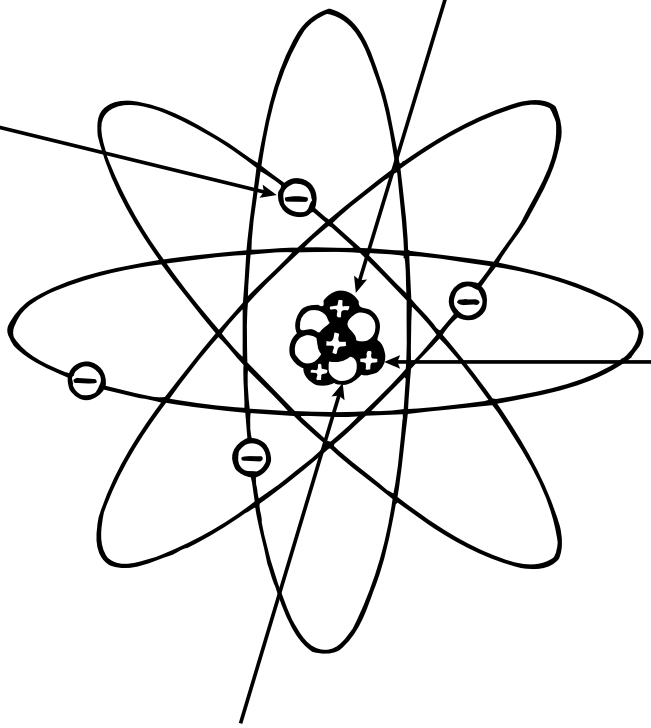
Name _____ Date _____

ATOMIC STRUCTURE

*An **atom** is made up of three basic parts: **protons**, **neutrons**, and **electrons**. The protons which have a positive charge (**+**) and the neutrons which have no charge, form the **nucleus** in the center of the atom. The electrons which have a negative charge (**–**), spin in orbits around the nucleus. Each atom has an equal number of protons and electrons. Because the negative charge of the electrons balances the positive charge of the protons, atoms are neutral.*

Nucleus
The nucleus is the center of the atom. Most of the mass of the atom is in the nucleus.

Electrons
Electrons are very light, negatively charged particles. They circle the nucleus. Most of an atom is empty space!



Protons
Protons are positively charged particles found in the nucleus. There are an equal number of protons and electrons.

Neutrons
Neutrons, also found in the nucleus, have no electrical charge. They are neutral. They have about the same mass as the proton.