

## Cosmic Chemistry: Understanding Elements

## The Modern Periodic Table

### STUDENT TEXT

Chemists at Los Alamos National Laboratory, a Genesis partner organization, supply the nation with purified chemicals. Their Web site displays a modern periodic table of the elements.

At the Web site <http://mwana1.lanl.gov/CST/imagemap/periodic/periodic.html> you may click on any element and access information about its physical and chemical properties, as well as other fascinating facts.



### READING THE MODERN PERIODIC TABLE

Our modern day periodic table is expanded beyond Mendeleev's initial 63 elements. Most of the current periodic tables include 108 or 109 elements.

It is also important to notice how the modern periodic table is arranged. Although we have retained the format of rows and columns, which reflects a natural order, the rows of today's tables show elements in the order of Mendeleev's columns. In other words the elements of what we now call a "period" were listed vertically by Mendeleev. Chemical "groups" are now shown vertically in contrast to their horizontal format in Mendeleev's table.

Note also that Mendeleev's 1871 arrangement was related to the atomic ratios in which elements formed **oxides**, binary compounds with oxygen; whereas today's periodic tables are arranged by increasing atomic numbers, that is, the number of protons a particular element contains. Although we can imply the formulas for oxides from today's periodic table, it is not explicitly stated as it was in Mendeleev's 1871 table. The oxides ratio column was not shown in earlier Mendeleev versions. Can you think of a reason why not?

### GROUPS

The modern periodic table of the elements contains 18 **groups**, or vertical columns. Elements in a group have similar chemical and physical properties because they have the same number of outer electrons. Elements in a group are like members of a family—each is different, but all are related by common characteristics.

Notice that each group is titled with Roman numerals and the letters A and B. Scientists in the United States and Europe now use different titles to refer to the same groups. To avoid confusion, the Roman numerals and letters designating groups will eventually be replaced by the numerals from one to eighteen.

### PERIODS

Each of the table's horizontal rows is called a **period**. Along a period, a gradual change in chemical properties occurs from one element to another. For example, metallic properties decrease and nonmetallic properties increase as you go from left to right across a period. Changes in the properties occur because the number of protons and electrons increases from left to right across a period or row. The increase in number of electrons is important because the outer electrons determine the element's chemical properties.

The periodic table consists of seven periods. The periods vary in length. The first period is very short and contains only two elements, hydrogen and helium. The next two periods contain eight elements each. Periods four and five each have 18 elements. The sixth period has 32 elements. The last period is not complete yet because new **exotic** or man-made elements are still being made in laboratories.

# Cosmic Chemistry Understanding Elements Answers

**L Darling-Hammond**



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