History of the Periodic Table

As chemists discovered more and more elements, and learned more and more about their properties, they began to see certain patterns emerge. These patterns led to a desire to classify the elements, or to organize them in a logical way according to their properties. This desire eventually led to the development of the modern periodic table.

In this lesson, you will be introduced to a variety of attempts at classifying the elements.

Lavoisier (1789)

In 1789, Antoine de Lavoisier wrote what is considered to be the first modern chemistry textbook. Contained within this book was an extensive list of elements (approximately 33 in total). In his list, Lavoisier classified metals into two categories: metals and non-metals.

Note: Some of Lavoisier's elements were later shown to be compounds and mixtures.

Döbereiner (1817)

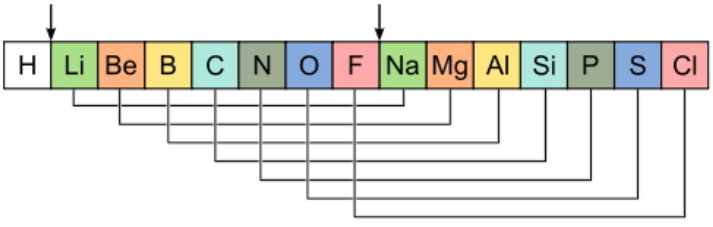
In 1817, Johann Döbereiner made one of the earliest attempts to classify the elements. He found that some elements formed groups of three with related properties. He called these groups "triads." Some of the triads classified by Döbereiner were:

1. Chlorine, bromine, and iodine.
2. Calcium, strontium, and barium.
3. Sulfur, selenium, and tellurium.
4. Lithium, sodium, and potassium.

In each triad, the atomic mass of the middle element was almost exactly the average of the first and third elements.

Newlands (1865)

In 1865, the English chemist John Newlands became the first person to arrange the elements in order of their atomic masses. Upon doing so, he discovered that "each element had similar properties to the eighth element following it in the table." He called this the law of octaves.



Mendeleev (1869)

Dmitri Mendeleev, a Russian chemist, was the first scientist to create a periodic table similar to the one we use today.

Mendeleev observed that, when the elements are placed in order by atomic mass, a pattern can be seen in which similar properties occur regularly. He called this the **periodic law**.

In Mendeleev's table, the 64 known elements were arranged in order of increasing atomic mass. Elements with similar properties were placed below each other in the table. When no known element fit his pattern, Mendeleev left a blank space. He assumed that an element would later be discovered to fit that space.

Mendeleev's table is shown below.

Reihen	Gruppo I. — R^1O	Gruppo II. — RO	Gruppo III. — R^2O^3	Gruppo IV. RH^4 RO^2	Gruppo V. RH^3 R^2O^5	Gruppo VI. RH^2 RO^3	Gruppo VII. RH R^2O^7	Gruppo VIII. — RO^4
1	H=1							
2	Li=7	Be=9,4	B=11	C=12	N=14	O=16	F=19	
3	Na=23	Mg=24	Al=27,3	Si=28	P=31	S=32	Cl=35,5	
4	K=39	Ca=40	—=44	Ti=48	V=51	Cr=52	Mn=55	Fe=56, Co=59, Ni=59, Cu=63.
5	(Cu=63)	Zn=65	—=68	—=72	As=75	Se=78	Br=80	
6	Rb=85	Sr=87	?Yt=88	Zr=90	Nb=94	Mo=96	—=100	Ru=104, Rh=104, Pd=106, Ag=108.
7	(Ag=108)	Cd=112	In=113	Sn=118	Sb=122	Te=125	J=127	
8	Cs=133	Ba=137	?Di=138	?Ce=140	—	—	—	— — — —
9	(—)	—	—	—	—	—	—	
10	—	—	?Er=178	?La=180	Ta=182	W=184	—	Os=195, Ir=197, Pt=198, Au=199.
11	(Au=199)	Hg=200	Tl=204	Pb=207	Bi=208	—	—	
12	—	—	—	Th=231	—	U=240	—	— — — —

The blank spaces left in Mendeleev's table were instrumental in the discovery of a number of new elements over the next 30 years.

Meyer (1869)

A few months after Mendeleev published his periodic table, Lothar Meyer published an almost identical table. While many consider Mendeleev and Meyer to be co-creators of the periodic table, Mendeleev's accurate prediction of future elements earned him the lion's share of the credit.

Moseley (1914)

In 1914, Henry Moseley discovered the connection between the atomic number of an element and the number of protons in its nucleus. Before that time, the atomic numbers were simple sequential numbers based on an element's atomic mass.

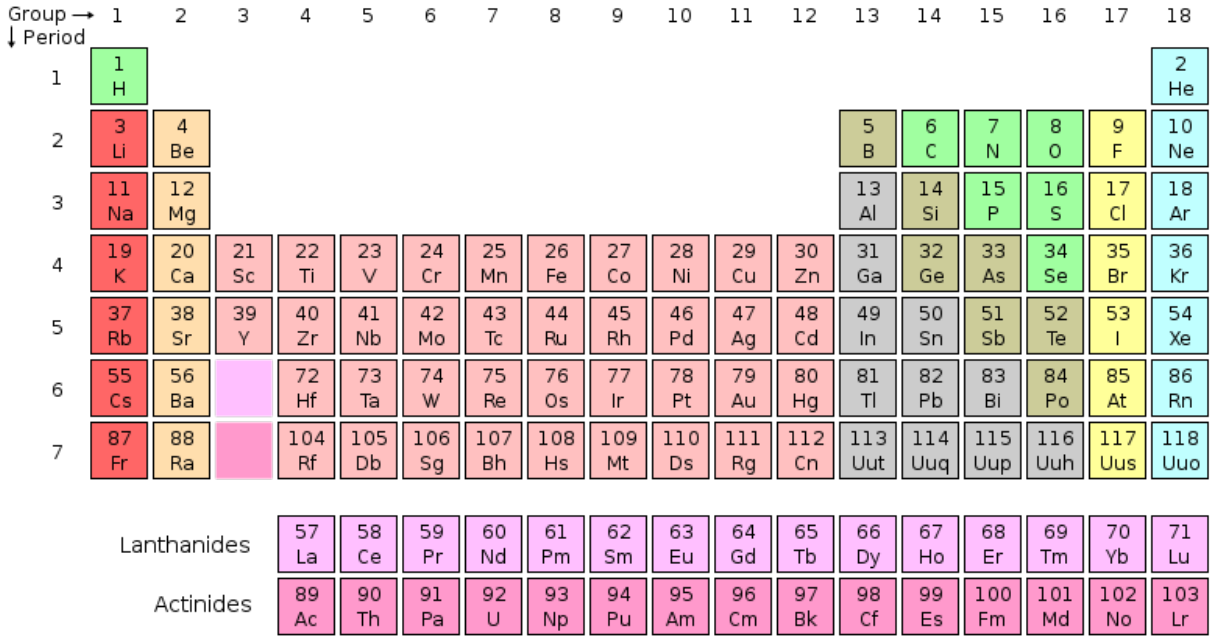
With this discovery, Moseley correctly identified the atomic number of all known elements. He then rearranged the periodic table to place the elements in order by atomic number instead of atomic mass. This new order better fit the observed properties of the elements, and so became the accepted way of organizing the elements.

Moseley is widely recognized as the creator of the modern periodic table.

The Modern Periodic Table

In the modern periodic table, the elements are presented in order of increasing atomic number (the number of protons in the nucleus).

While its general shape is rectangular, gaps are included in the horizontal rows (called **periods**) as needed to keep elements with similar properties together in the same vertical columns (known as **groups**).



Groups

A group, or family, is a vertical column in the periodic table. Groups are considered the most important method of classifying the elements. Under the modern system, the groups are numbered 1 to 18 from left to right.

Some of the groups have been given names, such as the alkali metals, alkaline earth metals, halogens, chalcogens, and noble gases. Other groups do not have names.

Elements in the same group have similar properties. They also show patterns in certain properties. For example, the elements' masses increase as you go down a group, as does the size of the atoms.

Periods

A period is a horizontal row in the periodic table. Under the modern system, the periods are numbered 1 to 7 from top to bottom.

Elements in the same period have the same number of electron orbits in the Bohr model of the atom (or the same number of energy levels in the quantum model).

Elements in the same period also exhibit patterns in their properties. For example, the size of the atoms generally decreases as you move from left to right across a period.