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The Creation of the Modern Periodic Table

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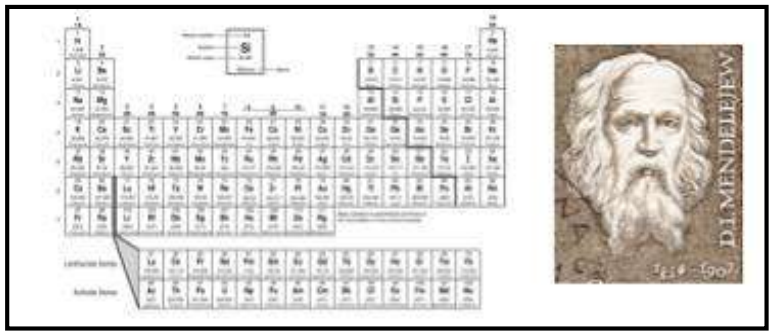

1 You may have already heard the name Dmitri Mendeleev, the Russian chemist who is often given the credit for creating the modern Periodic Table. He did play a critical role in the formation of the Periodic Table. His original elemental table was very similar to the one that you use today. However, he did not come to this conclusion by himself. A long history of discoveries led to Mendeleev's creation, and there were even more discoveries after his death that led to the final version of this all-important resource. Let us recount this journey.

2 Almost 3,000 years ago, there were people who studied nature, known as natural philosophers, who attempted to understand how natural systems worked. Aristotle was one of these natural philosophers. In 330 BC, he deduced that all matter was made of four "elements": earth, air, fire, and water. This is not quite as elementary as it may seem, as the elements that he deduced do in fact pertain to both the states of matter that we know today and the energy required to create chemical reactions.

3 It wasn't until the 1700s that "modern" advancements in science began. Antoine Lavoisier is often referred to as the "Father of Modern Chemistry." Lavoisier used these types of scientific philosophies along with the scientific method to produce some groundbreaking discoveries. In the late 1700s, Lavoisier was able to make the distinction between metals and nonmetals. This would be an important distinction on the Periodic Table of the future. He also was able to identify and name over 30 elements. In 1789, he published the first modern chemistry textbook. This book included the first accurate definition of the Law of Conservation of Mass, a critical concept that aids in the process of chemical analysis.

4 The scientific method continued as Jöns Jakob Berzelius created a table based upon the atomic weights of the known elements in 1828. In order to better recognize those elements, he gave them symbols, or letters. In 1829, a scientist named Johann Döbereiner saw patterns of elements with similar properties. He grouped elements into triads. For example, he saw that chlorine, bromine, and iodine formed a triad. (In the modern table, these elements are in the same group.) The science of chemistry continued to advance.

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In 1864, a man named John Newlands used the 56 elements known at the time to expand on Döbereiner's triad patterns. He saw that there were even more similarities among the elements, specifically between the first and ninth elements. He called these similarities the "law of octaves". (In the modern table, these elements are in the same period.) He organized these elements into 11 groups, based on similar characteristics.

5 The year 1869 was a very important year for the creation of the modern Periodic Table. In 1864, another scientist named Lothar Meyer had made contributions to its early form. He developed a version of the table using the pattern of the valence electrons in 28 of the 56 known elements. Then, in 1869, he took all of this information and created a Periodic Table of the 56 known elements based on other elemental properties, such as atomic weight.

6 In this same year, 1869, Dmitri Mendeleev created his own table. So, why does Mendeleev's table receive so much credit? His table was also based on atomic weights, but it was the way that he arranged this information that made his table so valuable. He arranged the elements in a "periodic way." This means that elements with similar properties were placed underneath each other. The elements with lower atomic weights were placed on the top row. The elements with heavier atomic weights were placed below them. This led to the first Periodic Table in the form like the one you use today. There were gaps in Mendeleev's table, but those gaps would soon be filled by future discoveries. The truly interesting thing is that as modern science was able to fill these gaps, the form of his table did not need to be altered. Mendeleev had gotten it right!

7 In 1894, a man named William Ramsay discovered the noble gases. In 1913, Henry Moseley calculated the atomic number of each of the known elements. He discovered that the properties of elements relied only partially on their atomic number. He found that the number of valence electrons in an atom was what actually contributed chemical properties. Even though elements are placed in the periodic table in order of increasing atomic number, it was shown that the organization of the periodic table is based on electron properties. Mendeleev's form still held. There were two final pieces of the puzzle. In 1932, James Chadwich discovered neutrons, and in 1945, Glenn Seaborg discovered the lanthanides and actinides.

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1 Who was known as the "Father of Modern Chemistry," and who created the first chemistry textbook?

A Jöns Jakob Berzelius

B Dmitri Mendeleev

C Antoine Lavoisier

D Lothar Meyer

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2 Dmitri Mendeleev created an early version of the Periodic Table based on atomic mass. The modern Periodic Table has elements placed in increasing order of which characteristic?

A Atomic number

B Electron properties

C Atomic size

D The date that the element was discovered

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3 Dmitri Mendeleev and Lothar Meyer created similar elemental tables in 1869. Why was Mendeleev's table "more valuable" to modern science than Meyer's table?

A Mendeleev ordered his table in a periodic way.

B Meyer did not include atomic weights.

C Mendeleev used more elements.

D There were gaps in Meyer's table.

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4 In 1913, a scientist named Henry Moseley discovered that the properties of elements relied partially on what?

A Their color

B Their atomic mass

C The number of valence electrons

D Their atomic size

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5 Which scientist discovered that elements could be grouped into “triads,” or elements with similar properties?

A James Chadwich

B Aristotle

C William Ramsay

D Johann Döbereiner

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6 A scientist named John Newlands discovered an early pattern on the periodic table regarding similarities between the first and ninth elements. What did he call this pattern?

A The law of periodicity

B The law of octaves

C The law of elements

D The law of trends