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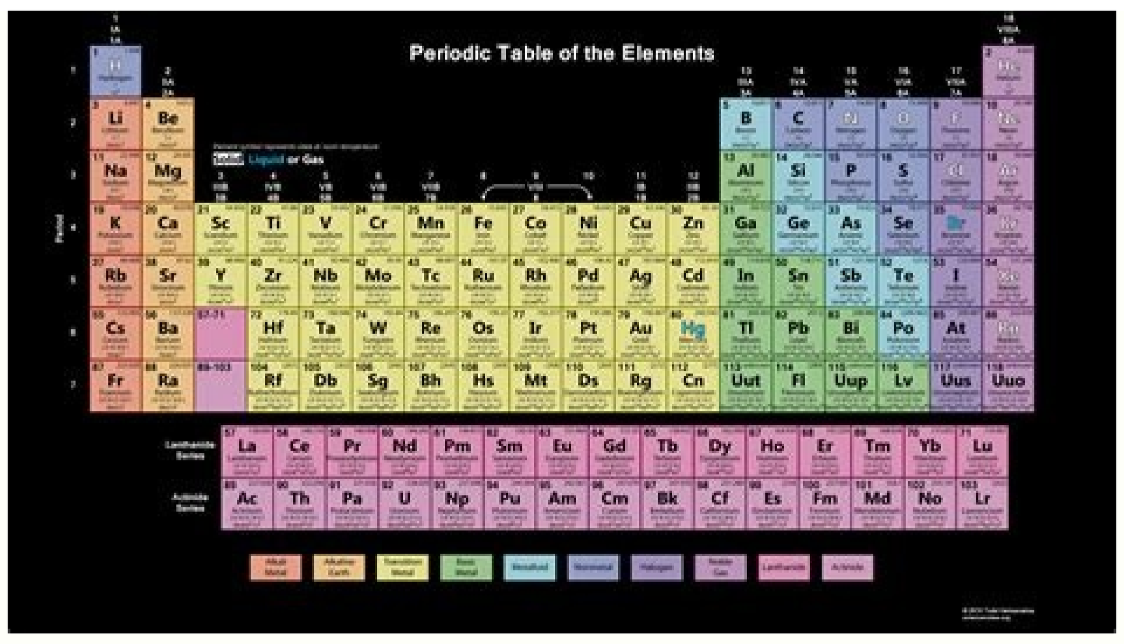

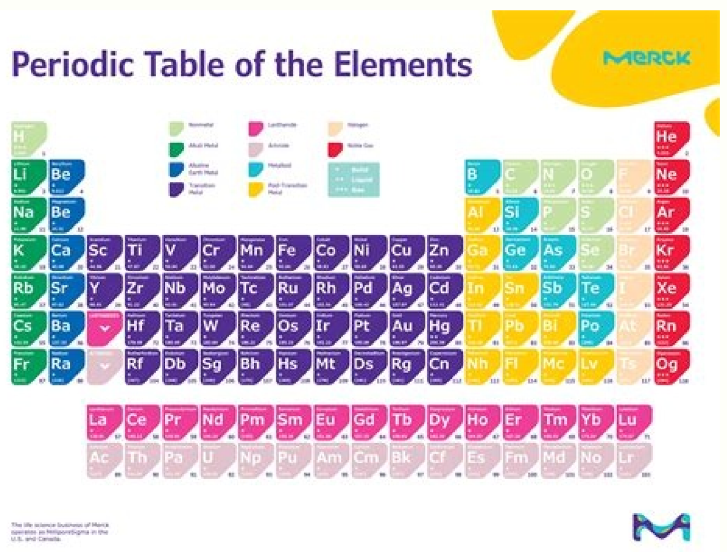

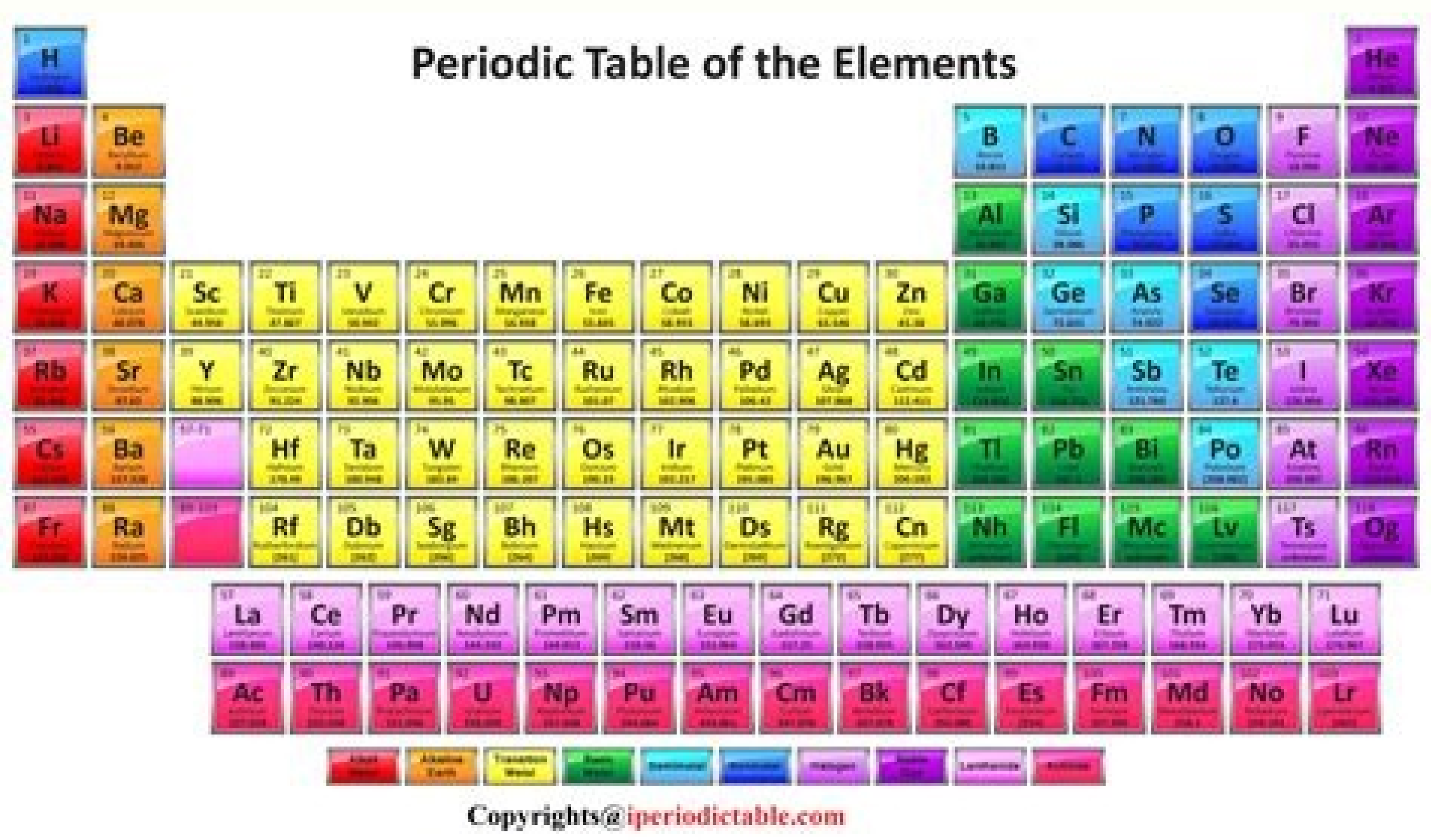

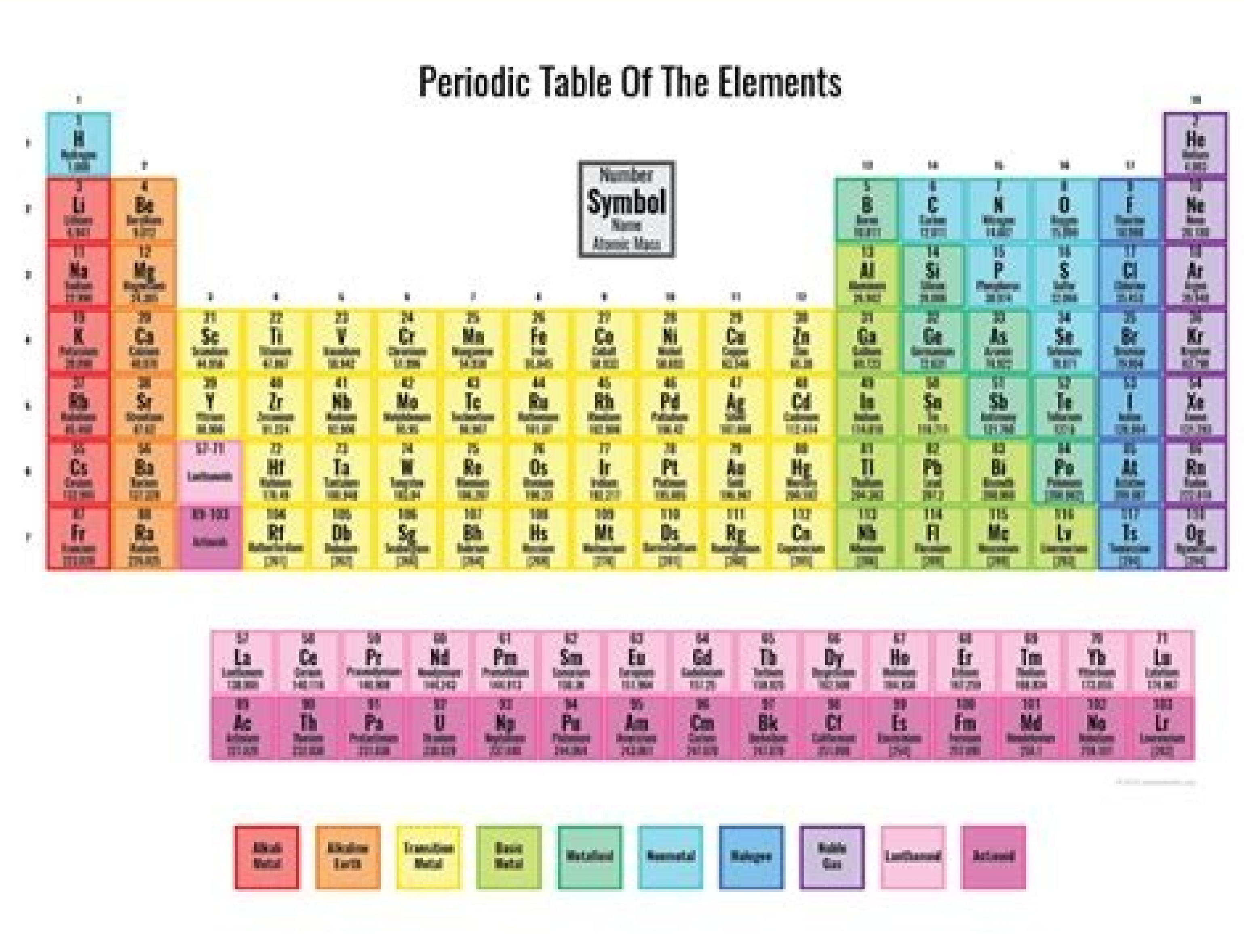

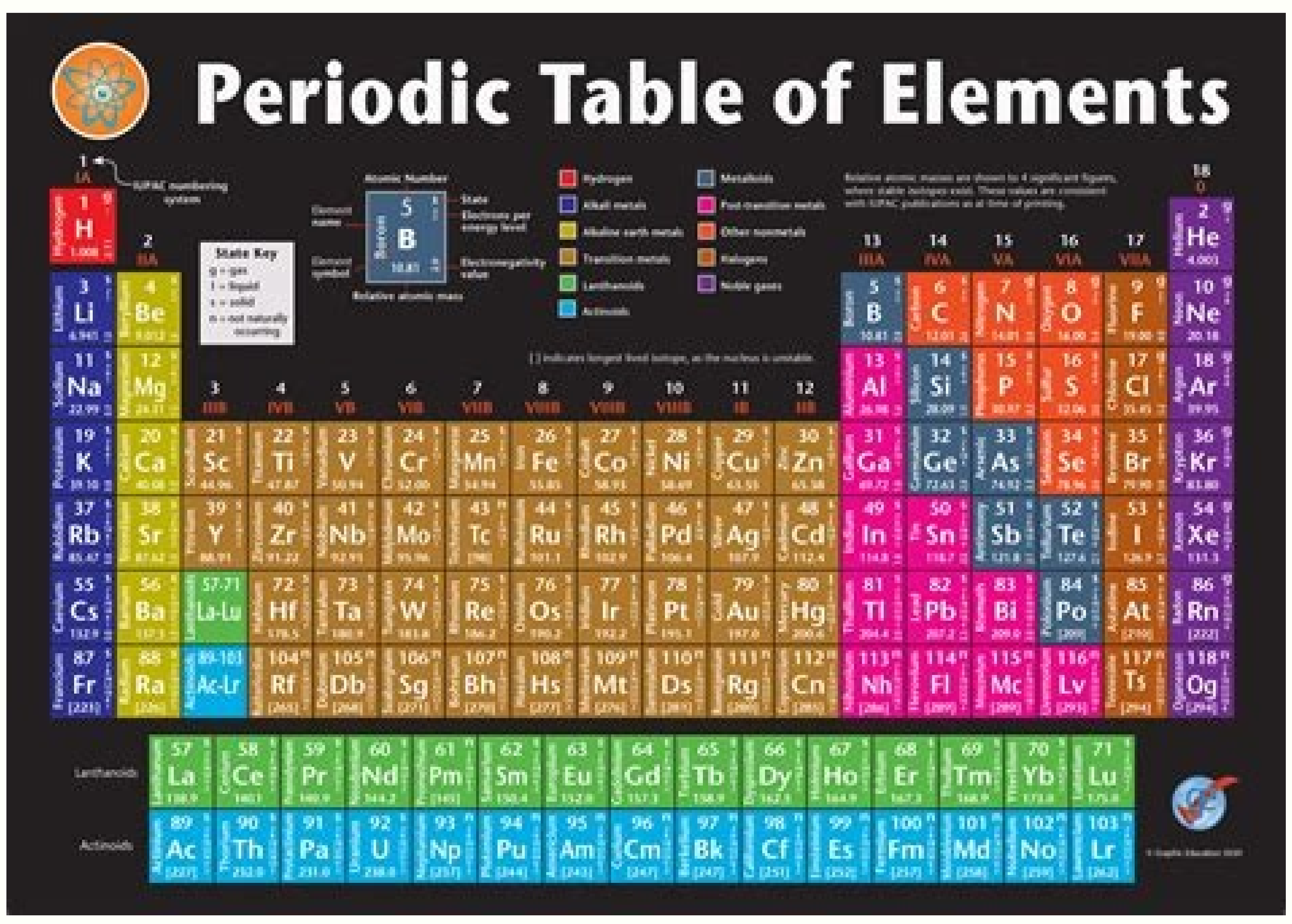

What is interesting about the periodic table. What are 5 facts about the periodic table.

Home Science Chemistry The groups of the periodic table are displayed as vertical columns numbered from 1 to 18. The elements in a group have very similar chemical properties, which arise from the number of valence electrons present—that is, the number of electrons in the outermost shell of an atom.The arrangement of the elements in the periodic table comes from the electronic configuration of the elements. Because of the Pauli exclusion principle, no more than two electrons can fill the same orbital. The first row of the periodic table consists of just two elements, hydrogen and helium. As atoms have more electrons, they have more orbits available to fill, and thus the rows contain more elements farther down in the table.The periodic table has two rows at the bottom that are usually split out from the main body of the table. These rows contain elements in the lanthanoid and actinoid series, usually from 57 to 71 (lanthanum to lutetium) and 89 to 103 (actinium to lawrencium), respectively. There is no scientific reason for this. It is merely done to make the table more compact. periodic table, in full periodic table of the elements, in chemistry, the organized array of all the chemical elements in order of increasing atomic number—i.e., the total number of protons in the atomic nucleus. When the chemical elements are thus arranged, there is a recurring pattern called the "periodic law" in their properties, in which elements in the same column (group) have similar properties. The initial discovery, which was made by Dmitry I. Mendeleyev in the mid-19th century, has been of inestimable value in the development of chemistry.Study chemistry's periodic law to understand elements' properties and how they relate to one anotherExplanation of the periodic table.Encyclopædia Britannica, Inc.See all videos for this articleIt was not actually recognized until the second decade of the 20th century that the order of elements in the periodic system is that of their atomic numbers, the integers of which are equal to the positive electrical charges of the atomic nuclei expressed in electronic units. In subsequent years great progress was made in explaining the periodic law in terms of the electronic structure of atoms and molecules. This clarification has increased the value of the law, which is used as much today as it was at the beginning of the 20th century, when it expressed the only known relationship among the elements. Periodic Table of the Elements Test your bond with the periodic table of elements in this quiz on all 118 chemical elements and their symbols. You may be familiar with the chemical symbols for hydrogen and oxygen, but can you match such lower-profile elements as gadolinium and erbium with their corresponding symbols? The early years of the 19th century witnessed a rapid development in analytical chemistry—the art of distinguishing different chemical substances—and the consequent building up of a vast body of knowledge of the chemical and physical properties of both elements and compounds. This rapid expansion of chemical knowledge soon necessitated classification, for on the classification of chemical knowledge are based not only the systematized literature of chemistry but also the laboratory arts by which chemistry is passed on as a living science from one generation of chemists to another. Relationships were discerned more readily among the compounds than among the elements; it thus occurred that the classification of elements lagged many years behind that of compounds. In fact, no general agreement had been reached among chemists as to the classification of elements for nearly half a century after the systems of classification of compounds had become established in general use.interactive periodic tableModern version of the periodic table of the elements. To learn an element's name, atomic number, electron configuration, atomic weight, and more, select one from the table.Encyclopædia Britannica, Inc. J.W. Döbereiner in 1817 showed that the combining weight, meaning atomic weight, of strontium lies midway between those of calcium and barium, and some years later he showed that other such "triads" exist (chlorine, bromine, and iodine [halogens] and lithium, sodium, and potassium [alkali metals]). J.-B.-A. Dumas, L. Gmelin, E. Lenssen, Max von Pettenkofer, and J.P. Cooke expanded Döbereiner's suggestions between 1827 and 1858 by showing that similar relationships extended further than the triads of elements, fluorine being added to the halogens and magnesium to the alkaline-earth metals, while oxygen, sulfur, selenium, and tellurium were classed as one family and nitrogen, phosphorus, arsenic, antimony, and bismuth as another family of elements. Get a Britannica Premium subscription and gain access to exclusive content. Subscribe Now Attempts were later made to show that the atomic weights of the elements could be expressed by an arithmetic function, and in 1862 A.-E.-B. de Chancourtois proposed a classification of the elements based on the new values of atomic weights given by Stanislao Cannizzaro's system of 1858. De Chancourtois plotted the atomic weights on the surface of a cylinder with a circumference of 16 units, corresponding to the approximate atomic weight of oxygen. The resulting helical curve brought closely related elements onto corresponding points above or below one another on the cylinder, and he suggested in consequence that "the properties of the elements are the properties of numbers," a remarkable prediction in the light of modern knowledge. In 1864, J.A.R. Newlands proposed classifying the elements in the order of increasing atomic weights, the elements being assigned ordinal numbers from unity upward and divided into seven groups having properties closely related to the first seven of the elements then known: hydrogen, lithium, beryllium, boron, carbon, nitrogen, and oxygen. This relationship was termed the law of octaves, by analogy with the seven intervals of the musical scale. New from Britannica Laughter that comes from tickling is called gargalesis, and aside from primates the only animal known to experience it is the rat. See All Good Facts Then in 1869, as a result of an extensive correlation of the properties and the atomic weights of the elements, with special attention to valency (that is, the number of single bonds the element can form), Mendeleyev proposed the periodic law, by which "the elements arranged according to the magnitude of atomic weights show a periodic change of properties." Lothar Meyer had independently reached a similar conclusion, published after the appearance of Mendeleyev's paper. ChemLuminary Awards Recognizing ACS local sections, divisions and other volunteers for their work in promoting chemistry. The periodic table, also called the periodic table of elements, is an organized arrangement of the 118 known chemical elements. The chemical elements are arranged from left to right and top to bottom in order of increasing atomic number, or the number of protons in an atom's nucleus, which generally coincides with increasing atomic mass.The horizontal rows on the periodic table are called periods, where each period number indicates the number of orbitals for the elements in that row, according to Los Alamos National Laboratory (opens in new tab). (Atoms have protons and neutrons in their nucleus, and surrounding that, they have their electrons arranged in orbitals, where an atomic orbital is a math term that describes the location of an electron as well as its wave-like behavior.)For instance, period 1 includes elements that have one atomic orbital where electrons spin; period 2 has two atomic orbitals, period 3 has three and so on up to period 7. The columns, or groups, on the periodic table represent the atomic elements that have the same number of valence electrons, or those electrons in the outermost orbital shell. As an example, elements in Group 8A (or VIIIA) all have a full set of eight electrons in the highest-energy orbital, according to chemist William Reusch, on his webpage at Michigan State University (opens in new tab). Elements that occupy the same column on the periodic table (called a "group") have identical valence electron configurations and consequently behave in a similar fashion chemically. For instance, all the group 18 elements are inert gases, meaning they don't react with any other elements.Related: How are the elements grouped?Who created the periodic table?Dmitri Mendeleev, a Russian chemist and inventor, is considered the "father" of the periodic table, according to the Royal Society of Chemistry (opens in new tab). In the 1860s, Mendeleev was a popular lecturer at a university in St. Petersburg, Russia. At the time, no modern organic chemistry textbooks in the Russian language existed, so Mendeleev decided to write one. As he was working on that book, titled "Principles of Chemistry" (two volumes, 1868–1870), he simultaneously tackled the problem of the disordered elements, according to Khan Academy (opens in new tab).(Image credit: Oxford Science Archive/Print Collector/Getty Images)Putting the elements in any kind of order would prove quite difficult. At the time, there were 63 known chemical elements, each with an atomic weight calculated using Avogadro's hypothesis, which states that equal volumes of gases, when kept at the same temperature and pressure, hold the same number of molecules. Just two strategies existed at the time to categorize these elements: separating them into metals and nonmetals or grouping them by an element's number of valence electrons (or those electrons in the outermost shell). The first section of Mendeleev's book dealt with just eight of the known elements — carbon, hydrogen, oxygen, nitrogen, chlorine, fluorine, bromine and iodine — and those two strategies worked for those particular elements, according to Michael D. Gordin in his book "A Well-Ordered Thing: Dmitrii Mendeleev and the Shadow of the Periodic Table" (Princeton University Press, Revised Edition 2018). But they weren't enough to usefully sort the 55 additional chemical elements known at the time. So according to the Royal Society of Chemistry, Mendeleev wrote the properties of each element on cards, and then he started ordering them by increasing atomic weight. This is when he noticed certain types of elements regularly appearing and noticed a correlation between atomic weight and chemical properties.But the exact Eureka! moment that led Mendeleev to the sorting strategy that produced his complete periodic table is shrouded in mystery. "It is extremely difficult to reconstruct the process by which Mendeleev came to his periodic organization of elements in terms of their atomic weights," Gordin wrote of the full periodic table. "The problem from the historian's perspective is that while Mendeleev kept almost every document and draft that crossed his hands after he believed he would become famous, he did not do so before his formulation of the periodic law."Mendeleev's first Periodic Table of Elements is shown here. (Image credit: Photo12/Universal Images Group via Getty Images) (opens in new tab)Gordin continued, "There are two basic ways that Mendeleev could have moved from a recognition of the importance of atomic weight as a good classifying tool to a draft of a periodic system: either he wrote out the elements in order of atomic weight in rows and noticed periodic repetition or he assembled several 'natural groups' of elements, like the halogens and the alkali metals, and noticed a pattern of increasing weight." Turns out, the only known statement from Mendeleev that was related to his method came in April 1869; he wrote that he "gathered the bodies with the lowest atomic weights and placed them by order of their increase in atomic weight," according to Gordin's book.Whatever his thought process, Mendeleev ultimately arranged the elements according to both atomic weight and valence electrons. Not only did he leave space for elements not yet discovered, but he predicted the properties of five of these elements and their compounds. In March 1869, he presented the findings to the Russian Chemical Society. Later that year, his new periodic system was published as an abstract in the German chemistry periodical Zeitschrift für Chemie (opens in new tab) (Journal of Chemistry), according to the University of California, San Diego (opens in new tab).Reading the Periodic TableThe periodic table contains an enormous amount of information: Atomic number: The number of protons in an atom's nucleus is referred to as the atomic number of that element. The number of protons defines what element it is and also determines the chemical behavior of the element. For example, carbon atoms always have six protons; hydrogen atoms always have one; and oxygen atoms always have eight. Different versions of the same element, called isotopes, can have a different number of neutrons; also an element can gain or lose electrons to become charged, in which case they are called ions. Atomic symbol: The atomic symbol (or element symbol) is an abbreviation chosen to represent an element ("C" for carbon, "H" for hydrogen and "O" for oxygen, etc.). These symbols are used internationally and are sometimes unexpected. For example, the symbol for tungsten is "W" because another name for that element is wolfram. Also, the atomic symbol for gold is "Au" because the word for gold in Latin is "aurum." Atomic mass: The standard atomic weight of an element is the average mass of the element written in atomic mass units (amu). Even though each atom has roughly a whole number of atomic mass units, you will notice that the atomic mass on the periodic table is a decimal; that's because the number is a weighted average of the various naturally-occurring isotopes of an element based on their abundance. An isotope is a version of an element with a different number of neutrons in its nucleus. (To calculate the average number of neutrons in an element, subtract the number of protons (atomic number) from the atomic mass.)For example, here's how you would calculate the atomic mass of carbon, which has two isotopes:Multiply the abundance of the isotope by its atomic mass: Carbon-12: 0.9889 x 12.0000 = 11.8668 Carbon-13: 0.0111 x 13.0034 = 0.1443Then, add the results:11.8668 + 0.1443 = 12.0111 = atomic weight of carbonAtomic mass for elements 93-118: For lab-created trans-uranium elements (elements beyond uranium, which has an atomic number of 92), there is no "natural" abundance, the Los Alamos National Laboratory (LANL) noted. For these elements, the atomic weight of the longest-lived isotope gets listed on the periodic table, according to the International Union of Pure and Applied Chemistry (IUPAC) — the world authority on chemical nomenclature and terminology. These atomic weights should be considered provisional, since a new isotope with a longer half-life (how long it takes 50% of that element to decompose) could be produced in the future, according to the LANLThe superheavy elements, or those with atomic numbers above 104, also fit into this non-natural category. The larger the atom's nucleus — which increases with the number of protons inside — the more unstable that element is, generally. As such, these outsized elements are fleeting, lasting mere milliseconds before decaying into lighter elements, according to the IUPAC. For instance, superheavy elements 113, 115, 117 and 118 were verified by the IUPAC in December 2015, completing the seventh row, or period, on the table. Several different labs produced the superheavy elements. The atomic numbers, temporary names and official names are:How is the Periodic Table arranged?Hydrogen shares its single valence electron with one of the valence electrons of oxygen; when two hydrogen atoms form these covalent bonds with a single oxygen atom, the result is H2O or water. (Image credit: Encyclopaedia Britannica/UIG Via Getty Images) (opens in new tab)The periodic table is arranged by atomic weight and valence electrons. These variables allowed Mendeleev to place each element in a certain row (called a period) and column (called a group). The table comprises seven rows and 18 columns. Each element in the same row has the same number of atomic orbitals (the spaces where electrons exist) as the others in that row or period. That means all of the elements in the third period — sodium, magnesium, aluminum, silicon, phosphorus, sulfur, chlorine and argon — have three atomic orbitals where their electrons reside. Meanwhile, the column or group signifies the number of electrons in the atom's outermost shell; these are called the valence electrons, and they are the electrons that can chemically bond with valence electrons of other elements. The valence electrons can be either shared with another element, a type of covalent bonding, or exchanged in a type of ionic bonding, according to Lumen Learning (opens in new tab).For example, all of the elements in the second column have two valence electrons; in the third column, they have three valence electrons. There are some exceptions to this rule in the transition elements, which fill the shorter columns at the center of the periodic table. These transition elements Let's try an example: We can choose selenium, which has an atomic number of 34, meaning there are 34 total electrons in a neutral atom of selenium. This non-metal resides in Period 4, Group 6A. That means selenium keeps its electrons in four atomic orbitals, and has six valence electrons, or six electrons in its outermost orbital. You can also figure out how many electrons are in its first, second and third orbitals: The first orbital can hold a maximum of two electrons, while the second has four suborbitals and so can hold a total of eight electrons. The third shell of an atom, which consists of nine suborbitals, can hold a maximum of 18 electrons, according to Florida State University's Department of Chemistry and Biochemistry (opens in new tab). That means selenium has 2, 8, 18 and 6 electrons in its first, second, third and fourth atomic orbital, respectively.How is the Periodic Table used today?By knowing that certain elements that are lumped together on the table have certain characteristics and behaviors, scientists can figure out which ones would be best for certain industries and processes. For instance, engineers use different combinations of elements in Groups III and V of the table to create new semiconductor alloys, such as gallium nitride (GaN) and Indium nitride (InN), according to the National Institute of Standards and Technology (opens in new tab) (NIST). In general, chemists and other scientists can use the table to predict how certain elements will react with one another. The alkali metals, for instance, are in the first column or group of the table and tend to have one valence electron and so carry a charge of +1. This charge means they "react vigorously with water, and combine readily with nonmetals," chemist Anne Marie Helmenstine wrote on ThoughtCo. (opens in new tab) Magnesium, which is in the same group on the table as calcium, is becoming useful as part of alloys for bone implants, NIST said. Since these alloys are biodegradable, they serve as a scaffolding and then disappear after natural bone grows on the structures. Additional reporting by Traci Pedersen, Live Science contributor

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