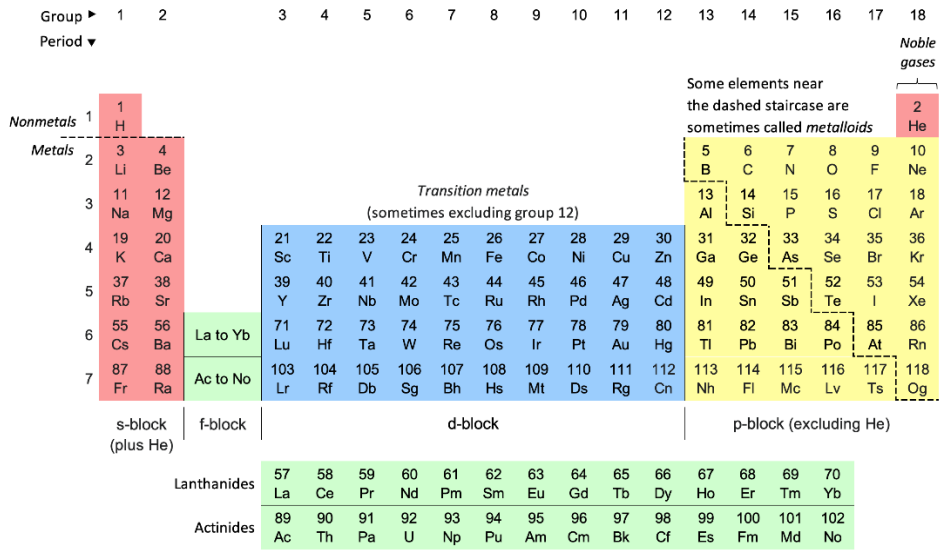
The Periodic Table of Elements



The periodic table of elements

The periodic table, also known as the periodic table of elements, is a tabular display of the chemical elements, which are **arranged** by atomic number, electron configuration, and **recurring** chemical properties. The structure of the table shows periodic trends. The seven rows of the table, called periods, generally have metals on the left and non-metals on the right. The columns, called groups, contain elements with similar chemical behaviours. Six groups have accepted names as well as assigned numbers: for example, group 17 elements are the **halogens**; and group 18 are the noble gases. Also displayed are four simple rectangular areas or blocks associated with the filling of different atomic **orbitals**.

Each chemical element has a unique **atomic number** (*Z*) representing the number of protons in its nucleus. Most elements have differing numbers of neutrons among different atoms, with these variants being referred to as isotopes. For example, carbon has three naturally occurring isotopes: all of its atoms have six protons and most have six neutrons as well, but about one per cent have seven neutrons, and a very small **fraction** have eight neutrons. Isotopes are never separated in the periodic table; they are always grouped together under a single element. Elements with no **stable** isotopes have the atomic masses of their most stable isotopes, where such masses are shown, listed in parentheses.

It 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.

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.

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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.

Text Study

1- Using a dictionary give full definitions to the words written in bolds in the text.
   a) Give the French equivalents to these words
   b) Choose five words and use them in sentences from your own style.
2- State the general idea of the text.
3- State the main ideas of each paragraph in the text.

Reading Comprehension Questions

Basic Understanding:

1. What is the periodic table, and how are elements arranged in it?
2. What do the rows (periods) and columns (groups) in the periodic table represent?
3. Why do elements in the same group have similar chemical properties?
4. What are the names of the elements in **group 17** and **group 18**?
5. What does the atomic number of an element tell us?

Deeper Understanding:

6. What are **isotopes**, and why are they grouped together in the periodic table?
7. Why was the arrangement of elements based on atomic number an important discovery?
8. How did advancements in chemistry help in the classification of elements?
9. Why was it easier to classify compounds before elements?
10. How did the discovery of electron structure help explain the periodic table's organization?

Critical Thinking & Application:

11. Why do you think organizing elements in a table is useful for scientists?
12. If a new element is discovered, how can scientists determine where it belongs in the periodic table?
13. What challenges might scientists face when classifying newly discovered elements?
14. If you could redesign the periodic table, what changes would you make to improve its organization?
15. Imagine the periodic table did not exist—how do you think this would affect chemistry and science in general?