

The Basics: Periodic Table of Elements

Part I: The History of the Periodic Table

Visit [Resource 1: Development of Elements and the Periodic Table](#) to discover the contributions of some of the individuals that helped develop the periodic table:

Scientist	Approx. Date	Contribution to the development of the periodic table
Robert Boyle	1661	Defined a substance that could not be broken down into a simpler substance by a chemical reaction.
Johann Döbereiner	1829	Grouped known elements into families of triads of elements with similar properties.
John Newlands	1865	Found that similar elements were separated by intervals of eight when listed in order of increasing atomic mass, called the Law of Octaves.
Dmitri Mendeleev	1869	Created the first accepted periodic table by grouping elements on the basis of similar chemical properties, leaving blank spaces for new elements to be added, and predicting properties for undiscovered elements
Glenn Seaborg	1944	Created the modern version of the periodic table.

Part II: Get Organized Periodically

Visit [Resource #2: Chem4Kids - Elements as Building Blocks](#)

- Why are the elements placed in specific places on the Periodic Table?
Each element is placed in a specific location because of its atomic structure.
- Periods are rows that run from left to right.
- Elements in the same period have the same atomic orbitals.
- Every element in the first period has one shell for its electrons. Every element in the second period has two orbitals for its electrons. See the pattern?
- Groups are columns that run from top to bottom.
- The elements of a group have the same number of electrons in their outer shell.
- Every element in Group 1 has one electron in its outer shell. Every element in Group 2 has two electrons in its outer shell.
- Hydrogen is special because it can act like two groups, one and seven.
- Hydrogen sometimes is missing an electron and sometimes it has an extra electron.
- Although helium has only two electrons in its outer shell, it is grouped with elements that have eight electrons (because its only energy shell is considered full).

- e. What are the three characteristics of ALL metals? malleable, ductile, good conductors of heat & electricity
- f. Are these metals soft or hard? softer than most
- g. Name the two most reactive elements in this group? Cesium and Francium
- h. What happens when they are exposed to water? explode or sizzle

12. Click on Alkaline Earth Metals (in the left sidebar) and answer these questions.

- a. What is the group number? 2
- b. Are these metals reactive? yes
- c. Do these metals occur freely in nature? no
- d. How many electrons are in their outer shell? 2 (Hint: It's the same as their oxidation number or group number.)

13. Click on Transition Metals and answer these questions.

- a. How many elements are in this group? 38
- b. What are the group numbers? 3 through 12
- c. What are valence electrons? the electrons found in the outer shells
- d. Because the valence electrons are present in more than one shell, transition metals often exhibit several common oxidation states.
- e. Name the three elements in this family that produce a magnetic field. iron, cobalt, and nickel.

14. Click on Other Metals (left bar) and answer these questions.

- a. How many elements are in this group? 7
- b. What are the group numbers? 13 through 15
- c. How are these other metals similar to the transition metals? they are ductile & malleable
- d. How are these metals different than the transition metals? they do not exhibit variable oxidation states & their val. elec. are only present in their outer shell.
- e. List three physical properties of these other metals. solid, high density, + opaque
- f. What are the oxidation numbers for this group? +3, ±4, -3

15. Click on Metalloids to answer these questions.

- a. On your periodic table, locate the black stair-step line that distinguishes metals from nonmetals.
- b. Metalloids have properties of both metals and nonmetals.

Part III: Reading the Periodic Table

Visit [Resource #3 - Reading the Period Table](#)

In the area below, label and define the following:

- atomic mass
- atomic number
- (element) name
- (chemical) symbol

The diagram shows a square box representing an element's entry in the periodic table. Inside the box, from top to bottom, are: the atomic number '27', the chemical symbol 'Co', the element name 'Cobalt', and the atomic mass '58.93'. Four arrows point from labels on the right to these elements: 'atomic number' points to '27', 'chemical symbol' points to 'Co', 'element name' points to 'Cobalt', and 'atomic mass' points to '58.93'.

Term/Word	Definition
(chemical) symbol	A one- or two-letter abbreviation derived from the element's English or Latin name.
(element) name	The element's common name.
atomic number	Equal to the number of protons in the nucleus, as well as the number of electrons in the electron cloud (if not an ion).
atomic mass	The mass of the atom; the total number of neutrons plus protons in the nucleus. (Weighted average of the masses of all the element's isotopes.)
mass number	The sum of the numbers of protons and neutrons in a specific isotope.

Part IV: Family Fun

Visit [Resource #4 Chemical Elements](#)

11. Click on **Alkali Metals** (in the left sidebar) and answer the following questions.

- What is the group number? 1
- Are these metals reactive? yes
- Do these metals occur freely in nature? no
- How many electrons are in their outer shell? 1

- c. Define semiconductor can carry an electrical charge under special conditions
- d. Name two metalloids that are semi-conductors. silicon and germanium
- e. This property makes metalloids useful in computers and calculators.

16. Click in Nonmetals to answer these questions.

- a. What are the group numbers? 14 through 16
- b. List four characteristics of ALL nonmetals. poor conductors of electricity and heat, very brittle, cannot be rolled into wires or pounded into sheets
- c. What two states of matter do nonmetals exist in at room temperature? gases & solids
- d. The nonmetals have no metallic luster and do not reflect light.
- e. What are the oxidation numbers of the nonmetals? +4, -3, -2

17. Click on the Halogens (left bar) to answer these questions.

- a. What is the halogen group number? 17
- b. Are halogens metals or nonmetals? nonmetals
- c. The term "halogen" means salt former and compounds containing halogens are called salts.
- d. How many electrons are in their outer shell? 7e
- e. What is their oxidation number? -1
- f. What states of matter do halogens exist in at room temperature? solid, liquid, gas

18. Click on Noble Gases (left bar) and answer these questions.

- a. What is the group number? 18
- b. Why were these gases considered to be inert or stable? oxidation number 0 (2 or 8 e⁻ outer shell)
- c. What is their oxidation number? 0

19. Click on Rare Earth Elements (Inner Transition) (left bar) and answer these questions.

- a. The rare earth elements are made up of the lanthanide and actinide series.
- b. How many Rare Earth Elements are there? 30
- c. Define trans-uranium. synthetic or man made
- d. The rare earth metals are found in group 3 and periods 6 + 7 and 7.