

## Periodic Table

- Mendeleev (1869):
  - When atoms are arranged in order of their atomic weight, some of their chemical and physical properties repeat at regular intervals (periods)
  - Some of the physical and chemical properties of atoms could be calculated based on atomic weight
- Mendeleev was able to predict the properties of previously unknown elements using his "periodic law"

## Modern periodic table

- organized based on ATOMIC NUMBER rather than ATOMIC WEIGHT. This eliminated some problems (elements out of order) with Mendeleev's original arrangement

## Organization of the table

### GROUPS

- columns
- atoms in a group often have similar chemical (and sometimes physical) properties

Group numbering:

- 1) Roman numerals: Similar to Mendeleev's groupings
  - "A" groups: Main group or "representative" elements
  - "B" groups: Transition elements (also called transition metals)
- 2) Arabic numerals: IUPAC (international) accepted numbering system

### PERIODS

- rows
- Atoms in later periods are generally larger than in earlier periods
- More on the significance of periods at the end of the course!

## Groups and periods

	IA																VIIIA	
1	H	IIA															He	
2	Li	Be																
3	Na	Mg	IIIB	IVB	VB	VIB	VII B	VIII B	IB	IIB		Al	Si	P	S	Cl	Ar	
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
7	Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt									

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- The "B" groups are called the transition elements

The elements in the purple box have similar chemistry to the transition elements, even though they are not transition elements.

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GROUP numbers shown in GREEN

PERIOD numbers shown in RED

The elements in the purple box have similar chemistry to the transition elements, even though they are listed in the "A" groups. A/B group notation isn't perfect!

## Categories of elements

### METALS

- good conductors of heat and electricity
- almost all solids at room temperature (exception: Mercury - Hg - is liquid)
- appearance: shiny, mirrored surface - mostly grey
- ductile (can be drawn into wires), malleable (can be hammered)
- located on the left hand side of the periodic table

### NONMETALS

- poor conductors of heat and electricity. Most nonmetals do not conduct well at all (insulators)
- many of the nonmetals are gases at room temperature. A few solids, and one liquid (bromine)
- color: Nonmetals may be white, black, purple, green, blue, orange, or colorless etc.
  - usually have low melting points in the solid form
  - solids tend to be brittle (not malleable) - break when hit
  - located on the right hand side of the periodic table

## METALLOIDS / SEMICONDUCTORS

- in between metals and nonmetals on the table
- most periodic tables have a zig-zagging line where the metalloids are
- properties tend to be "between" metals and nonmetals, too!
- some have chemical reactivity like a nonmetal, but conduct electricity better than nonmetals
- some have unusual electrical properties (silicon / germanium diodes) , and are useful in electronics

## Types of elements on the periodic table

This red line appears in some way on most periodic tables. It's the dividing line between metals and nonmetals. You can find the metalloids here!

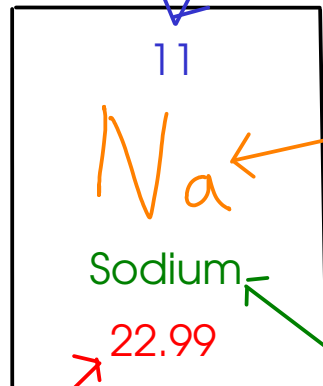
IA																		VIIIA
H	IIA											IIIA	IVA	VA	VIA	VIIA	He	
Li	Be											B	C	N	O	F	Ne	
Na	Mg	IIIB	IVB	VB	VIB	VII B	VIII B	IB	IIB			Al	Si	P	S	Cl	Ar	
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
Cs	Ba	La*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At*	Rn	
Fr	Ra	Ac*	Rf	Db	Sg	Bh	Hs	Mt	*"inner" transition metals go here									

METALS shown in BLACK

NONMETALS shown in BLUE

METALLOIDS shown in PURPLE

## Blocks on the periodic table

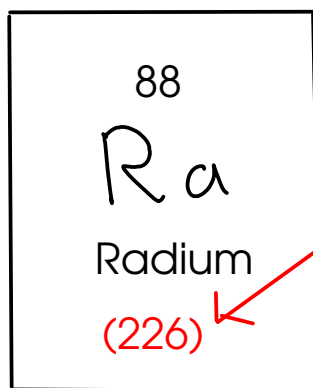


Atomic number: This is always a whole number. The periodic table is arranged by atomic number!

Element symbol: A one or two letter abbreviation for the name of the element. Sometimes, the abbreviation is based on a language OTHER THAN ENGLISH! (Example: Na is short for "natrium", the Latin name of sodium.)

Element name: Sometimes, this is left off of periodic tables, especially small ones!

Atomic weight: This is a decimal number, but for radioactive elements it is replaced with a number in parenthesis.



For RADIOACTIVE ELEMENTS - elements where the atomic nucleus breaks down, causing the atom to break apart - the MASS NUMBER of the most stable ISOTOPE is given in (parenthesis) instead of the atomic weight!