The Periodic Table of the Elements

What are some observations you made about the periodic table in your activity?

Mendeleev and the Periodic Table

- Dimitry Mendeleev put together the first periodic table by organizing the 60 (then) known elements by their mass.
  - > When organized, he saw repeating patterns of properties of the various elements.
  - > He was able to predict undiscovered elements based on the patterns of other known elements.

ОПЫТЪ СИСТЕМЫ ЭЛЕМЕНТОВЪ.

ОСНОВАННОЙ НА ИХЪ АТОМНОМЪ ВѢСѢ И ХИМИЧЕСКОМЪ СХОДСТВѢ.

			Ti = 50	Zr = 90	? = 180.
			V = 51	Nb = 94	Ta = 182.
			Cr = 52	Mo = 96	W = 186.
			Mn = 55	Rh = 104,4	Pt = 197,1.
			Fe = 56	Ru = 104,4	Ir = 198.
			Ni = Co = 59	Pl = 106,6	O = 199.
H = 1			Cu = 63,4	Ag = 108	Hg = 200.
	Be = 9,4	Mg = 24	Zn = 65,2	Cd = 112	
	B = 11	Al = 27,4	? = 68	Ur = 116	Au = 197?
	C = 12	Si = 28	? = 70	Sn = 118	
	N = 14	P = 31	As = 75	Sb = 122	Bi = 210?
	O = 16	S = 32	Se = 79,4	Te = 128?	
	F = 19	Cl = 35,6	Br = 80	I = 127	
Li = 7	Na = 23	K = 39	Rb = 85,4	Cs = 133	Tl = 204.
		Ca = 40	Sr = 87,6	Ba = 137	Pb = 207.
		? = 45	Ce = 92		
		?Er = 56	La = 94		
		?Yt = 60	Di = 95		
		?In = 75,6	Th = 118?		

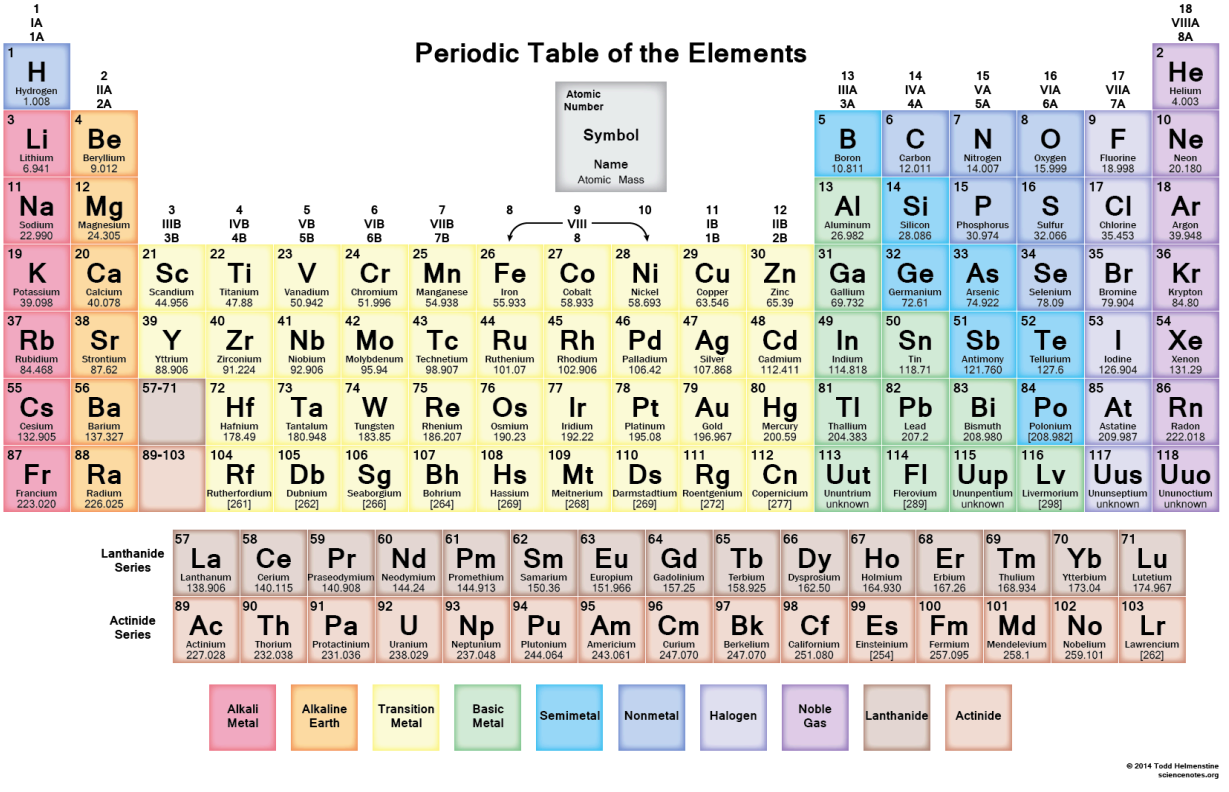
Д. Менделѣевъ

A later version of Mendeleev's Periodic Table

Reihen	Gruppe I. — R^1O	Gruppe II. — RO	Gruppe III. — R^2O^3	Gruppe IV. RH^4 RO^2	Gruppe V. RH^3 R^2O^5	Gruppe VI. RH^2 RO^3	Gruppe VII. RH R^2O^7	Gruppe VIII. — RO^4
1	H=1							
2	Li=7	Be=9,4	B=11	C=12	N=14	O=16	F=19	
3	Na=23	Mg=24	Al=27,3	Si=28	P=31	S=32	Cl=35,5	
4	K=39	Ca=40	—=44	Ti=48	V=51	Cr=52	Mn=55	Fe=56, Co=59, Ni=59, Cu=63.
5	(Cu=63)	Zn=65	—=68	—=72	As=75	Se=78	Br=80	
6	Rb=85	Sr=87	?Yt=88	Zr=90	Nb=94	Mo=96	—=100	Ru=104, Rh=104, Pd=106, Ag=108.
7	(Ag=108)	Cd=112	In=113	Sn=118	Sb=122	Te=125	J=127	
8	Cs=133	Ba=137	?Di=138	?Ce=140	—	—	—	— — — —
9	(—)	—	—	—	—	—	—	
10	—	—	?Er=178	?La=180	Ta=182	W=184	—	Os=195, Ir=197, Pt=198, Au=199.
11	(Au=199)	Hg=200	Tl=204	Pb=207	Bi=208	—	—	
12	—	—	—	Th=231	—	U=240	—	— — — —

The Periodic Table

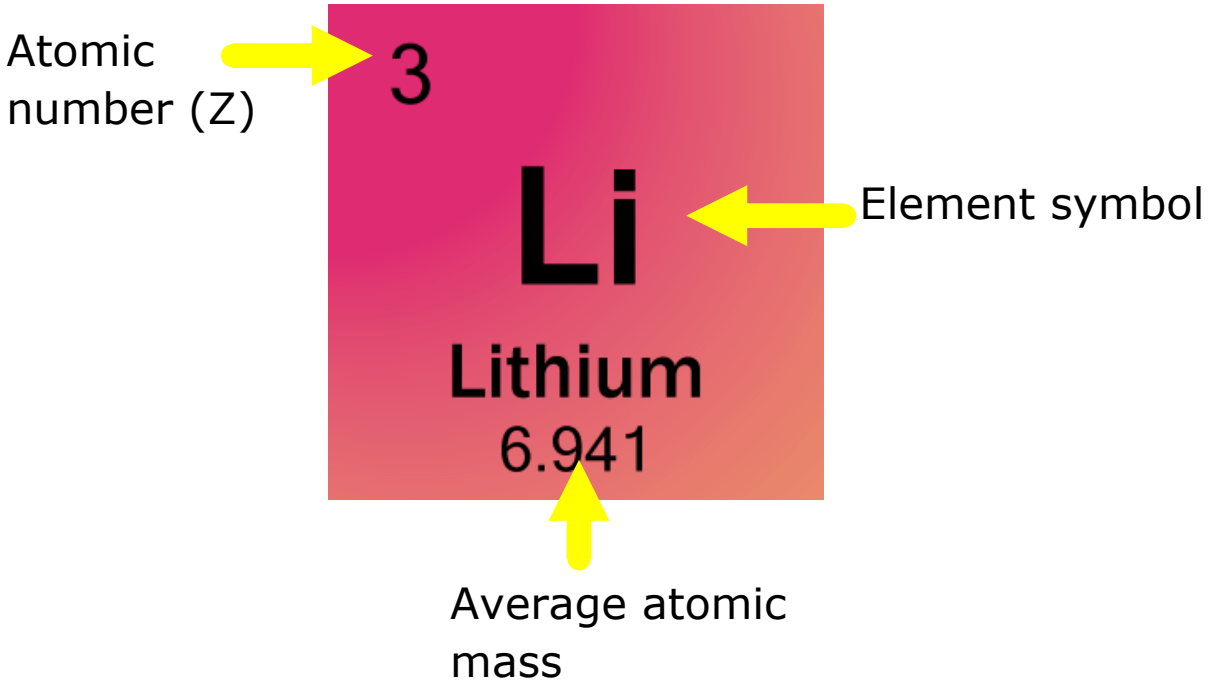
- The periodic table is a tabular display of the chemical elements, organized by *their atomic number, electron configuration, and recurring properties.*



Why is it called the periodic table?

- The properties of the elements in the table repeat in a "periodic" way (specific pattern).
- **Periodic law**: There is a periodic repetition of chemical and physical properties of the elements when they are arranged by increasing atomic number
- The modern periodic table is arranged by
  - > atomic number = # of protons
  - > properties
  - > electron configuration

Reading the Periodic Table



Elements and the Periodic Table

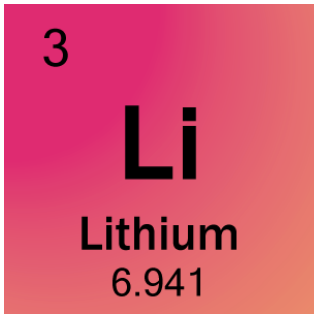
- **Atomic number** (# of protons) defines an element.
- **Average atomic mass:** weighted average of all the atomic masses of all naturally occurring isotopes
  - > Different # of neutrons = isotopes.
  - > Isotopes don't occur in equal abundance. There are more of some isotopes than others.
  - > Example:

Isotope	Atomic Mass (u)	Abundance (%)
Li-6	6.015	7.5
Li-7	7.016	92.5

Elements and the Periodic Table

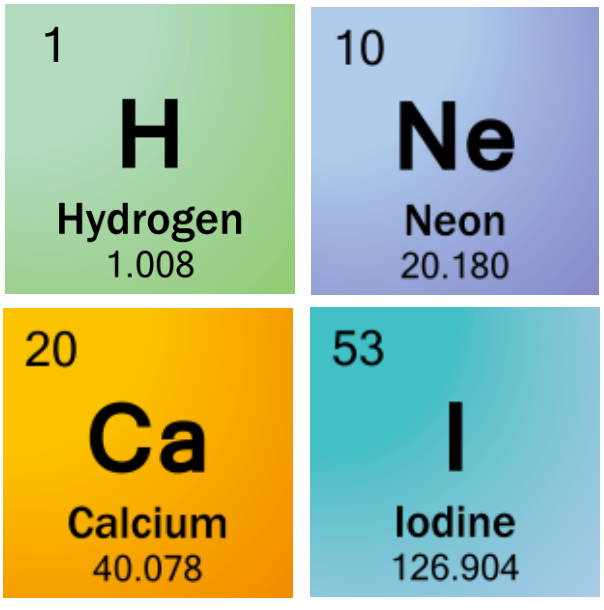
- Average atomic mass does not equal the mass number!
- Mass number = # of protons + # of neutrons for a particular isotope
- For lithium, what do you notice about the average atomic mass and the mass number for each isotope?

Isotope	Atomic Mass (u)	Abundance (%)
Li-6	6.015	7.5
Li-7	7.016	92.5



Elements and the Periodic Table

- What about electrons?
  - > For a neutral atom, the # of protons = # of electrons

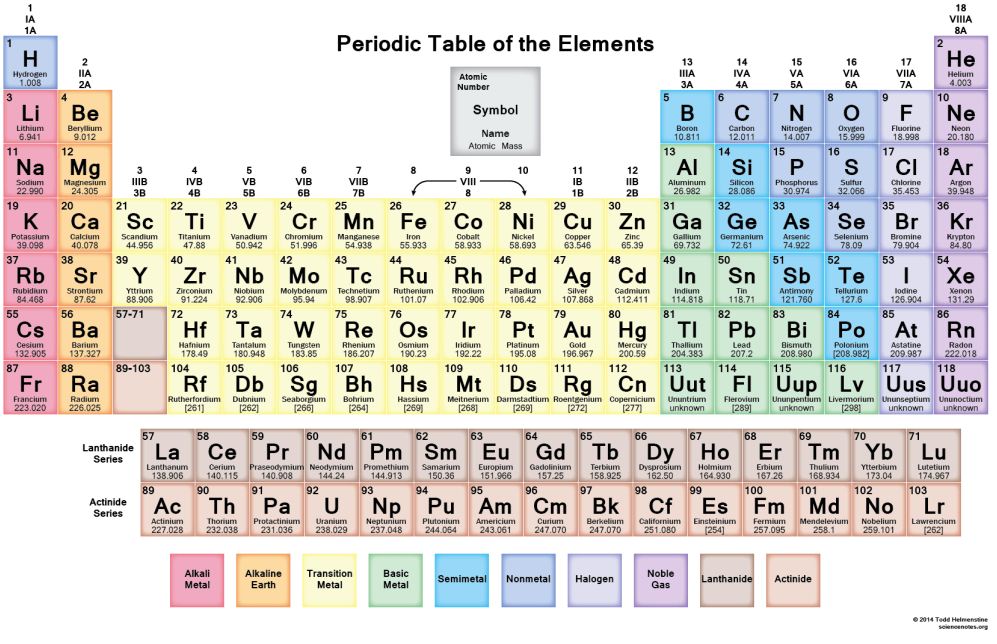


How many protons?
Neutrons? Electrons?

Groups/Families and Periods

- Groups/Families: Columns
  - > Elements in the same family share similar properties

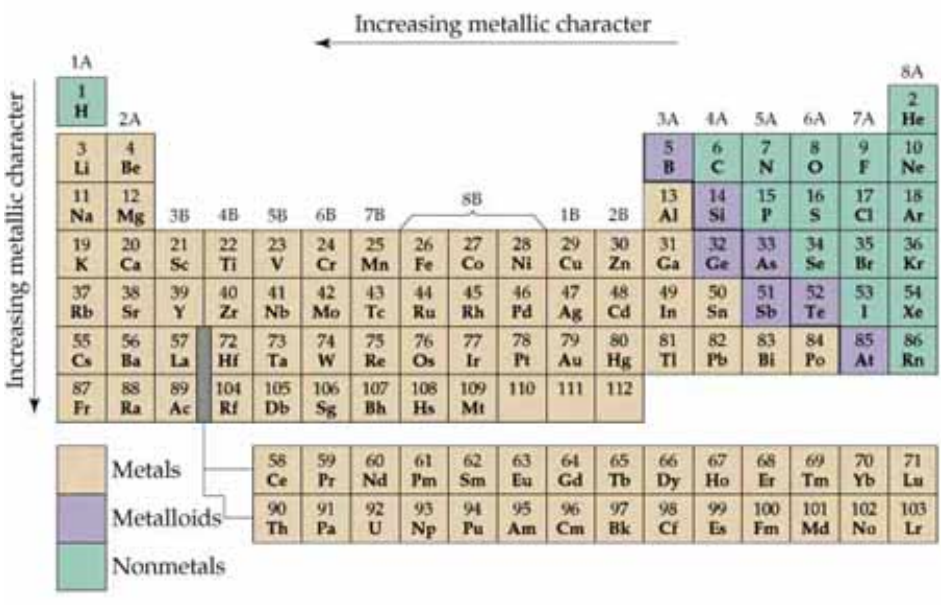
- Periods: Rows



Metals, Nonmetals, and Metalloids

- There is a "stair case" that separates the table in half.
- **Metals** are found on the left side of the periodic table
- **Nonmetals** are found on the right side of the periodic table.
- **Metalloids or semimetals** line the stair case.

Example of how the periodic table is organized by properties!



Metals	Metalloids	Nonmetals
• Shiny • Malleable • Ductile • Good conductors Examples:	• Inbetween metals and nonmetals! Examples:	• No luster, various colors. • Brittle solids • Poor conductors Examples: