

Modern Periodic Table

The Elements



What does the table tell us?

- A lot of information can be gathered from an element's position in the periodic table.
- For example, the physical and chemical properties can be predicted pretty accurately.
- You can also predict what other elements a particular element will react with.
- This means you don't have to memorize a bunch of facts about each element because you can figure it out from the table!

What's in the box?


- Each square on the periodic table contains information about an element:
 - Name
 - Chemical symbol
 - Atomic number
 - Atomic mass

6

C

Carbon

12.011



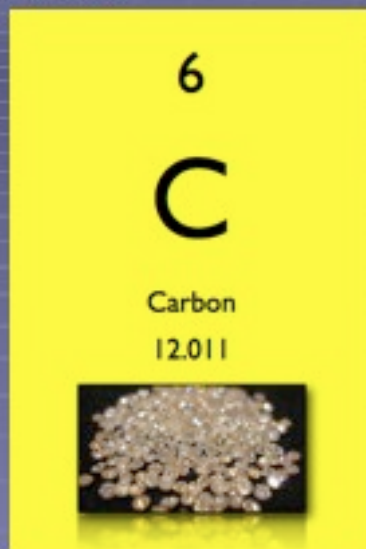
What's in the box?

- What does the C stand for?
 - Chemical symbol
 - Carbon
- Usually consists of one or two letters.
 - The first letter is always capitalized
 - The second letter is always lowercase
- Names come from many sources and languages
 - Scientists, geographical regions etc.



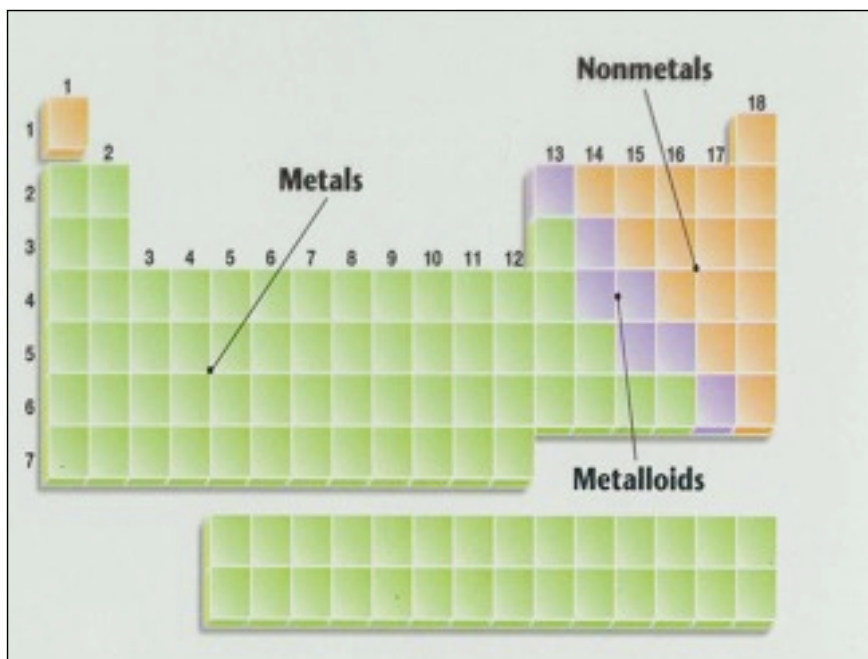
What's in the box?

- What does the 6 stand for?
 - Atomic Number
 - This tells us what about an atom of C?
 - # of protons
- What does the 12.011 stand for?
 - Atomic Mass
 - This tells us what about an atom of C?
 - Mass in nucleus (# of protons and neutrons)



Classes of elements

- Elements are classified according to their properties as:
 - Metals
 - Nonmetals
 - Metalloids



- Most elements are metals (everything on the left of the zigzag line on the periodic table)
- Elements that are shiny, smooth and clean
- Solid at room temperature
- Good conductors of heat and electricity
- Malleable
 - Hammered flat into a sheet
- Ductile
 - Drawn out into a wire

1. Metals



Main-Group Elements
s Subshell fills

Main-Group Elements
p Subshell fills

Period	1	2	Transition Metals d Subshell fills										Main-Group Elements p Subshell fills										
	1A	2A																3A	4A	5A	6A	7A	8A
1	H	He																B	C	N	O	F	Ne
2	Li	Be																B	C	N	O	F	Ne
3	Na	Mg																Al	Si	P	S	Cl	Ar
4	K	Ca																Ga	Ge	As	Se	Br	Kr
5	Rb	Sr																In	Sn	Sb	Te	I	Xe
6	Cs	Ba																Tl	Pb	Bi	Po	At	Rn
7	Fr	Ra																113	114	115	116	117	118

*Lanthanides

**Actinides

Inner-Transition Metals
f Subshell fills

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

Metal

Metalloid

Nonmetal

2. Nonmetals

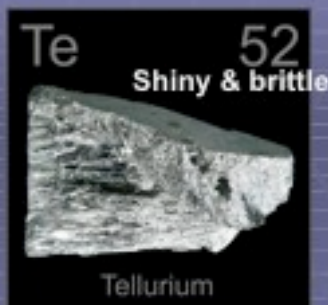
- The right side of the zigzag line on the periodic table
- Mostly gases
- Opposite of metals
- Brittle, dull-looking solids
- Poor conductors of heat and electricity
- Bromine (Br) is the only nonmetal that is liquid at room temperature



Main-Group Elements s Subshell fills																		Main-Group Elements p Subshell fills									
1	2											13	14	15	16	17	18										
1A	2A											3A	4A	5A	6A	7A	8A										
1	2											3	4	5	6	7	8										
1	2											3	4	5	6	7	8										
3	4											5	6	7	8	9	10										
11	12	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18										
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36										
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54										
55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72										
87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104										
Fr	Ra	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr											

3. Metalloids

- Elements that border the zigzag on the periodic table
- Called semiconductors
- Some properties of metals and some of non metals



Periodic Table of Elements showing Main-Group Elements (s and p subshell fills), Transition Metals (d subshell fills), and Inner-Transition Metals (f subshell fills). The table is color-coded by groups: IA (1), IIA (2), IIIA (13), IVA (14), VA (15), VIA (16), VIIA (17), and VIIIA (18). A red circle highlights the elements from Boron (B) to Xenon (Xe) in the p-block.

Legend:

- Atomic number
- Symbol
- Valence-shell configuration

Color Key:

- Metal (Blue)
- Metalloid (Purple)
- Nonmetal (Orange)

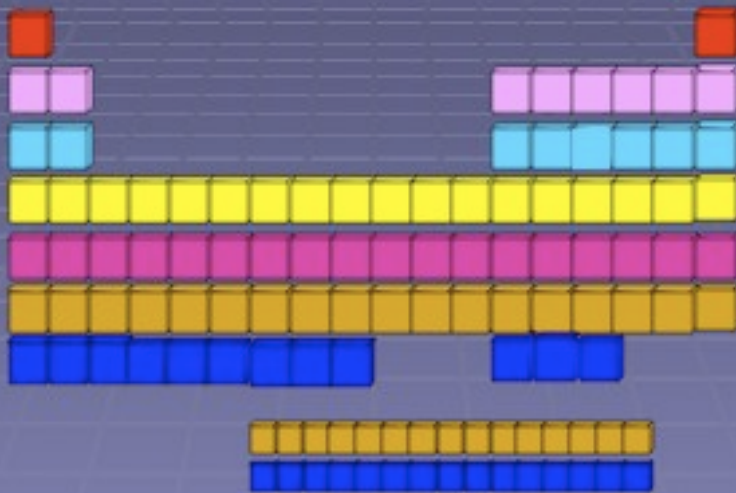
What does the arrangement of the periodic table tell us?

- Let's recall...on the modern periodic table, how are elements arranged?
 - In order of increasing atomic number, left to right
- The periodic table arranges the elements into columns and rows based on physical and chemical similarities.

Periods

- Horizontal rows are called periods.
- The properties of elements in a row follow a repeating, or periodic, pattern as you move across the table.
- The physical and chemical properties, such as conductivity and the number of electrons in the outer level of atoms, change gradually as you move from metal to nonmetal.

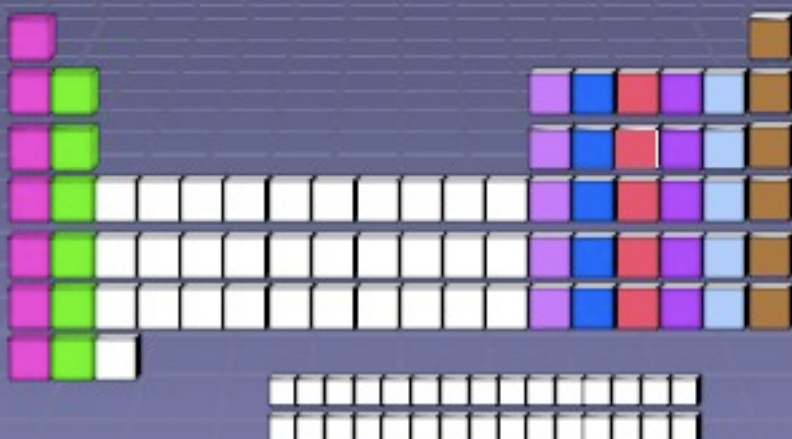
Periods



Periods

- The first element in a period is always an extremely reactive solid (with the exception of hydrogen), which means the readily combine with other elements.
- The last element in a period is a very inactive gas.

Groups



Groups

- There are 18 main columns of elements.
- Columns of elements are called *groups* or *families*.
- Elements within the same group or family have similar, but not identical properties.
- For example, all the elements of Family 1 are soft, white, shiny metals that are highly reactive.

Main-Group Elements s Subshell fills

1 IA 2 IIA

1 H He

2 Li Be

3 Na Mg

4 K Ca

5 Rb Sr

6 Cs Ba

7 Fr Ra

Transition Metals d Subshell fills

3 4 5 6 7 8 9 10 11 12

IIIb IVb Vb Vlb VIb VIIb VIIIb

13 14 15 16 17 18

IIIA IVA VA VIA VIIA VIIIA

13 B 14 C 15 N 16 O 17 F 18 Ne

19 K 20 Ca 21 Sc 22 Ti 23 V 24 Cr 25 Mn 26 Fe 27 Co 28 Ni 29 Cu 30 Zn 31 Ga 32 Ge 33 As 34 Se 35 Br 36 Kr

37 Rb 38 Sr 39 Y 40 Zr 41 Nb 42 Mo 43 Tc 44 Ru 45 Rh 46 Pd 47 Ag 48 Cd 49 In 50 Sn 51 Sb 52 Te 53 I 54 Xe

55 Cs 56 Ba 57 La* 58 Ce 59 Pr 60 Nd 61 Pm 62 Sm 63 Eu 64 Gd 65 Tb 66 Dy 67 Ho 68 Er 69 Tm 70 Yb 71 Lu

72 Hf 73 Ta 74 W 75 Re 76 Os 77 Ir 78 Pt 79 Au 80 Hg 81 Tl 82 Pb 83 Bi 84 Po 85 At 86 Rn

87 Fr 88 Ra 89 Ac** 90 Th 91 Pa 92 U 93 Np 94 Pu 95 Am 96 Cm 97 Bk 98 Cf 99 Es 100 Fm 101 Md 102 No 103 Lr

Inner-Transition Metals f Subshell fills

*Lanthanides

**Actinides

Legend: Metal (blue), Metalloid (purple), Nonmetal (orange)