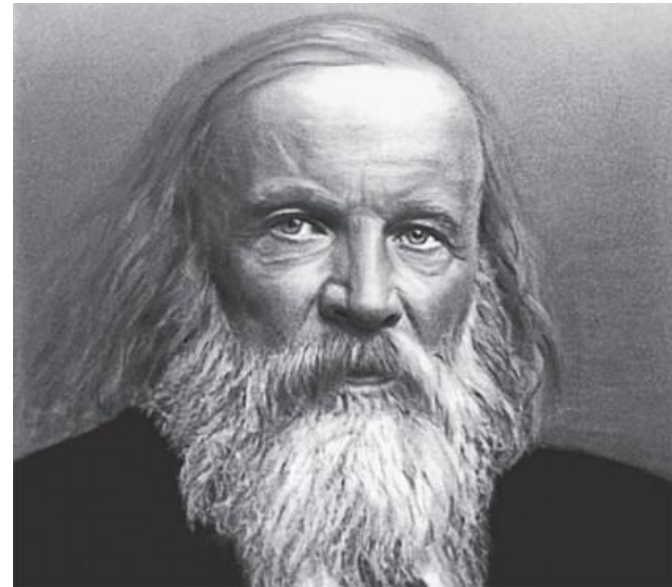


A Little **Periodic Table** History...



History of the Periodic Table

- Dmitri **Mendeleev**, a Russian scientist born in Siberia in 1834, is known as the father of the periodic table of the elements
- The periodic table is designed to help you predict **chemical** and **physical** properties of elements

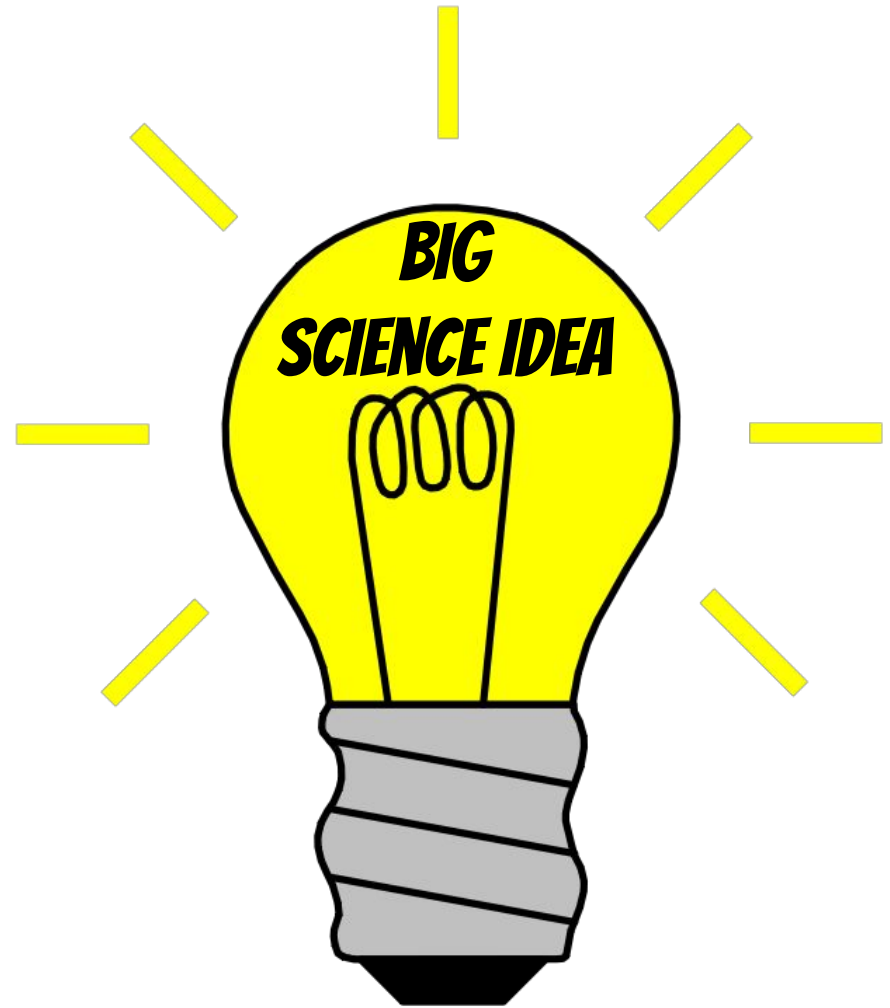


Method Behind the Madness

- He noticed that by arranging them according to their properties they were arranged in order of increasing atomic mass
- Mendeleev was even able to use the patterns in his table to predict the properties of undiscovered elements
- The first periodic table was published in 1869

Today, elements are arranged in order of increasing **atomic number on the periodic table**

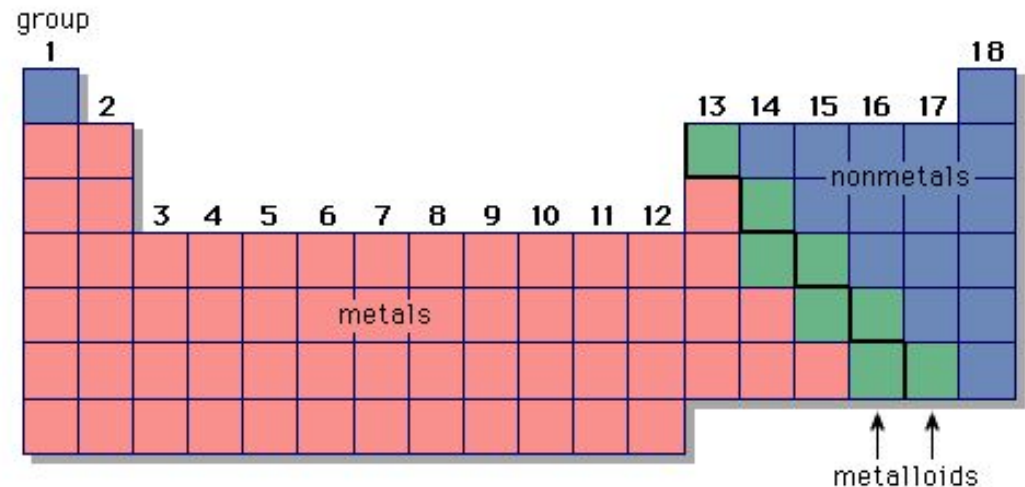
4A	5A	6A
6 C carbon 2.01	7 N nitrogen 14.01	8 O oxygen 16.00
14	15	16



Element Location

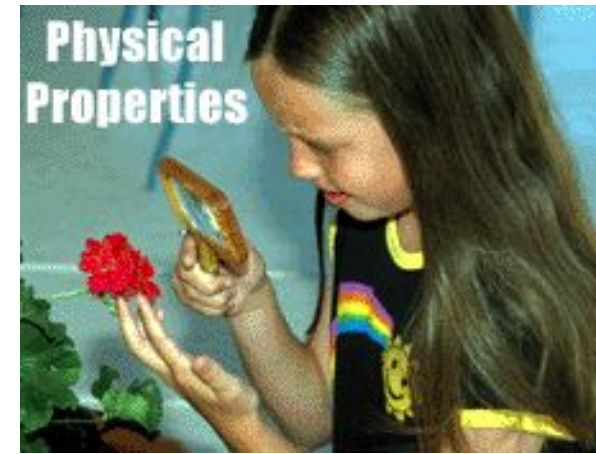
Elements are located in three main categories on the periodic table based on their **physical** properties

- ✓ Metals
- ✓ Nonmetals
- ✓ Metalloids



Physical Properties

Physical Property - a property of matter that can be observed or measured **WITHOUT CHANGING** the substance



Examples of Physical Properties

Mass – How much matter is in an object



Color/Texture



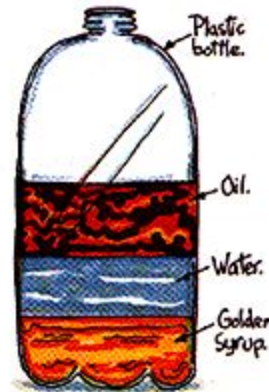
Malleable – Can be pounded/rolled into a shape



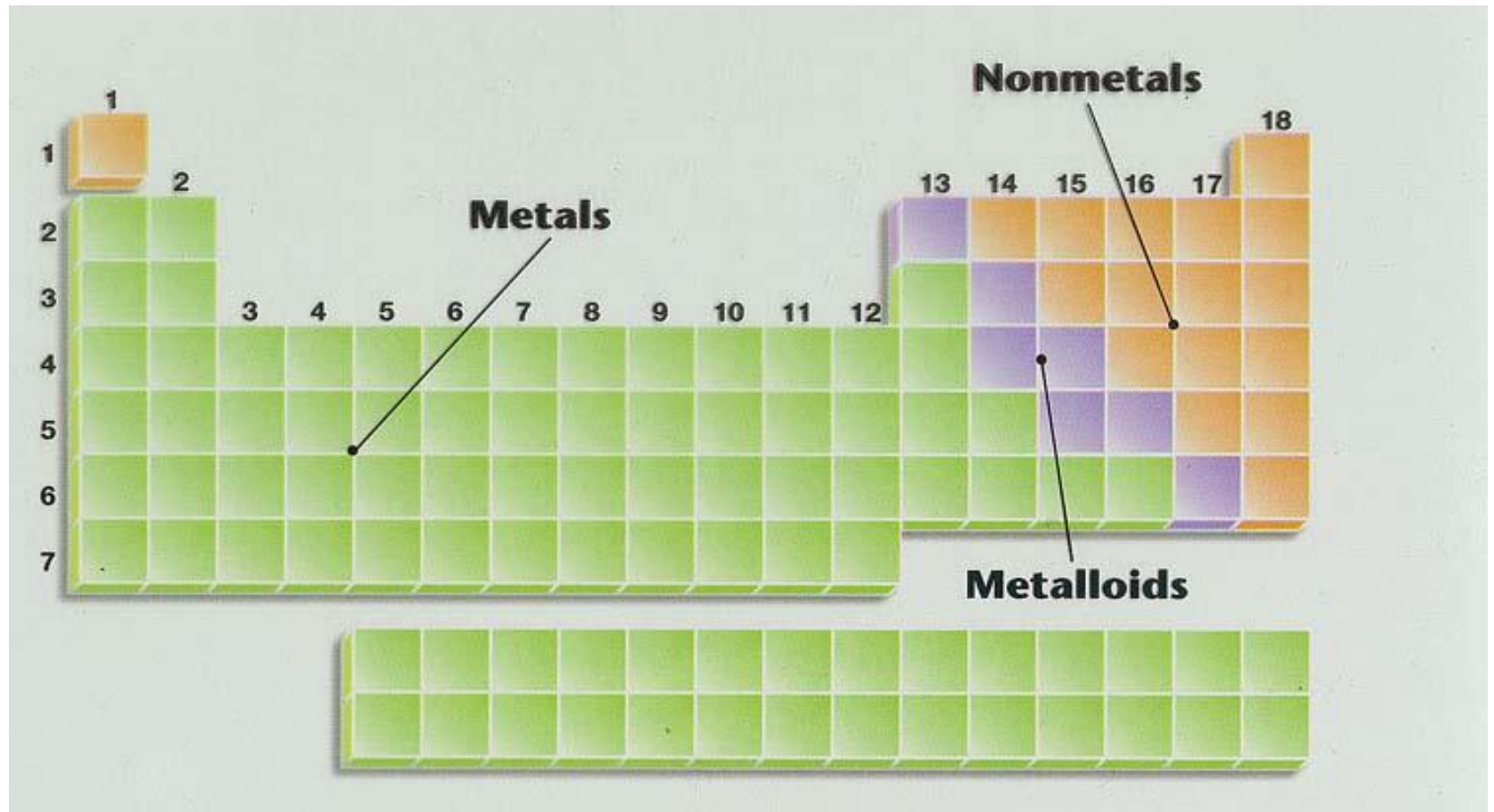
Ductile – Can be stretched into a long wire



Density – How tightly mass is packed into an object



Metals, Nonmetals, & Metalloids



Metals

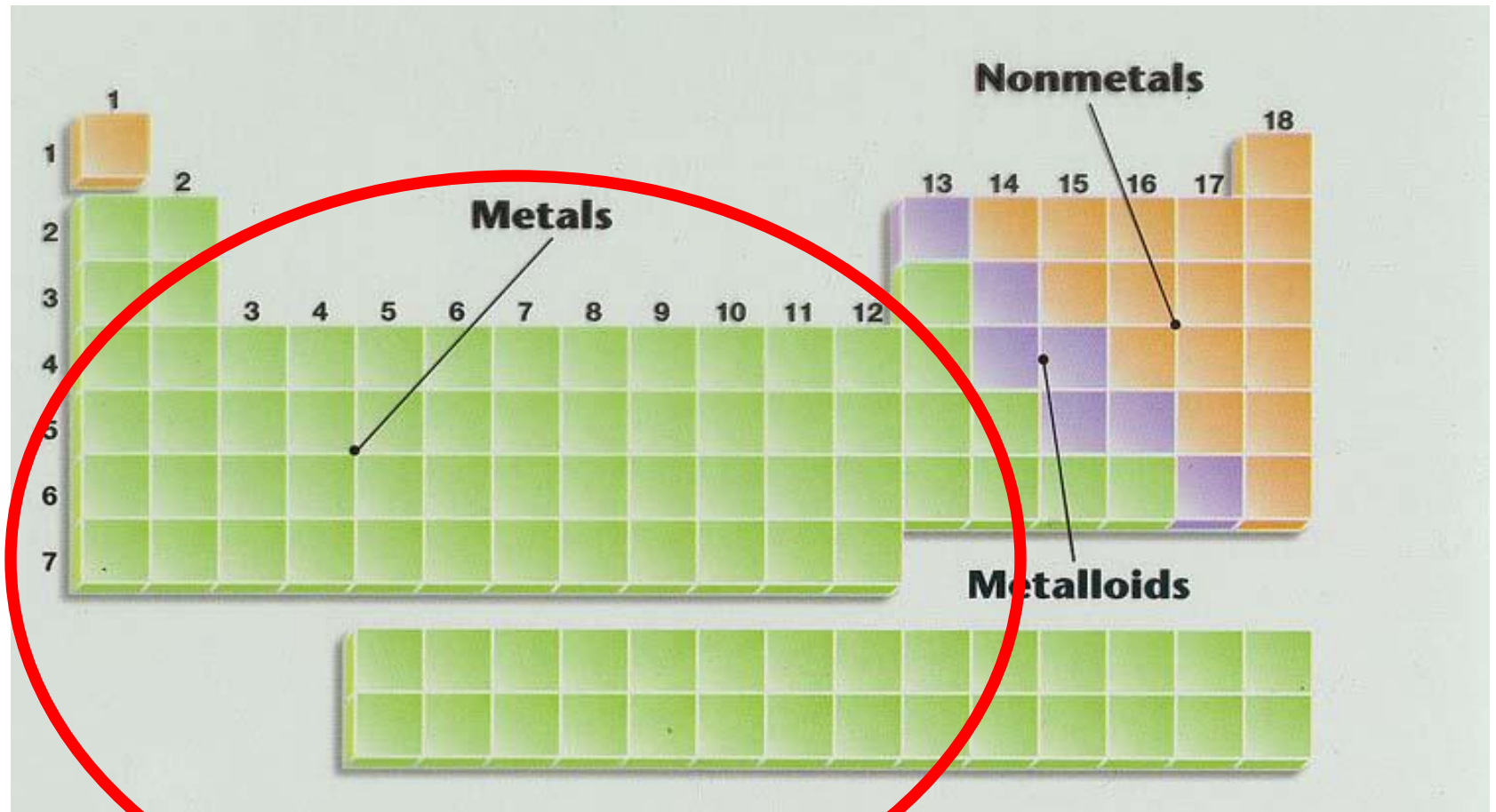
Most elements are **metals**.

Physical Properties of Metals:

- ✓ **high luster (shininess)**
- ✓ **good conductors of heat and electricity**
- ✓ **high density (heavy for their size)**
- ✓ **high melting point**
- ✓ **ductile**
- ✓ **malleable**



Metals



Non-Metals

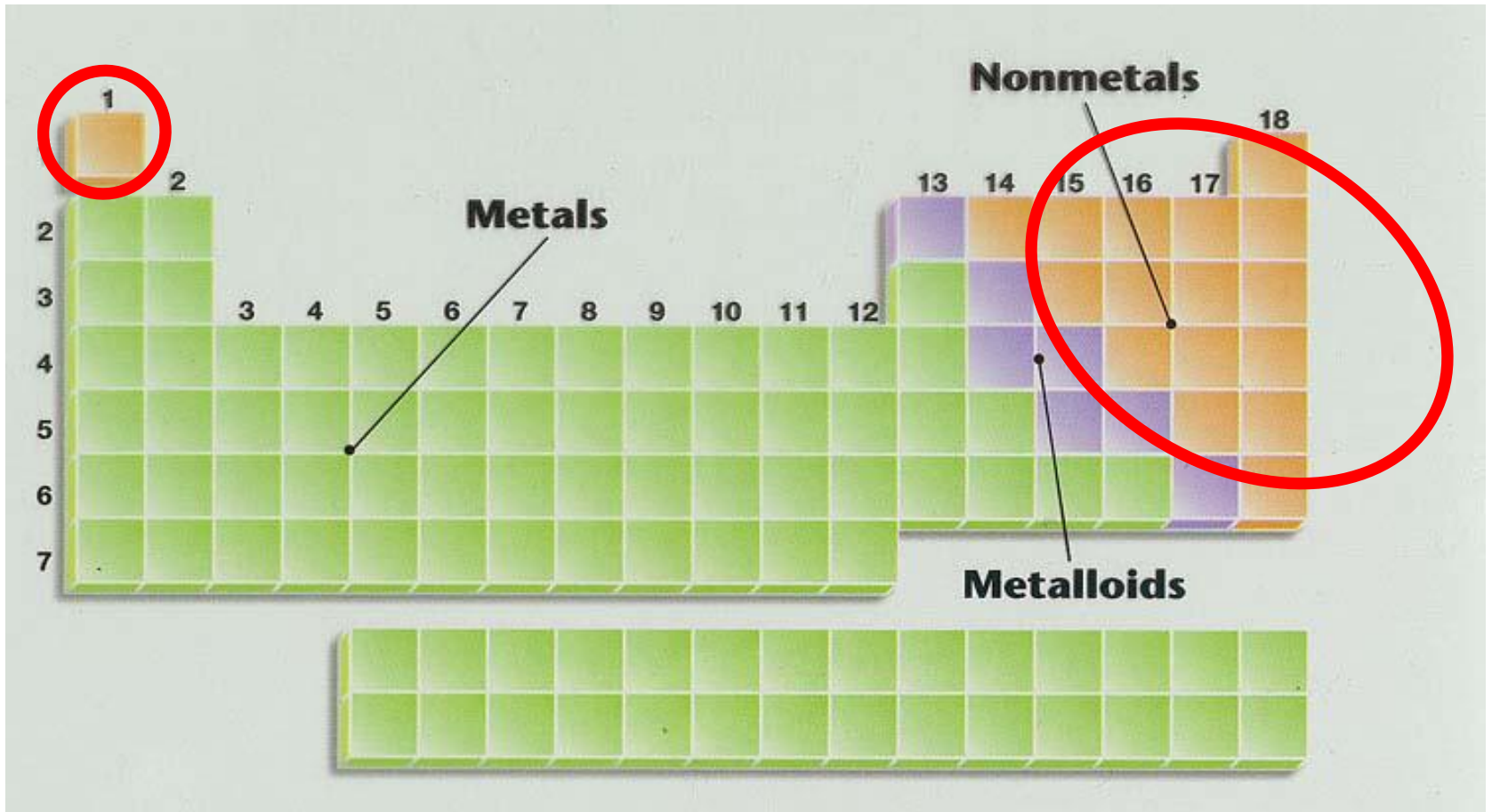
Non-metals are found to the **right** of the stair-step line. Their characteristics are **opposite** those of metals.

Physical Properties of Nonmetals:

- ✓ no luster (dull appearance)
- ✓ poor conductor of heat and electricity
- ✓ brittle (breaks easily)
- ✓ not ductile
- ✓ not malleable
- ✓ low density
- ✓ low melting point



Non-Metals



Metalloids

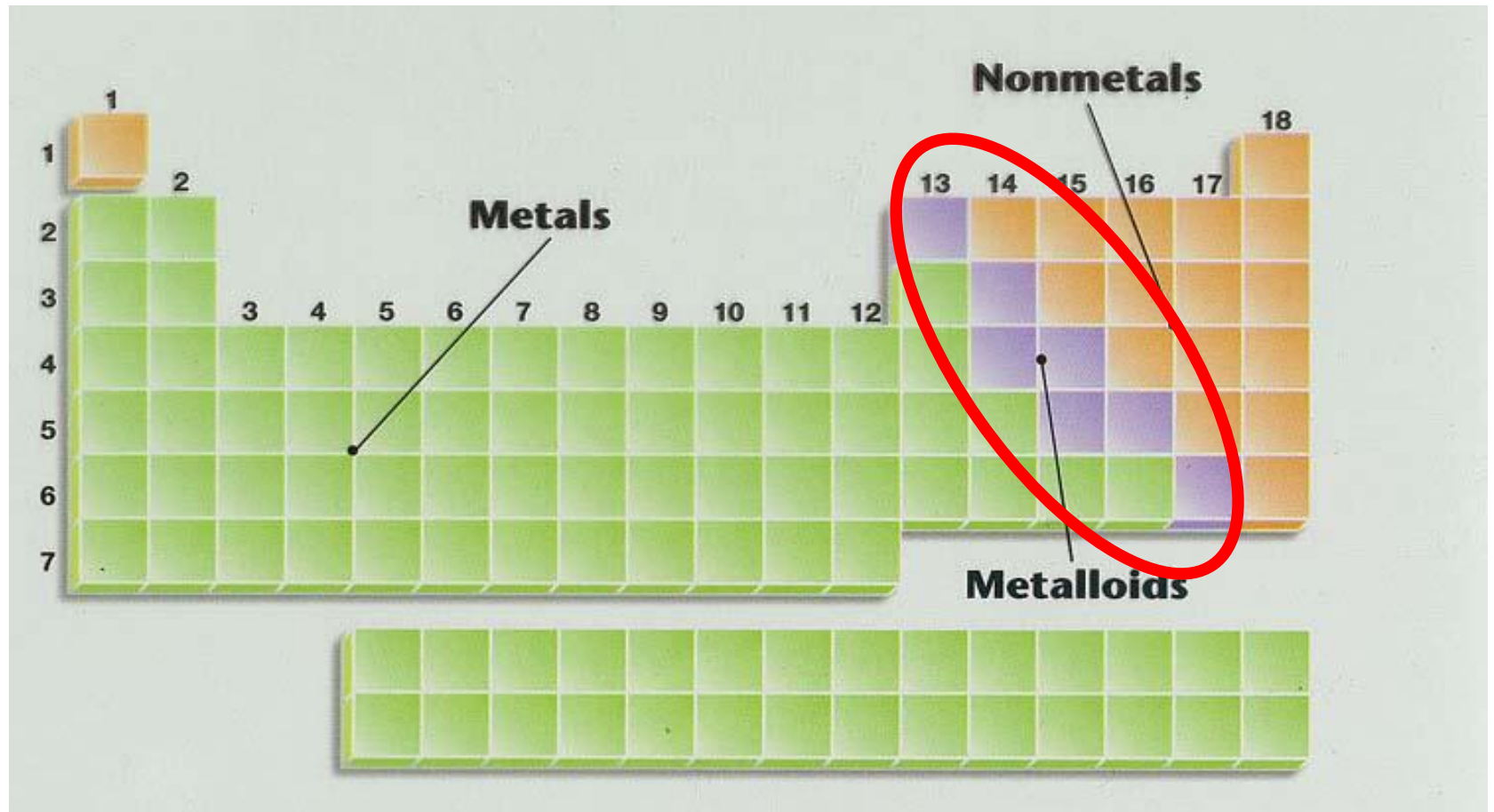
Metalloids have properties of both metals and nonmetals.

Physical Properties of Metalloids:

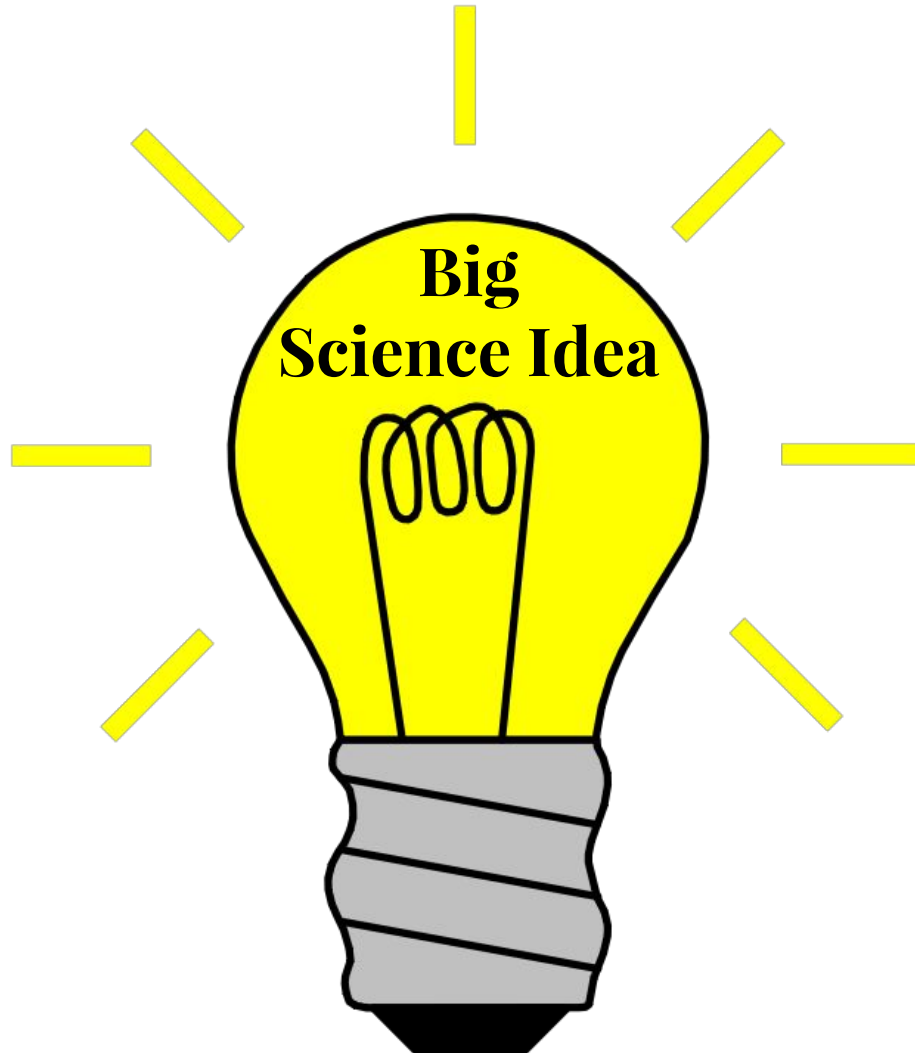
- ✓ solids
- ✓ can be shiny or dull
- ✓ ductile
- ✓ malleable
- ✓ conduct heat and electricity, but not as well as metals



Metalloids



Scientists organize elements according to their physical and chemical properties



How to Read the Periodic Table

Group

Periodic Table of Elements
by Tsigaridis Kostas

	1																	18	
	1	2											13	14	15	16	17	2	
	1	2											5	6	7	8	9	10	
	2	3	4											13	14	15	16	17	18
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			
Period	1	H																	He
	2	Li	Be											B	C	N	O	F	Ne
	3	Na	Mg											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	Uun								
	Lanthanides	58	59	60	61	62	63	64	65	66	67	68	69	70	71				
	Actinides	90	91	92	93	94	95	96	97	98	99	100	101	102	103				

- The Periodic table is designed to help you predict what an element's **physical** and **chemical** properties are
- You can also predict what elements will **bond** with each other

Elements are arranged:

Vertically into **Groups** (also called **Families**)

4
Be
12
Mg
20
Ca
38
Sr
56
Ba
88
Ra

[Periodic Table Bitesize](#)
(only show part 1)

Horizontally Into **Periods**

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

Why?

4
Be
12
Mg
20
Ca
38
Sr
56
Ba
88
Ra

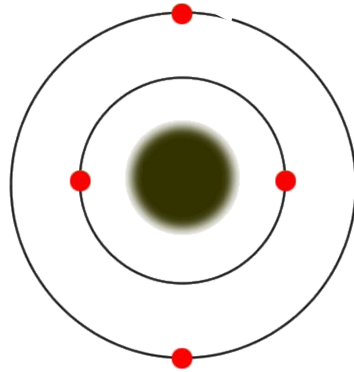
If you looked at one atom of every element in a **group** you would see...

Each atom has the same number of **valence electrons** (the electrons in its outermost shell).

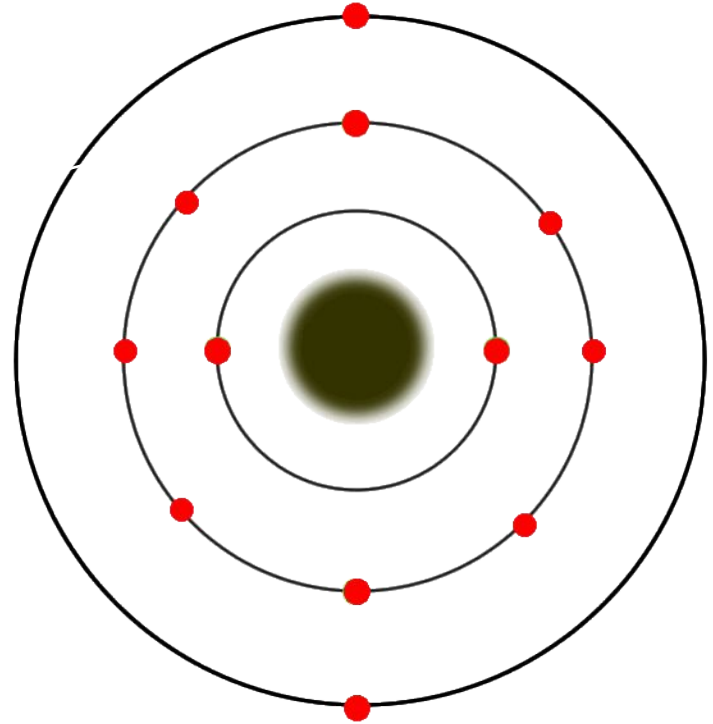
Group or family=each atom has the same number of electrons

The **group 2** atoms all have **2 electrons** in their outer shells

4
Be
12
Mg
20
Ca
38
Sr
56
Ba
88
Ra

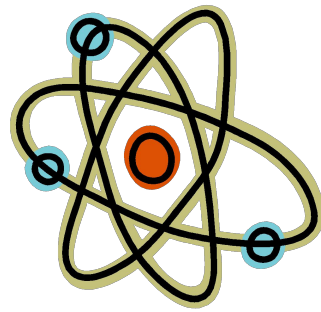


Be (Beryllium) Atom



Mg (Magnesium) Atom

Valence Electrons



- Affect the way an atom bonds, which **determines many of the chemical properties of the element**
 - Atoms can have anywhere between 1 and 8 valence electrons
- **This is why elements within a group usually have similar chemical properties**

Chemical Properties

A chemical property is a characteristic that is observed when a substance changes into a **different** substance



Metals – Reactivity

The reactivity of metals increases from right to left.
Increases from top to bottom.

Periodic Table of the Elements

1 H																	2 He 4.00
3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.20	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.64	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.0	45 Rh 102.9	46 Pd 106.4	47 Ag 107.8	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.7	52 Te 127.6	53 I 126.9	54 Xe 131.2
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.1	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (264)	108 Hs (265)	109 Mt (266)	110 Ds (268)	111 Rg (272)	112 Uub (285)	113 Uut (284)	114 Uuq (289)	115 Uup (288)	116 Uul (292)		

Metals increase going right to left

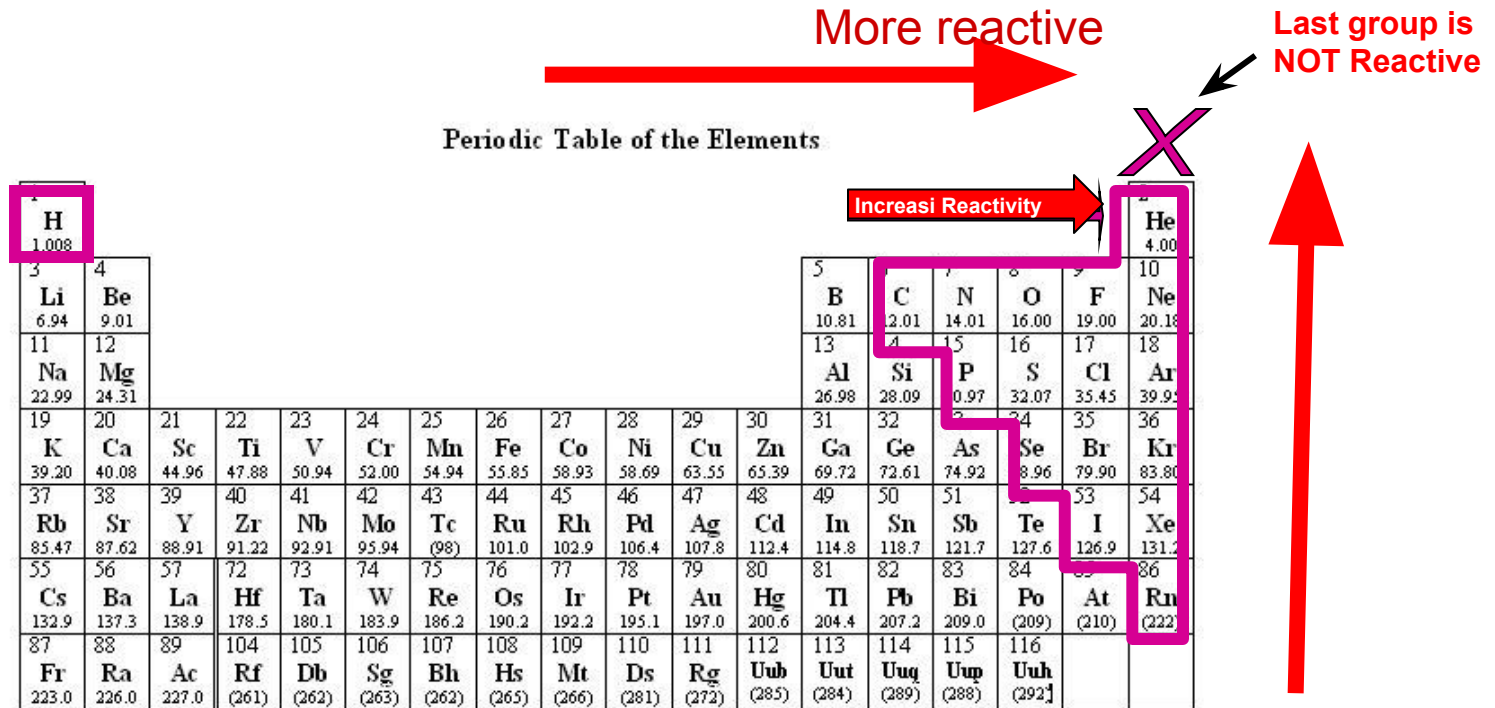
More reactive (Fr
most reactive

Less reactive
metals

58 Ce 140.1	59 Pr 141.0	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 153.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.4	91 Pa 231.4	92 U 238.0	93 Np (237)	94 Pu (240)	95 Am (243)	96 Cm (247)	97 Bk (248)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (257)	102 No (259)	103 Lr (262)

Nonmetals – Reactivity

The reactivity of non-metals increases from left to right



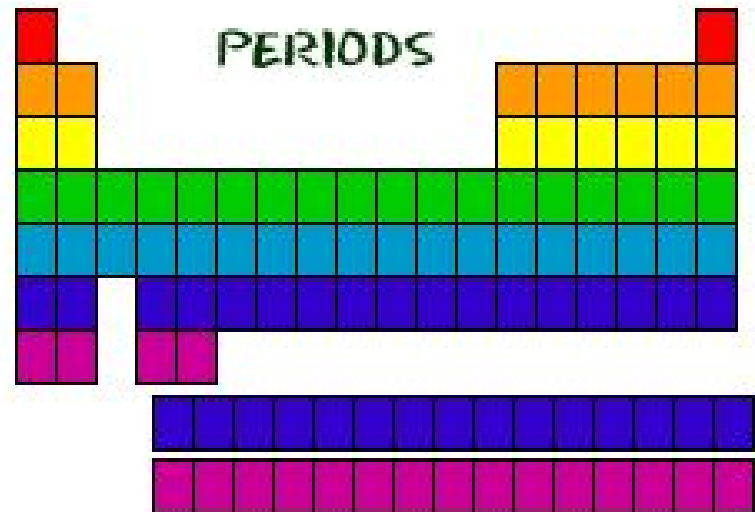
58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
140.1	141.0	144.2	(145)	150.4	153.0	157.3	158.9	162.5	164.9	167.3	168.9	173.0	175.0
90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
232.4	231.4	238.0	(237)	(240)	(243)	(247)	(248)	(251)	(252)	(257)	(257)	(259)	(262)

Less Reactive

If you looked at an atom from each element
in a **period**

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

you would see...

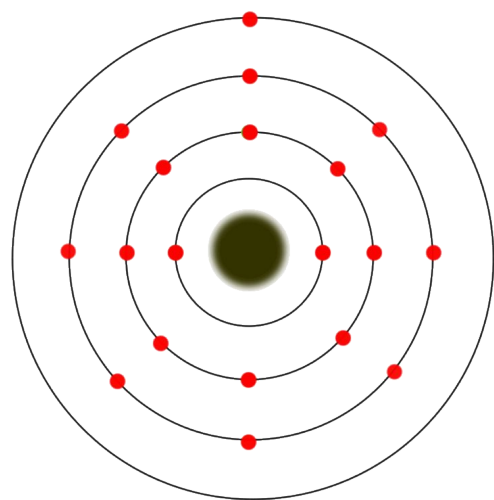


Each atom in a period has the same number of electron holding **shells**.

An example...

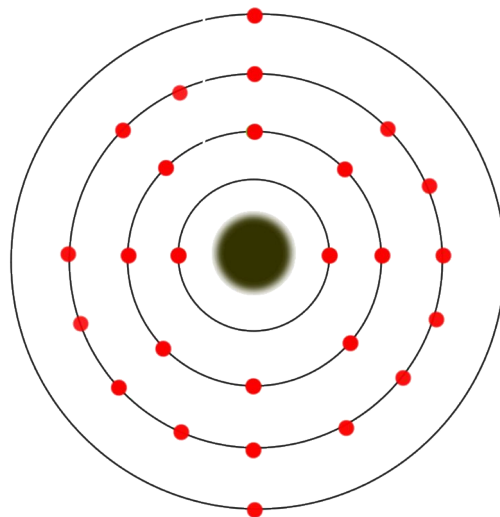
The **period 4** atoms each have **4 electron containing shells**

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

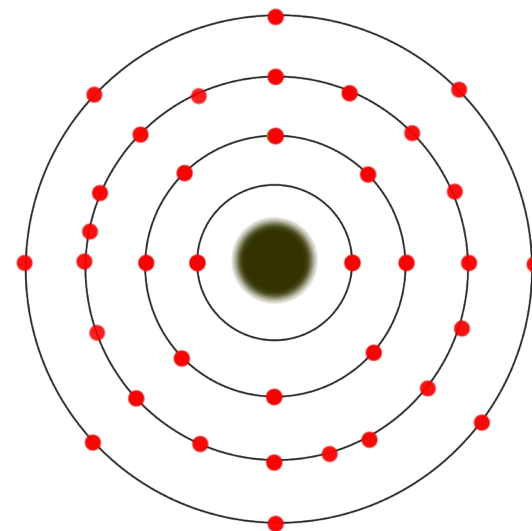


K (Potassium) Atom

4th Shell











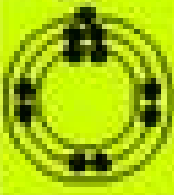



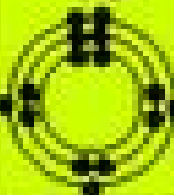
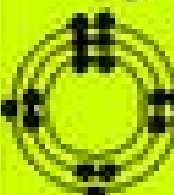

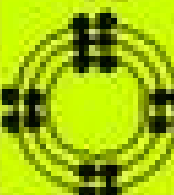


Fe (Iron) Atom



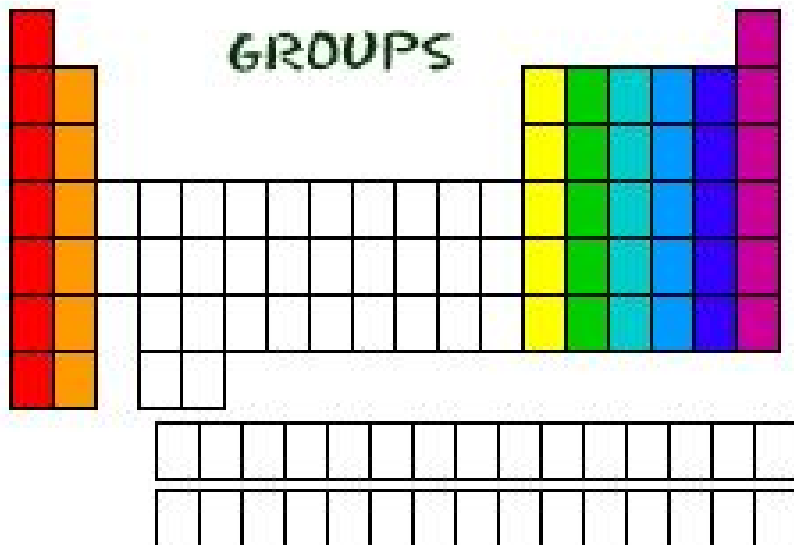
Kr (Krypton) Atom

Every element in a period has the same number of shells.

1st Shell	 1								 2
2nd Shell	Li 3 	Be 4 	B 5 	C 6 	N 7 	O 8 	F 9 	Ne 10 	
3rd Shell	Na 11 	Mg 12 	Al 13 	Si 14 	P 15 	S 16 	Cl 17 	Ar 18 	

Each group has distinct properties

The periodic Table is divided into several groups based on the properties of different atoms



For example...

Periodic Table

Information on the periodic table:

- Atomic number
- Atomic symbol
- Mass number (Atomic Mass)
- Element name
- Group and period numbers