

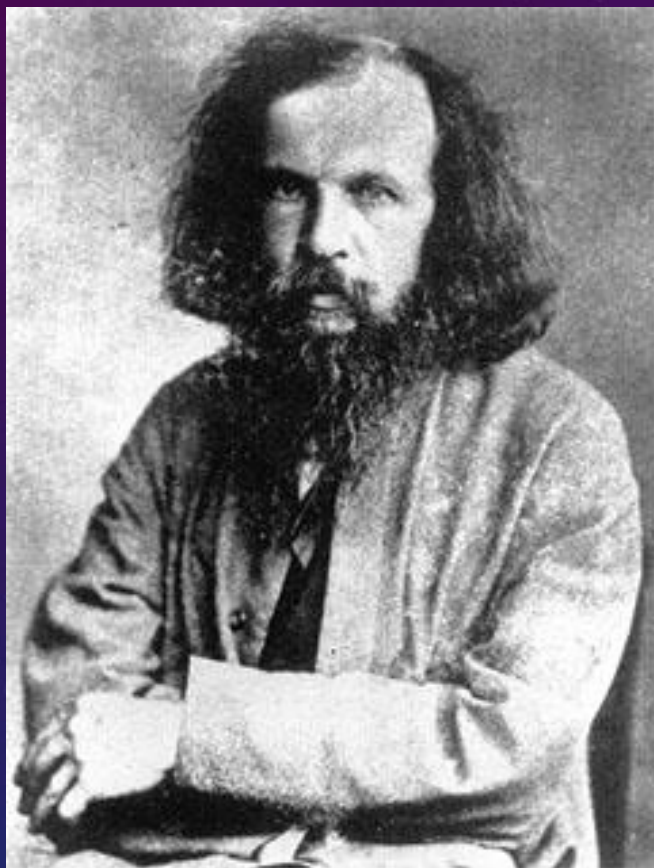
The background features a dark blue gradient with faint, light blue circular patterns and numbers. The numbers, including 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, and 260, are arranged in a circular path, suggesting a scale or a clock face. There are also several concentric circles and dashed lines with arrows, creating a technical or scientific aesthetic.

INTRODUCTION TO THE PERIODIC TABLE

ATOMIC NUMBER • SYMBOL • ATOMIC WEIGHT

ELEMENT • COMPOUND • MIXTURE

CREATED BY DMITRI MENDELEEV



Periodic Table

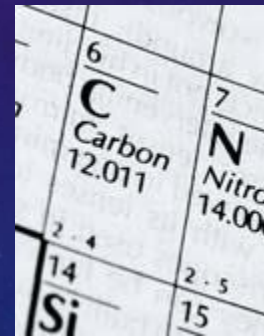
- Group numbering is based on the new IUPAC system.
- Atomic weights are based on $^{12}\text{C} = 12$ and conform to the 1995 IUPAC reported values. Number in () indicates the isotope of longest half-life.

1																	18				
H 1.00794 Hydrogen																	He 4.002602 Helium				
2																	10				
Li 6.941 Lithium	Be 9.012182 Beryllium															B 10.811 Boron	C 12.0107 Carbon	N 14.0064 Nitrogen	O 15.9994 Oxygen	F 18.9984032 Fluorine	Ne 20.1797 Neon
11	12															13	14	15	16	17	18
Na 22.98976928 Sodium	Mg 24.304 Magnesium															Al 26.981538 Aluminum	Si 28.0855 Silicon	P 30.973762 Phosphorus	S 32.06 Sulfur	Cl 35.453 Chlorine	Ar 39.948 Argon
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36				
K 39.0983 Potassium	Ca 40.078 Calcium	Sc 44.955910 Scandium	Ti 47.867 Titanium	V 50.9415 Vanadium	Cr 51.9961 Chromium	Mn 54.938049 Manganese	Fe 55.845 Iron	Co 58.933200 Cobalt	Ni 58.6934 Nickel	Cu 63.546 Copper	Zn 65.39 Zinc	Ga 69.723 Gallium	Ge 72.61 Germanium	As 74.92160 Arsenic	Se 78.96 Selenium	Br 79.904 Bromine	Kr 83.80 Krypton				
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54				
Rb 85.4678 Rubidium	Sr 87.62 Strontium	Y 88.90585 Yttrium	Zr 91.224 Zirconium	Nb 92.90638 Niobium	Mo 95.94 Molybdenum	Tc 98.906250 Technetium	Ru 101.07 Ruthenium	Rh 102.90550 Rhodium	Pd 106.42 Palladium	Ag 107.8682 Silver	Cd 112.411 Cadmium	In 114.818 Indium	Sn 118.710 Tin	Sb 121.757 Antimony	Te 127.60 Tellurium	I 126.90447 Iodine	Xe 131.29 Xenon				
55	56	Lanthanides		72	73	74	75	76	77	78	79	80	81	82	83	84	85				
Cs 132.90545 Cesium	Ba 137.327 Barium	Lanthanides		Hf 178.49 Hafnium	Ta 180.9479 Tantalum	W 183.84 Tungsten	Re 186.207 Rhenium	Os 190.23 Osmium	Ir 192.225 Iridium	Pt 195.078 Platinum	Au 196.96655 Gold	Hg 200.59 Mercury	Tl 204.3833 Thallium	Pb 207.2 Lead	Bi 208.9804 Bismuth	Po 209 Polonium	At 210 Astatine	Rn 222 Radon			
87	88	Actinides		104	105	106	107	108	109	110	111	112	113	114	115	116	117	118			
Fr (223) Francium	Ra 226.025 Radium	Actinides		Rf (261) Rutherfordium	Db (262) Dubnium	Sg (263) Seaborgium	Bh (264) Bohrium	Hs (265) Hassium	Mt (268) Meitnerium	Ds (269) Darmstadtium	Rg (270) Roentgenium	Uub (271) Ununbium	Uut (272) Ununtrium	Uuq (273) Ununquadium	Uup (274) Ununpentium	Uuh (275) Ununhexium	Uus (276) Ununseptium	Uuo (277) Ununoctium			
Lanthanides		57	58	59	60	61	62	63	64	65	66	67	68	69	70	71					
Lanthanides		La 138.90549 Lanthanum	Ce 140.116 Cerium	Pr 140.90765 Praseodymium	Nd 144.24 Neodymium	Pm (145) Promethium	Sm 150.36 Samarium	Eu 151.964 Europium	Gd 157.25 Gadolinium	Tb 158.92534 Terbium	Dy 162.50 Dysprosium	Ho 164.93032 Holmium	Er 167.26 Erbium	Tm 168.93421 Thulium	Yb 173.04 Ytterbium	Lu 174.967 Lutetium					
Actinides		89	90	91	92	93	94	95	96	97	98	99	100	101	102	103					
Actinides		Ac (227) Actinium	Th 232.0377 Thorium	Pa 231.03688 Protactinium	U 238.02891 Uranium	Np (237) Neptunium	Pu (244) Plutonium	Am (243) Americium	Cm (247) Curium	Bk (247) Berkelium	Cf (251) Californium	Es (252) Einsteinium	Fm (257) Fermium	Md (258) Mendelevium	No (259) Nobelium	Lr (262) Lawrencium					

Illustrated by Masahiko Suenaga
<http://www1.bbiq.jp/zffz/>

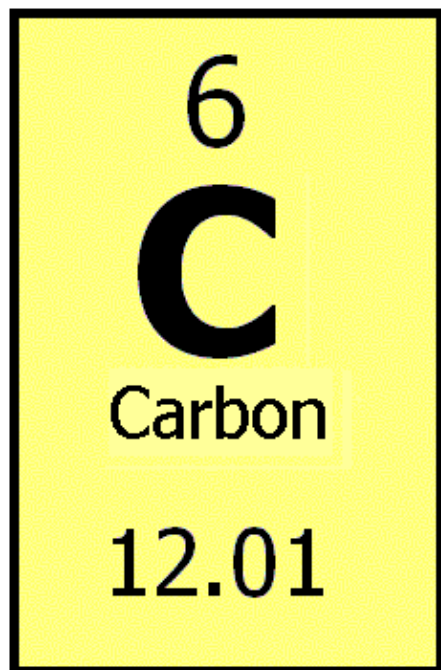
WHAT IS THE PERIODIC TABLE?

- o Shows all known elements in the universe.
- o Organizes the elements by chemical properties.



6		7
C Carbon 12.011		N Nitrogen 14.006
2.4		2.5
14		15
Si		

HOW DO YOU READ THE PERIODIC TABLE?



- Atomic number
- Symbol
- Name
- Atomic Weight

WHAT IS THE ATOMIC NUMBER?

6
C
Carbon
12.01

— Atomic
number

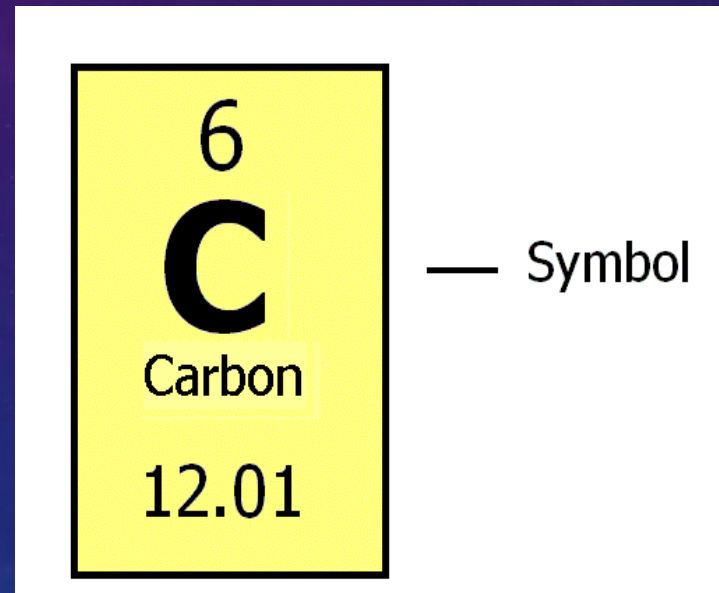
o The number of protons found in the nucleus of an atom

Or

o The number of electrons surrounding the nucleus of an atom.

WHAT IS THE SYMBOL?

- o An abbreviation of the element name.



WHAT IS THE ATOMIC WEIGHT?

6	
C	
Carbon	
12.01	— Atomic Weight

o The number of protons and neutrons in the nucleus of an atom.

HOW DO I FIND THE NUMBER OF PROTONS, ELECTRONS, AND NEUTRONS IN AN ELEMENT USING THE PERIODIC TABLE?

- o # of PROTONS = ATOMIC NUMBER
- o # of ELECTRONS = ATOMIC NUMBER
- o # of NEUTRONS = ATOMIC WEIGHT - ATOMIC NUMBER

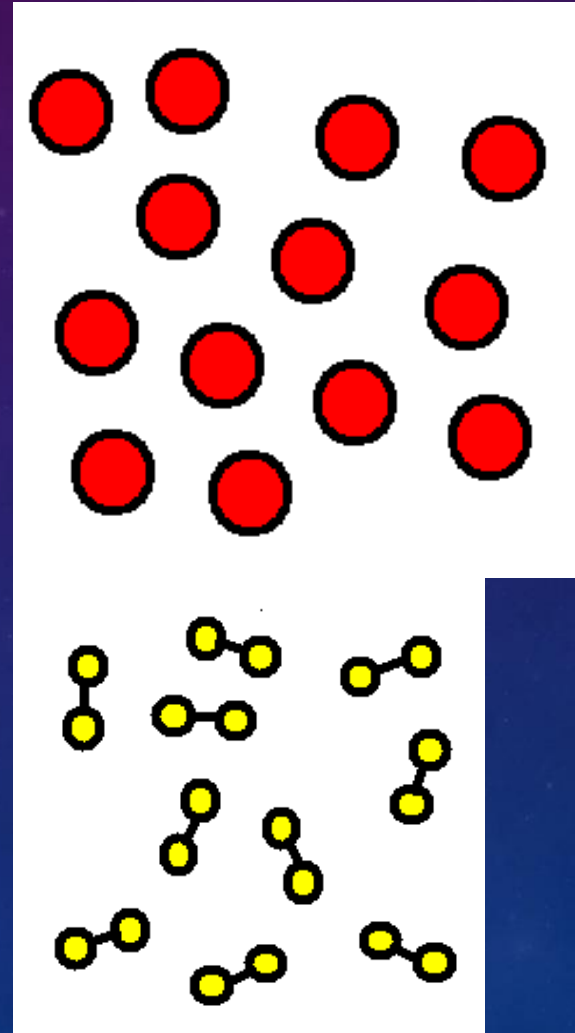
ELEMENTS, COMPOUNDS, AND MIXTURES

A hand-drawn periodic table with colored blocks for different groups of elements. The colors are: pink for Group 1, 2, and 18; yellow for Groups 13, 14, 15, and 16; light blue for Groups 17 and 18; light green for Groups 13, 14, 15, and 16; and light blue for Groups 17 and 18. The table is organized into rows and columns, with the noble gases (He, Ne, Ar, Kr, Xe, Rn) in the far right column. The transition metals (Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ge, As, Se, Br, Kr) are in the middle rows. The lanthanides and actinides (La, Hf, Ta, W, Re, Os, Ir, Pt, Au, Hg, Tl, Pb, Bi, Po, At, Rn) are in the bottom row.

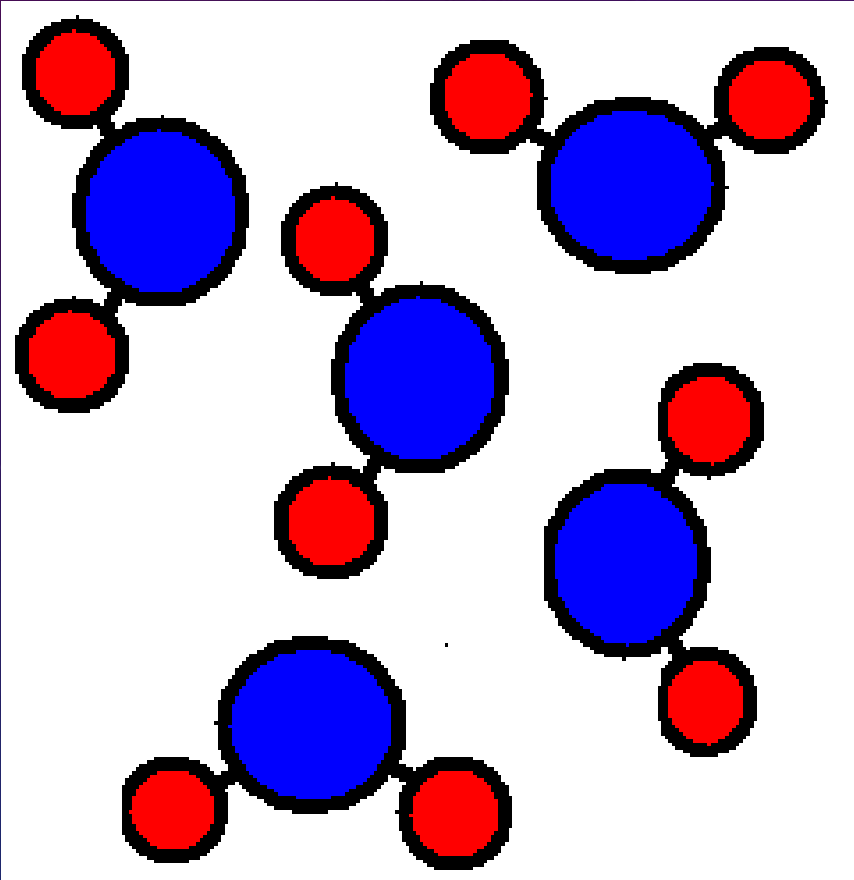
H																		He
Li	Be											B	C	N	O	F	Ne	
Na	Mg											Al	Si	P	S	Cl	Ar	
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	

WHAT IS AN ELEMENT?

- o A substance composed of a single kind of atom.
- o Cannot be broken down into another substance by chemical or physical means.



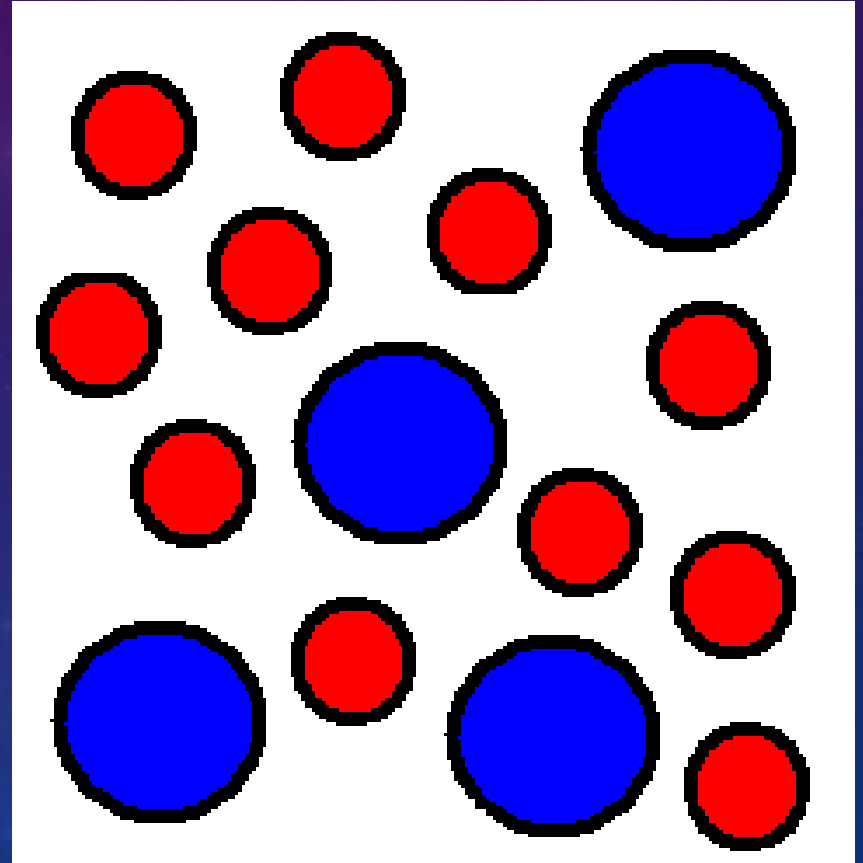
WHAT IS A COMPOUND?



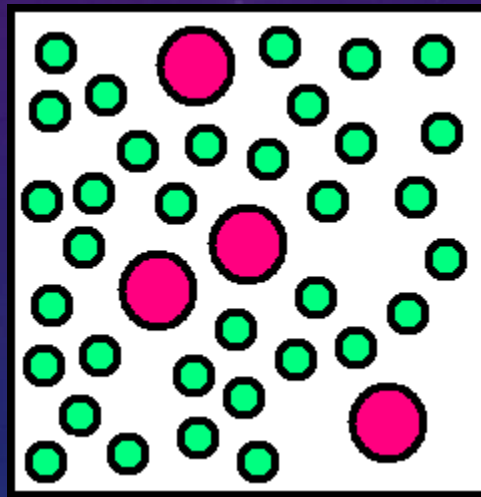
o A substance in which two or more different elements are **CHEMICALLY** bonded together.

WHAT IS A MIXTURE?

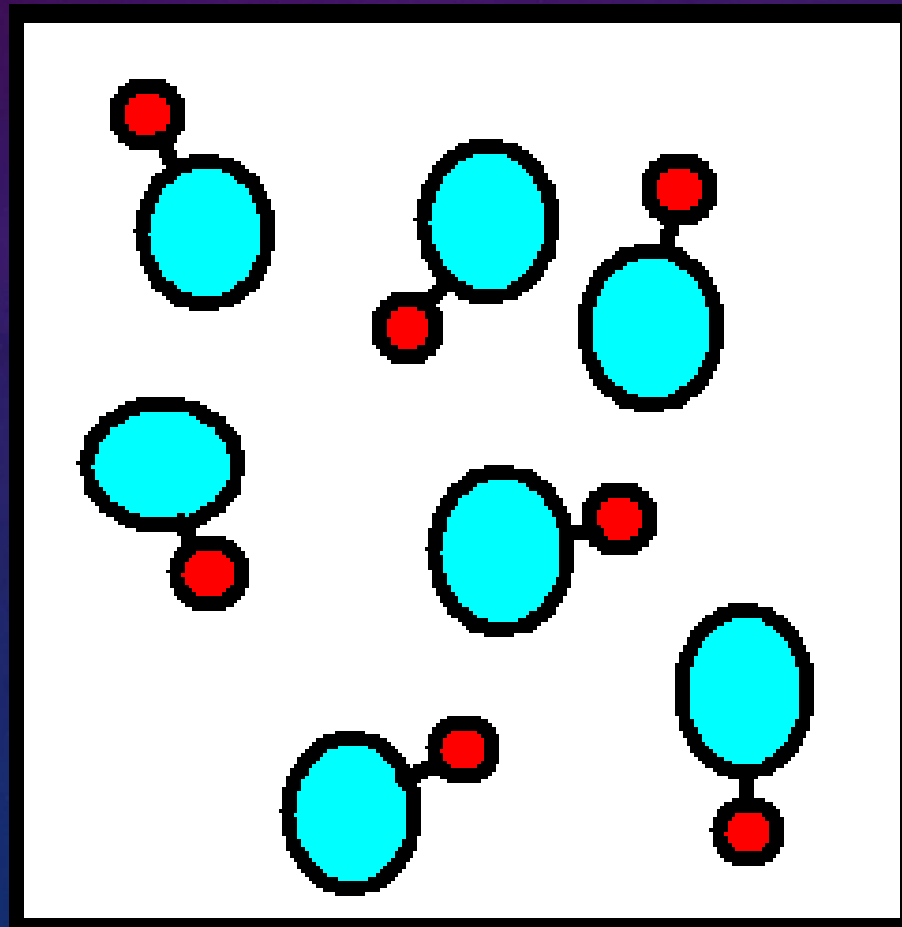
- o Two or more substances that are mixed together but are NOT chemically bonded.



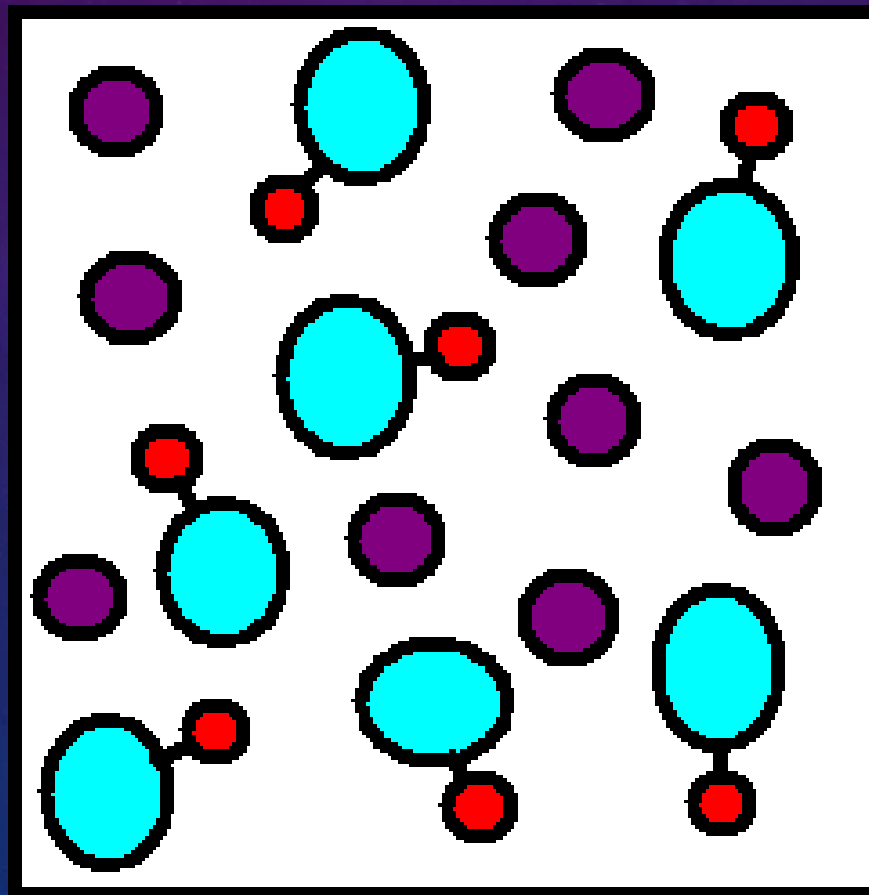
ELEMENT, COMPOUND OR MIXTURE?



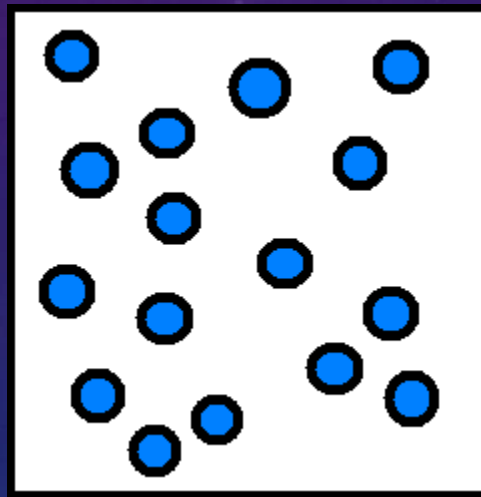
ELEMENT, COMPOUND OR MIXTURE?



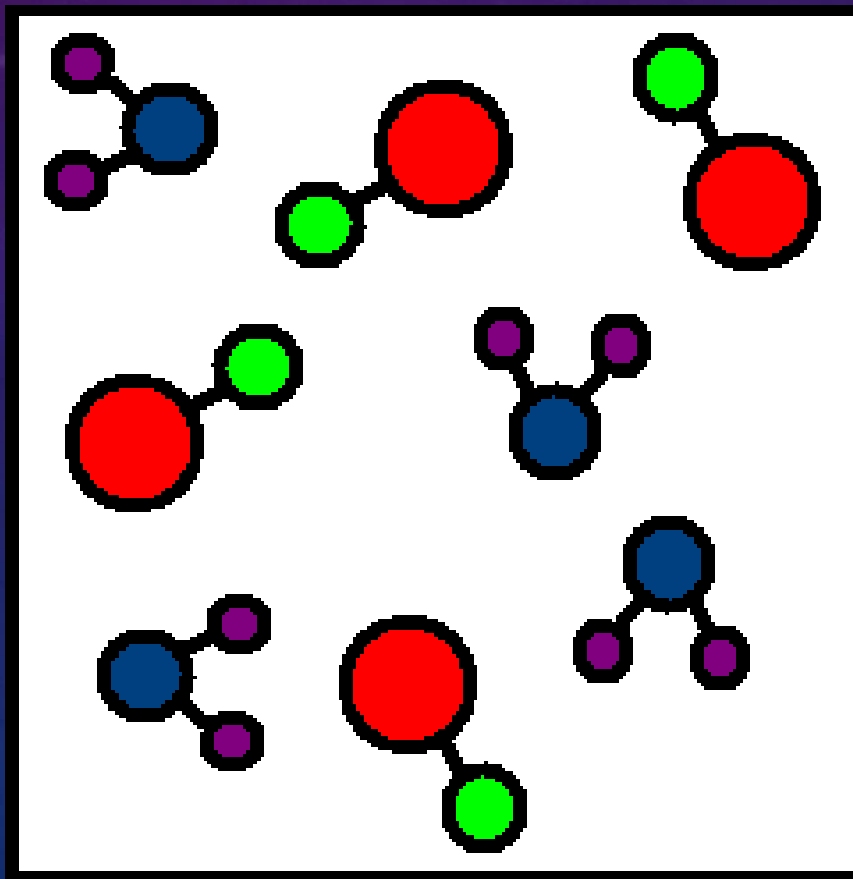
ELEMENT, COMPOUND OR MIXTURE?



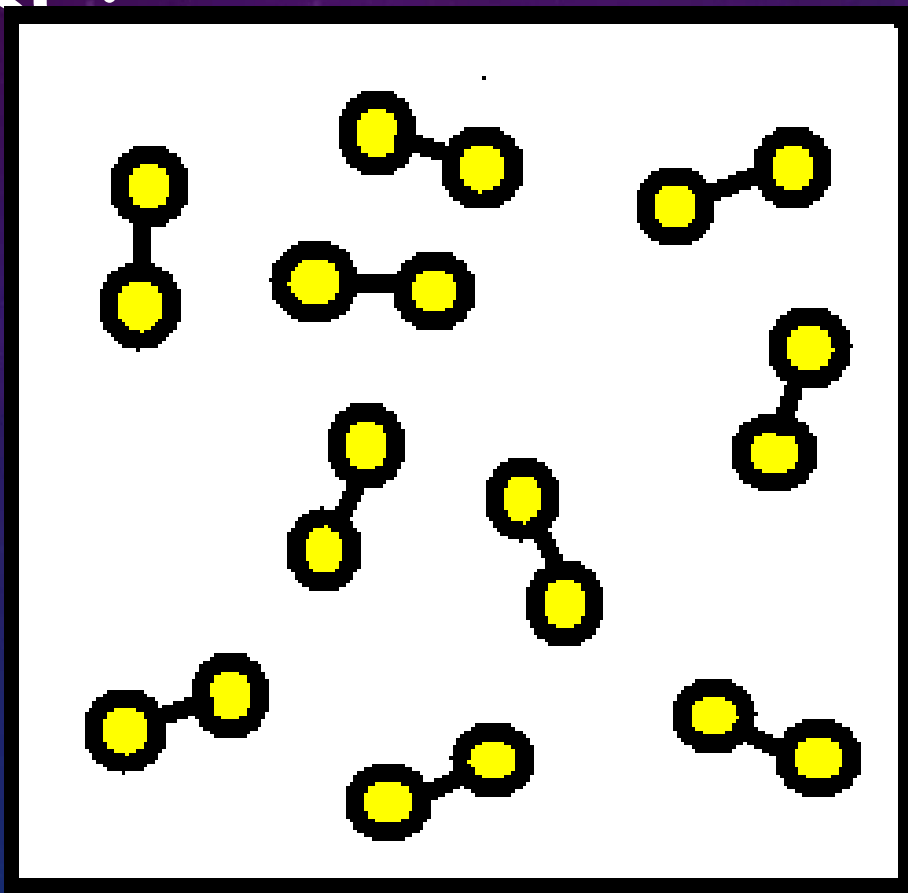
ELEMENT, COMPOUND OR MIXTURE?



ELEMENT, COMPOUND OR MIXTURE?



ELEMENT, COMPOUND OR MIXTURE?



Periods:

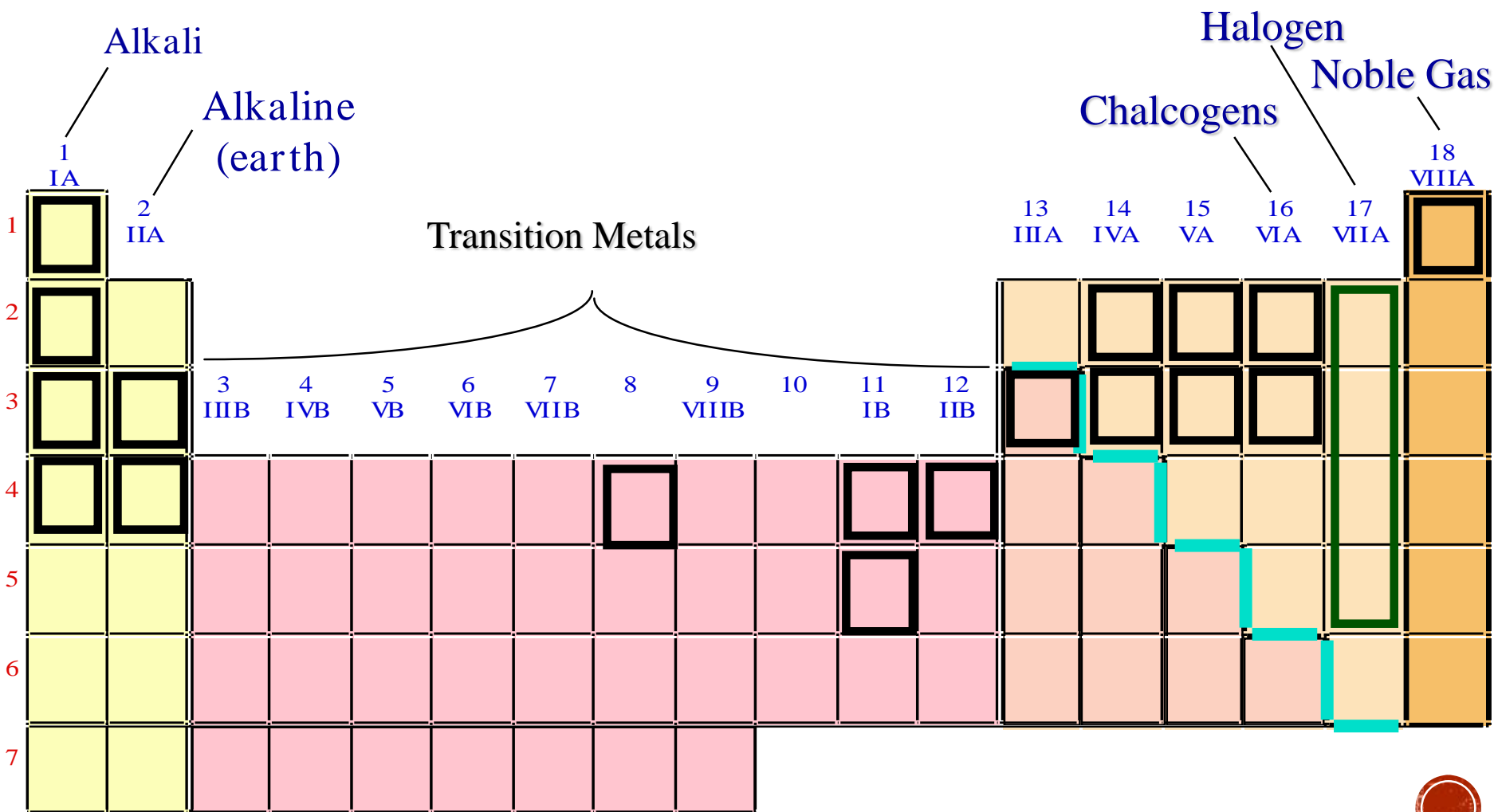
Are arranged horizontally across the periodic table (rows 1-7). These elements have the same number of valence shells.

1	1 IA	2 IIA											13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA		
2			2nd Period																	
3			3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8	9 VIIB	10	11 IB	12 IIB								
4																				
5																				
6																				
7																				

6th Period



Notable families of the Periodic Table and some important members:



IMPORTANT MEMBERS - THE ELEMENTS

- Individual members of selected Elements & their characteristics

	1 IA	2 IIA											13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1	H																	He
2	Li													C	N	O	F	
3	Na	Mg	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8	9 VIIB	10	11 IB	12 IIB	Al	Si	P	S	Cl	
4	K	Ca						Fe			Cu	Zn					Br	
5											Ag						I	
6																		
7																		



PERIODIC TABLE: ELECTRON BEHAVIOR

- The periodic table can be classified by the behavior of their electrons

West (South) METALS	Mid-plains METALLOID	East (North) NON-METALS
Alkali Alkaline Transition		Noble gas Halogens Calcogens
These elements tend to give up e^- and form CATIONS	These elements will give up e^- or accept e^-	These elements tend to accept e^- and form ANIONS

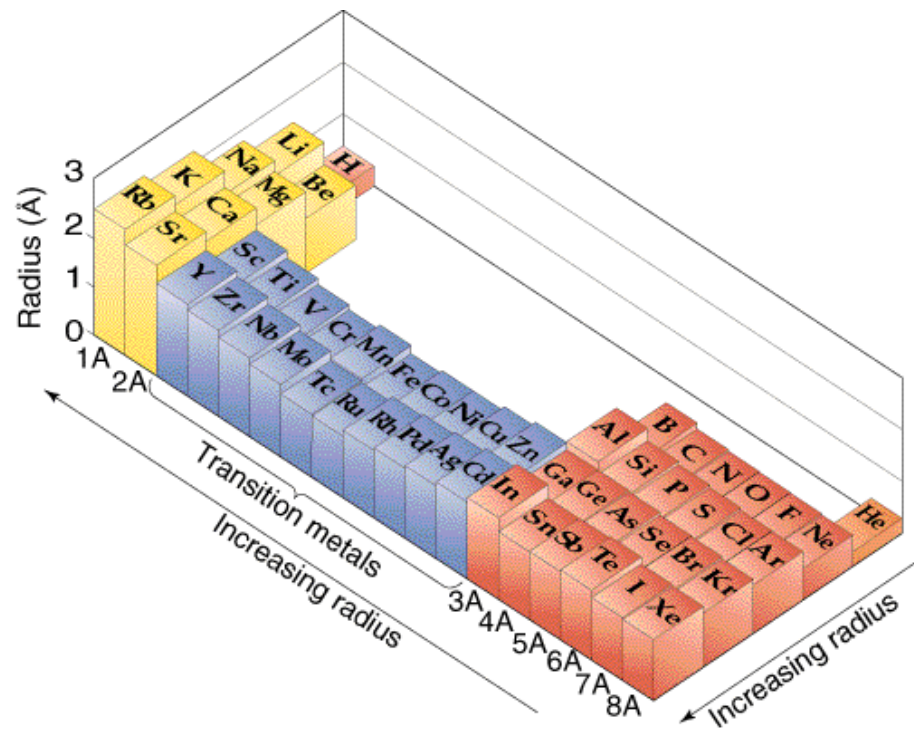
	1 IA		2 IIA															18 VIIIA	
1																			
2																			
3			3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8	9 VIII B	10	11 IB	12 IIB							
4																			
5																			
6																			
7																			



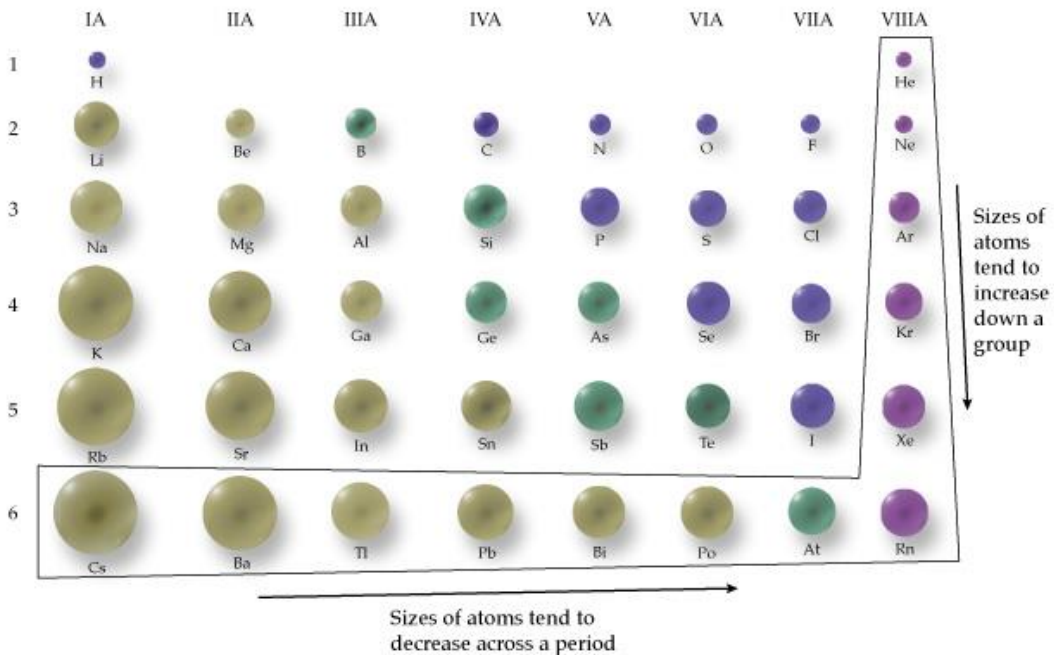
2. TREND IN ATOMIC RADIUS

Atomic Radius:

- The size of an atomic species is determined by the boundaries of the valence e⁻. Largest atomic species are those found in the SW corner since these atoms have the largest n, but the smallest Z_{eff} .



Relative Atomic Sizes of the Representative Elements

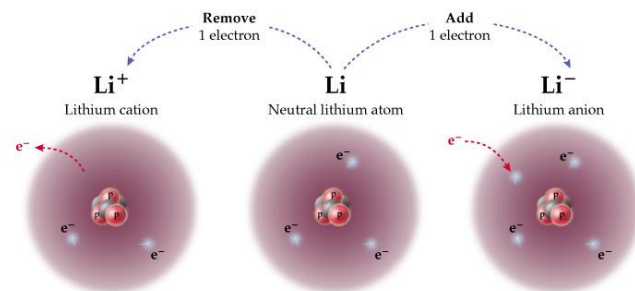
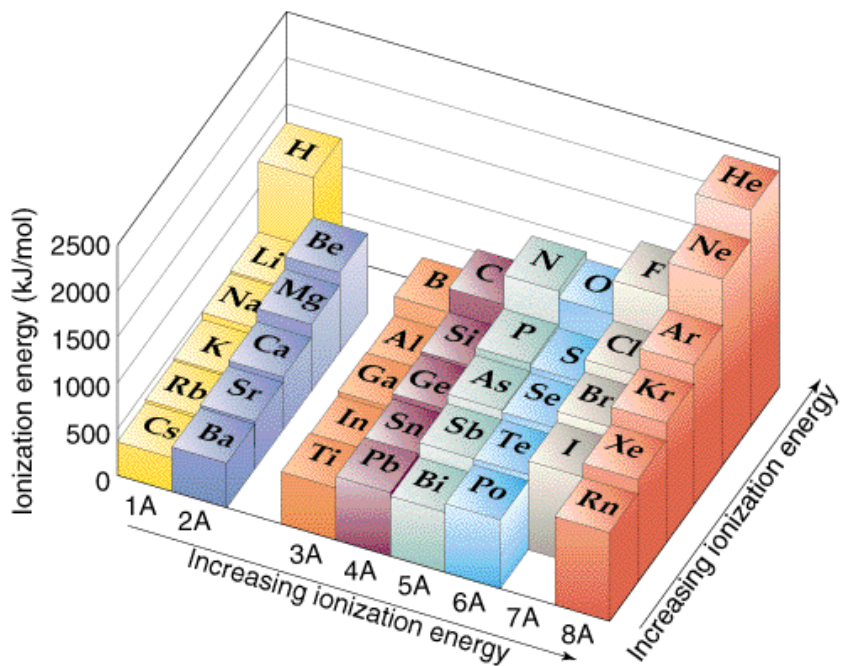


3. TREND IN IONIZATION POTENTIAL

Ionization potential:

The energy required to remove the valence electron from an atomic specie. Largest toward NE corner of PT since these atoms hold on to their valence e- the tightest.

	IA	IIA	IIIA	IVA	VA	VIA	VIIA	VIIIA
1	H 1312							He 2372
2	Li 520	Be 899	B 801	C 1086	N 1402	O 1314	F 1681	Ne 2081
3	Na 496	Mg 738	Al 578	Si 786	P 1012	S 1000	Cl 1251	Ar 1521
4	K 419	Ca 590	Ga 579	Ge 762	As 947	Se 941	Br 1140	Kr 1351
5	Rb 403	Sr 549	In 558	Sn 709	Sb 834	Te 869	I 1008	Xe 1170
6	Cs 376	Ba 503	Tl 589	Pb 716	Bi 703	Po 812	At 926	Rn 1037



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4. TREND IN ELECTRON AFFINITY

Electron Affinity:

The energy release when an electron is added to an atom. Most favorable toward NE corner of PT since these atoms have a great affinity for e^- .

H -73							He >0
Li -60	Be >0	B -27	C -122	N >0	O -141	F -328	Ne >0
Na -53	Mg >0	Al -43	Si -134	P -72	S -200	Cl -349	Ar >0
K -48	Ca -4	Ga -30	Ge -119	As -78	Se -195	Br -325	Kr >0
Rb -47	Sr -11	In -30	Sn -107	Sb -103	Te -190	I -295	Xe >0
1A	2A	3A	4A	5A	6A	7A	8A



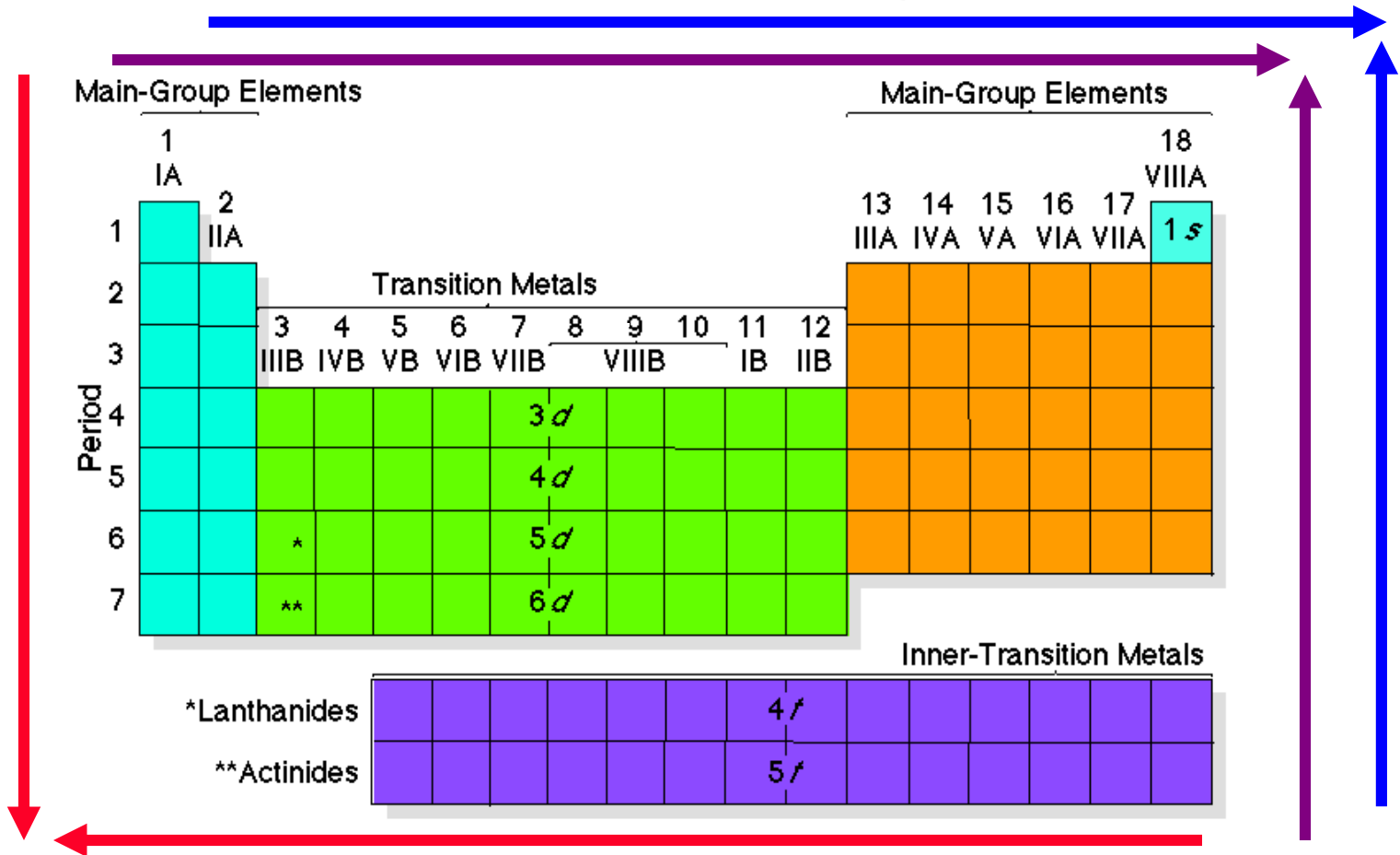
SUMMARY OF TREND

- **Periodic Table** and Periodic Trends

- 1. Electron Configuration

3. Ionization Energy: Largest toward NE of PT

4. Electron Affinity: Most favorable NE of PT



2. Atomic Radius: Largest toward SW corner of PT



SUMMARY

- **Periodic Table**: Map of the Building block of matter
- **Type**: Metal, metalloid and Nonmetal
- Groupings: Representative or main, transition and Lanthanide/Actanides
- **Family**: Elements in the same column have similar chemical property because of similar valence electrons
- Alkali, Alkaline, chalcogens, halogens, noble gases
- **Period**: Elements in the same row have valence electrons in the same shell.

