

16%
Periodic Table
Session 2

Migma Tshering

Periodic Table of the Elements

1 IA 1 H Hydrogen 1.008 1	2 IIA 3 Li Lithium 6.94 3	4 Be Beryllium 9.0122 4											13 IIIA 5 B Boron 10.81 5	14 IVA 6 C Carbon 12.011 6	15 VA 7 N Nitrogen 14.007 7	16 VIA 8 O Oxygen 15.999 8	17 VIIA 9 F Fluorine 18.998 9	18 VIIIA 10 Ne Neon 20.180 10																	
11 Na Sodium 22.98976928 11	12 Mg Magnesium 24.305 12	13 Al Aluminium 26.982 2-8-3	14 Si Silicon 28.085 2-8-4	15 P Phosphorus 30.974 2-8-5	16 S Sulfur 32.06 2-8-6	17 Cl Chlorine 35.45 2-8-7	18 Ar Argon 39.948 2-8-8											19 K Potassium 39.0983 19	20 Ca Calcium 40.078 2-8-8-2	21 Sc Scandium 44.955908 2-8-9-2	22 Ti Titanium 47.867 2-8-9-2	23 V Vanadium 50.9415 2-8-9-2	24 Cr Chromium 51.9961 2-8-9-3	25 Mn Manganese 54.938044 2-8-9-5	26 Fe Iron 55.845 2-8-9-6	27 Co Cobalt 58.933 2-8-9-7	28 Ni Nickel 58.693 2-8-9-8	29 Cu Copper 63.546 2-8-9-10	30 Zn Zinc 65.38 2-8-9-10	31 Ga Gallium 69.723 2-8-9-11	32 Ge Germanium 72.630 2-8-9-14	33 As Arsenic 74.922 2-8-9-15	34 Se Selenium 78.971 2-8-9-16	35 Br Bromine 79.904 2-8-9-17	36 Kr Krypton 83.798 2-8-9-18
37 Rb Rubidium 85.4678 2-8-18-8-1	38 Sr Strontium 87.62 2-8-18-8-2	39 Y Yttrium 88.90584 2-8-18-9-2	40 Zr Zirconium 91.224 2-8-18-10-2	41 Nb Niobium 92.90637 2-8-18-10-1	42 Mo Molybdenum 95.95 2-8-18-10-1	43 Tc Technetium (98) 2-8-18-10-2	44 Ru Ruthenium 101.07 2-8-18-10-1	45 Rh Rhodium 102.91 2-8-18-10-1	46 Pd Palladium 106.42 2-8-18-10	47 Ag Silver 107.87 2-8-18-10-1	48 Cd Cadmium 112.41 2-8-18-10-2	49 In Indium 114.82 2-8-18-10-3	50 Sn Tin 118.71 2-8-18-10-4	51 Sb Antimony 121.76 2-8-18-10-5	52 Te Tellurium 127.60 2-8-18-10-4	53 I Iodine 126.90 2-8-18-10-5	54 Xe Xenon 131.29 2-8-18-10-6																		
55 Cs Caesium 132.90545196 2-8-18-10-6-1	56 Ba Barium 137.327 2-8-18-10-6-2	57-71 Lanthanides	72 Hf Hafnium 178.49 2-8-18-10-10-2	73 Ta Tantalum 180.94788 2-8-18-10-11-2	74 W Tungsten 183.84 2-8-18-10-10-2	75 Re Rhenium 186.21 2-8-18-10-10-2	76 Os Osmium 190.23 2-8-18-10-10-2	77 Ir Iridium 192.22 2-8-18-10-10-5-2	78 Pt Platinum 195.08 2-8-18-10-10-1	79 Au Gold 196.97 2-8-18-10-10-1	80 Hg Mercury 200.59 2-8-18-10-10-2	81 Tl Thallium 204.38 2-8-18-10-10-3	82 Pb Lead 207.2 2-8-18-10-10-4	83 Bi Bismuth 208.98 2-8-18-10-10-5	84 Po Polonium (209) 2-8-18-10-10-6	85 At Astatine (210) 2-8-18-10-10-7	86 Rn Radon (222) 2-8-18-10-10-8																		
87 Fr Francium (223) 2-8-18-10-10-6-1	88 Ra Radium (226) 2-8-18-10-10-6-2	89-103 Actinides	104 Rf Rutherfordium (261) 2-8-18-10-10-10-2	105 Db Dubnium (268) 2-8-18-10-10-10-2	106 Sg Seaborgium (269) 2-8-18-10-10-10-2	107 Bh Bohrium (270) 2-8-18-10-10-10-2	108 Hs Hassium (277) 2-8-18-10-10-10-2	109 Mt Meitnerium (278) 2-8-18-10-10-10-2	110 Ds Darmstadtium (285) 2-8-18-10-10-10-1	111 Rg Roentgenium (282) 2-8-18-10-10-10-2	112 Cn Copernicium (285) 2-8-18-10-10-10-2	113 Nh Nihonium (284) 2-8-18-10-10-10-3	114 Fl Flerovium (289) 2-8-18-10-10-10-4	115 Mc Moscovium (288) 2-8-18-10-10-10-5	116 Lv Livermorium (293) 2-8-18-10-10-10-6	117 Ts Tennessine (294) 2-8-18-10-10-10-7	118 Og Oganesson (294) 2-8-18-10-10-10-8																		
57 La Lanthanum 138.91 2-8-18-10-1-2	58 Ce Cerium 140.12 2-8-18-10-1-2	59 Pr Praseodymium 140.91 2-8-18-10-1-2	60 Nd Neodymium 144.24 2-8-18-10-1-2	61 Pm Promethium (145) 2-8-18-10-1-2	62 Sm Samarium 150.36 2-8-18-10-1-2	63 Eu Europium 151.96 2-8-18-10-1-2	64 Gd Gadolinium 157.25 2-8-18-10-1-2	65 Tb Terbium 158.93 2-8-18-10-1-2	66 Dy Dysprosium 162.50 2-8-18-10-1-2	67 Ho Holmium 164.93 2-8-18-10-1-2	68 Er Erbium 167.26 2-8-18-10-1-2	69 Tm Thulium 168.93 2-8-18-10-1-2	70 Yb Ytterbium 173.05 2-8-18-10-1-2	71 Lu Lutetium 174.97 2-8-18-10-1-2																					
89 Ac Actinium (227) 2-8-18-10-10-1-2	90 Th Thorium 232.04 2-8-18-10-10-1-2	91 Pa Protactinium 231.04 2-8-18-10-10-1-2	92 U Uranium 238.03 2-8-18-10-10-1-2	93 Np Neptunium (237) 2-8-18-10-10-1-2	94 Pu Plutonium (244) 2-8-18-10-10-1-2	95 Am Americium (243) 2-8-18-10-10-1-2	96 Cm Curium (247) 2-8-18-10-10-1-2	97 Bk Berkelium (247) 2-8-18-10-10-1-2	98 Cf Californium (251) 2-8-18-10-10-1-2	99 Es Einsteinium (252) 2-8-18-10-10-1-2	100 Fm Fermium (257) 2-8-18-10-10-1-2	101 Md Mendelevium (258) 2-8-18-10-10-1-2	102 No Nobelium (259) 2-8-18-10-10-1-2	103 Lr Lawrencium (260) 2-8-18-10-10-1-2																					

Atomic Number → 13
 Symbol ← Al
 Name → Aluminium
 Atomic Weight ← 26.982
 Electrons per shell → 2-8-3

State of matter (color of name)
 GAS LIQUID SOLID UNKNOWN

Subcategory in the metal-metalloid-nonmetal trend (color of background)
 ■ Alkali metals ■ Lanthanides ■ Metalloids ■ Unknown chemical properties
 ■ Alkaline earth metals ■ Actinides ■ Reactive nonmetals
 ■ Transition metals ■ Post-transition metals ■ Noble gases

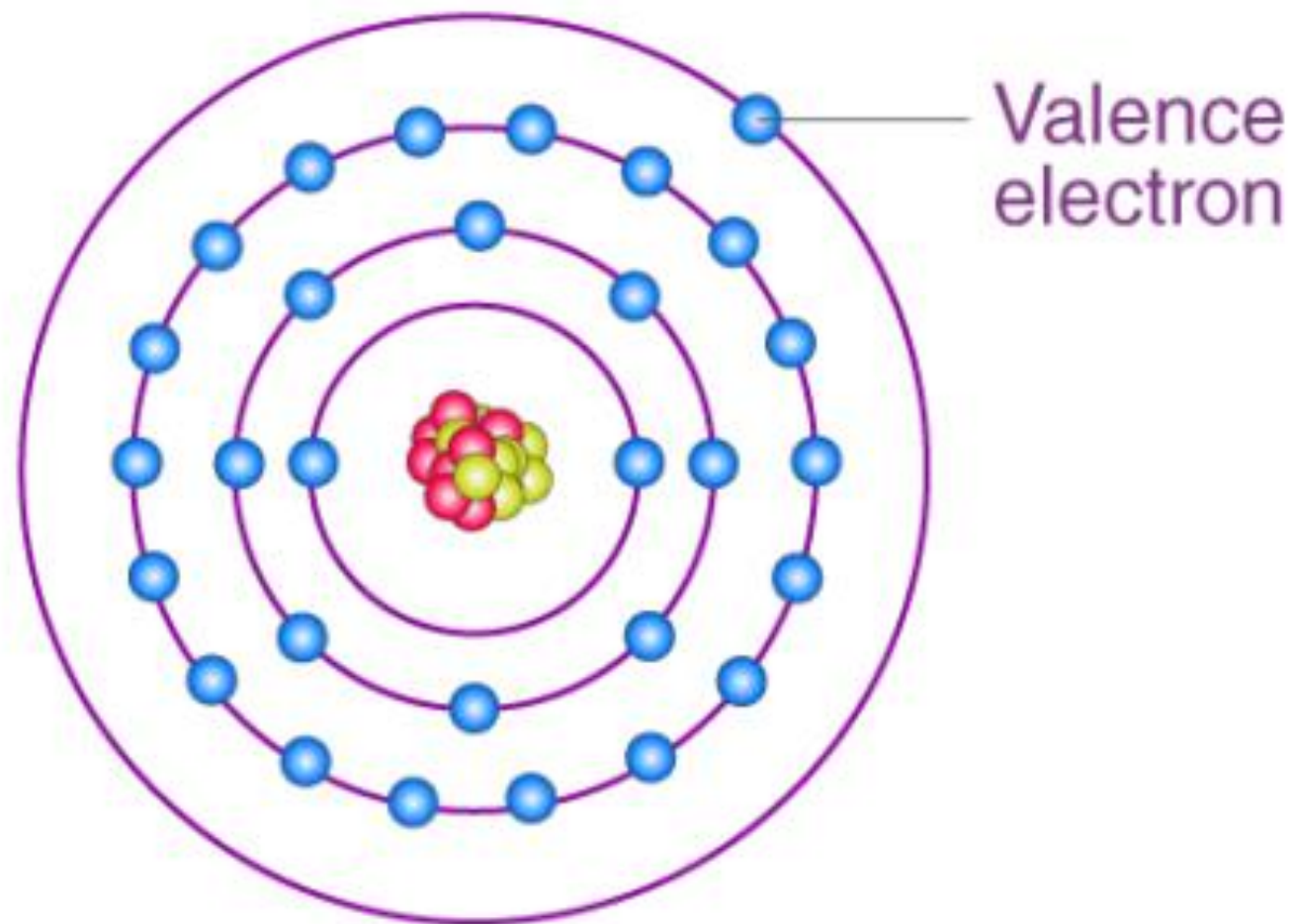
Learning Objectives

Periodic Properties

- *Valence Electron*
- *Atomic Size*
- *Metallic Character*
- *Ionization Enthalpy*

Periodic Properties: VALENCE ELECTRONS

Valence Electron



Periodic Properties: **Valence Electron**

The electrons present in the outermost shell of an atom

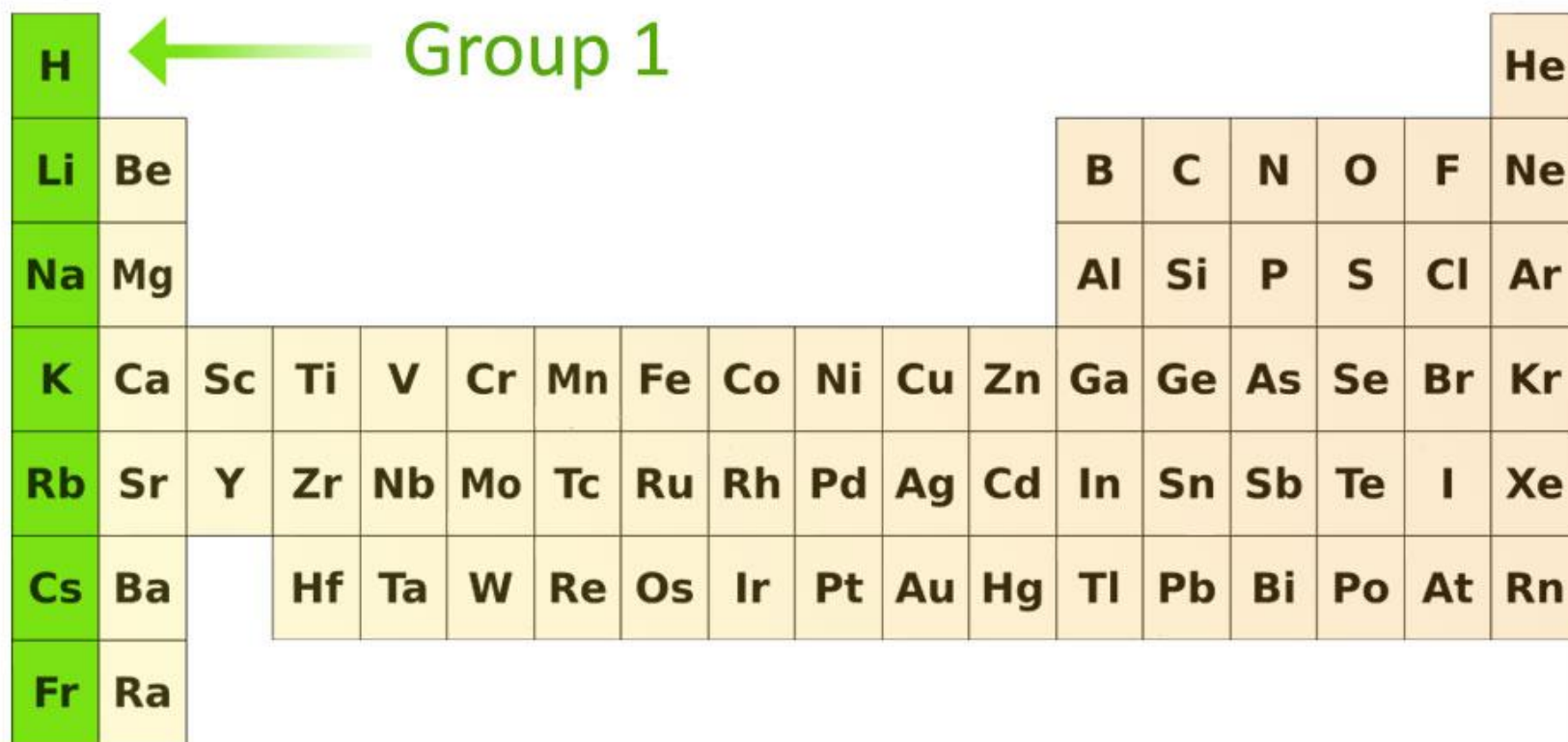
The elements present in the same group contain **SAME number** of valence electron.

Periodic Properties: **Valence Electron**

*For example, all the elements in Group 1 have same valence electron (i.e. **1 valence electron**)*

*For Group 17, all the element contain **7 valence electrons.***

Periodic Properties: Valence Electron

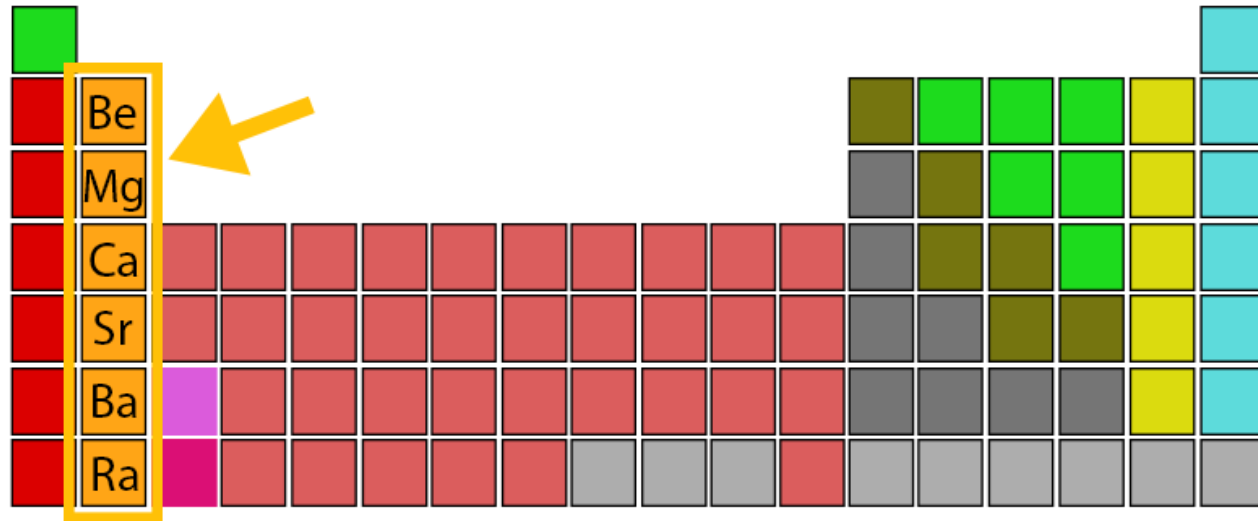


← Group 1

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		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra																

*Group 1 contain
ONE Valence electron*

Periodic Properties: Valence Electron



		Be																			
		Mg																			
		Ca																			
		Sr																			
		Ba																			
		Ra																			

Group 2:

TWO Valence Electrons

Periodic Properties: Valence Electron



Halogens

1 H Hydrogen																	2 He Helium																												
3 Li Lithium	4 Be Beryllium																	10 Ne Neon																											
11 Na Sodium	12 Mg Magnesium																	18 Ar Argon																											
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton																												
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon																												
55 Cs Cesium	56 Ba Barium	57 La Lanthanum	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon																												
87 Fr Francium	88 Ra Radium	89 Ac Actinium	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Copernicium	113 Nh Nihonium	114 Fl Flerovium	115 Mc Moscovium	116 Lv Livermorium	117 Ts Tennessine	118 Og Oganesson																												
<table border="1" style="width: 100%; text-align: center;"> <tbody> <tr> <td>58 Ce Cerium</td> <td>59 Pr Praseodymium</td> <td>60 Nd Neodymium</td> <td>61 Pm Promethium</td> <td>62 Sm Samarium</td> <td>63 Eu Europium</td> <td>64 Gd Gadolinium</td> <td>65 Tb Terbium</td> <td>66 Dy Dysprosium</td> <td>67 Ho Holmium</td> <td>68 Er Erbium</td> <td>69 Tm Thulium</td> <td>70 Yb Ytterbium</td> <td>71 Lu Lutetium</td> </tr> <tr> <td>90 Th Thorium</td> <td>91 Pa Protactinium</td> <td>92 U Uranium</td> <td>93 Np Neptunium</td> <td>94 Pu Plutonium</td> <td>95 Am Americium</td> <td>96 Cm Curium</td> <td>97 Bk Berkelium</td> <td>98 Cf Californium</td> <td>99 Es Einsteinium</td> <td>100 Fm Fermium</td> <td>101 Md Mendelevium</td> <td>102 No Nobelium</td> <td>103 Lr Lawrencium</td> </tr> </tbody> </table>																		58 Ce Cerium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium	63 Eu Europium	64 Gd Gadolinium	65 Tb Terbium	66 Dy Dysprosium	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium	71 Lu Lutetium	90 Th Thorium	91 Pa Protactinium	92 U Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium
58 Ce Cerium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium	63 Eu Europium	64 Gd Gadolinium	65 Tb Terbium	66 Dy Dysprosium	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium	71 Lu Lutetium																																
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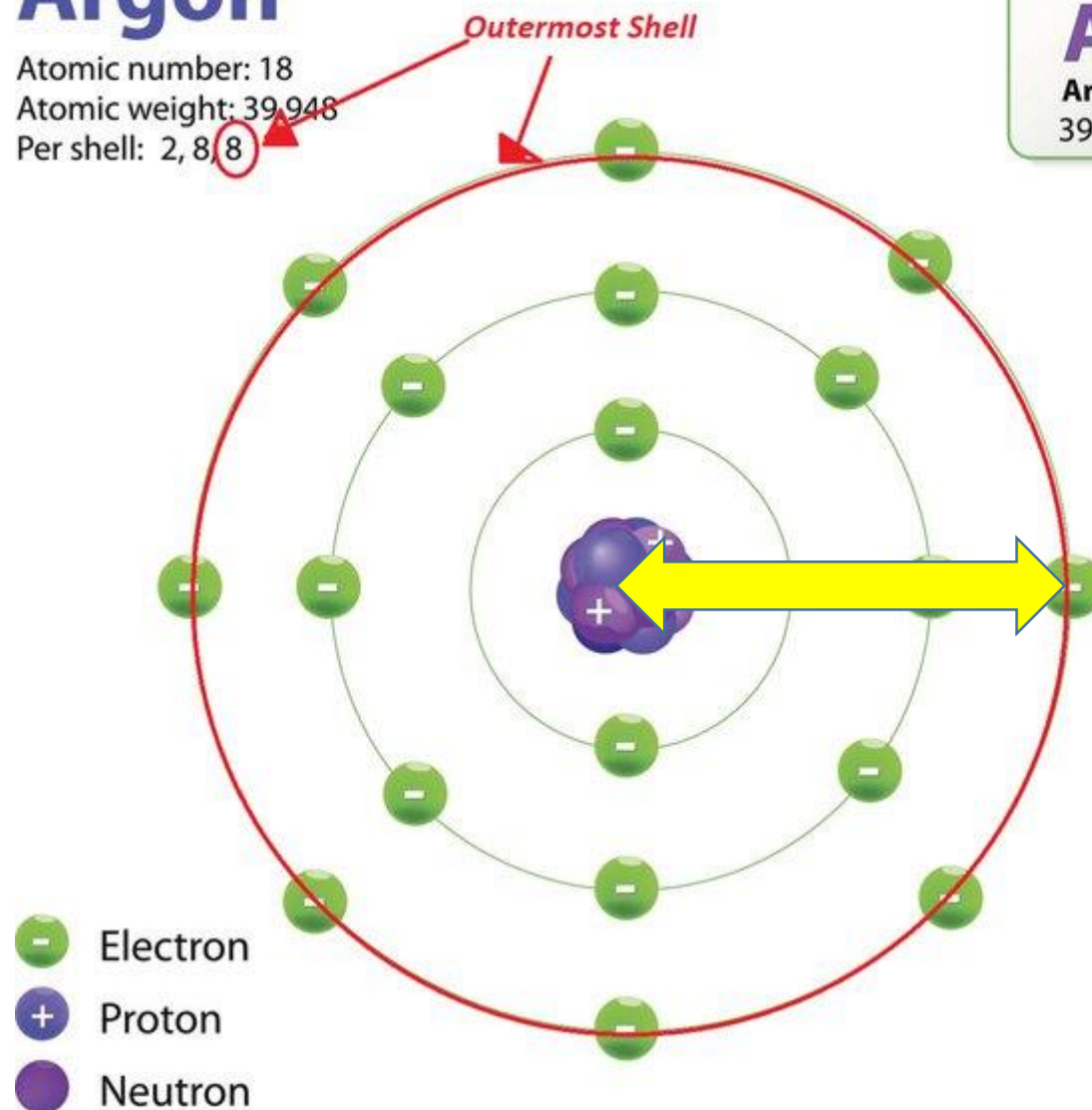
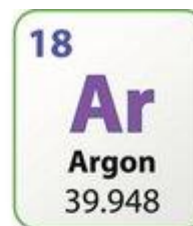
Group 17:
SEVEN Valence Electrons

Periodic Properties: ATOMIC SIZE

Atomic Size

Argon

Atomic number: 18
Atomic weight: 39.948
Per shell: 2, 8, 8

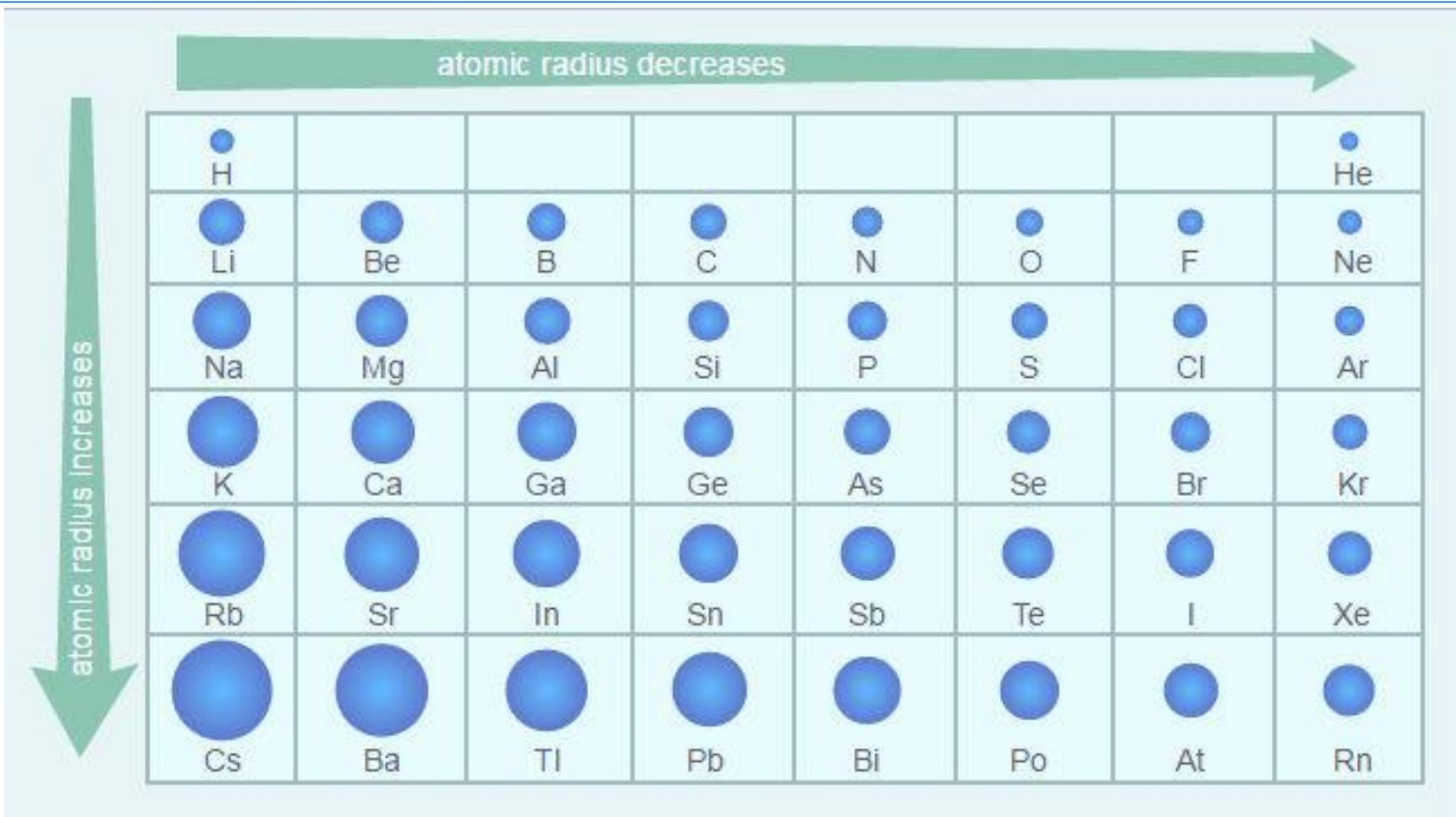


Periodic Properties: Atomic Size

The distance between the centre of the nucleus and the outermost shell



Periodic Properties: Atomic Size

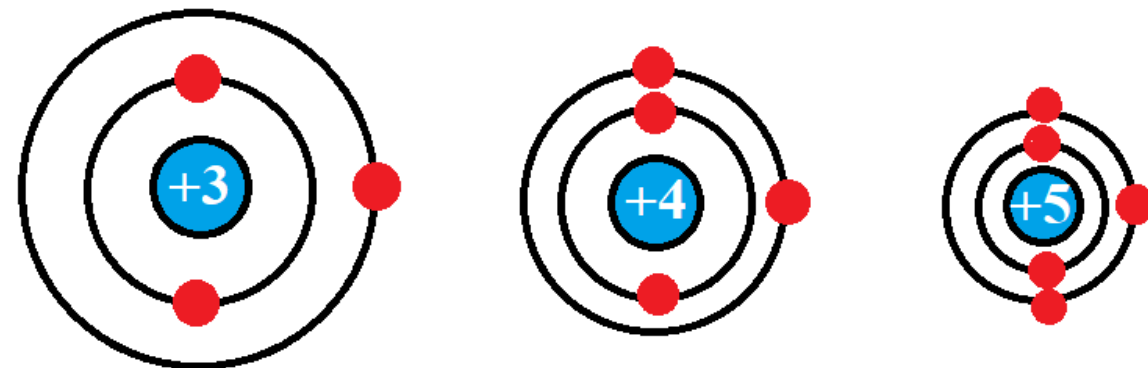


Periodic Properties: Atomic Size

- Across the Period:
Atomic size (radius) **decreases**

atomic radius decreases →

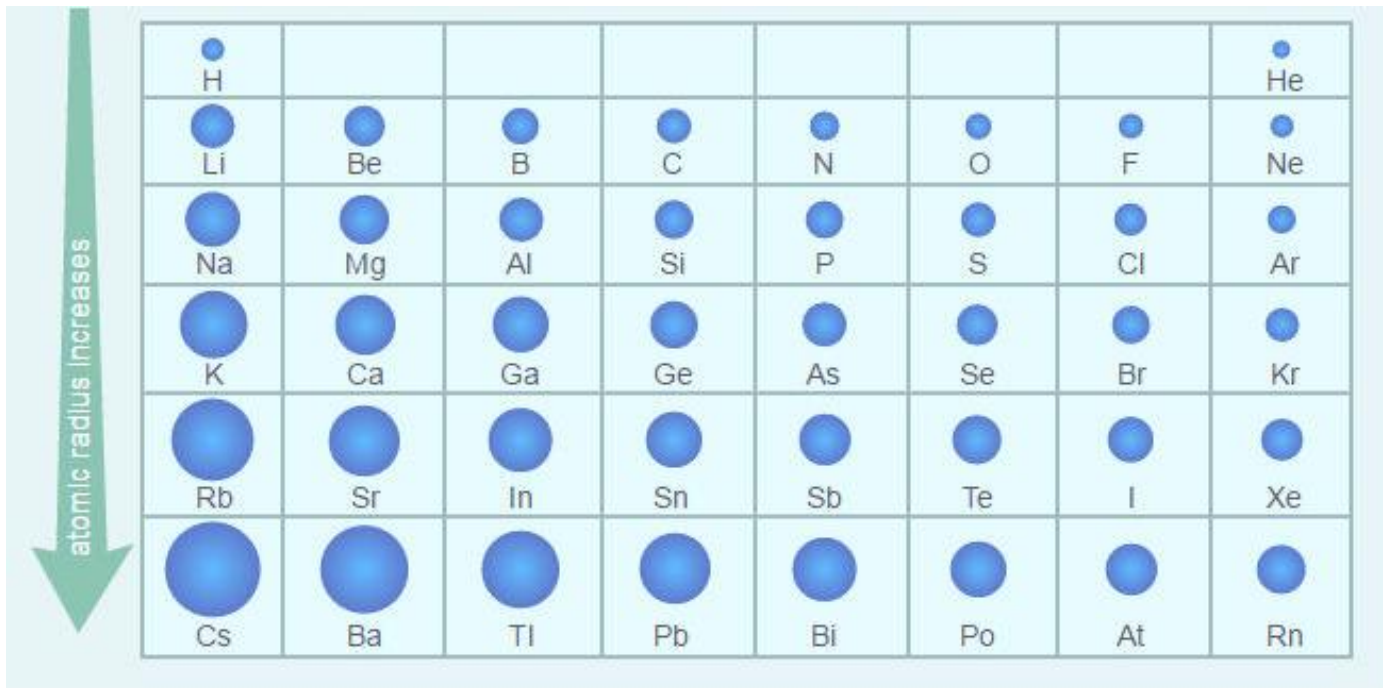
H							He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar
K	Ca	Ga	Ge	As	Se	Br	Kr
Rb	Sr	In	Sn	Sb	Te	I	Xe
Cs	Ba	Tl	Pb	Bi	Po	At	Rn



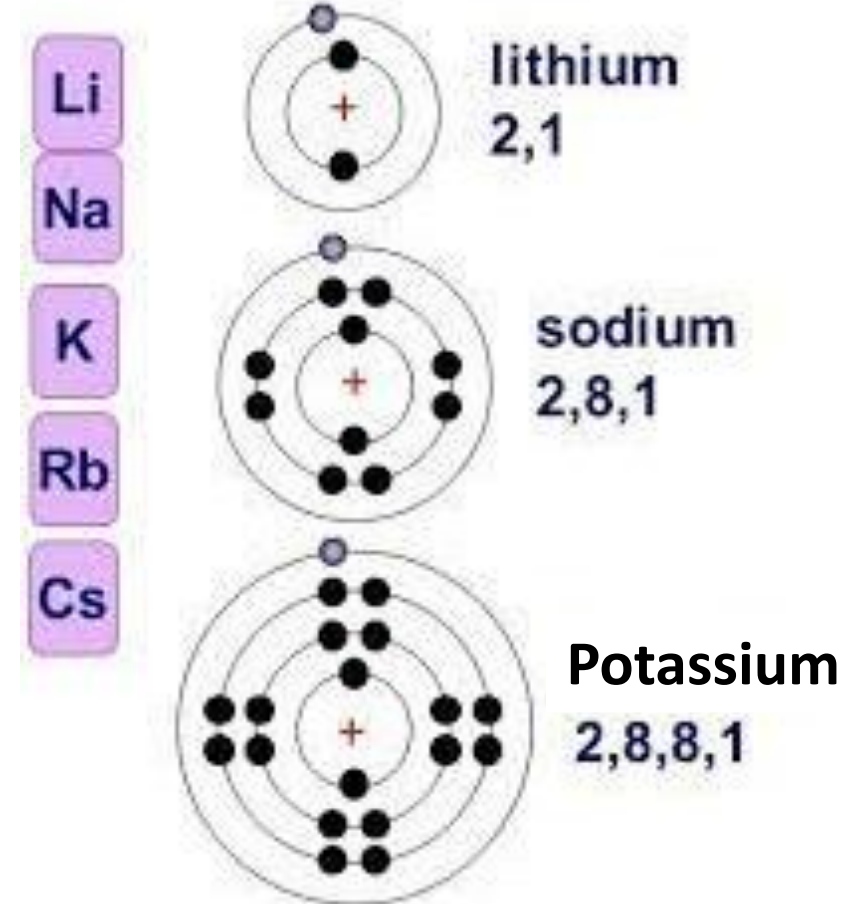
- ❖ Nuclear Charge Increases
- OR
- ❖ Attraction Increases

Periodic Properties: Atomic Size

- Down the Group:
Atomic size **increases**



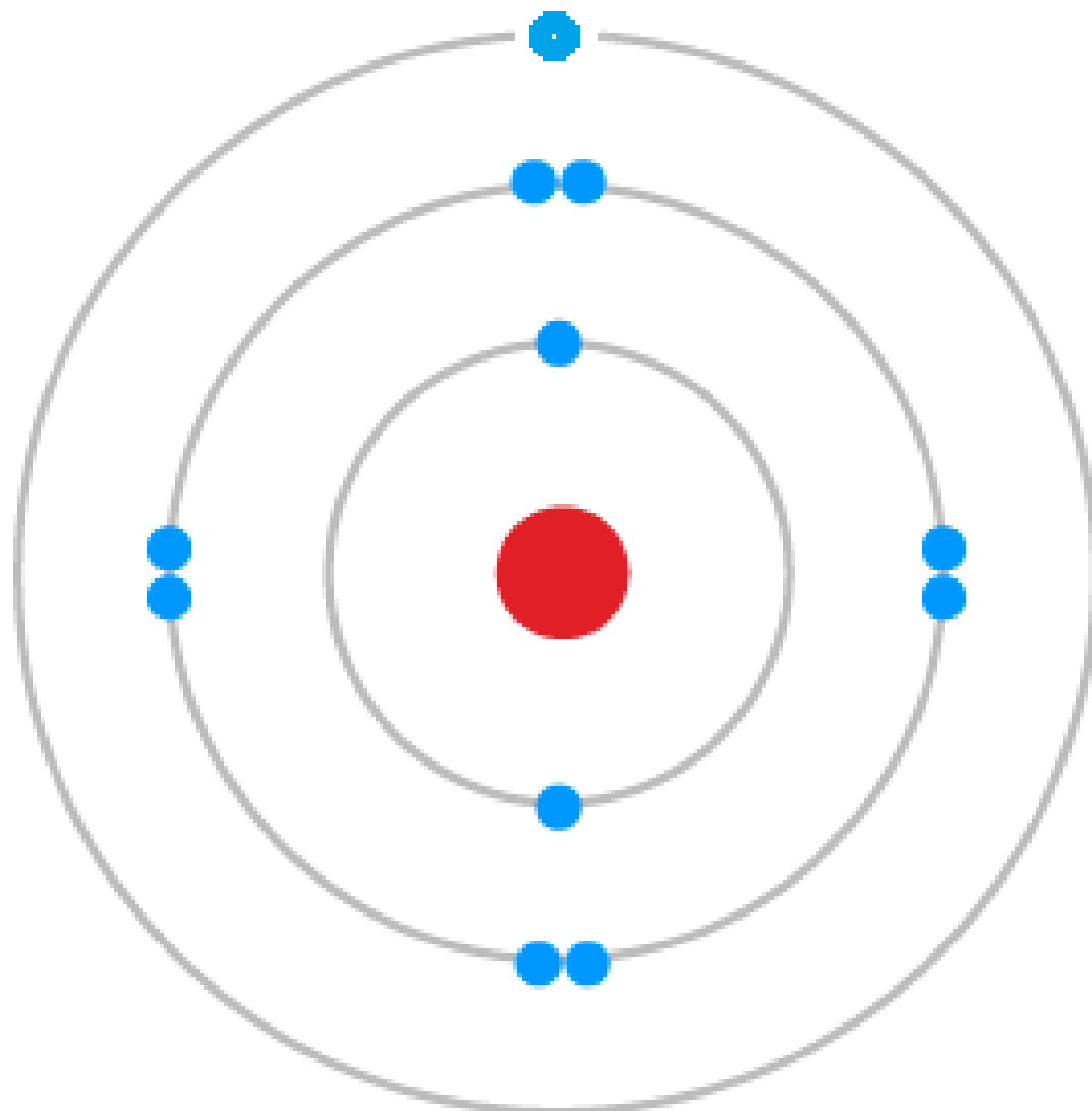
H							He
Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar
K	Ca	Ga	Ge	As	Se	Br	Kr
Rb	Sr	In	Sn	Sb	Te	I	Xe
Cs	Ba	Tl	Pb	Bi	Po	At	Rn



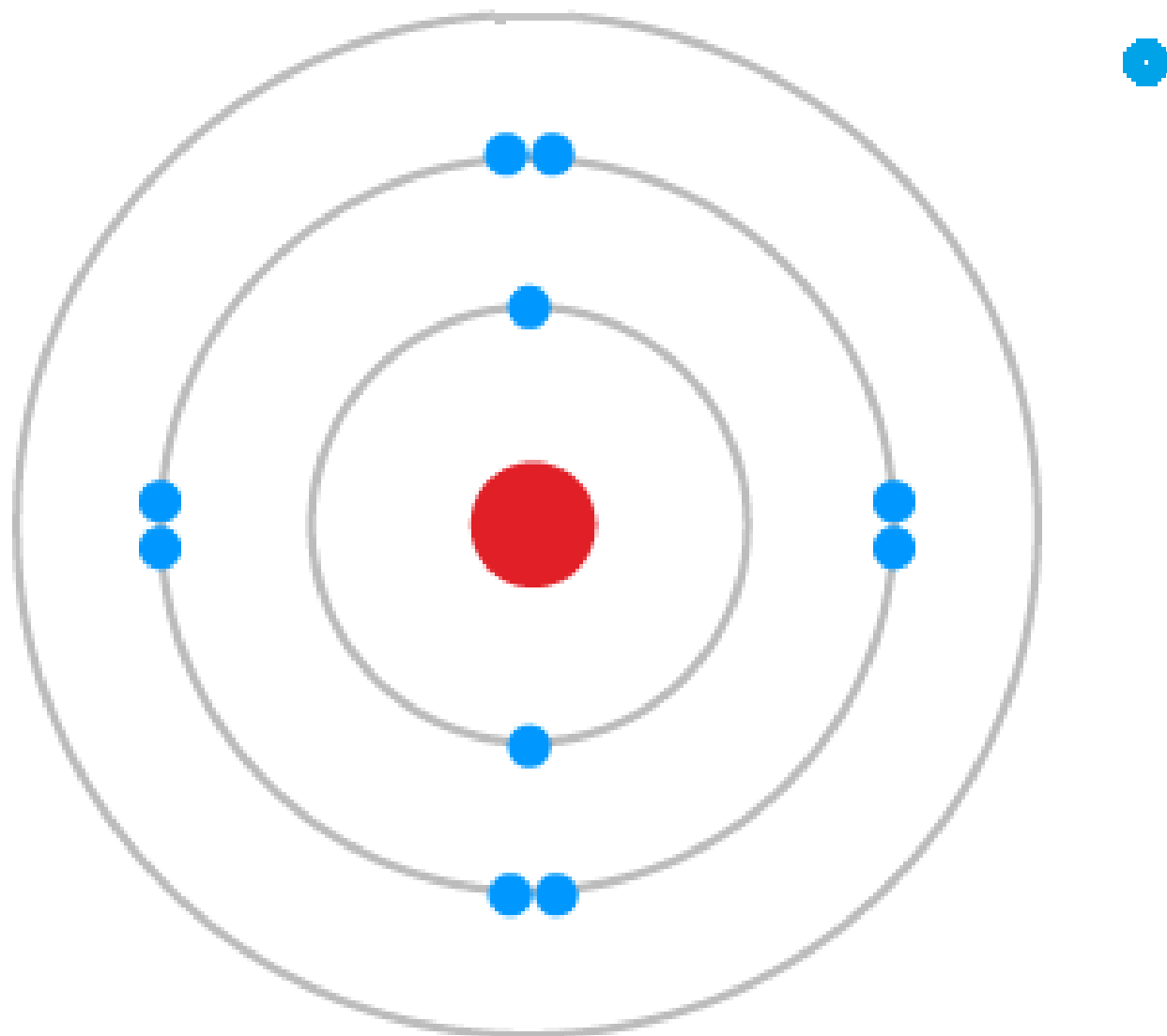
❖ No. of Shell Increases

Periodic Properties: METALLIC CHARACTER

Metallic Character

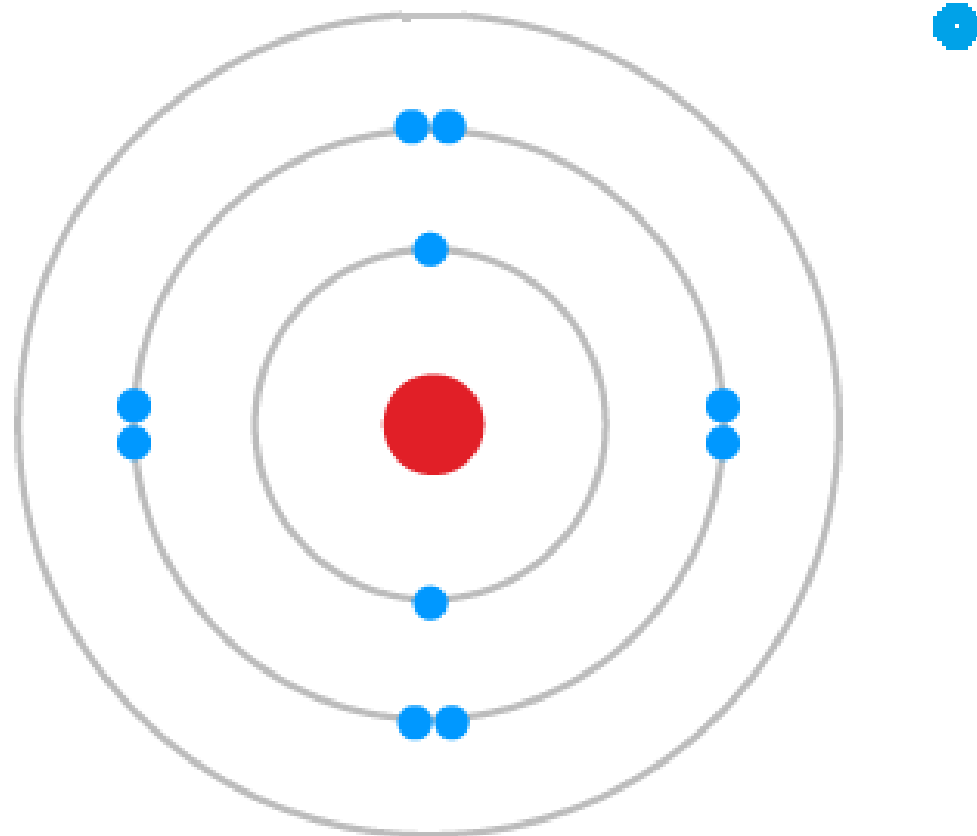


Metallic Character

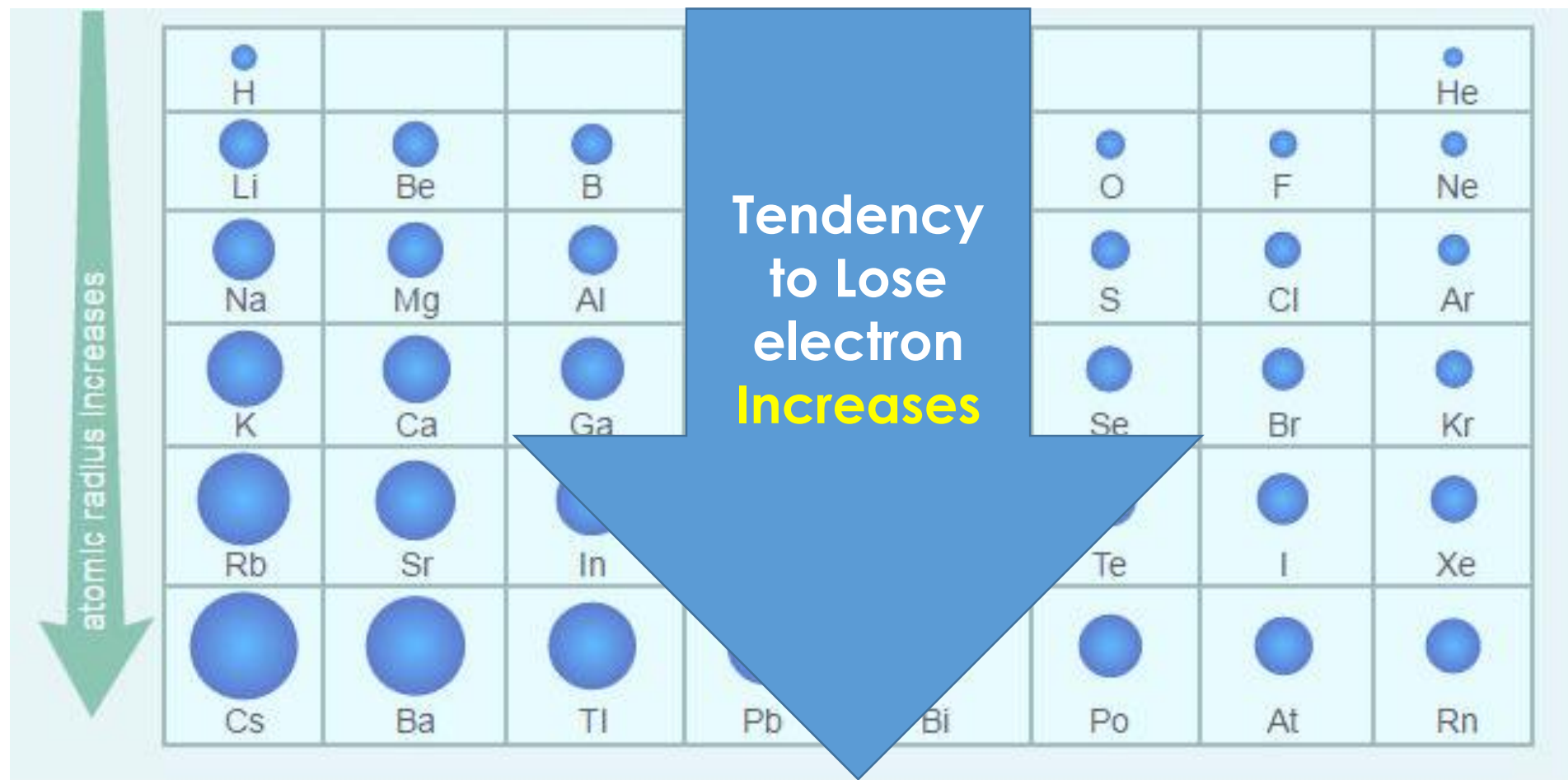


Periodic Properties: **Metallic Character**

The tendency to **lose** electron



Periodic Properties: **Metallic Character**



Down the Group:

Metallic Character increases

Periodic Properties: **Metallic Character**

atomic radius decreases

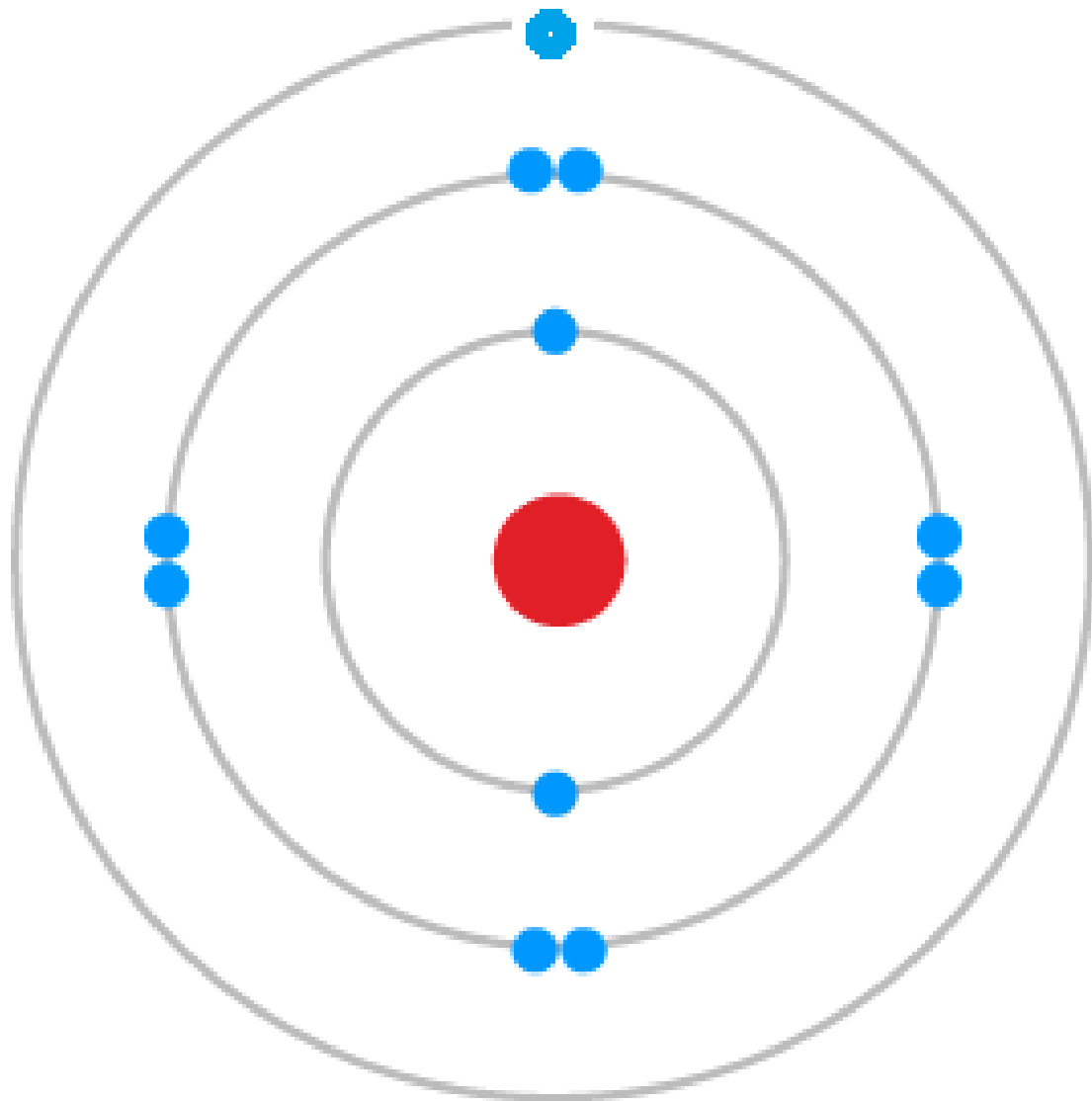
Tendency to lose electron Decreases

**Across the
Period:**

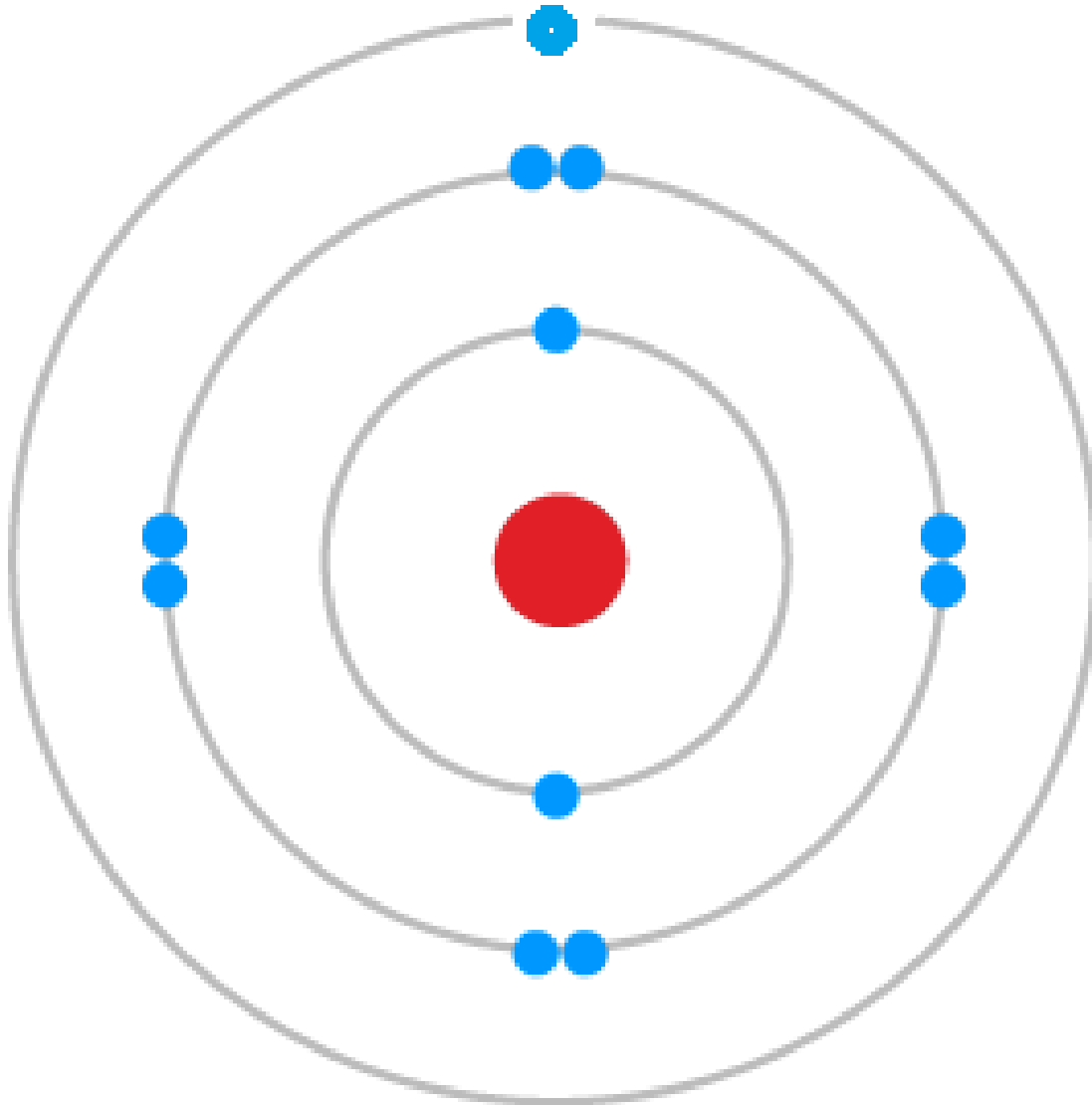
**Metallic
Character
Decreases**

Periodic Properties: Ionization Enthalpy OR Ionization Energy

Ionization Energy



Ionization Energy



- **Energy** required
- to **remove** electron

Periodic Properties: Ionization Energy

atomic radius decreases

Attraction **Increases**

Ionization Energy **Increases**

Across the
Period:

**Ionization
Energy
Increases**

Learning Objectives

Periodic Properties

- *Valence Electron*
- *Atomic Size*
- *Metallic Character*
- *Ionization Enthalpy*