

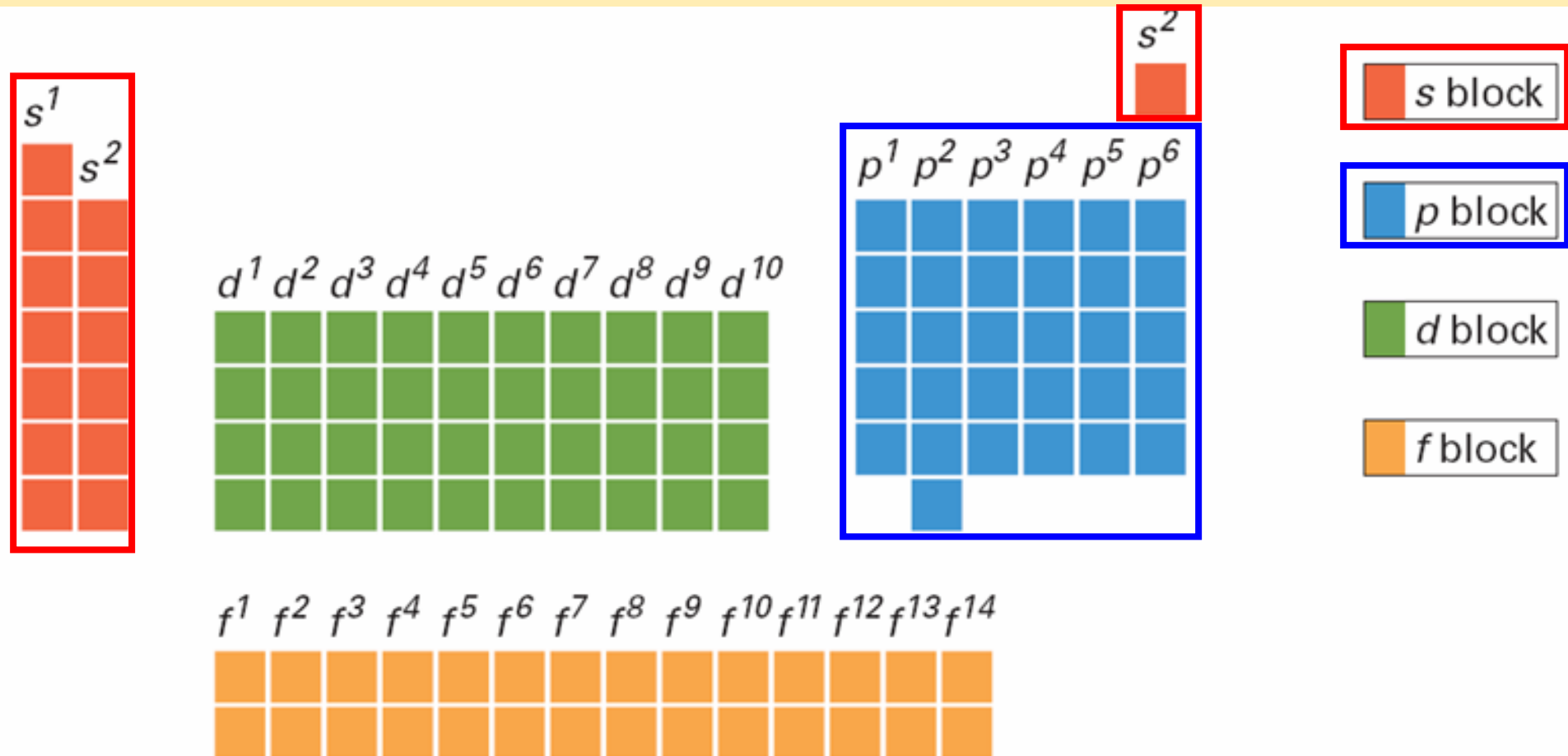
# Section 2: Classifying the Elements

																												18 8A							
1A																	2	18																	
1 <b>H</b> Hydrogen 1.0079																	<b>He</b> Helium 4.0026																		
2A																		3A	4A	5A	6A	7A	10												
3 <b>Li</b> Lithium 6.941	4 <b>Be</b> Beryllium 9.0122																	5 <b>B</b> Boron 10.81	6 <b>C</b> Carbon 12.011	7 <b>N</b> Nitrogen 14.007	8 <b>O</b> Oxygen 15.999	9 <b>F</b> Fluorine 18.998	10 <b>Ne</b> Neon 20.179												
11 <b>Na</b> Sodium 22.990	12 <b>Mg</b> Magnesium 24.305																	13 <b>Al</b> Aluminum 26.982	14 <b>Si</b> Silicon 28.086	15 <b>P</b> Phosphorus 30.974	16 <b>S</b> Sulfur 32.06	17 <b>Cl</b> Chlorine 35.453	18 <b>Ar</b> Argon 39.948												
		3B	4B	5B	6B	7B	8B		11B	12B																									
19 <b>K</b> Potassium 39.098	20 <b>Ca</b> Calcium 40.08	21 <b>Sc</b> Scandium 44.956	22 <b>Ti</b> Titanium 47.88	23 <b>V</b> Vanadium 50.941	24 <b>Cr</b> Chromium 51.996	25 <b>Mn</b> Manganese 54.938	26 <b>Fe</b> Iron 55.847	27 <b>Co</b> Cobalt 58.933	28 <b>Ni</b> Nickel 58.71	29 <b>Cu</b> Copper 63.546	30 <b>Zn</b> Zinc 65.38	31 <b>Ga</b> Gallium 69.72	32 <b>Ge</b> Germanium 72.59	33 <b>As</b> Arsenic 74.922	34 <b>Se</b> Selenium 78.96	35 <b>Br</b> Bromine 79.904	36 <b>Kr</b> Krypton 83.80																		
37 <b>Rb</b> Rubidium 85.468	38 <b>Sr</b> Strontium 87.62	39 <b>Y</b> Yttrium 88.906	40 <b>Zr</b> Zirconium 91.22	41 <b>Nb</b> Niobium 92.906	42 <b>Mo</b> Molybdenum 95.94	43 <b>Tc</b> Technetium (98)	44 <b>Ru</b> Ruthenium 101.07	45 <b>Rh</b> Rhodium 102.91	46 <b>Pd</b> Palladium 106.4	47 <b>Ag</b> Silver 107.87	48 <b>Cd</b> Cadmium 112.41	49 <b>In</b> Indium 114.82	50 <b>Sn</b> Tin 118.69	51 <b>Sb</b> Antimony 121.75	52 <b>Te</b> Tellurium 127.60	53 <b>I</b> Iodine 126.90	54 <b>Xe</b> Xenon 131.30																		
55 <b>Cs</b> Cesium 132.91	56 <b>Ba</b> Barium 137.33	71 <b>Lu</b> Lutetium 174.97	72 <b>Hf</b> Hafnium 178.49	73 <b>Ta</b> Tantalum 180.95	74 <b>W</b> Tungsten 183.85	75 <b>Re</b> Rhenium 186.21	76 <b>Os</b> Osmium 190.2	77 <b>Ir</b> Iridium 192.22	78 <b>Pt</b> Platinum 195.09	79 <b>Au</b> Gold 196.97	80 <b>Hg</b> Mercury 200.59	81 <b>Tl</b> Thallium 204.37	82 <b>Pb</b> Lead 207.2	83 <b>Bi</b> Bismuth 208.98	84 <b>Po</b> Polonium (209)	85 <b>At</b> Astatine (210)	86 <b>Rn</b> Radon (222)																		
87 <b>Fr</b> Francium (223)	88 <b>Ra</b> Radium (226)	103 <b>Lr</b> Lawrencium (262)	104 <b>Rf</b> Rutherfordium (261)	105 <b>Db</b> Dubnium (262)	106 <b>Sg</b> Seaborgium (263)	107 <b>Bh</b> Bohrium (264)	108 <b>Hs</b> Hassium (265)	109 <b>Mt</b> Meitnerium (268)	110 <b>Ds</b> Darmstadtium (269)	111 <b>Rg</b> Roentgenium (271)	112 <b>Uub</b> Uutonium (277)	114 <b>Uuq</b> Ununquadium																							
Elements 104-114 are the transactinide elements.																		*Name not officially assigned.																	
Lanthanide Series																																			
57 <b>La</b> Lanthanum 138.91	58 <b>Ce</b> Cerium 140.12	59 <b>Pr</b> Praseodymium 140.91	60 <b>Nd</b> Neodymium 144.24	61 <b>Pm</b> Promethium (145)	62 <b>Sm</b> Samarium 150.4	63 <b>Eu</b> Europium 151.96	64 <b>Gd</b> Gadolinium 157.25	65 <b>Tb</b> Terbium 158.93	66 <b>Dy</b> Dysprosium 162.50	67 <b>Ho</b> Holmium 164.93	68 <b>Er</b> Erbium 167.26	69 <b>Tm</b> Thulium 168.93	70 <b>Yb</b> Ytterbium 173.04																						
Actinide Series																																			
89 <b>Ac</b> Actinium (227)	90 <b>Th</b> Thorium 232.04	91 <b>Pa</b> Protactinium 231.04	92 <b>U</b> Uranium 238.03	93 <b>Np</b> Neptunium (237)	94 <b>Pu</b> Plutonium (244)	95 <b>Am</b> Americium (243)	96 <b>Cm</b> Curium (247)	97 <b>Bk</b> Berkelium (247)	98 <b>Cf</b> Californium (251)	99 <b>Es</b> Einsteinium (252)	100 <b>Fm</b> Fermium (257)	101 <b>Md</b> Mendelevium (258)	102 <b>No</b> Nobelium (259)																						

# Main-Group Elements:

**Groups 1-2 & 3A-8A (*s* and *p* orbitals)**

-wide range of properties (metals/nonmetals)

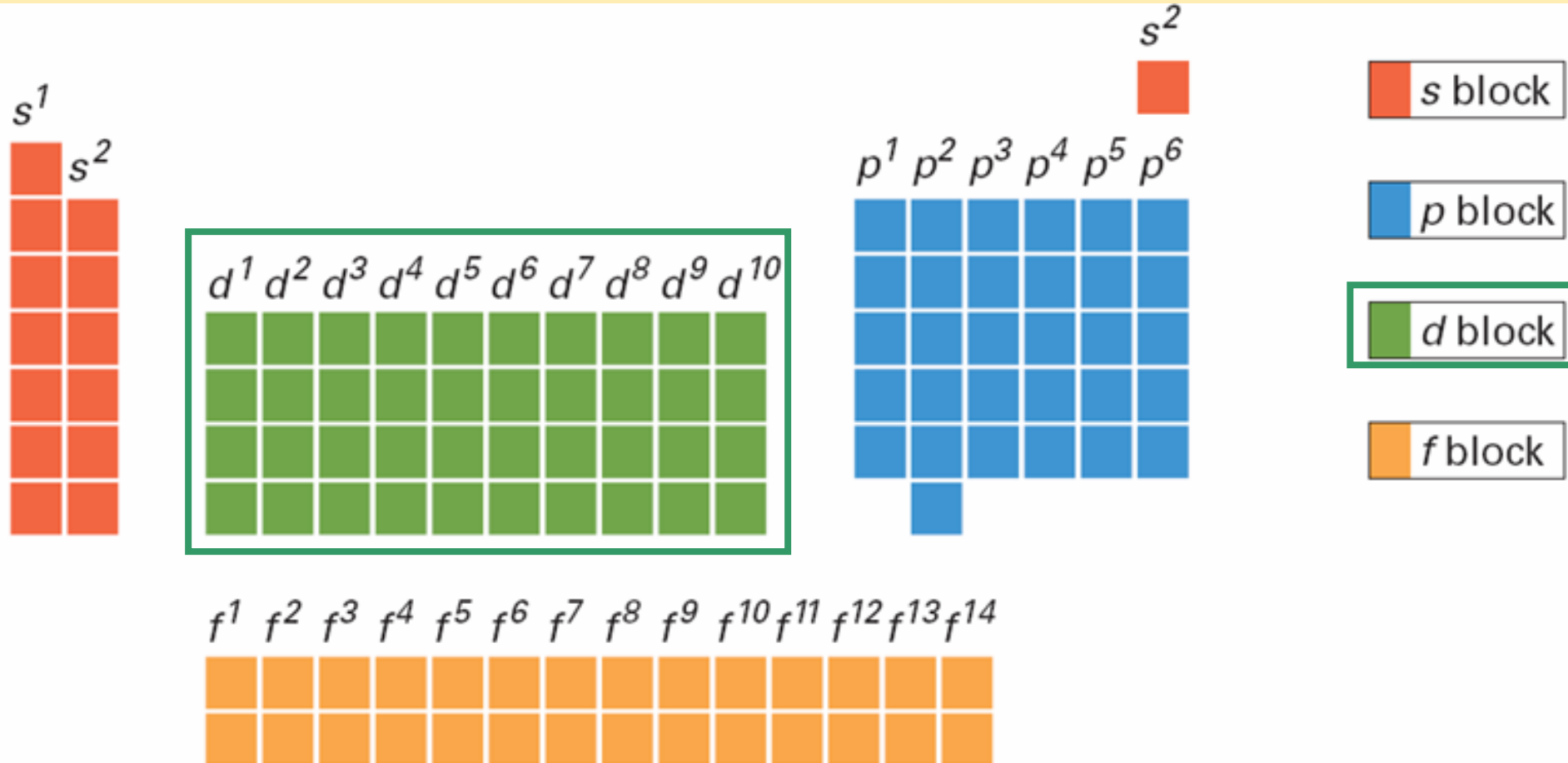


# Main-Group Elements:

**Groups 1-2 & 3A-8A (*s* and *p* orbitals)**

-wide range of properties (metals/nonmetals)

**Transition Metals: Groups 3-12 (*d* orbitals)**

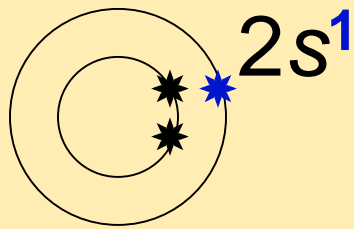




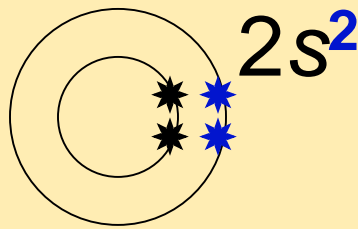
**What's the *number one, most significant factor that groups the elements together?***

**Valence Electrons:**

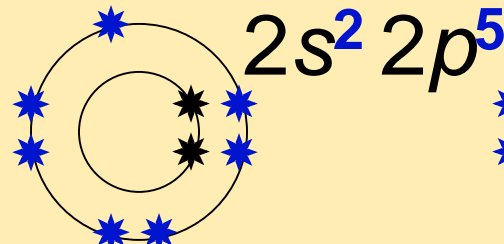
e<sup>-</sup>'s in the **highest** occupied energy **level**



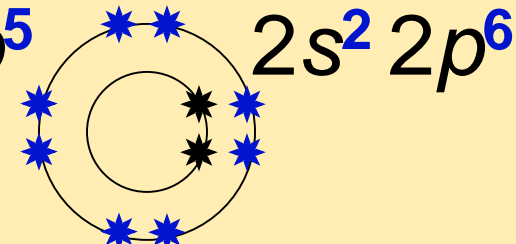
**3-lithium  
(Li)**



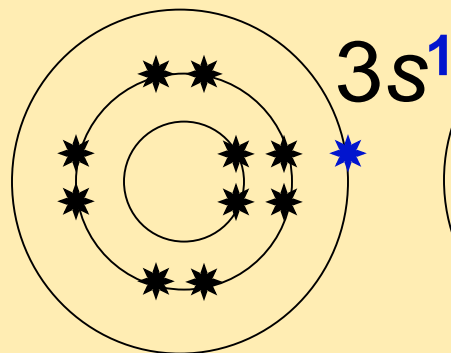
**4-beryllium  
(Be)**



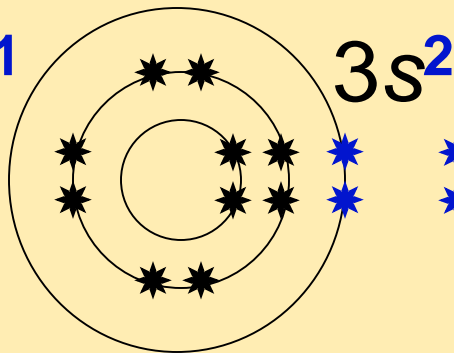
**9-fluorine  
(F)**



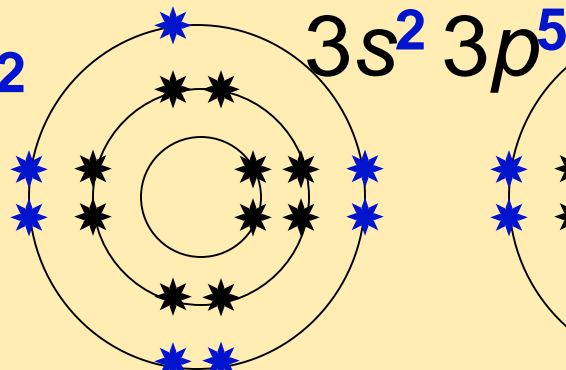
**10-neon  
(Ne)**



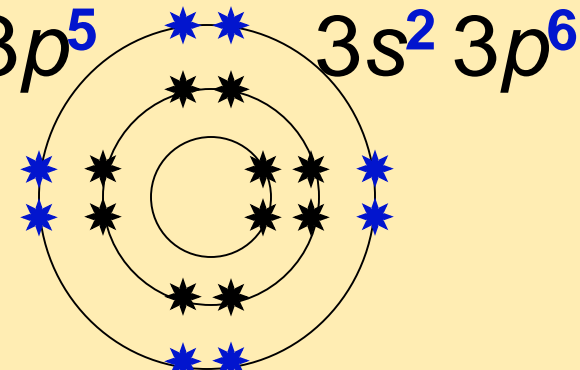
**11-sodium  
(Na)**



**12-magnesium  
(Mg)**



**17-chlorine  
(Cl)**



**18-argon  
(Ar)**

# Alkali Metals

Group # : 1

Valence electrons: 1

soft, metallic solids

most reactive metals

more reactive down a group b/c...

...lose 1 e<sup>-</sup> easiest



[video clip 1](#)

[video clip 2](#)

Lithium (Li)	$1s^2 2s^1$
Sodium (Na)	$1s^2 2s^2 2p^6 3s^1$
Potassium (K)	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

1 1A 1 <b>H</b> Hydrogen 1.0079
3 <b>Li</b> Lithium 6.941
11 <b>Na</b> Sodium 22.990
19 <b>K</b> Potassium 39.098
37 <b>Rb</b> Rubidium 85.468
55 <b>Cs</b> Cesium 132.91
87 <b>Fr</b> Francium (223)

# Alkaline Earth Metals

Group # : 2

Valence electrons: 2

reactive metals

more reactive down a group b/c...

...lose 2 e<sup>-</sup>'s fairly easily

Beryllium (Be)

$1s^2 2s^2$

Magnesium (Mg)

$1s^2 2s^2 2p^6 3s^2$

Calcium (Ca)

$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

1 1A 1 H Hydrogen 1.0079	2 2A 4 Be Beryllium 9.0122
3 Li Lithium 6.941	12 Mg Magnesium 24.305
11 Na Sodium 22.990	20 Ca Calcium 40.08
19 K Potassium 39.098	38 Sr Strontium 87.62
37 Rb Rubidium 85.468	56 Ba Barium 137.33
55 Cs Cesium 132.91	88 Ra Radium (226)
87 Fr Francium (223)	

# Halogens

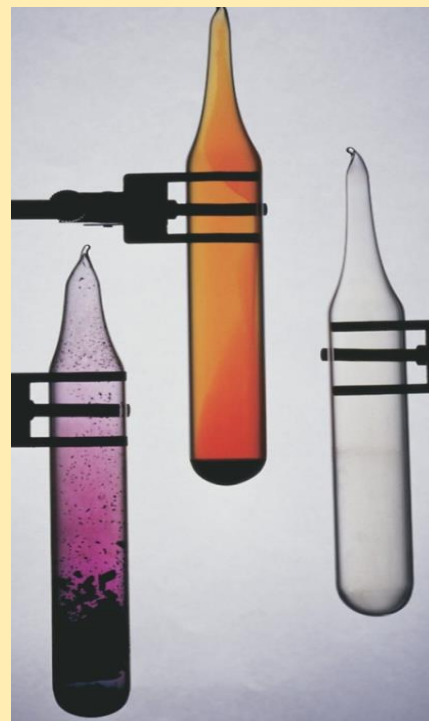
Group # : 7A (17)

Valence electrons: 7

most reactive nonmetals

more reactive at top of group b/c...

...gain 1 e<sup>-</sup> easiest

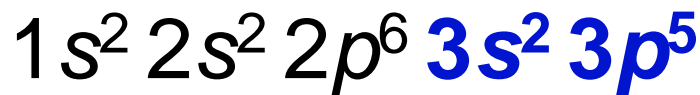


17 7A F Fluorine 18.998	2 2 He Helium 4.0026
9 2 7 F Fluorine 18.998	10 2 8 Ne Neon 20.179
17 3 8 7 Cl Chlorine 35.453	18 2 8 8 Ar Argon 39.948
35 2 8 18 7 Br Bromine 79.904	36 2 8 18 8 Kr Krypton 83.80
53 2 8 18 18 7 I Iodine 126.90	54 2 8 18 18 8 Xe Xenon 131.30
85 2 8 18 32 18 7 At Astatine (210)	86 2 8 18 32 18 8 Rn Radon (222)

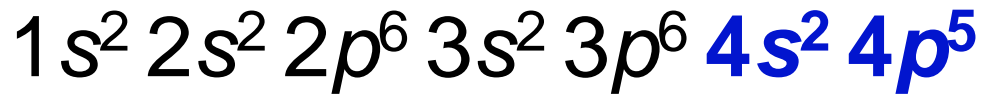
Fluorine (F)



Chlorine (Cl)



Bromine (Br)





# Noble Gases

**Group # : 8A (18)**

**Valence electrons: 8**

***unreactive gases*** b/c...

...**filled valence shell** with **8 e<sup>-</sup>'s**  
(none lost or gained)

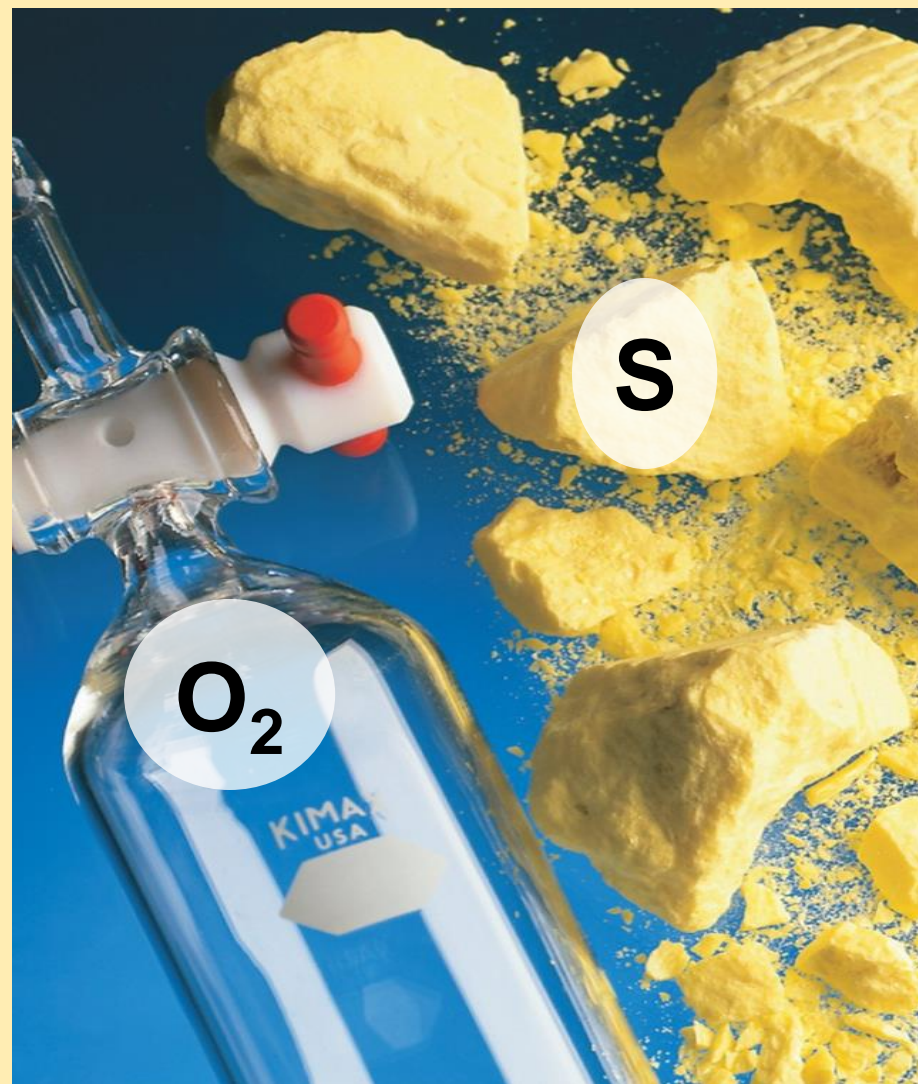
Helium (He)	<b>1s<sup>2</sup></b>
Neon (Ne)	<b>1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup></b>
Argon(Ar)	<b>1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>2</sup> 3p<sup>6</sup></b>

2	<b>He</b> Helium 4.0026
10	<b>Ne</b> Neon 20.179
18	<b>Ar</b> Argon 39.948
36	<b>Kr</b> Krypton 83.80
54	<b>Xe</b> Xenon 131.30
86	<b>Rn</b> Radon (222)

same group , similar chemical properties

same group , same # of valence e<sup>-</sup>'s

**WHY?**



# Quick Quiz!

1. Elements in a group in the periodic table...

A. have the same mass

B. have similar properties

C. have the same atomic number

D. have the same number of valence electrons

## Quick Quiz.

2. Alkali metals have how many valence electrons in the highest occupied energy level?

A. 8

B. 1

C. 2

D. 3

## Quick Quiz.

3. Noble gases...

A. are the most reactive nonmetals

B. are the most reactive metals

C. are typically unreactive

D. have 8 valence electrons

## Quick Quiz.

4. Which one of the following is incorrectly labeled?
- A. Ne, noble gas
  - B. Cu, transition metal
  - C. Sn, nonmetal
  - D. Cl, halogen

# Quick Quiz.

5. Transition metals are characterized by having electrons in which orbitals?

A. *s*

B. *p*

C. *d*

D. *f*

