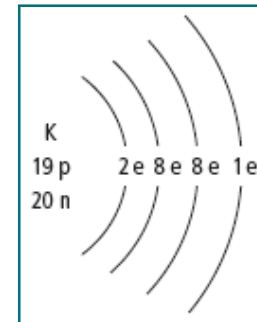
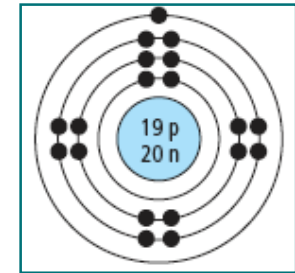
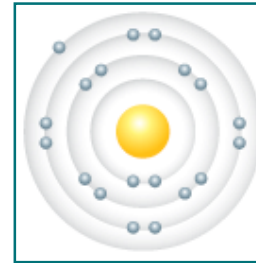
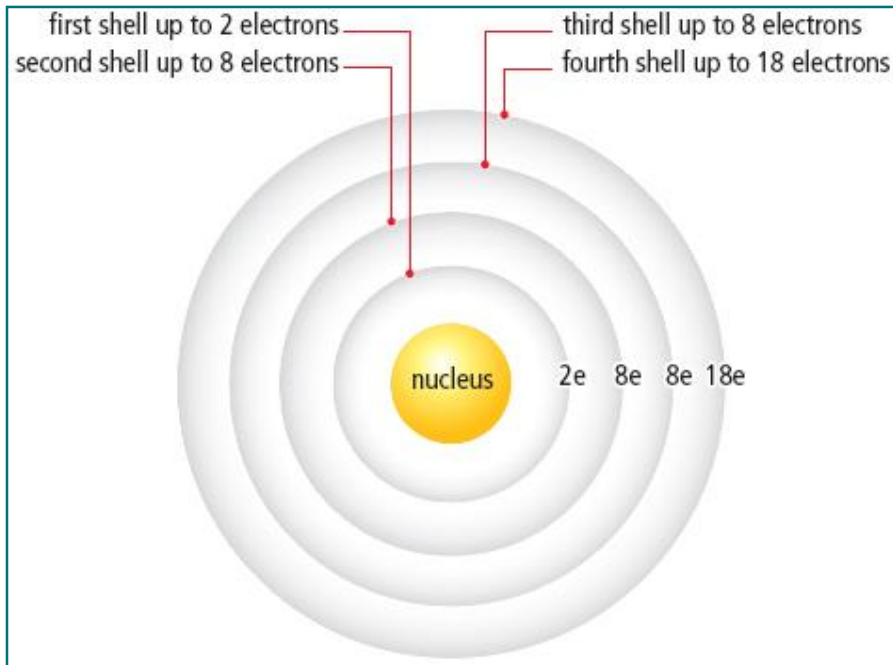


2.3 Periodic Table and Atomic Theory

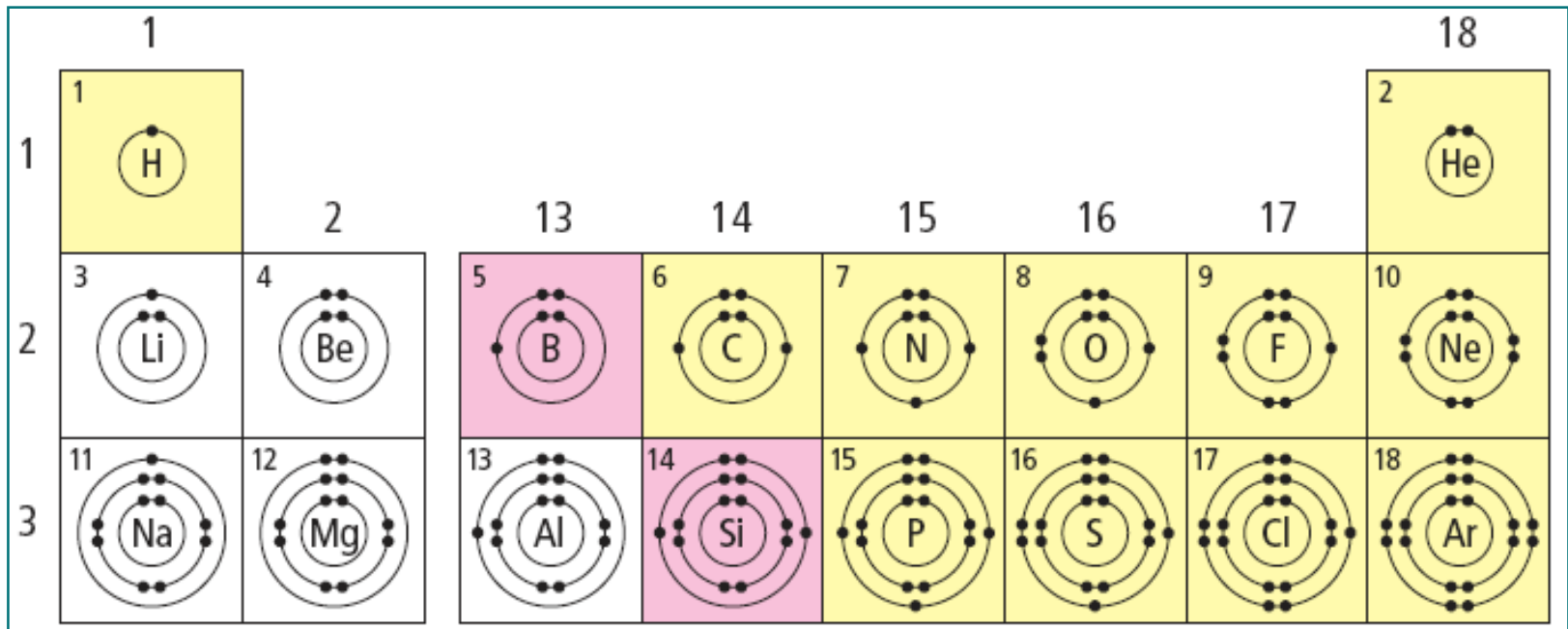
2.3 Periodic Table and Atomic Theory

- Elements with similar properties have similar electron arrangements
- Bohr models show electron arrangement in shells or orbitals
- The arrangement of electrons in these orbitals is called electron configuration



Bohr model patterns

- Chemical families on the periodic table have the same number of **valence electrons (electrons that appear on the valence or outer most shell)**
- Elements in the same period have the same number of shells
- Period number indicates the number of electron shells



Reading the Periodic Table

- For the first **20** elements of the periodic table you can “read” how **electrons** are arranged around the nucleus.
- **Rows** represent **levels** (or layers) of the orbital.
- **Columns** represent each electron added.
- (pg 54)

Periodic Table of the Elements

1 1A 11A	2 IIA 2A											13 IIIA 3A	14 IVA 4A	15 VA 5A	16 VIA 6A	17 VIIA 7A	18 VIIIA 8A												
1 H Hydrogen 1.0079	2 He Helium 4.0026											3 Li Lithium 6.941	4 Be Beryllium 9.01218											5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.0064	8 O Oxygen 15.9994	9 F Fluorine 18.998463	10 Ne Neon 20.1797
11 Na Sodium 22.98976928	12 Mg Magnesium 24.304	3 III B 3B	4 IV B 4B	5 V B 5B	6 VI B 6B	7 VII B 7B	8 VIII 8	9 VIII 8	10 VIII 8	11 IB 1B	12 IIB 2B	13 Al Aluminum 26.9815385	14 Si Silicon 28.0855	15 P Phosphorus 30.973762	16 S Sulfur 32.065	17 Cl Chlorine 35.4527	18 Ar Argon 39.948												
19 K Potassium 39.0983	20 Ca Calcium 40.078	21 Sc Scandium 44.95591	22 Ti Titanium 47.88	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938	26 Fe Iron 55.847	27 Co Cobalt 58.9332	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.36	31 Ga Gallium 69.723	32 Ge Germanium 72.64	33 As Arsenic 74.921595	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80												
37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.90585	40 Zr Zirconium 91.224	41 Nb Niobium 92.90638	42 Mo Molybdenum 95.94	43 Tc Technetium 98.9062	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.9055	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.757	52 Te Tellurium 127.6	53 I Iodine 126.90447	54 Xe Xenon 131.29												
55 Cs Cesium 132.90545	56 Ba Barium 137.327	57-71 Lanthanide Series		72 Hf Hafnium 178.49	73 Ta Tantalum 180.9479	74 W Tungsten 183.85	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.96655	80 Hg Mercury 200.59	81 Tl Thallium 204.3833	82 Pb Lead 207.2	83 Bi Bismuth 208.98039	84 Po Polonium [209]	85 At Astatine 208.9804	86 Rn Radon 222.01758											
87 Fr Francium [223]	88 Ra Radium 226.0254	88-103 Actinide Series		104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [277]	109 Mt Meitnerium [268]	110 Ds Darmstadtium [285]	111 Rg Roentgenium [282]	112 Cn Copernicium [285]	113 Uut Ununtrium [284]	114 Uuq Ununquadium [289]	115 Uup Ununpentium [288]	116 Uuh Ununhexium [289]	117 Uus Ununseptium [286]	118 Uuo Ununoctium [289]											
Lanthanide Series		57 La Lanthanum 138.905	58 Ce Cerium 140.12	59 Pr Praseodymium 140.90768	60 Nd Neodymium 144.24	61 Pm Promethium [145]	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.92534	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93033	68 Er Erbium 167.255	69 Tm Thulium 168.93402	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967													
Actinide Series		88 Ac Actinium [227]	89 Th Thorium [232]	90 Pa Protactinium [231]	91 U Uranium [238]	92 Np Neptunium [237]	93 Pu Plutonium [244]	94 Am Americium [243]	95 Cm Curium [247]	96 Bk Berkelium [247]	97 Cf Californium [251]	98 Es Einsteinium [252]	99 Fm Fermium [257]	100 Md Mendelevium [258]	101 No Nobelium [259]	102 Lr Lawrencium [260]													
	Alkali Metal	Alkali Earth	Transition Metal	Basic Metal	Semimetals	Nonmetals	Halogens	Noble Gas	Lanthanides	Actinides																			

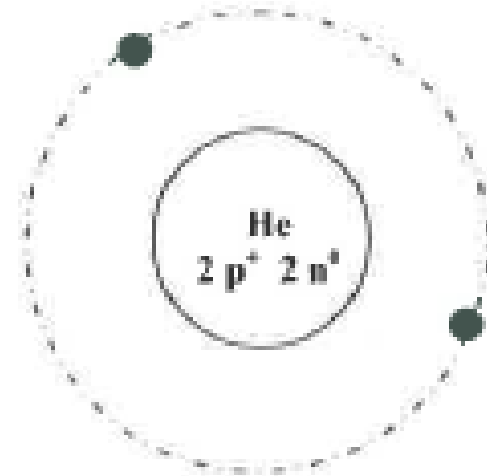
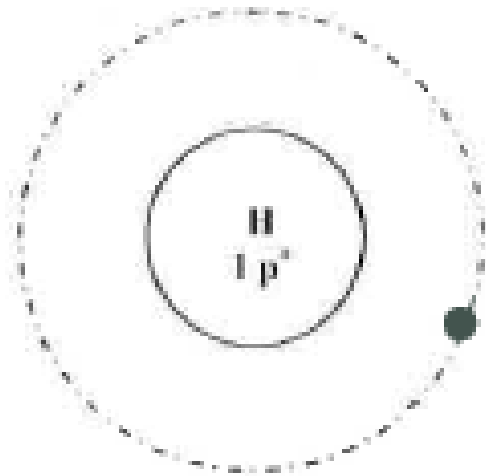
1st Row

- The first energy level can only hold two electrons.
- So there are only two elements in the first row (hydrogen and helium)

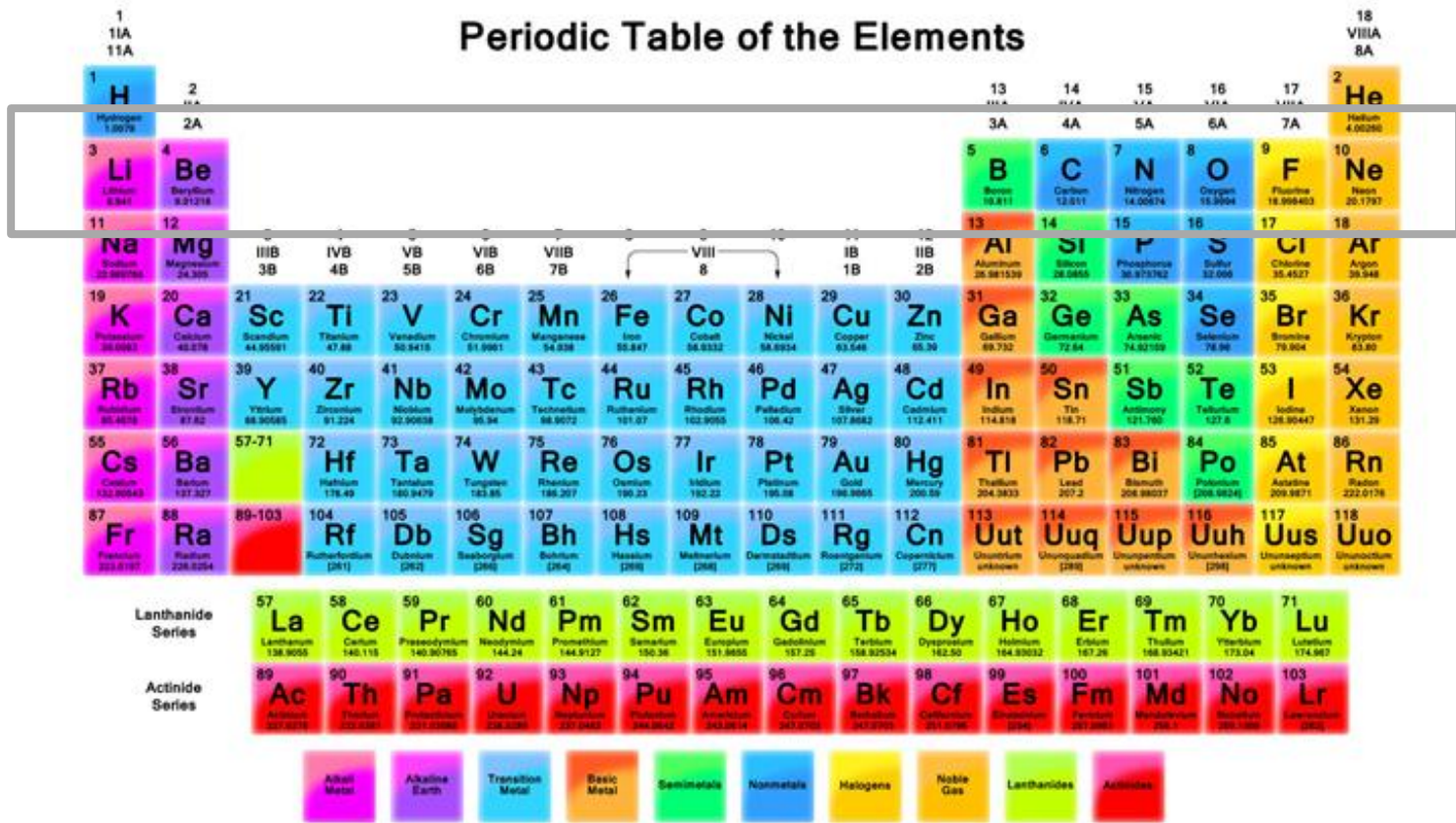
Periodic Table of the Elements

1 1IA 11A																	18 VIII 8A										
1 H Hydrogen 1.0079																	2 He Helium 4.00260										
3 Li Lithium 6.941	4 Be Beryllium 9.01218											5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.00704	8 O Oxygen 15.9994	9 F Fluorine 18.998403	10 Ne Neon 20.1797										
11 Na Sodium 22.989768	12 Mg Magnesium 24.305	13 IIIB 3B	14 IVB 4B	15 VB 5B	16 VIB 6B	17 VIIB 7B	18 VIII 8	19 VIII 8	20 VIII 8	21 IIB 2B	22 Ca Calcium 40.078	23 Sc Scandium 44.95591	24 Ti Titanium 47.88	25 V Vanadium 50.9415	26 Cr Chromium 51.9961	27 Mn Manganese 54.938	28 Fe Iron 55.847	29 Co Cobalt 58.9332	30 Ni Nickel 58.6934	31 Cu Copper 63.546	32 Zn Zinc 65.39	33 Al Aluminum 26.981539	34 Si Silicon 28.0855	35 P Phosphorus 30.973762	36 S Sulfur 32.06	37 Cl Chlorine 35.4527	38 Ar Argon 39.948
19 K Potassium 39.0983	20 Ca Calcium 40.078	21 Sc Scandium 44.95591	22 Ti Titanium 47.88	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938	26 Fe Iron 55.847	27 Co Cobalt 58.9332	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.723	32 Ge Germanium 72.64	33 As Arsenic 74.92159	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80										
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87 Fr Francium 223.0197	88 Ra Radium 226.0254	89-103 Actinide Series	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [269]	109 Mt Meitnerium [268]	110 Ds Darmstadtium [271]	111 Rg Roentgenium [272]	112 Cn Copernicium [277]	113 Uut Ununtrium [288]	114 Uuq Ununquadium [289]	115 Uup Ununpentium [288]	116 Uuh Ununhexium [288]	117 Uus Ununseptium [289]	118 Uuo Ununoctium [289]										
		57 La Lanthanum 138.9055	58 Ce Cerium 140.115	59 Pr Praseodymium 140.90766	60 Nd Neodymium 144.24	61 Pm Promethium 144.9127	62 Sm Samarium 150.36	63 Eu Europium 151.9645	64 Gd Gadolinium 157.25	65 Tb Terbium 158.92534	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93032	68 Er Erbium 167.26	69 Tm Thulium 168.93421	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967											
		89 Ac Actinium 227.0277	90 Th Thorium 232.0376	91 Pa Protactinium 231.03626	92 U Uranium 238.02891	93 Np Neptunium 237.04817	94 Pu Plutonium 244.06422	95 Am Americium 243.06136	96 Cm Curium 247.07545	97 Bk Berkelium 247.07129	98 Cf Californium 251.07958	99 Es Einsteinium 252.08322	100 Fm Fermium 257.10528	101 Md Mendelevium 258.10	102 No Nobelium 259.1009	103 Lr Lawrencium 260.101											
Alkali Metal	Alkaline Earth	Transition Metal	Basic Metal	Semimetals	Nonmetals	Halogens	Noble Gas	Lanthanides	Actinides																		

Hydrogen and Helium

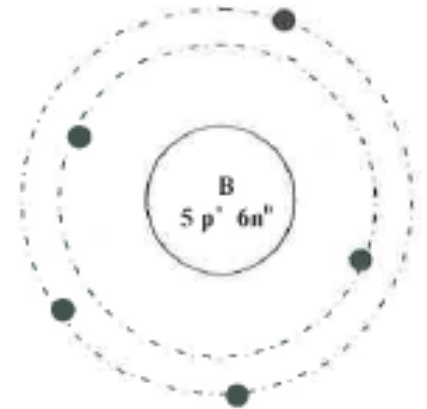
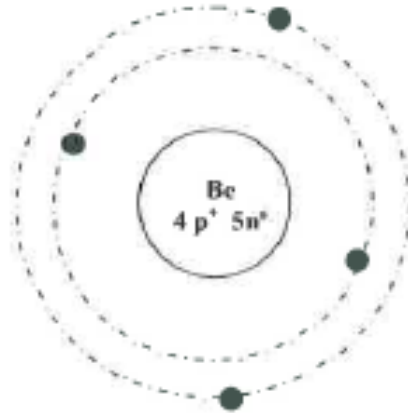
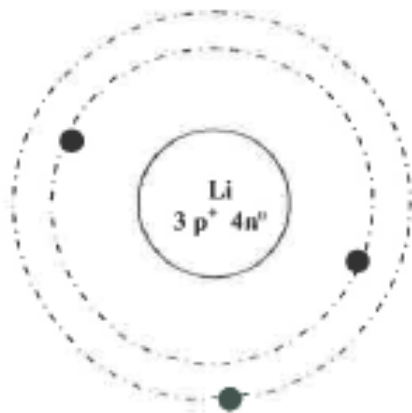


2nd row



2nd Row

- The second energy level can hold **eight** electrons.
 - 2 columns + 6 more columns
 - There are **eight** elements in the second row



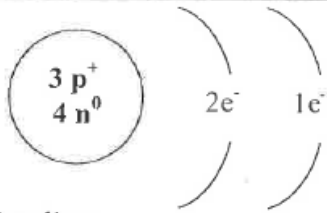
Other Rows

- 3rd row, 8 electrons
- 4th row, 18 electrons

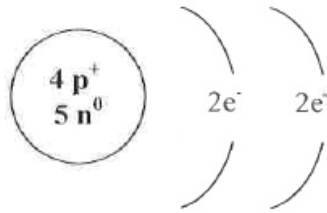
Bohr models

- Instead of continuing to draw all these circles a **Bohr** diagram simplifies things for us.
- A Bohr diagram just shows the **nucleus** and indicates how many **electrons** are in each level.
- Lets practice.
- Remember the first layer can hold 2 electrons, the 2nd and 3rd can hold 8! If you forget just count the number of elements in each row!

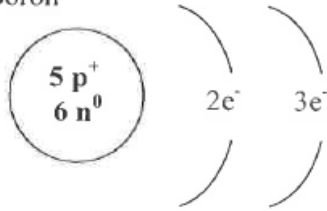
Lithium



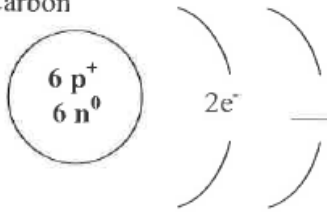
Beryllium



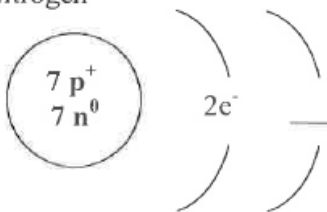
Boron



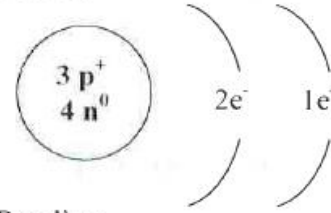
Carbon



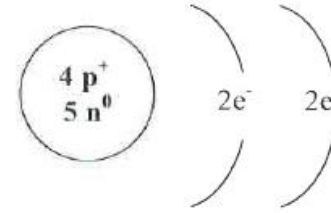
Nitrogen



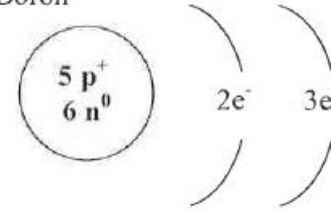
Lithium



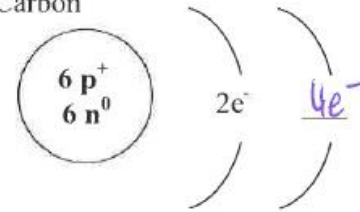
Beryllium



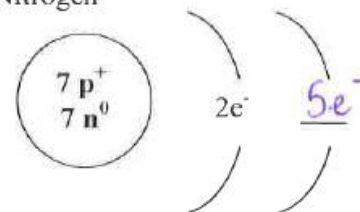
Boron



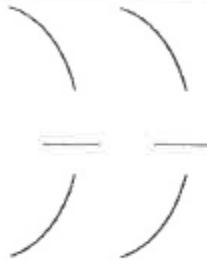
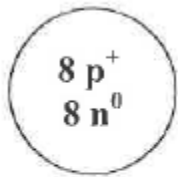
Carbon



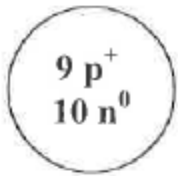
Nitrogen



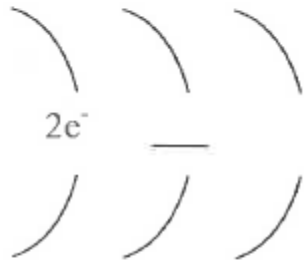
Oxygen



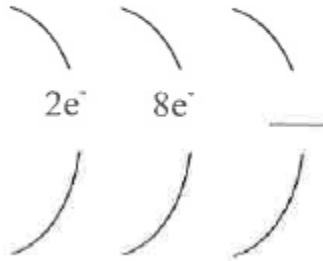
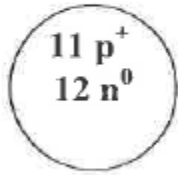
Flourine



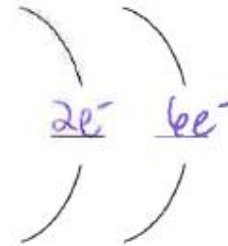
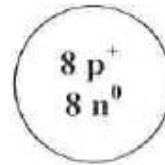
Neon



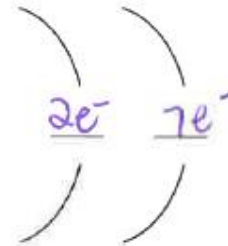
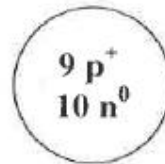
Sodium



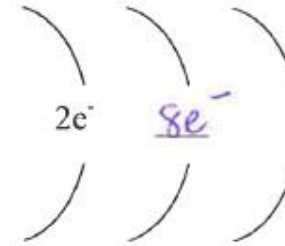
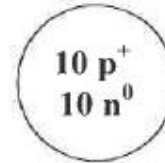
Oxygen



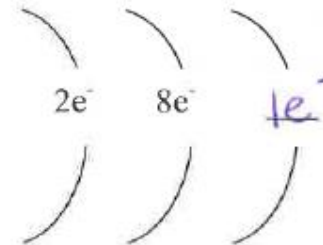
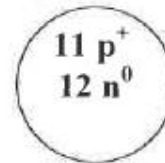
Flourine



Neon



Sodium



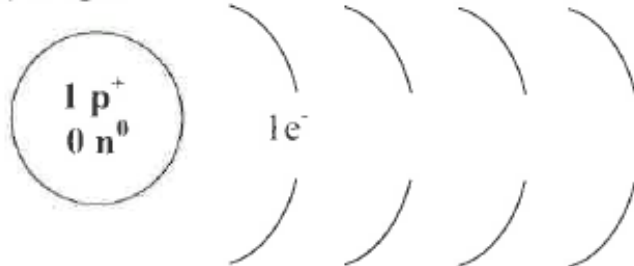
- Complete your other diagrams from your handout

Atom Stability

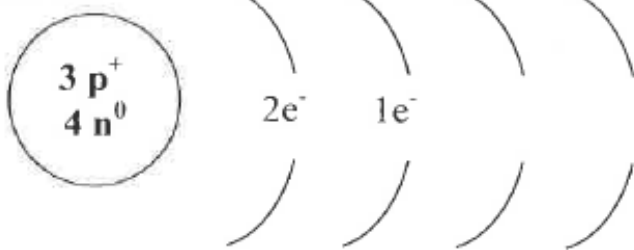
- Noble gases are very unreactive because their atoms have filled valence shells. Filled shells make atoms stable. Atoms with filled shells do not easily trade or share electrons.
- Other atoms gain or lose electrons in order to achieve the stability of noble gases. Gaining or losing electrons makes atoms into ions.
 - Metals lose electrons to form positive ions (more positive!)
 - Non-metals gain electrons to form negative ions (more negative!)
 - Ions have a similar electron arrangement to the nearest noble gas
 - Example: Sodium ion (**Na⁺**) has 11 protons (**11⁺**) and 10 electrons (**10⁻**) for a total charge of **1⁺**

	Lithium	Magnesium	Chlorine
Atom	Li 3 p 2, 1	Mg 12 p 2, 8, 2	Cl 17 p 2, 8, 7
Ion	Li ⁺ 3 p 2	Mg ²⁺ 12 p 2, 8	Cl ⁻ 17 p 2, 8, 8

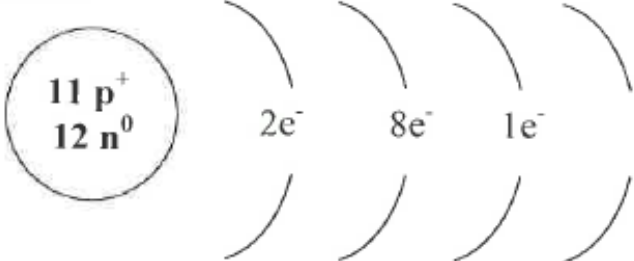
Hydrogen



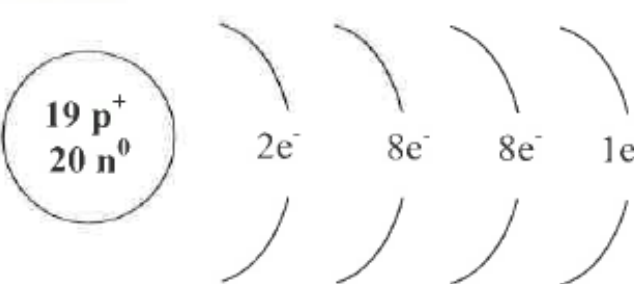
Lithium



Sodium



Potassium

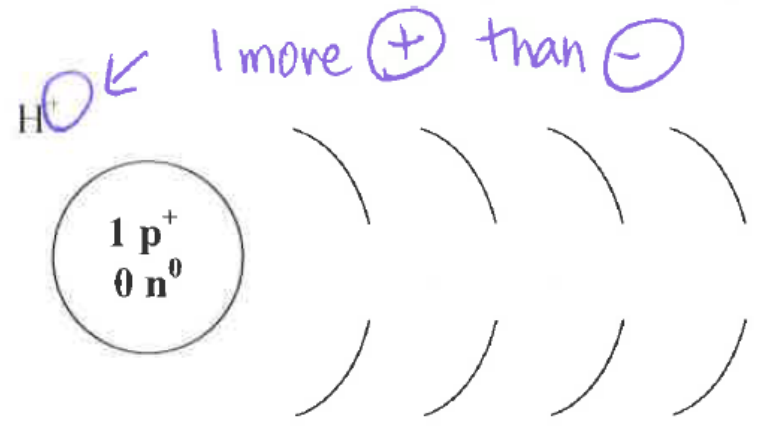
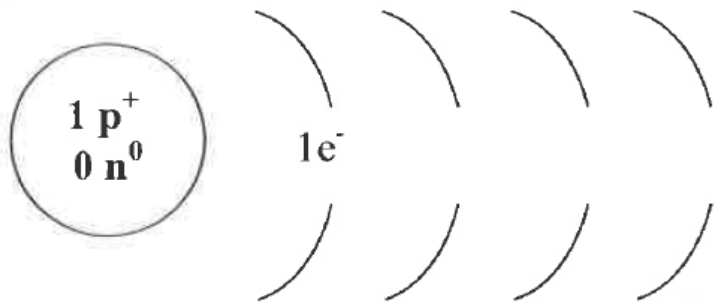


- Each of the Alkali metals has one electron in its outer most level. The atom becomes more **positive** if it can get rid of that one outer electron!
- If the atom is able to **give** the outer electron away it becomes **positive** in charge. It will have one more proton than electrons.
- Thus it is an **ion** with a **+** charge.

- Fill in the following Bohr Diagrams for the alkali metals and the non-metal halogens and their ions, the first pair is already done for you.

done.

H



Practice drawing Bohr models

- Handout
- Quiz next class on Bohr models and review
- Atomic theory (ch 1/20 test on Monday)