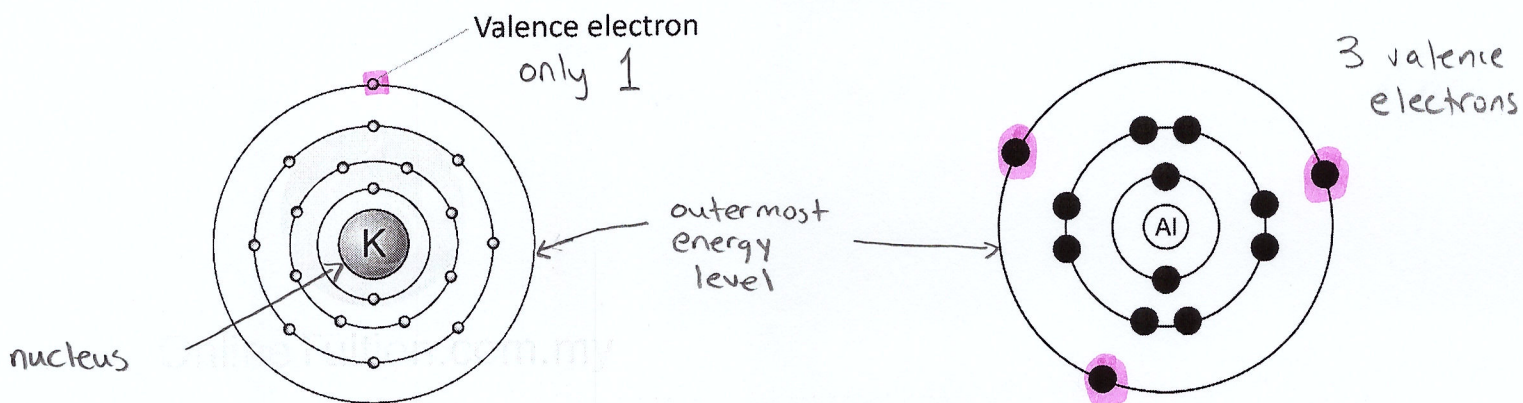


# Electron Dot Diagrams

- An **electron dot diagram** is a model that only shows the valence electrons present in an atom
  - Valence electrons** are the electrons only found in the outermost energy level (or the electrons farthest from the nucleus of the atom)
  - \* Valence electrons are involved in bond formation



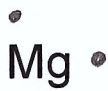
- An electron dot diagram consists of the symbol of the element with dots located around it to represent the valence electrons
- Steps needed to draw electron dot diagrams
  - Determine the number of valence electrons in the atom. The group number (ignoring the "1" in front for all numbers over 10) indicates the number of valence electrons in an atom.
  - Place the dots around the symbol clockwise for a maximum of four dots
  - If you have more electrons to place, go back to the top of the symbol and start pairing up the electrons

Periodic Table of the Elements

1																	18
1																	2
1	2											13	14	15	16	17	18
H Hydrogen 1.008	He Helium 4.003											B Boron 10.811	C Carbon 12.011	N Nitrogen 14.007	O Oxygen 15.999	F Fluorine 18.998	Ne Neon 20.180
3	4											5	6	7	8	9	10
Li Lithium 6.941	Be Beryllium 9.012											Al Aluminum 26.982	Si Silicon 28.086	P Phosphorus 30.974	S Sulfur 32.066	Cl Chlorine 35.453	Ar Argon 39.948
11	12	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Na Sodium 22.990	Mg Magnesium 24.305	Sc Scandium 44.956	Ti Titanium 47.867	V Vanadium 50.942	Cr Chromium 51.996	Mn Manganese 54.938	Fe Iron 55.845	Co Cobalt 58.933	Ni Nickel 58.693	Cu Copper 63.546	Zn Zinc 65.38	Ga Gallium 69.723	Ge Germanium 72.631	As Arsenic 74.922	Se Selenium 78.971	Br Bromine 79.904	Kr Krypton 84.798
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
K Potassium 39.098	Ca Calcium 40.078	Sc Scandium 44.956	Ti Titanium 47.867	V Vanadium 50.942	Cr Chromium 51.996	Mn Manganese 54.938	Fe Iron 55.845	Co Cobalt 58.933	Ni Nickel 58.693	Cu Copper 63.546	Zn Zinc 65.38	Ga Gallium 69.723	Ge Germanium 72.631	As Arsenic 74.922	Se Selenium 78.971	Br Bromine 79.904	Kr Krypton 84.798
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Rb Rubidium 84.458	Sr Strontium 87.62	Y Yttrium 88.906	Zr Zirconium 91.224	Nb Niobium 92.906	Mo Molybdenum 95.95	Tc Technetium 98.907	Ru Ruthenium 101.07	Rh Rhodium 102.906	Pd Palladium 106.42	Ag Silver 107.868	Cd Cadmium 112.414	In Indium 114.818	Sn Tin 118.710	Sb Antimony 121.760	Te Tellurium 127.6	I Iodine 126.904	Xe Xenon 131.294
55	56	57-71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Cs Cesium 132.905	Ba Barium 137.328	Lanthanides	Hf Hafnium 178.49	Ta Tantalum 180.948	W Tungsten 183.84	Re Rhenium 186.207	Os Osmium 190.23	Ir Iridium 192.222	Pt Platinum 195.085	Au Gold 196.967	Hg Mercury 200.592	Tl Thallium 204.382	Pb Lead 207.2	Bi Bismuth 208.980	Po Polonium 209	At Astatine 210	Rn Radon 222
87	88	89-103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118
Fr Francium 223	Ra Radium 226	Actinides	Rf Rutherfordium [261]	Db Dubnium [262]	Sg Seaborgium [266]	Bh Bohrium [264]	Hs Hassium [265]	Mt Meitnerium [268]	Ds Darmstadtium [271]	Rg Roentgenium [272]	Cn Copernicium [285]	Uut Ununtrium [288]	Fl Flerovium [289]	Uup Ununpentium [293]	Lv Livermorium [293]	Uus Ununseptium [294]	Uuo Ununoctium [294]

group #

EXAMPLES: Draw the electron dot diagram for each atom.



group # 2  
 $\therefore$  2 valence  $e^-$



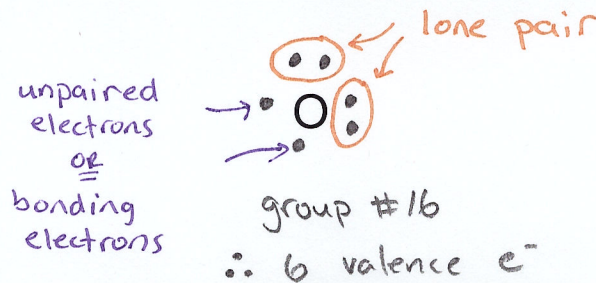
group # 4  
 $\therefore$  4 valence  $e^-$



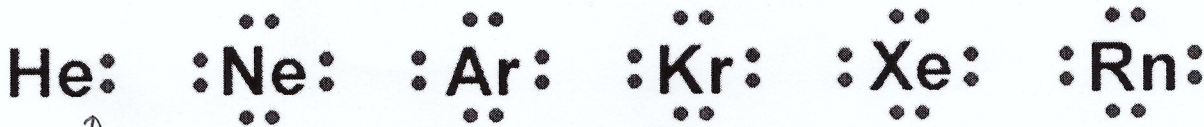
group # 17  
 $\therefore$  7 valence  $e^-$

**\*\*\*Now try Practice Problem #1\*\*\***

- \* • Two electrons that are paired together in the valence energy level are called a **lone pair**.
  - These electrons are **less likely to be involved in a chemical bond**.
- \* • An **unpaired electron** is a single electron found in the valence energy level and is **likely to be involved in chemical bonding**.
  - An unpaired electron is also sometimes referred to as a **bonding electron**.



- This helps explain why noble gases are inert and don't react with other atoms; there are no unpaired electrons (or bonding electrons) available to be involved in bond formation.



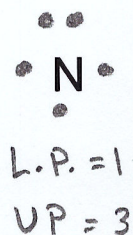
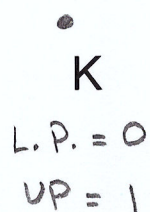
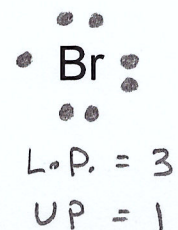
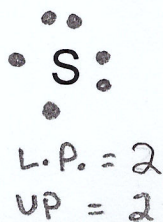
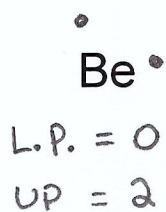
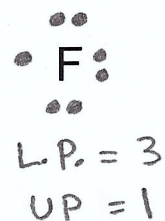
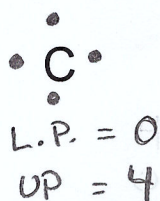
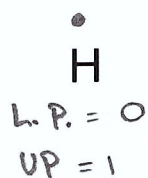
$\uparrow$   
 $e^-$  paired together b/c 1<sup>st</sup> energy level only allows for  $2e^-$

all group # 18  
 $\therefore$  8 valence  $e^-$

**\*\*\*Now try Practice Problem #2\*\*\***

## Practice Problems

1. Draw the electron dot diagram for each of the following atoms.



2. Identify how many lone pairs and how many unpaired electrons are present in each atom in question 1.

$\nearrow$  L.P.

$\downarrow$  UP