



Electron Configurations

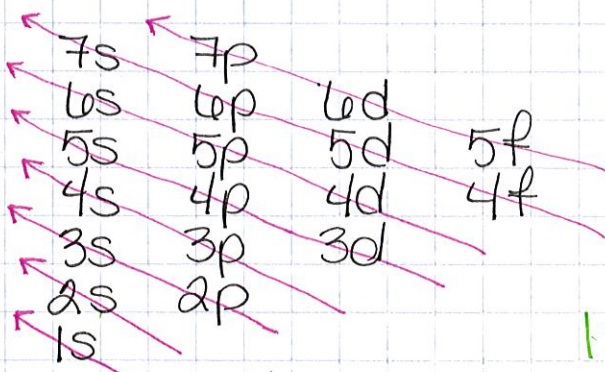
- show where the e^- 's reside within the orbital (energy levels) inside the atom.

1st way

- There are 7 orbitals in every atom. (they're numbered 1 \rightarrow 7)
- Each orbital has sublevels inside where the e^- reside. 2 e^- can exist in the same sublevel

| sublevels | shape | # sublevels | maximum # of e^- in all sublevels |
|--------------|---|-------------|-------------------------------------|
| s (sigma) |  sphere | 1 | 2 e^- |
| p (pi) |  infinity | 3 | 6 e^- |
| d (delta) | | 5 | 10 e^- |
| f | | 7 | 14 e^- |

Diagonal Rule - shows order the sublevels fill

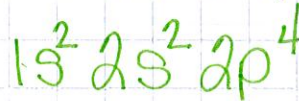


• nucleus (start)

s = 2 e^-
p = 6 e^-

d = 10 e^-
f = 14 e^-

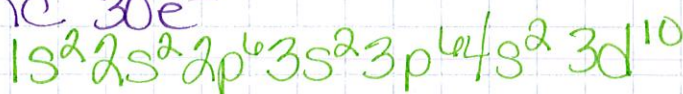
ex) Oxygen 8 e^-



ex) aluminum 13 e^-



ex) zinc 30 e^-



And way

Periodic Table of the Elements

start by H & go left to right across the rows counting the boxes for each sublevel.

1+ 3

Noble gases

| | |
|-------------------------------|--------------------------------|
| Hydrogen 1 H 1.01 | Helium 2 He 4.00 |
| Lithium 3 Li 6.94 | Beryllium 4 Be 9.01 |
| Sodium 11 Na 22.99 | Magnesium 12 Mg 24.31 |
| Potassium 19 K 39.10 | Calcium 20 Ca 40.08 |
| Rubidium 37 Rb 85.47 | Strontium 38 Sr 87.62 |
| Cesium 55 Cs 132.91 | Barium 56 Ba 137.33 |
| Francium 87 Fr [223] | Radium 88 Ra [226] |

| | | | | | | | | | | | | | | | |
|---------------------------------|--------------------------------|------------------------------------|---------------------------------|---------------------------------|---------------------------------|--------------------------------|----------------------------------|--------------------------------|----------------------------------|----------------------------------|--------------------------------|-----------------------------------|---------------------------------|-------------------------------|------------------------------|
| Scandium 21 Sc 44.96 | Titanium 22 Ti 47.88 | Vanadium 23 V 50.94 | Chromium 24 Cr 52.00 | Manganese 25 Mn 54.94 | Iron 26 Fe 55.85 | Cobalt 27 Co 58.93 | Nickel 28 Ni 58.69 | Copper 29 Cu 63.55 | Zinc 30 Zn 65.39 | Gallium 31 Ga 69.72 | Germanium 32 Ge 72.61 | Arsenic 33 As 74.92 | Selenium 34 Se 78.96 | Bromine 35 Br 79.90 | Krypton 36 Kr 83.80 |
| Yttrium 39 Y 88.91 | Zirconium 40 Zr 91.22 | Niobium 41 Nb 92.91 | Molybdenum 42 Mo 95.94 | Technetium 43 Tc [98] | Ruthenium 44 Ru 101.07 | Rhodium 45 Rh 102.91 | Palladium 46 Pd 106.42 | Silver 47 Ag 107.87 | Cadmium 48 Cd 112.41 | Indium 49 In 114.82 | Tin 50 Sn 118.71 | Antimony 51 Sb 121.76 | Tellurium 52 Te 127.60 | Iodine 53 I 126.90 | Xenon 54 Xe 131.29 |
| Lutetium 71 Lu 174.97 | Hafnium 72 Hf 178.49 | Tantalum 73 Ta 180.95 | Tungsten 74 W 183.84 | Rhenium 75 Re 186.21 | Osmium 76 Os 190.23 | Iridium 77 Ir 192.22 | Platinum 78 Pt 195.08 | Gold 79 Au 196.97 | Mercury 80 Hg 200.59 | Thallium 81 Tl 204.38 | Lead 82 Pb 207.20 | Bismuth 83 Bi 208.98 | Polonium 84 Po [209] | Astatine 85 At [210] | Radon 86 Rn [222] |
| Lanthanum 57 La 138.91 | Cerium 58 Ce 140.12 | Praseodymium 59 Pr 140.91 | Neodymium 60 Nd 144.24 | Promethium 61 Pm [145] | Samarium 62 Sm 150.36 | Europium 63 Eu 151.97 | Gadolinium 64 Gd 157.25 | Terbium 65 Tb 158.93 | Dysprosium 66 Dy 162.50 | Holmium 67 Ho 164.93 | Erbium 68 Er 167.26 | Thulium 69 Tm 168.93 | Ytterbium 70 Yb 173.04 | | |
| Actinium 89 Ac [227] | Thorium 90 Th 232.04 | Protactinium 91 Pa 231.04 | Uranium 92 U 238.03 | Neptunium 93 Np [237] | Plutonium 94 Pu [244] | Americium 95 Am [243] | Curium 96 Cm [247] | Berkelium 97 Bk [247] | Californium 98 Cf [251] | Einsteinium 99 Es [252] | Fermium 100 Fm [257] | Mendelevium 101 Md [258] | Nobelium 102 No [259] | | |

Ex) Ru # 44 - $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2 3d^10 4p^6 5s^2 4d^6$

Ex) Sb # 51 - $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2 3d^10 4p^6 5s^2 4d^10 5p^3$

| | | | | | | | | | | | | | |
|---------------------------------|-------------------------------|------------------------------------|---------------------------------|---------------------------------|--------------------------------|--------------------------------|----------------------------------|--------------------------------|----------------------------------|----------------------------------|-------------------------------|-----------------------------------|---------------------------------|
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3rd way - Noble Gas configuration

- uses the noble gases as a placeholder for part of the e⁻ configuration

1. - find the element you are writing the configuration for
2. - go up 1 row & all way to the right to determine the noble gas, write symbol in brackets
3. finish the e⁻ configuration.

Ex) Ru 44e⁻

old way $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^6$

Noble Gas way $[Kr] 5s^2 4d^6$

Ex) Sb 51e⁻

old way $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^3$

Noble Gas way $[Kr] 5s^2 4d^{10} 5p^3$