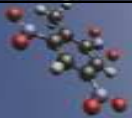


Atoms and Their Electrons

- Atoms
- Atomic Numbers
- Mass Numbers
- Electron Configuration

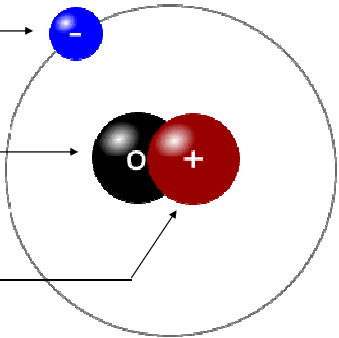
Author: J R Reid



Atoms

- Atoms are the smallest building blocks of **matter**.
- Atoms are composed of three main particles:
 - **Electrons** - small, negatively charged particles orbiting the nucleus
 - **Protons** - large (1860 times the mass of an electron), positively charged particles in the nucleus
 - **Neutrons** - large particles with no charge. They are also found in the nucleus

Atom Structure



- Electron →
- Neutron →
- Proton →

Atomic Number

- The **atomic number** for each element is found on a periodic table
- It is always the smallest number of the two numbers but each **periodic table** should have a key
- The atomic number (in the case of lithium it is 3) tells you how many protons it has
- Each element is determined by its number of protons i.e. H = 1 proton, He = 2 protons, Li = 3 protons...
- Check it out on a periodic table
- Note: The number of protons is always equal to the number of electrons in an atom

7
Li
3



Mass Number

- The other larger number on a periodic table is the **mass number**. This is the number you get if you add the number of protons and the neutrons of an atom together.
- An element must have a certain number of protons but it can have a range of numbers of neutrons i.e. hydrogen can have 0, 1, or 2 neutrons to go with its 1 proton. These are called **isotopes** of hydrogen
- In real life there may be a number of different stable isotopes of each element. This makes it difficult to work out which mass number to put onto a periodic table. Instead we put the relative mass number on (this is the average mass number of the element as found here on Earth). On the next page you will see that Lithium doesn't just have a mass number of 7, instead it is 6.9, meaning it's a mixture of the 7 isotope and the 6 isotope.

PERIODIC TABLE OF THE ELEMENTS

Atomic Number																		18
1																		2
H 1.0																		He 4.0
3	4											5	6	7	8	9	10	
Li 6.9	Be 9.0											B 10.8	C 12.0	N 14.0	O 16.0	F 19.0	Ne 20.2	
11	12											13	14	15	16	17	18	
Na 23.0	Mg 24.3											Al 27.0	Si 28.1	P 31.0	S 32.0	Cl 35.5	Ar 40.0	
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	
K 39.1	Ca 40.1	Sc 45.0	Ti 47.9	V 50.9	Cr 52.0	Mn 54.9	Fe 55.9	Co 58.9	Ni 58.7	Cu 63.6	Zn 65.4	Ga 69.7	Ge 72.6	As 74.9	Se 78.9	Br 79.9	Kr 83.8	
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
Rb 85.5	Sr 87.6	Y 88.9	Zr 91.2	Nb 92.9	Mo 95.9	Tc (98)	Ru 101.1	Rh 102.9	Pd 106.4	Ag 107.9	Cd 112.4	In 114.8	Sn 118.7	Sb 121.8	Te 127.6	I 126.9	Xe 131.3	
55	56	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	
Cs 132.9	Ba 137.3	Lu 175.0	Hf 178.5	Ta 180.9	W 183.9	Re 186.2	Os 190.2	Ir 192.2	Pt 195.1	Au 197.0	Hg 200.6	Tl 204.4	Pb 207.2	Bi 209.0	Po (209)	At (210)	Rn (222)	
87	88	103	104	105	106	107	108	109										
Fr (223)	Ra 226.0	Lr 262.1	Rf	Db	Sg	Bh	Hs	Mt										
57	58	59	60	61	62	63	64	65	66	67	68	69	70					
La* 138.9	Ce 149.1	Pr 140.9	Nd 144.2	Pm 146.9	Sm 150.4	Eu 152.0	Gd 157.3	Tb 159.0	Dy 162.5	Ho 164.9	Er 167.3	Tm 168.9	Yb 173.0					
89	90	91	92	93	94	95	96	97	98	99	100	101	102					
Ac 227.0	Th 232.0	Pa 231.0	U 238.0	Np 237.1	Pu 239.1	Am 241.1	Cm 247.1	Bk 249.1	Cf 251.1	Es 254.1	Fm 257.1	Md 258.1	No 255					

Working Out The Numbers

Atomic number	Mass number	Element	Protons	Neutrons	Electrons
3	7	Lithium (Li)	3	4	3
1	2				
1	1				
6	12				
7	13				

Electron Configuration 1

- Electrons don't just orbit the nucleus at the same distance from the nucleus (all the negatives together would repel each other too much). Instead they orbit in certain levels.
- These levels fill up from the inside out:
 - 2 electrons can fit into the first level
 - 8 electrons can fit into the second level
 - 8 electrons can fit into the one after that
- Atoms 'like' full shells of electrons (it makes them stable) and they can become ions by losing or gaining electrons to full up almost complete shells or by dropping incomplete shells

Working Out Electron Configurations					
Element	Electron number	Electrons in each shell			If it were to become a ion it would...
		1st	2nd	3rd	
Li	3	2	1	-	Lose 1 electron
Mg	12				
Al					
N					
Cl					