

## Today

Sections 1.1 – 1.3, 1.5

atomic structure and isotopes  
electrons, valence vs core electrons and using  
the periodic table for help  
periodic trends  
metals and nonmetals  
octet rule  
Ionic Interactions, Polar Bonds, and Nonpolar  
Bonds

## Next Class

Sections 1.4, 1.6

Different ways of representing molecules  
An introduction to Molecular Orbital Theory

## Mastering Chemistry Homework

Due 9/13 at 11:59 pm Introduction to Mastering Chemistry

estimated time required 40 min

Due 9/17 at 11:59 pm Homework Chapter 01

estimated time required 167 min

What Makes Carbon Carbon?

Sections 1.1 – 1.3

*# of protons*

*tiny magnet*

*Big ones react more slowly*

*reactions*

*radioactive*

*neutron*

*nothing particularly special*

*react identically*

${}^1_0n$   
 ${}^1_1p^+$

$6 {}^1_1p^+$   
 $6 {}^1_0n$   
 ${}^{12}C$   
 $\uparrow 8.89$

$6 {}^1_1p^+$   
 $7 {}^1_0n$   
 ${}^{13}C$   
 $1.1$

$6 {}^1_1p^+$   
 $8 {}^1_0n$   
 ${}^{14}C$   
 $< 0.001$

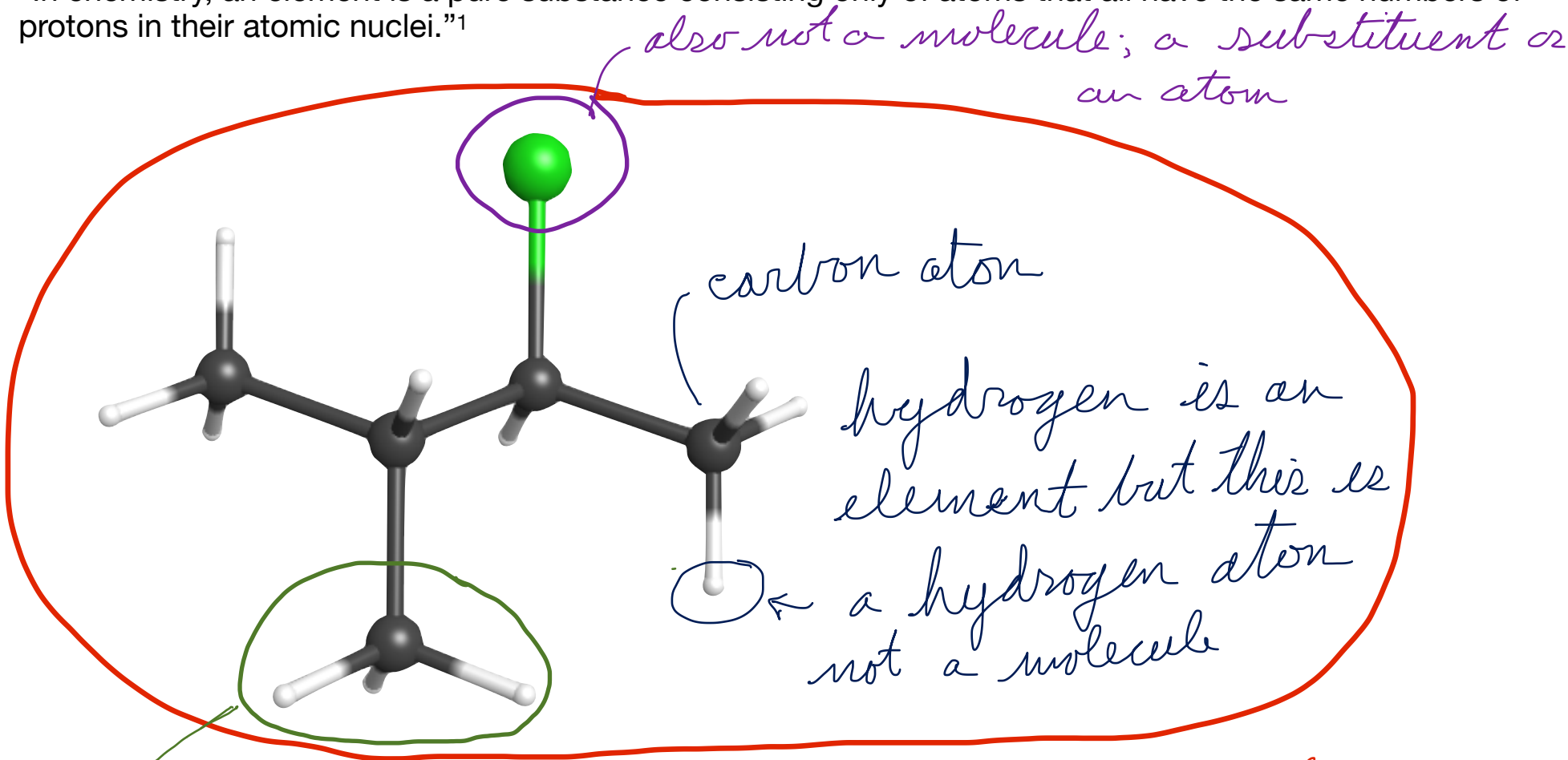
Remember atomic structure, meaning of isotope

Atoms, Elements, Molecules, and Substituents or Groups

*What to call stuff*

A diversion into the language of chemistry...

"In chemistry, an element is a pure substance consisting only of atoms that all have the same numbers of protons in their atomic nuclei."<sup>1</sup>



*all of these atoms together are a molecule*  
*these atoms are not a molecule, they are a group or a substituent*

<sup>1</sup> [https://en.wikipedia.org/wiki/Chemical\\_element](https://en.wikipedia.org/wiki/Chemical_element)

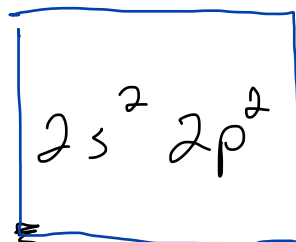
# And Where Are the Electrons Again?

Sections 1.1 – 1.3

$e^-$  exist in  $e^-$  clouds, shells, orbitals, energy levels

ground state  
 $e^-$  configuration

=  $1s^2$  /  
core  $e^-$



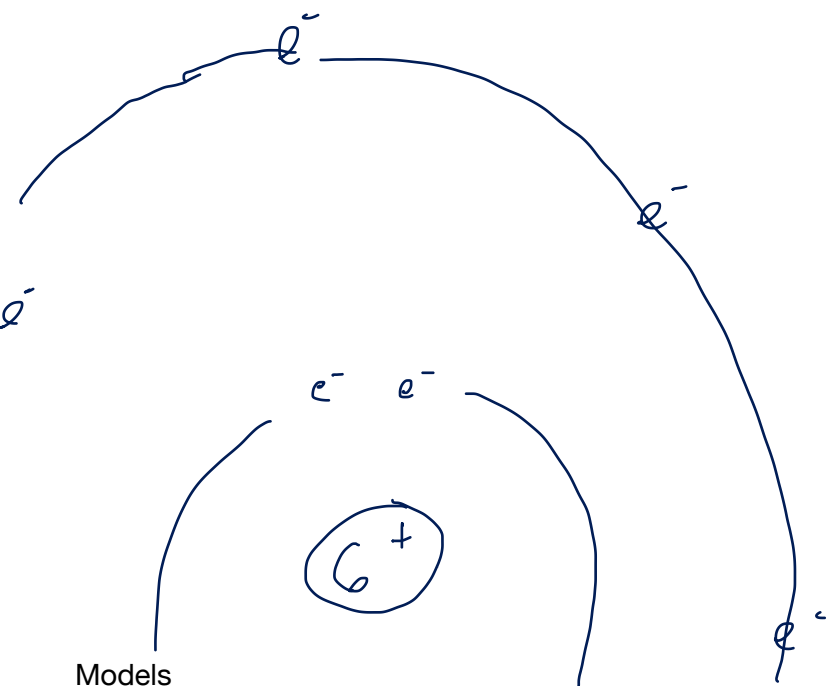
valence  $e^-$

$e^-$  repulsion



↓  
 $l=0$  is an s orbital

$n=1$  is the first principle energy level  
↑ is an  $e^-$   $m_s = +\frac{1}{2}$



Models

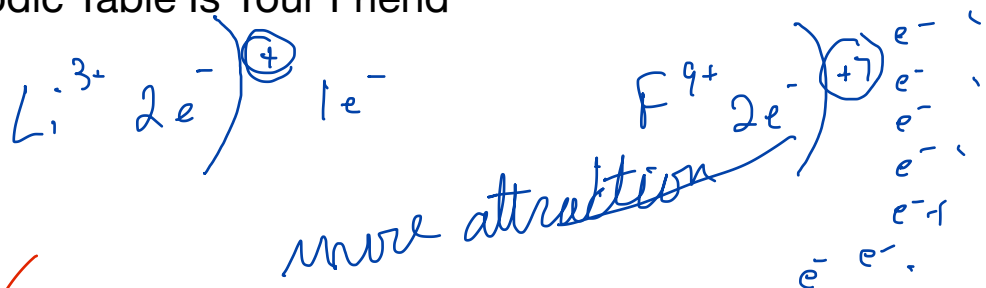
Remember how electrons are distributed  
Remember the importance of valence electrons



# The Periodic Table Is Your Friend

$F > O > N < Cl > C > H$

Sections 1.1 – 1.3



*electronegativity*

An atom's ability to attract an electron in a bond

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og

*increase eneg*

*increase size*

*size increases from right to left and from top to bottom*

*size differences from row to row are significant... within a row... not so much*

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Remember periodic trends

# The Periodic Table Is Your Friend

## Sections 1.1 – 1.3

1																	2
H																	He
3	4											5	6	7	8	9	10
Li	Be											B	C	N	O	F	Ne
11	12											13	14	15	16	17	18
Na	Mg											Al	Si	P	S	Cl	Ar
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
87	88	89	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og

*metals tend to lose e<sup>-</sup>*

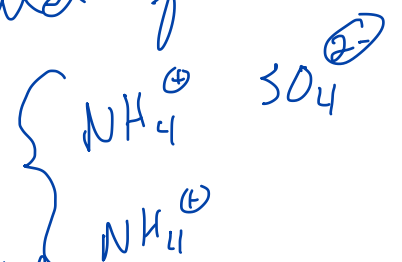
*non-metal tend to gain electrons or share e<sup>-</sup>*

*metal & non-metal = ionic*

*non metals can combine and form ions*

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

*we can make ionic compounds with non-metals*



Identify metals and non-metals





