

Today

Next Class

Attendance

Sections 1.4, 1.6

Sections 1.1 – 1.3, 1.5

Different ways of representing molecules
An introduction to Molecular Orbital Theory

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

Introduction to Mastering Chemistry for Organic Chemistry is open and due by 11:59 pm on 9/18

Homework Chapter 1 is open and due by 11:59 pm on 9/21

The Periodic Table Is Your Friend

Sections 1.1 – 1.3

Atomic # Z # of ip^+
 # e^- in neutral element

1																	2
H																	He
3	4															10	
Li	Be															Ne	
11	12															18	
Na	Mg															Ar	
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
K	Ca	Sc	Ti	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

$n=1$
 $n=2$
 $n=3$
 $n=6$

$1s^1$
 s

$1s^2$

d

$n=3$

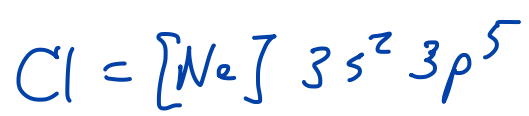
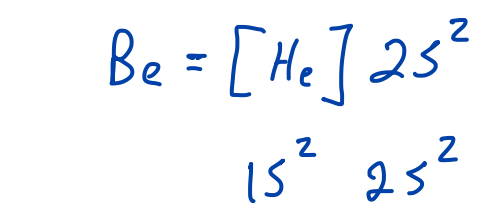
$n=4$

$n=5$

$n=6$

$n=4$

$n=5$



same valence e^- config

Cl has 10 core e^- 's

F has 2 core e^- 's

Remember how electrons are distributed into orbitals
 Remember the importance of valence and core electrons

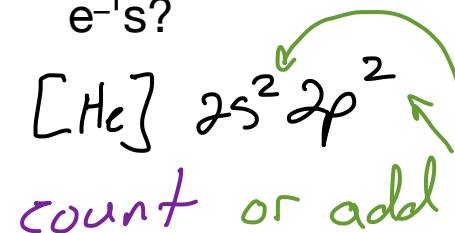
Example Electron configurations

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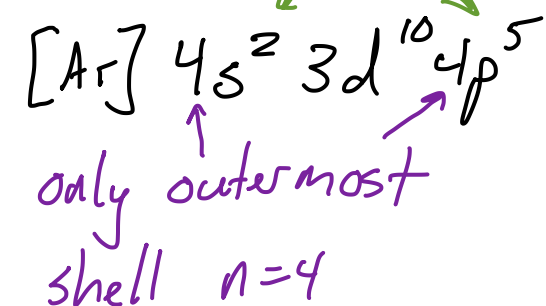
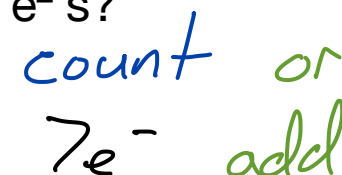
58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

C electron config
and # of valence
e-'s?

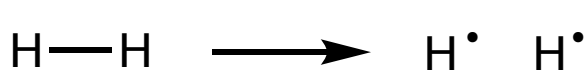


4e⁻

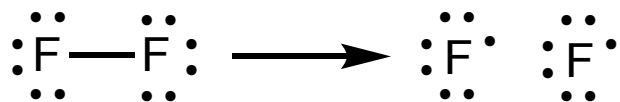
Br electron config
and # of valence
e-'s?



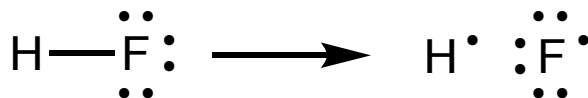
The measure of the ability of an atom to attract shared electrons



$$\Delta H_{\text{BDE}} = 436 \text{ kJ/mol}^1$$



$$\Delta H_{\text{BDE}} = 155 \text{ kJ/mol}^1$$



assuming BDE is average of H_2 and F_2 BDE

predict $\Delta H_{\text{BDE}} = 296 \text{ kJ/mol} ?$

@ why isn't BDE for HF just the average of the $\text{H}_2 + \text{F}_2$ BDE's? something else holding them together?

565

~~*296*~~

b If H is \oplus & F is \ominus then that attraction would make the bond stronger.

$\text{H}-\ddot{\text{F}}: \rightleftharpoons \text{H}^{\oplus} \text{F}^{\ominus}$

$\uparrow \uparrow$
attraction between \oplus & \ominus

c But why would F get more e^- density and be \ominus ?



$\text{F}'s + 9$
nucleus is more attractive to e^- 's than the $\text{H}'s + 1$ nucleus

$\delta^+ \quad \delta^-$
 $\text{H}-\text{F}$
 δ (lower case delta) means partial charge

The Periodic Table Is Your Friend: Electronegativity

Sections 1.1 – 1.3

a better estimate

Z_{eff} for C is 3.25
for F is 5.20

valence e^- $4e^-$ $7e^-$
 Z_{eff} $+4$ $+7$
 core e^- $2e^-$ $2e^-$
 effective nuclear charge $+6$ $+9$
 is what valence e^- 's
 experience as the nuclear
 charge

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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
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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

eneg increases
 from left to
 right because
 nuclear charge
 increases but the
 # of core e^- 's
 stays the same.

because $V e^-$'s
 move farther
 out from the
 nucleus as we

we go down the table
 (as the principal quantum
 # increases) attraction
 decreases so eneg decreases

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

Remember periodic trends $Z_{\text{eff}} = 5.2$ & 6.1



The Periodic Table Is Your Friend: Size

Sections 1.1 – 1.3

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

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

Why does electronegativity or the size of the atom matter?

Sections 1.1 – 1.3

High energy electrons are reactive

low energy electrons are less reactive

The Periodic Table Is Your Friend

Sections 1.1 – 1.3

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

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

Identify metals and non-metals

The Periodic Table Is Your Friend

Sections 1.1 – 1.3

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											31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y											49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57 La											81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 Ac											113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og
		58 Ce					68 Er	69 Tm	70 Yb	71 Lu								
		90 Th					100 Fm	101 Md	102 No	103 Lr								

Predict the number of electrons or bonds needed for an element to form a stable compound

