TABLE 8.6 Lewis Structures in Which the Central Atom Exceeds an Octet

Group 4A	Group 5A	Group 6A	Group 7A	Group 8
SiF_5^-	PF_5	SF_4	ClF_3	XeF_2
SiF_6^{2-}	PF_6^-	SF_6	BrF_5	XeF_4

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Linear | Trigonal planar | Tetrahedral | Trigonal bipyramidal | Octahedral

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Fig. 8-4, p. 368

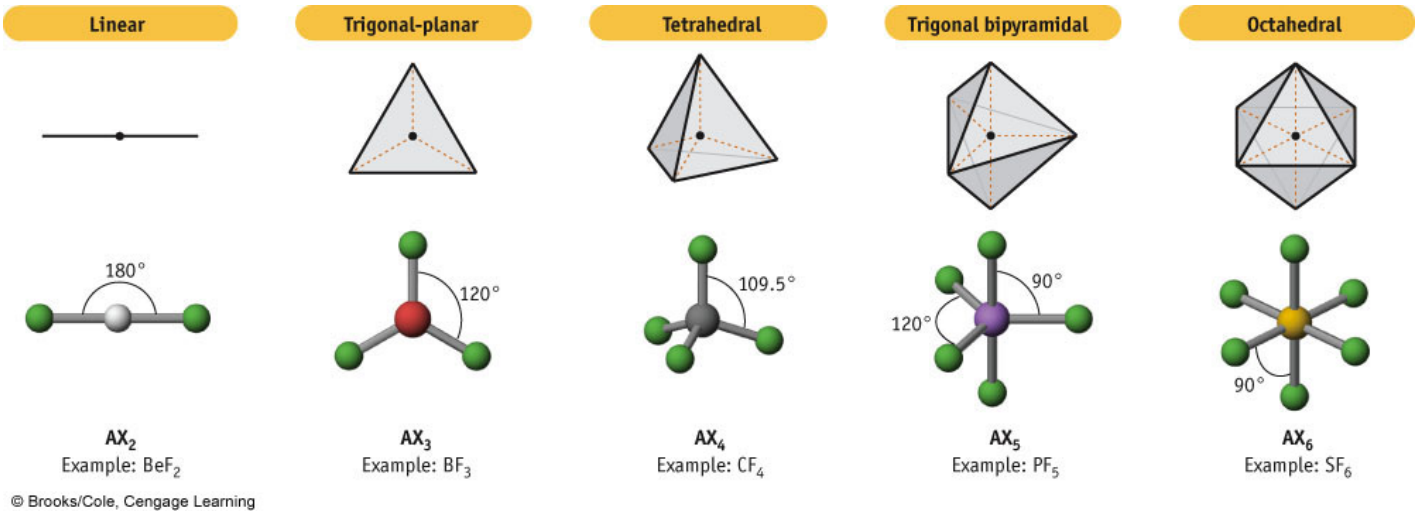

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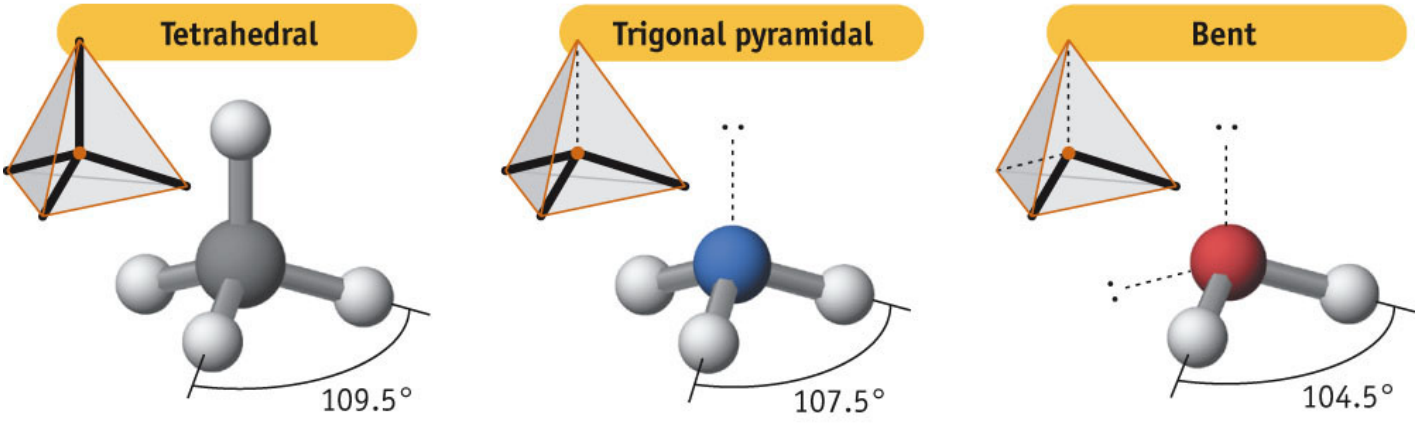
Fig. 8-5, p. 369

FOUR ELECTRON PAIRS
Electron Pair Geometry = tetrahedral



Methane, CH_4
4 bond pairs
no lone pairs

(a)

Ammonia, NH_3
3 bond pairs
1 lone pair

(b)

Water, H_2O
2 bond pairs
2 lone pairs

(c)

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Fig. 8-6, p. 371

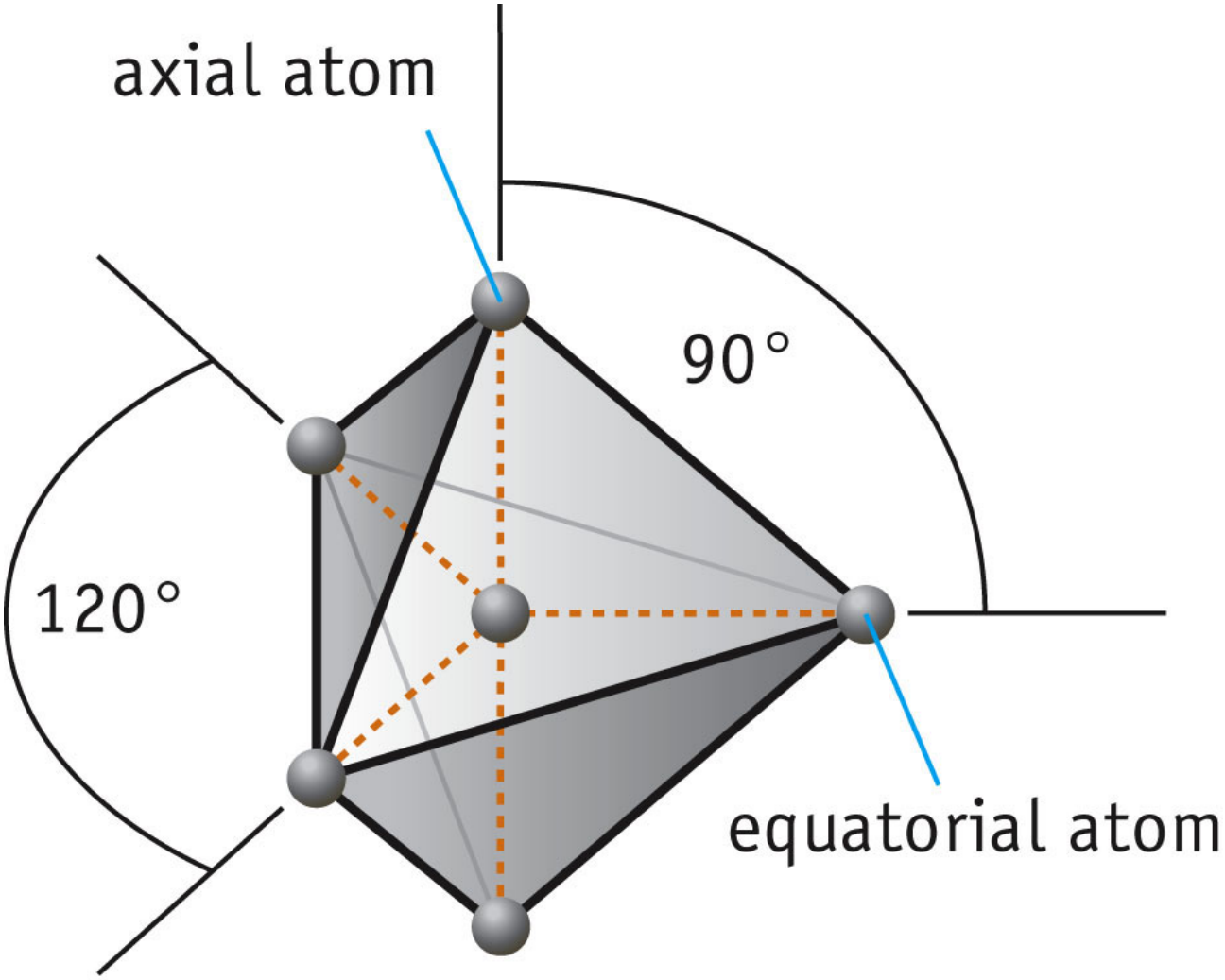

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Fig. 8-7, p. 372

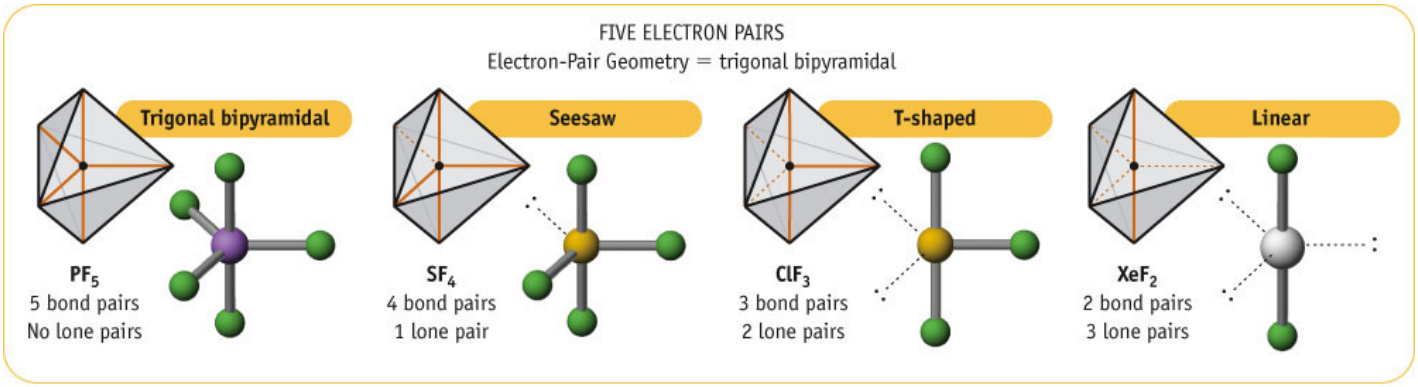

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Fig. 8-8, p. 372

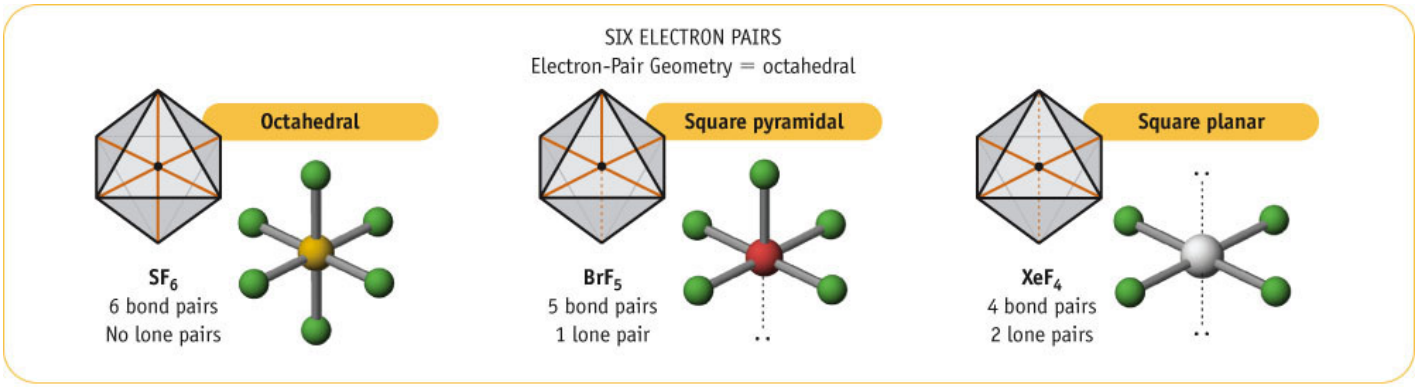

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Fig. 8-8, p. 372

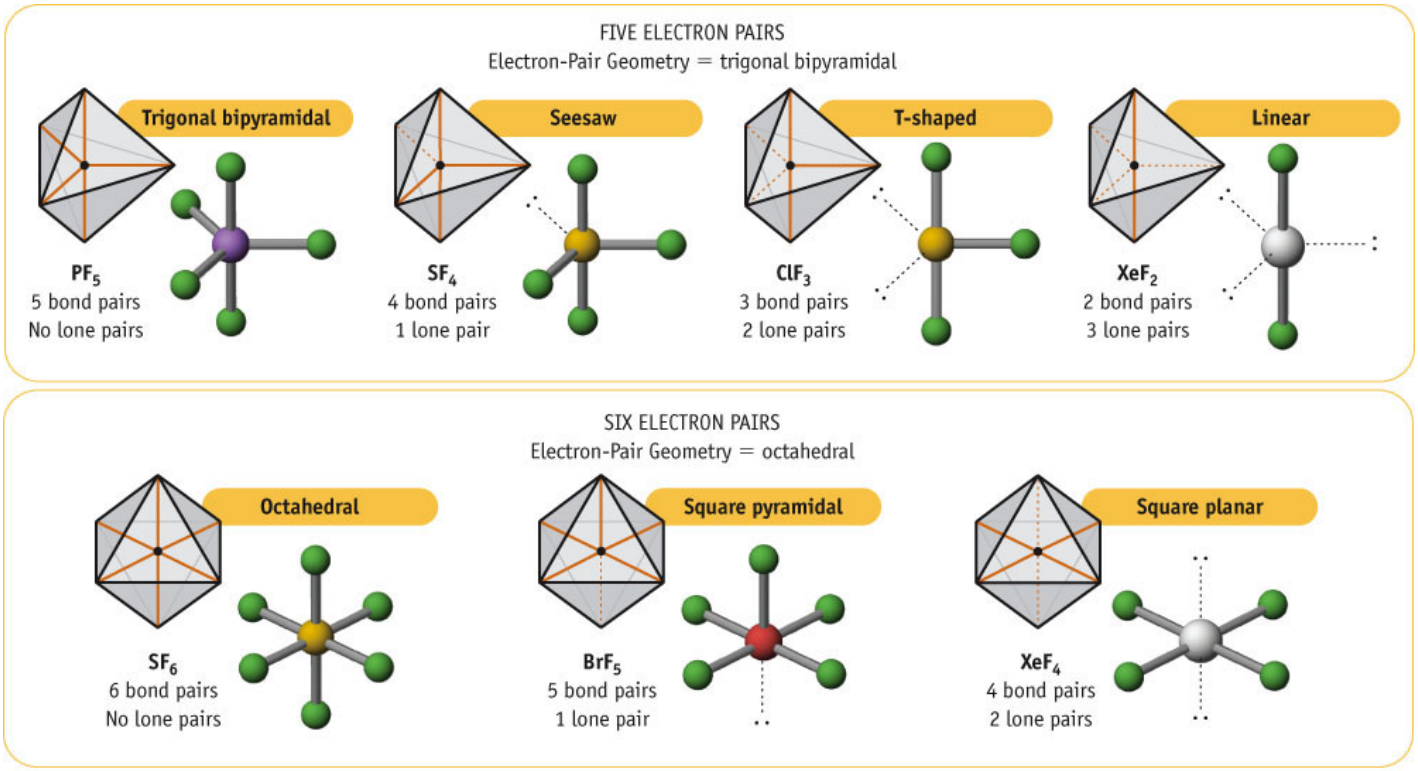

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Fig. 8-8, p. 372

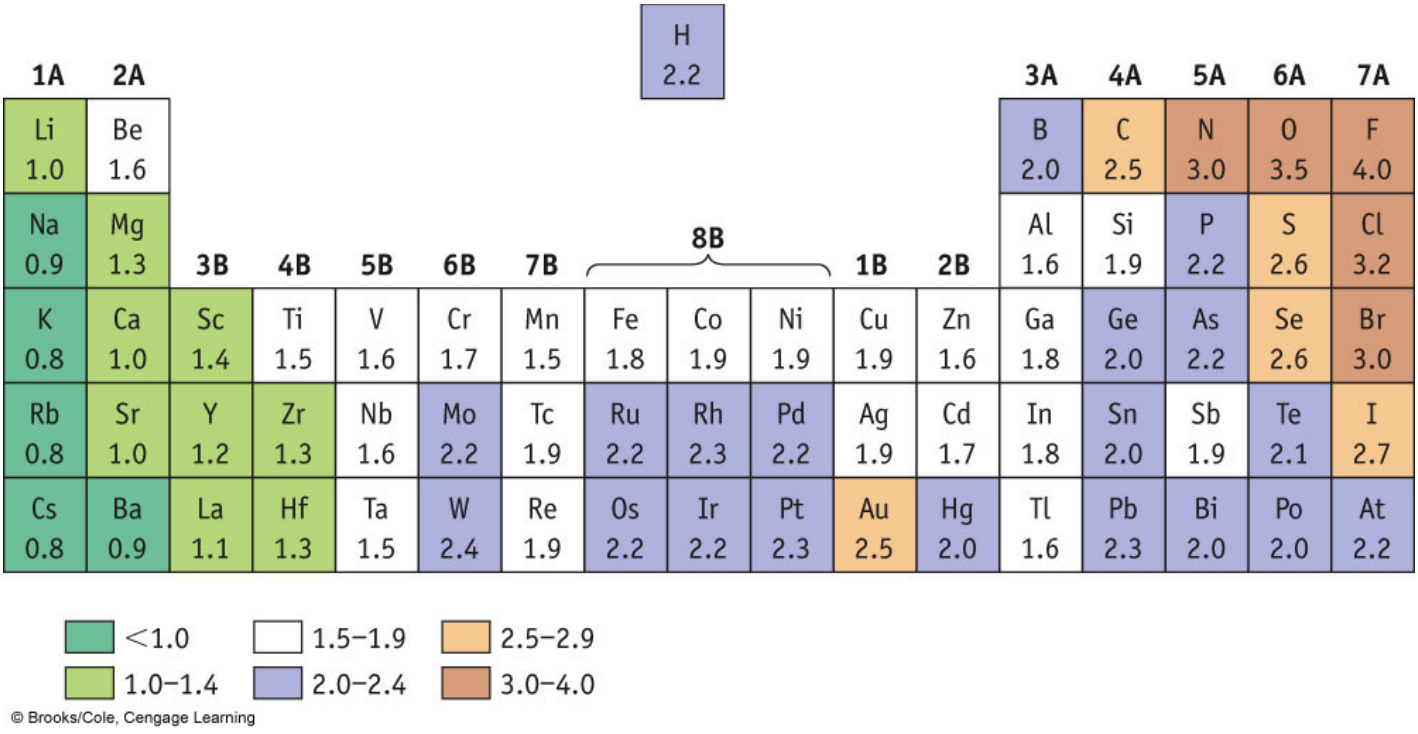

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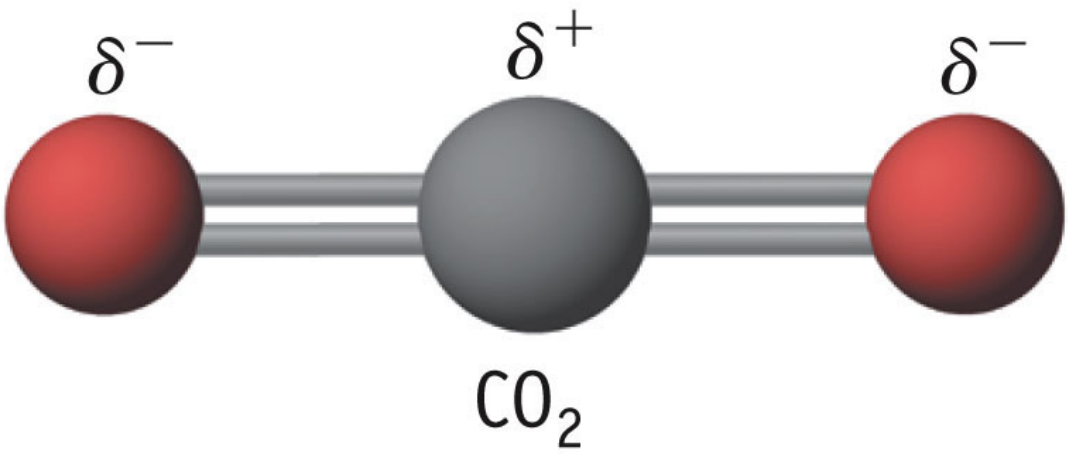
Fig. 8-11, p. 376

No net dipole moment



(a)

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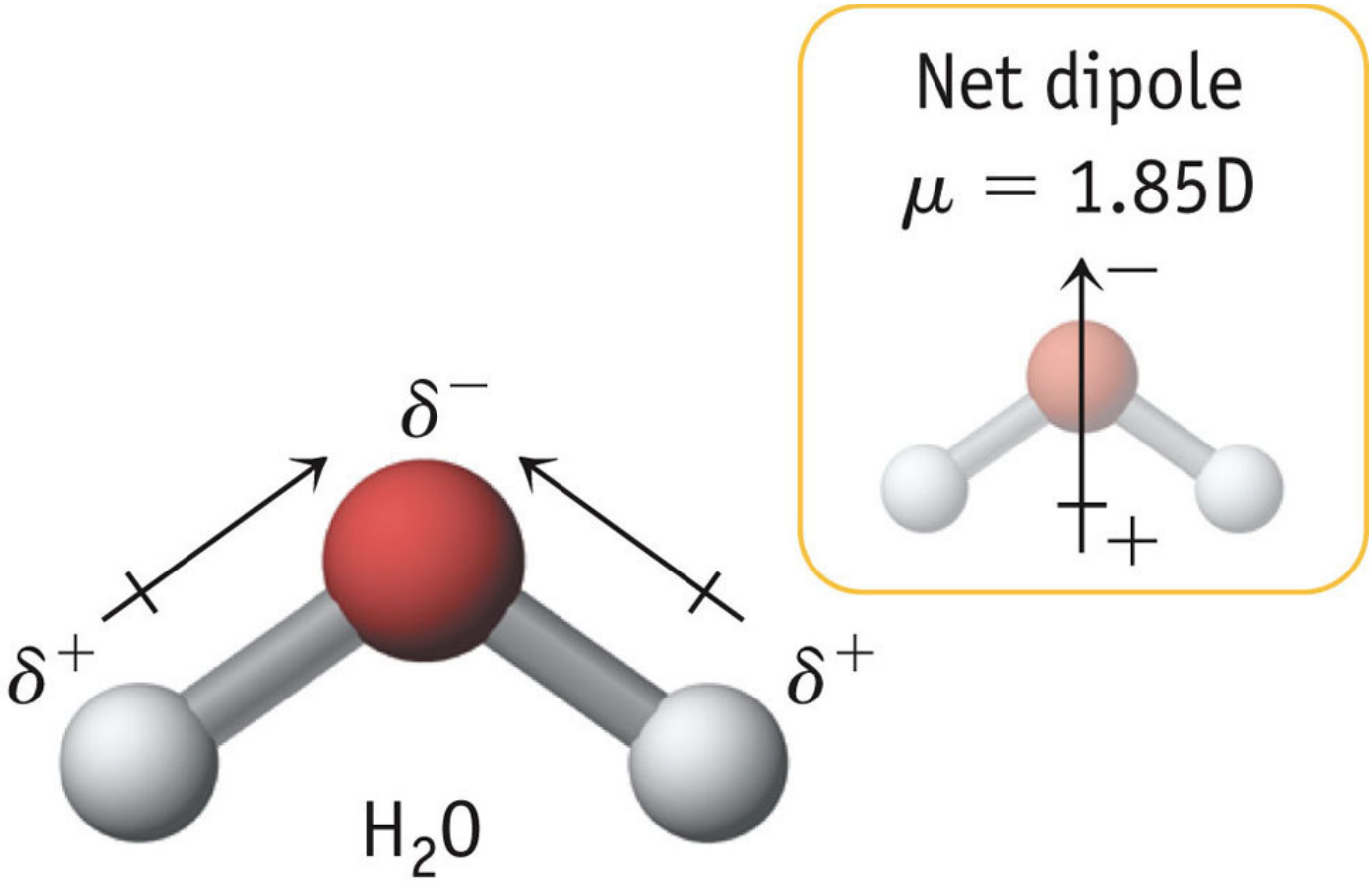
Fig. 8-13, p. 381



(b)

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Fig. 8-13, p. 381

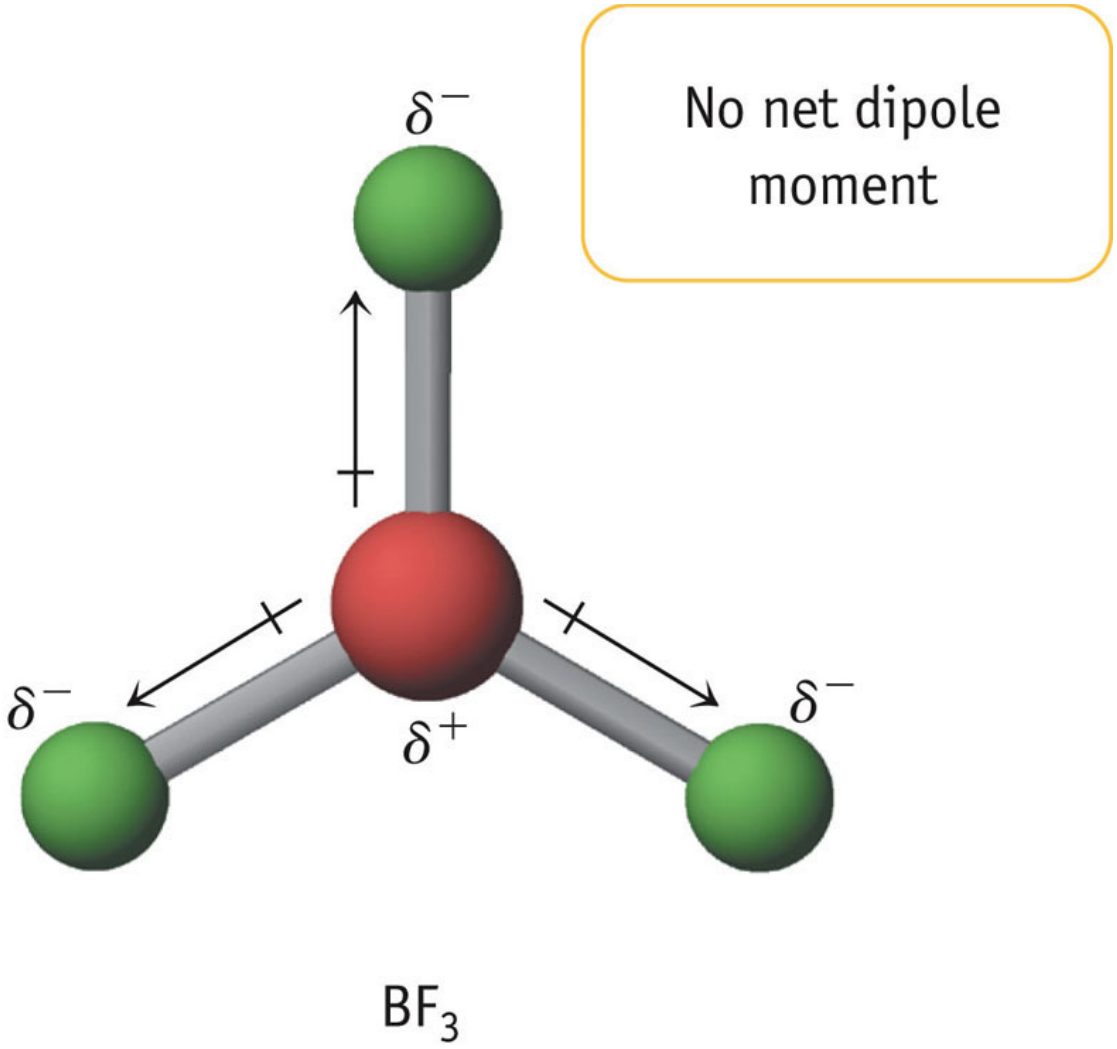

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Fig. 8-14, p. 383

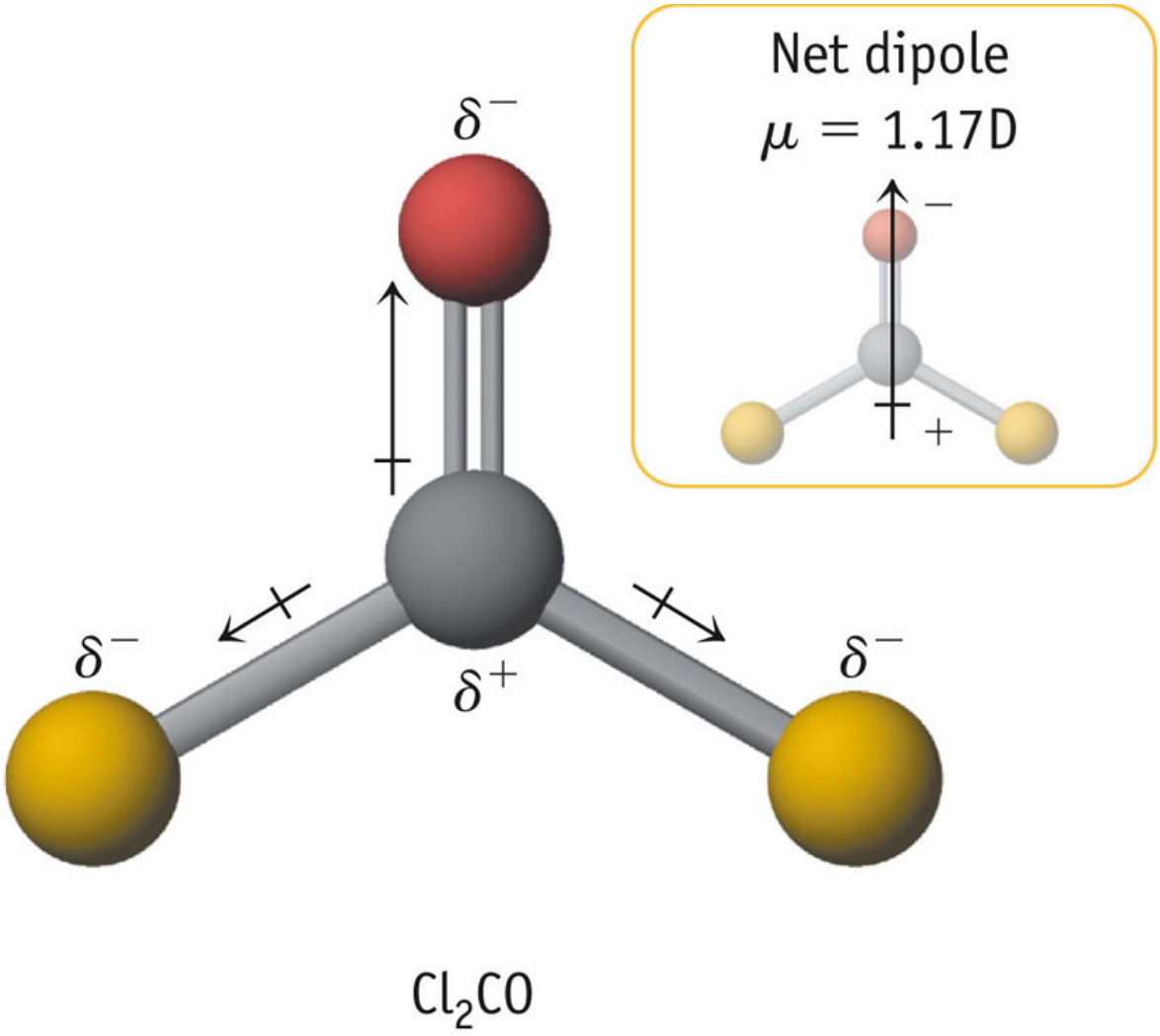

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Fig. 8-14, p. 383

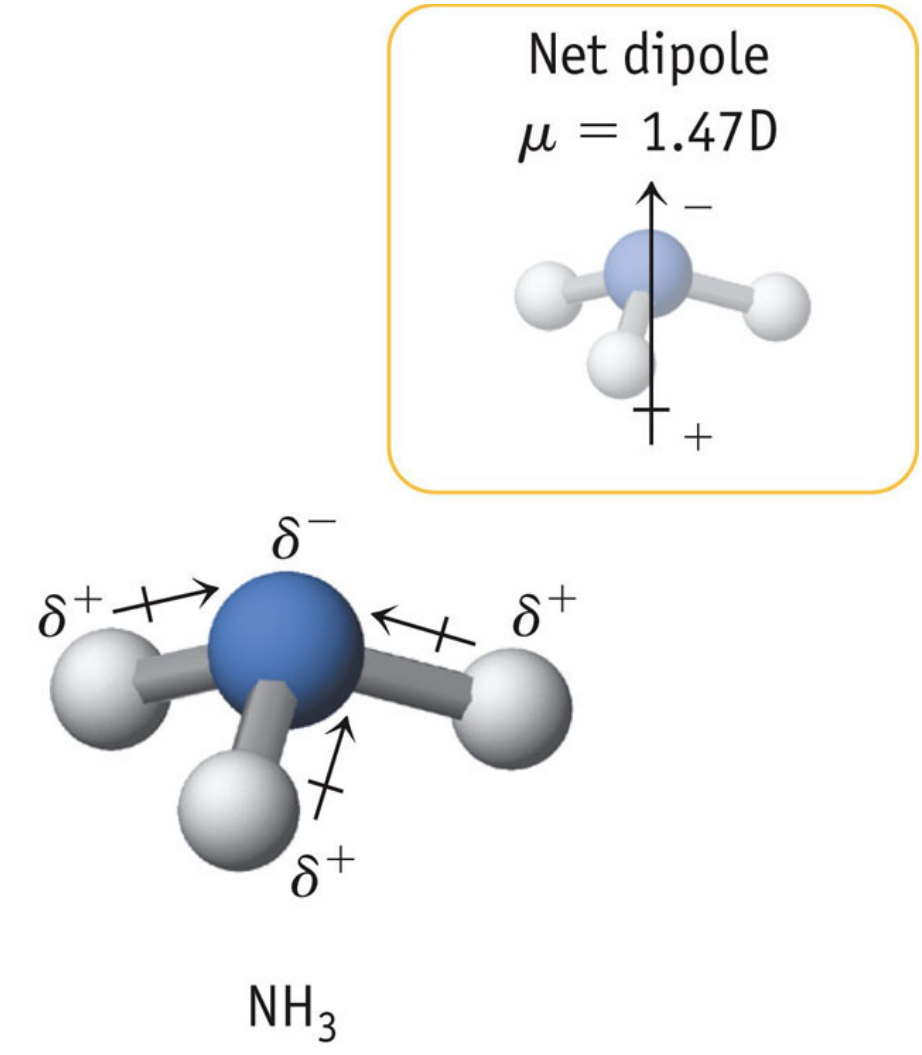

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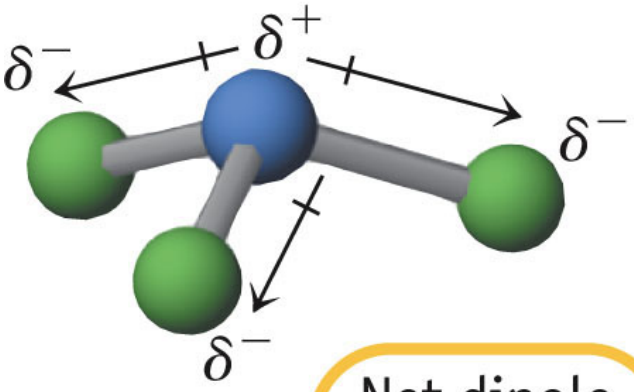
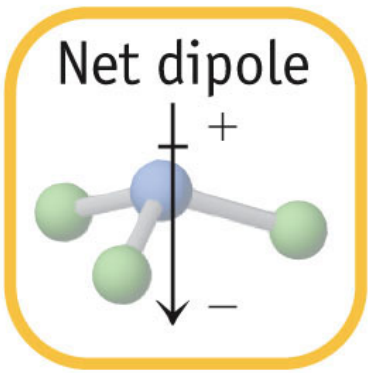
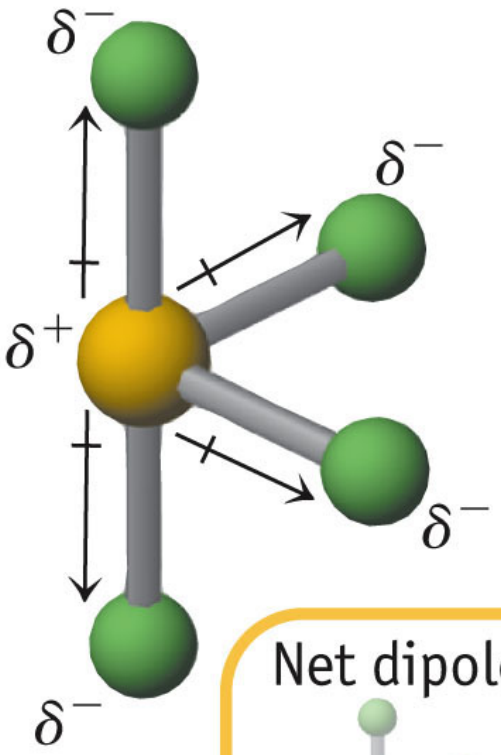
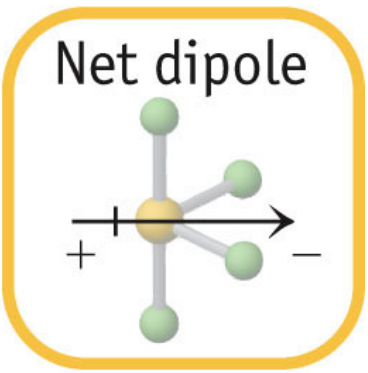
Fig. 8-14, p. 383





NF_3





SF_4

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Example 8-12, p. 384

TABLE 8.8 Some Average Single- and Multiple-Bond Lengths in Picometers (pm)*

Single Bond Lengths

	Group 1A	4A	5A	6A	7A	4A	5A	6A	7A	7A	7A
	H	C	N	O	F	Si	P	S	Cl	Br	I
H	74	110	98	94	92	145	138	132	127	142	161
C		154	147	143	141	194	187	181	176	191	210
N			140	136	134	187	180	174	169	184	203
O				132	130	183	176	170	165	180	199
F					128	181	174	168	163	178	197
Si						234	227	221	216	231	250
P							220	214	209	224	243
S								208	203	218	237
Cl									200	213	232
Br										228	247
I											266

Multiple Bond Lengths

C═C	134	C≡C	121
C═N	127	C≡N	115
C═O	122	C≡O	113
N═O	115	N≡O	108

*1 pm = 10^{-12} m.

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Table 8-8, p. 387

TABLE 8.9 Some Average Bond Dissociation Enthalpies (kJ/mol)*

Single Bonds

	H	C	N	O	F	Si	P	S	Cl	Br	I
H	436	413	391	463	565	328	322	347	432	366	299
C		346	305	358	485	—	—	272	339	285	213
N			163	201	283	—	—	—	192	—	—
O				146	—	452	335	—	218	201	201
F					155	565	490	284	253	249	278
Si						222	—	293	381	310	234
P							201	—	326	—	184
S								226	255	—	—
Cl									242	216	208
Br										193	175
I											151

Multiple Bonds

N═N	418	C═C	610
N≡N	945	C≡C	835
C═N	615	C═O	745
C≡N	887	C≡O	1046
O═O (in O_2)	498		

*Sources of dissociation enthalpies: I. Klotz and R. M. Rosenberg: *Chemical Thermodynamics*, 4th Ed., p. 55, New York, John Wiley, 1994; and J. E. Huheey, E. A. Keiter, and R. L. Keiter: *Inorganic Chemistry* 4th Ed., Table E. 1, New York, Harper-Collins, 1993. See also Lange's *Handbook of Chemistry*, J. A. Dean (ed.), McGraw-Hill Inc., New York.

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Table 8-9, p. 389