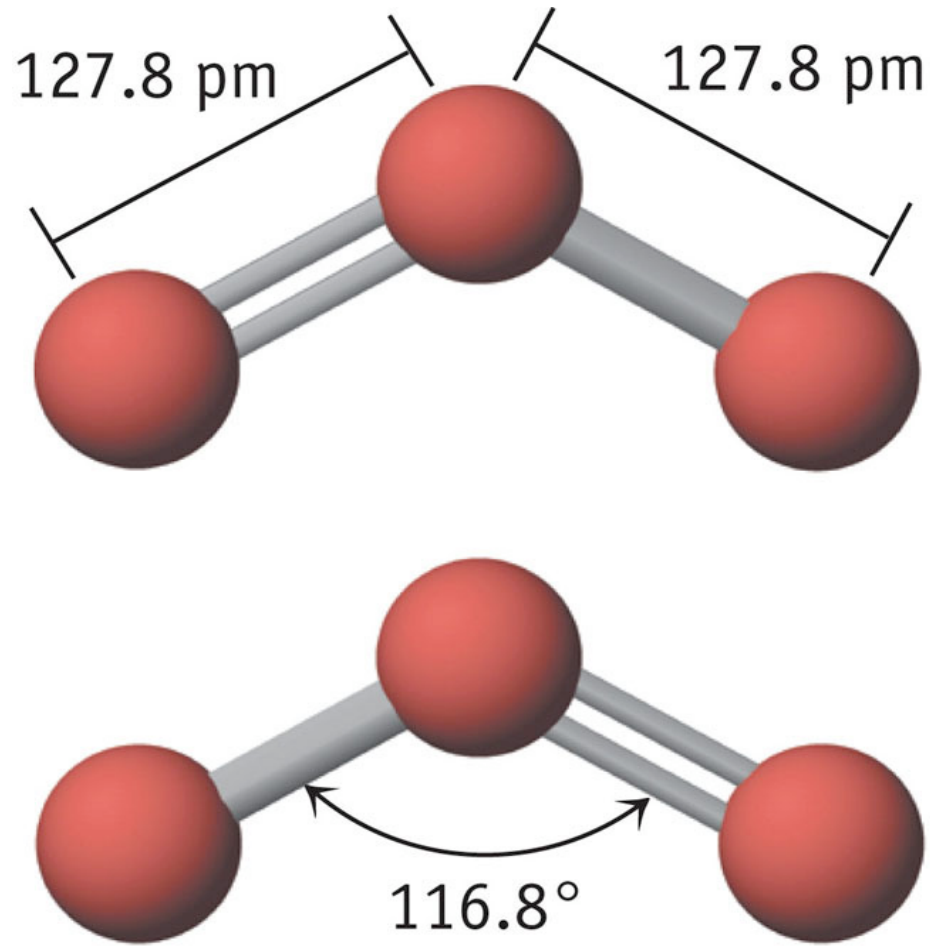


How do we know (predict) that ozone is bent?



How do we know (predict) that ozone is bent?

Coulomb!

How do we know (predict) that ozone is bent?

Coulomb!
and Lewis

How do we know (predict) that ozone is bent?

Coulomb!
and Lewis

- Consider BeF_2

How do we know (predict) that ozone is bent?

Coulomb!
and Lewis

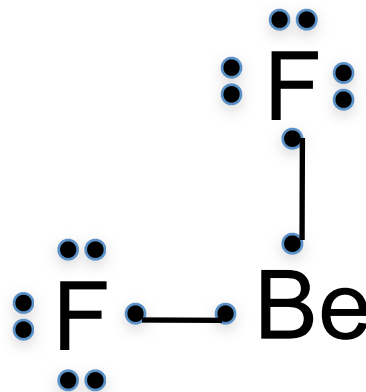
- Consider BeF_2



How do we know (predict) that ozone is bent?

Coulomb!
and Lewis

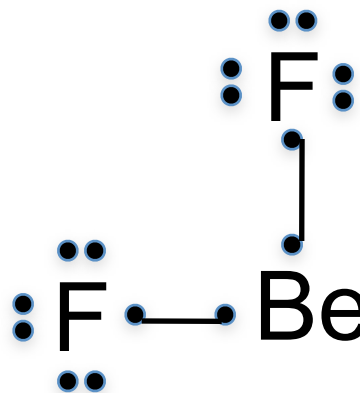
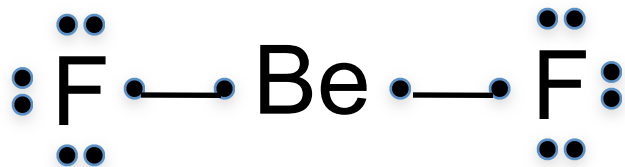
- Consider BeF_2



How do we know (predict) that ozone is bent?

Coulomb!
and Lewis

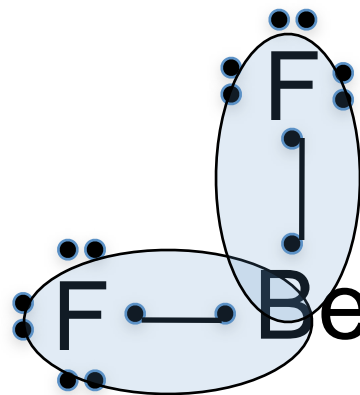
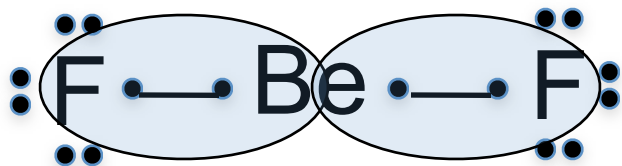
- Consider BeF_2



How do we know (predict) that ozone is bent?

Coulomb!
and Lewis

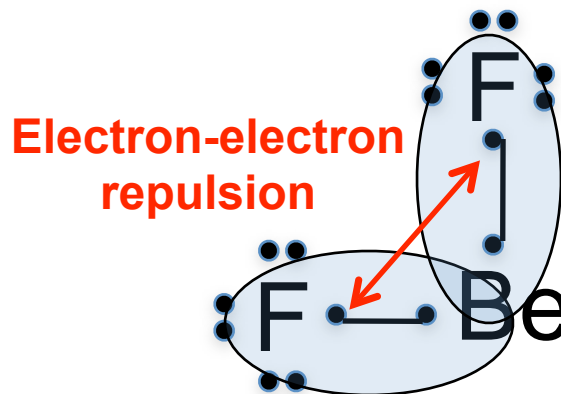
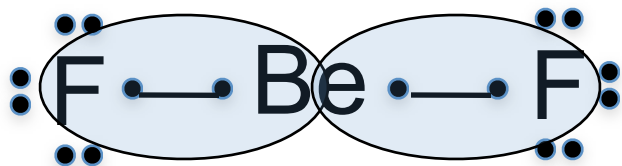
- Consider BeF_2



How do we know (predict) that ozone is bent?

Coulomb!
and Lewis

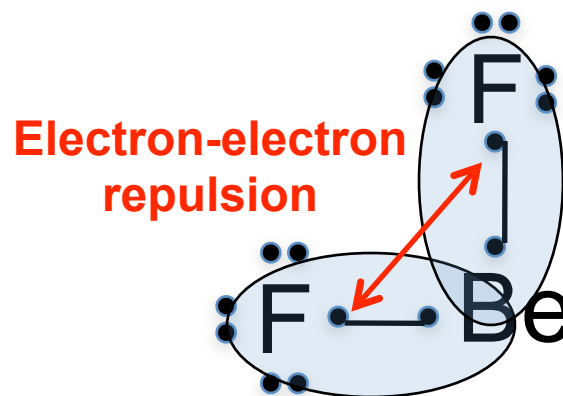
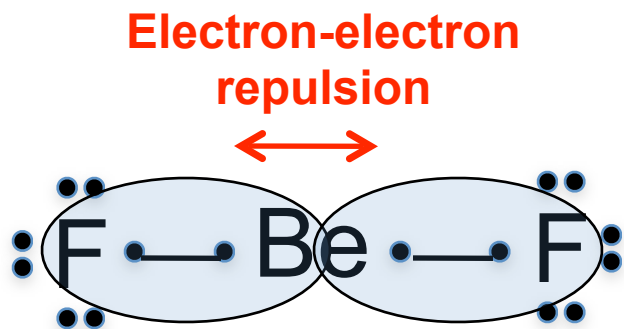
- Consider BeF_2



How do we know (predict) that ozone is bent?

Coulomb!
and Lewis

- Consider BeF_2



Valence Shell Electron Pair Repulsion

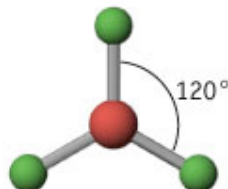
Linear



AX_2

Example: BeF_2

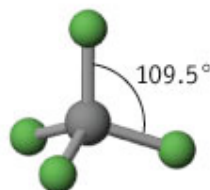
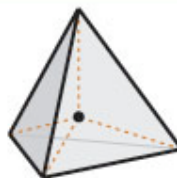
Trigonal-planar



AX_3

Example: BF_3

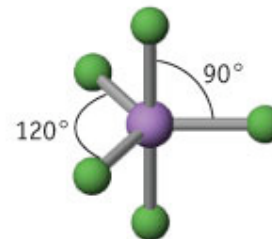
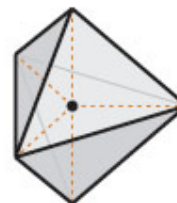
Tetrahedral



AX_4

Example: CF_4

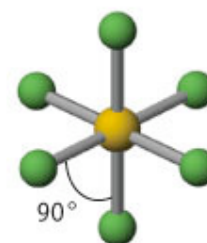
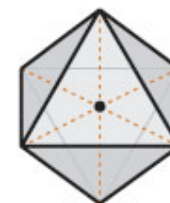
Trigonal bipyramidal



AX_5

Example: PF_5

Octahedral



AX_6

Example: SF_6

© Brooks/Cole, Cengage Learning

Valence Shell Electron Pair Repulsion

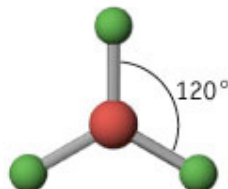
Linear



AX_2

Example: BeF_2

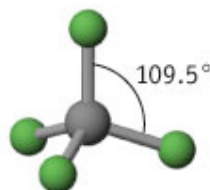
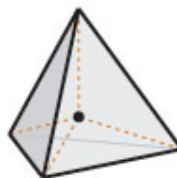
Trigonal-planar



AX_3

Example: BF_3

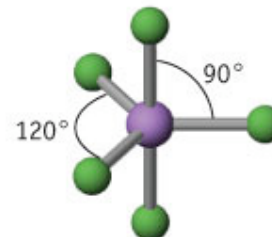
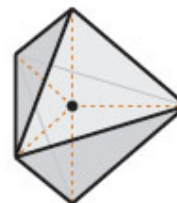
Tetrahedral



AX_4

Example: CF_4

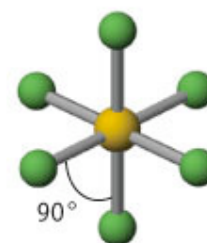
Trigonal bipyramidal



AX_5

Example: PF_5

Octahedral



AX_6

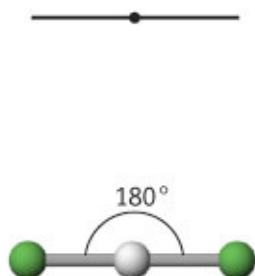
Example: SF_6

© Brooks/Cole, Cengage Learning

Valence Shell – bonds and lone pairs

Valence Shell Electron Pair Repulsion

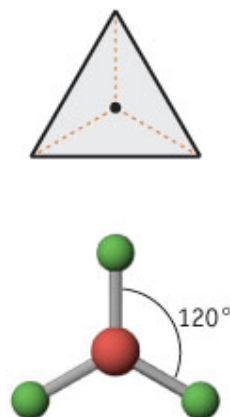
Linear



AX_2

Example: BeF_2

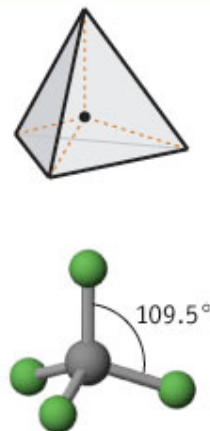
Trigonal-planar



AX_3

Example: BF_3

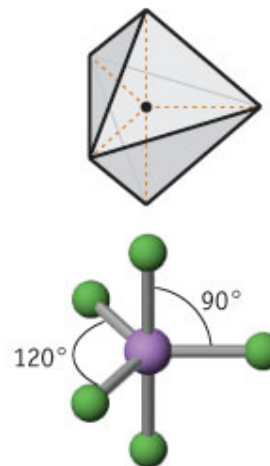
Tetrahedral



AX_4

Example: CF_4

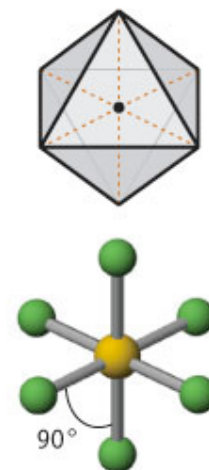
Trigonal bipyramidal



AX_5

Example: PF_5

Octahedral



AX_6

Example: SF_6

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2 groups

3 groups

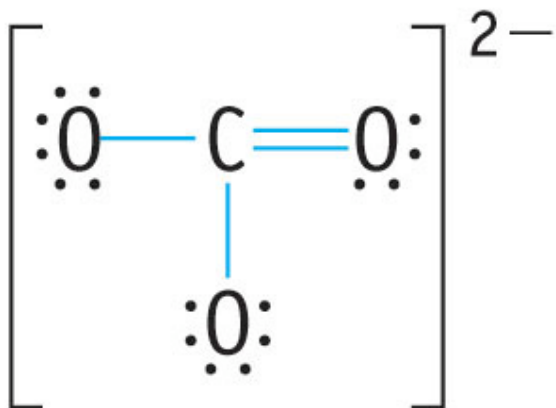
4 groups

5 groups

6 groups

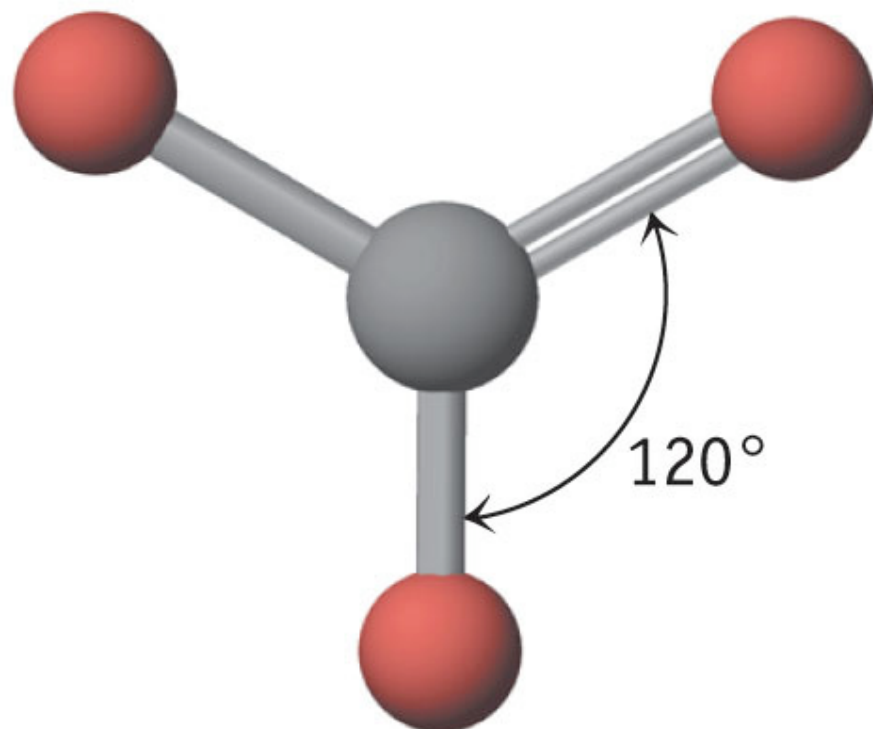
Valence Shell – bonds and lone pairs

3 “groups” of valence shell electrons



Lewis structure, one resonance structure, electron-pair geometry = trigonal planar

© Brooks/Cole, Cengage Learning



Molecular structure, trigonal planar

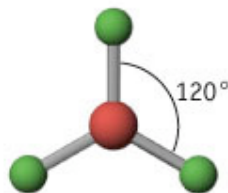
Linear



AX_2

Example: BeF_2

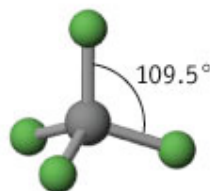
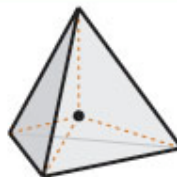
Trigonal-planar



AX_3

Example: BF_3

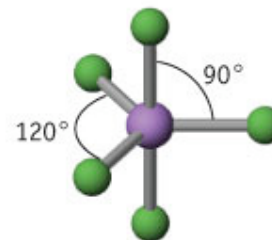
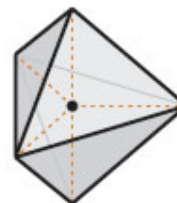
Tetrahedral



AX_4

Example: CF_4

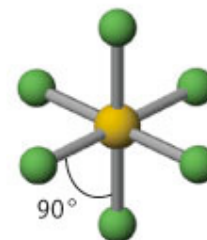
Trigonal bipyramidal



AX_5

Example: PF_5

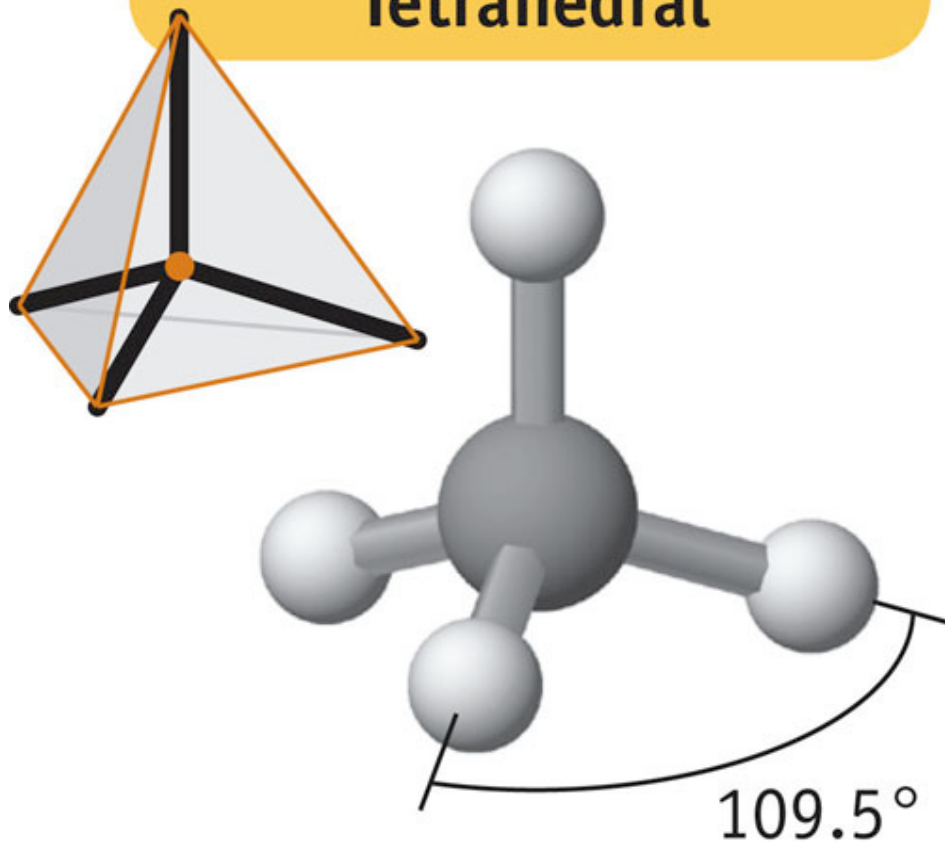
Octahedral



AX_6

Example: SF_6

Tetrahedral



Methane, CH_4

4 bond pairs

no lone pairs

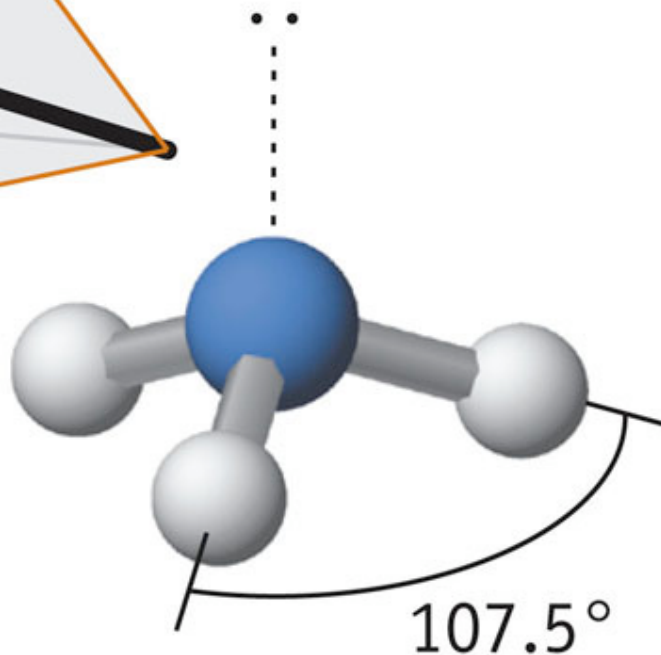
(a)

Trigonal pyramidal

Molecular Geometry



**Tetrahedral
Electron Pair
Geometry**



Ammonia, NH₃

3 bond pairs

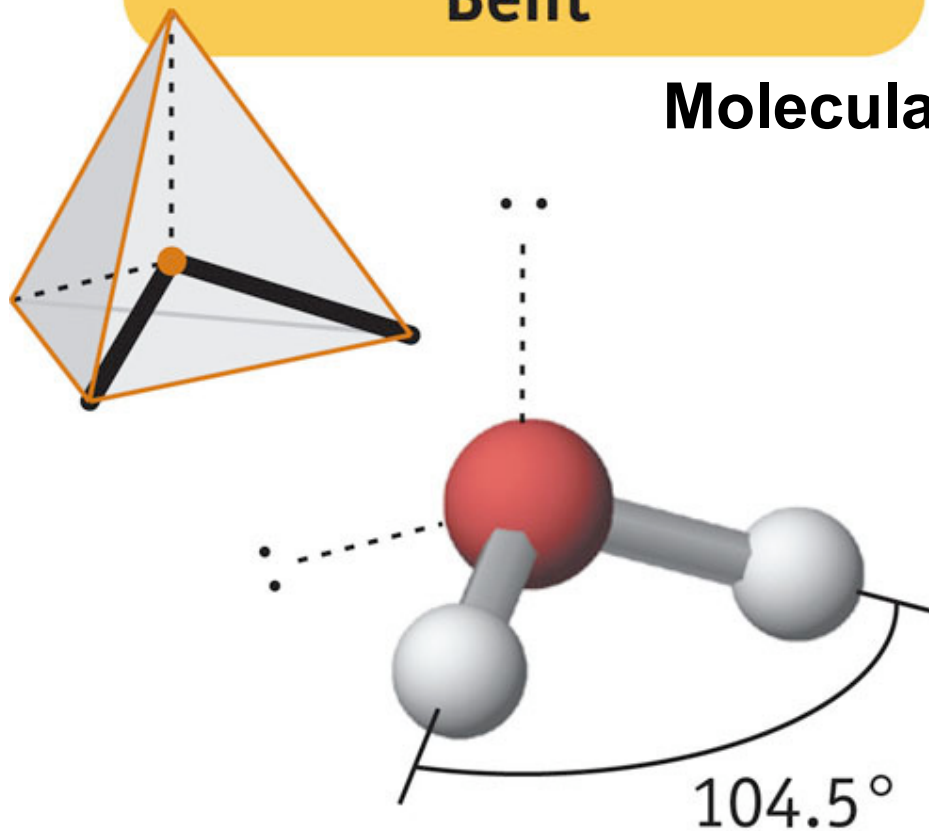
1 lone pair

(b)

Bent

Molecular Geometry

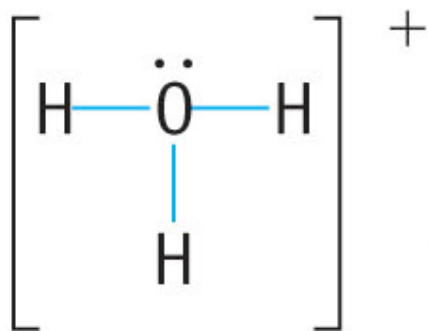
**Tetrahedral
Electron Pair
Geometry**



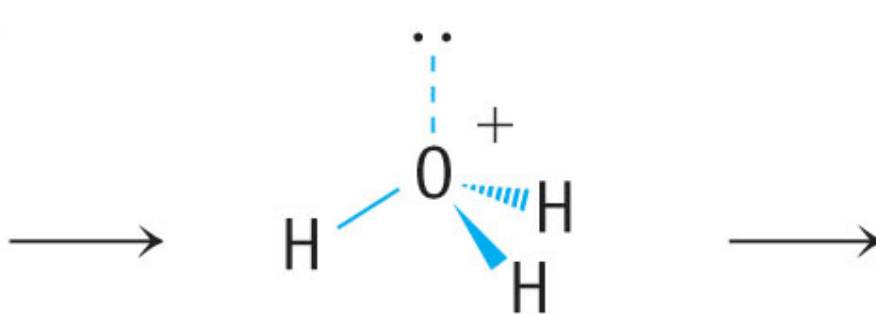
Water, H_2O
2 bond pairs
2 lone pairs

(c)

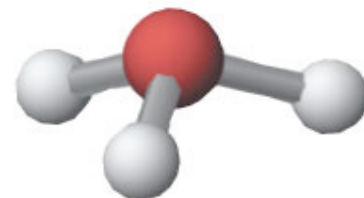
When asked for molecular geometry
Always determine electron pair geometry *first*



Lewis structure

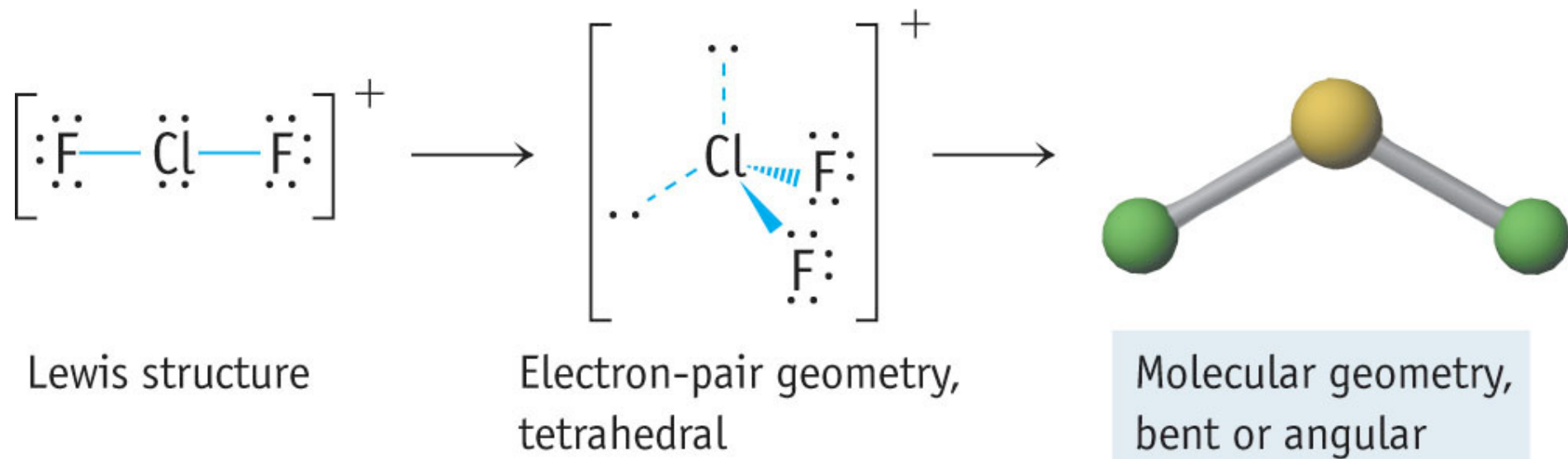


Electron-pair geometry,
tetrahedral



Molecular geometry,
trigonal pyramidal

When asked for molecular geometry
Always determine electron pair geometry *first*



FIVE ELECTRON PAIRS
Electron-Pair Geometry = trigonal bipyramidal

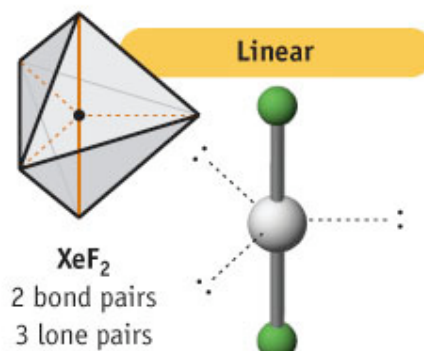
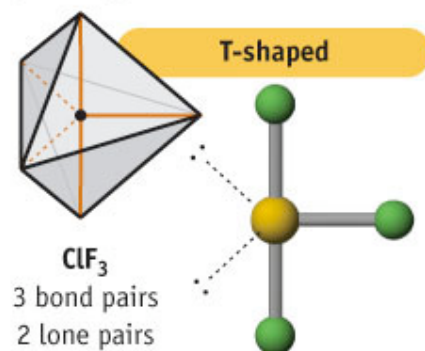
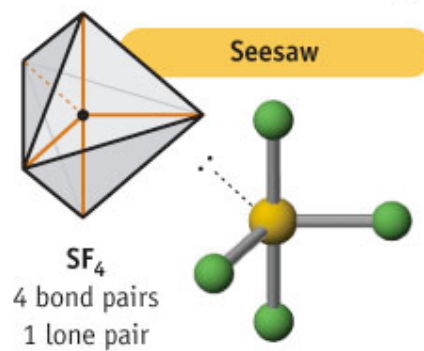
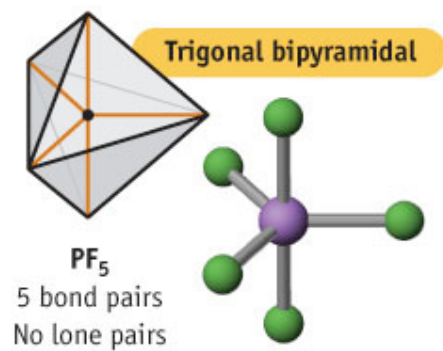


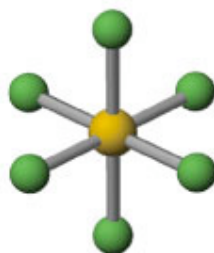
Fig. 8-8, p. 372



Octahedral



6 bond pairs
No lone pairs



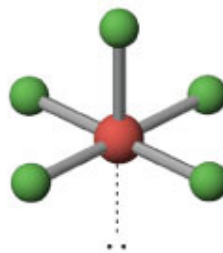
SIX ELECTRON PAIRS
Electron-Pair Geometry = octahedral



Square pyramidal



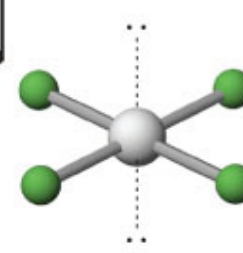
5 bond pairs
1 lone pair



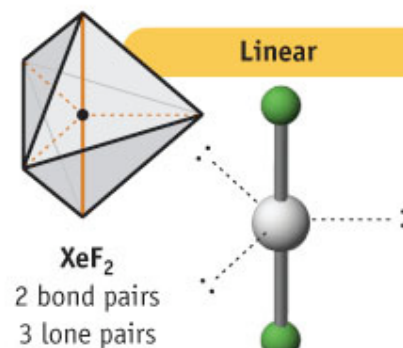
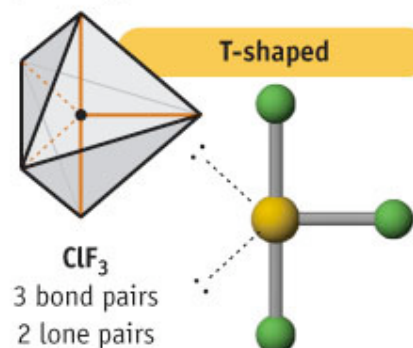
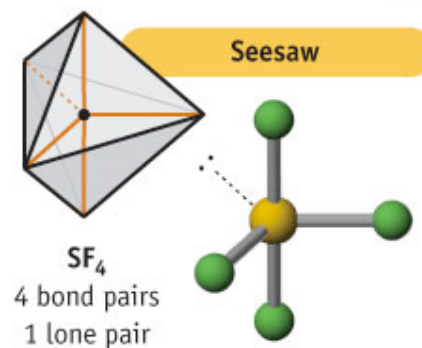
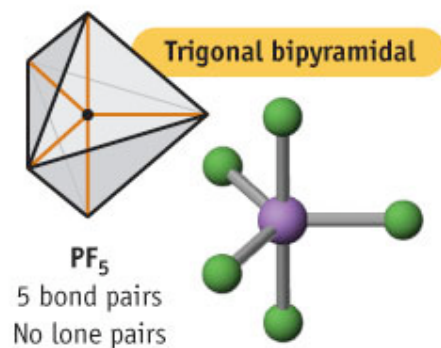
Square planar



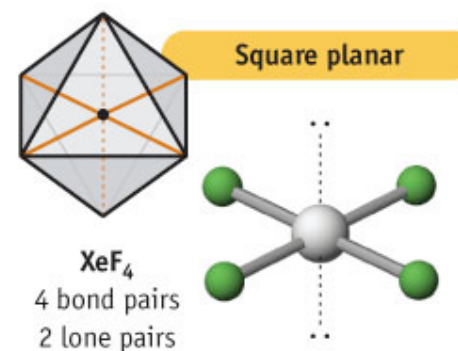
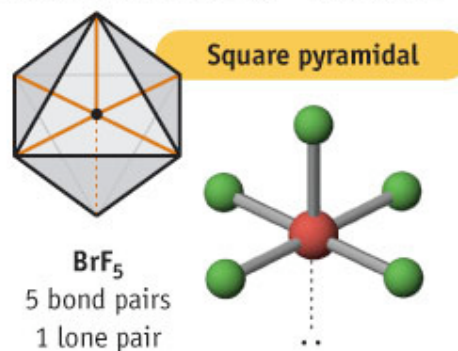
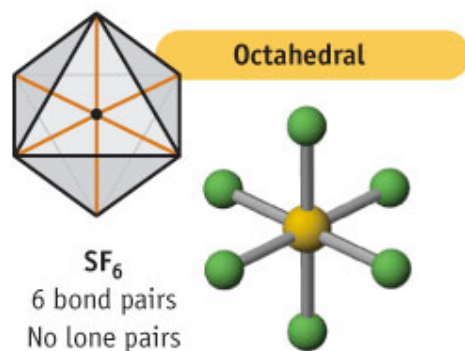
4 bond pairs
2 lone pairs



FIVE ELECTRON PAIRS
Electron-Pair Geometry = trigonal bipyramidal



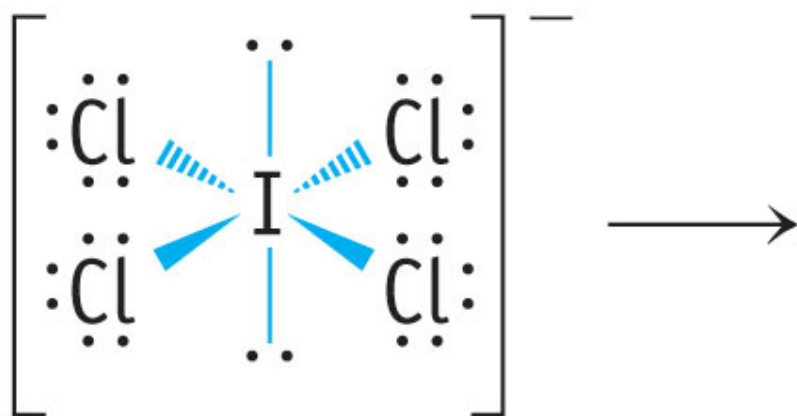
SIX ELECTRON PAIRS
Electron-Pair Geometry = octahedral



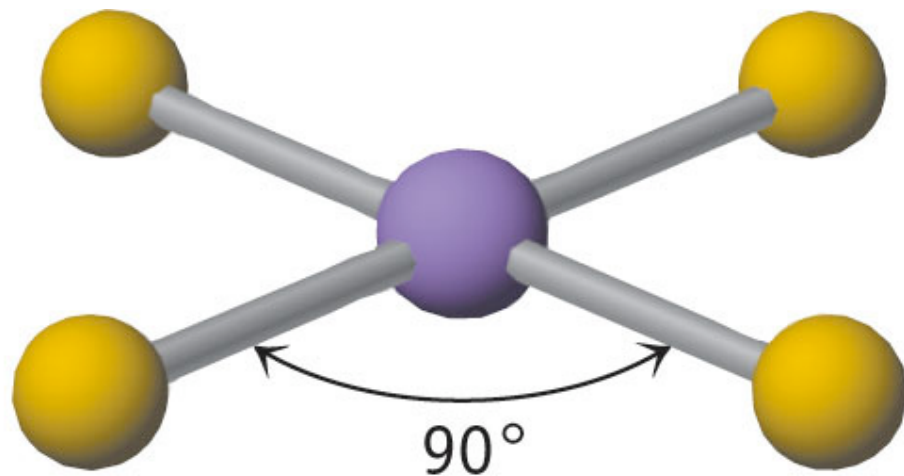
What is the molecular geometry of ICl_4^- ?

- 1) Tetrahedral
- 2) Trigonal pyramidal
- 3) Square planar
- 4) Octahedral





Electron-pair geometry,
octahedral

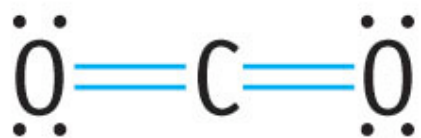


Molecular geometry,
square planar

What is the molecular geometry of CO₂?

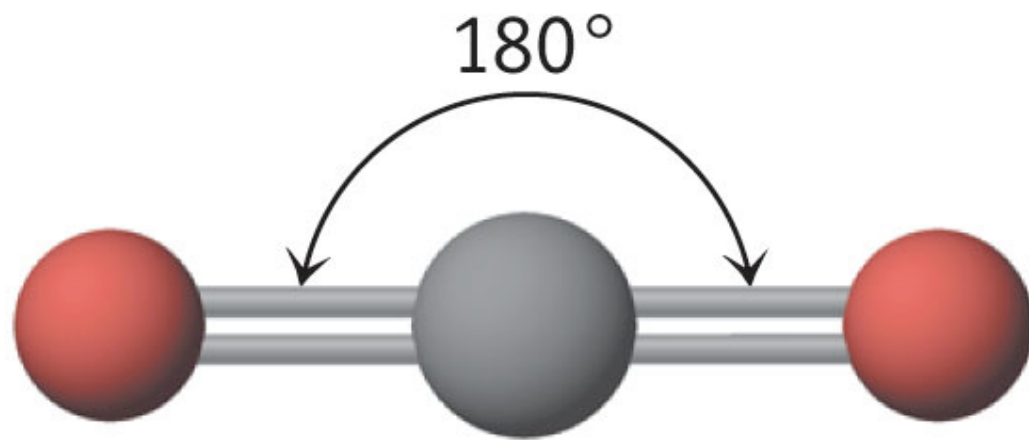
- 1) Bent
- 2) Linear
- 3) Tetrahedral



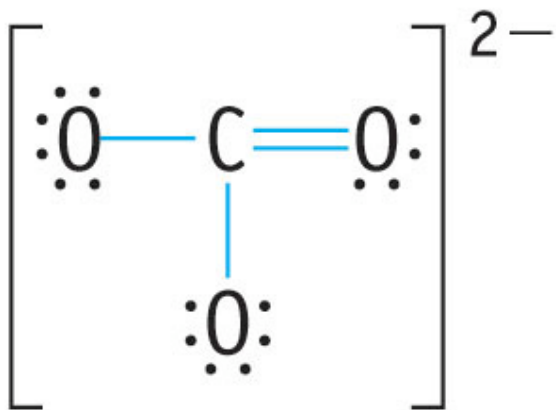


Lewis structure,
electron-pair
geometry = linear

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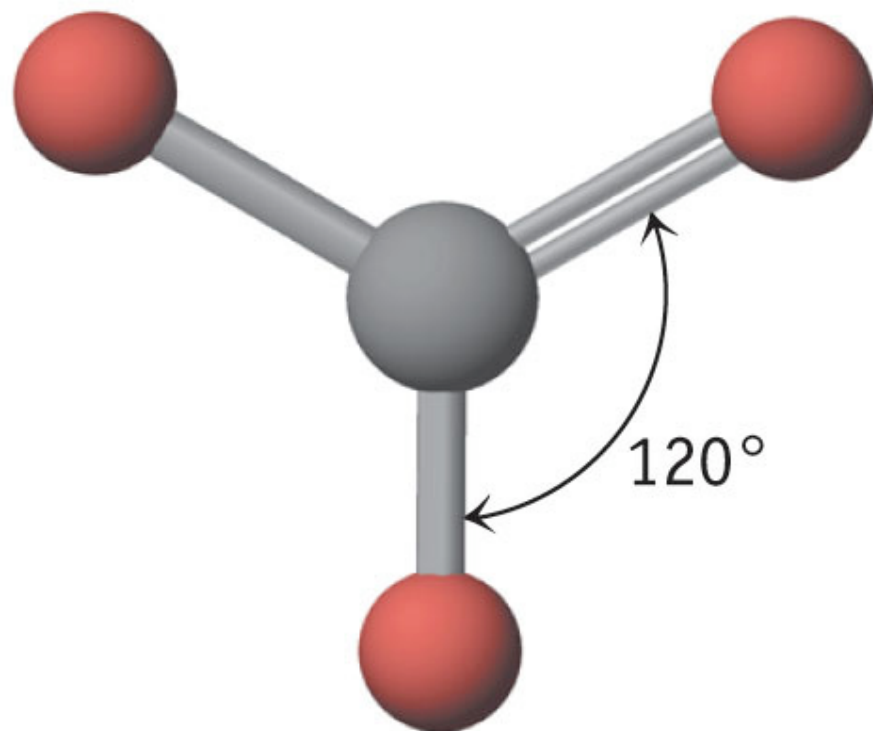


Molecular structure, linear

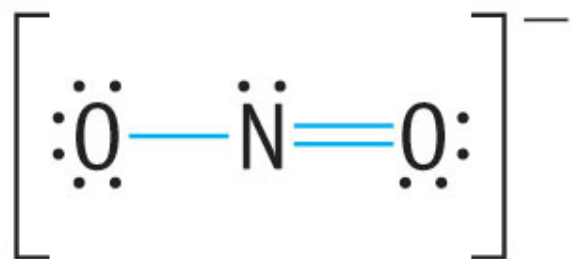


Lewis structure, one resonance structure, electron-pair geometry = trigonal planar

© Brooks/Cole, Cengage Learning

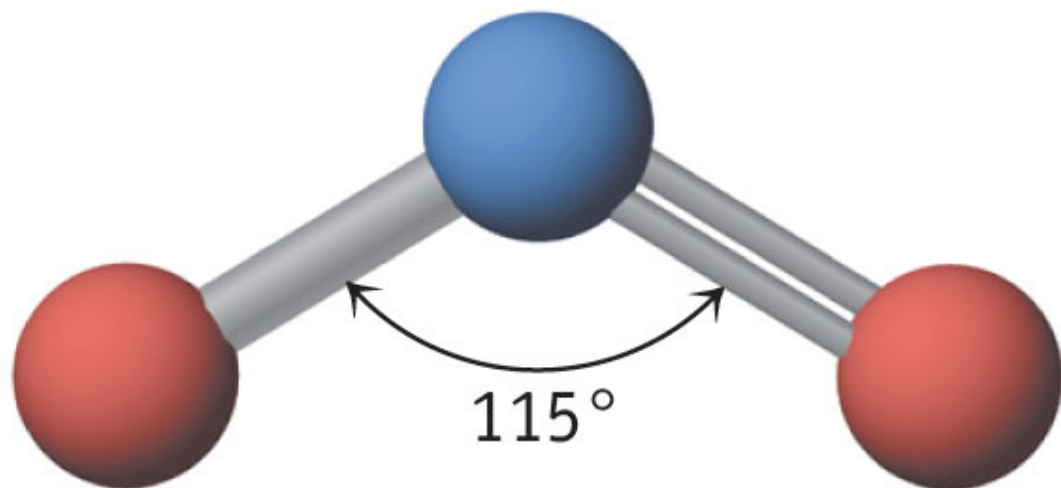


Molecular structure, trigonal planar

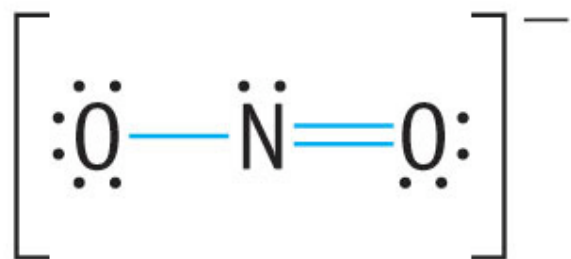


Lewis structure, one
resonance structure,
electron-pair geometry
= trigonal planar

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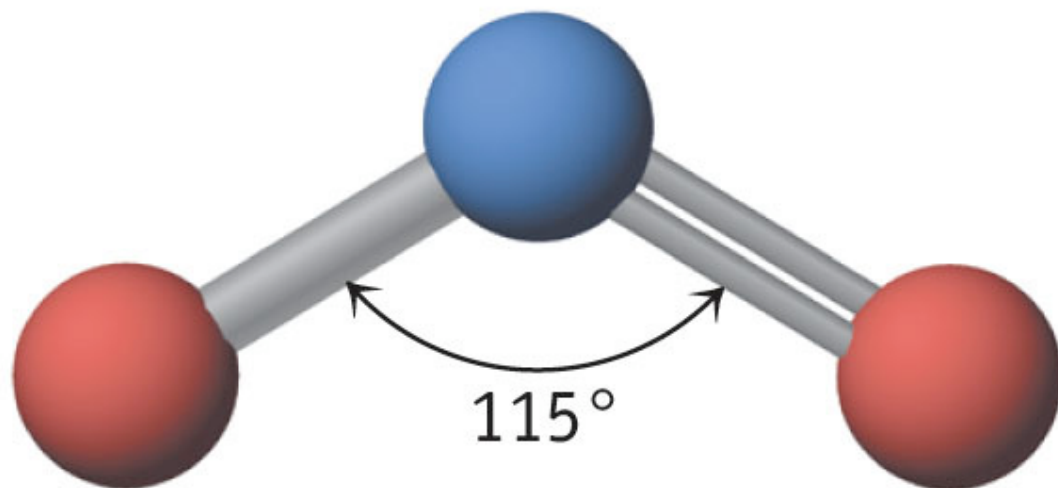


Molecular structure,
angular or bent



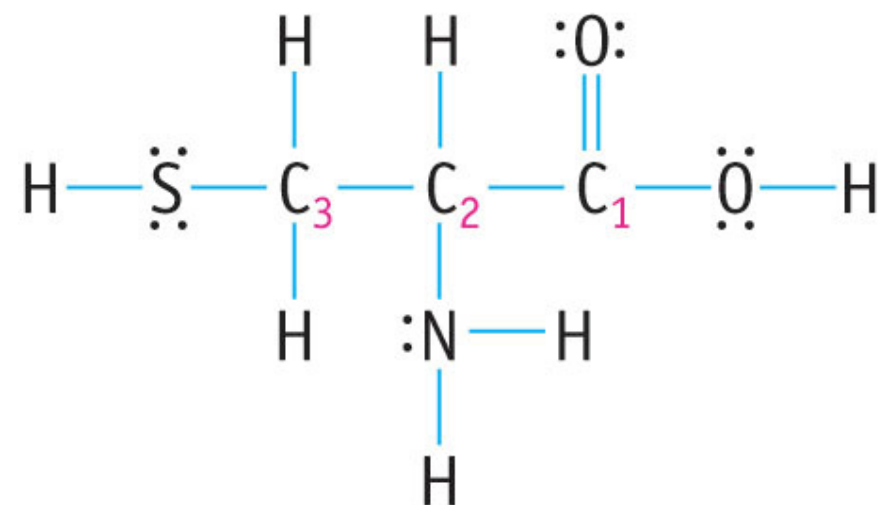
Lewis structure, one
resonance structure,
electron-pair geometry
= trigonal planar

© Brooks/Cole, Cengage Learning

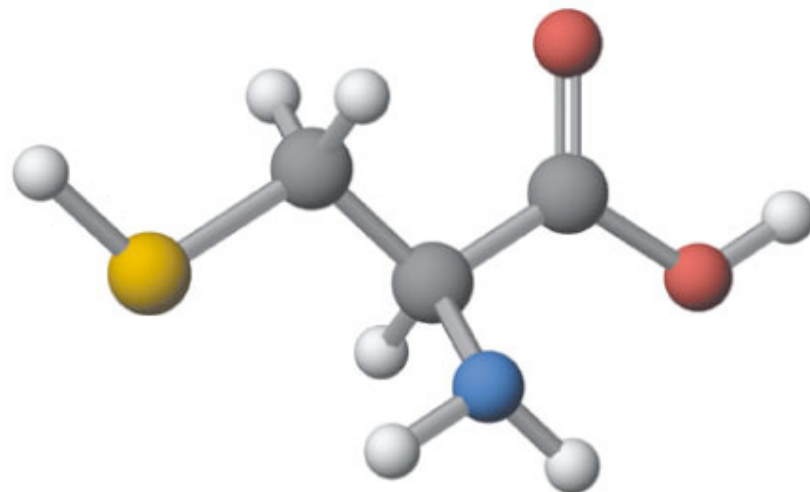


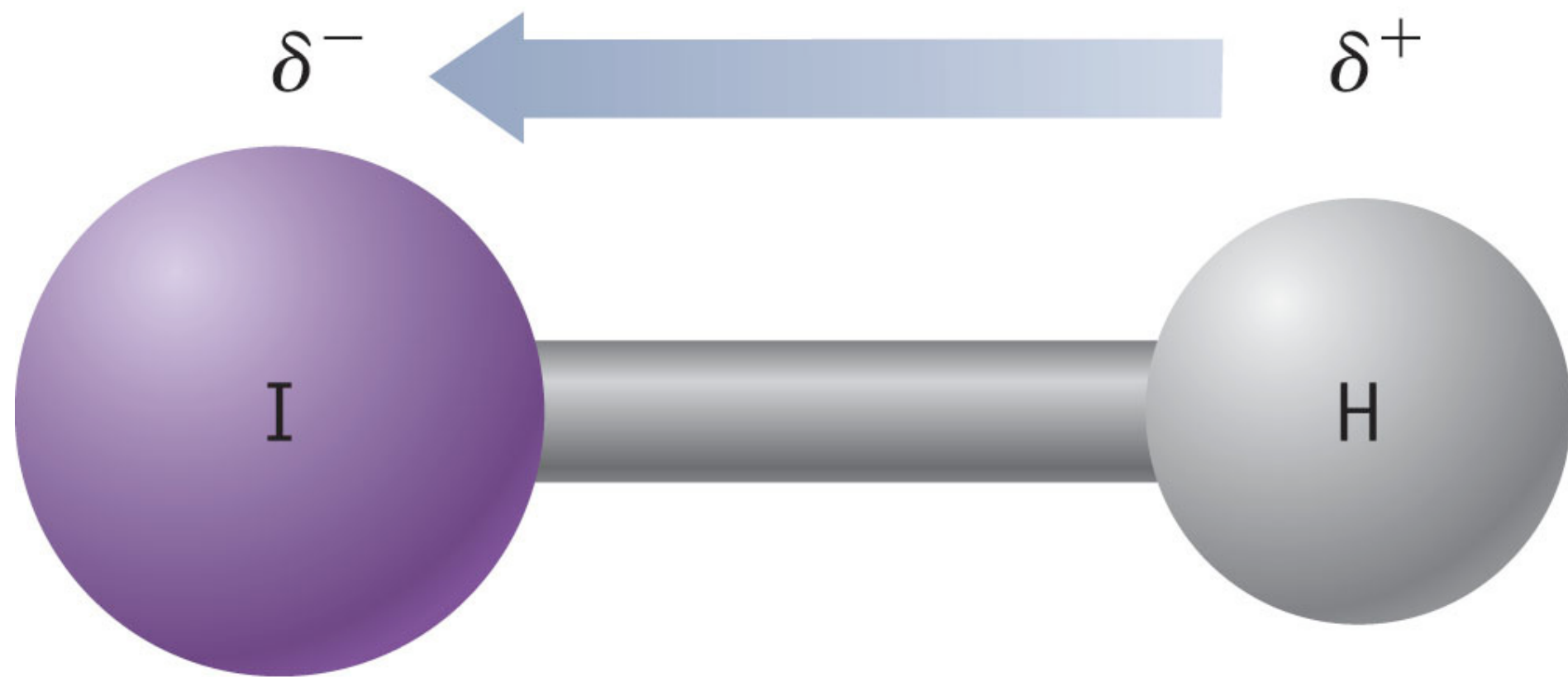
Molecular structure,
angular or bent

Same for ozone O_3



Cysteine, $\text{HSCH}_2\text{CH}(\text{NH}_2)\text{CO}_2\text{H}$

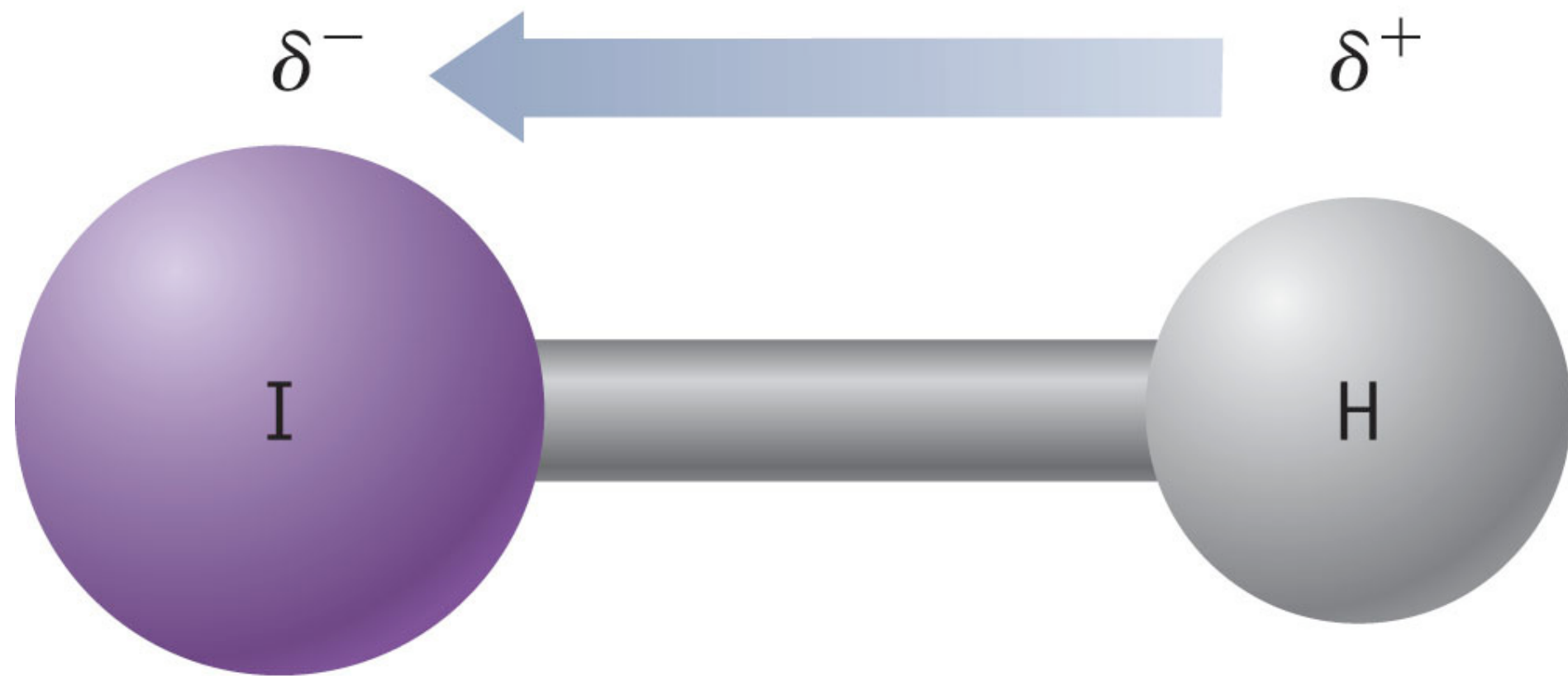




© Brooks/Cole, Cengage Learning

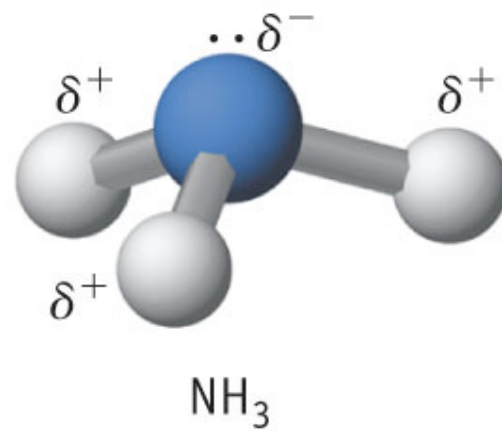
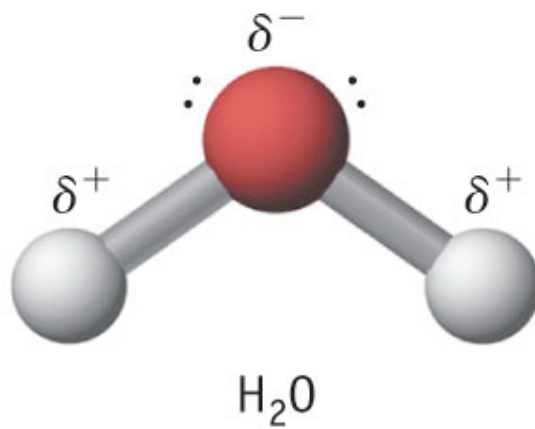
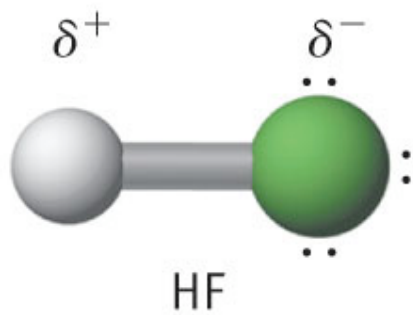
Unequal sharing of the bonding electron pair

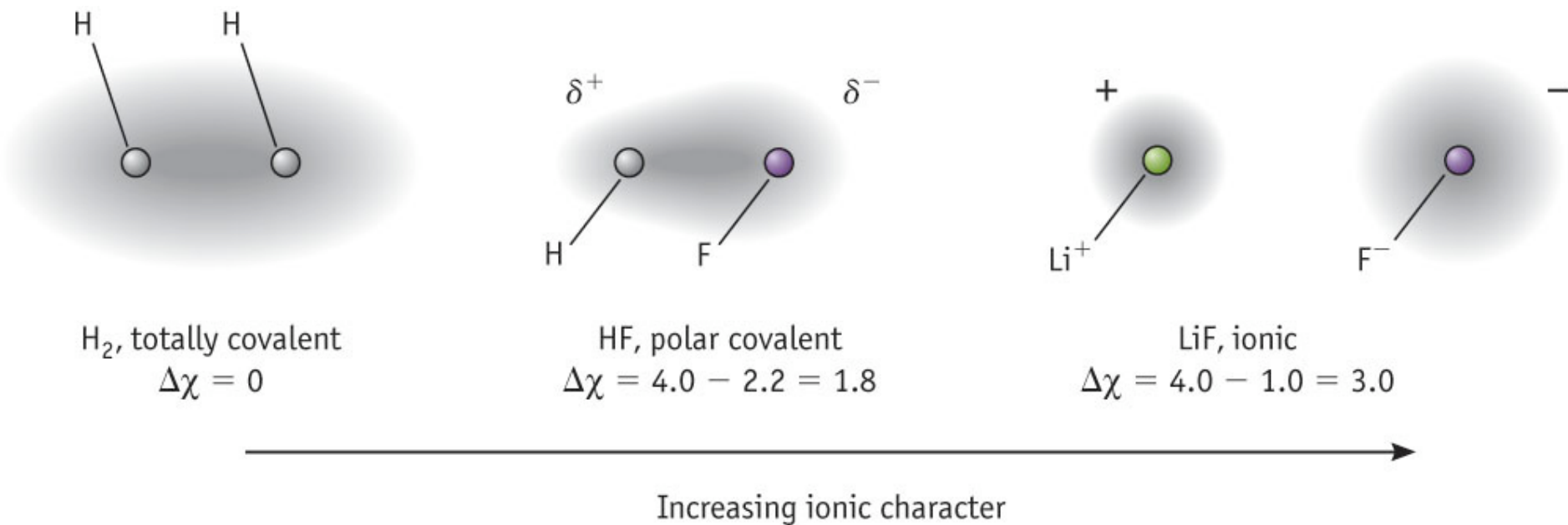
Polarity



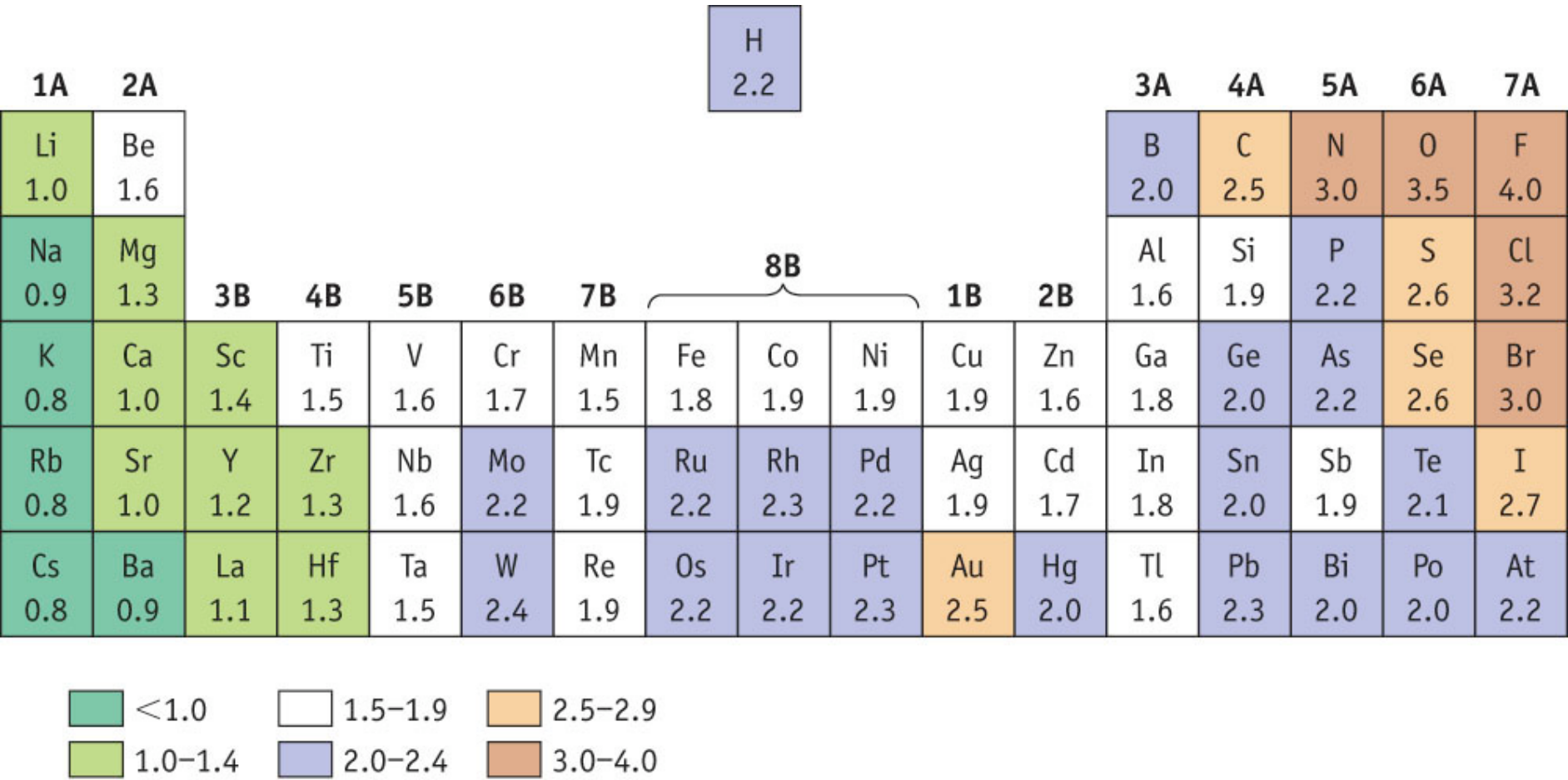
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Unequal sharing of the bonding electron pair





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Fig. 8-11, p. 376

Even compounds with high electronegativity differences are not 100% ionic.

