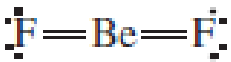
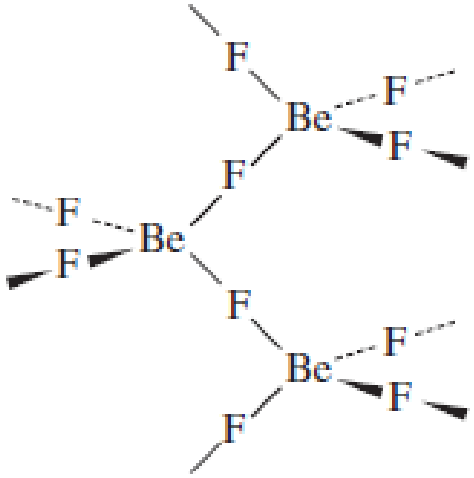
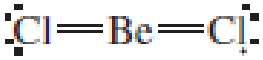


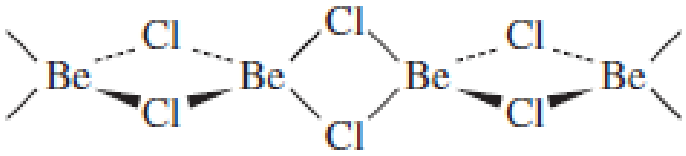
Predicted



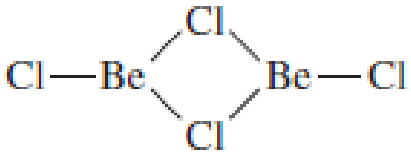
Actual solid



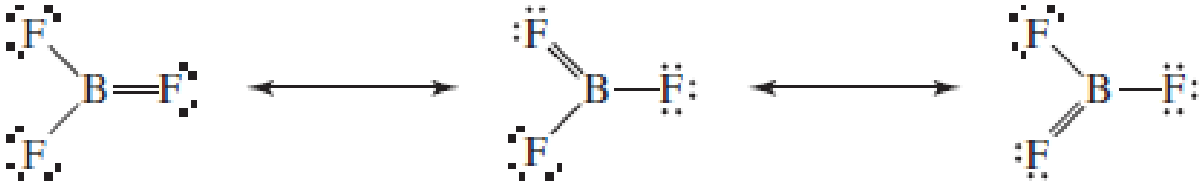
Predicted



Solid

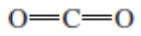
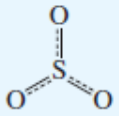
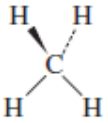
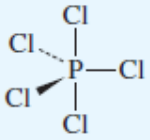
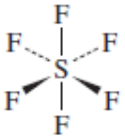
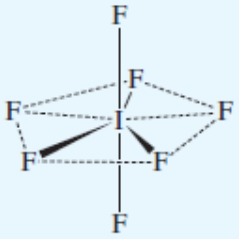
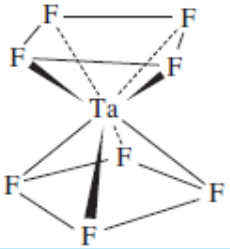


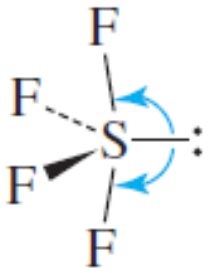
Vapor



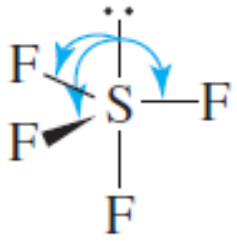
Predicted

The B—F bond length is 131 pm;
the calculated single-bond length is 152 pm.

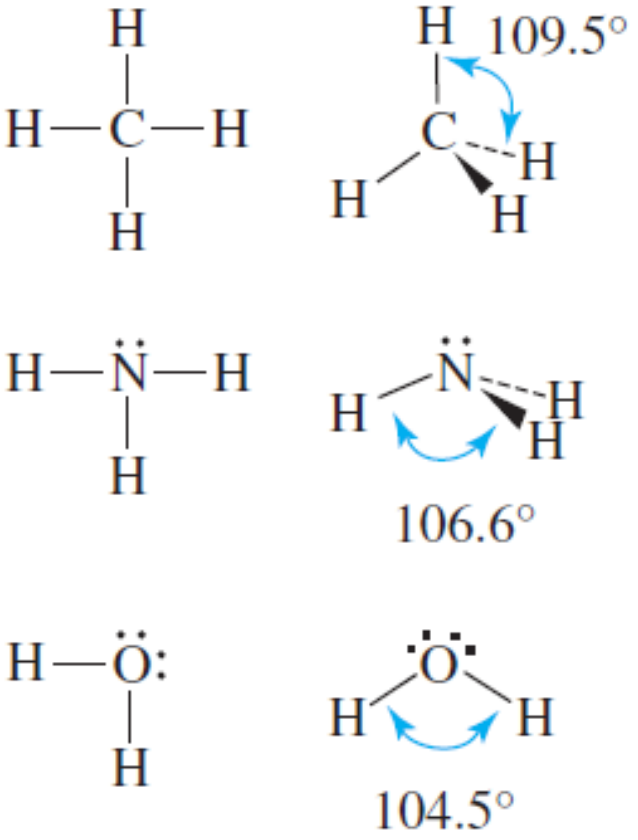
Steric Number	Geometry	Examples	Calculated Bond Angles	
2	Linear	CO_2	180°	
3	Trigonal (triangular)	SO_3	120°	
4	Tetrahedral	CH_4	109.5°	
5	Trigonal bipyramidal	PCl_5	120°, 90°	
6	Octahedral	SF_6	90°	
7	Pentagonal bipyramidal	IF_7	72°, 90°	
8	Square antiprismatic	$[TaF_8]^{3-}$	70.5°, 99.6°, 109.5°	

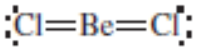
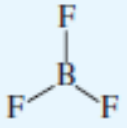
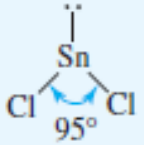
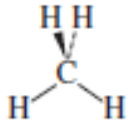
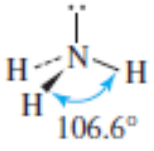
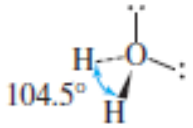
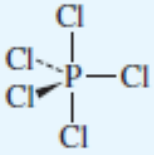
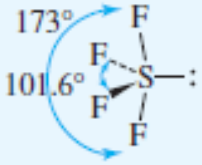
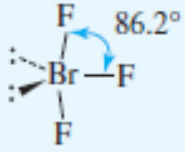
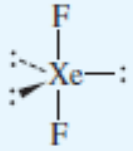
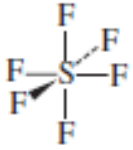
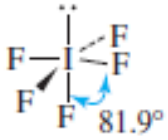
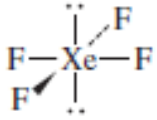


Equatorial lone pair
(observed structure)



Axial lone pair



Steric Number	None	Number of Lone Pairs on Central Atom		
		1	2	3
2				
3				
4				
5				
6				

Molecule	X–P–X Angle (°)	Molecule	X–S–X Angle (°)
PF_3	97.8	OSF_2	92.3
PCl_3	100.3	$OSCl_2$	96.2
PBr_3	101.0	$OSBr_2$	98.2

Molecule	Bond Angle (°)	Molecule	Bond Angle (°)
H_2O	104.5	NCl_3	106.8
H_2S	92.1	PCl_3	100.3
H_2Se	90.6	$AsCl_3$	98.9

TABLE 3.6 Bond Angles and Lengths

Molecule	Bond Angle (°)	Bond Length (pm)	Molecule	Bond Angle (°)	Bond Length (pm)	Molecule	Bond Angle (°)	Bond Length (pm)	Molecule	Bond Angle (°)	Bond Length (pm)
H_2O	104.5	97	OF_2	103.3	96	OCl_2	110.9	170			
H_2S	92.1	135	SF_2	98.0	159	SCl_2	102.7	201			
H_2Se	90.6	146				$SeCl_2$	99.6	216			
H_2Te	90.2	169				$TeCl_2$	97.0	233			
NH_3	106.6	101.5	NF_3	102.2	137	NCl_3	106.8	175			
PH_3	93.2	142	PF_3	97.8	157	PCl_3	100.3	204	PBr_3	101.0	220
AsH_3	92.1	151.9	AsF_3	95.8	170.6	$AsCl_3$	98.9	217	$AsBr_3$	99.8	236
SbH_3	91.6	170.7	SbF_3	87.3	192	$SbCl_3$	97.2	233	$SbBr_3$	98.2	249

Source: N. N. Greenwood and A. Earnshaw, *Chemistry of the Elements*, 2nd ed., Butterworth-Heinemann, Oxford, 1997, pp. 557, 767; A. F. Wells, *Structural Inorganic Chemistry*, 5th ed., Oxford University Press, Oxford, 1987, pp. 705, 793, 846, and 879; R. J. Gillespie and I. Hargittai, *The VSEPR Model of Molecular Geometry*, Allyn and Bacon, Needham Heights, MA, 1991.