

Molecular Geometry

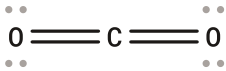
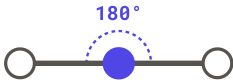
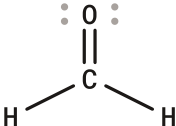
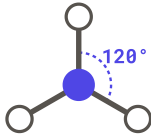
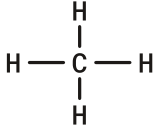
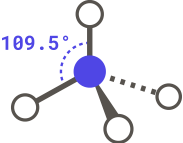
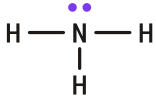
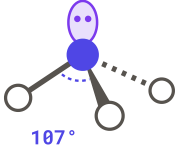
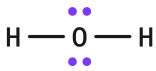
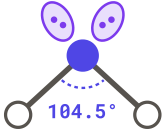
Electrons in bonds and lone pairs repel and push apart. The shape is the arrangement that gives them the most room.

1 Draw the Lewis structure. Find the central atom.

2 Count surrounding atoms on the central atom. Count an attached atom once, even with a double or triple bond.

3 Count lone pairs on the central atom only. Lone pairs on surrounding atoms do not count.

4 Match your two counts to a row below.

MOLECULAR GEOMETRY	SURROUNDING ATOMS	LONE PAIRS ON THE CENTRAL ATOM	LEWIS STRUCTURE	SHAPE	EXAMPLES
Linear 180° The bonds push to opposite sides, making a line.	2	0			CO_2 carbon dioxide HCN hydrogen cyanide
Trigonal planar 120° · flat Three bonds push apart evenly, making a flat triangle.	3	0			HCHO formaldehyde COCl_2 carbonyl chloride
Tetrahedral 109.5° · 3D Four bonds need more room, so the bonds push into 3D.	4	0			CH_4 methane CCl_4 carbon tetrachloride
Trigonal pyramidal 107° · 3D The lone pair pushes the three bonds down, making a pyramid.	3	1			NH_3 ammonia PBr_3 phosphorus tribromide
Bent 104.5° Two lone pairs push on the two bonds, leaving a bent shape.	2	2			H_2O water H_2S hydrogen sulfide

i **Lone pairs push too.** Bonds contain electrons, and lone pairs also contain electrons. Trigonal pyramidal and bent start from the same four directions as tetrahedral, but lone pairs take some of the spots and push the bonds closer together. ● lone pairs on the central atom ● lone pairs on surrounding atoms (do not count)