

Answer on Question #43516 - Chemistry - Inorganic Chemistry

Question:

predict the geometry of the following molecules using the VSEPR model.

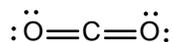
CO₂, NH₃, CH₄, H₂O, SO₂, NO₂, ClF₃, SF₆

Answer:

Valence shell electron pair repulsion (VSEPR) theory is a model used, in chemistry, to infer, from the number of electron pairs surrounding their central atoms, the geometry of individual molecules.

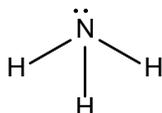
We can predict the geometry of a molecule using Lewis dot structure of the molecule.

Lewis dot structure for CO₂ molecule:

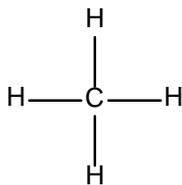


There are two electron regions (double bonds) around the central atom, that's why the angle in a molecule is 180° and this molecule is linear.

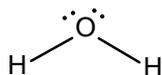
NH₃ molecule has 4 electron regions (3 single bonds and lone pair of electron), that's why the geometry of this molecule is triangular pyramid:



CH₄ molecule has 4 electron regions (4 single bonds), that's why the geometry of this molecule is tetrahedral:



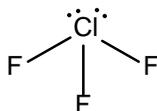
H₂O has 4 electron regions (2 single bonds and 2 lone pairs of electrons), that's why the geometry of this molecule is bent:



SO₂ and NO₂ have 3 electron regions (1 single bond, 1 double bond and 1 lone pair) each, that's why the geometry of these molecules is bent:



ClF₃ has 5 electron regions or 5 pairs of electrons (3 bonding pairs and two lone pairs). Therefore the geometry is trigonal bipyramidal, but since there are two lone pairs of electrons, the molecule is T-shaped:



SF₆ has 6 electron regions (6 single bonds), that's why the geometry of this molecule is octahedral:

