AX₂E₃

Shape: Linear
Steric Number: 5
Lone Pairs: 3
Polar/NonPolar: NonPolar
Hybridization: sp³d
Example: I⁻

NOTES: This molecule is made up of 5 sp³d hybrid orbitals. Three orbitals are arranged around the equator of the molecule with bond angles of 120°. Two orbitals are arranged along the vertical axis at 90° from the equatorial orbitals. The shape of the orbitals is trigonal bipyramidal. All three equatorial orbitals contain lone pairs of electrons. The three atom molecule has a linear shape.

Beryllium Hydride

An example of linear electron pair and molecular geometry is BeH₂. This molecule is electron deficient and does not follow the octet rule because it has only 4 valence electrons. The hydrogen atoms are as far apart as possible if opposite each other at 180°; this is linear geometry.

Beryllium hydride is a solid at room temperature. It does not have any common uses and all beryllium compounds are quite toxic.
Carbon Dioxide

In this example, CO₂, the Lewis diagram shows carbon at the center with no lone electron pairs. The carbon and both oxygen are bonded through double bonds which counts as "two electron pairs". Hence the molecule has two electron pairs and is linear. Carbon dioxide is the major product of all combustion reactions involving carbon based materials such as natural gas, gasoline, and coal. Carbon dioxide is the end product of animal/human metabolism/respiration. It is also the gas that provides the carbonation in soda and beer. Carbon dioxide is the major gas implicated in the greenhouse effect or global warming. The gas in the atmosphere acts to trap heat that might otherwise escape from the earth to outer space.
Hydrogen Cyanide

In this example, HCN, the Lewis diagram shows carbon at the center with no lone electron pairs. The carbon and nitrogen are bonded through a triple bond which counts as "one electron pair". Hence the molecule has two electron pairs and is linear. Hydrogen cyanide is prepared on an industrial scale by the reaction of methane with ammonia in the presence of a platinum catalyst at 1200°C. It boils at 25°C, and thus is a gas at room temperature. HCN is very toxic and will cause death in a matter of minutes if inhaled or ingested.

Contributors

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