Introduction for Module 14 – Molecular Geometry

Textbook: Open Stax Chemistry 2e

Suggested Reading: Chapter 7.6

Learning Objectives:

- **Determine the geometry for molecules with up to 4 domains**
- **Recognize the role of lone pairs vs. bonded pairs for determining geometry**
- **Demonstrate how different electronegativities between atoms results in bond dipoles**
- **Determine whether a molecule is polar vs. non-polar based on geometry and existence of bond dipoles**

Captions and Attributions:

1) Electron pair repulsion around methane (CH_4) can be shown by portraying each electron domain as an individual lobe, each of which spreads evenly around the central atom with an angle of 109.5°. Figure 7.16, The basic electron-pair geometries predicted by Open Stax is licensed under CC BY 4.0.

2) Chart featuring two, three, or four electron domains highlights Valence Shell Electron Pair Repulsion (VSEPR) theory and provides parent structures for many molecules. Figure 7.16, The basic electron-pair geometries predicted by Open Stax is licensed under CC BY 4.0.

3) Replacing bonded electron pairs with non-bonded does not change the fundamental parent structure, but does cause distortion when comparing structures with the same number of bonded domains. Figure 7.19, The molecular structures are identical by Open Stax is licensed under CC BY 4.0.

4) Molecules with multiple centers will have geometry around each of these central atoms, which can be clearly defined. Labeled acetic acid (c) 2020 used with permission of Becca Edwards

5) The lone pairs on a molecule will cause bonded pairs to spread at angles based on their parent electron geometry and explains the polarity of water (H_2O) compared to the non-polarity of carbon dioxide (CO_2). Figure 7.27, The overall dipole moment of a molecule by Open Stax is licensed under CC BY 4.0.

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