Chemistry 20

Unit A: Matter and chemical bonding

Molecular shapes and polarity

Two oxygen compounds, two outlines

- Carbon dioxide is a straight three-atom line.
- Water is a two-bond bend, so the outline is bent.

Five outlines and one polarity decision

- The outlines to name are linear, bent, tetrahedral, trigonal pyramidal, and trigonal planar.
- Polarity is decided after the outline and the bond pulls are both known.

Key terms

VSEPR

Valence shell electron pair repulsion, the idea that electron domains around a central atom stay as far apart as they can. (domains repel)

electron domain

One lone pair or one bonding region. A double bond counts as one domain, the same as a single bond. (one region)

molecular polarity

A molecule's overall separation of charge, decided by both its shape and whether the bond pulls cancel. (shape plus pulls)

bond dipole

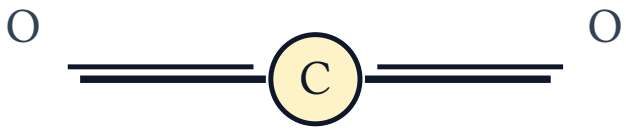
The pull along one bond when the two atoms share electrons unequally. (partial charges)

Electron regions and shape

- A double bond counts as one domain, the same as a single bond.
- BeH_2 is linear too, and the practice case with a full octet on the central atom is CO_2.

Domains and shape

Double bond = 1 domain



CO_2 linear (2 domains)

BeH_2 linear too (2 domains)

Central atom keeps full octet in CO_2

Five molecules, five names

- CO_2 is linear, CH_4 is tetrahedral, and BF_3 is trigonal planar.
- NH_3 is trigonal pyramidal and H_2O is bent.

One new planar molecule

- Formaldehyde, H_2CO, has three domains around carbon.
- The double bond to oxygen counts once in that domain total.

Review

- Water is polar, and carbon dioxide is a nonpolar molecule.
- CCl_4 is nonpolar and CH_3Cl is polar.

