

What determines molecular shape?

Worksheet

Electron domains-bonding pairs and lone pairs-repel each other, positioning atoms in specific 3D shapes: linear, trigonal planar, tetrahedral, trigonal bipyramidal, or octahedral.

Questions

1. Ammonia (NH) has 3 N-H bonds and 1 lone pair. What is its molecular geometry?
 - A) Tetrahedral
 - B) Trigonal planar
 - C) Trigonal pyramidal
 - D) Linear
2. How many electron domains does a double bond count as?
 - A) One domain
 - B) Two domains
 - C) Three domains
 - D) Depends on the element
3. What is the geometry of BF (boron trifluoride)?
 - A) Tetrahedral
 - B) Trigonal planar
 - C) Trigonal pyramidal
 - D) Octahedral
4. Why do lone pairs compress bond angles?
 - A) They attract bonding electrons
 - B) They repel bonding electrons more strongly than bonding pairs repel each other
 - C) They have no effect
 - D) They always increase angles
5. Methane (CH) has a carbon atom bonded to 4 hydrogens with no lone pairs on carbon. What is its molecular geometry?
6. Water (HO) has oxygen bonded to 2 hydrogens and has 2 lone pairs. What is its shape?
7. Carbon dioxide (CO) has carbon bonded to 2 oxygens (double bonds) with no lone pairs. What geometry?
8. Define: What is VSEPR theory?
9. Define: What is an electron domain?
10. Define: How do lone pairs affect geometry?

Answer Key

1. C) Trigonal pyramidal - 3 bonding domains + 1 lone pair = 4 electron domains (tetrahedral) but pyramidal shape due to lone pair.
2. A) One domain - A double bond is still one region of electron density, so it counts as one domain.
3. B) Trigonal planar - 3 B-F bonds, 0 lone pairs 3 electron domains trigonal planar (120 angles).
4. B) They repel bonding electrons more strongly than bonding pairs repel each other - Lone pair electron density is more concentrated, creating stronger repulsion.
5. Count electron domains: 4 C-H bonds = 4 electron domains Count lone pairs on central atom: 0 4 domains, 0 lone pairs tetrahedral geometry
6. Count electron domains: 2 O-H bonds + 2 lone pairs = 4 electron domains Bent/angular shape due to repulsion pushing lone pairs Bond angle 104.5 (compressed from tetrahedral 109.5)
7. Count electron domains: 2 C=O bonds = 2 electron domains (double bond counts as one domain) 0 lone pairs 2 domains linear geometry, 180 bond angle
8. Valence Shell Electron Pair Repulsion theory predicts molecular geometry based on electron domain repulsion.
9. A region of electron density around the central atom: a bonding pair or a lone pair counts as one domain.
10. Lone pairs take up space and repel other domains more strongly, compressing bond angles.

Bounlu

All cards, step-by-step solutions and an AI tutor are in the Notek app.
Promy turns exam dates into automatic reminders.