Molecular Geometry Worksheet

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Part 1: Building a Foundation

What does VSEPR stand for?

Hint: Think about the principles of electron pair interactions.

- ◯ Valence Shell Electron Pair Repulsion
- ◯ Valence Shell Electron Pair Rotation
- ◯ Valence Shell Electron Pair Reaction
- ◯ Valence Shell Electron Pair ResonANCE

Which of the following are considered electron domains?

Hint: Consider all types of electron pairs and bonds.

- ☐ Lone pairs
- ☐ Single bonds
- ☐ Double bonds
- ☐ Triple bonds

Explain why lone pairs occupy more space than bonding pairs in a molecule.

Hint: Consider the repulsion between electron pairs.

List the bond angles associated with the following molecular geometries:

Hint: Think about the ideal angles for each geometry.

1. Linear

2. Trigonal Planar

3. Tetrahderal

Part 2: Comprehension and Application

Which molecular geometry is associated with a molecule that has three bonding pairs and one lone pair?

Hint: Consider the arrangement of electron pairs around the central atom.

- ◯ Linear
- ◯ Trigonal Planar
- ◯ Trigonal Pyramidal
- ◯ Bent

Identify the molecular geometries that can result from sp3 hybridization.

Hint: Think about the types of geometries associated with four electron domains.

- ☐ Linear
- ☐ Tetrahderal
- ☐ Trigonal Pyramidal
- ☐ Bent

Describe how the presence of lone pairs affects the bond angles in a trigonal pyramidal molecule compared to a tetrahedral molecule.

Hint: Consider the repulsion between lone pairs and bonding pairs.

Given a molecule with the formula AX3E2, what is the expected molecular geometry?

Hint: Consider the arrangement of bonding and lone pairs.

- ◯ Linear
- ◯ Trigonal Bipyramidal
- ◯ T-shaped
- ◯ Octahedral

Predict the molecular geometry and bond angles for a molecule with the formula AX2E2.

Hint: Consider the effects of lone pairs on the geometry.

- ☐ Linear, 180°
- ☐ Bent, <120°
- ☐ Bent, <109.5°
- ☐ Trigonal Planar, 120°

Apply the VSEPR theory to predict the shape of the water molecule and explain your reasoning.

Hint: Consider the number of bonding and lone pairs around the central atom.

Part 3: Analysis, Evaluation, and Creation

Which of the following molecules has a trigonal planar geometry?

Hint: Think about the arrangement of electron pairs around the central atom.

- ◯ CO_2
- ◯ BF_3
- ◯ NH_3
- ◯ H_2O

Analyze the following molecules and identify which have a bent geometry.

Hint: Consider the presence of lone pairs in the molecular structure.

- ☐ H_2O
- ☐ CO_2
- ☐ SO_2
- ☐ CH_4

Analyze the differences in molecular geometry between NH_3 and CH_4, focusing on the role of lone pairs.

Hint: Consider how lone pairs affect the shape and angles.

Which molecule would likely have the smallest bond angle due to lone pair repulsion?

Hint: Consider the effect of lone pairs on bond angles.

- ◯ CH_4
- ◯ NH_3
- ◯ H_2O
- ◯ BF_3

Evaluate the following statements and select those that correctly describe the impact of lone pairs on molecular geometry.

Hint: Consider how lone pairs influence bond angles and molecular shape.

- ☐ Lone pairs increase bond angles.
- ☐ Lone pairs decrease bond angles.

- [ ] Lone pairs have no effect on molecular geometry.
- [ ] Lone pairs can cause deviations from ideal bond angles.

Design a hypothetical molecule with a trigonal bipyramidal geometry. Describe the types of atoms involved, the number of bonding pairs, and any lone pairs present.

Hint: Consider the arrangement of atoms in a trigonal bipyramidal structure.