VSEPR Theory Quiz Questions and Answers PDF

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What does VSEPR stand for?

- ◯ **Valence Shell Electron Pair Repulsion ✓**
- ◯ Valence Shell Electron Pair Rotation
- ◯ Valence Shell Electron Pair Reaction
- ◯ Valence Shell Electron Pair Reduction

> VSEPR stands for Valence Shell Electron Pair Repulsion, which is a model used in chemistry to predict the geometry of individual molecules based on the repulsion between electron pairs in the valence shell of the central atom.

Which molecular shapes can result from a molecule with five electron pairs around the central atom?

- ☐ **Trigonal Bipyramidal ✓**
- ☐ **Seesaw ✓**
- ☐ Tetrahderal
- ☐ Octahedral

> A molecule with five electron pairs around the central atom can adopt either a trigonal bipyramidal or a seesaw shape, depending on the presence of lone pairs.

What shape does a molecule with three bonding pairs and one lone pair have?

- ◯ Linear
- ◯ Trigonal Planar
- ◯ **Trigonal Pyramidal ✓**
- ◯ Tetrahderal

> A molecule with three bonding pairs and one lone pair adopts a trigonal pyramidal shape due to the repulsion between the lone pair and the bonding pairs.

Which of the following are limitations of VSEPR theory?

- [ ] **Does not predict the exact bond angles ✓**
- [ ] **Can not explain the shapes of large molecules ✓**
- [ ] **Assumes all electron pairs are equivalent ✓**
- [ ] Accurately predicts molecular polarity

> VSEPR theory has limitations such as its inability to accurately predict the geometries of molecules with delocalized electrons, and it does not account for the effects of electronegativity and hybridization on molecular shape.

Which factor does NOT influence molecular shape according to VSEPR theory?

- ◯ **Number of electron pairs ✓**
- ◯ **Electronegativity ✓**
- ◯ Atomic mass
- ◯ **Presence of lone pairs ✓**

> VSEPR theory primarily considers the repulsion between electron pairs to determine molecular shape. Factors such as the type of bonding or the presence of lone pairs are significant, but the size of the atoms involved does not directly influence the molecular shape according to this theory.

Which of the following molecules has a trigonal pyramidal shape?

- ◯ CH4
- ◯ **NH3 ✓**
- ◯ H2O
- ◯ CO2

> A molecule with a trigonal pyramidal shape has a central atom bonded to three other atoms and one lone pair of electrons, resulting in a three-dimensional structure that resembles a pyramid. An example of such a molecule is ammonia (NH3).

Which molecules have a bent shape?

- [ ] **H2O ✓**
- [ ] CO2
- [ ] **SO2 ✓**
- [ ] CH4

> Bent shape molecules typically include water (H2O) and sulfur dioxide (SO2), which have lone pairs of electrons that cause the bond angles to deviate from the ideal linear arrangement.

Which of the following molecules is linear?

- ◯ H2O
- ◯ **CO2 ✓**
- ◯ NH3
- ◯ CH4

> Linear molecules have a straight-line arrangement of atoms, typically characterized by a bond angle of 180 degrees. Common examples include carbon dioxide (CO2) and acetylene (C2H2).

What are the key assumptions of VSEPR theory?

- ☐ **Electron pairs repel each other ✓**
- ☐ Electron pairs are attracted to lone pairs
- ☐ **Electron pairs arrange to minimize repulsion ✓**
- ☐ Electron pairs do not affect molecular shape

> VSEPR theory is based on the idea that electron pairs around a central atom will arrange themselves to minimize repulsion, leading to specific molecular geometries. The key assumptions include that electron pairs (bond pairs and lone pairs) repel each other and that the shape of the molecule is determined by the number of electron pairs around the central atom.

Which of the following shapes can result from a molecule with four electron pairs around the central atom?

- ☐ **Tetrahderal ✓**
- ☐ **Trigonal Pyramidal ✓**
- ☐ **Bent ✓**
- ☐ Linear

> A molecule with four electron pairs around the central atom can adopt a tetrahedral shape if all pairs are bonding pairs. If one or more pairs are lone pairs, the shape can be trigonal pyramidal or bent, depending on the number of lone pairs.

What is the ideal bond angle in a tetrahedral molecule?

- ◯ 90°
- ◯ **109.5° ✓**

- ◯ 120°
- ◯ 180°

> In a tetrahedral molecule, the ideal bond angle is approximately 109.5 degrees. This angle arises from the arrangement of four electron pairs around a central atom, minimizing repulsion according to VSEPR theory.

What factors can cause deviations from ideal bond angles?

- ☐ **Lone pairs ✓**
- ☐ Bond pairs
- ☐ **Electronegativity differences ✓**
- ☐ Atomic number

> Deviations from ideal bond angles can occur due to factors such as lone pair repulsion, steric hindrance from bulky groups, and differences in electronegativity between bonded atoms.

Which molecular shape is associated with a molecule that has two bonding pairs and no lone pairs?

- ◯ Bent
- ◯ **Linear ✓**
- ◯ Trigonal Planar
- ◯ Tetrahderal

> A molecule with two bonding pairs and no lone pairs adopts a linear molecular shape. This arrangement allows the bonding pairs to be as far apart as possible, minimizing repulsion between them.

In VSEPR theory, which type of electron pair causes more repulsion?

- ◯ Bond pair
- ◯ **Lone pair ✓**
- ◯ Both cause equal repulsion
- ◯ Neither causes repulsion

> In VSEPR theory, lone pairs of electrons cause more repulsion than bonding pairs due to their closer proximity to the nucleus and their higher electron density. This increased repulsion can affect the geometry of the molecule.