

Class 11 - Chemistry

Chemistry Part - I

Chemical Bonding and Molecular Structure

CBSE NOTES

Chemical Bonding and Molecular Structure - Challenge Worksheet

Strengthen your foundation with key concepts and basic applications.



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Challenge Questions

Solve the following questions. Write your answers in the space provided.

1. Evaluate the implications of the octet rule when considering the stability of molecules such as SF₆ versus PCl₅.

Hint: Consider how the octet rule applies and fails in hypervalent molecules like SF₆.

2. Discuss the relevance of Lewis structures in predicting molecular reactivity, using the example of butadiene and its reaction with electrophiles.

Hint: Think about formal charges and resonance forms in your explanation.



Solve the following questions. Write your answers in the space provided.

3. How does VSEPR theory facilitate predictions about molecular geometry, particularly in cases of resonance structures?

Hint: You might consider examples like ozone (O_3) to illustrate your points.

4. Critically compare the Valence Bond Theory and Hybridization with Molecular Orbital Theory in the context of complex ions such as $[\text{Fe}(\text{CN})_6]^{4-}$.

Hint: Reflect on how hybridization explains geometry while MO theory can account for magnetic properties.



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Challenge Questions

Solve the following questions. Write your answers in the space provided.

5. Elaborate on the limitations of the molecular orbital theory in explaining the behavior of transition metal complexes.

Hint: Consider aspects like ligand field theory in your response.

6. Assess the impact of hydrogen bonding on the physical properties of water compared to H₂S.

Hint: Think about how the presence of significant hydrogen bonds alters molecular behavior.



Challenge Questions

Solve the following questions. Write your answers in the space provided.

7. Analyze the roles of s, p, and d orbital hybridization in determining molecular shape and bond angles for transition metal complexes.

Hint: Examples of ligands in square planar and octahedral geometries could help illustrate your analysis.

8. Examine the exceptions to the octet rule and their implications for molecular stability and reactivity, particularly focusing on BCl_3 .

Hint: Consider the role of electron-deficient species in chemical reactivity.



Challenge Questions

Solve the following questions. Write your answers in the space provided.

9. Evaluate how the concept of electronegativity influences bond characteristics in polar versus nonpolar molecules.

Hint: You might explore bonds between various halogens and hydrogen.

10. Investigate the role of molecular geometry in the function of biological molecules, particularly focusing on enzyme-substrate interactions.

Hint: Think about how molecular structure drives function in biochemical systems.



Check your answers with the solutions below.

1. Evaluate the implications of the octet rule when considering the stability of molecules such as SF₆ versus PCl₅.

Solution: Examine the differences in electron configurations and bonding capabilities. Address potential exceptions to the octet rule and their significance.

2. Discuss the relevance of Lewis structures in predicting molecular reactivity, using the example of butadiene and its reaction with electrophiles.

Solution: Analyze how Lewis structures inform about electron availability and molecular orbital interactions.

3. How does VSEPR theory facilitate predictions about molecular geometry, particularly in cases of resonance structures?

Solution: Elucidate the relationship between electronic repulsion, molecular shape, and resonance stabilization.

4. Critically compare the Valence Bond Theory and Hybridization with Molecular Orbital Theory in the context of complex ions such as [Fe(CN)₆]⁴⁻.

Solution: Discuss how these theories provide different insights into bonding and electrons in transition metals.

5. Elaborate on the limitations of the molecular orbital theory in explaining the behavior of transition metal complexes.

Solution: Identify cases where MO theory may oversimplify realities or fails to predict magnetic properties accurately.



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Check your answers with the solutions below.

6. Assess the impact of hydrogen bonding on the physical properties of water compared to H₂S.

Solution: Explore the significance of hydrogen bonds in determining boiling points, solubility, and molecular interactions.

7. Analyze the roles of s, p, and d orbital hybridization in determining molecular shape and bond angles for transition metal complexes.

Solution: Discuss the hybridization effect taking into account different oxidation states and ligand types.

8. Examine the exceptions to the octet rule and their implications for molecular stability and reactivity, particularly focusing on BCl₃.

Solution: Discuss how incomplete octets affect bonding and the formation of alternative structures.

9. Evaluate how the concept of electronegativity influences bond characteristics in polar versus nonpolar molecules.

Solution: Discuss the relationship between electronegativity differences and bond polarity, giving specific examples.

10. Investigate the role of molecular geometry in the function of biological molecules, particularly focusing on enzyme-substrate interactions.

Solution: Analyze how specific molecular shapes enhance or inhibit biological activity, citing examples of the lock-and-key model.



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