

Name

Understanding Lewis Structures and Charges

Class

Total questions: 15

Worksheet time: 8mins

Date

Instructor name: Dr. Ramanathan Saitechinfo

1. What is the first step in drawing a Lewis structure?
 - a) Identify the central atom.
 - b) Determine the total number of valence electrons.
 - c) Draw the molecular shape.
 - d) Count the number of bonds needed.
2. How do you determine the total number of valence electrons in a molecule?
 - a) The total number of valence electrons in a molecule is the sum of the valence electrons of all its constituent atoms, adjusted for any ionic charges.
 - b) Multiply the number of atoms by 8 to get the total valence electrons.
 - c) Count only the electrons in the outermost shell of the central atom.
 - d) Use the atomic number of each atom to find the total electrons.
3. What is the significance of lone pairs in a Lewis structure?
 - a) Lone pairs are irrelevant in determining molecular weight.
 - b) Lone pairs only affect the color of the molecule.
 - c) Lone pairs are significant as they influence molecular geometry, reactivity, and stability.
 - d) Lone pairs have no impact on molecular stability.

4. How do you calculate the formal charge of an atom in a molecule?

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| a) Formal Charge = Valence Electrons + Bonding Electrons | b) Formal Charge = Non-bonding Electrons - Bonding Electrons |
| c) Formal Charge = Total Electrons - Non-bonding Electrons | d) Formal Charge = Valence Electrons - (Non-bonding Electrons + 1/2 Bonding Electrons) |

5. What is the formula for calculating formal charge?

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| a) Formal Charge = Valence Electrons + Non-bonding Electrons - 1/2 Bonding Electrons | b) Formal Charge = Valence Electrons - (Non-bonding Electrons + 1/2 Bonding Electrons) |
| c) Formal Charge = 2 x Valence Electrons - (Non-bonding Electrons + Bonding Electrons) | d) Formal Charge = Non-bonding Electrons + Bonding Electrons - Valence Electrons |

6. What are resonance structures and why are they important?

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| a) Resonance structures are the same as molecular shapes. | b) Resonance structures are alternative Lewis structures for a molecule that differ only in the placement of electrons. They are important for understanding the stability and reactivity of molecules. |
| c) They are only relevant for ionic compounds. | d) Resonance structures represent different molecules entirely. |

7. How do you identify resonance structures for a given molecule?

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| a) Resonance structures can be identified by removing all lone pairs from the Lewis structure. | b) Draw only one Lewis structure without considering electron placement. |
| c) Identify resonance structures by changing the arrangement of atoms in the molecule. | d) Identify resonance structures by drawing valid Lewis structures that differ only in the placement of electrons, while keeping the arrangement of atoms the same. |

13. What is the difference between a bonding pair and a lone pair?
- a) A bonding pair is always a single bond, while a lone pair can form multiple bonds.
 - b) A bonding pair is shared between atoms, while a lone pair is not shared and belongs to one atom.
 - c) A bonding pair is found only in ionic compounds, while a lone pair is found in covalent compounds.
 - d) A bonding pair consists of two electrons, while a lone pair consists of one electron.
14. How can you tell if a molecule is polar or nonpolar based on its Lewis structure?
- a) A molecule is nonpolar if it contains only carbon and hydrogen atoms.
 - b) A molecule is nonpolar if it has a symmetrical shape and no lone pairs on the central atom.
 - c) A molecule is polar if it has only single bonds between atoms.
 - d) A molecule is polar if it has an asymmetrical shape, significant electronegativity differences, or lone pairs on the central atom; otherwise, it is nonpolar.
15. What role do double and triple bonds play in Lewis structures?
- a) Double and triple bonds are only found in ionic compounds.
 - b) Double and triple bonds indicate the presence of unshared electrons.
 - c) Double and triple bonds indicate the sharing of multiple pairs of electrons between atoms in Lewis structures.
 - d) Double and triple bonds represent lone pairs of electrons.

Answer Keys

1. b) Determine the total number of valence electrons.
2. a) The total number of valence electrons in a molecule is the sum of the valence electrons of all its constituent atoms, adjusted for any ionic charges.
3. c) Lone pairs are significant as they influence molecular geometry, reactivity, and stability.
4. d) Formal Charge = Valence Electrons - (Non-bonding Electrons + $1/2$ Bonding Electrons)
5. b) Formal Charge = Valence Electrons - (Non-bonding Electrons + $1/2$ Bonding Electrons)
6. b) Resonance structures are alternative Lewis structures for a molecule that differ only in the placement of electrons. They are important for understanding the stability and reactivity of molecules.
7. d) Identify resonance structures by drawing valid Lewis structures that differ only in the placement of electrons, while keeping the arrangement of atoms the same.
8. b) Phosphorus trifluoride (PF₃)
9. b) Common exceptions to the octet rule include molecules with an odd number of electrons, expanded octets, and stable configurations with fewer than eight electrons.
10. a) Molecular geometry is influenced by the arrangement of bonding pairs and lone pairs, with lone pairs causing greater repulsion
11. a) VSEPR theory is used to predict molecular geometry based on electron pair repulsion.
12. b) Use VSEPR theory to analyze electron pairs and adjust for lone pairs.

and altering bond angles.

13. b) A bonding pair is shared between atoms, while a lone pair is not shared and belongs to one atom.
14. d) A molecule is polar if it has an asymmetrical shape, significant electronegativity differences, or lone pairs on the central atom; otherwise, it is nonpolar.
15. c) Double and triple bonds indicate the sharing of multiple pairs of electrons between atoms in Lewis structures.