Lewis Structure Worksheet

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Part 1: Building a Foundation

Which of the following elements typically does not follow the octet rule?

Hint: Consider the elements' positions in the periodic table.

- ◯ A) Oxygen
- ◯ B) Nitrogen
- ◯ C) Boron
- ◯ D) Carbon

Select all elements that can have an expanded octet.

Hint: Think about elements in the third period and beyond.

- ☐ A) Sulfur
- ☐ B) Phosphorus
- ☐ C) Helium
- ☐ D) Chlorine

Explain the significance of valence electrons in forming chemical bonds.

Hint: Consider how valence electrons interact between atoms.

List the steps involved in drawing a basic Lewis structure.

Hint: Think about the order of operations when drawing.

1. Step 1

2. Step 2

3. Step 3

What is the maximum number of electrons that can be shared in a triple bond?

Hint: Consider how many pairs of electrons are involved in bonding.

- ◯ A) 2
- ◯ B) 4
- ◯ C) 6
- ◯ D) 8

Part 2: Understanding and Interpretation

Which molecule is most likely to have a resonance structure?

Hint: Think about molecules with multiple valid Lewis structures.

- ◯ A) H_2O
- ◯ B) CO_2
- ◯ C) O_3
- ◯ D) CH_4

Which of the following are characteristics of a polar covalent bond?

Hint: Consider the distribution of electron density in the bond.

- ☐ A) Unequal sharing of electrons
- ☐ B) Equal sharing of electrons
- ☐ C) High electronegativity difference
- ☐ D) No electronegativity difference

Describe how formal charge is used to determine the most stable Lewis structure.

Hint: Think about how formal charge calculations influence structure selection.

Part 3: Application and Analysis

Which of the following Lewis structures correctly represents the nitrate ion (NO3^-)?

Hint: Consider the bonding and charge distribution in the ion.

- ◯ A) A structure with one double bond and two single bonds
- ◯ B) A structure with three single bonds
- ◯ C) A structure with two double bonds and one single bond
- ◯ D) A structure with three double bonds

When drawing the Lewis structure for sulfur hexafluoride (SF6), which of the following statements are true?

Hint: Think about the bonding and electron arrangement in SF6.

- ☐ A) Sulfur has an expanded octet
- ☐ B) Each fluorine atom forms a single bond with sulfur
- ☐ C) Sulfur follows the octet rule
- ☐ D) There are no lone pairs on sulfur

Draw the Lewis structure for ammonia (NH3) and explain the arrangement of electrons around the nitrogen atom.

Hint: Consider the number of valence electrons and bonding pairs.

In the molecule CO_2, what is the formal charge on the oxygen atoms?

Hint: Consider the electron distribution in the Lewis structure.

- ◯ A) +1
- ◯ B) 0
- ◯ C) -1
- ◯ D) -2

Analyze the following statements about the molecule H_2O. Which are true?

Hint: Consider the molecular shape and bonding in water.

- ☐ A) The molecule has a bent shape
- ☐ B) The oxygen atom has two lone pairs
- ☐ C) The molecule is nonpolar
- ☐ D) Each hydrogen atom forms a single bond with oxygen

Compare and contrast the Lewis structures of O_2 and O_3, focusing on bond types and electron arrangement.

Hint: Think about the differences in bonding and resonance.

Part 4: Evaluation and Creation

Which Lewis structure is more stable for the sulfate ion (SO4^2-), considering formal charges?

Hint: Consider the distribution of charges in the structures.

- ◯ A) A structure with all single bonds
- ◯ B) A structure with two double bonds and two single bonds
- ◯ C) A structure with four double bonds
- ◯ D) A structure with one double bond and three single bonds

Evaluate the following Lewis structures for the phosphate ion (PO4^3-). Which are correct?

Hint: Consider the bonding and charge distribution in the ion.

- ☐ A) A structure with three single bonds and one double bond
- ☐ B) A structure with four single bonds
- ☐ C) A structure with two double bonds and two single bonds
- ☐ D) A structure with one triple bond and one single bond

Design a Lewis structure for a hypothetical molecule with the formula X2Y3, where X and Y are different elements. Explain your reasoning for the arrangement of bonds and electron pairs.

Hint: Consider the valence electrons of X and Y.