

Lewis Dot Structure Online Lab

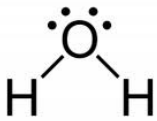
1. In your own words, EXPLAIN the following terms.

a. Duet Rule

b. Octet Rule

2. How is the total number of valence electrons in a molecule determined?

3. Fill in the following table, leaving only the ACTUAL column empty.

Name	Formula	Valence e ⁻	Prediction	Actual
Hydrogen fluoride				
Molecular fluorine	F ₂			
Water				
Carbon dioxide				
Hydrogen peroxide	H ₂ O ₂			
Boron trifluoride				
Ammonia				

4. Go to <http://www.stolaf.edu/depts/chemistry/courses/toolkits/123/js/lewis/> and check your predictions. If they were correct, place a check (✓) in the Actual column. If not, draw the correct structure instead.

5. Judging by its Lewis structure, why do you think molecular nitrogen is so stable?

6. Make predictions for the following table.

Name	Formula	Valence e ⁻	Prediction	Actual
Methanol	CH ₃ OH			
Ethanol	CH ₃ CH ₂ OH			
Acetone	CH ₃ COCH ₃			
Acetyline	HCCH			
Methyl ion	CH ₃ ⁺			

7. Based on the naming system you have learned, what other name might acetyline be called? _____

8. Using the same website, check your predictions and fill in the last column appropriately.

9. The formulas written above are variations on the ones you are used to seeing. Why might someone choose to write methanol as CH₃OH rather than CH₄O?

10. Judging by its Lewis structure, why do you think the methyl ion is so reactive?

11. Make predictions for the following table.

Name	Formula	Valence e ⁻	Prediction	Actual	Number of resonance structures
Acetate ion					
Nitrite ion					
Nitrate ion					
Ozone	O ₃				

12. Using the same website, check your predictions and fill in the last TWO (2) columns appropriately. To find the **resonance structures**, simply click *Show Resonance Structures* on the simulation.

13. Based on the simulation, what is a **resonance structure**?

14. Make predictions for the following table.

Name	Formula	Valence e ⁻	Prediction	Actual	Number of resonance structures
Phosphate ion					
Sulfate ion					

15. Some of the above resonance structures clearly violate the octet rule. What is different about those atoms that allow them to hold “extra” electrons? (Hint: Think about their electron configurations.)

16. The positive and negative numbers that appear on the simulation are called **formal charges**. Look at the resonance structures for ozone and the acetate ion. How do you think formal charge is determined?
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17. **Formal charges** provide a way to determine the most probably Lewis structure for a particular species. The resonance structure that has the lowest formal charges AND places the negative charges on the most electronegative atoms is usually preferred. Based on this information, look at the resonance structures for phosphate and sulfate again and determine the preferred structure for both.

(Show formal charges.)

Phosphate:

Sulfate:

18. Based on what you learned in questions #15-17, draw preferred Lewis structures for the following molecules:

