


Module 4: Bonding, Formula Writing, and Nomenclature

Topic 2 Content: Lewis Dot Diagrams Notes

Introduction

Lewis Dot Diagrams

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Lewis Dot Diagrams

In 1916, American scientist Gilbert N. Lewis proposed a new way of diagramming the bonds between atoms, molecules, and electrons. In his article, *The Atom and the Molecule*, Lewis put forth his ideas on bonds that would be known as covalent bonds. He also introduced Lewis dot diagrams. In this interactivity, click on each of the bars to learn more about Lewis dot diagrams.

- Lewis Dot Diagrams
- Example: Sodium
- Example: Nitrogen
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In 1916, American scientist Gilbert N. Lewis proposed a new way of diagramming the bonds between atoms, molecules, and electrons. In his article, *The Atom and the Molecule*, Lewis put forth his ideas on bonds that would be known as covalent bonds. He also introduced Lewis dot diagrams. In this interactivity, click on each of the bars to learn more about Lewis dot diagrams.

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Lewis Dot Diagrams for Main Group Atoms

1A	2A	3A	4A	5A	6A	7A	8A
ns^1	ns^2	ns^2np^1	ns^2np^2	ns^2np^3	ns^2np^4	ns^2np^5	ns^2np^6
Li •	•Be •	• B •	• C •	• N •	• O •	• F •	• Ne •
Na •	•Mg •	• Al •	• Si •	• P •	• S •	• Cl •	• Ar •

Lewis dot diagrams are visual representations of an atom. A Lewis dot diagram represents the nucleus and core electrons with the symbol of the element. The valence electrons are represented as dots around the top, bottom, right and left sides of the symbol. Each side of the element symbol represents an orbital, so there is a maximum of two electrons for each side. Shown here are some examples of Lewis dot diagrams for main group atoms.

Example: Sodium

Example: Nitrogen

Other Examples

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Example: Sodium

Lewis Dot Diagrams

Example: Sodium

$$1s^2 2s^2 2p^6 3s^1$$

Na •

How would you construct the Lewis dot diagram for sodium? First, you must recall the electron configuration for sodium. The valence electrons are the electrons in the highest energy level, which for sodium is the third energy level. After looking at the electron configuration, you would know that sodium only has one valence electron. View the image for the Lewis dot diagram of sodium. The side where the dot is placed makes no difference.

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Example: Nitrogen

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Example: Sodium

Example: Nitrogen

Example: Nitrogen

$1s^2 2s^2 2p^3$

Electrons in the same orbital

Electrons in different orbitals

How would you construct the Lewis dot diagram for nitrogen? Again, you must recall the electron configuration for nitrogen. The valence electrons are the electrons in the highest energy level, which for nitrogen is the second energy level. That means that nitrogen has five valence electrons: two in the $2s$ sublevel and three in the $2p$ sublevel. View the image for the Lewis dot diagram of nitrogen. The bottom three electrons must be placed in different orbitals according to Hund's Rule.

Other Examples

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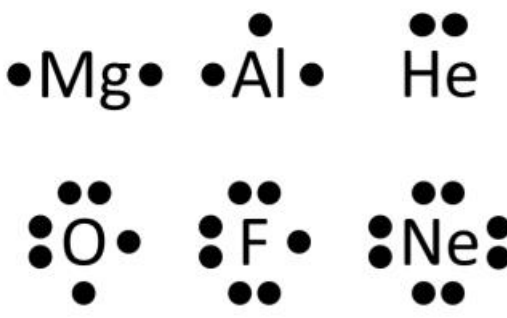
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Other Examples

Lewis Dot Diagrams

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Example: Sodium
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Other Examples

Other Examples



The image shows six Lewis dot diagrams arranged in two rows. The top row contains Mg, Al, and He. The bottom row contains O, F, and Ne. Each diagram consists of the element's symbol with dots representing its valence electrons. Mg has two dots on the left and right. Al has one dot on the left, one on the right, and one above. He has two dots above. O has two dots on the left, two on the right, and two below. F has two dots on the left, two on the right, and two below. Ne has two dots on the left, two on the right, and two below.

Shown here are other examples of Lewis dot diagrams for the elements magnesium, aluminum, helium, oxygen, fluorine, and neon.

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