The Octet Rule

Video Workbook with Dr. B

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The **Octet Rule** helps us draw Lewis Structures and predict how electrons will be arranged in atoms and molecules.

It states that atoms are most stable when they have eight (an octet) valence electrons.

Be careful, though, there are exceptions.

The Octet Rule

Exceptions to the Octet Rule

Hydrogen (H) is an important exception. It only needs 2 valence electrons to fill its highest energy level.

Key Terms

A **valence electron** is an electron in the highest energy level or an atom.

A **chemical bond** forms when valence electrons are transferred (ionic) or shared (molecular) between atoms.

Bonds are formed to fill their highest energy level (often called an **Octet**). Noble gases have octets.

Ionic Bond—a strong bond between a metal cation (positive ions) and non-metal anion (negative ions)

Ion—atoms that have a charge (+ or -).
Lost electron = + charge = cation.
Gained electron = - charge = anion.

Molecular (Covalent) Bond—a semi-strong bond between two non-metals.

Expanded Octets – elements in the third period and beyond **can** have more than 8 valence electrons. They don't always, but they can.

If your time is extremely limited, watch these videos and do the practice problems:

Counting Valence Electrons: https://youtu.be/VBp7mKdcrDk
Lewis Structures Made Simple: https://youtu.be/1ZlnzyHahvo
More Lewis Structures Practice: https://youtu.be/DQclmBeIKTc
The Octet Rule: https://youtu.be/6Ecr7m-0E0E
Exceptions to the Octet Rule: https://youtu.be/Dkj-SMBLQzM
Calculating Formal Charge: https://youtu.be/vOFAPlq4y_k
Practice Calculating Formal Charge: https://youtu.be/-9f4H0puVzc
Lewis Structures for Ionic Compounds: https://youtu.be/2urppjeSfgA

Practice

1. Which element only needs two valence electrons to fill its highest energy level?
   Explanation: https://youtu.be/SqnfcwKMmYE

2. Sodium (Na) has one valence electron. Chlorine (Cl) has seven valence electrons. Describe how they would bond to obtain octets.
   Explanation: https://youtu.be/nQyOaEtboC8

3. How can you tell how many valence electrons there are for NH_3?
   Explanation: https://youtu.be/EPYQ2uxP_sY

4. Covalent (also called Molecular) compounds share electrons to obtain octets. Draw the Lewis Structure for H_2O to show this.
   Explanation: https://youtu.be/UfiltW_xkrA

5. Is it possible for an atom to have more than eight valence electrons?
   Explanation: https://youtu.be/Dkj-SMBLQzM

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