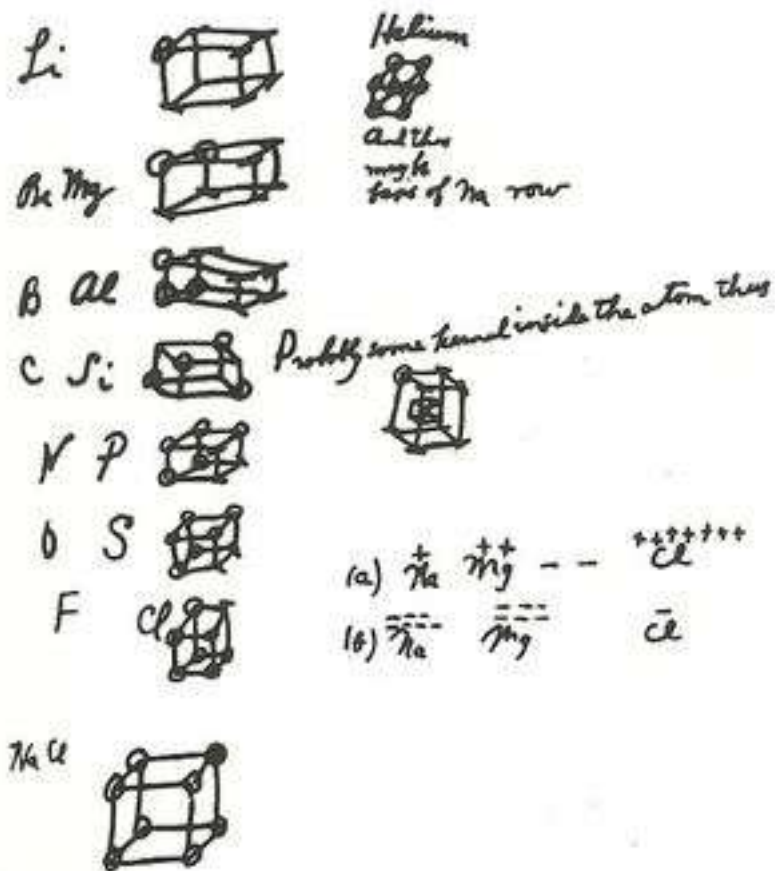


Pre-AP Chemistry

September 4, 2011

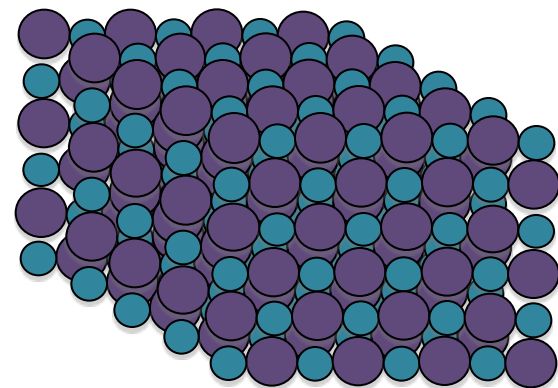
12. Ionic Bonding I



Review

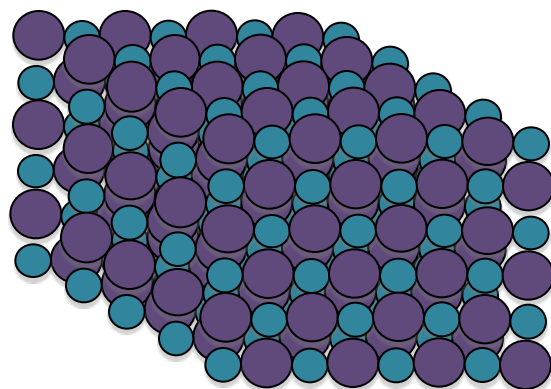
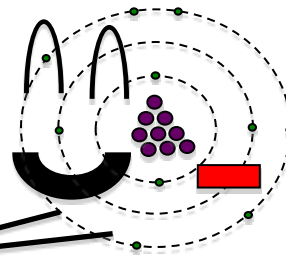
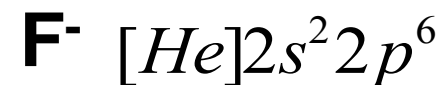
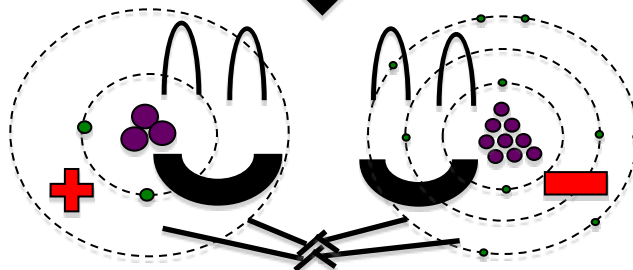
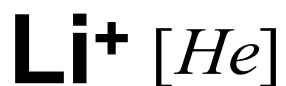
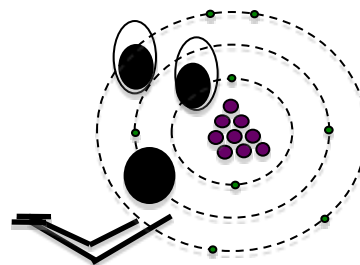
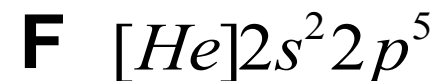
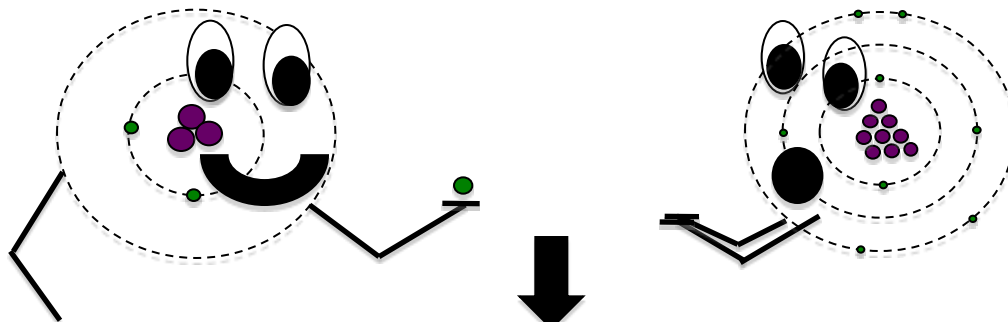
- Fill in the blanks:

1. A cation has a _____ atomic radius than its neutral atom.
1. An anion has a _____ atomic radius than its neutral atom.
1. Halogens (gain / lose) _____ electrons to become (cations / anions).
1. Alkali metals (gain / lose) _____ electrons to become (cations / anions).
1. Salts are made of _____ and _____.



Review

- Can you think of a better way to represent the formation of a salt?



Chemists use **Lewis structures** to show how atoms and molecules react.

Outline

- Valence Electrons
- Introduction to Lewis Structures
- Octet Rule

- Valence Electrons
- Introduction to Lewis Structures
 - Neutral atoms
 - Ions
- Octet Rule

Outline

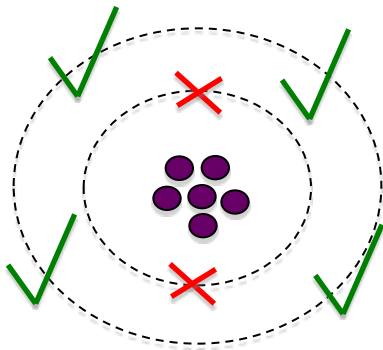
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Valence Electrons

- **Valence electrons** are ...
 1. the outermost electrons of an atom

1.



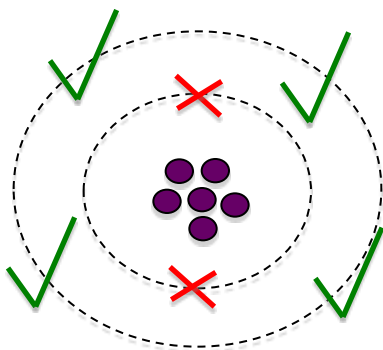
✗ = Noble-gas core electron

✓ = Valence electron

Valence Electrons

- **Valence electrons** are ...
 1. the outermost electrons of an atom
 2. all electrons outside the 'noble-gas core' of electrons

1.



X

==

Noble-gas core
electron

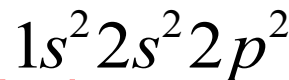
✓

==

Valence electron

2.

C



Noble-gas core
electrons

Valence
electrons

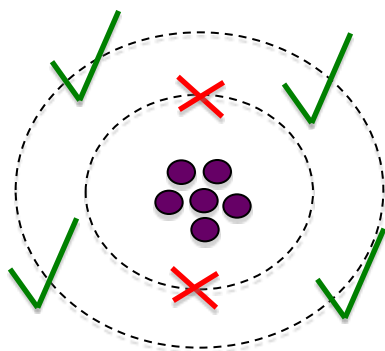
C



Valence Electrons

- **Valence electrons** are ...
 1. the outermost electrons of an atom
 2. all electrons outside the 'noble-gas core' of electrons
 3. responsible for almost all chemicals and chemical reactions

1.



X

=

Noble-gas core
electron

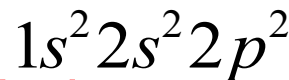
✓

=

Valence electron

2.

C



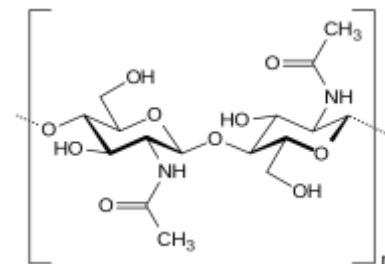
Noble-gas core
electrons

Valence
electrons

C

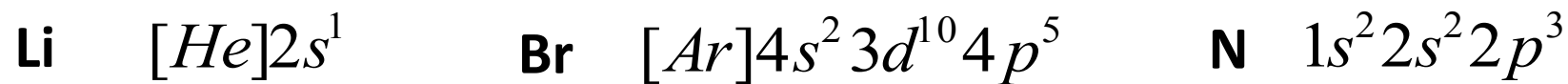


3.



Mini-Quiz

- Identify the valence electrons in each of the following atoms:



- How many valence electrons are in the following atoms?
- To which group do these atoms belong?

	Valence electrons	Group	Valence electrons	Group
Be			0	
Mg			S	

Mini-Quiz

- Identify the valence electrons in each of the following atoms:



- How many valence electrons are in the following atoms?
- To which group do these atoms belong?

	Valence electrons	Group		Valence electrons	Group
Be	2	2	O	6	6
Mg	2	2	S	6	6

Outline

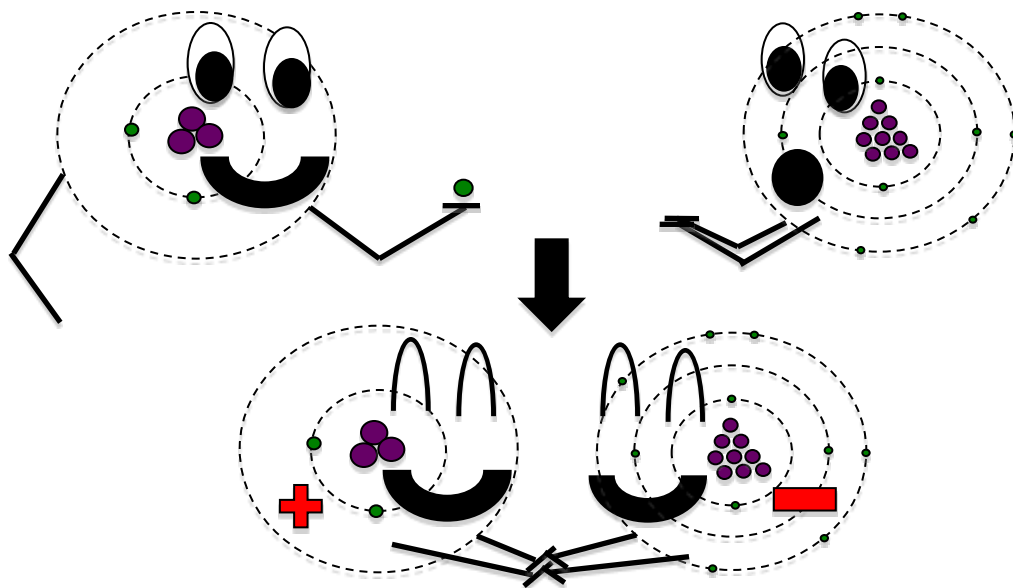
- Valence Electrons
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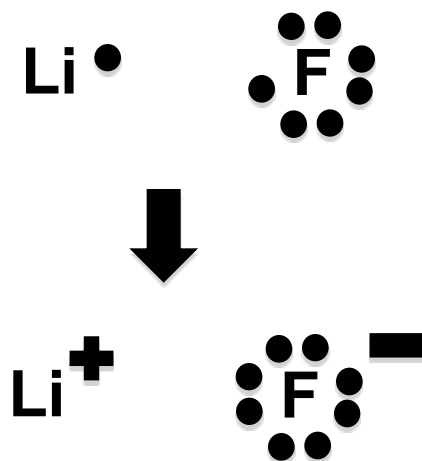
Lewis Structures

- Developed by G. N. Lewis in 1916
- **Lewis structures** show how **electrons** are **shared** or **transferred** in a chemical **bond**

Electron Shell Picture



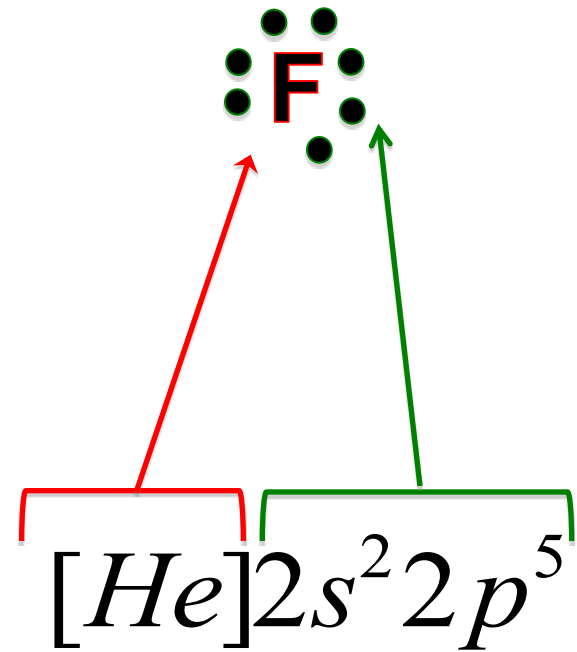
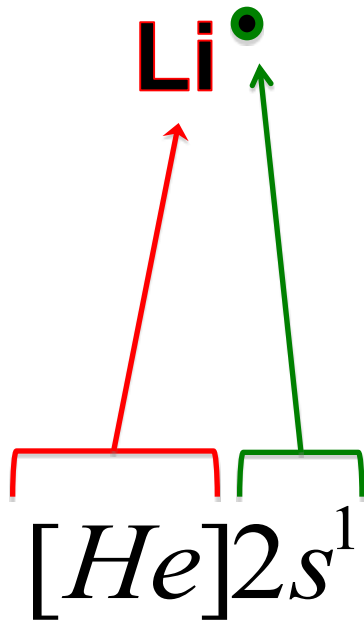
Lewis Structures



Let's see how to build Lewis structures for atoms and ions

Lewis Structures

- A Lewis structure for an atom consists of
 1. its atomic symbol, representing the nucleus and core electrons
 2. dots representing each valence electron



Lewis Structures

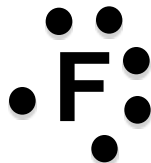
- For atoms with more than one electron ...
 1. Add first four electrons unpaired, one on each side
 2. Add additional electrons to make 'lone pairs' with first four



First four electrons added unpaired ...



... additional electrons form lone pairs.



unpaired electron

lone pair

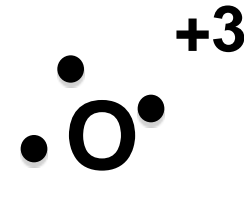
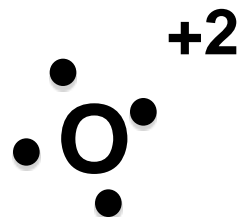
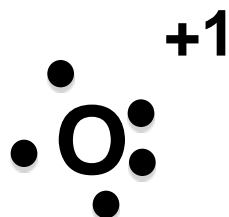
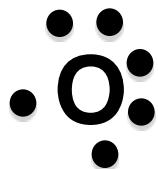
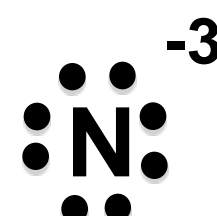
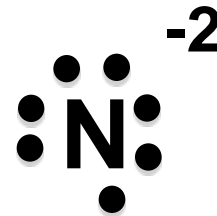
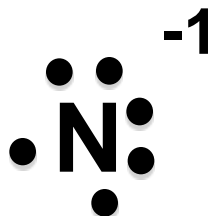
Outline

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Lewis Structures

- To draw Lewis structures for ions
 1. Draw Lewis structure of neutral atom
 2. Add (remove) enough electrons in the same (reverse) order as neutral atom until you have anion (cation) with correct charge



Mini Quiz

Draw the Lewis structures of the following atoms

Na

B

O

Draw the Lewis structures of the following ions

Na⁺

B³⁺

O²⁻

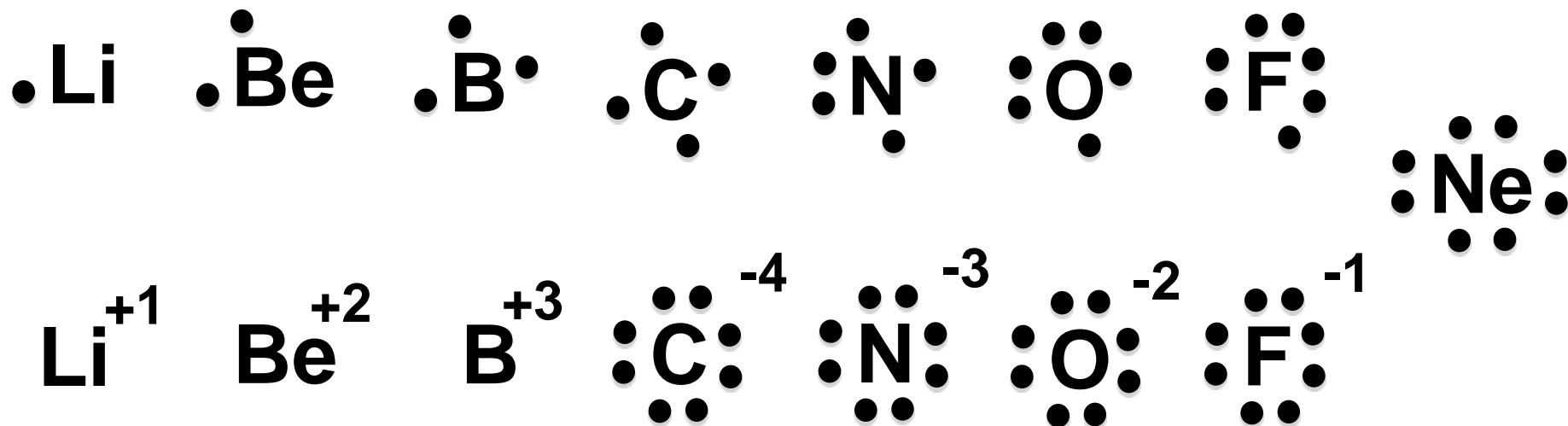
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Octet Rule

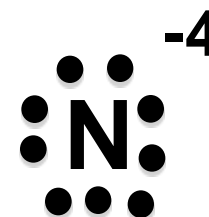
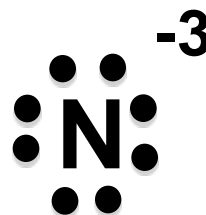
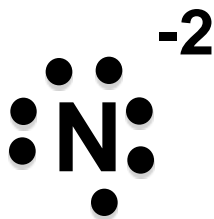
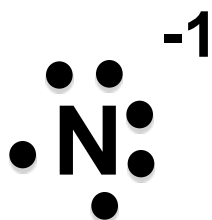
- Atoms in rows 1 and 2 have at most eight valence electrons
- Atoms and ions in rows 1 to 3 with eight valence electrons have noble gas electron configurations



Lewis structures are a great way to see how an atom gains (loses) electrons to become an anion (cation)

Mini Quiz

- Which one of the following Lewis structures is incorrect? Why?



- Using Lewis structures, draw a series of pictures showing the formation of NaCl (salt) from Na and Cl atoms.

Summary

- An atom's outermost, or valence, electrons are responsible for most of its chemical properties
- Lewis structures represent an atom's nucleus and valence electrons
- The octet rule limits valence electrons to eight per atom

Homework

- TBD