Cycle 4 Chemistry I Lesson 1

Identify and Predict Closed-Shell Ions with Noble Gas Configuration

VOCAB:

Anion, Cation, Ionic Compound

WARMUP:

Draw Lewis Structure of **Na** and **Cl** atoms.

Try to draw Lewis of NaCl – why doesn't this work?

CLASSWORK:

"Determining the Ionic Charge" Handout

"Valence Electron Gain and Loss" Worksheet

End Of Slide

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Ionic Bonding

☹ 1 Valence Electron!

☹ 7 Valence Electrons!

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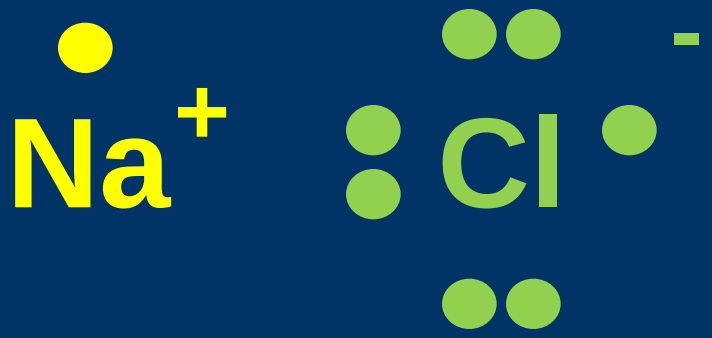

Metal-nonmetal compounds usually form IONIC compounds.

Na^+ is like [Ne], and Cl^- is like [Ar] – 'closed shell'

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Ionic Bonding

Chemical Reactivity

- We have learned how to use the **octet rule** to write Lewis structures of covalent compounds.
- **Metals usually do not form covalent compounds!** In this unit, we learn about the **ionic compounds** metals and nonmetals form when they combine.
- Elements often form stable ions with **'Closed Shell Configurations'** – these have either EMPTY or FULL Valence shells and are IDENTICAL to those of a noble gas.

End Of Slide

Valence Electrons, *continued*

Atoms Gain Or Lose Electrons to Form Stable Ions, *continued*

- Metals generally form positive ions, or **cations**.
- Nonmetals generally form negative ions, or **anions**
- **Ionic compounds** are held together by the attraction of positive and negative ions. The total charge of an ionic compound must equal zero.
- We will learn more about ionic compounds this cycle.

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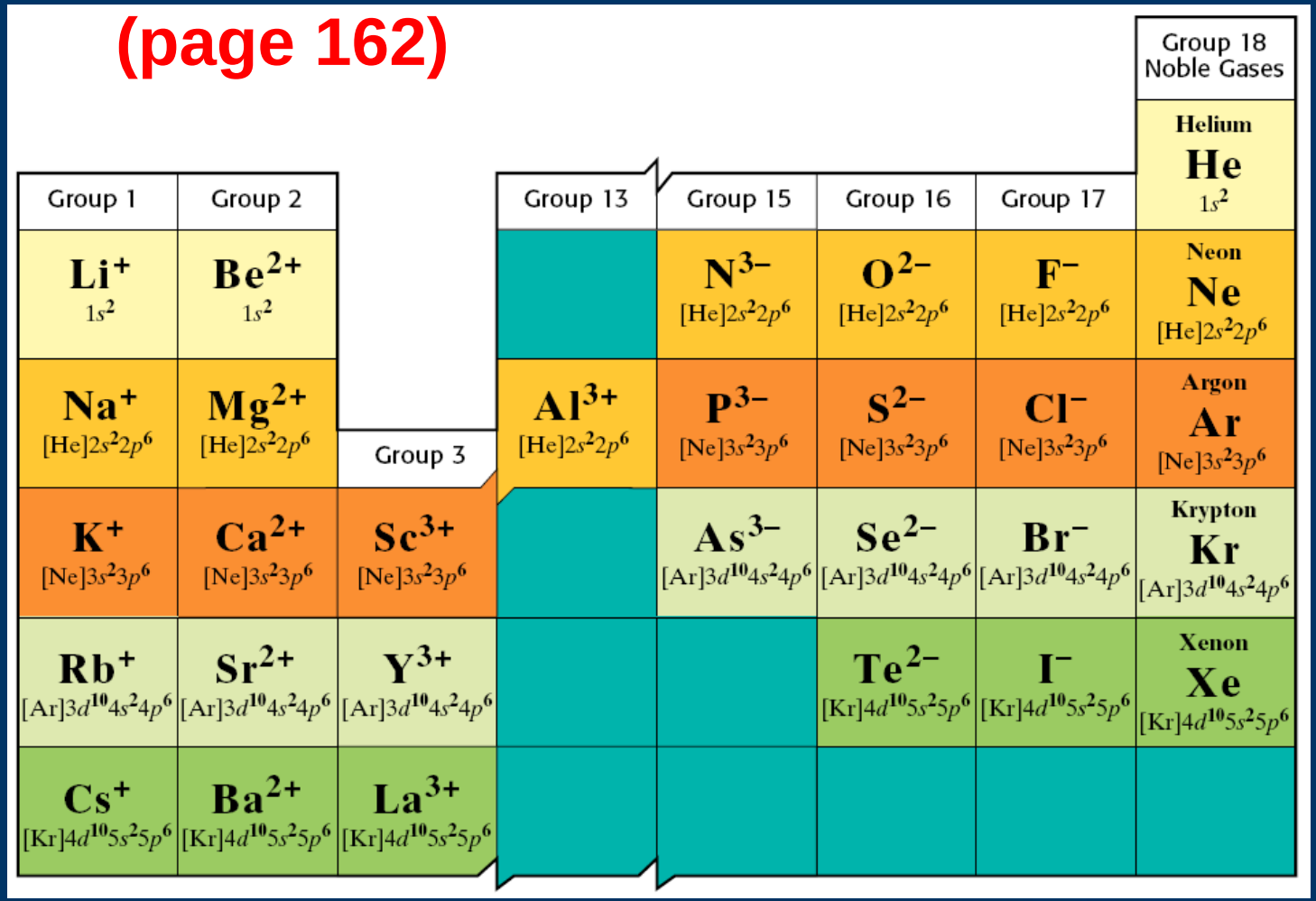
Stable Ions with Noble-Gas Configurations (page 162)



Group 1	Group 2	Group 3	Group 13	Group 15	Group 16	Group 17	Group 18 Noble Gases
							Helium He $1s^2$
Li^+ $1s^2$	Be^{2+} $1s^2$			N^{3-} $[He]2s^22p^6$	O^{2-} $[He]2s^22p^6$	F^- $[He]2s^22p^6$	Neon Ne $[He]2s^22p^6$
Na^+ $[He]2s^22p^6$	Mg^{2+} $[He]2s^22p^6$		Al^{3+} $[He]2s^22p^6$	P^{3-} $[Ne]3s^23p^6$	S^{2-} $[Ne]3s^23p^6$	Cl^- $[Ne]3s^23p^6$	Argon Ar $[Ne]3s^23p^6$
K^+ $[Ne]3s^23p^6$	Ca^{2+} $[Ne]3s^23p^6$	Sc^{3+} $[Ne]3s^23p^6$		As^{3-} $[Ar]3d^{10}4s^24p^6$	Se^{2-} $[Ar]3d^{10}4s^24p^6$	Br^- $[Ar]3d^{10}4s^24p^6$	Krypton Kr $[Ar]3d^{10}4s^24p^6$
Rb^+ $[Ar]3d^{10}4s^24p^6$	Sr^{2+} $[Ar]3d^{10}4s^24p^6$	Y^{3+} $[Ar]3d^{10}4s^24p^6$			Te^{2-} $[Kr]4d^{10}5s^25p^6$	I^- $[Kr]4d^{10}5s^25p^6$	Xenon Xe $[Kr]4d^{10}5s^25p^6$
Cs^+ $[Kr]4d^{10}5s^25p^6$	Ba^{2+} $[Kr]4d^{10}5s^25p^6$	La^{3+} $[Kr]4d^{10}5s^25p^6$					

Atoms and Ions

- Having identical electron configurations does not mean that a sodium cation is a neon atom.
  - They still have different numbers of protons and neutrons.

Ions and Their Parent Atoms Have Different Properties

- Both sodium and chlorine are very reactive.
  - When they are mixed, a violent reaction takes place, producing a white solid—table salt (sodium chloride).
  - It is made from sodium cations and chloride anions.

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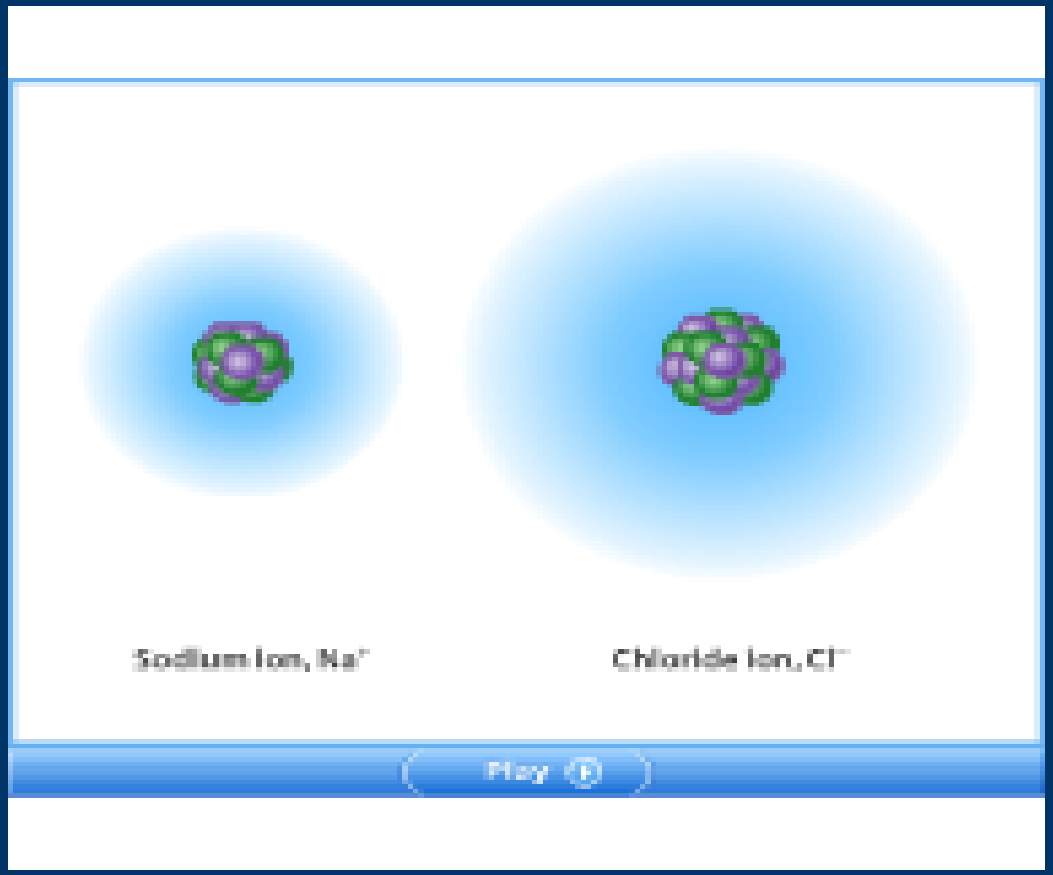
Ion



Valence Electrons, *continued*

Atoms Gain Or Lose Electrons to Form Stable Ions

Element	Property	Before Making an Octet	After Making an Octet
Li	electron config		
	# protons		
	#electrons		
	charge		
	Bohr Diagram		
	Lewis Dot Structure		

Li loses 1 valence electron to give Li^+

Valence Electrons, *continued*

Atoms Gain Or Lose Electrons to Form Stable Ions

Element	Property	Before Making an Octet	After Making an Octet
F	electron config		
	# protons		
	#electrons		
	charge		
	Bohr Diagram		
	Lewis Dot Structure		

F gains 1 valence electron to become F^-