# Chapter 5 Lesson 1 Notes

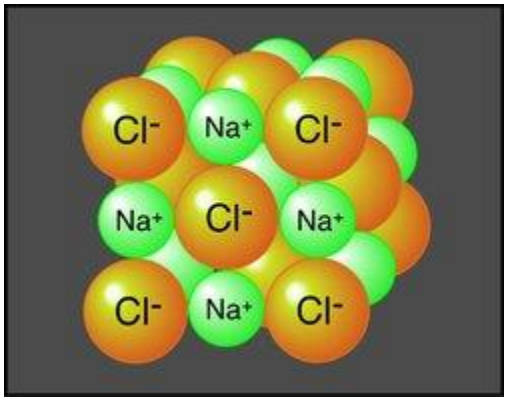
# 5.1 How Atoms Form Compounds

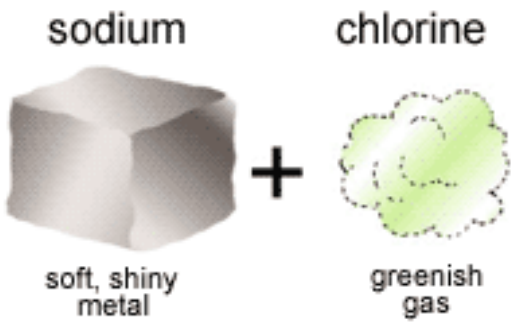
## LESSON Vocabulary

- compound
- chemical formula
- molecule
- chemical bond
- ionic bond
- valence
- covalent bond

# What is a compound?

- A **compound** is a pure substance that contains two or more elements.
- Compounds are chemical combinations of elements with properties that are different from the elements that formed them.




# Chemical Formulas for Compounds

- A **chemical formula** contains atomic symbols and subscripts to show the elements and the number of atoms of each element in the compound.

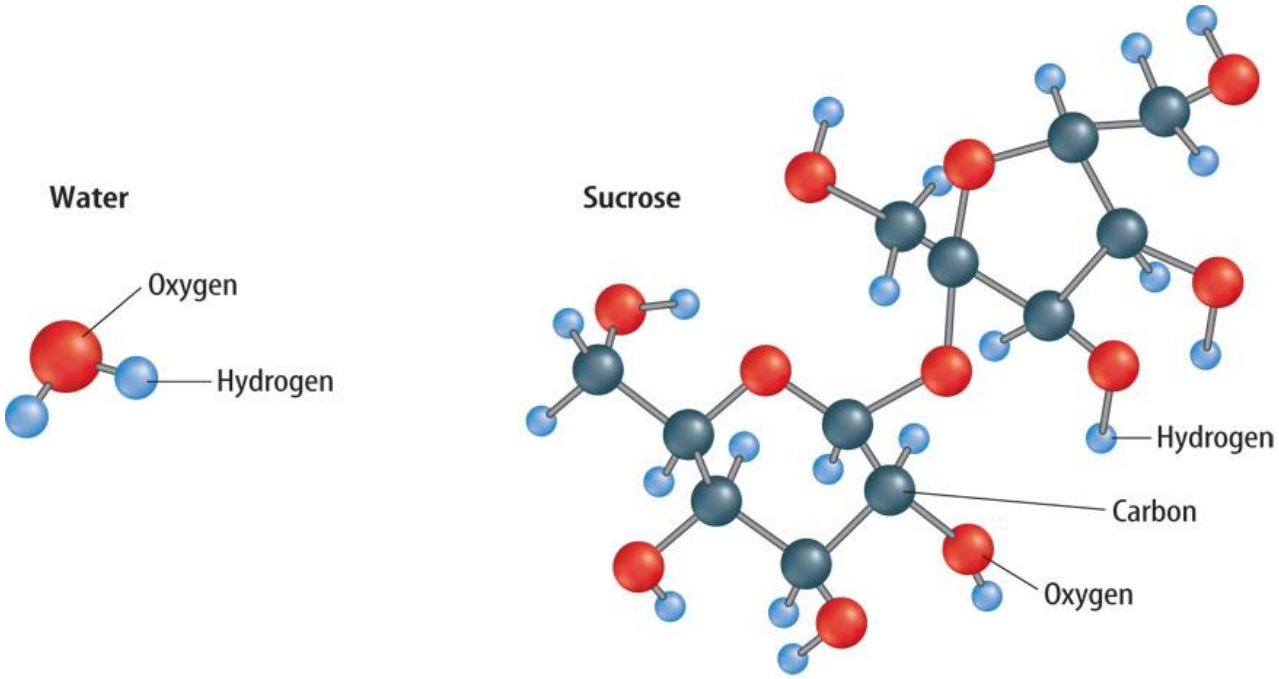
$NaCl$ sodium chloride (salt)

$H_2O$ dihydrogen oxide (water)

$CO_2$ carbon dioxide

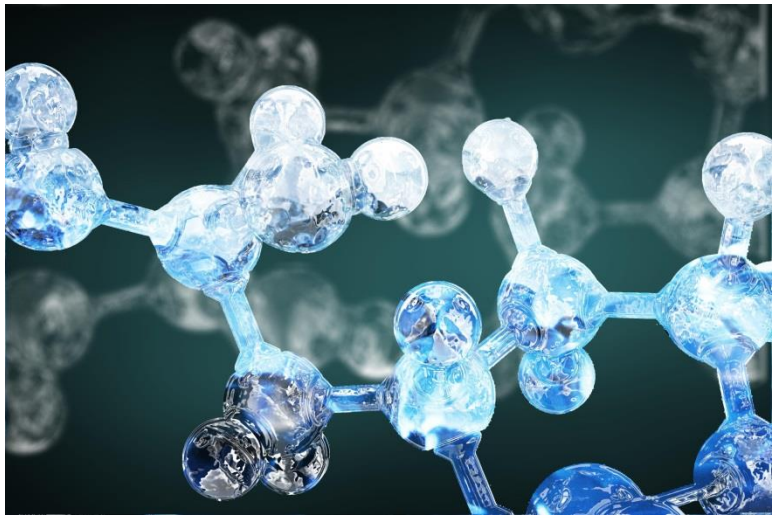
# Describing Compounds (cont.)

- The chemical formula for sucrose, $C_{12}H_{22}O_{11}$, includes all the atoms in one molecule.



# Describing Compounds

- A **molecule** is a neutral particle that forms as a result of electron sharing.



Virtual Lab

**How can a molecule model be built?**

http://www.glencoe.com/sites/common_assets/science/virtual_labs/E02/E02.swf

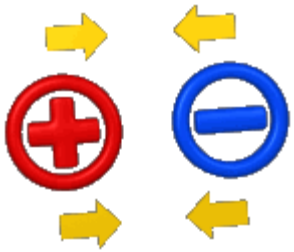
# Formulas and the Law of Definite Proportion

- A pure compound will always contain the same elements in the same proportion by mass.
- Extra credit Whiteboard point:
  - Give an example of this law!!!!

# Ionic Bonds and Ionic Compounds

- A **chemical bond** is a force that holds atoms together in a compound.


- An **ionic bond** is an electrical attraction between positively and negatively charged ions in an ionic compound.

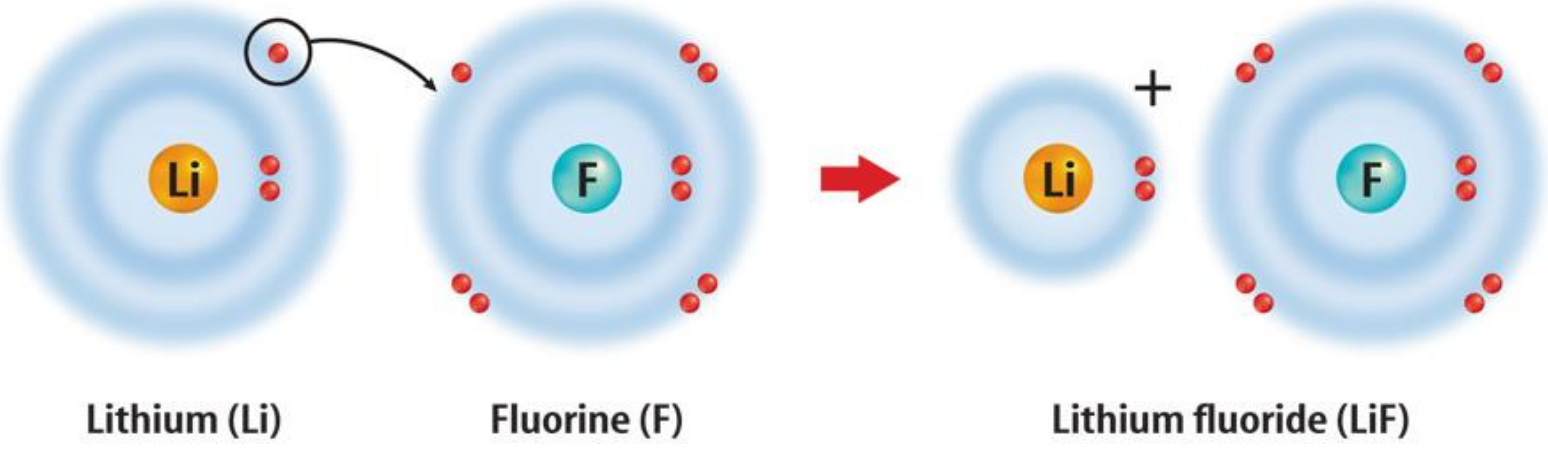


# Ionic Bonds—Transferring Electrons

- An atom can become charged by transferring one or more electrons to another atom.
- Both atoms become charged particles, or ions.

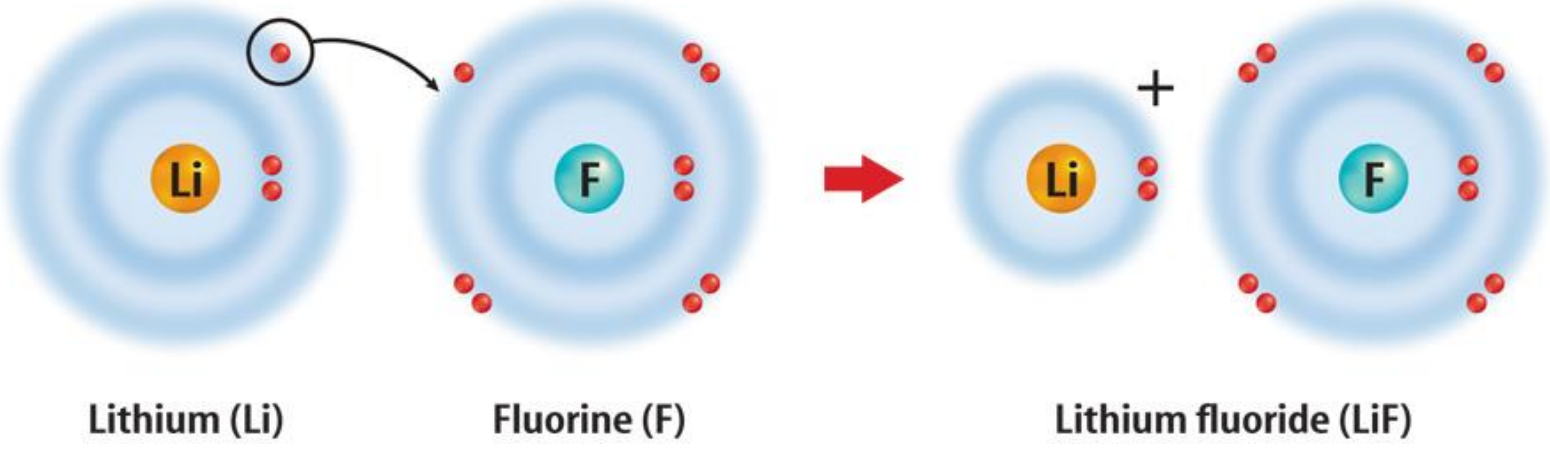
# Ionic Bonds—Transferring Electrons (cont.)

- A lithium atom gives up an electron to a fluorine atom.
- The result is a positively charged lithium ion and a negatively charged fluoride ion.



# Ionic Bonds—Transferring Electrons (cont.)

- The two ions have opposite charges and are attracted to each other.
- Lithium fluoride is the simplest type of compound, made only of two elements and known as a binary compound.



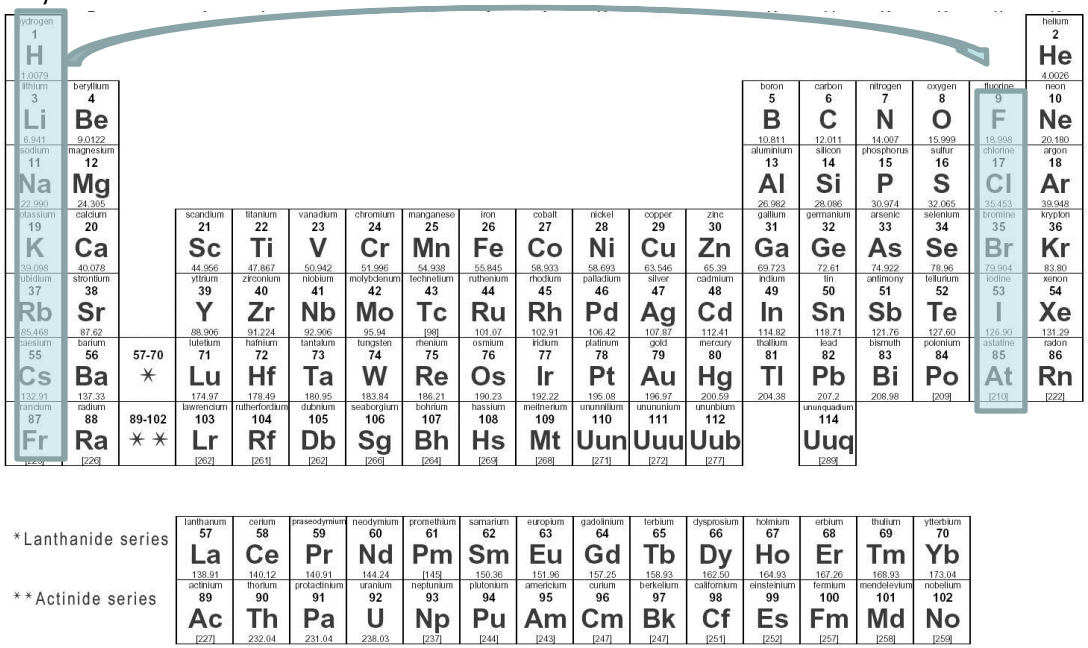
# Ionic Bonds—Transferring Electrons (cont.)

Concepts In Motion

http://www.youtube.com/watch?v=NgD9yHSJ29I

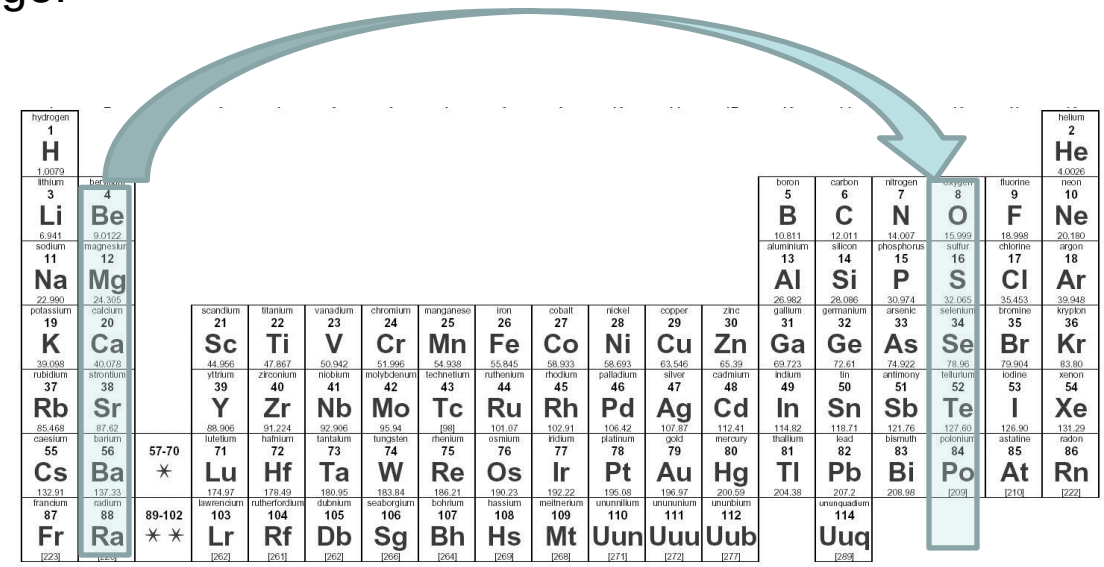
# Ionic Compounds

- Elements in the same column on the periodic table form a group.
- Metals in Group 1 can transfer 1 electron and will become +1 ions.
- Non-metals in Group 17 can gain an electron to form −1 ions.
- When a positive ion from Group 1 and a negative ion from Group 17 combine, a salt like sodium chloride forms.



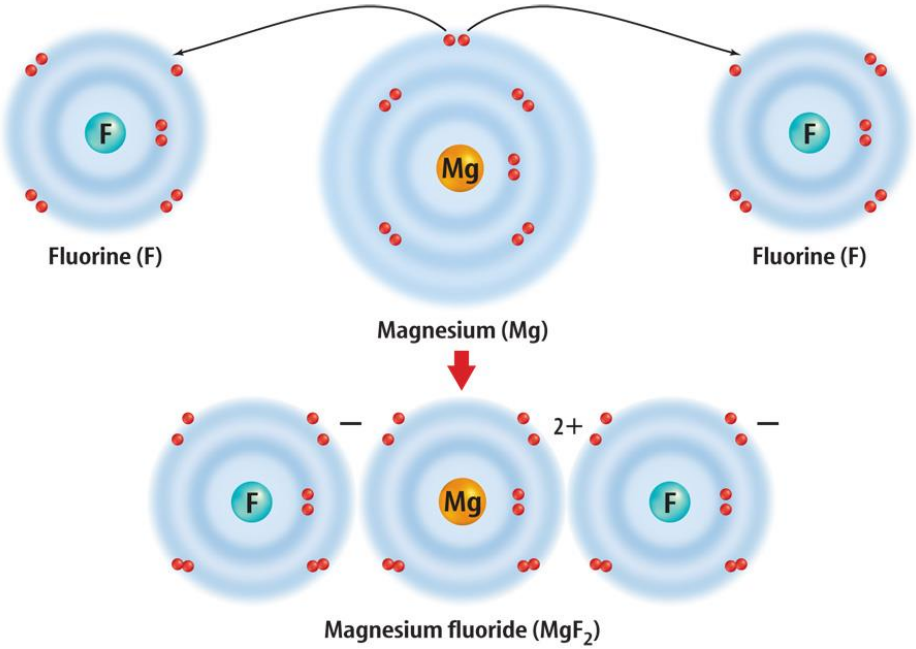
# Other Binary Ionic Compounds

- Group 2 elements are also metals and can lose 2 electrons and form ions with a +2 charge.
- Elements in Group 16 can gain 2 electrons and form ions with a −2 charge.



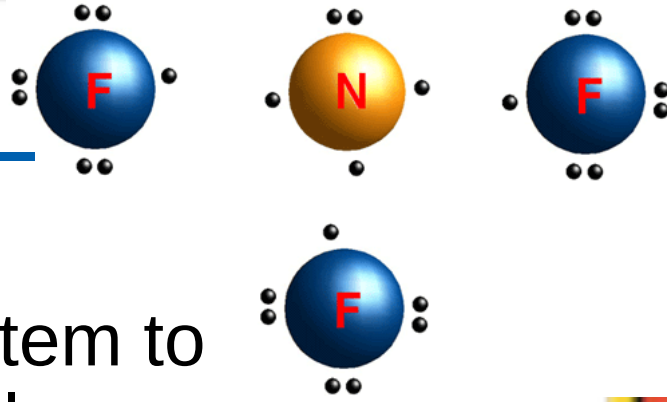
# Other Binary Ionic Compounds (cont.)

- Magnesium can ***transfer*** one electron to each of 2 Fluorine atoms to form magnesium fluoride ($MgF_2$).



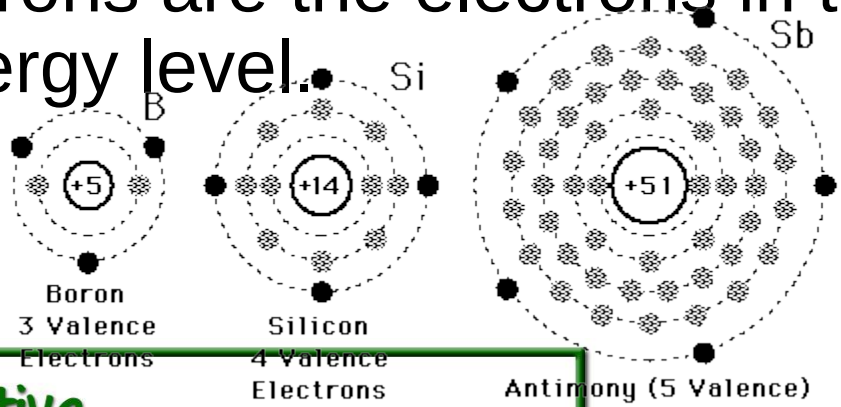
# Properties of Ionic Compounds

- Usually solids at room temperature
- Brittle and break apart easily
- Have high melting and boiling points
- Many dissolve in water




# Diagramming Electrons—Lewis Dot Diagrams

- A Lewis dot diagram is a system to represent atoms and their valence electrons.
- **Valence** electrons are the electrons in the outermost energy level.




Interactive Table

Valence and Lewis Dot Diagrams

# 8th grade Physical Science!

## Mrs. Winters

# Hot Sync

Wednesday 1/28/15

Copy table and Show all work on your hot sync. Answer in a complete sentence.

## Materials Needed Today

**Please take these materials out of your backpack.**

- Pencil & notes Lesson 1

**3** A spring scale is pulled downward and readings are recorded.

Data Table

| Distance Pulled | Spring Scale Reading |
|---|---|
| 1.0 cm | 4 N |
| 1.5 cm | 6 N |
| 2.0 cm | 8 N |
| 2.5 cm | 10 N |

If the spring is pulled 3.5 cm, the spring scale should read

A 12 N.

B 13 N.

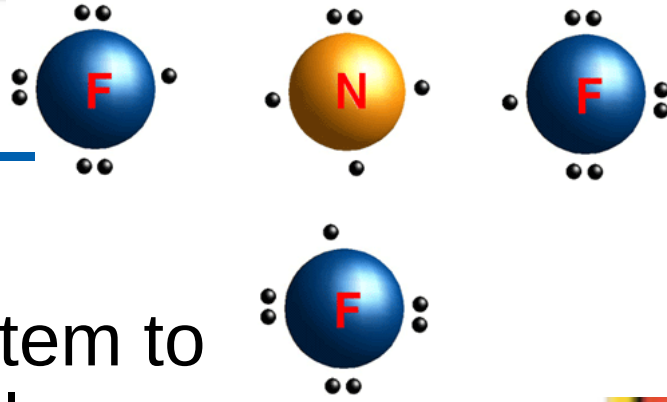
C 14 N.

D 15 N.

# Riddle of the Day!!!

What is…..

Free, but it's priceless.
You can't own it, but you can use it.
You can't keep it, but you can spend it.
Once you've lost it you can never get it back

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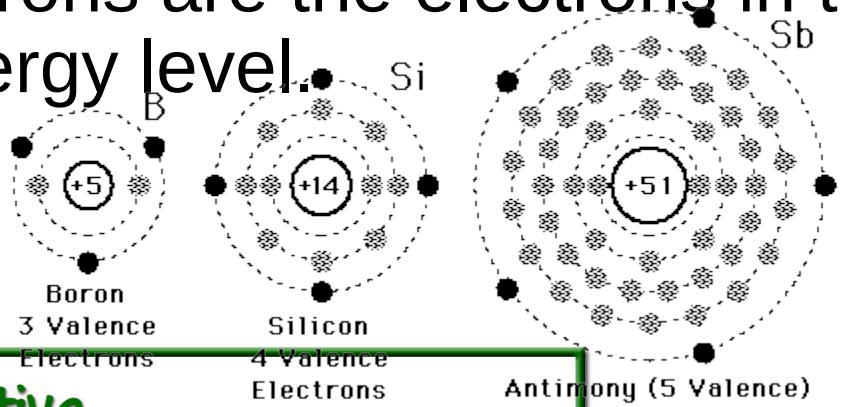



Interactive Table

Valence and Lewis Dot Diagrams

# Your turn

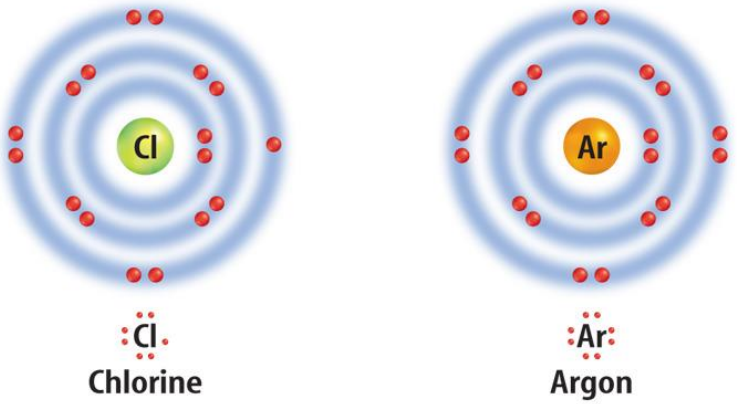
- Draw a Lewis Dot diagram for Lithium…

# Ions and Noble Gases

- Groups 3–12 of the periodic table are metals and the valence number can vary.
- Elements in Group 18 are the noble gases.
- The noble gases are stable because their outer energy levels are filled.
- Elements that are stable rarely react to form compounds.

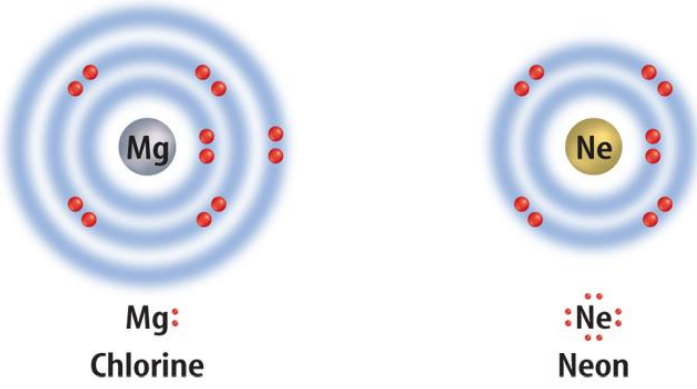
# Noble Gas Structure by Gaining Electrons

- Chlorine can achieve noble gas structure by filling its outer energy levels.
- Argon is the nearest noble gas to chlorine.
- Chlorine can become more stable by gaining one electron and forming the chloride ion $Cl^-$.



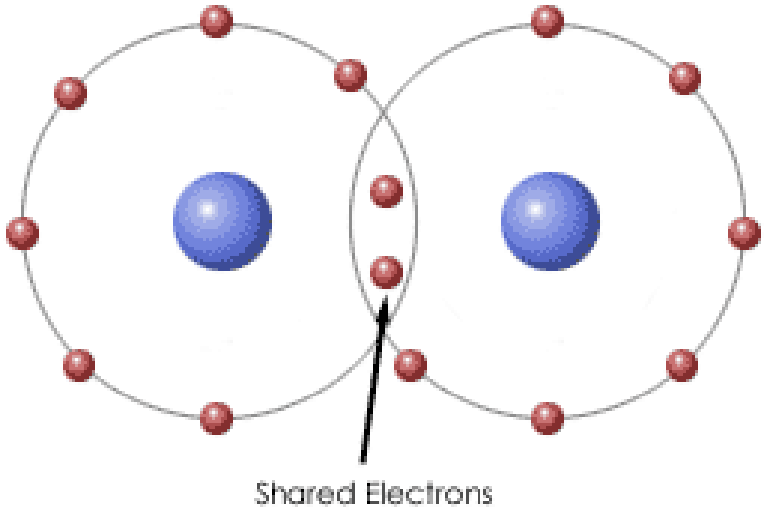
# Noble Gas Structure by Losing Electrons

- Magnesium can achieve the electron structure of neon, the nearest noble gas on the periodic table.
- Magnesium can lose two electrons to form the stable ion $Mg^{2+}$.



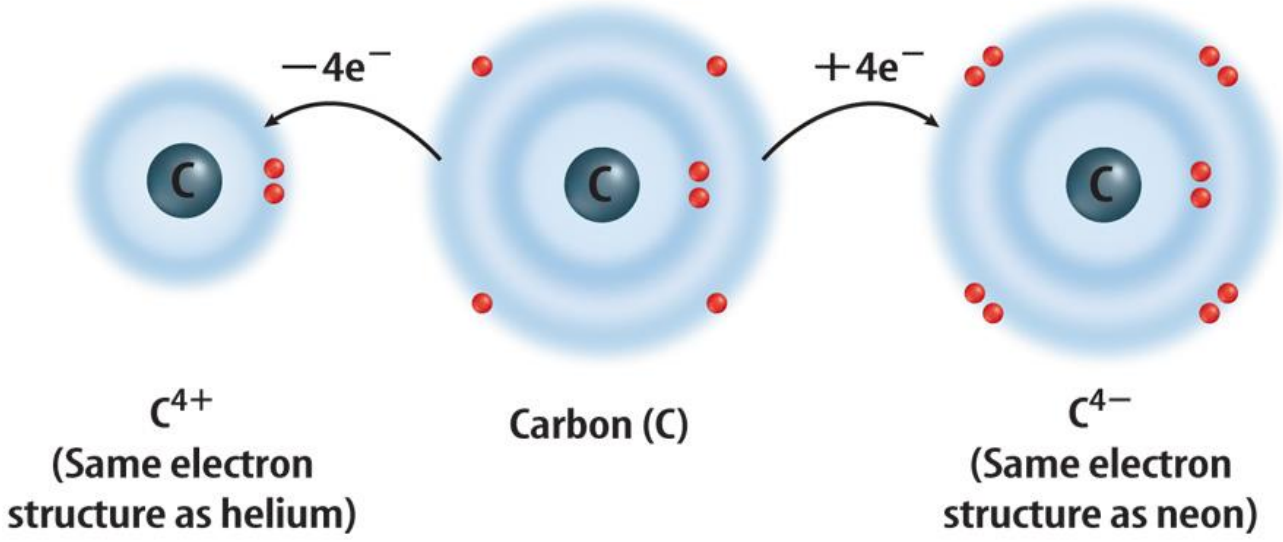
# Covalent Bonds—Sharing Electrons

- Ionic bonds form when electrons are transferred.
- Some elements need to gain or lose too many electrons.
- A **covalent bond** is a chemical bond formed when atoms share electrons. (potluck)



# Covalent Bonds—Sharing Electrons (cont.)

- Carbon has 4 valence electrons.
- Too much energy is needed for carbon to easily gain or lose 4 electrons.

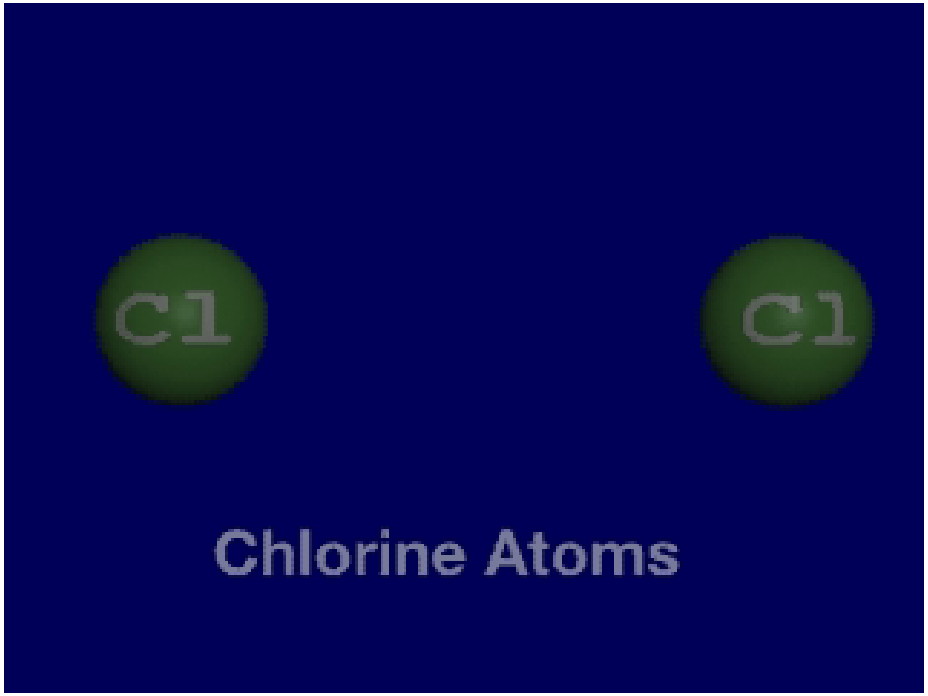


# Covalent Bonds—Sharing Electrons (cont.)

- Covalent bonds form by sharing electrons.
- Elements that are close together on the periodic table are more likely to share electrons in a covalent bond than to transfer electrons.
- *Organic compounds are covalent compounds containing carbon atoms and are important for living organisms.*

# Covalent Bonds—Sharing Electrons (cont.)

Concepts In Motion

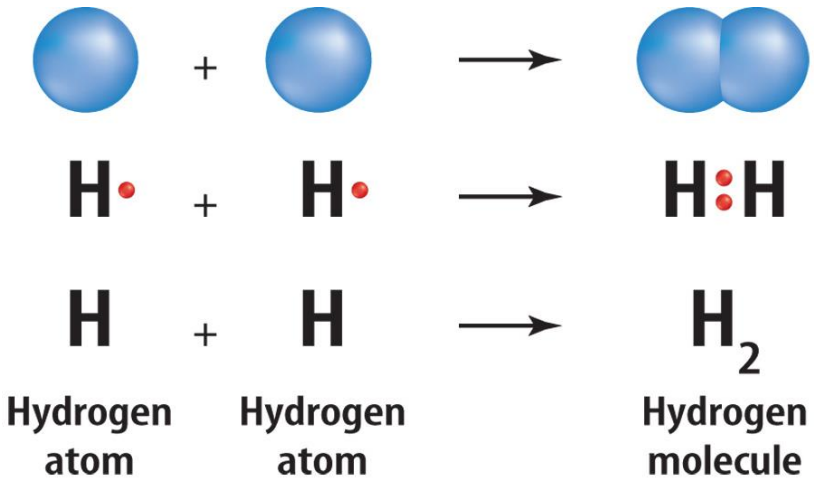


# Properties of Covalent Compounds

- Can be solids, liquids, or gases at room temperature
- Usually have lower melting and boiling points than ionic compounds
- Do not usually separate in water
- Most do not conduct electricity

# Single Covalent Bonds

- Hydrogen has one unpaired electron.
- Two hydrogen atoms share their single electrons to form a pair.




- The shared pair of electrons is a single covalent bond, which holds the hydrogen molecule $H_2$ together.

# Double and Triple Bonds

- Some atoms may form stronger bonds by sharing more than one pair of electrons.
- A double bond has two pairs of shared electrons and is stronger than a single bond.
- A triple bond has three pairs of shared electrons and is stronger than a double bond.