SNC1D
UNIT 2: CHEMISTRY
CHAPTER 6: UNDERSTANDING THE PROPERTIES OF COMPOUNDS

6.1: IONIC COMPOUNDS

How are compounds formed and why are many elements of the periodic table often not found in their pure state?

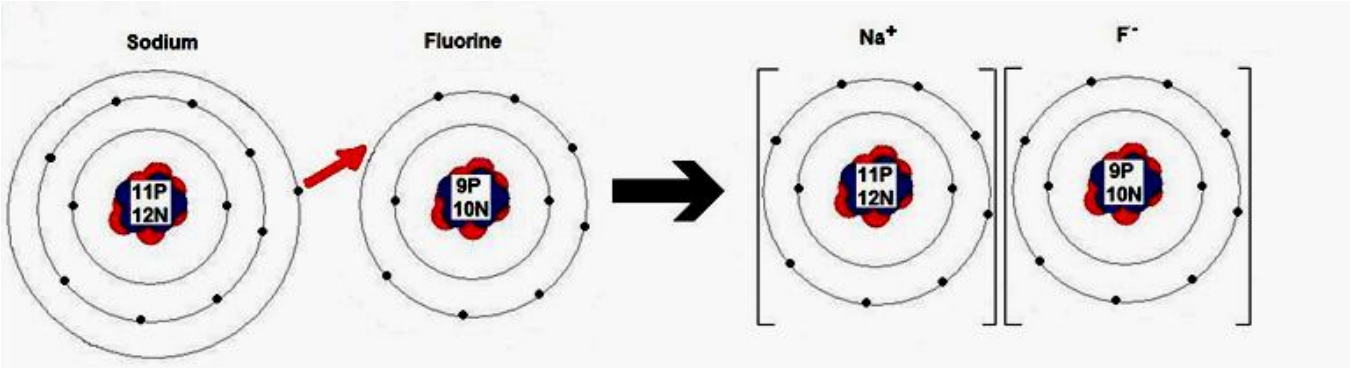
Elements form compounds because atoms want to have **eight** electrons in the outermost shell and will either **share, gain or lose** electrons to accomplish this.

IONIC COMPOUNDS **Page 221**

All atoms want to become stable with a full outer shell, called their ***valence shell***. Depending on how many electrons are in the outer shell, the atom may **"gain"** or **"lose"** electrons to achieve this. By gaining or losing electrons, the atom changes its charge, producing an ion (a positively or negatively charged atom).

METALS usually have **less than 4 electrons** in their outermost orbit so it is easier to **lose electrons** to obtain a full outer shell. To do this, metals will give electrons to non-metals. As a result, metals become **positive ions** (having more protons than electrons).

NON-METALS usually have **more than 4 electrons** in the outermost orbit and want to **gain electrons** to reach a full outer shell. As a result, the non-metals become **negative ions** with the added electrons. Naturally, the oppositely charged ions are attracted to each other producing an **ionic bond** and forming an **ionic compound**.



Sodium will transfer an electron to fluorine producing sodium fluoride, an ionic compound.
Also see Figure 6.4 on page 223 for the formation of sodium chloride

Did you know?

Sodium fluoride is used in toothpaste to help strengthen the tooth enamel and prevent cavities. Yet as individual elements, sodium is a highly reactive metal that will burst into fire in water and fluorine is a poisonous gas.

CHECK YOUR UNDERSTANDING:

1. Which two types of elements usually form ionic compounds?

2. If an atom loses an electron, what kind of particle does it become?

3. Looking at Figure 6.4 on page 223, the electron arrangement of sodium is 2, 8, 1. Compare the chlorine atom, sodium ion and chlorine ion by writing their electron arrangements.

4. The ions that make up an ionic compound are attracted to each other because they have opposite charges. Describe an everyday situation that involves charged objects sticking together.

5. Draw the Bohr-Rutherford diagrams for each of the following:

   A) beryllium atom and its ion B) sulfur atom and its ion

PROPERTIES OF IONIC COMPOUNDS **Page 225**

① Physical States

Most ionic compounds...

- exist in a **solid arrangement called a crystal lattice**. See Fig. 6.6
- are **solid at room temperature**
- have **very high melting points** – NaCl is 801^0C and NaF is 993^0C
- do not have a gaseous state -- almost non-existent.

② Solubility

Many ionic compounds are **soluble in water.** The water separates the positive and negative ions from each other, causing the ionic bonds to break. [See Figure 6.7]
The solubility of ionic compounds in water is essential for most living things.

Read pages 225 – 226 and list examples related to water solubility.

- Provide ***3 examples*** of ***human health*** and ***3 examples*** of ***plant health***

- Identify problems created by each of the following:

  i) dehydration in humans

  ii) overusing fertilizers on plants

③ Conductivity

A substance can conduct an electric current if charged particles, such as electrons or ions, are free to move around.
Metals are good electrical conductors because they have electrons that are free to move throughout them.

Ionic compounds are good electrical conductors when...

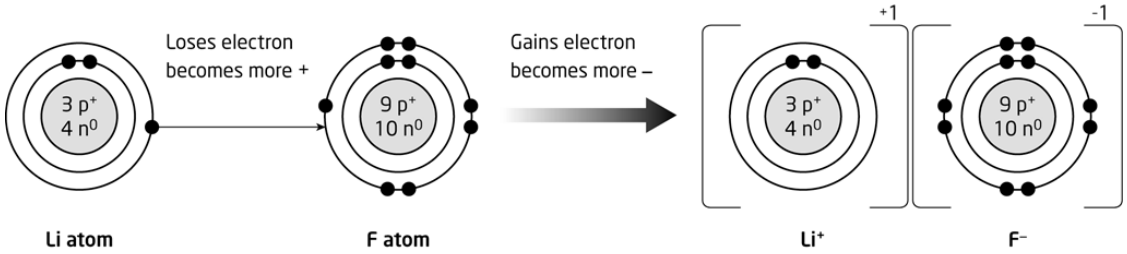
- in a liquid state -- when melted OR
- dissolved in water

because the ions are free to move around.
Ionic compounds are poor conductors in the solid state because the ions are locked in position in their crystal structure.

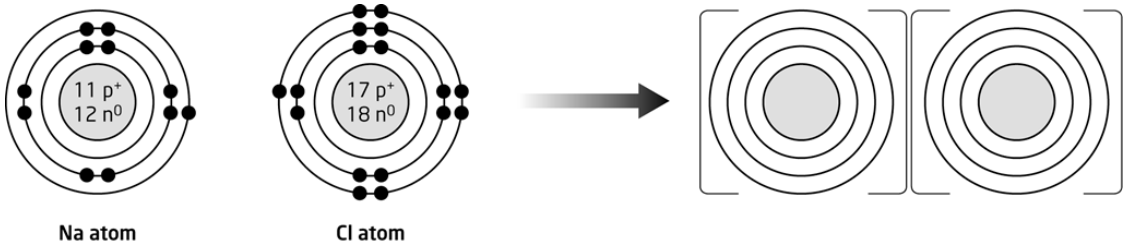
6.1 REVIEW

1. Complete these diagrams as shown in Figure 6.3 on page 223 of your textbook. Part A is done for you.

A.



B.



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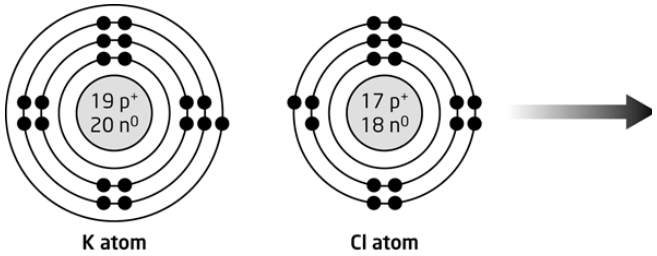
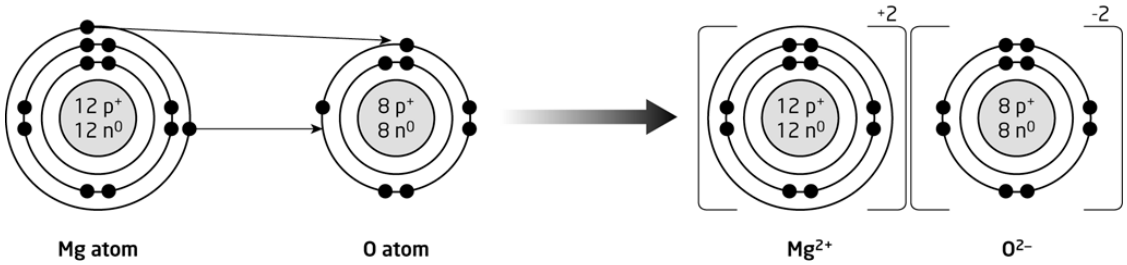
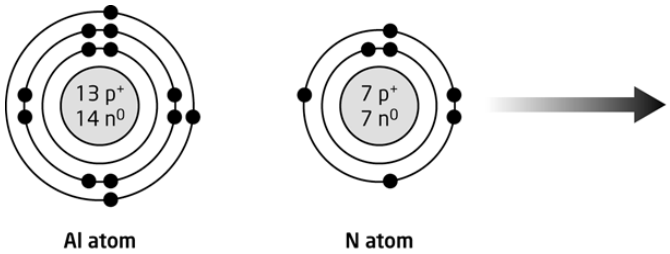


2. Some atoms can lose two or three electrons. Other elements gain two or three electrons. Complete the diagrams. Part A is done for you.

A.



B.



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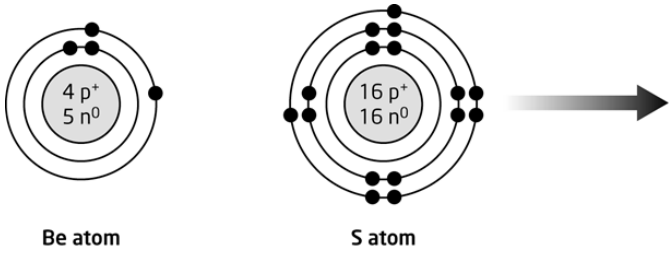
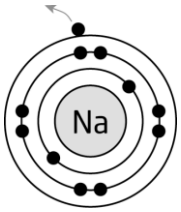
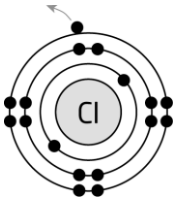
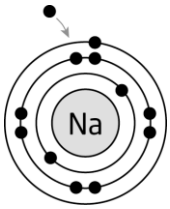
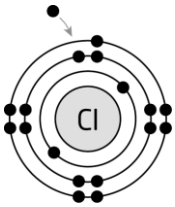


3. One of these pictures shows how a negative ion forms. Circle the correct picture.

A. 

B. 

C. 

D. 

4. Which formulas are ionic compounds? Circle ALL of the correct answers.

A. KCl	B. CO_2	C. CF_4	D. NaI
E. CS_2	F. CaS	G. PBr_3	H. Fe_2O_3

5. Complete the sentences using the correct choices from the box. [Not all choices will be used.]

electron	proton	valence	give up	accept	will	will never	ionic

A fluorine atom and a chlorine atom _____ form an _____ compound. This is due to neither atom _____ a(n) _____ so that both atoms will have a full _____ shell.

6. Write the letter of the best answer on the line to complete the sentence.

Ionic compounds, such as salt, melt at very hot temperatures because _____.

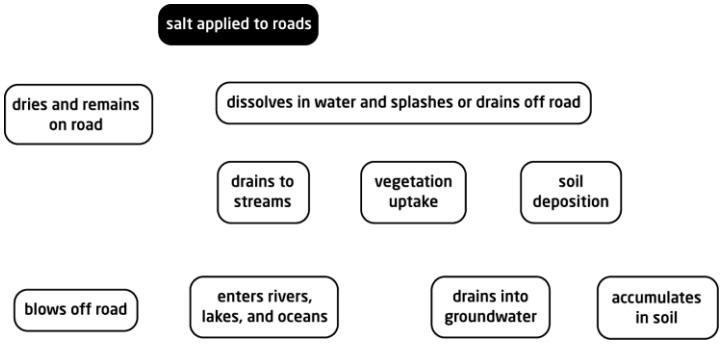
A. ionic compounds do not form crystal lattices and, as a result, have strong bonds.
B. ionic compounds do form crystal lattices and, as a result, have strong bonds.
C. ionic compounds do not form crystal lattices and, as a result, have weak bonds.
D. ionic compounds do form crystal lattices and, as a result, have weak bonds.

7. Complete the sentences using the words in the box.

pure water	salt water	ionic solids	charged	uncharged	able	not able

_____ is a better conductor than _____ or _____ because it has many _____ particles that are _____ to move freely.

8. Draw lines to show how road salt enters rivers and lakes.



9. Circle the factor in each pair that would cause a car to rust more quickly.

   a. There is salt on the road.

      There is no salt on the road.

   b. The paint on the car has been scratched to expose the metal.

      None of the car's metal is exposed.

   c. The air is dry.

      The air is very moist.

   d. The temperature is well below freezing.

      The temperature is just above freezing.