

Ionic Compounds and Metals

Section 7.1 Ion Formation

pages 206–209

Section 7.1 Assessment

page 209

1. **Compare** the stability of a lithium atom with that of its ion, Li^+ .

The Li^+ ion is more stable because it has a complete octet.

2. **Describe** two different causes of the force of attraction in a chemical bond.

The two causes are the attraction between the positive nucleus of one atom and the negative electrons of another atom, and the attraction between positive ions and negative ions.

3. **Apply** Why are all of the elements from group 18 relatively unreactive, whereas those in group 17 are very reactive?

The group 18 elements, known as noble gases, have complete outer energy levels and do not easily form ions. The group 17 elements are highly reactive because they need only to gain a single electron to form an octet.

4. **Summarize** ionic bond formation by correctly pairing these terms: *cation*, *anion*, *electron gain*, *electron loss*.

(anion, electron gain), (cation, electron loss)

5. **Apply** Write out the electron configuration for each atom. Then predict the change that must occur in each to achieve a noble gas configuration.

- a. nitrogen

$[\text{He}]2s^22p^3$; gain 3 electrons (3^- ion) or lose 5 electrons (5^+ ion)

- b. sulfur

$[\text{Ne}]3s^23p^4$; gain 2 electrons (2^- ion)

- c. barium

$[\text{Xe}]6s^2$; lose 2 electrons (2^+ ion)

- d. lithium

$[\text{He}]2s^1$; lose 1 electron (1^+ ion)

6. **Model** Draw models to represent the formation of the positive calcium ion and the negative bromide ion.

Models should show that the calcium atom loses two electrons, forming Ca^{2+} , and that bromine gains one electron, forming Br^- . The models should also show the addition of energy to form the calcium ion, and the release of energy to form the bromide ion.

Section 7.2 Ionic Bonds and Ionic Compounds

pages 210–217

Practice Problems

page 212

Explain how an ionic compound forms from these elements.

7. sodium and nitrogen

Three Na atoms each lose $1 e^-$, forming 1^+ ions. One N atom gains $3 e^-$, forming a 3^- ion. The ions attract, forming Na_3N .

$$3 \text{ Na ions } \left(\frac{1+}{\text{Na ion}} \right) + 1 \text{ N ion } \left(\frac{3-}{\text{N ion}} \right) \\ = 3(1+) + 1(3-) = 0$$

The overall charge on one formula unit of Na_3N is zero.

8. lithium and oxygen

Two Li atoms each lose $1 e^-$, forming 1^+ ions. One O atom gains $2 e^-$, forming a 2^- ion. The ions attract, forming Li_2O .

$$2 \text{ Li ions } \left(\frac{1+}{\text{Li ion}} \right) + 1 \text{ O ion } \left(\frac{2-}{\text{O ion}} \right) \\ = 2(1+) + 1(2-) = 0$$

The overall charge on one formula unit of Li_2O is zero.

Chemistry Ionic Compounds Solution Manual

Raymond Chang



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