

CHAPTER 3.10

Ions



Sec 24-0

BONDING MODELS & LEWIS STRUCTURES

OBJECTIVES

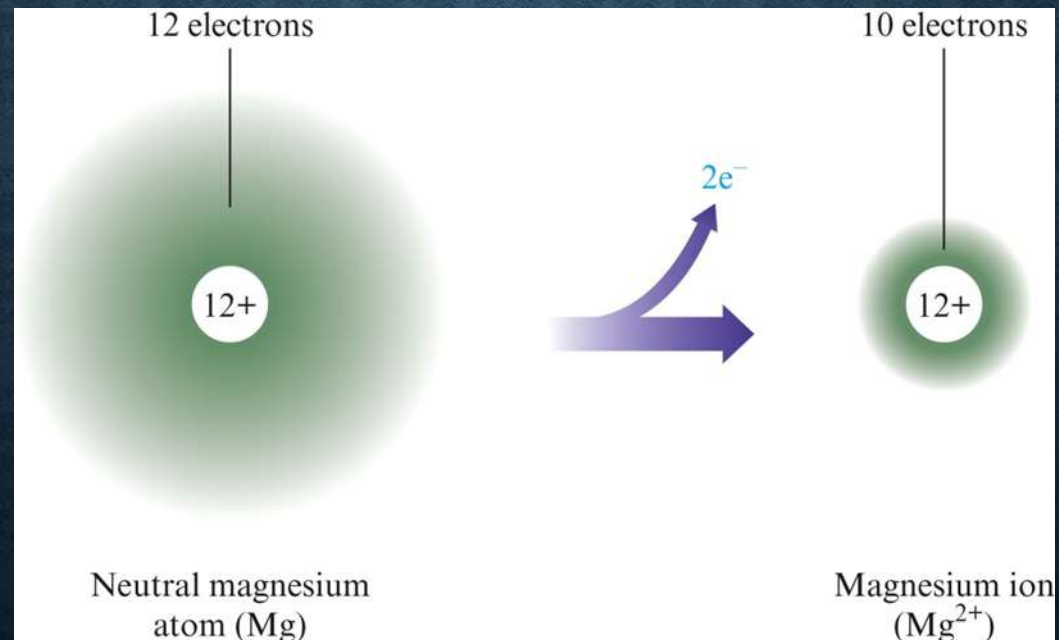
1. To describe the formation of ions from their parent atoms
2. To learn to name ions
3. To predict which ion a given element forms by using the periodic table
4. To describe how ions combine to form neutral compounds

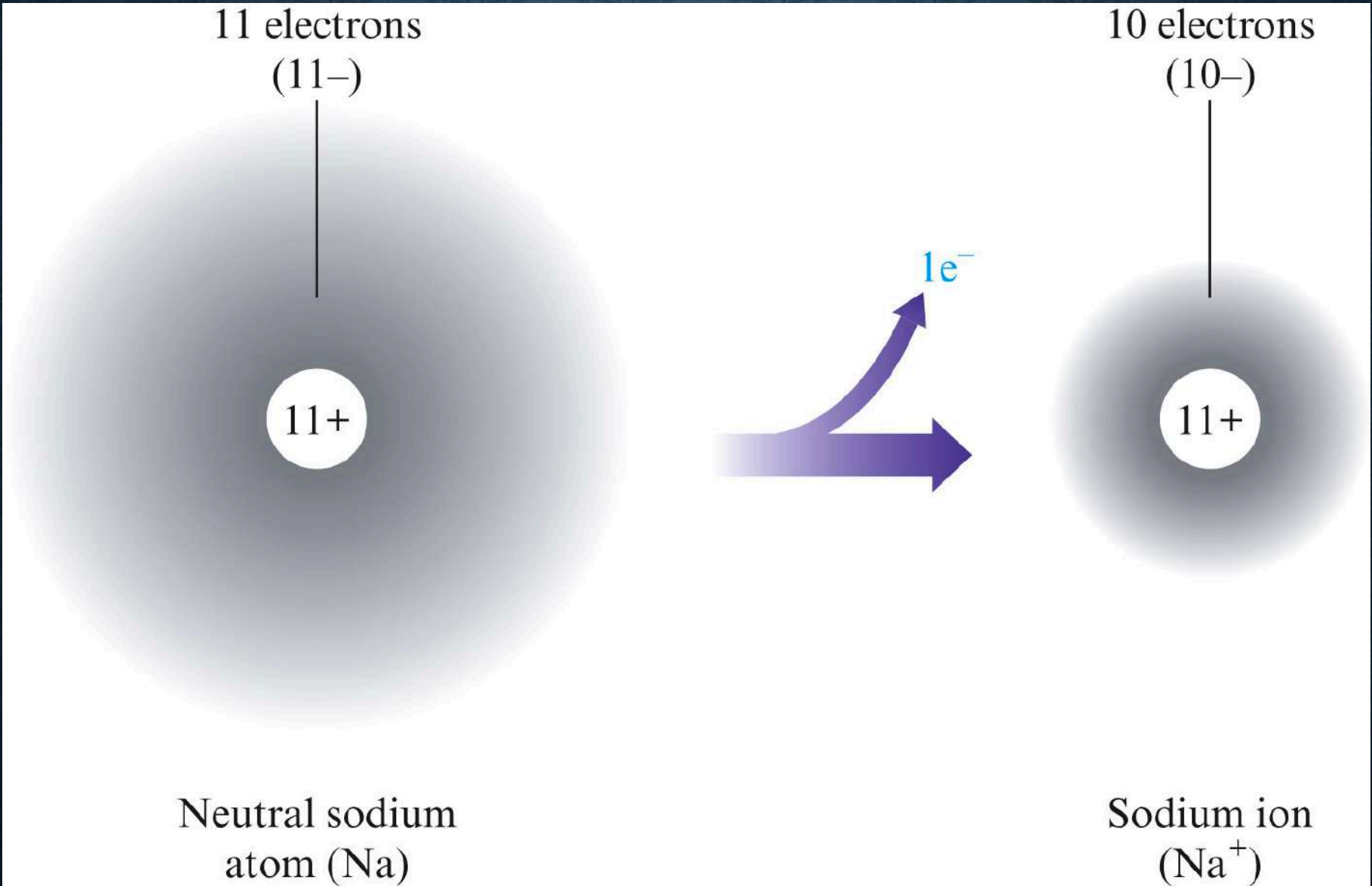
IONS

- Atoms can form ions by gaining or losing electrons.
- They commonly form when metallic elements combine with non-metallic elements

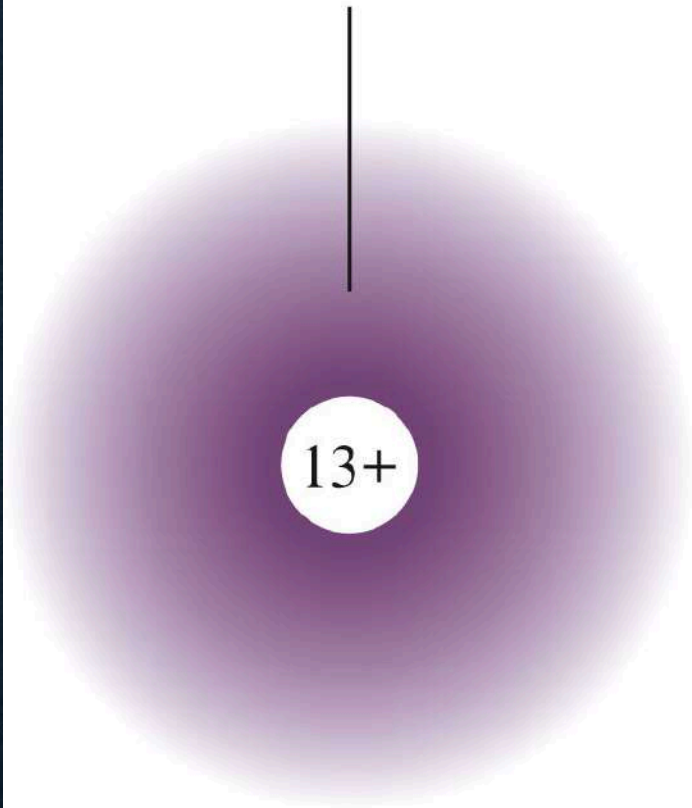
CATIONS

- Metals tend to lose one or more electrons to form positive ions called **cations**.
- Cations are generally named by using the name of the parent atom.



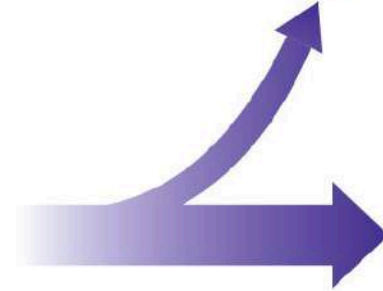


13 electrons



Neutral aluminum
atom (Al)

$3e^-$



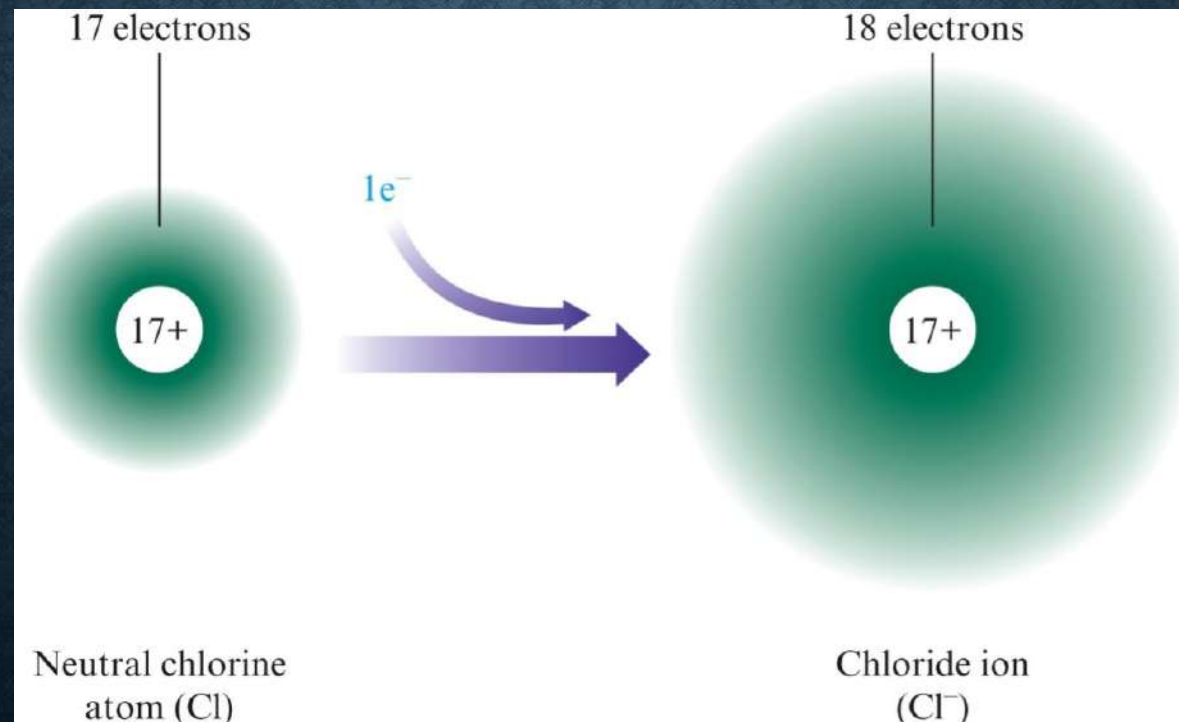
10 electrons



Aluminum ion
(Al^{3+})

ANIONS

- Nonmetals tend to gain one or more electrons to form negative ions called **anions**.
- Anions are named by using the root of the atom name followed by the suffix ***-ide***.



Element		Name
Flourine	$F + e^- \rightarrow F^-$	Flouride ion
Bromine	$Br + e^- \rightarrow Br^-$	Bromide ion
Iodine	$I + e^- \rightarrow I^-$	Iodide ion
Oxygen	$O + 2e^- \rightarrow O^{2-}$	Oxide ion
Sulfur	$S + 2e^- \rightarrow S^{2-}$	Sulfide ion

ION CHARGES AND THE PERIODIC TABLE

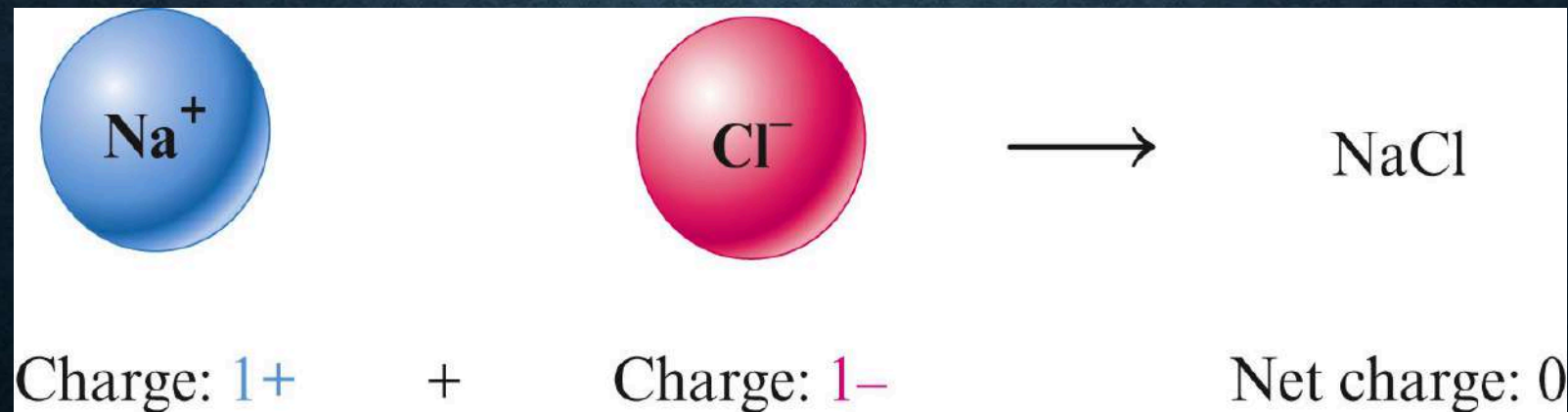
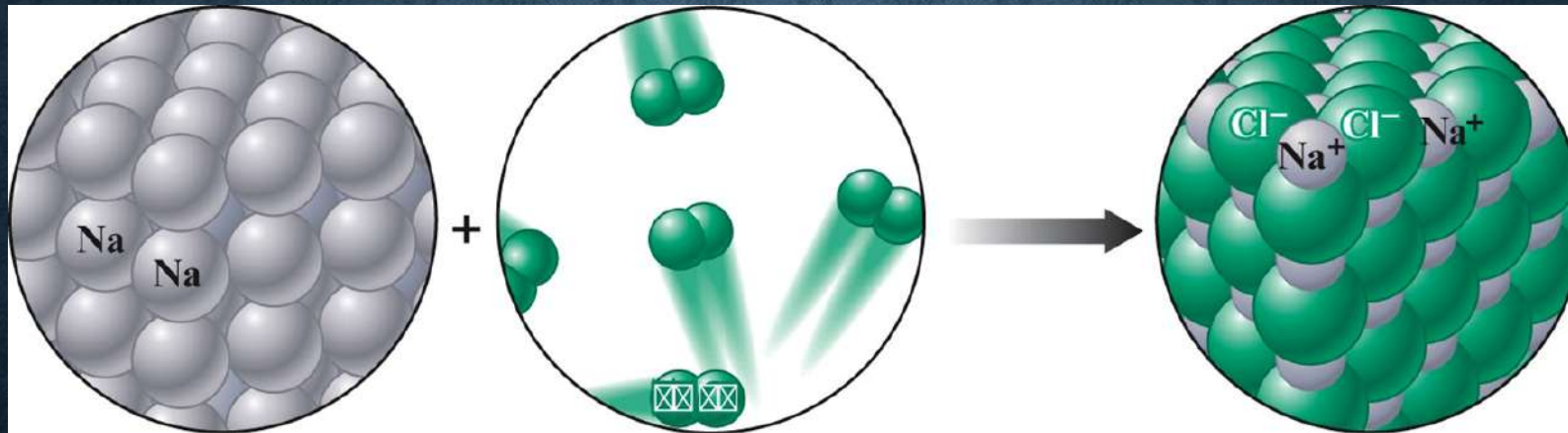
- The ion that a particular atom will form can be predicted from the periodic table.
 - Elements in Group 1 and 2 form 1+ and 2+ ions, respectively
 - Group 7 atoms form anions with 1– charges
 - Group 6 atoms form anions with 2– charges

1	2									3	4	5	6	7	8
Li ⁺	Be ²⁺												O ²⁻	F ⁻	
Na ⁺	Mg ²⁺									Al ³⁺			S ²⁻	Cl ⁻	
K ⁺	Ca ²⁺									Ga ³⁺			Se ²⁻	Br ⁻	
Rb ⁺	Sr ²⁺									In ³⁺			Te ²⁻	I ⁻	
Cs ⁺	Ba ²⁺														

Transition metals form cations with various charges.

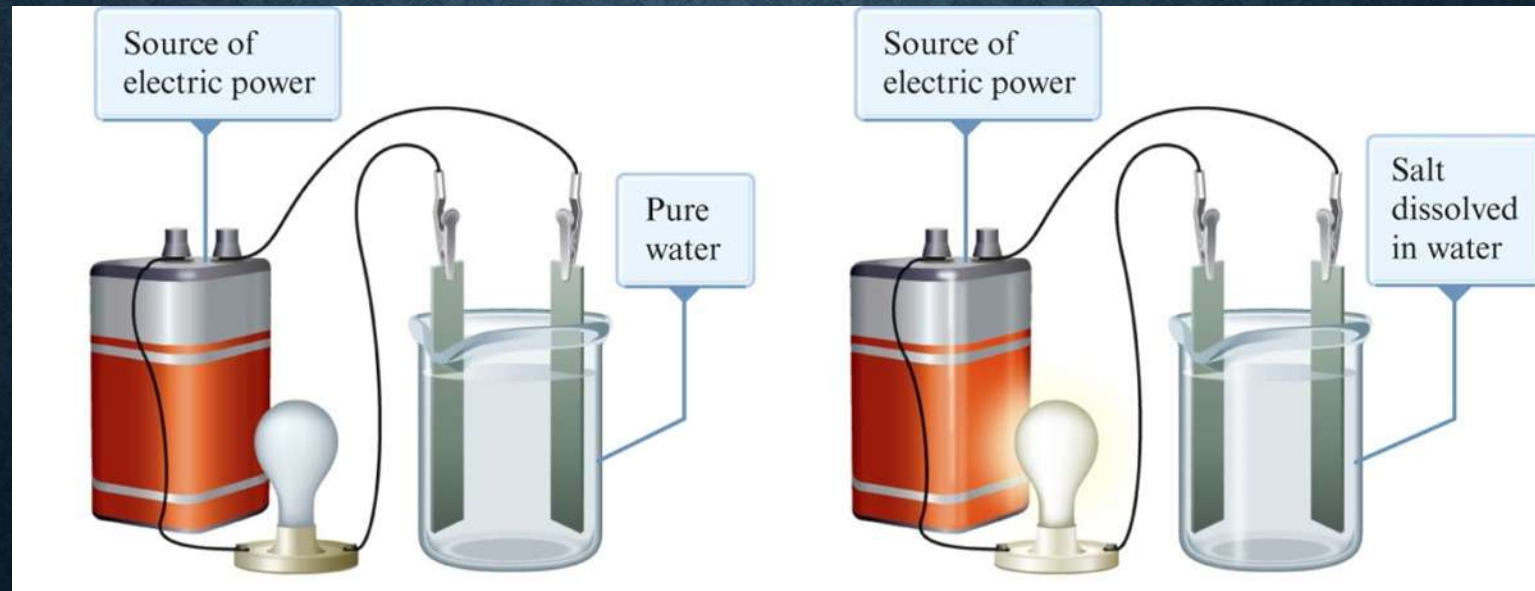
COMPOUNDS THAT CONTAIN IONS

- Ions combine to form ionic compounds.
- Net charge = 0



PROPERTIES OF IONIC COMPOUNDS

- High melting points
- Conduct electricity
 - If melted
 - If dissolved in water
 - Electrons must be free to move

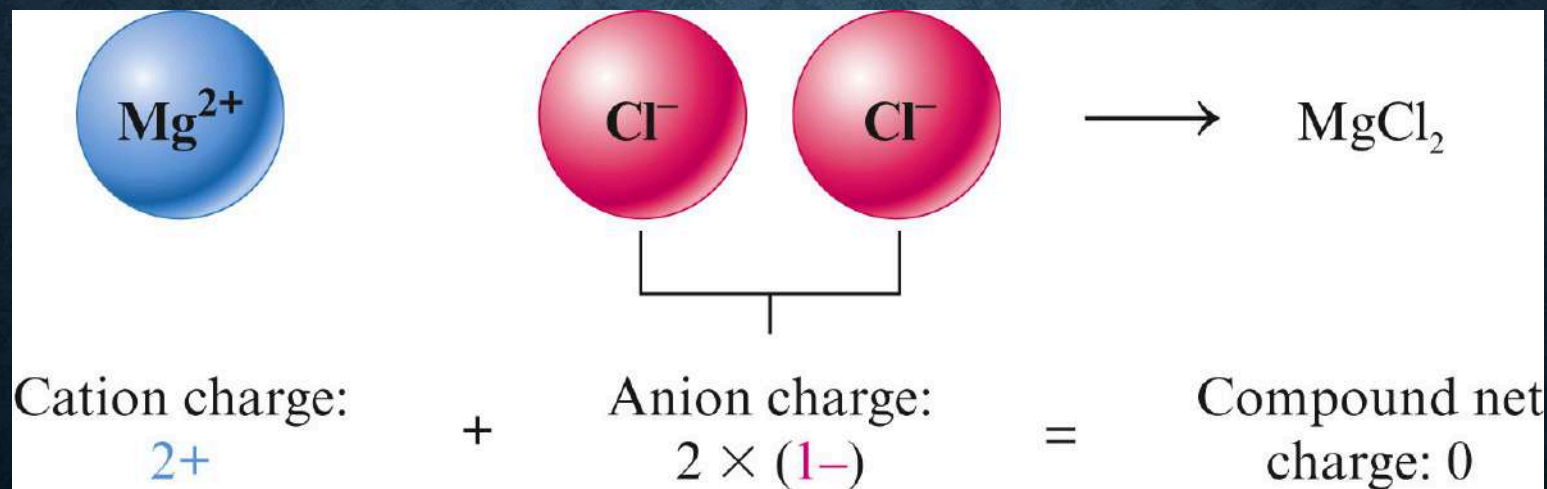


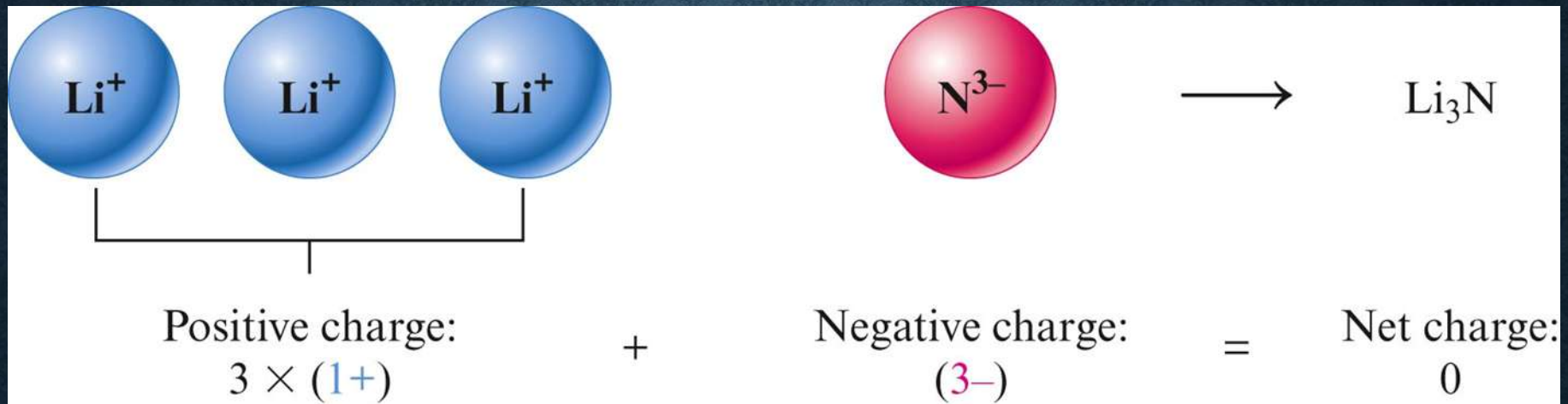
B. COMPOUNDS THAT CONTAIN IONS

- Ionic compounds are electrically neutral.
- The charges on the anions and cations in the compound must sum to zero.

FORMULAS FOR IONIC COMPOUNDS

- Write the cation element symbol followed by the anion element symbol.
- The number of cations and anions must be correct for their charges to sum to zero.





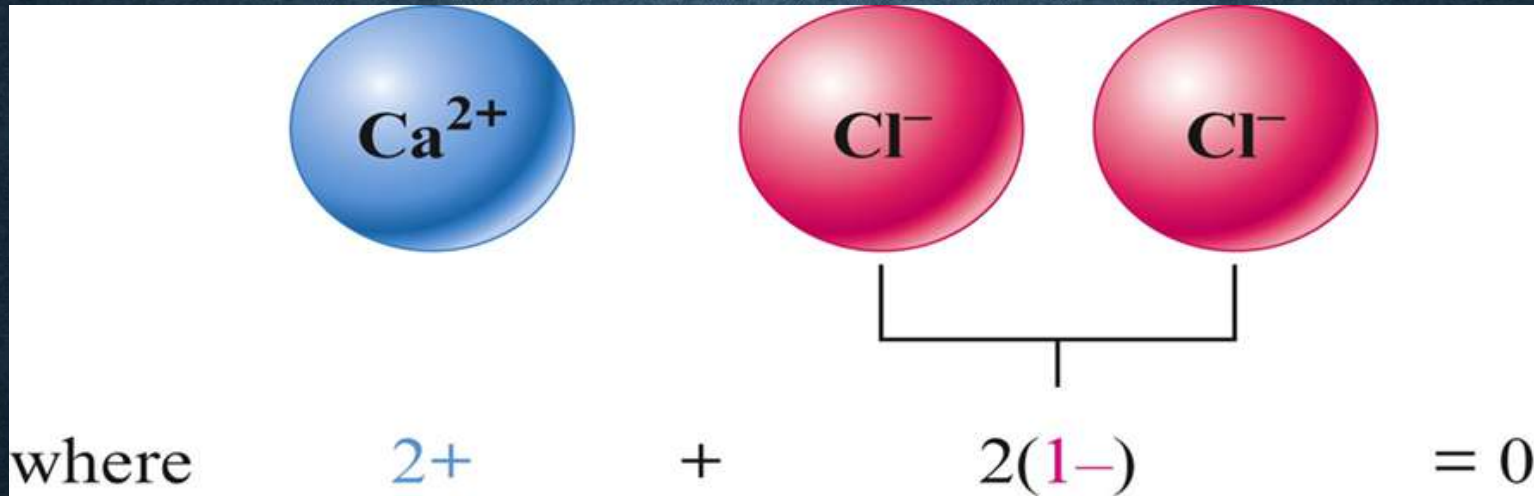
CONCEPT CHECK

Pairs of ions are listed below. What is the **formula** for the ionic compound it forms?

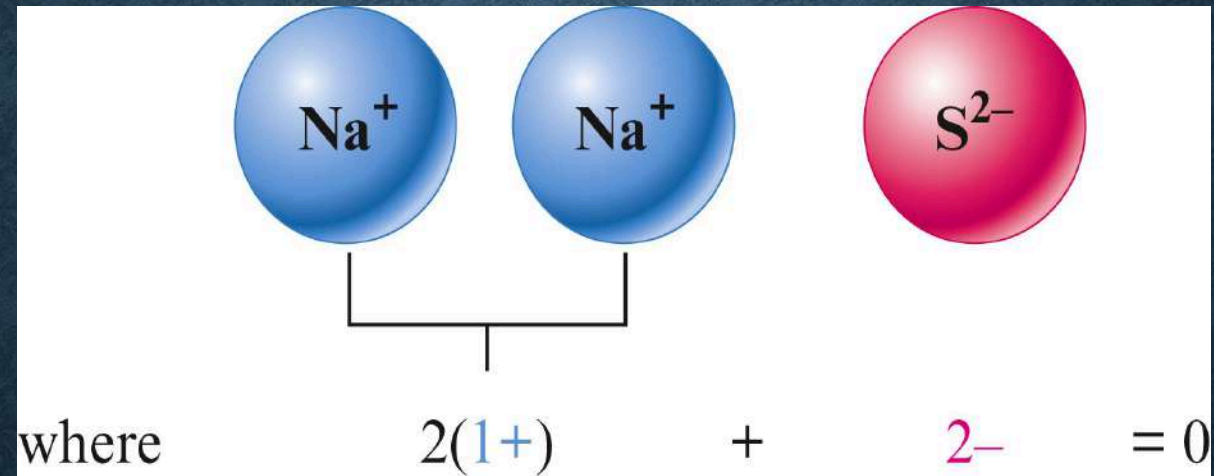
- a) K^+ and O^{2-}
- b) Ca^{2+} and Cl^-
- c) Na^+ and S^{2-}
- d) Ca^{2+} and P^{3-}



- Ca^{2+} and Cl^-



- Na^+ and S^{2-}



• Ca^{2+} and P^{3-}

