

AIM | Why do certain elements 28 | link up to form compounds?

Now that you know about electron shells, you can understand more about why atoms link up.

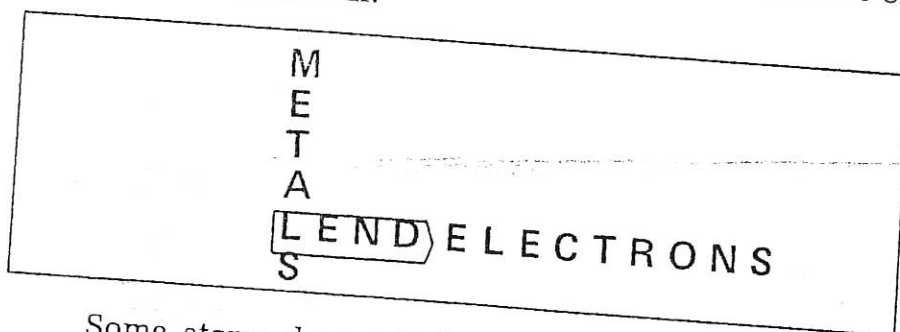
Atoms that link up have outer shells that are not full. The atoms link up by gaining or losing the outer-ring electrons. A total of 8 outer-ring electrons is needed.

For example, an atom with 7 outer-ring electrons will form a compound with an atom with 1 outer-ring electron [$7 + 1 = 8$]. [See Figure A, page 177.]

An atom with 6 outer-ring electrons will link up with an atom with 2 outer-ring electrons. [$6 + 2 = 8$]. [See Figure B, page 178.]

The number of outer-ring electrons tells us if an atom is a metal or nonmetal. Atoms of metals have fewer than 4 electrons in the outer ring. Atoms of nonmetals have more than 4 electrons in the outer ring.

When forming compounds, metals "lend" electrons. Nonmetals "borrow" electrons. A compound has at least one metal and one nonmetal.



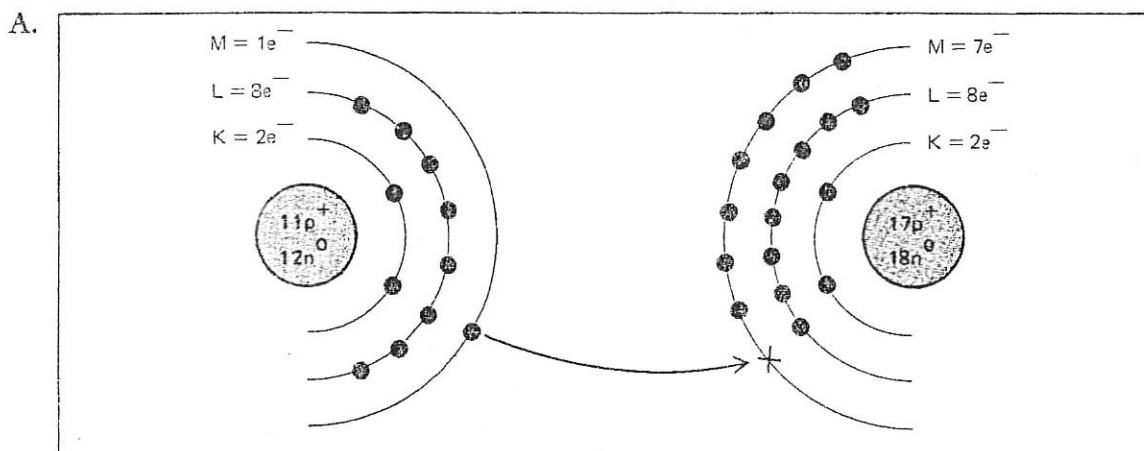
Some atoms do not link up with any other elements. And not every atom that can combine with another kind of atom will combine with the other atom.

DRAWING A COMPOUND

Information about two compounds is given below. Study the information and then look at the drawing of each compound. Try to answer the questions about each compound.

- I. Sodium (Na) and chlorine (Cl) link up to form the compound sodium chloride (NaCl). This is table salt.

SODIUM (Na)		CHLORINE (Cl)	
Atomic number = 11		Atomic number = 17	
Atomic weight = 23		Atomic weight = 35	
Protons = 11		Protons = 17	
Neutrons = 12		Neutrons = 18	
Electrons = 11	K = 2e ⁻	Electrons = 17	K = 2e ⁻
	L = 8e ⁻		L = 8e ⁻
	M = 1e ⁻		M = 7e ⁻

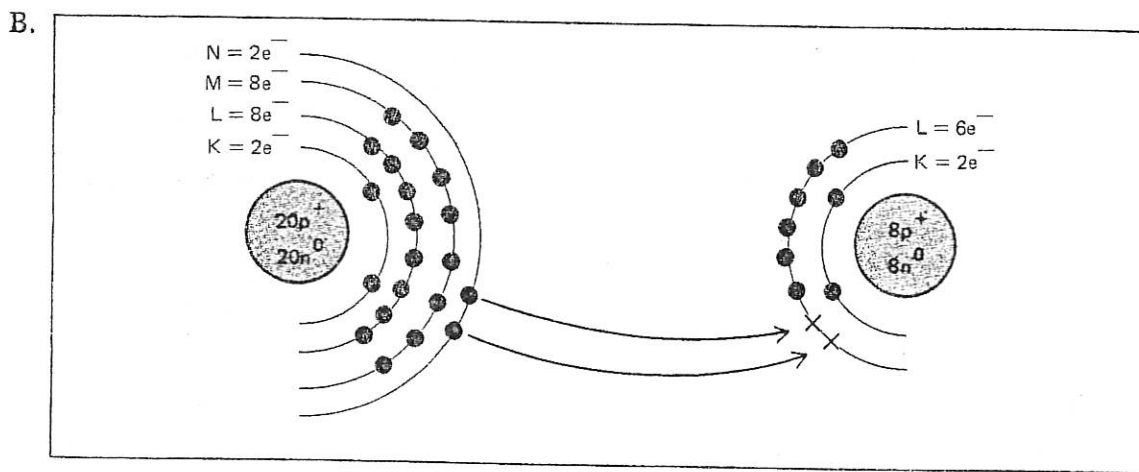


- How many outer-ring electrons does sodium have? _____
 - Is the outer shell full? _____
 - Is sodium a metal or a nonmetal? _____
- How many outer-ring electrons does chlorine have? _____
 - Is this a full outer shell? _____
 - Is chlorine a metal or a nonmetal? _____
- Altogether, how many outer-ring electrons do sodium and chlorine have? (Count them.) _____
 - Together, do they make a full shell? _____

4. Which atom is the electron "lender"? _____
5. How many electrons are lent? _____
6. Which atom borrows the electron? _____
7. How many electrons are borrowed? _____
8. What is formed, a mixture or a compound? _____
9. When sodium and chlorine link up, do their properties change? _____

II. Calcium and oxygen join to form the compound calcium oxide (CaO).

CALCIUM (Ca)	OXYGEN (O)
Atomic number = 20	Atomic number = 8
Atomic weight = 40	Atomic weight = 16
Protons = 20	Protons = 8
Neutrons = 20	Neutrons = 8
Electrons = 20	Electrons = 8
	K = 2e ⁻
	L = 8e ⁻
	M = 8e ⁻
	N = 2e ⁻
	K = 2e ⁻
	L = 6e ⁻



1. a) How many outer-ring electrons does calcium have? _____
- b) Is the outer ring full? _____
- c) Is calcium a metal or nonmetal? _____

2. a) How many outer-ring electrons does oxygen have? _____
 b) Is this a full shell? _____
 c) Is oxygen a metal or a nonmetal? _____
3. a) Altogether, how many outer-ring electrons do calcium and oxygen have?
 (Count them.) _____
 b) Together, do they make a full shell? _____
4. Which atom lends electrons? _____
5. How many electrons are lent? _____
6. Which atom borrows the electrons? _____
7. How many electrons are borrowed? _____
8. What is formed, a mixture or a compound? _____
9. When calcium and oxygen link up, do their properties change? _____

Remember:

1. *Metals have fewer than 4* electrons in the outer ring.
2. *Nonmetals have more than 4* electrons in the outer ring.
3. Metals lend electrons.
4. Nonmetals borrow electrons.
5. A total of 8 *shared* outer-ring electrons are needed to make a compound.

CHOOSE Choose the correct word or term for each statement. Write your
ONE choice in the space.

-
1. A compound is formed when outer-ring electrons _____
separate, link up
 2. A compound needs a total of _____ outer-ring electrons.
2, 8

3. The outer-ring electrons of a compound come from _____.
one atom, two or more
different atoms
4. The outer ring of a metal has _____ than four electrons.
fewer, more
5. Metals _____ electrons.
lend, borrow
6. The outer ring of a nonmetal has _____ than four electrons.
fewer, more
7. Nonmetals _____ electrons.
lend, borrow
8. Most elements are _____.
metals, nonmetals

COMPLETING THE CHARTS

In each of the charts below, fill in the missing information. Use the Periodic Table to help. The first element, calcium, has already been done for you in chart I.

I.

Element	Number of Electrons in Outer Ring	Metal or Nonmetal?	Electron Lender or Borrower?	Lends or Borrows How Many Electrons?
1. calcium	2	metal	lender	2
2. copper				
3. phosphorus				
4. potassium				
5. oxygen				
6. iodine				
7. gold				
8. bromine				
9. sulfur				
10. cobalt				

