

## Characteristics of Nonmetals

### Skills to Develop

- List some characteristics of nonmetals
- Contrast metals and nonmetals

Remember that non-metals are on the right and top of the periodic table. Based on the periodic trends in the last 4 sections, this means that they are usually smaller, more likely to gain electrons, and less likely to lose electrons, than the metals.

### Elemental Properties

In the elemental form, non-metals can be gas, liquid or solid. They aren't shiny (lustrous) and they don't conduct heat or electricity well. Usually their melting points are lower than for metals, although there are exceptions. The solids usually break easily, and can't bend like metals. It's a general pattern that the closer an atom is to the noble gas electron configuration, the fewer bonds it makes. Non-metals are close to the noble gas configuration, so they usually make a few bonds to a few neighbors. The noble gases make no bonds, and are monatomic (single atoms); halogens make 1 bond to 1 other atom, etc. This means that they don't usually form extended structures (except diamond and graphite). Instead, they form separate molecules. These molecules aren't held together tightly, so solids can easily melt or break. The electrons are held tightly by just 1 - 2 atoms, so they can't conduct electricity.

### Reaction Patterns

Non-metals can react with each other to form compounds in which electrons are shared. These compounds have some of the same characteristics as the elemental forms: usually they melt or boil at relatively low temperature and don't conduct heat or electricity. When non-metals react with metals, they usually gain electrons to form anions. The cations are then attracted to the anions, so the result are ionic or sort of ionic compounds. The more a non-metal wants to gain electrons, the more reactive it is. Thus, the halogens are all reactive, but iodine is pretty safe, while bromine, chlorine and especially fluorine are really nasty and dangerous! Oxygen only seems safe and friendly to us because we are adapted to it. When oxygen first appeared in the atmosphere due to photosynthesis, most of the early life forms probably died from it; we descended from the survivors.

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