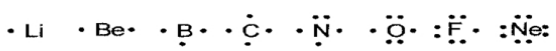
Worksheet 13 - Chemical Bonding

The concept of **electron configurations** allowed chemists to explain **why** chemical molecules are formed from the elements. In 1916 the American chemist Gilbert Lewis proposed that atoms can achieve a **noble gas electronic configuration** by gaining, losing or sharing electrons with other atoms. Since the noble gases (except He) have **8 valence electrons** his proposal is known as the **octet rule**.

The rule states that, except for hydrogen, an atom combines with other atoms to form bonds in order to have 8 electrons in its valence shell. Hydrogen shares electrons with other atoms to achieve the He electronic configuration.

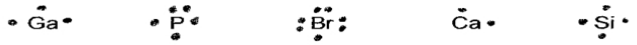
Lewis dot symbols are representations of the elements which give a dot (·) for each **valence** electron on the atom.

The Lewis dot symbols for the period 2 elements are:



Notice that Hund's rule is followed and that the electrons are left unpaired if possible. Transition metals (and the lanthanides and actinides) can't be represented by simple Lewis Dot symbols.

1. Fill in the Lewis dot symbols for:



Lewis dot structures allow us to understand two types of bonding, **ionic** and **covalent**.

Ionic Bonds

Ionic bonds are usually formed by the reaction of **metals** with **non-metals**.

Sodium reacts explosively with chlorine gas to form sodium chloride:

$$2\ Na\ (s) + Cl_2\ (g) \rightarrow 2\ NaCl\ (s)$$

2. Fill in the Lewis dot symbols for Na and Cl, below, and complete the shorthand electron configuration for each:

[Ne] $2s^1$

[Ne] $2s^2\ 2p^5$