

Pre-AP Chemistry/Chemistry I
Unit #5—Bonding

Lewis Structures for Main Group/Representative Elements

| Number of Valence Electrons | 1 | | 2 | | 3 | 4 | 5 | 6 | 7 | 8 |
|--|----------------|-------------------------|--------|--------------------------------|-----------|----------|---------|----------|----------------------|--|
| Example | Hydrogen | Group I (Alkali metals) | Helium | Group II (alkali earth metals) | Group III | Group IV | Group V | Group VI | Group VII (Halogens) | Group VIII except Helium (Noble Gases) |
| Lewis Structure (electron dot diagram) | H [•] | Li [•] | He:• | Be:• | •B• | •C• | •N• | •O• | •F• | •Ne• |

Lewis Structures for Ions of the Main Group/Representative Elements

The chemical symbol for the element is surrounded by the number of valence electrons present in the ion. The whole structure is placed within square brackets and with a superscript to indicate the charge on the ion.

Atoms will gain or lose electrons in order to achieve the stable Noble Gas electron configuration.

Anions (negative ions) are formed when an atom gains electrons

Cations (positive ions) are formed when an atom loses electrons.

| Charge on Ion | 1+ | | 2+ | 3+ | 4+ | 4- | 3- | 2- | 1- | |
|--|---------------------------------------|---|--|---|---|------------------------|-----------------------|------------------------|-----------------------------------|--------------------------|
| No. electrons gained or lost | 1e lost | | 2e lost | 3e lost | 4e lost | 4e gained | 3e gained | 2e gained | 1e gained | |
| Example | H ⁺ | Group I ⁺ (Alkali metals) | Group II ²⁺ (alkali earth metals) | Group III ³⁺ | Group IV ⁴⁺ | Group IV ⁴⁻ | Group V ³⁻ | Group VI ²⁻ | Group VII ⁻ (Halogens) | H ⁻ (hydride) |
| Lewis Structure (electron dot diagram) | [H] ⁺ OR H ⁺ | [Li] ⁺ OR Li ⁺ | [Be] ²⁺ OR Be ²⁺ | [B] ³⁺ OR B ³⁺ | [C] ⁴⁺ OR C ⁴⁺ | [C] ⁴⁻ | [N] ³⁻ | [O] ²⁻ | [F] ⁻ | [H] ⁻ |