Transition metal ions

- All monoatomic anions have noble gas electron configurations, but not every monoatomic cation has a noble gas electron configuration.
- Most of the first transition metals form ions with a 2+ charge.

$$[Ar]3d^6 4s^2 + [He]2s^2 2p^4 \rightarrow [Ar]3d^6 + [He]2s^2 2p^6$$

$$Fe + O \rightarrow Fe^{2+} + O^{2-}$$

- The two electrons are removed from the 4s orbital before the 3*d* orbital because the ion with $[Ar]3d^6$ is of lower energy than $[Ar]4s^2 3d^4$.
- There is not very much difference between the 3d orbitals and the 4s orbitals. The third electron will be removed from the 3d orbitals.

$$[Ar]3d^6 \rightarrow [Ar]3d^5 + e^-$$

$$Fe^{2+} \rightarrow Fe^{3+} + e^-$$

Transition metal ions

- As a rule, the transition metals and the lanthanides form cations by losing the n*s* electrons before the (n - 1)*d* or (n - 2)*f* electrons, respectively, which is opposite to the order when the orbitals are filled.
- There is no simple rule for predicting which type of cation will be more common.
- A number of elements near the end of the transition series have filled *d* subshells.

For example Zn [Ar]3d^{10}4s^2

Zn^{2+} [Ar]3d^{10} So Zn does not form a 3+ ion