Forming Ions

I’ve got my ion you . . .
Ions

* A neutral atom has the same number of protons and electrons.
* Atoms that lose or gain an electron are called ions.
The octet rule: atoms are most stable when their valence shell is full, like that of Noble Gases, so all atoms want to have a full valence shell.
- **Cations**: positively charged ions, have lost electrons.

- **Anions**: negatively charged ions, have gained electrons.
They achieve this by gaining or losing electrons, depending on how many they have.

- If they have less than 4 $e^-$ they will lose them.
- If they have more than 4 $e^-$ they will gain them.
Ions

* Ions can also be represented by Lewis symbols: the Lewis symbol is enclosed in square brackets, the charge of the ion is placed outside the brackets.

\[ \text{[Na]}^+ \]
Example

* Let's look at a sodium atom:

![Sodium Atom Diagram]

\[ \text{Na} \]
\[ p = 11 \]
\[ n = 12 \]
The last shell wants to contain eight electrons.

Is it easier to lose one or gain seven?
The last shell wants to contain eight electrons.

Is it easier to lose one or gain seven?

ANSWER: Lose one
Examples

* So the sodium ion would look like this:

\[
\begin{align*}
\text{Na} \\
p = 11 \\
n = 12
\end{align*}
\]
Since the sodium ion now has eleven protons (+) and only ten electrons(-1), it will have an overall charge of +1.

You can write this Na⁺
Example

* Let’s look at chlorine.

\[ Cl \]
\[ p = 17 \]
\[ n = 18 \]
* To be full chlorine can lose seven or gain one.
To be full chlorine can lose seven or gain one.

It is easier for chlorine to gain one.
Chlorine gains one giving it a charge of negative one.
**RULE:**

- Metals lose electrons and have a positive charge equal to the group number.

- Non-metals gains electrons, and have a negative charge of eight minus the group number.