

Ions

1. What is an ion?

An atom or molecule that has an overall charge.

2. How are ions formed?

An atom becomes an ion when electrons are lost or gained – thereby creating a disparity in positive and negative charge.

The reasons for molecules developing charges are a bit less cut and dry. For now it would good to understand that polyatomic ions (molecules with a charge) contain covalently bound atoms that result in an overall charge on the molecule.

3. What is a cation?

A cation is an ion with a positive charge. One way you can remember that is the t in cation looks like a positive sign.

a. How is a cation formed?

A cation is formed by the *loss of electrons*. Remember that there is no change in the number of protons – only the number of electrons.

b. How is a cation named?

A cation is simply named. It is just the name of the element as found in the periodic table with the word ion behind it.

For example, if naming Na^+ , you would simply call it a sodium ion.

4. What is an anion?

An anion is an ion with a negative charge.

a. How is an anion formed?

An anion is formed by adding electrons to an atom. Once again, there is no change in the number of protons, only the number of electrons.

b. How is an anion named?

An anion is named by replacing the suffix of the element name with “-ide” followed by the word ion.

For example, if naming F^- , you would name it a fluoride ion.

5. What elements on the period table tend not to form ions? Why?

Noble gases. They have a stable electron configuration as all orbitals are filled.

6. What ion most commonly formed by

- | | |
|------------------------------|-----------------------------|
| a. Alkali Metals: +1 | one electron is lost. |
| b. Alkaline Earth Metals: +2 | two electrons is lost. |
| c. Group 3A : +3 | three electrons is lost. |
| d. Group 5A : - 3 | three electrons are gained. |

electrons = 10

(number of protons – charge = number of electrons)

$$(9 - (-1) = 10)$$

neutrons = 30

(Mass number – number of protons = number of neutrons)

$$(19 - 9 = 10)$$

c. $^{15}\text{N}^{3-}$

protons = 7

(determined by periodic table)

electrons = 10

(number of protons – charge = number of electrons)

$$(7 - (-3) = 10)$$

neutrons = 8

(Mass number – number of protons = number of neutrons)

$$(15 - 7 = 8)$$

d. $^{23}\text{Na}^{+}$

protons = 11

(determined by periodic table)

electrons = 10

(number of protons – charge = number of electrons)

$$(11 - (+1) = 10)$$

neutrons = 12

(Mass number – number of protons = number of neutrons)

(23 – 11 = 12)

9. In a neutral atom,

- a. The number of protons, electrons and neutrons are all equal.
- b. The number of protons and neutrons are equal. The electron count can be different.
- c. The number of neutrons and electrons are equal. The proton count can be different.
- d. The number of protons and electrons are equal. The neutron count can be different.