

Ions/Ionic Bonding

Chem Part 2/SG #2

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1. Define an ion: an atom (or group of atoms) that is no longer electrically neutral because it has lost or gained valence electrons

2. Because electrons have a negative charge, losing or gaining an electron will CHANGE the overall charge of an atom.

3. An atom that loses valence electrons becomes an ion with a positive charge. This is because the total number of electrons is now less than the total number of protons.

4. An atom that gains valence electrons becomes an ion with a negative charge. This is because the total number of electrons is now greater than the total number of protons.

5. To write an ion you write the symbol and then the charge as an exponent

Example Na^{+1} it is also acceptable to write an ion like this: Na^{1+}

In class, I will use the first example to write ions.

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6. Metal atoms (like sodium and magnesium) become more stable when they lose valence electrons and form a chemical bond with a nonmetal.

7. When sodium loses one electron it becomes like Ne with 10 total electrons. 8 of those electrons are now valence electrons.

(the electrons in the next lower energy will become valence electrons when electrons are lost) Sodium is now ____**chemically**____ stable. (like a noble gas)

8. Nonmetals (like oxygen and chlorine) will **_gain_** valence electrons from metal atoms. This is because they will now have a stable arrangement of 8 valence electrons. (like a **_noble_** gas)

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9. **Define** an ionic bond: **_the attraction between positively and negatively charged ions in an ionic compound_**

10. An example of an ionic bond is **____NaCl____**

11. List the properties of an ionic compound

a. usually **_solid_** and brittle at room temperature

b. high **_melting_** and boiling points

c. Can be **_dissolved_** in water – becomes a good **_conductor_** of electricity because the electric charge can pass from ion to **ion_** in the solution.

*12. An ionic bond results in an ionic compound that is made up of **____positive____** and negative ions. The total positive charge of all the positive ions **____equals____** the total negative charge of all the negative ions. This makes a **____neutral____** ionic compound.

*13. Ionic bonds **_TRANSFER_** electrons and usually occur between metals and non metals.

Metallic bonding

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14. Metal atoms form compounds with one another by **_combining_** or pooling their valence electrons.

15. Define metallic bond: **a bond formed when many metal atoms share their pooled valence electrons**

16. Valence electrons in metals are not bonded to one atom, instead a "sea of electrons" surrounds the positive ions.

17. A good analogy of a metallic bond is to think about filling up your bathtub with golf balls. They will arrange themselves into an orderly fashion. Then turn on the water and the water will fill the gaps. The golf balls are the metal atoms and the water is the sea of electrons they all share. Once the valence electrons detach from their original atomic owners and float around in the sea, the metal atoms become positive ions. The result is an orderly structure of positive metal atoms surrounded by a sea of negative electrons that hold the ions together like glue. This is why metals can conduct heat and electricity, are malleable and ductile, and are shiny.

See the picture on p. 401 for a good visual example.