Cheatography

Ionic and Covalent Bonding Cheat Sheet

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Why do atoms bond?

• Atoms like Noble Gases do not combine with other atoms because they have stable electronic structures
• All other atoms bond during chemical reactions in order to have a Stable Noble Gas Configuration
• Bonding only involves the valence electrons
• Valence electrons are responsible for the chemical properties of an atom

Forming Ions

• Atoms of metals have few valence electrons (1-2) thus they tend to lose electrons to form positive ions (cations).
• Atoms of non-metals have many valence electrons (4-7) thus they tend to gain electrons to form negative ions (anions).
• In this way, they obtain the electronic configuration of a stable noble gas.

Ionic Bonding

• Ionic bonding is the electrostatic forces of attraction between oppositely charged metal cations and non-metal anions.
• Ionic bonding occurs between 1 METALLIC atom and 1 or more NON-METALLIC atoms.
• It involves the TRANSFER OF ELECTRONS from a metal atom to a non-metal atom to achieve a stable noble gas configuration.
• This results in the formation of oppositely charged IONS.

Covalent Bonding

• A covalent bond occurs between 2 or more NON-METALLIC atoms.
• It involves the SHARING of one or more pair/s of electrons between the non-metallic atoms to achieve a noble gas electronic configuration. This results in the formation of MOLECULES.
• The bonds can be formed between atoms of the same elements or between atoms of different elements.

Covalent Bonding (cont)

• A COVALENT bond is the electrostatic forces of attraction between the nuclei of the 2 atoms and the pair of shared electrons.

Ionic Bonding VS Covalent Bonding

Difference	Ionic Bond	Covalent Bond
Atoms involved	Metal and Non-metal	Non-metals only
Formed by	Electron Transfer	Electron Sharing
Electrical Conductivity	Only in aqueous/molten form	Does not conduct EXCEPT for graphite
Solubility in Water	Most are soluble	Most are insoluble

Dot and Cross (Ionic)

1. Write down the formula of the compound and the electronic configuration of the atoms.
2. Look at the valency of the atoms and determine how many need to be transferred.
3. The cation loses all its valence electrons while the anion gains electrons until both ions obtain a stable noble gas configuration.
4. Draw circles to represent the electron shells and dots/crosses to represent electrons. (Do not forget to write the element's formula in the centre of the circle.)
5. For the anion, use the symbol (dots or crosses) that you used for the cation to represent the number of ions transferred from the cation to the anion.
6. Remember to draw brackets, write the number of atoms before the brackets, and write the charge to the top right of the bracket. (e.g 3+)

Dot and Cross (Covalent)

1. Write down the formula of the compound and the electronic configuration of the atoms.
2. Look at the valency of the atoms and determine how many need to be shared.
3. For compounds of a single element like Cl_2 or N_2, the number of bonds that need to be shared is the number of electrons it needs to become stable. (E.g for N_2, it has 5 valence electrons and needs 3 more to become stable, therefore it has 3 pairs of shared electrons.)
4. For compounds made of multiple elements, determine how many bonds are required for all elements to become stable. Note that 1 pair of shared electrons = 1 more electron for the atom.
5. Draw circles to represent the valence electron shells and dots/crosses to represent the valence electrons. Note that the circles have to intersect so there is space to draw shared pairs of electrons.
6. Draw the valence electrons on the circles and the shared pairs of electrons in the intersection.

1 pair of shared electrons = 1 more electron for the individual atom