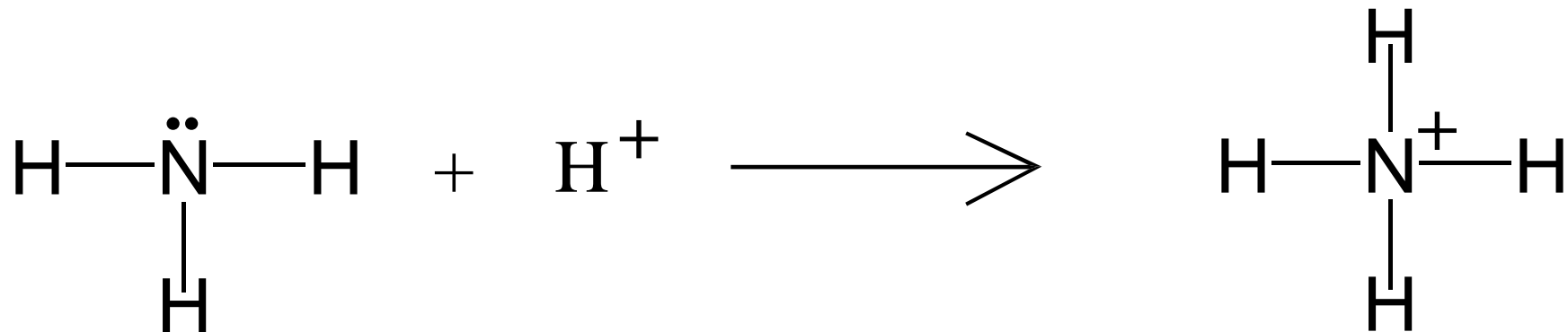# Lewis Structures

Method of representing molecular structures using the symbol of the element to represent the atom, dots represent the valence electrons and dashes for covalent bonds.

Formal Charges:

Formal charges are apparent charges associated with some atoms in lewis structures.

Formal Charges cont..:

$$H—\overset{..}{N}—H \;+\; H^+ \longrightarrow$$

(structure: $H—\underset{H}{\overset{H}{N^+}}—H$ with four H bonded to N)

Ex:

Formal Charge = (# valence electrons)
- (# bonds) - (#unshared electrons)

Ex: NH_4^+

N: formal charge = 5 - 4 - 0 = 5 - 4 = +1

H: formal charge = 1 - 1 - 0 = 1 - 1 = 0

Drawing Lewis Structures:

Will be using the example of ClO_3^- .

STEP 1: Find the total number of valence electrons supplied by all the atoms in the structure. If an anion, increase the total number of valence electrons by the charge. If a cation, decrease the total number of valence electrons by the charge.

STEP 2: Add up the total # of valence electrons required. There are 2 needed for each H atom and 8 for other elements.

STEP 3: The # in STEP 2 minus that in STEP 1 is the number of electrons that must be shared. Divide this number by 2 to obtain the total number of bonds.

STEP 4: Write out the elements with the one with the lowest electronegativity in the centre.

STEP 5: Indicate covalent bonds using dashes. Connect each atom and then add any multiple bonds until the # obtained is equal to the # of bonds calculated in STEP 3.

STEP 6: The total # of electrons from STEP 1 minus the # bonding electrons in STEP 3 is equal to the # of unshared electrons. Complete the octet of each atom.

STEP 7: Indicate the formal charges.

Resonance:

Occurs when a molecule or ion has two or more possible lewis structures.
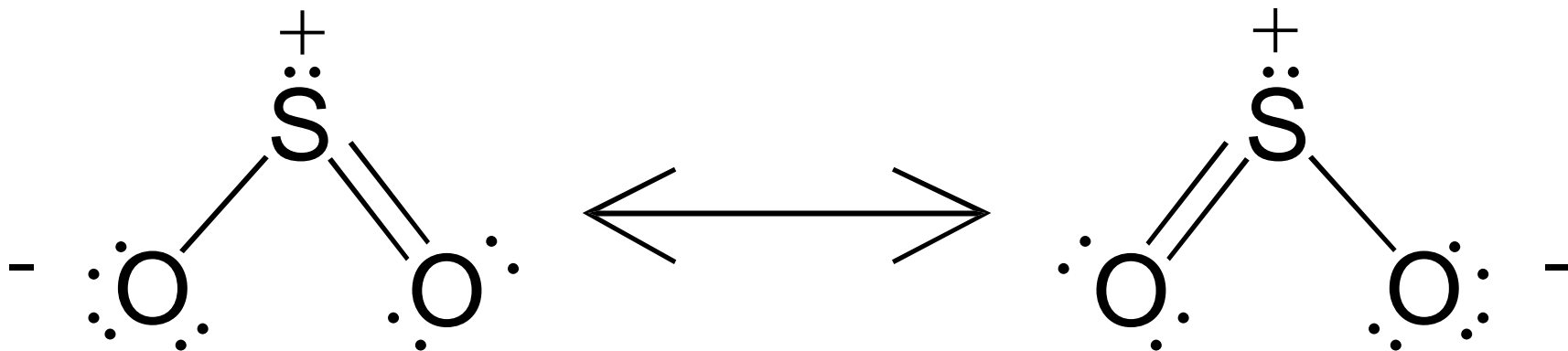
Valence-Shell Electron-Pair Repulsion(VSEPR) Theory:

Theory which predicts the geometric arrangement of atoms in a molecule. The valence electron pairs occupy positions as far as possible from one another. All electron pairs are considered.

In VSEPR theory double and triple bonds are treated as single bonds.

Hybridization:

Hybridization is the mixing of atomic orbitals to form new hybrid orbitals.

Explains violations of octet rule.

Ex: Consider

SF_6