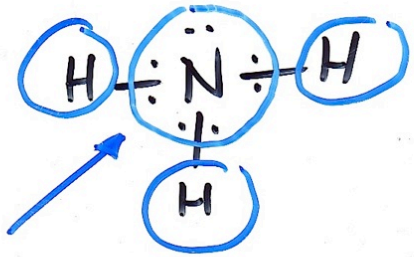
ARIS : Due 2 weeks from today!

Ox.# Pretending all atoms are ions in a molecule

Give lone-pairs → atom
Give bonding pairs → atom w/ greater electronegativity

ex: NH_3



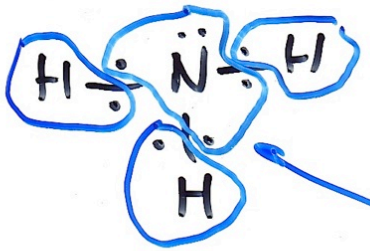
H
ORIG: 1
NOW: 0
Ox#: +1

N
ORIG: 5
NOW: 8
Ox#: -3

Formal Charges

- Pretend all bonds are non-polar covalent (all e^-'s are shared equally)
- lone-pairs → atoms
- ½ bonding-pairs → atoms

ex: NH_3



H
ORIG: 1
NOW: 1
FC: 0

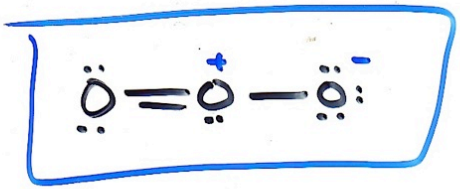
N
ORIG: 5
NOW: 5
FC: 0

ex: O_3

Formal Charges

$\sum F.C$ = total charge

ORIG:	6	6	6
NOW:	6	5	7
FC:	0	1+	1−



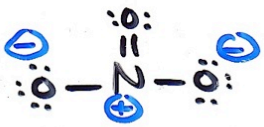
ex: NO_3^-

ORIG: 6e⁻
NOW: 6e⁻
FC: 0

ORIG: 6e⁻
NOW: 7e⁻
FC: 1−

ORIG: 5e⁻
NOW: 4e⁻
FC: 1+

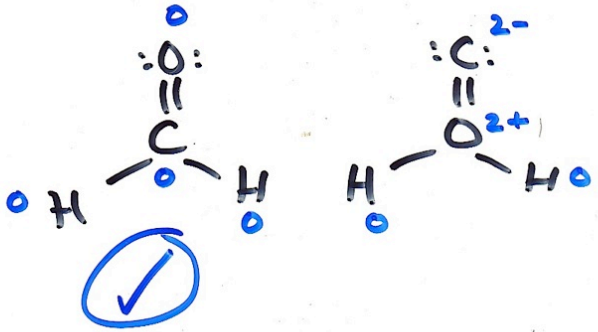
FC = 1−



If there's more than 1 possible Lewis Structure, the "best" one is usually the one w/ lowest set of FC's.

ex: CH_2O

FC

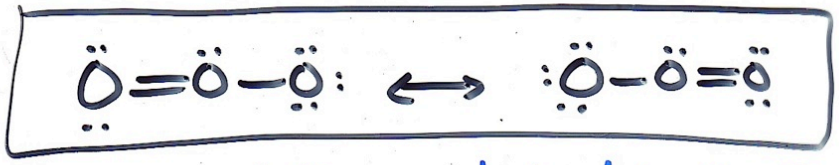


O_3

Real Structure

Best Lewis Structure = Blend / Hybrid!

- Resonance Hybrid

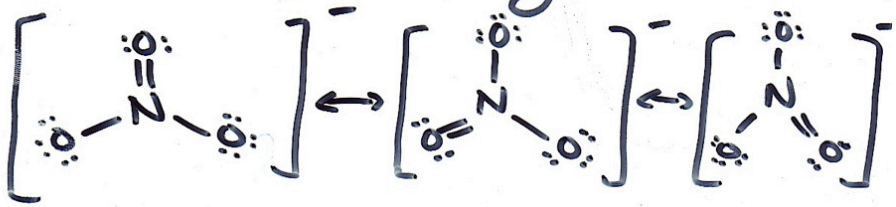


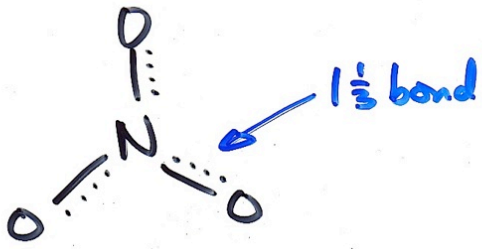
50% of time: each bond is O—O

other 50% " — " : " —— " O=O

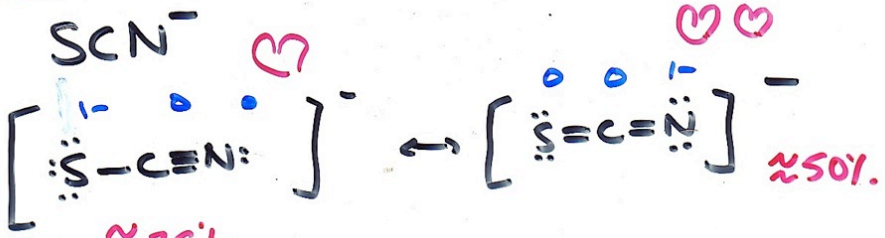
as if we have 1.5 bonds between O's

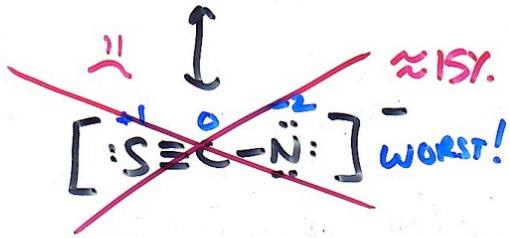
ex: NO_3^- all NO bonds are same length XPTlly





SCN^-





"Best" resonance structures have lowest FC's.

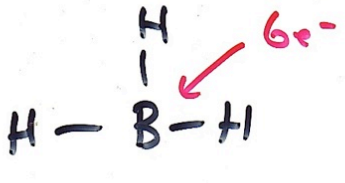
"Bestest" resonance structure has the −ve FC's on the most electronegative atom(s).

Exceptions to the octet rule

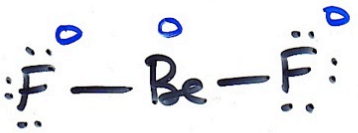
ex: B, Be are often e^- deficient.

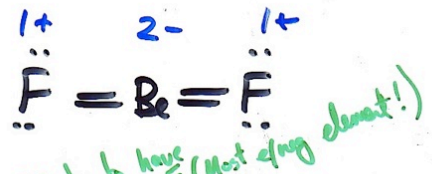
ex: BeH_2

BH_3

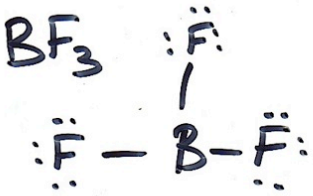


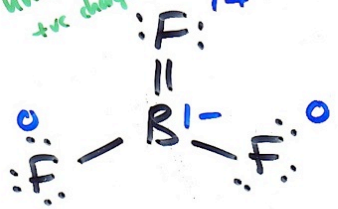
BeF_2





BF_3





Expanded Octet

ex: 2nd period always obey octet rule.

reason: $\underbrace{2s^2 2p^6}_{8e^-}$

3rd period can hold more than 8 valence e⁻s!
+ beyond

reason: $\underbrace{3s^2 3p^6 3d^{10}}_{\text{up to } 18\ e^-}$

ex: SF_4