**Lewis Dot Structures – Beyond the Basics!** Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Central idea**: the most stable arrangement of electrons is one in which all atoms have a

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ configuration.

**Three steps for “basic” Lewis structures:**

1. Sum the valence electrons for all atoms to determine \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of electrons.
2. Use pairs of electrons to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between each pair of atoms (\_\_\_\_\_\_\_\_\_\_\_\_\_).
3. Arrange remaining electrons around atoms (\_\_\_\_\_\_\_\_\_\_\_\_) to satisfy the “\_\_\_\_\_\_\_\_\_\_\_\_\_\_” (“duet” rule for hydrogen).

|  |  |
| --- | --- |
| An example: Cl2O | An example: CH4 |
| An example: CO2 | An example: NO+ |

**Resonance Structures**

* We have assumed up to this point that there is **one** correct Lewis structure.
* There are systems for which \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Lewis structure is possible:
  + Different atomic linkages: Structural \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Same atomic linkages, different bonding: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The classic example: O3



Conceptually, we think of the bonding being an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of these two structures.

Electrons are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between the oxygen’s such that on average the bond strength is equivalent to 1.5 O-O bonds

**Formal Charge**

**Formal Charge**: Compare the nuclear charge (+Z) to the number of electrons (dividing bonding electron pairs by 2). Difference is known as the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Cl** | **O** | **Cl** |  | **Cl** | **Cl** | **O** |
| **#e-** |  |  |  |  |  |  |  |
| **Z+** |  |  |  |  |  |  |  |
| **Formal C.** |  |  |  |  |  |  |  |

***Try CO2***! (hint: there are three possibilities!)

There are numerous exceptions to the octet rule

* *We will deal with two classes of violation here*:
* Some atoms (Be and B in particular) undergo bonding, but will form stable molecules that \_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Experiments demonstrate that the B-F bond strength is consistent with single bonds only.
* For third-row elements (“Period 3”), the energetic proximity of the d orbitals allows for the participation of these orbitals in bonding.
* When this occurs, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can surround a third-row element.
* Example: ClF3 (a 28 e- system)

***What do you need to know!?***