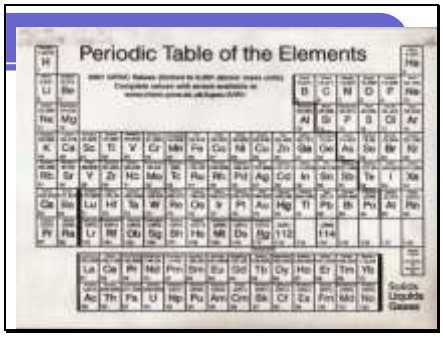
Slide 1



Slide 2

Lewis Dot Structures

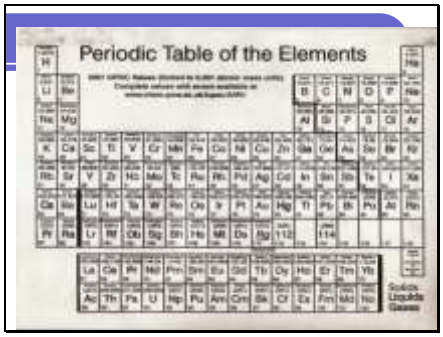
Gateway to Understanding
Molecular Structure

Slide 3

Drawing Lewis Dot Structures

1. Determine the total number of valence electrons.
2. Determine which atom is the “central” atom.
3. Stick everything to the central atom using a single bond.
4. Fill the octet of every atom by adding dots.
5. Verify the total number of valence electrons in the structure.
6. Add or subtract electrons to the structure by making/breaking bonds to get the correct # of valence electrons.
7. Check the “formal charge” of each atom.

Slide 4



Slide 5

Dot structure for SO_3^{2-}

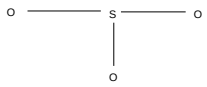
1. Total number of valence electrons:
   6 + (3 x 6) + 2 for the charge =26

2. Central Atom
   S is below O (leftmost, downmost)

3. Stick all terminal atoms to the central atom using a single bond.

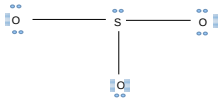
Slide 6

Stick all terminal atoms to the central atom using a single bond.



Slide 7

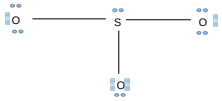
Fill the octet of every atom by adding dots.



Slide 8

Verify the total number of valence electrons in the structure.

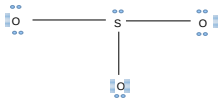
Yep - 26



Slide 9

Add or subtract electrons to the structure by making/breaking bonds to get the correct # of valence electrons.

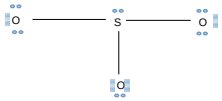
Not necessary



Slide 10

Check Formal charges:

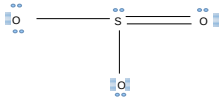
FC = # valence e- - # bonds - # electrons
FC(S) = 6-3-2=+1
FC(O) = 6-1-6 = -1
They're *OK – not great*



Slide 11

It's sulfur, it can expand.

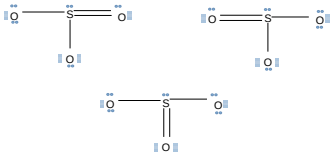
If we make an extra bond to sulfur then…
FC(S) = 6-4-2=0
FC(O=S) = 6-2-4 = 0
FC(O-S) = 6-1-6 = -1
BETTER! And we get resonance!



Slide 12

Resonance

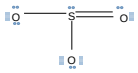
Same structure, different arrangement of electrons



Slide 13

Once I have a Lewis Structure…

Geometry is automatic based on number of electron groups!

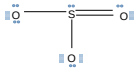


Central atom has 4 electron groups: 3 bond groups + pair of electrons.

Slide 14

Electron vs. molecular

4 electron groups = tetrahedral e-geometry



4 electron groups – 1 pair of electrons = trigonal pyramidal molecular geometry

Slide 15

Shape is half the issue…

Shape determines how the molecules can approach each other. (Remember trying to hug someone with a leg sticking out of their chest.)

Charge is the other half.

Opposites attract. Polarity is velcro.

Slide 16

Polarity is all electronegativity.

Slide 17

O (EN = 3.5)
S (EN = 2.5)

Not the same. The difference is 1.0. What kind of bond is this?

POLAR covalent.

Slide 18

Each bond is polar…

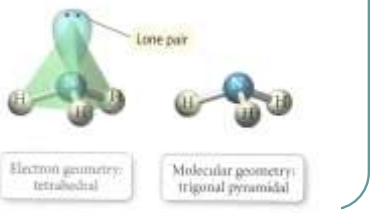
What about the molecule?

We need to consider shape and whether the polarities cancel.

It's trigonal pyramidal!

Slide 19

It's like ammonia Ammonia



Slide 20

Molecule Polarity

The H-N bond is polar. All the sets of bonding electrons are pulled toward the N end of the molecule. The net result is a polar molecule.

Slide 21

SO_3^{2-} is a polar molecular with a trigonal pyramidal shape

That shape and polarity will determine how sulfite interacts with other molecules and ions.

Form = Function

Form + charges = Function