Name:
AP Chemistry
Date:
Period:

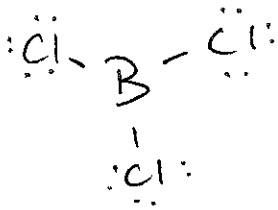
Empower Yourself
Empower Your Community
Empower Your World

Table Tennis – Chemical Bonding

Lewis Structures

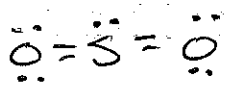
Draw the Lewis structures for the compounds below. Make sure to indicate formal charge for all atoms in your structures.

1. BCl_3



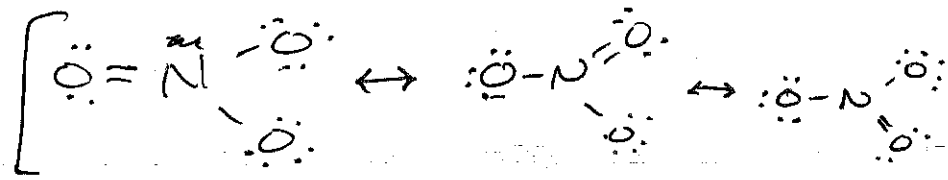
2. SO_2

$6+6+6=18\ e^-$



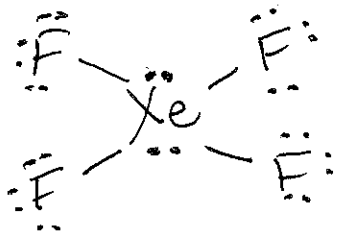
3. NO_3^-

$5+3(6)+1=18$



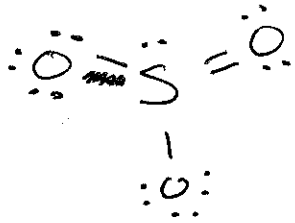
4. XeF_4

$8+4(7)=36$



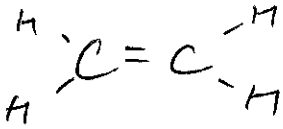
5. SO_3^{2-}

$6+6(3)+2=26$



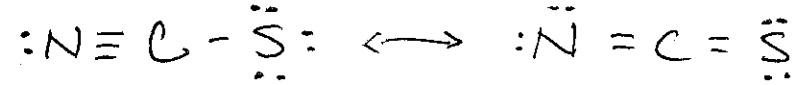
2 resonance structure

6. C_2H_2



7. NCS^-

$4+6+5+1$



8. Arrange the following molecules from shortest to longest C – O bond length for the molecules CO, CO_2, and CO_3^{2-}. Justify your reasoning for the ordering!

CO has a ~~double~~ triple bond, so it is the shortest, CO_2 has double bonds, so it is second shortest, CO_3^{2-} has resonance of single and double so it's the longest

Name:
AP Chemistry
Date:
Period:

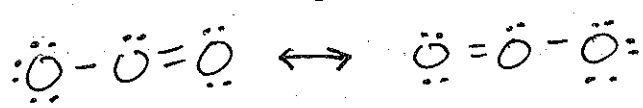
Empower Yourself
Empower Your Community
Empower Your World

Resonance

9. Draw all possible Lewis structures for the following molecules:

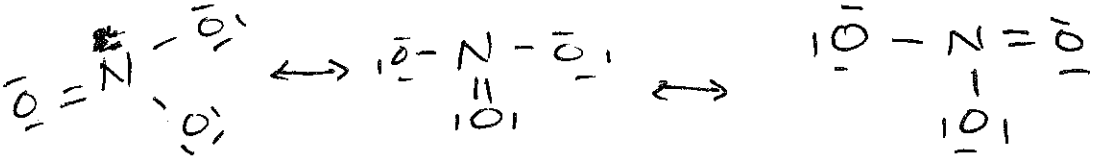
a. O_3

$6(3) = 18$ e⁻



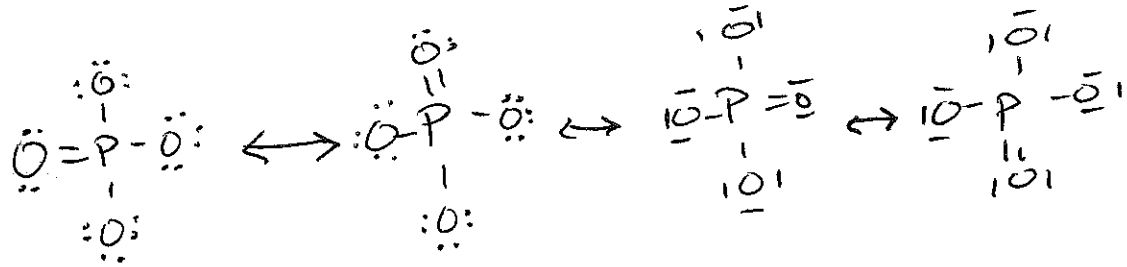
b. NO_3^-

$5 + 1 + 3(6) = 24$ e⁻



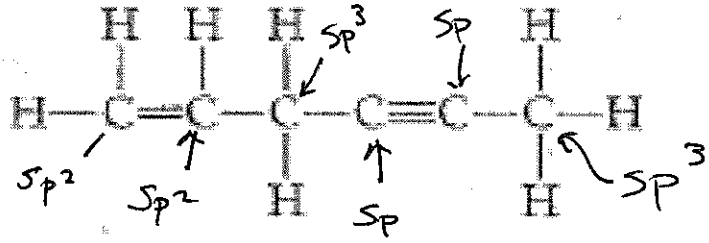
c. PO_4^{3-}

$5 + 3 + 4(6) =$



Hybrid Orbitals

10. In the hydrocarbon below:



a. What is the hybridization at each carbon atom in the molecule?

See above

b. How many sigma bonds are there in the molecule?

13 σ bonds

c. How many pi bonds are there in the molecule

3 π bonds

d. Do all of the carbon atoms lie in the same plane. Justify your reasoning!

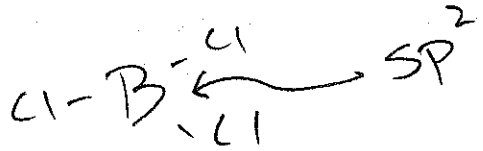
No! There are multiple sp^3 hybrids, which has a tetrahedral arrangement. Tetrahedral structures lie in multiple planes.

Name:
AP Chemistry
Date:
Period:

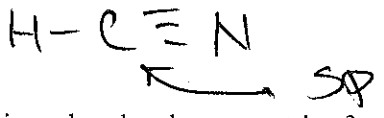
Empower Yourself
Empower Your Community
Empower Your World

11. Indicate the hybridization of the central atom in:

a. BCl_3



b. HCN



VSEPR Structures

12. Give the electron domain and molecular geometries for the following molecules:

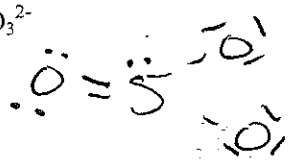
a. HCN

Domain: Linear

Geometry: Linear

b. SO_3^{2-}

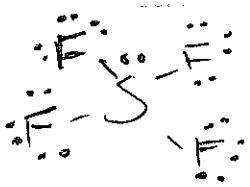
26



Tetrahedral

Pyramidal

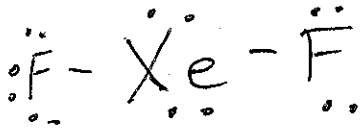
c. SF_4



Trigonal Bypyramidal

Seesaw

d. XeF_2



Tetrahedral

Bent

e. BrO_2^-

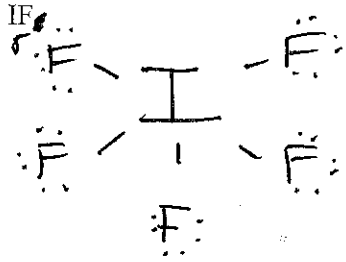
Tetrahedral

Bent

Polarity

13. Indicate whether the following molecules are polar or non-polar. If the molecules are polar, then indicate the direction of the dipole moment. HINT – You may need to consider the VSEPR structure to determine whether there is an overall dipole moment.

a. IF_5



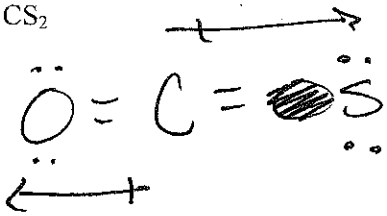
Non-polar.

Pulled equally in each direction

Name:
AP Chemistry
Date:
Period:

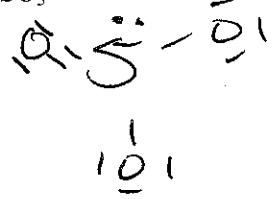
Empower Yourself
Empower Your Community
Empower Your World

b. CS_2



Non-polar

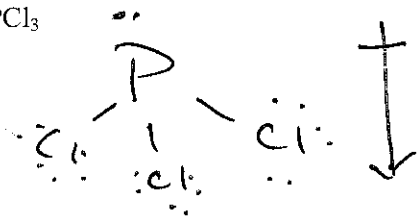
c. SO_3



Polar

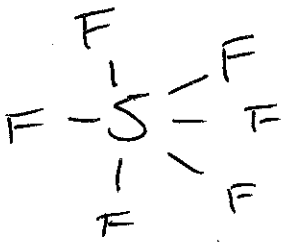
pyramidal pulls electrons down

d. PCl_3



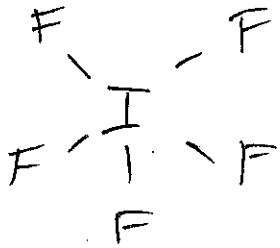
Polar

e. SF_6



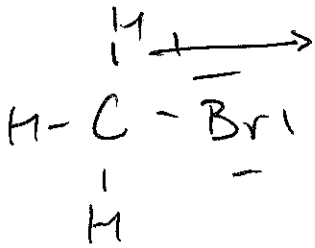
Non-Polar

f. IF_5



Non-Polar

g. CH_3Br



Polar