

Name Key Name _____
 (print name) (sign name)

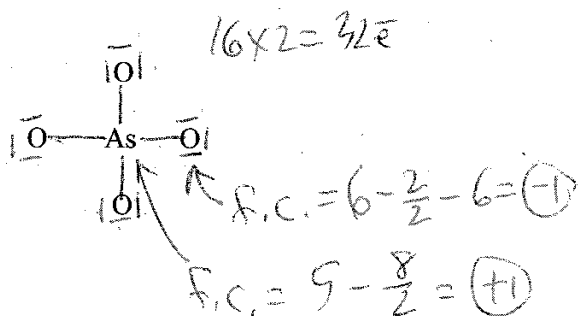
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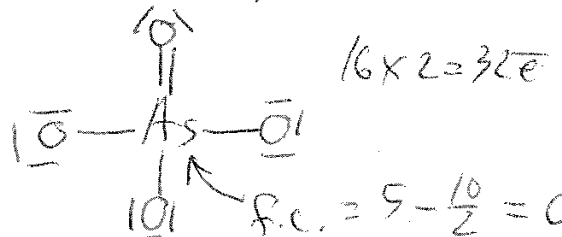
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1. Complete the following Lewis Dot Structure with an expanded octet around the central atom. (It is possible to have a valid Lewis Dot Structure without having an expanded octet but please show the Lewis Dot Structure with an expanded octet. AsO_4^{3-} Give the formal charge on all atoms in the structure in your final Lewis Dot Structure with the expanded octet. I have provided the frame of the molecule. (4 pts total, 2 pts final Lewis Dot Structure)

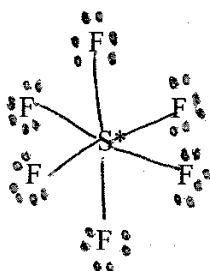
of valence electrons 32 (2 pts)



As - group 5, O - group 6
 $5 + 4(6e) + 3 = 32e^-$



2. For the following molecule given the Lewis Dot structure, complete the following using the VSEPR handout. (5 pts, 1 pt per blank) SF_6



8:30

The # of electron pairs around the atom with the * is 6

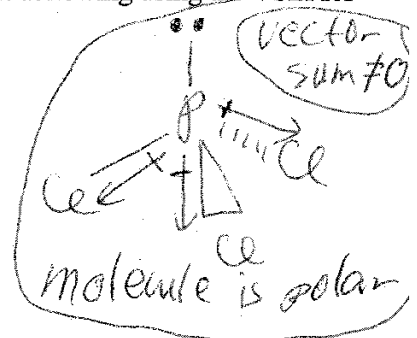
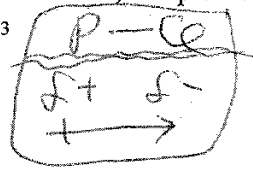
The # of lone pair electrons around atom with the * is 0

The geometry of the electron pairs is octahedral

The geometry of the molecule is octahedral

The hybridization of the atom with the * is sp^3d^2

3. For the following molecule given the Lewis Dot structure, complete the following using the VSEPR handout. (7 pts, 1 pt per blank or choice) PCl_3



The number of electron pairs around the atom with the * is 4

The number of lone pair electrons around atom with the * is 1

The geometry of the electron pairs around the atom with the * is tetrahedral

The geometry of the molecule around the atom with the * is trigonal pyramidal

The hybridization of the atom with the * is sp^3

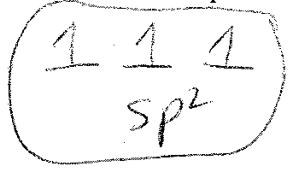
The bond P---Cl is a [(polar) or (nonpolar)] (circle one) bond

Cl is close to F, P is far
Cl is more EN than F

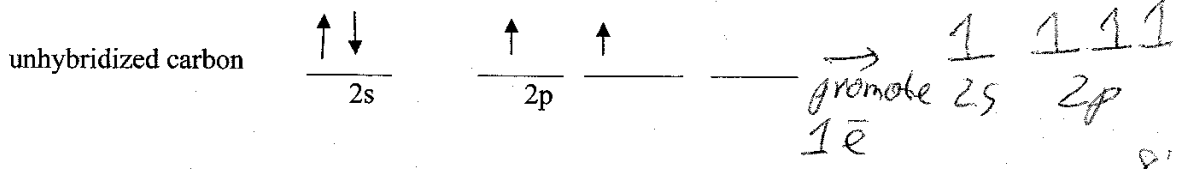
The molecule as a whole is a [(polar) or (nonpolar)] (circle one) molecule.

3. Show the conversion of the Carbon valence atomic orbital from the unhybridized carbon to the sp^2 hybridized carbon in C_2H_4 . Use arrows to represent electrons (2 pts, 1 pt electron, 1 pt orbitals)

sp^2 hybridized carbon
(you need to show both the orbitals and the electrons in the orbitals)

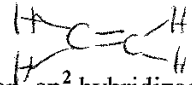


← hybridize

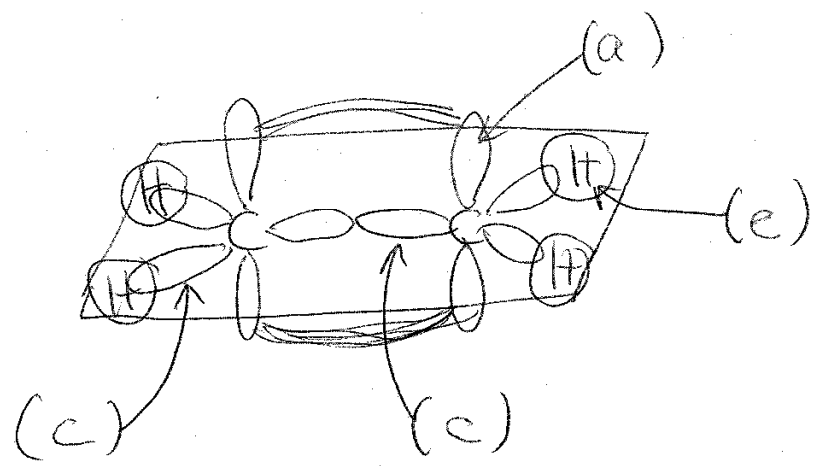


8:30

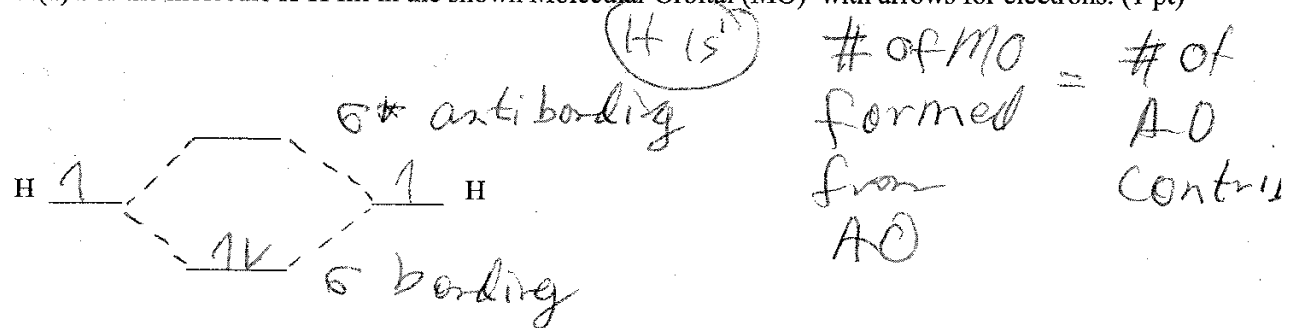
4. Given the diagram showing the orbitals, label the orbitals with the appropriate letter shown below by filling in the blank with the appropriate letter. You may not use all of the letter given and you may use the letters more than one time. (1 pt each blank, 4 pts total)



- (a) carbon p orbital (b) carbon sp hybridized orbital (c) carbon sp² hybridized orbital (d) carbon sp³ hybridized orbital (e) Hydrogen s orbital



5.(a) For the molecule H-H fill in the shown Molecular Orbital (MO) with arrows for electrons. (1 pt)



(b) Is the molecule H₂ a stable molecule based on your filled in MO? Give a short sentence of explanation. (1 pt)

The molecular orbitals formed are σ + σ^* . σ is lower energy than the starting 1s. σ^* is higher energy than the starting H 1s. Since H₂ has 2e⁻ in σ + no e⁻ in σ^* all e⁻ are in a lower energy orbital than the starting H 1s. So H₂ is more stable than H by itself so the molecule H₂ does form.

8/30

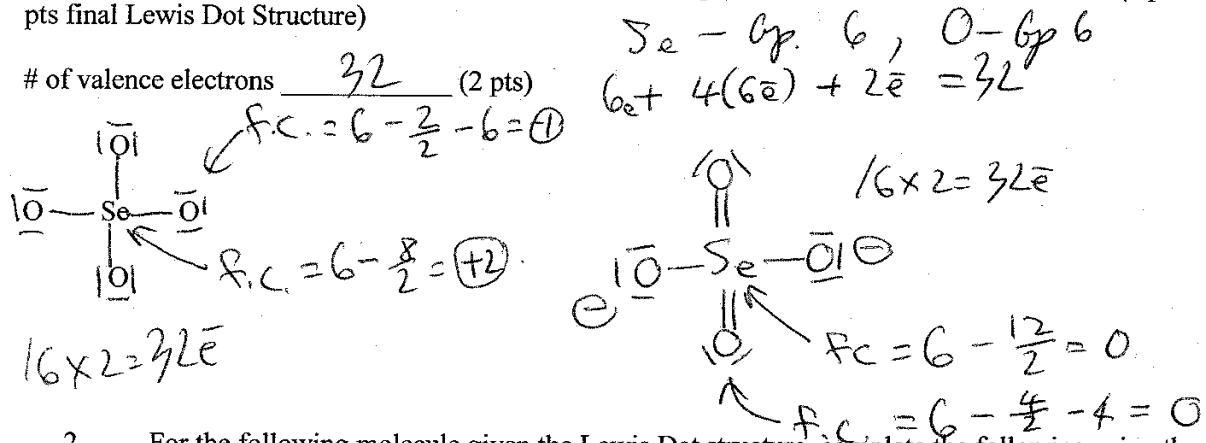
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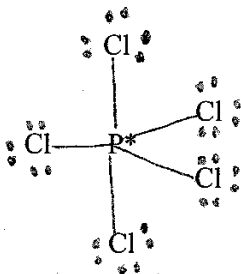
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1. Complete the following Lewis Dot Structure with an expanded octet around the central atom. (It is possible to have a valid Lewis Dot Structure without having an expanded octet but please show the Lewis Dot Structure with an expanded octet. SeO_4^{2-} Give the formal charge on all atoms in the structure in your final Lewis Dot Structure with the expanded octet. I have provided the frame of the molecule. (4 pts total, 2 pts final Lewis Dot Structure)



2. For the following molecule given the Lewis Dot structure, complete the following using the VSEPR handout. (5 pts, 1 pt per blank) PCl_5



The number of electron pairs around the atom with the * is 5

The number of lone pair electrons around atom with the * is 0

The geometry of the electron pairs is trigonal bipyramidal

The geometry of the molecule is trigonal bipyramidal

The hybridization of the atom with the * is sp³d

3. For the following molecule given the Lewis Dot structure, complete the following using the VSEPR handout. (7 pts, 1 pt per blank or choice) AsF₃



The number of electron pairs around the atom with the * is 4

The number of lone pair electrons around atom with the * is 1

The geometry of the electron pairs around the atom with the * is tetrahedral

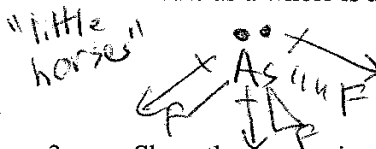
The geometry of the molecule around the atom with the * is trigonal pyramidal

The hybridization of the atom with the * is sp³

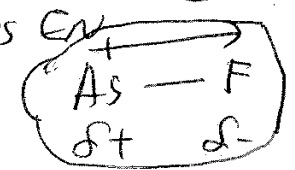
The bond As----F is a (polar) or (nonpolar) (circle one) bond

F is most EN ↓
As is far from (F) so
less EN

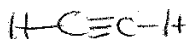
The molecule as a whole is a (polar) or (nonpolar) (circle one) molecule.



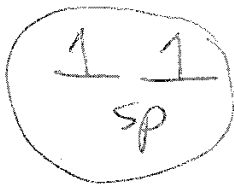
vector sum ≠ 0, bc
vectors not symmetric



3. Show the conversion of the Carbon valence atomic orbital from the unhybridized carbon to the sp hybridized carbon in C₂H₂. Use arrows to represent electrons (2 pts, 1 pt electron, 1 pt orbitals)

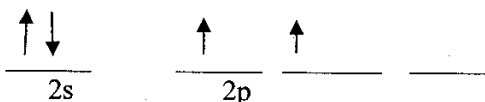


sp hybridized carbon
(you need to show both the orbitals and the electrons in the orbitals)

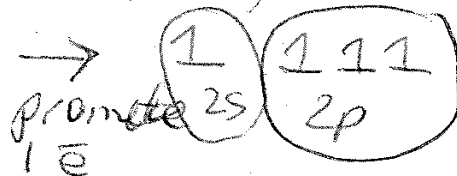


← hybridize

unhybridized carbon



9.55

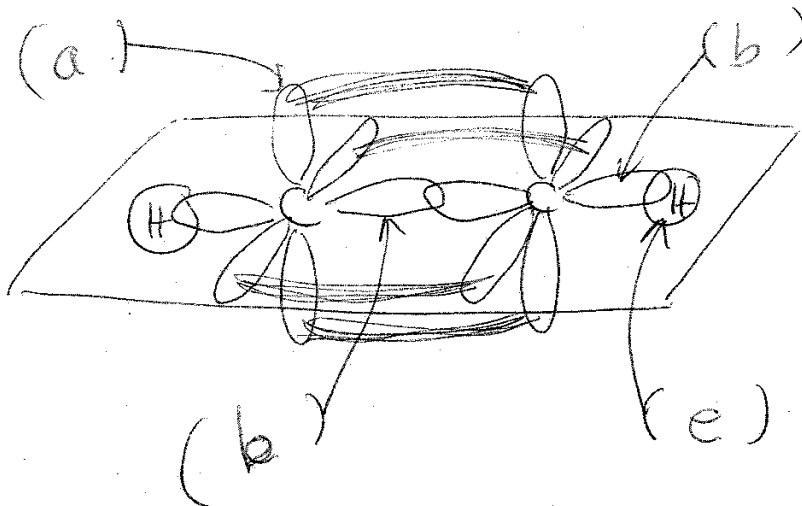


4. Given the diagram showing the orbitals, label the orbitals with the appropriate letter shown below by filling in the blank with the appropriate letter. You may not use all of the letter given and you may use the letters more than one time. (1 pt each blank, 4 pts total)

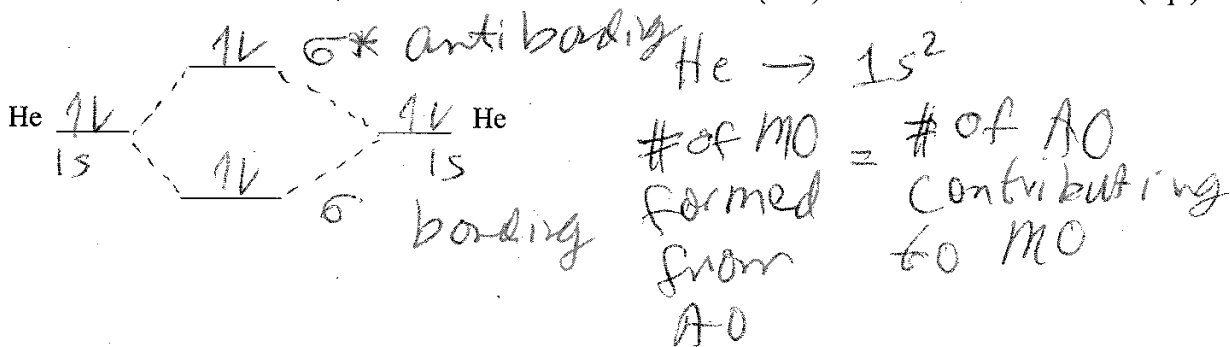


9:55

- (a) carbon p orbital (b) carbon sp hybridized orbital (c) carbon sp² hybridized orbital (d) carbon sp³ hybridized orbital (e) Hydrogen s orbital



4.a. For the molecule He-He, fill in the shown Molecular Orbital (MO) with arrows for electrons. (1 pt)



b. Is the molecule He₂ a stable molecule based on your filled in MO? Give a short sentence of explanation. (1 pt)

The molecular orbitals formed are σ + σ^* , σ is lower energy than the starting He 1s atomic orbital. σ^* is higher energy. Since He₂ molecule would have same # of bonding + antibonding electrons, the He₂ molecule is not more stable than He. So He₂ does not exist. 3

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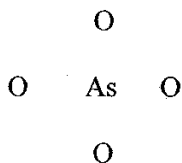
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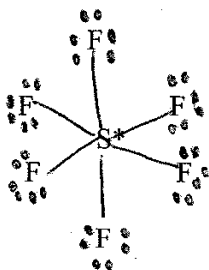
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of valence electrons _____ (2 pts)



2. For the following molecule given the Lewis Dot structure, complete the following using the VSEPRT handout. (5 pts, 1 pt per blank) SF₆



The # of electron pairs around the atom with the * is _____

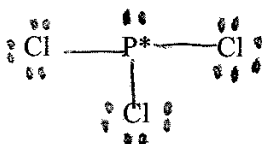
The # of lone pair electrons around atom with the * is _____

The geometry of the electron pairs is _____

The geometry of the molecule is _____

The hybridization of the atom with the * is _____

3. For the following molecule given the Lewis Dot structure, complete the following using the VSEPR handout. (7 pts, 1 pt per blank or choice) PCl_3



The number of electron pairs around the atom with the * is _____

The number of lone pair electrons around atom with the * is _____

The geometry of the electron pairs around the atom with the * is _____

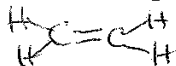
The geometry of the molecule around the atom with the * is _____

The hybridization of the atom with the * is _____

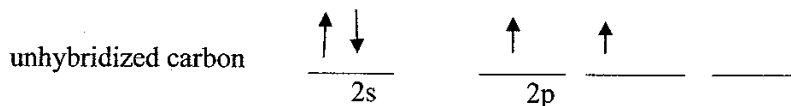
The bond P---Cl is a [(polar) or (nonpolar)] (circle one) bond

The molecule as a whole is a [(polar) or (nonpolar)] (circle one) molecule.

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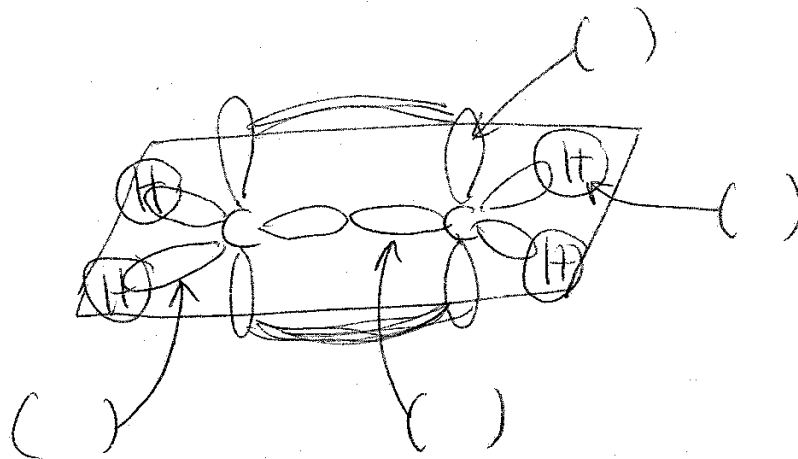


sp^2 hybridized carbon
(you need to show
both the orbitals
and the electrons
in the orbitals)

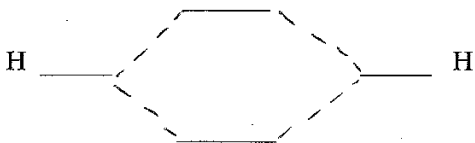


4. Given the diagram showing the orbitals, label the orbitals with the appropriate letter shown below by filling in the blank with the appropriate letter. You may not use all of the letter given and you may use the letters more than one time. (1 pt each blank, 4 pts total)

- (a) carbon **p** orbital (b) carbon **sp** hybridized orbital (c) carbon **sp²** hybridized orbital (d) carbon **sp³** hybridized orbital (e) Hydrogen **s** orbital



5.(a) For the molecule H-H fill in the shown Molecular Orbital (MO) with arrows for electrons. (1 pt)



(b) Is the molecule H₂ a stable molecule based on your filled in MO? Give a short sentence of explanation. (1 pt)

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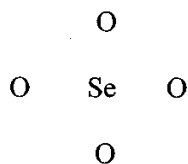
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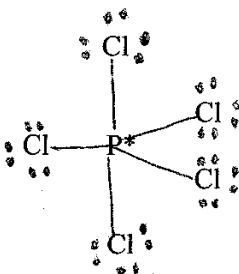
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of valence electrons _____ (2 pts)



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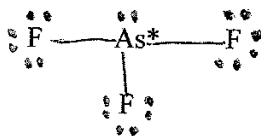
The number of lone pair electrons around atom with the * is _____

The geometry of the electron pairs is _____

The geometry of the molecule is _____

The hybridization of the atom with the * is _____

3. For the following molecule given the Lewis Dot structure, complete the following using the VSEPR handout. (7 pts, 1 pt per blank or choice) AsF₃



The number of electron pairs around the atom with the * is _____

The number of lone pair electrons around atom with the * is _____

The geometry of the electron pairs around the atom with the * is _____

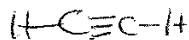
The geometry of the molecule around the atom with the * is _____

The hybridization of the atom with the * is _____

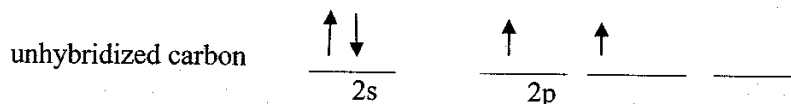
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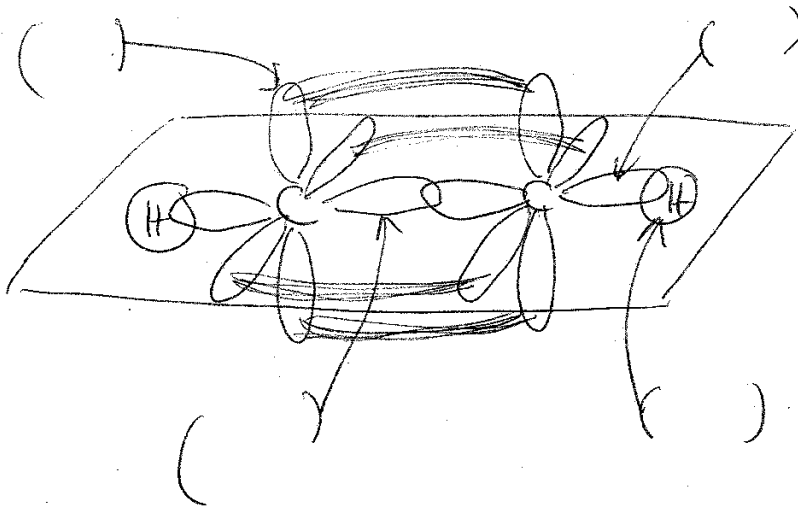
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