

①

# HW Set #7

Hybridization

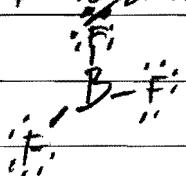
✓ of C

Ch. 6 = 52, 56, 68, 70

Ch 7 = 8, 12, 20, 40

⑤2 Lewis Dot & hybridization & geometry

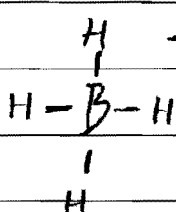
A.  $\text{BF}_3$



$\text{B} = \text{sp}^2$

trigonal planar

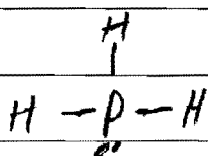
B.  $\text{BH}_4^-$



$\text{B} = \text{sp}^3$

tetrahedral

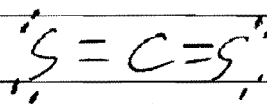
C.  $\text{PH}_3$



$\text{P} = \text{sp}^3$

trigonal pyramidal

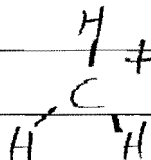
D.  $\text{CS}_2$



$\text{C} = \text{sp}$

linear

E.  $\text{CH}_3^+$



$\text{C} = \text{sp}^2$

trigonal planar

⑤6

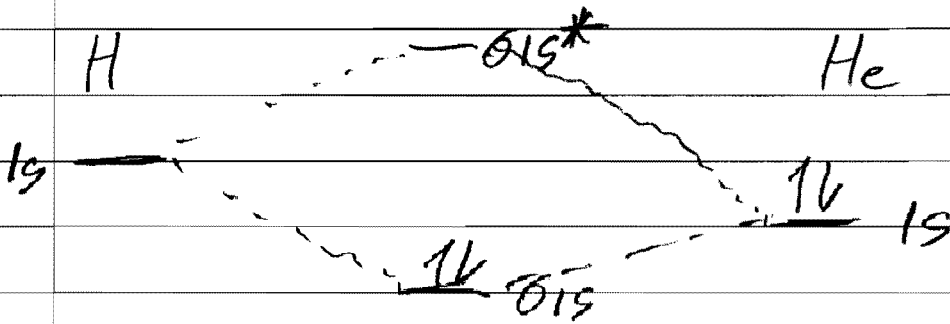
$\text{N} \equiv \text{C} - \text{Cl}$

$\text{C} = \text{sp}$

linear

2

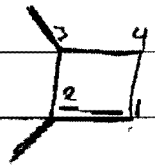
(68) HeH<sup>+</sup> Bond length = 0.774 Å Draw the diagram



$C_1 \psi_{1s}^H + C_2 \psi_{1s}^{He}$  is  $C_2$  larger than  $C_1$ ? yes,  $He^{+2}$  has more of an attraction to  $e^-$  than  $H^+$ .

## Chapter 7

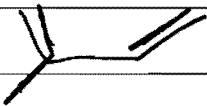
(8) A. 2,3-Dimethyl-1-cyclobutene =



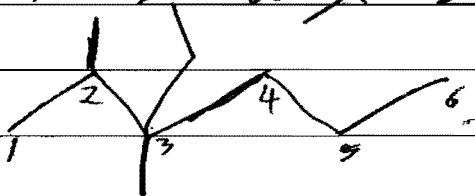
B. 2-Methyl-2-butene =



C. 2-Methyl-1,3-Butadiene

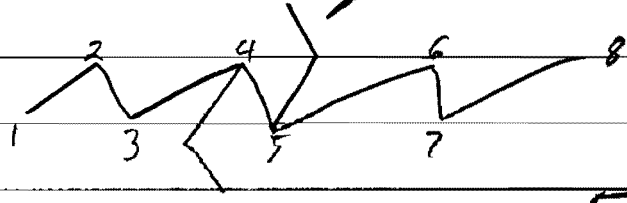


D. 2,3-Dimethyl-3-ethyl hexane

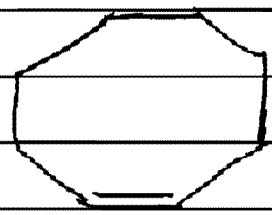


3

8E 4,5-Diethyloctane



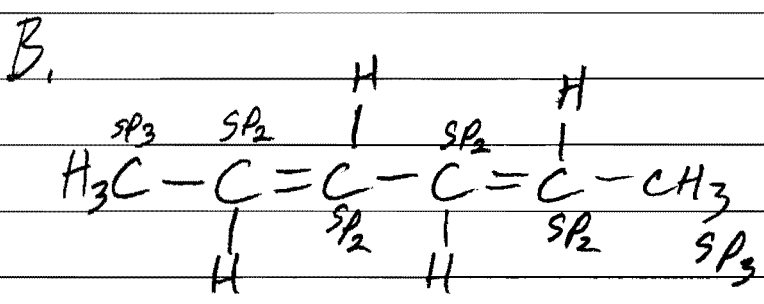
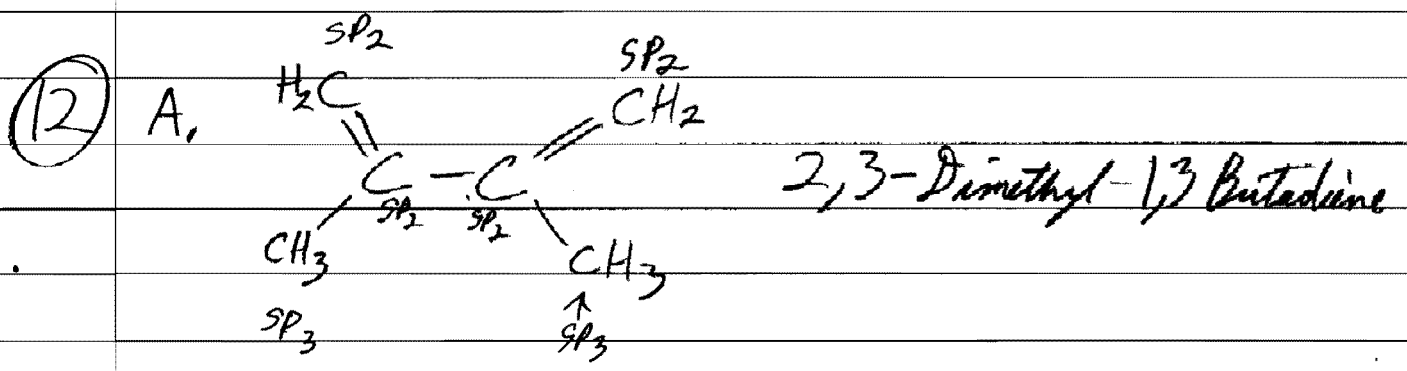
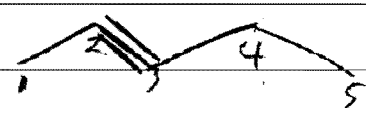
8F Cyclooctene



8G Propadiene



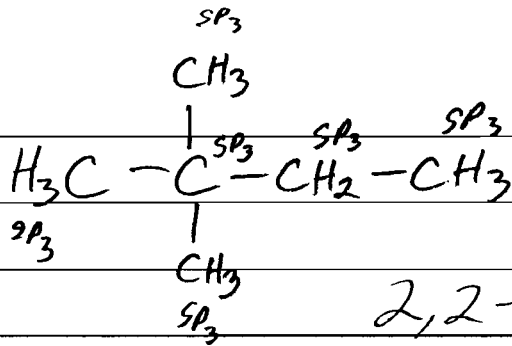
8H 2-Pentyne



2,4-hexadiene

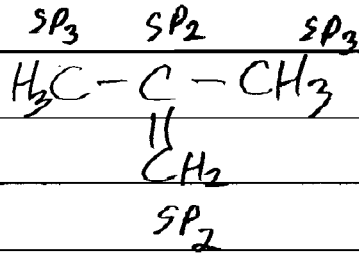
4

(12c)



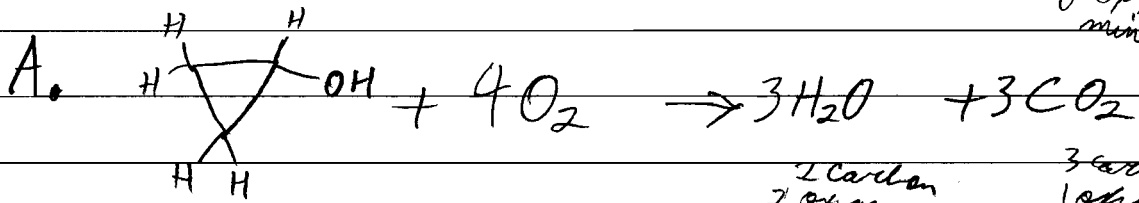
2,2-dimethylbutane.

(12d)



2-methyl-1-propene

(20)

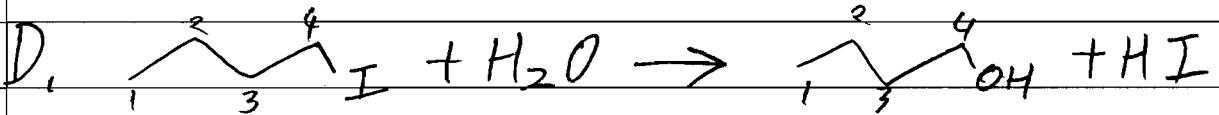
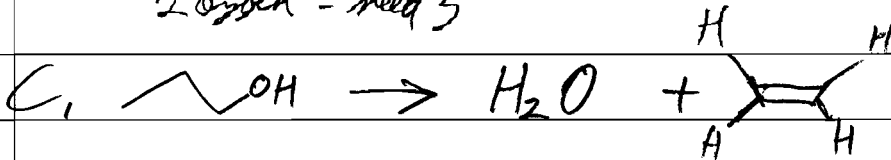
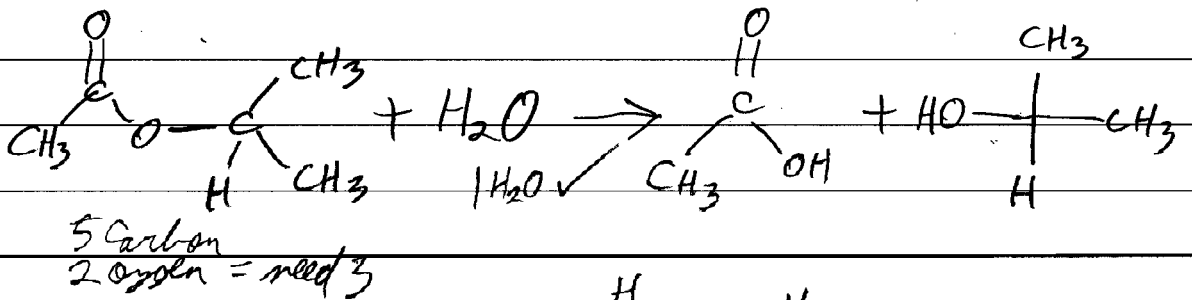


6 oxygen minimum

2 carbon 2 oxygen

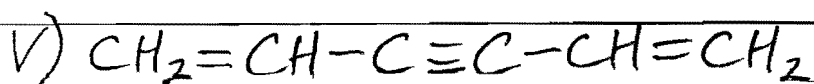
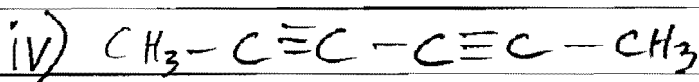
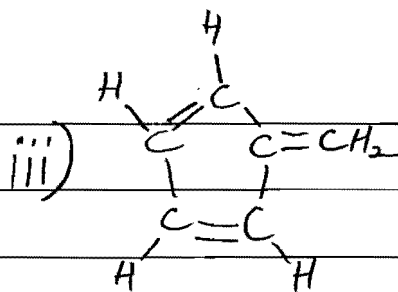
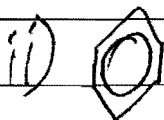
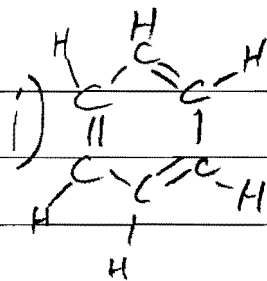
3 carbon 1 oxygen

B.



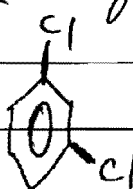
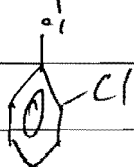
5

40



A. for only one isomer i, ii, and iv  
 iv = Cl replaces a H so no matter which was replaced, it would also look the same.

B.  $\text{C}_6\text{H}_4\text{Cl}_2$  forms 3 isomers only



only structure ii

all others form many more isomers.

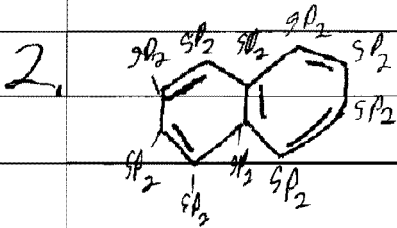
Ex i) 1,2-Cl each numbered atom distinguishes that atom,  
 1,3-Cl  
 1,4-Cl  
 1,5-Cl  
 1,6-Cl

6.

# Other Problems

1.  $H-C \equiv N:$

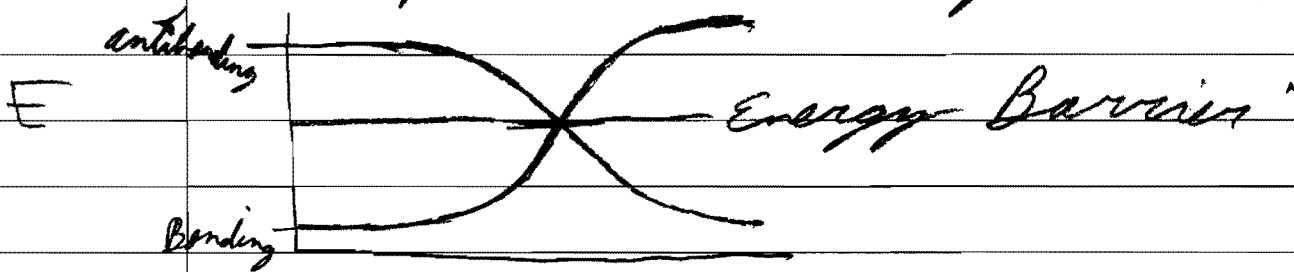
By VB the sigma bond between C and N is a combination of  $sp$  from Carbon and the  $sp$  <sup>orbital</sup> from nitrogen.



All carbons are  $sp^2$  hybridized. Each carbon is bound by sigma bonds to two other atoms, leaving the remaining p orbitals of each C to delocalize the  $\pi$  bond across the molecule.

3. Why is there an energetic barrier to the rotation of  $C=C$ ? By rotating the molecule, you rotate the  $\pi$  bond.

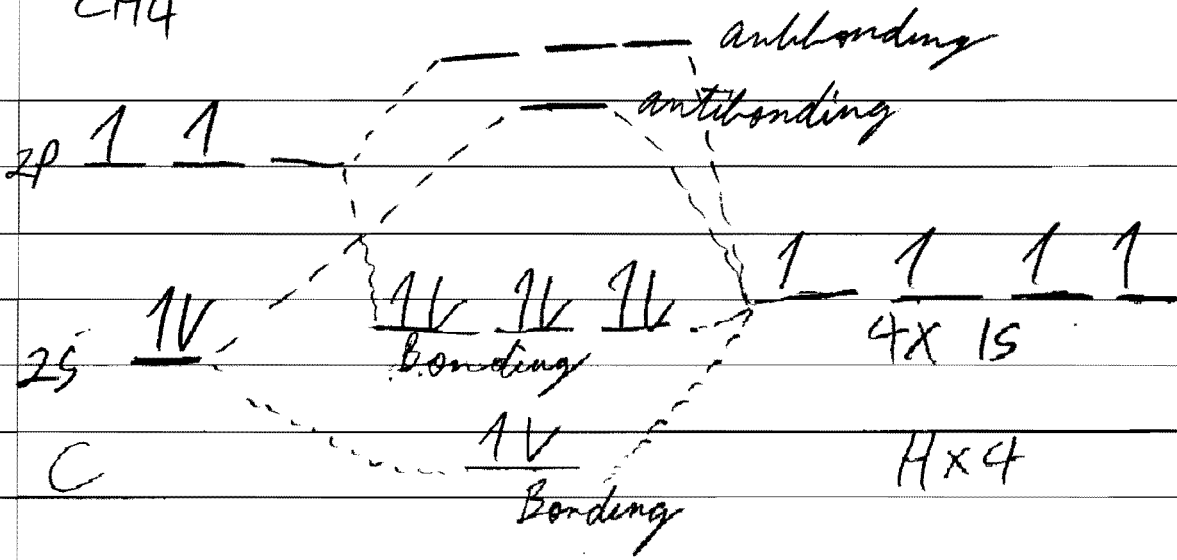
This forces the bonding electrons in the  $\pi$  bond to increase in energy until the electrons can "hop" to the antibonding orbital.



⑦

CH<sub>4</sub>

④

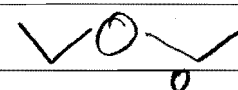


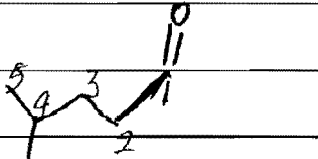
How is this similar to VB theory?  
How is it different?

Similar = Both methods predict that there will be four bonds within the molecule, with two e<sup>-</sup> per bond.

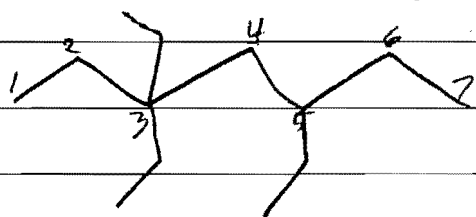
Different = MO theory predicts a non-equivalent energy between each C-H bond, whereas VB predicts equal bond energy, with each C-H bond sharing sp<sub>3</sub> character.

⑧

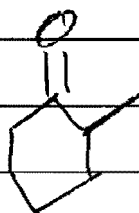
5.  diethyl ether

6.  4-methyl-1-pentanal

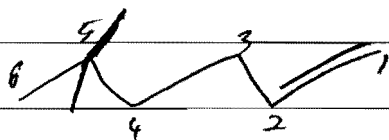
7. A. 3,3,5-triethylheptane



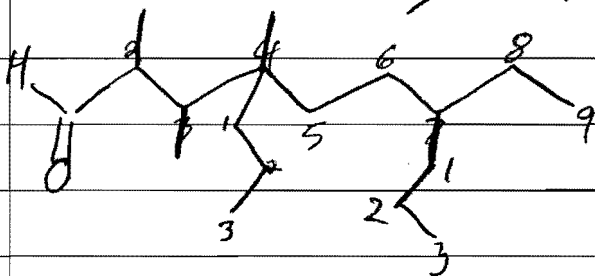
B. 2-Methylcyclohexanone



C. 5,5-Dimethyl-1-hexene



D. 2,3,4-trimethyl-9,7-dipropylnonan-1-al



E. 5-ethyl-1,3,6-heptatriene

