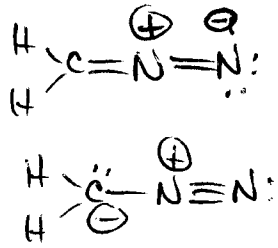
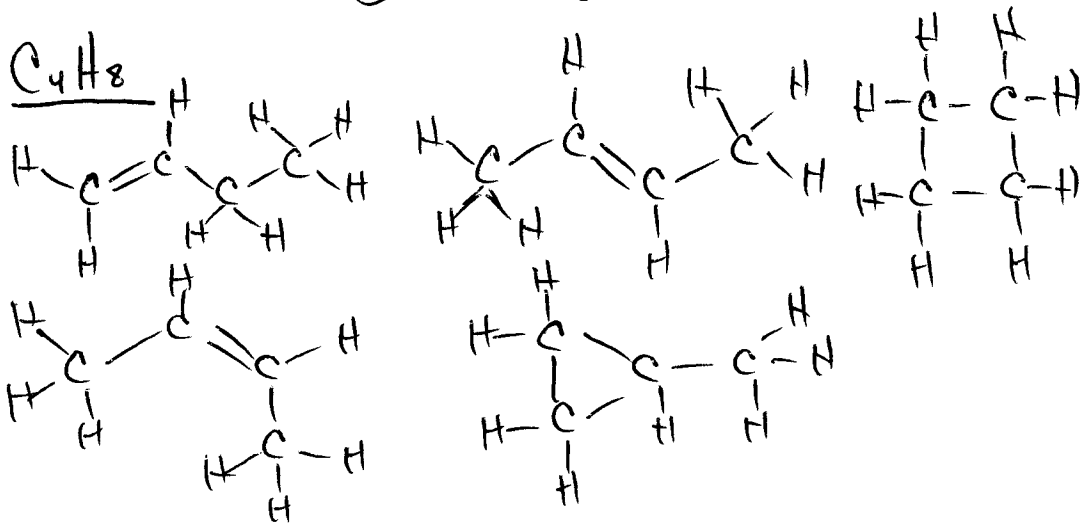
5.12 Review Session: Exam 1 Key

I. Review of Lewis Bonding Theory

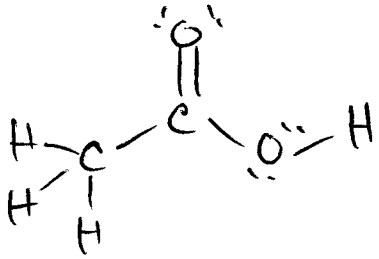
1. CH_2N_2



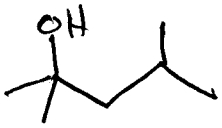
C_4H_8



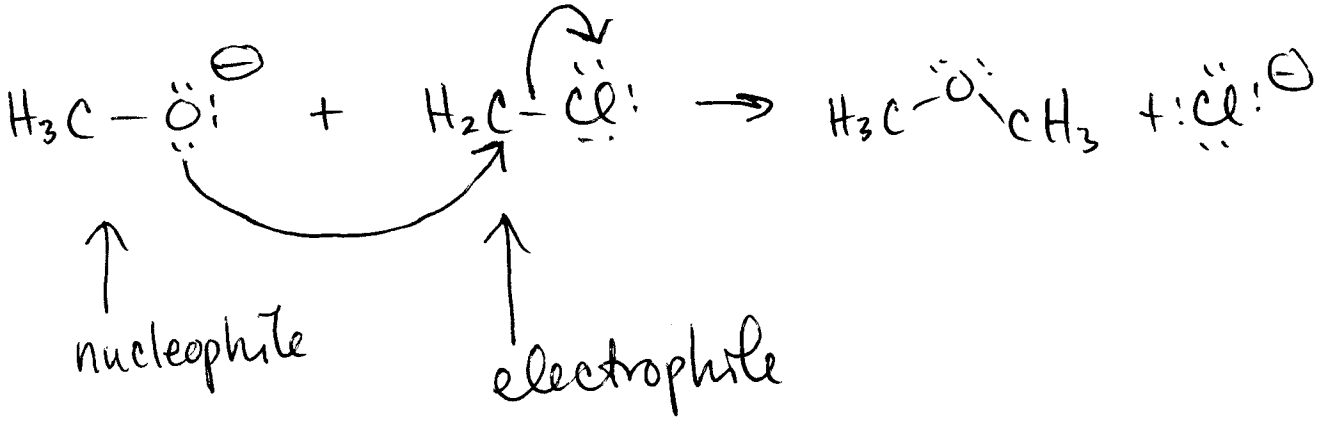
CH_3CO_2H



2. $(CH_3)_3CCHCH_2$ $(CH_3)_2C(OH)CH_2CH(CH_3)_2$

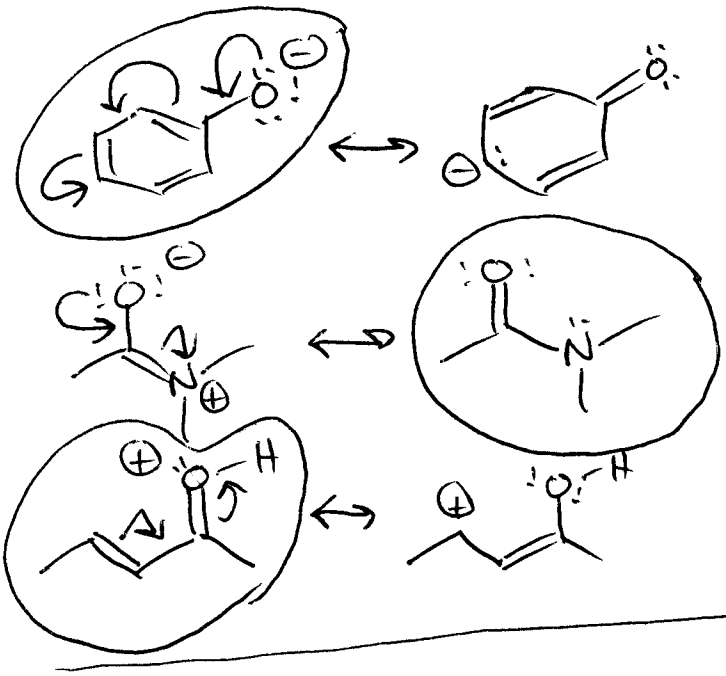


3.

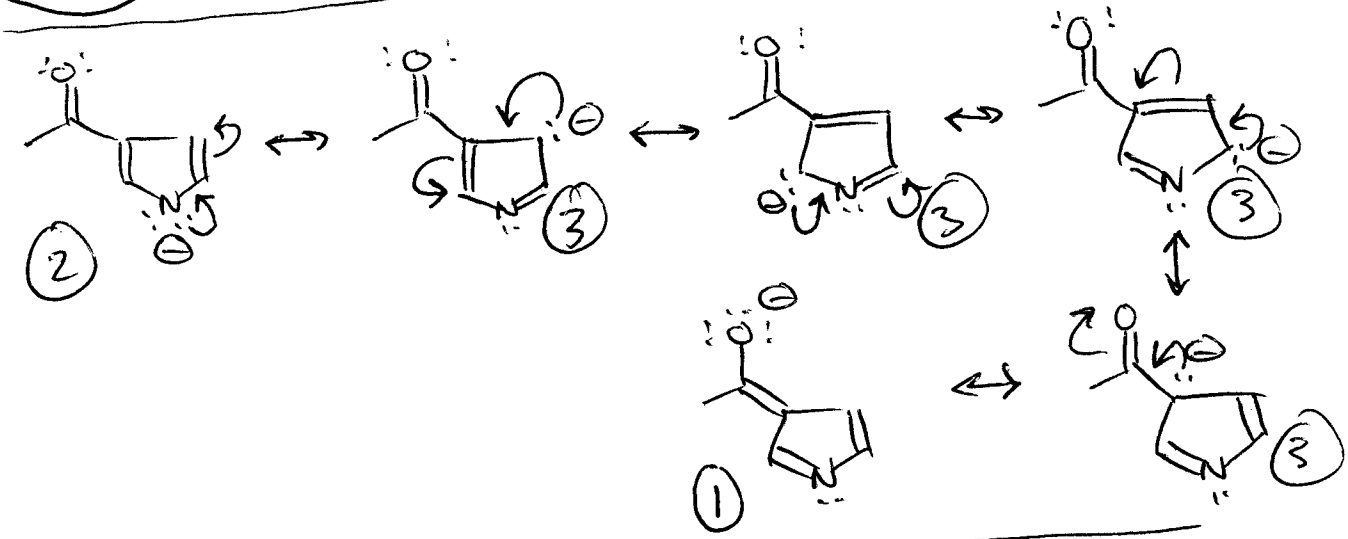


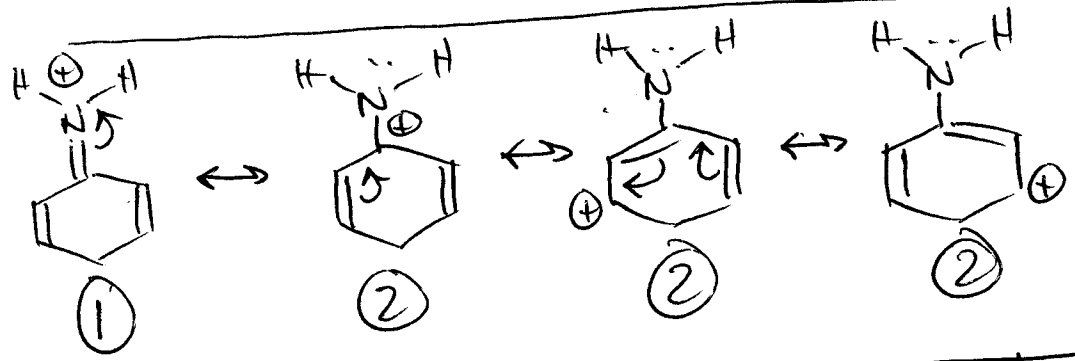
II. Resonance

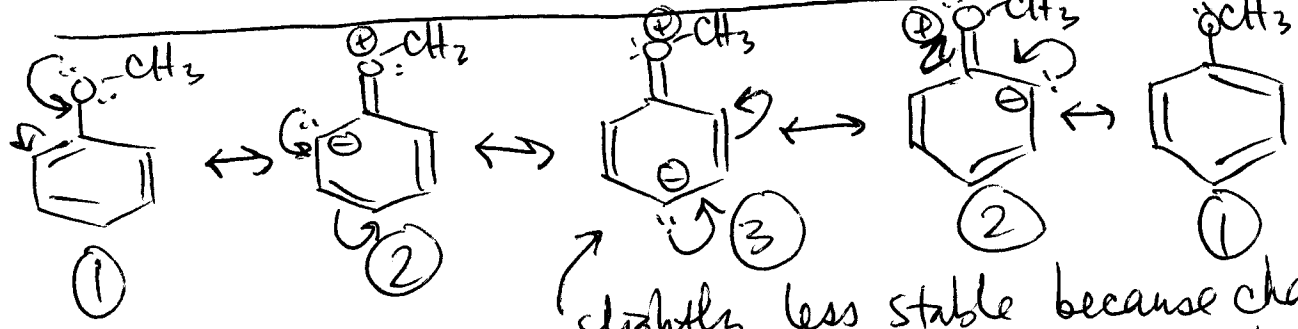
1.



2.



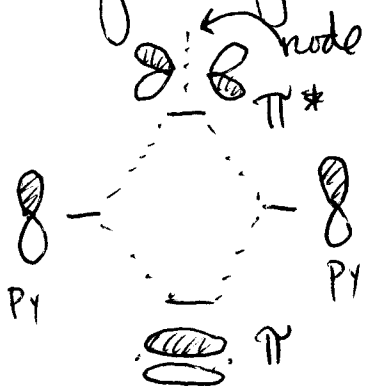




III. Review MO Theory

IV. Hybridization / LCAO

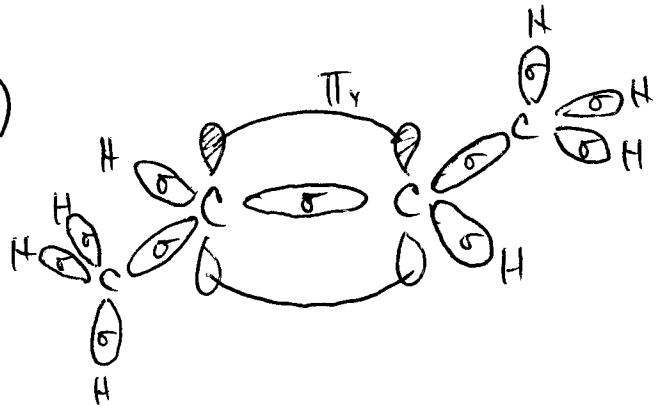
1.



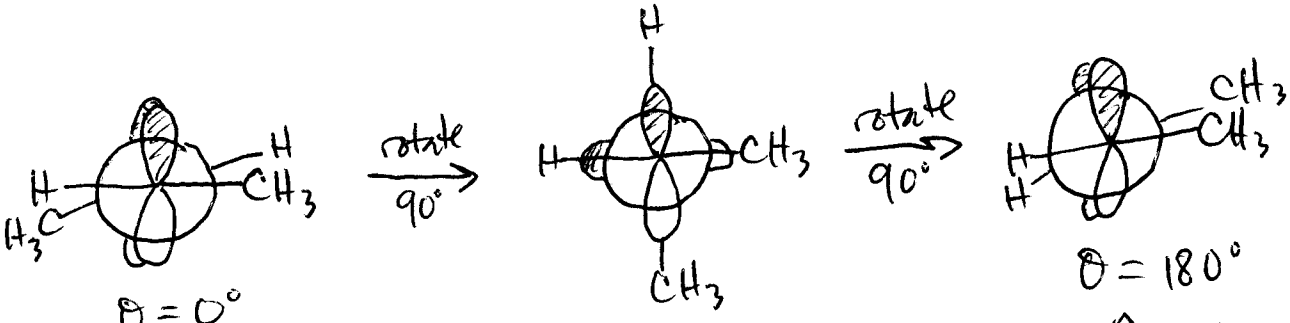
2.

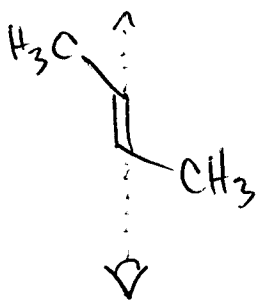
They are orthogonal! (no overlap)

3. a)



b) The π-overlap in a) is geometry-dependent. Look at the Newman projection:

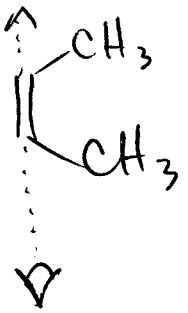




NO OVERLAP

(ORTHOGONAL)

You have to break the π-bond to rotate this molecule!



V. Properties of Molecules

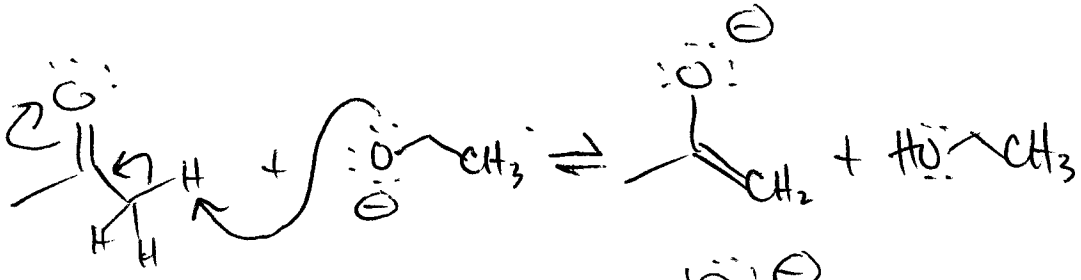
1. Me_3N : yes, N has an extra lone pair

   BF_3 : no, BF_3 has only 6 e^-, no lone pairs

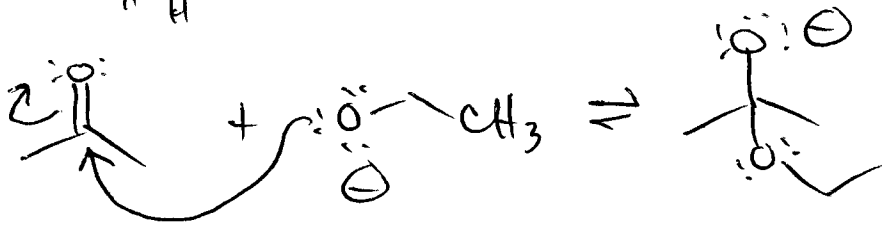
   H_2O : yes, O has two lone pairs

   CH_4 : no, C has no lone pairs

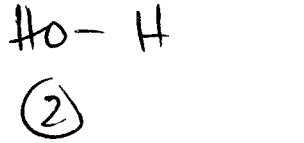
2. Bronsted :



   Lewis :



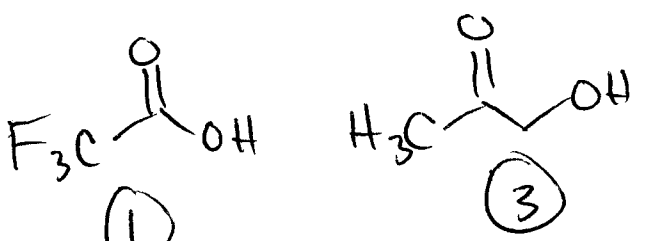
3. a)



   ② ③ ①

   atom size ; electronegativity

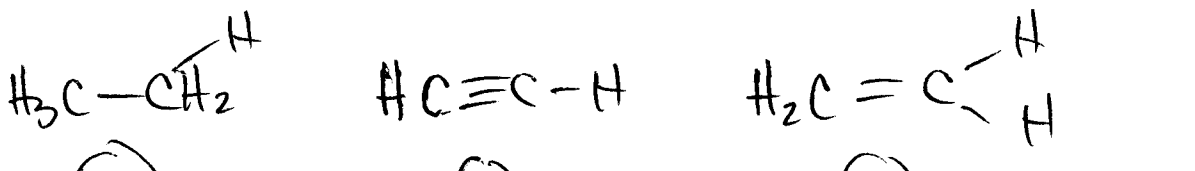
   b)



   ① ③ ②

   resonance ; inductive effects

   c)



   ③ ① ②

   hybridization

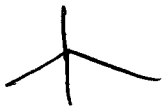
VI - Alkanes

Problem 3 will not be covered on the exam

1.

n-pentane

2-methylbutane

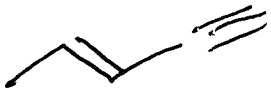


2,2-dimethylpropane

2. C_7H_{12} d.o.u. = 2

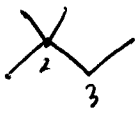
C_3H_6 d.o.u. = 1

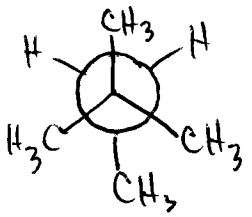
C_5H_6 d.o.u = 3

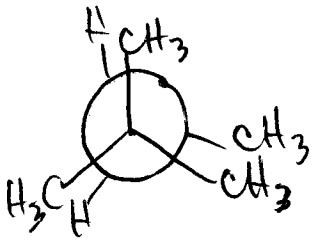


There are many possible isomers that you can draw!

3.



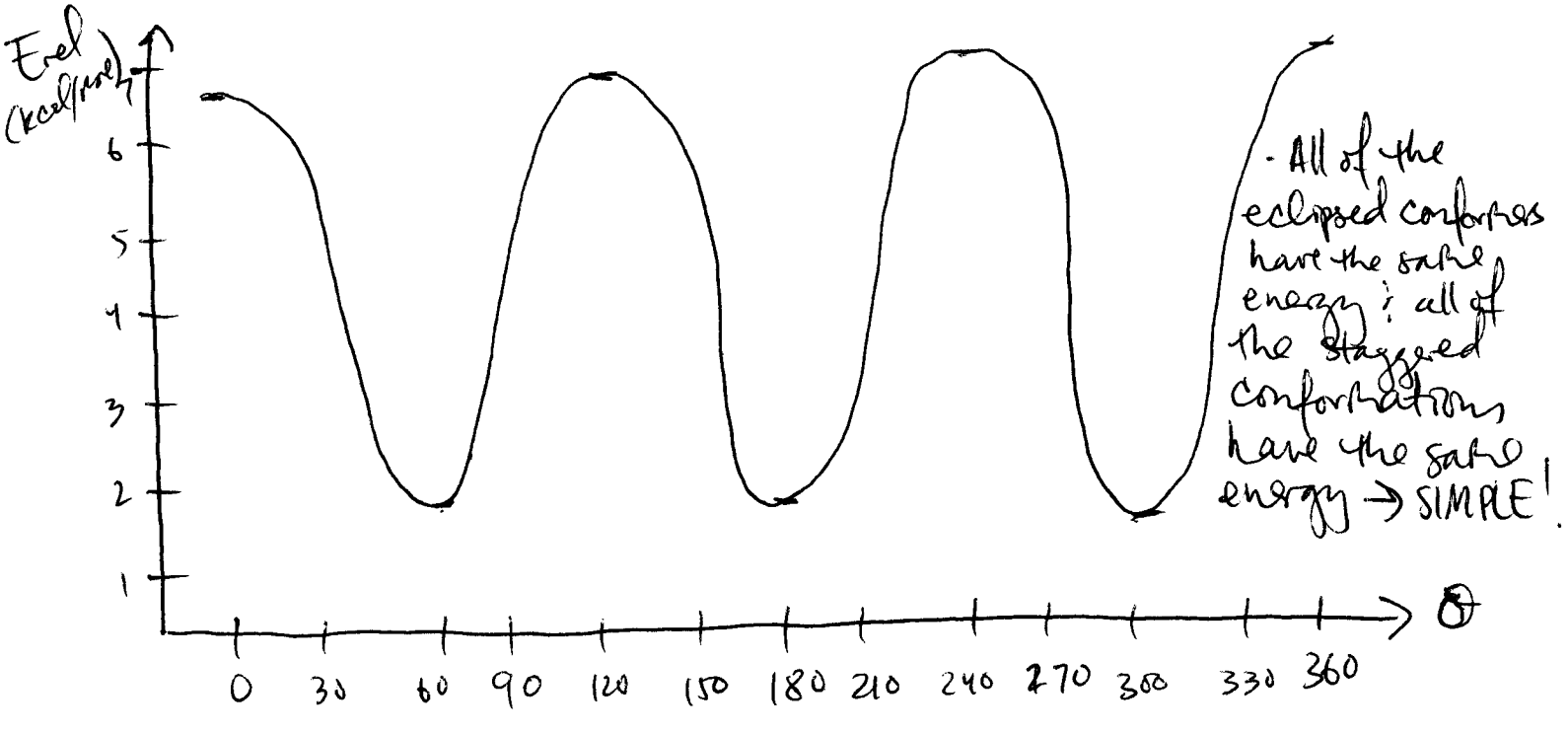




E_{rel} = 1.8 kcal/mol (2 g.b.i.)

E_{rel} = 6.6 kcal/mol

Barrier = 6.6 − 1.8 = 4.8 kcal/mol



- All of the eclipsed conformers have the same energy; all of the staggered conformations have the same energy → SIMPLE!