Fall 2002, Dr. Hunter

Chemistry 1506: Mid-Term Exam

Name:_____,_____
Last name **First** name

Student Number (your social security number): _____

Signature: _____

In addition to this cover page, this midterm exam consists of 5 pages of questions for 6 pages in total. Please make sure you place your name (last name first) and your student number (i.e., your Social Security number) in the spaces above and sign on the line. ***Initial each page in the top right hand corner*** (i.e. near the page number) in case your exam pages get separated.

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You may use molecular models to help you answer questions. Feel free to ask me questions. On those pages where you are given a choice about which parts to answer, be sure that you circle those parts you want me to grade. If you do not indicate your choice, I will not grade the last part.

This midterm is worth 100 points out of the 400 points for this semester. /100

1. [20 points maximum] For ***two*** *out of three* of the following parts, give an answer in the space provided. **Clearly show which ones you want me to grade by circling its letter.** Show your reasoning and/or your work.

(a) For each of the following functional groups, draw an example of a molecule having this group:

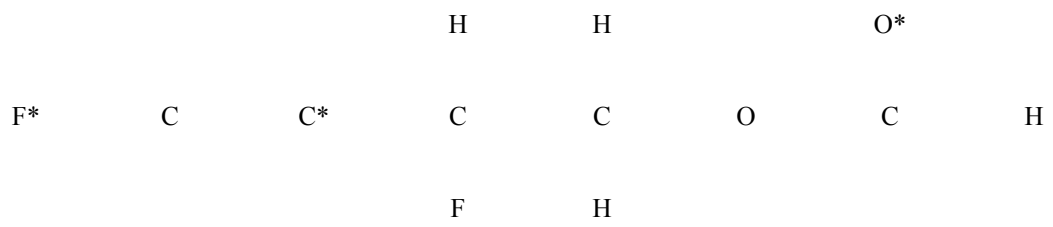
Alkene Ether Amide Ester Alcohol

(b) Vinyl chloride has the formula CH_2=CHCl and with the use of an appropriate catalyst it can undergo addition polymerization to give poly(vinyl chloride). Give an equation for this reaction. Draw the structure of the poly(vinyl chloride) product being sure to include at least 4 repeating units in your structure. Where would you find poly(vinyl chloride) on your block?

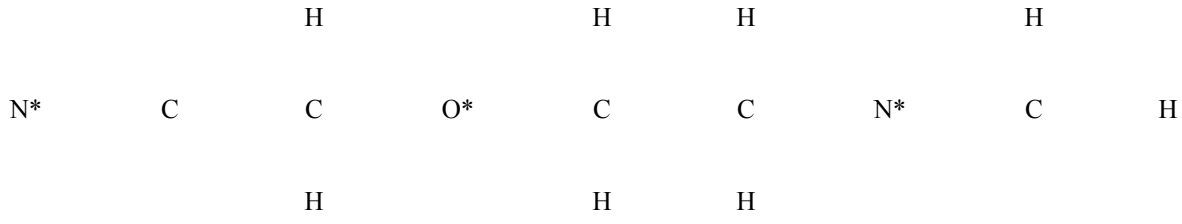
(c) Clearly describe the *structure* and the *bonding* of the carbon-carbon double bond in CH_2=CH_2. Include in this description a comparison of a carbon-carbon double bond to the carbon-carbon single bond in CH_3-CH_3.

[20 points maximum] For each of the following molecules, draw the Lewis structure and check if your Lewis structure is correct. For each atom in these molecules, predict the bond lengths and angles. For the three atoms with stars (*) in each molecule, give their hybridizations.

(a)



(b)



3. [20 points maximum] For following molecular formulae, draw 5 structural isomers. Be sure that you show **all** atoms and bonds for each.

(a) $C_6H_{15}N$

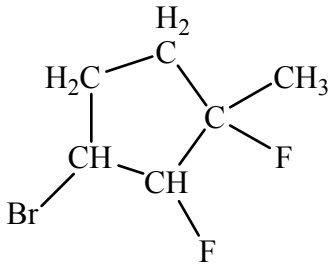
(b) $C_6H_{12}O_2$

4. [20 points maximum] For each of the following structures or names, give an IUPAC name or draw the correct structure (including all atoms), as required.

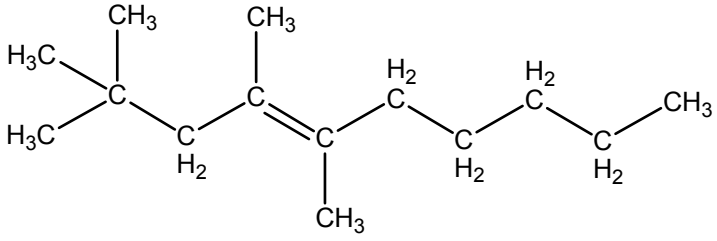
(a) 2,5-dimethyl-*cis*-3-hexene

(b) 4-*sec*butyl-3-*iso*propyldecane

(c)

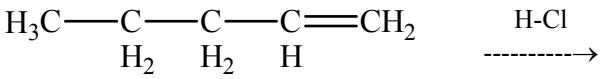


(d)



[20 points maximum] For each of the following reactions, fill in the correct product (clearly indicating all atoms around the reacting centers).

(a)



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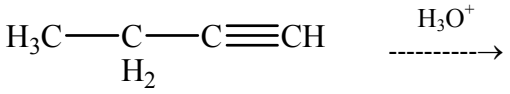
(b)



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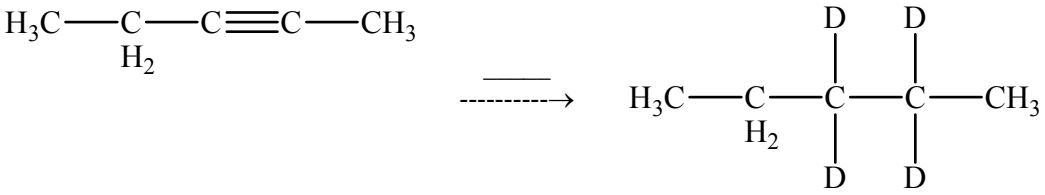
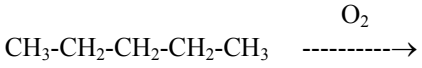
(c)



(d)



_____

Fall 2002, Dr. Hunter

Chemistry 1506: Mid-Term Exam

Name: Answers
Last name **First** name

Student Number (your social security number): _____

Signature: _____

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49 wrote exam
1 excused absence

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(a) For each of the following functional groups, draw an example of a molecule having this group:

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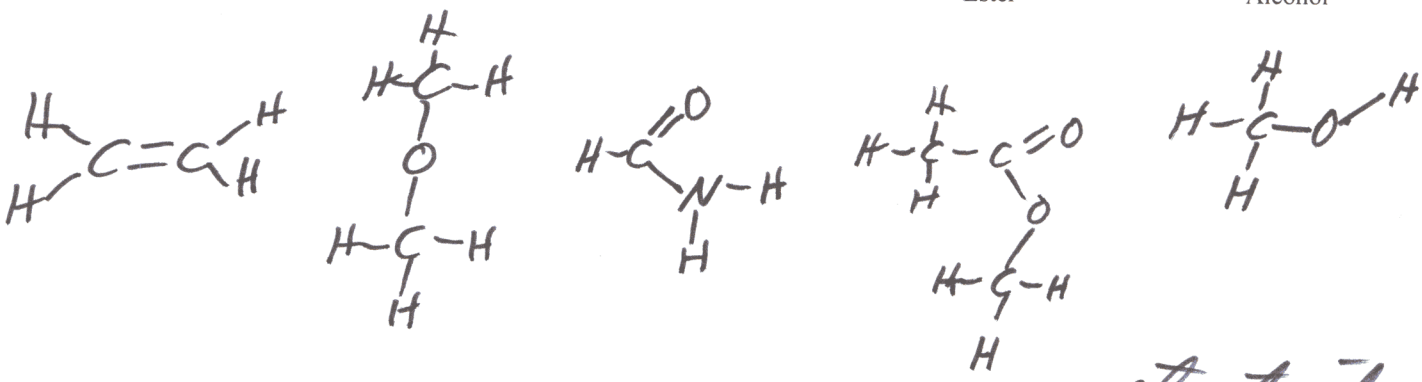
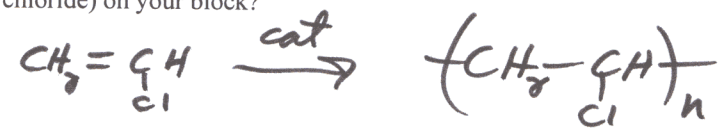
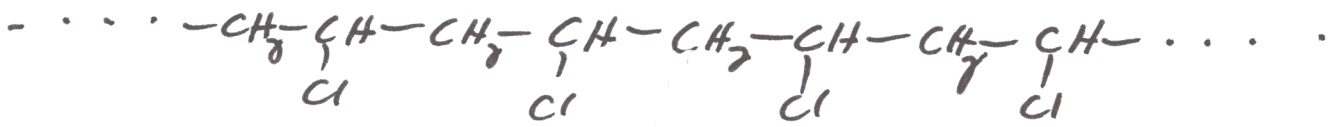


etc etc etc

(b) Vinyl chloride has the formula CH_2=CHCl and with the use of an appropriate catalyst it can undergo addition polymerization to give poly(vinyl chloride). Give an equation for this reaction. Draw the structure of the poly(vinyl chloride) product being sure to include at least 4 repeating units in your structure. Where would you find poly(vinyl chloride) on your block?





"vinyl" siding "vinyl" plumbing pipes

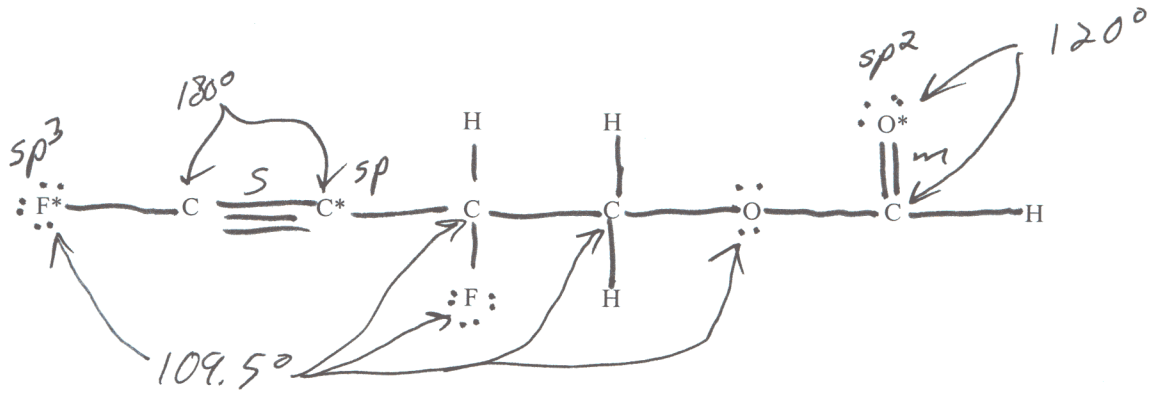
(c) Clearly describe the *structure* and the *bonding* of the carbon-carbon double bond in CH_2=CH_2. Include in this description a comparison of a carbon-carbon double bond to the carbon-carbon single bond in CH_3-CH_3.

Discuss both bond lengths & angles & σ & π bonding - multiple correct answers possible

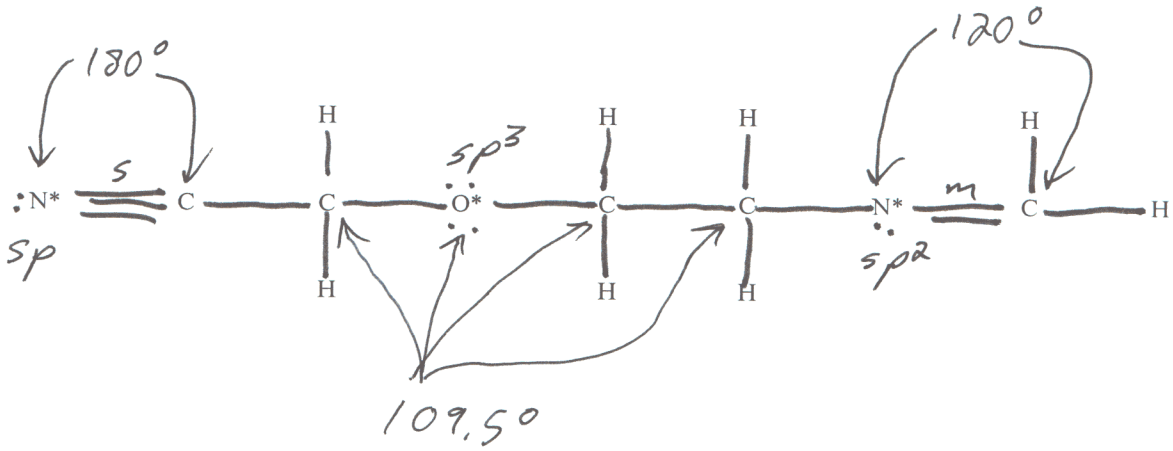
[20 points maximum] For each of the following molecules, draw the Lewis structure and check if your Lewis structure is correct. For each atom in these molecules, predict the bond lengths and angles. For the three atoms with stars (*) in each molecule, give their hybridizations.

All bonds are long unless otherwise noted

(a)



(b)



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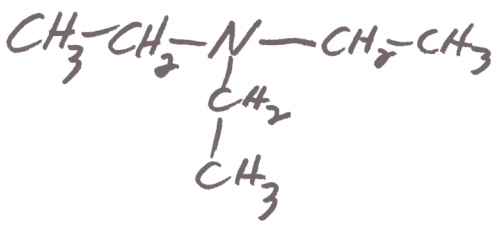
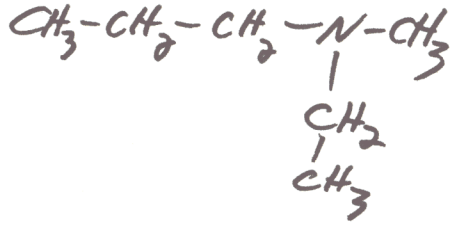
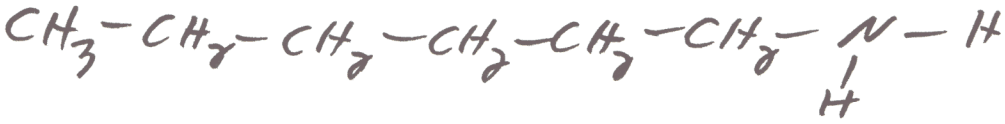
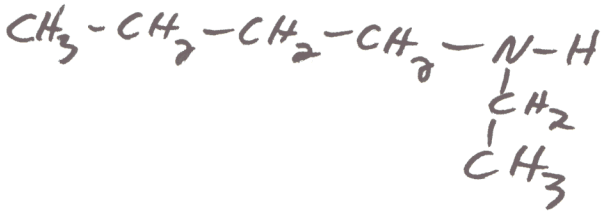
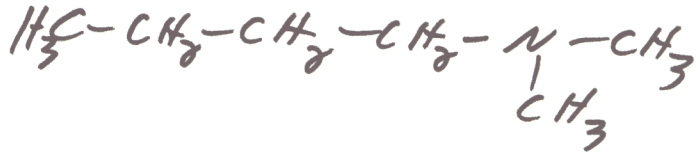




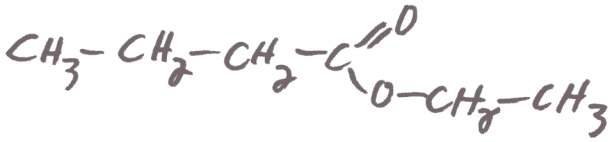


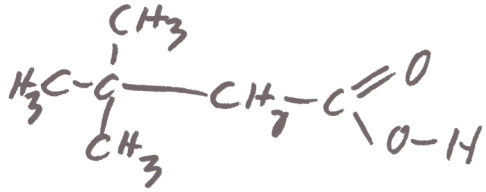


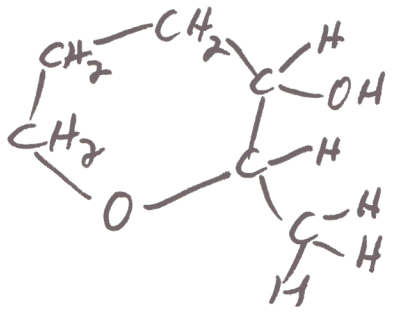


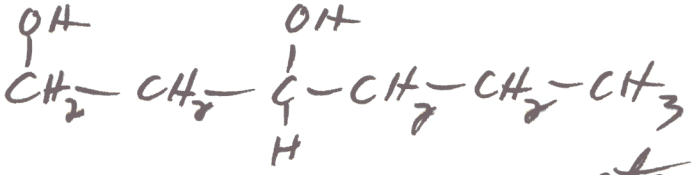
etc. etc. etc.

(b) $C_6H_{12}O_2$









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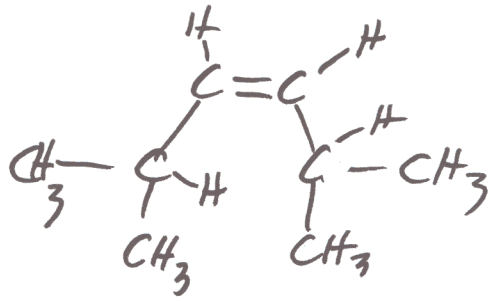

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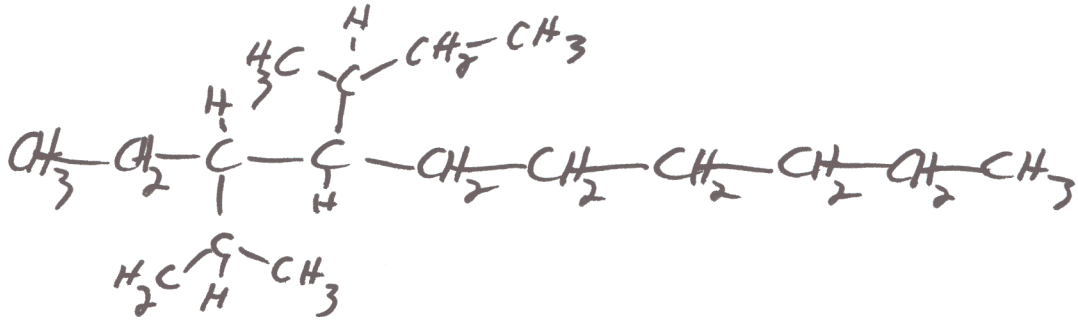
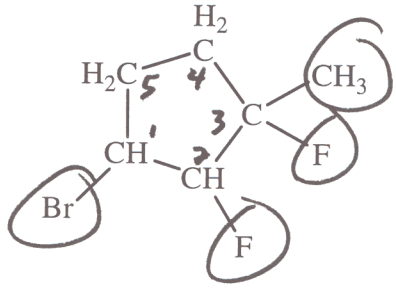
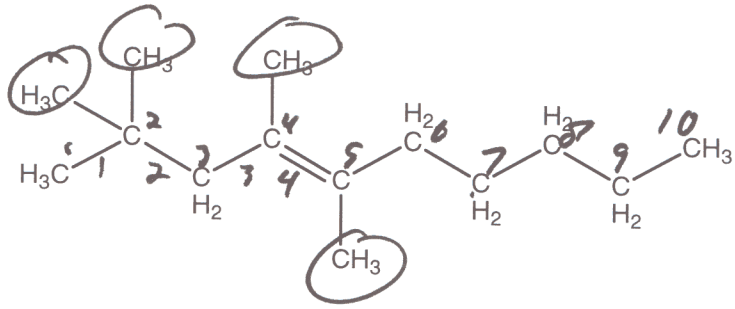


(c)



1-bromo-2,3-difluoro-3methylcyclopentane

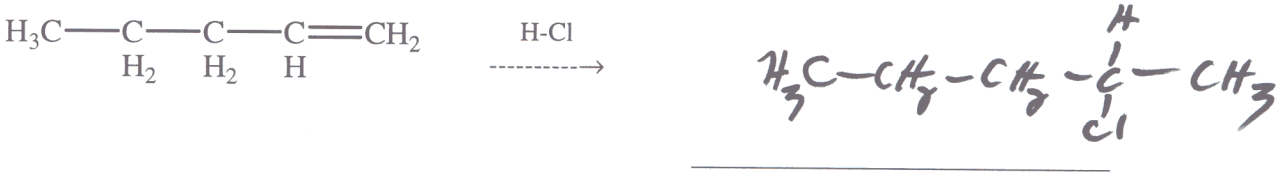
(d)



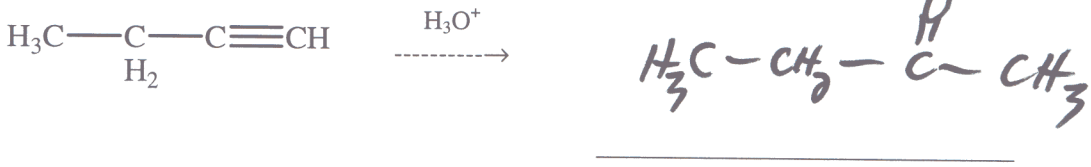
2,2,4,5-tetramethyl-trans-4-decene

[20 points maximum] For each of the following reactions, fill in the correct product (clearly indicating all atoms around the reacting centers).

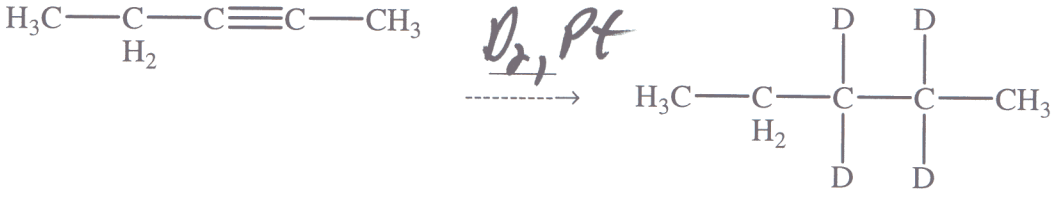
(a)



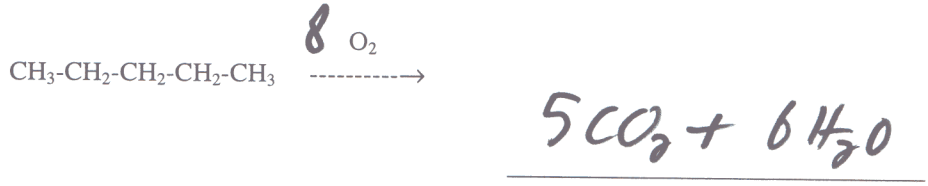
(b)



(c)



(d)



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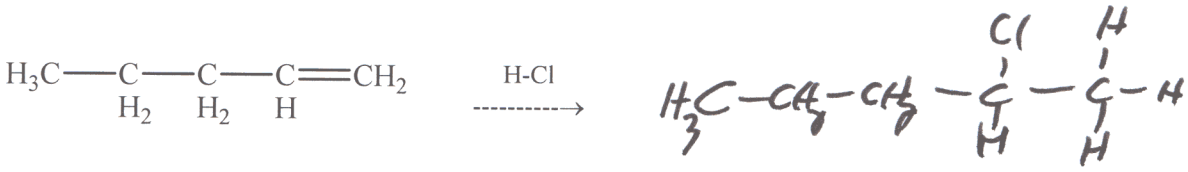
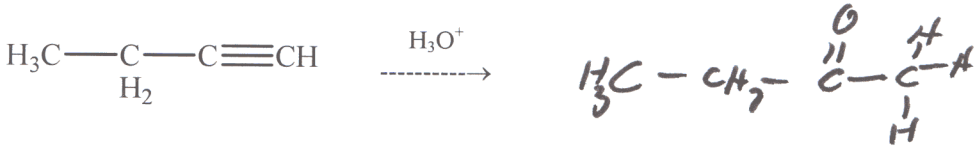
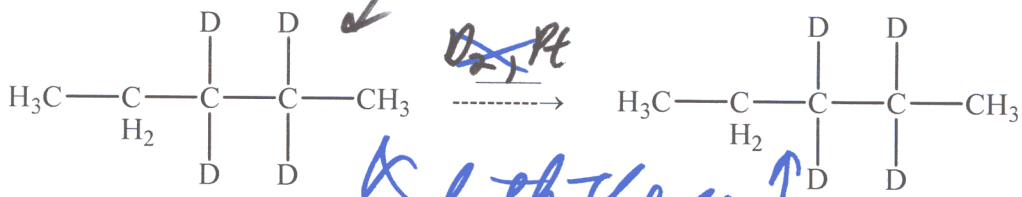


(b)



(c)

meant to be $H_3C-CH_2-C\equiv C-CH_3$



K both the same by accident

(d)