

Name \_\_\_\_\_

*If you do NOT want your graded exam placed in the box outside my office, then please check here \_\_\_\_\_*

(1 a-j) are TRUE/FALSE (10pts)

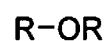
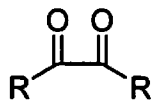
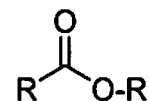
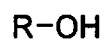
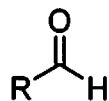
- a) A nucleophile is a two electron donor.
- b) Chlorine has 6 valence electrons.
- c) All  $\pi$  bonds are non-polar bonds.
- d) All alkenes have a Carbon-Carbon triple bond.
- e) Cahn, Ingold and Prelog created the rules for assigning R or S to a chiral center.
- f)  $S_N1$  and  $E1$  reactions both proceed through carbocation intermediates.
- g) An anion has a negative charge.
- h) Cyclopentanol has 10 Hydrogens, and is NOT chiral.
- i) Saturated hydrocarbons have the maximum number of bonds to Hydrogen.
- j) Kinetics deals with the speed of chemical reactions.

2) Define the following terms (2+2=4pts):

*Structural Isomer*

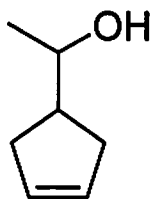
*Steric Hindrance*

3) Name the classes of compound (functional groups) that the following molecules belong to (e.g. alkane, amide, etc.). (5pts)



4) Circle the above functional group that will likely be most soluble in water. (1pt)

5) (4pts) For the below molecule:



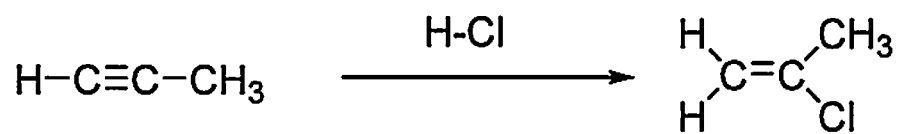
How many Hydrogens are there?

How many  $\pi$  bonds?

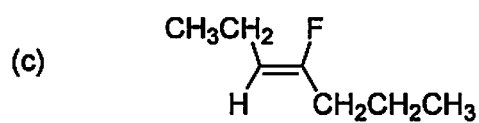
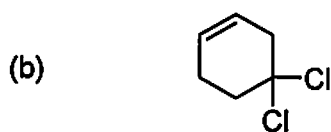
How many  $sp^3$  hybridized Carbons?

What is the hybridization of the Oxygen?

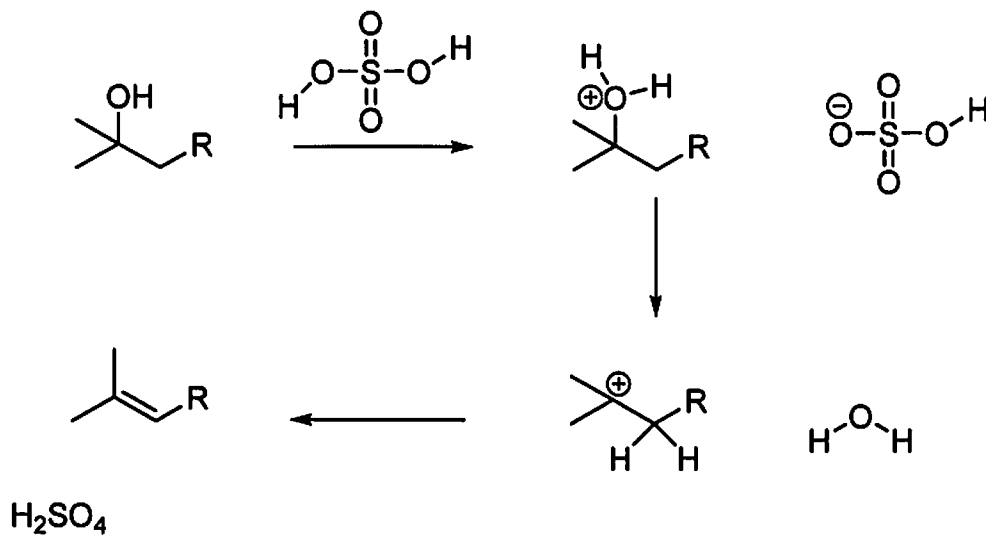
6) Write a mechanism (*i.e. curly arrows*) for this electrophilic addition. (6pts)



7) Name the following molecules in IUPAC form. (3x4=12pts)

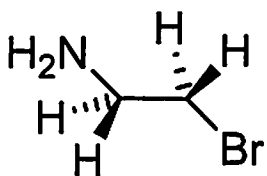


8) (i) Draw in the curly arrows for this acid catalyzed elimination. (6pts)



ii) Provide the specific name of the above reaction mechanism type – it should involve at least one letter, and a number. (1pt)

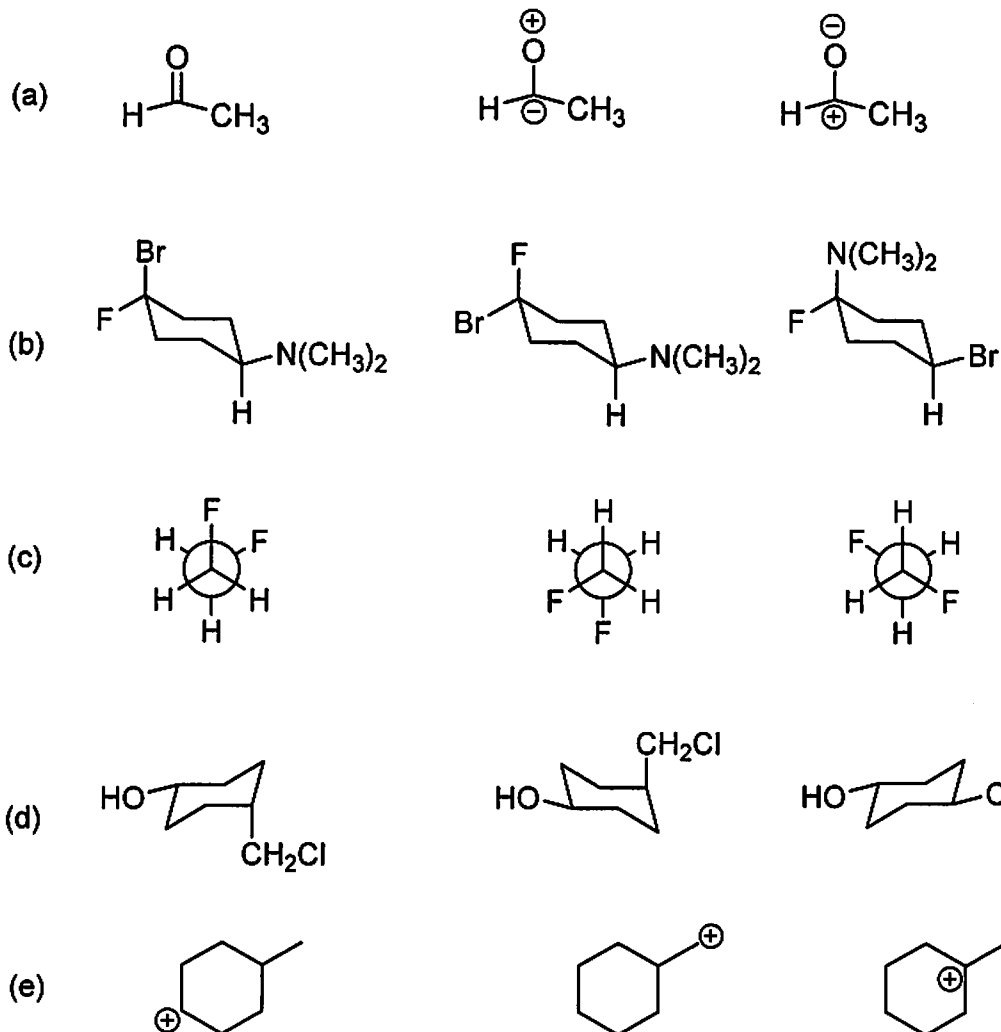
9) (3+1+1=5 pts) a) Draw the following molecule using a Newman projection.



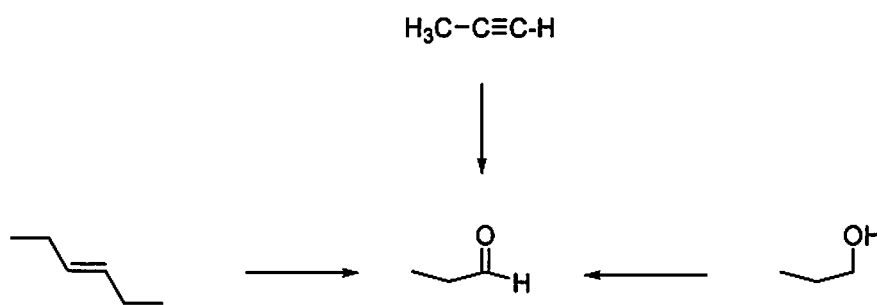
b) What is the size of the dihedral angle described by the N-C-C-Br bonds?

c) What name is given to the above conformation where the  $\text{NH}_2$  and Br are as far apart as possible?

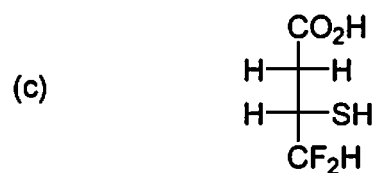
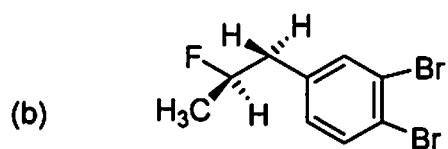
10) Circle the *lowest energy* member of each threesome. (5pts)



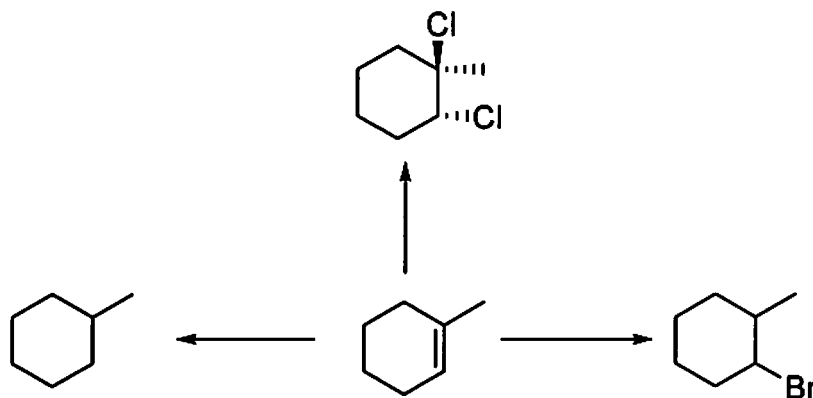
11) Provide the reagents for these three different ways to make the same product. (6pts)



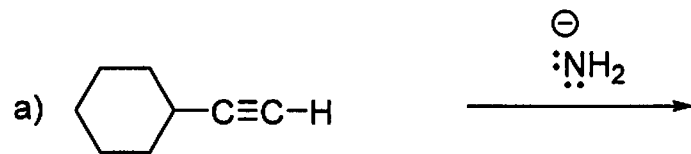
12) Assign **R** or **S** to each chiral center in these molecules. (6pts)



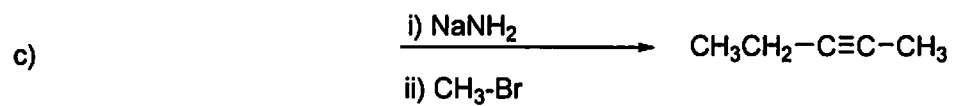
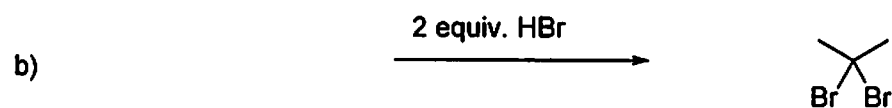
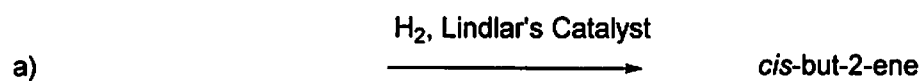
13) Give the **reagents** for the following reactions. (6pts)



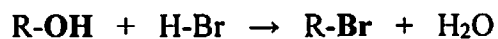
14) Write the mechanism (i.e. curly arrows), and draw **all** the products for the following acid/base (deprotonation) reactions. (3+3=6pts)



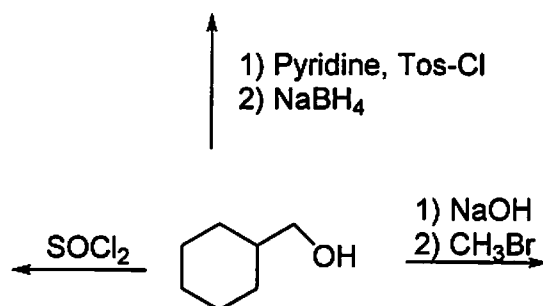
15) Give the starting materials for the following reactions. (6pts)



16) Write the mechanism (*i.e. curly arrows*) for the following  $S_N2$  transformation. (5pts)



17) Give the products for the following transformations. (6pts)



**\*\*\*BONUS POINTS (up to THREE)\*\*\***

Provide up to 3 reagents from this semester that are deliberately modified and employed as “less reactive reagents” so as to avoid the problem of over-reaction (or the reaction going “too far”).





Name \_\_\_\_\_

RAY DIAZ (ATOMIC)

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(1 a-j) are TRUE/FALSE (10pts)

- a) A nucleophile is a two electron donor. **T**
- b) Chlorine has 6 valence electrons. **False**
- c) All  $\pi$  bonds are non-polar bonds. **False**
- d) All alkenes have a Carbon-Carbon triple bond. **False**
- e) Cahn, Ingold and Prelog created the rules for assigning R or S to a chiral center. **T**
- f)  $S_N1$  and  $E1$  reactions both proceed through carbocation intermediates. **T**
- g) An anion has a negative charge. **T**
- h) Cyclopentanol has 10 Hydrogens, but is NOT chiral. **T**
- i) Saturated hydrocarbons have the maximum number of bonds to hydrogen. **T**
- j) Kinetics deals with the speed of chemical reactions. **T**

2) Define the following terms (2+2=4pts):

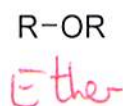
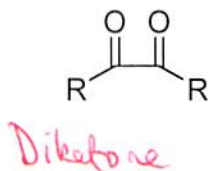
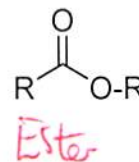
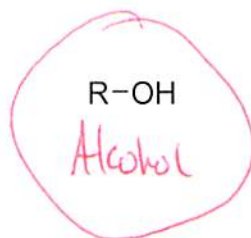
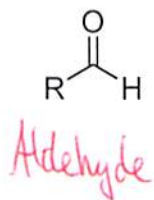
*Structural Isomer*

The same molecular formula but a different sequence of chemical bonds (different bond connectivity).

*Steric Hindrance*

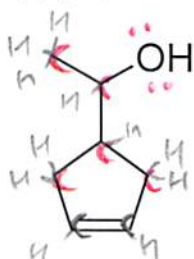
This is the effect of pairs of electrons repelling other pairs of electrons. Such repulsions discourage the approach or proximity of the species.

3) Name the classes of compound (functional groups) that the following molecules belong to (e.g. alkane, amide, etc.). (5pts)



4) Circle the above functional group that will likely be most soluble in water. (1pt)

5) (4pts) For the below molecule:



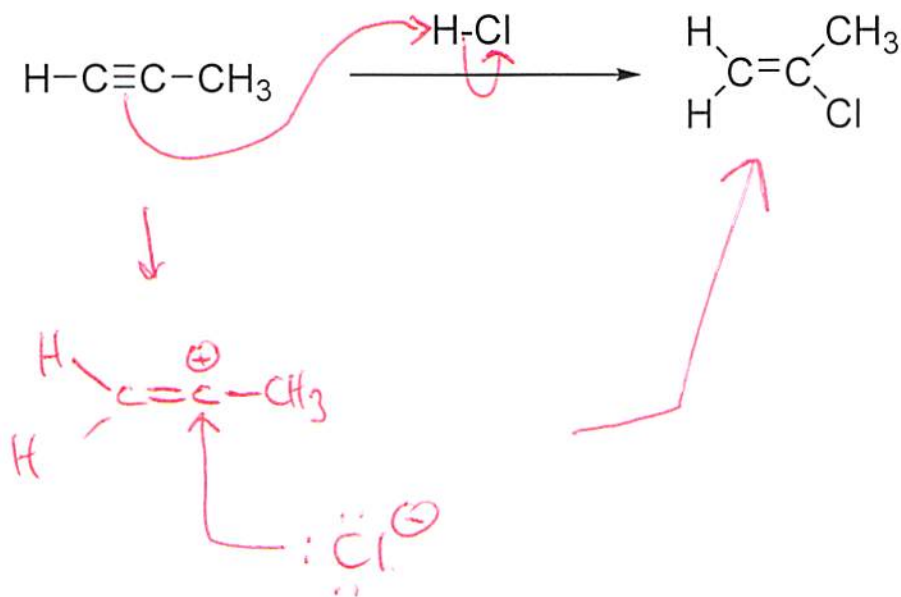
How many Hydrogens are there? 12

How many  $\pi$  bonds? 1

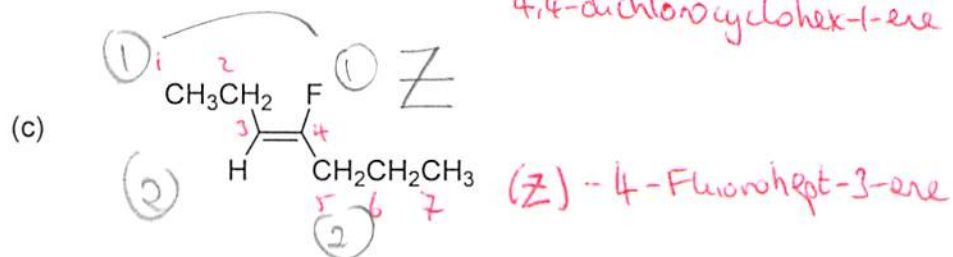
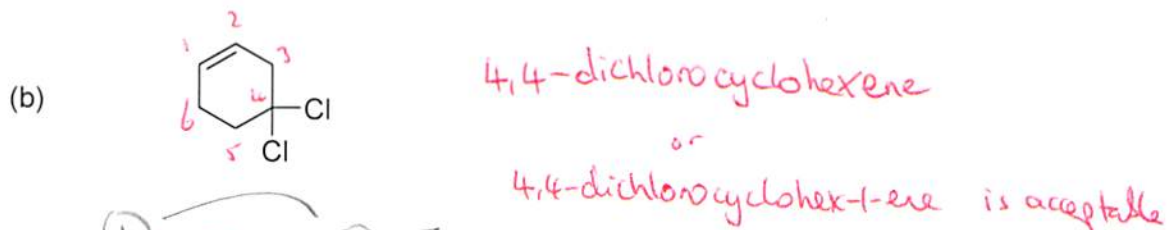
How many  $sp^3$  hybridized Carbons? 5

What is the hybridization of the Oxygen?  $sp^3$

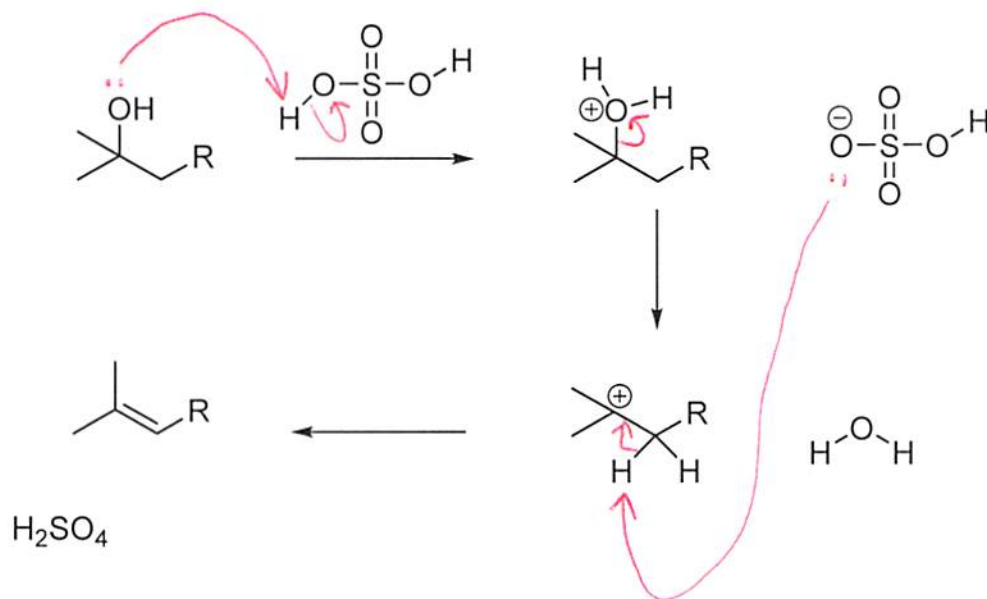
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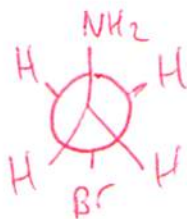
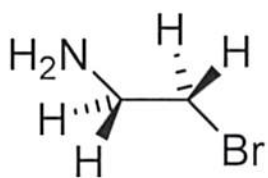
8) (i) Draw in the curly arrows for this acid catalyzed elimination. (6pts)



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E1

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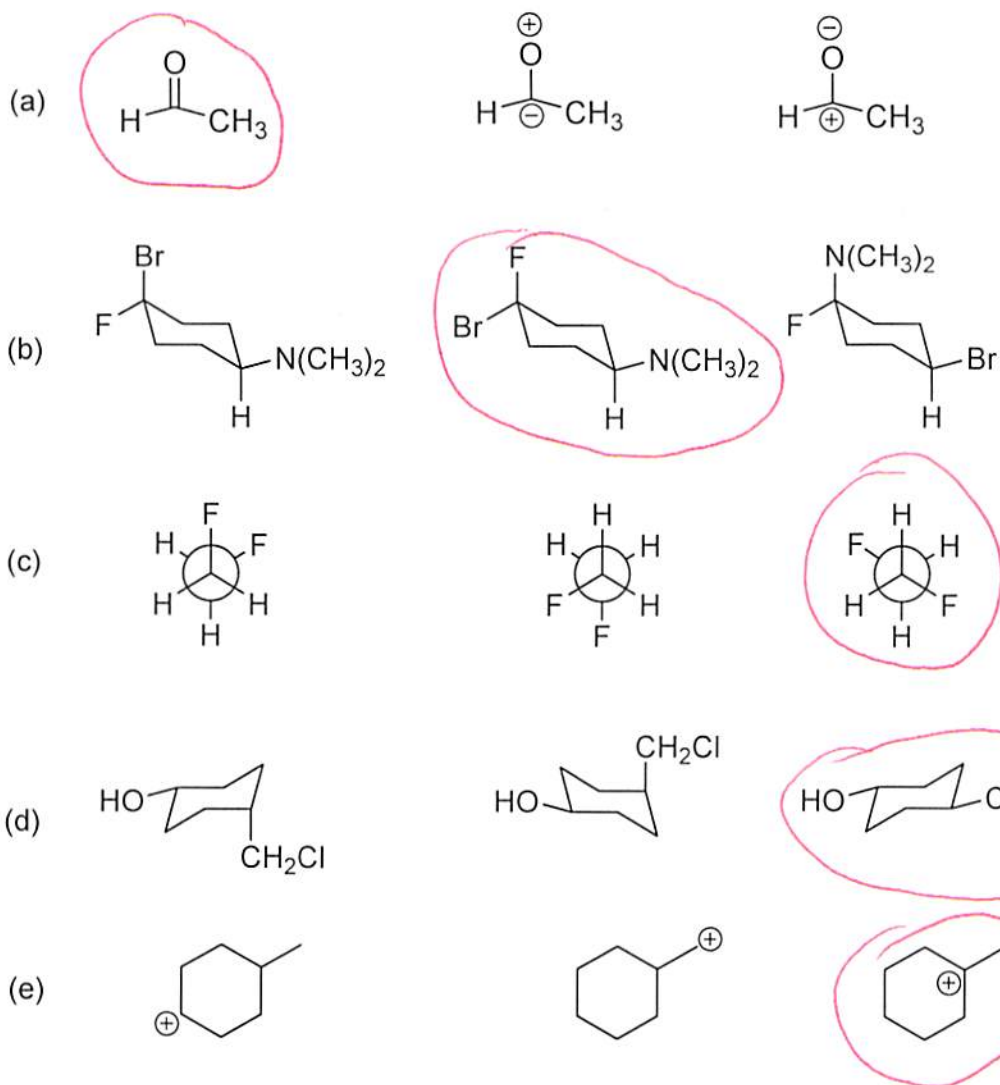
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180°

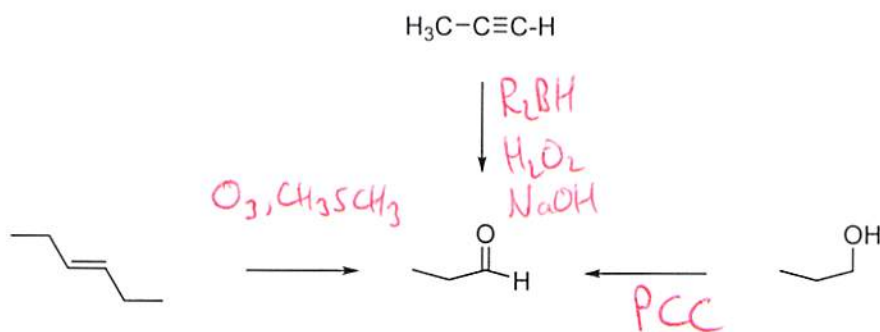
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ANTI

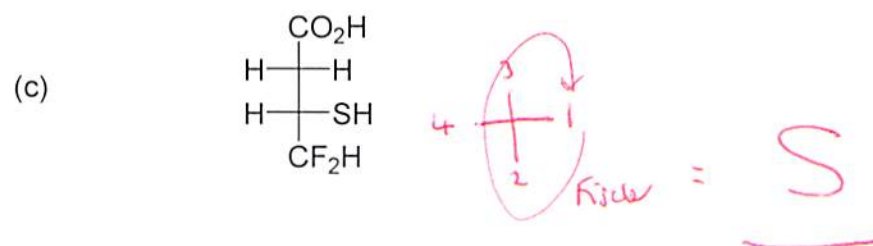
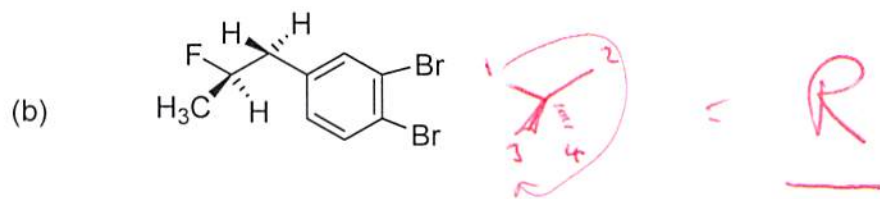
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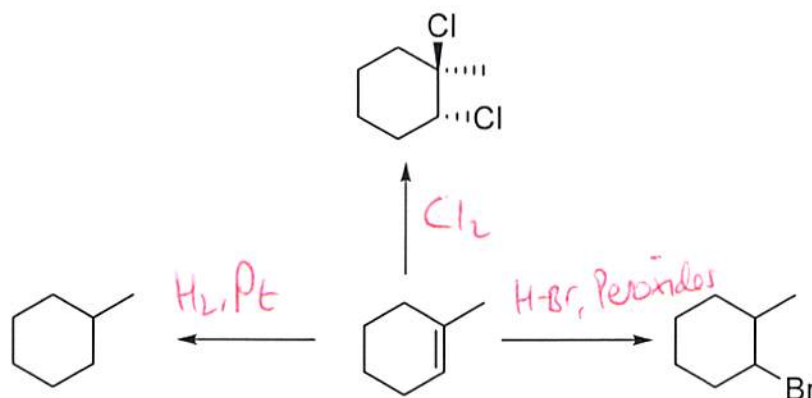
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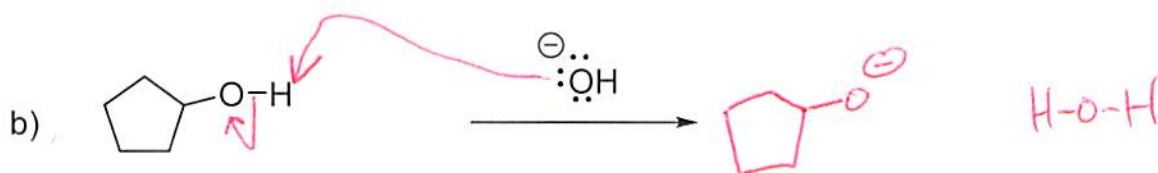
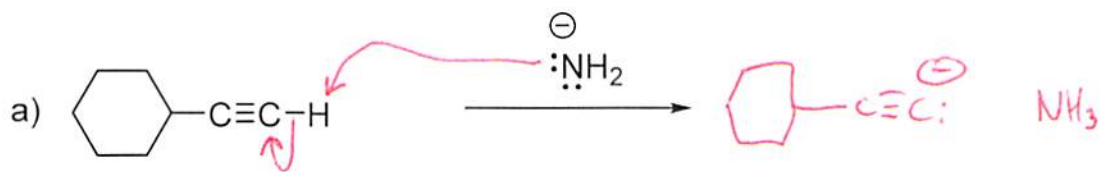
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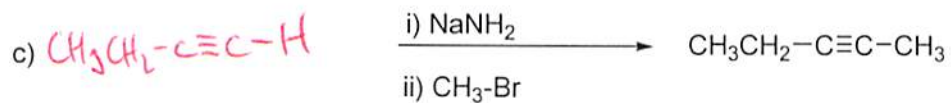
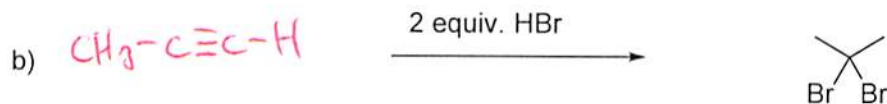
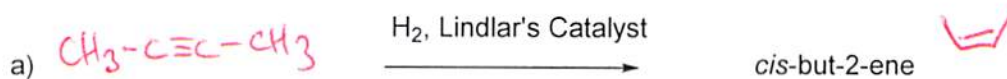
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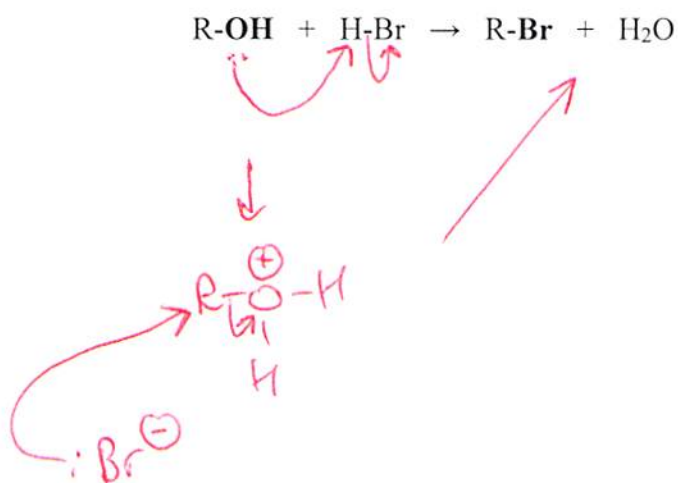


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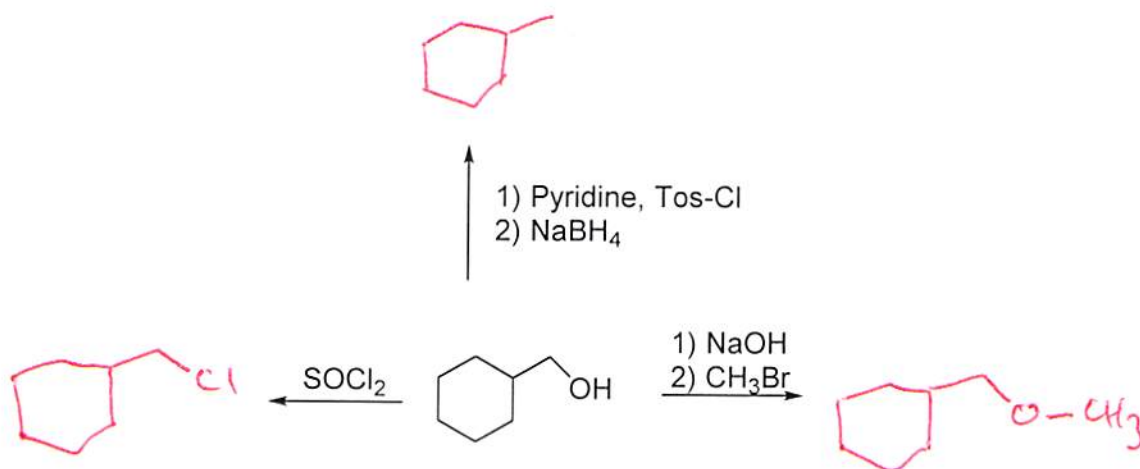




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\*\*\*BONUS POINTS (up to THREE)\*\*\*

Provide up to 3 reagents from this semester that are deliberately modified and employed as “less reactive reagents” so as to avoid the problem of over-reaction (or the reaction going “too far”).

eg PCC  
 $\text{R}_2\text{BH}$   
 Lindlar's Catalyst

$\text{Na}, \text{NH}_3$   
 using cold & neutral  $\text{KMnO}_4$