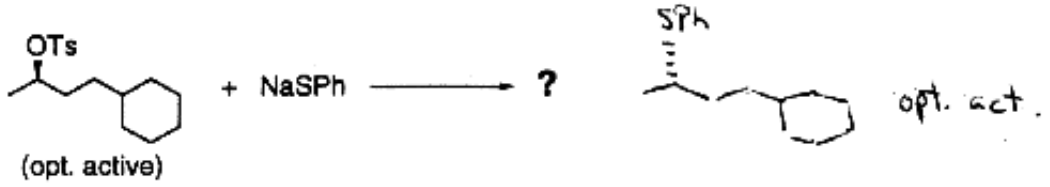
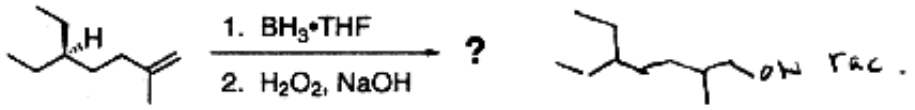
NAME_____

1. (30 points) Provide the missing reagents or products for the following reactions. If diastereomers will be generated, draw all of the diastereomers and indicate whether or not they are optically active (opt. act.). If a racemate is formed, show only one of the enantiomers, labelling the structure racemic (rac). If only one enantiomer is formed, label the structure optically active. Indicate any molecules that are meso. Carefully show the stereochemistry of each product using wedges and dashes.

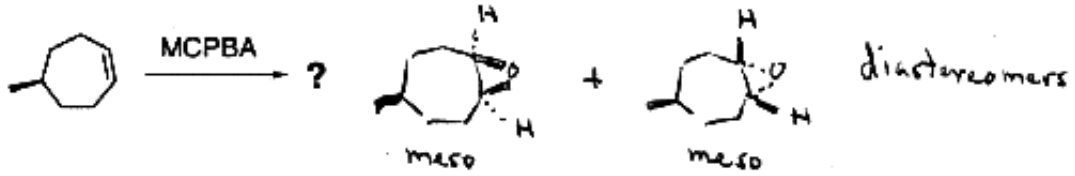
a.



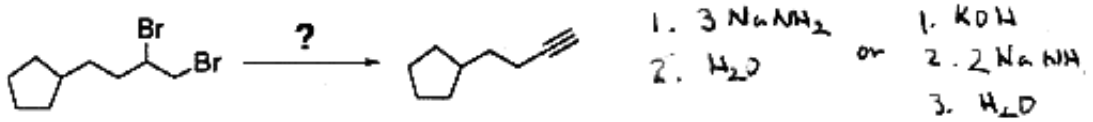
b.



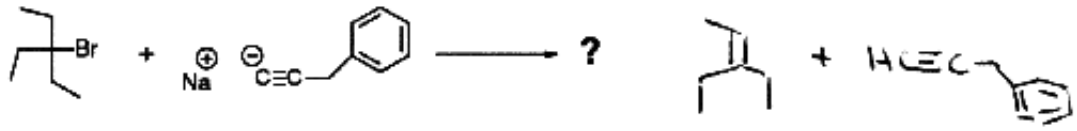
c.



d.

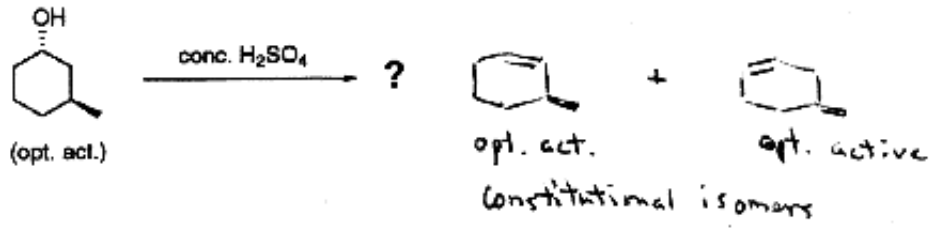


e.

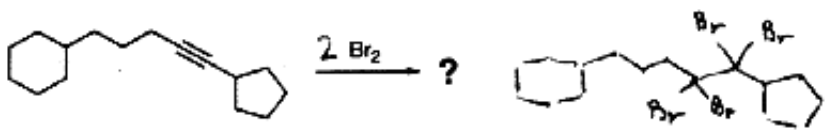


NAME_____

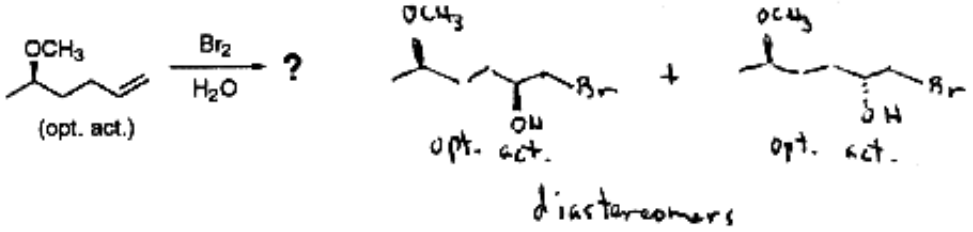
f.


OH
conc. H_2SO_4
?
(opt. act.)
opt. act.
+
opt. active
Constitutional isomers

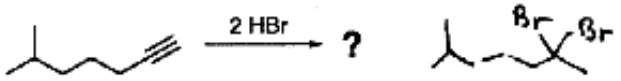
g.


2 Br_2
?
Br
Br
Br
Br

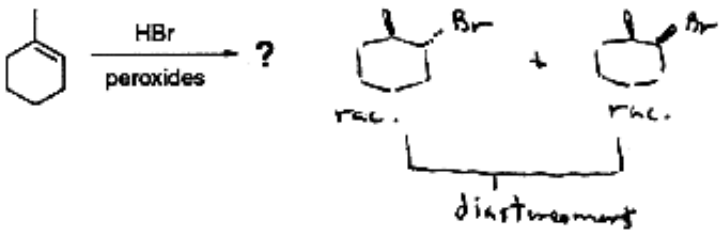
h.


OCH_3
Br_2
H_2O
?
(opt. act.)
OCH_3
Br
OH
opt. act.
+
OCH_3
Br
OH
opt. act.
diastereomers

i.


2 HBr
?
Br
Br

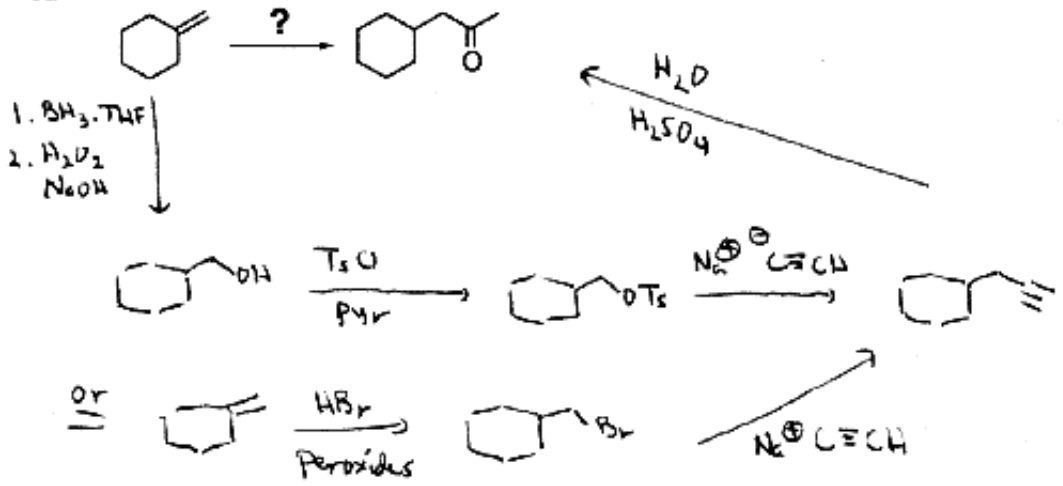
j.


HBr
peroxides
?
Br
+
Br
rac.
rac.
diastereomers

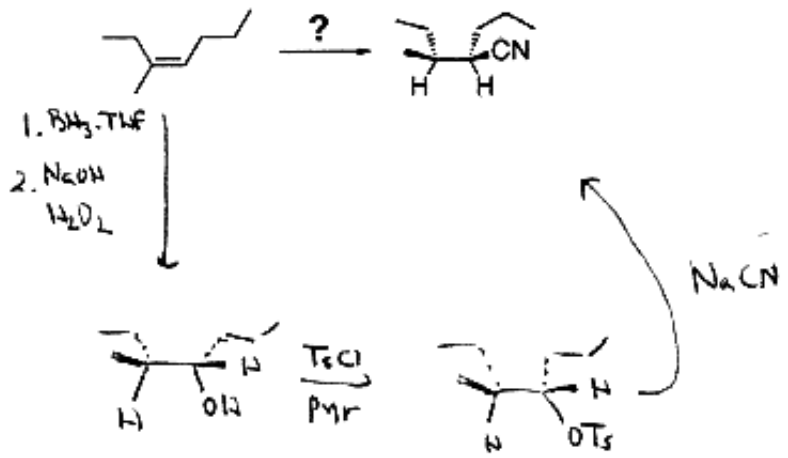
NAME _____

2. (20 points) Propose a synthesis of the target compounds starting with the substrate provided and any other chemical reagents. Several steps are required in each case. You do not have to show mechanisms for each of the individual steps, but do show the products formed from each of the reactions you perform.

A.

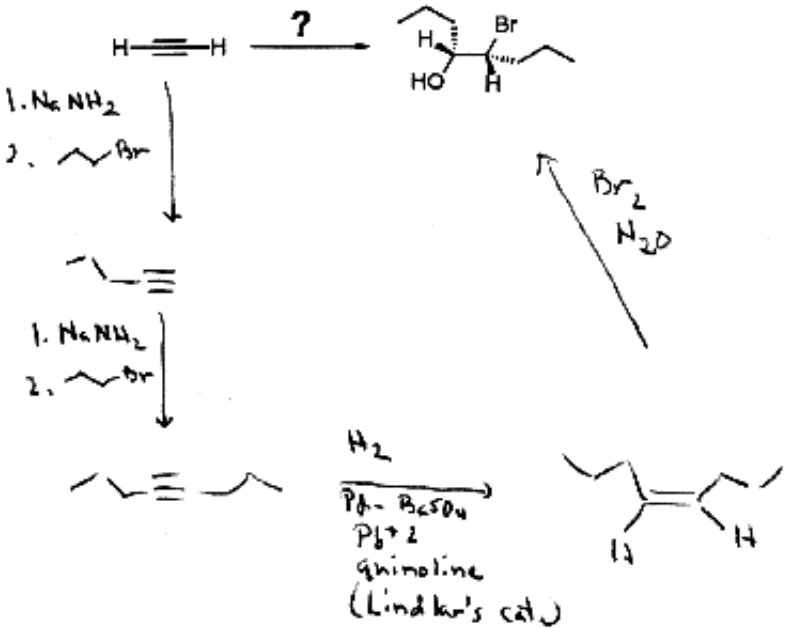


B.

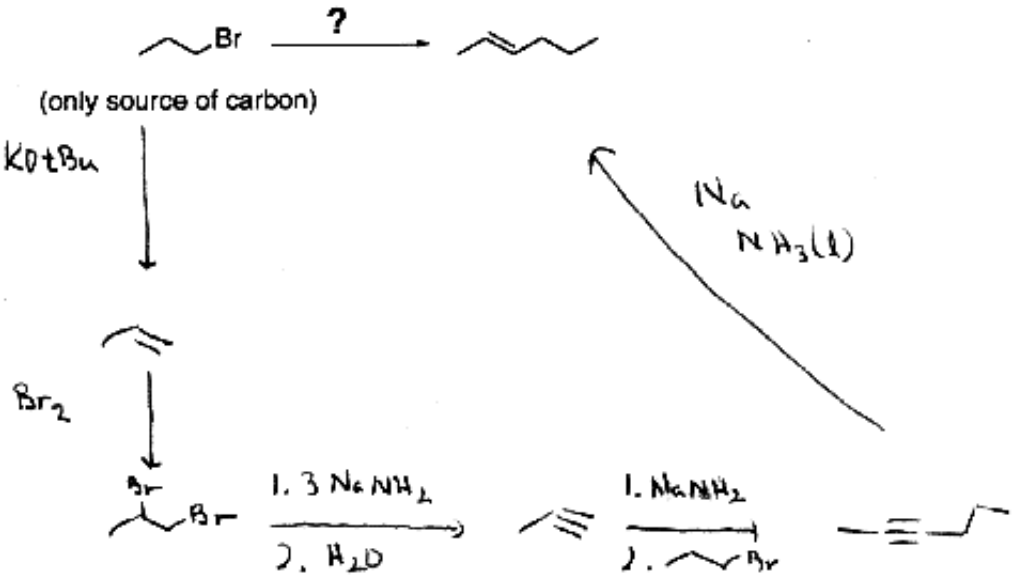


NAME_____

C.

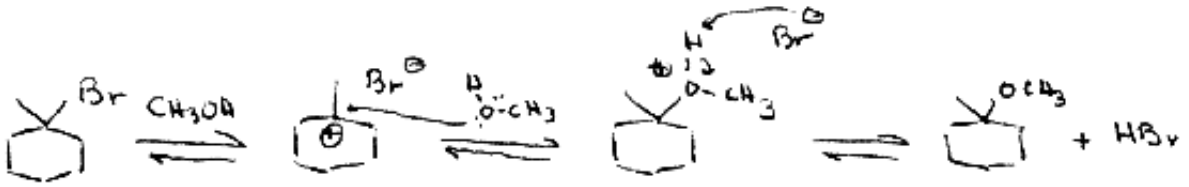

?
1. NaNH2
2.
Br2
H2O
H2
Pd- BaSO4
Pb+2
quinoline
(Lindlar's cat.)

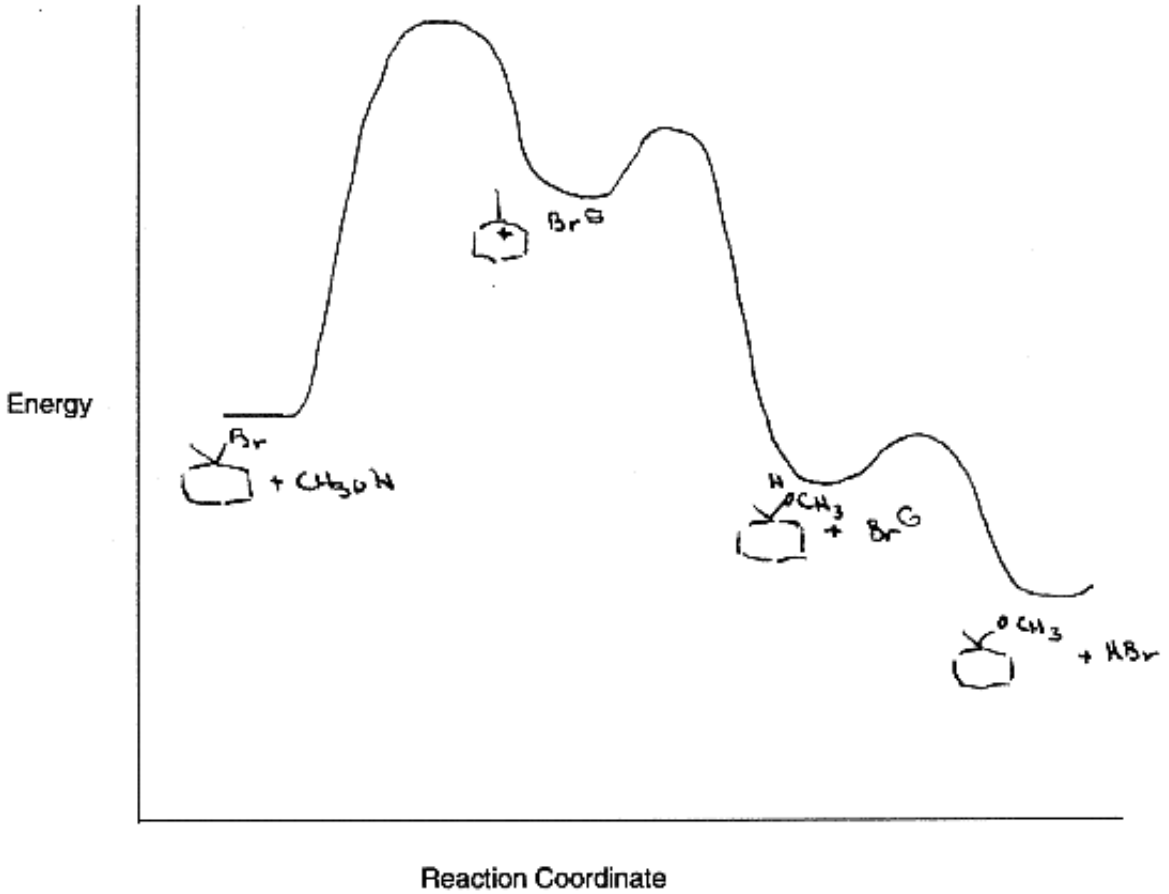
D.


Br
?
(only source of carbon)
KOtBu
Na
NH3(l)
Br2
1. 3 NaNH2
2. H2O
1. NaNH2
2.
Br

NAME_____

3. (25 points) Write out a detailed, stepwise mechanism for the substitution reaction of 1-bromo-1-methylcyclohexane that occurs in boiling methanol. Draw an energy vs reaction coordinate diagram displaying this reaction. Indicate the location of all pertinent intermediates on the diagram.

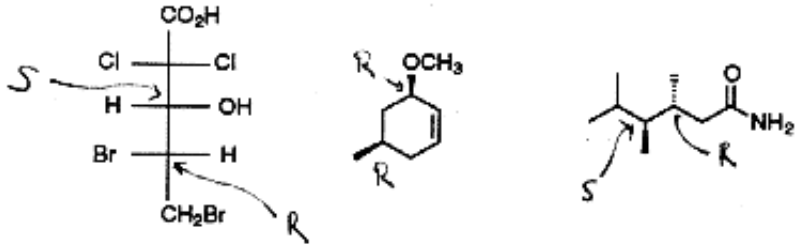




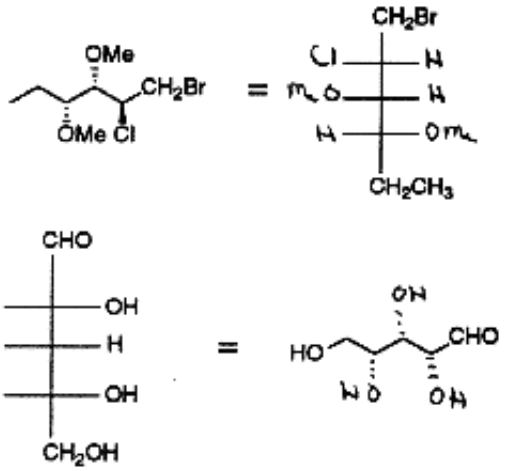
NAME_____

4. (25 points)

A. Label each stereocenter in the following structures using the CIP (R or S) system. Be careful to indicate which stereocenter goes with each descriptor.



B. Complete the structures below for the equivalent compounds.



C. Very briefly explain the advantages of using polar aprotic solvents such as DMF, DMSO, and acetonitrile in S_N2 reactions. What occurs in solution to make these solvents so effective?

These solvents lower the energy of activation of the process by selectively solvating the metal cation, leaving the nucleophilic anion "naked" and therefore more reactive.