Chemistry 3311
Organic I

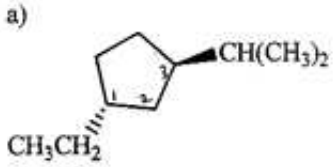
Exam #2

Key

Dr. Pacheco
15 June, 2004

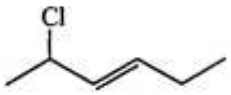
(4 points each) 1. Name the following compounds. Be sure to use *cis*, *trans*, E, or Z designations if appropriate.

a)



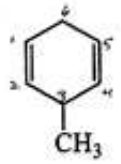
trans - 1-ethyl-3-isopropylcyclopentane

b)



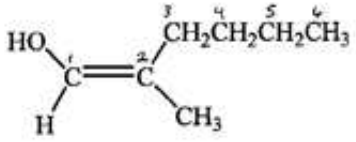
trans - 2-chloro-3-hexene
or E-2-chloro-3-hexene

c)



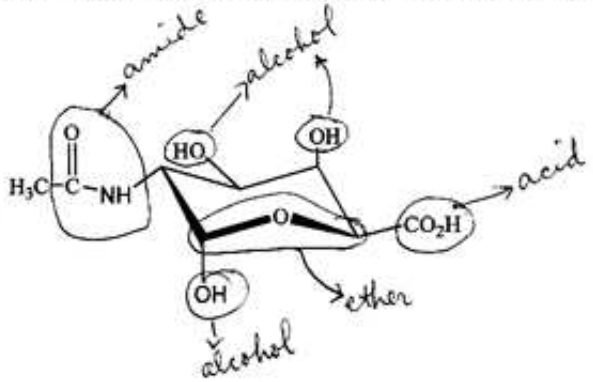
3-methyl-1,4-cyclohexadiene

d)

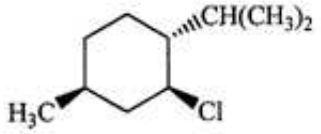


Z - 2-methyl-1-hexen-1-ol

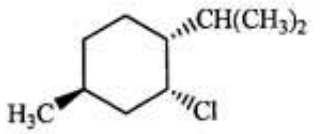
(6 points) 2. Label each of the functional groups shown in the following molecule.



(10 points) 3. Which of the following will react faster under the given conditions, reactant A or B? Why? Give the major product for each reaction. (Be sure to show stereochemistry.)



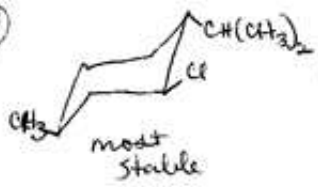
A



B

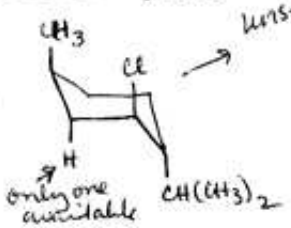
A or B $\xrightarrow{CH_3O^-/CH_3OH}$ product

(A)



most stable

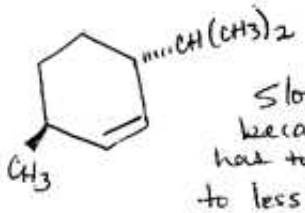
must flip



only one available

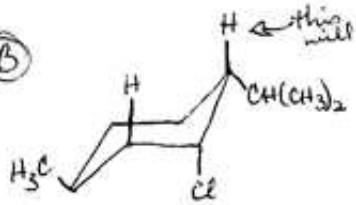
unstable!

CH_3O^-



slower because has to flip to less stable chair

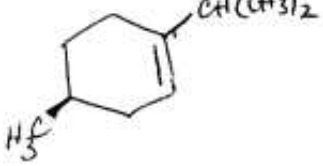
(B)



most stable

this will react to give most stable alkene

CH_3O^-



faster — (doesn't have to flip) also gives more stable alkene

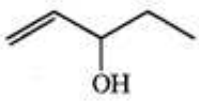
(6 points) 4. Of the following compounds with similar molecular weights, which has the highest boiling point? Why? Which has the lowest boiling point? Why?

A

Dispersion forces (only induced dipole-induced dipole effects)

2nd Lowest

(no net dipole)



B

① Induced-Dipole-induced dipole

② Dipole-induced dipole

③ Dipole-dipole due to -O-H & slight effect from double bond

④ H-bonding

Highest

C

Only ① induced dipole-induced dipole

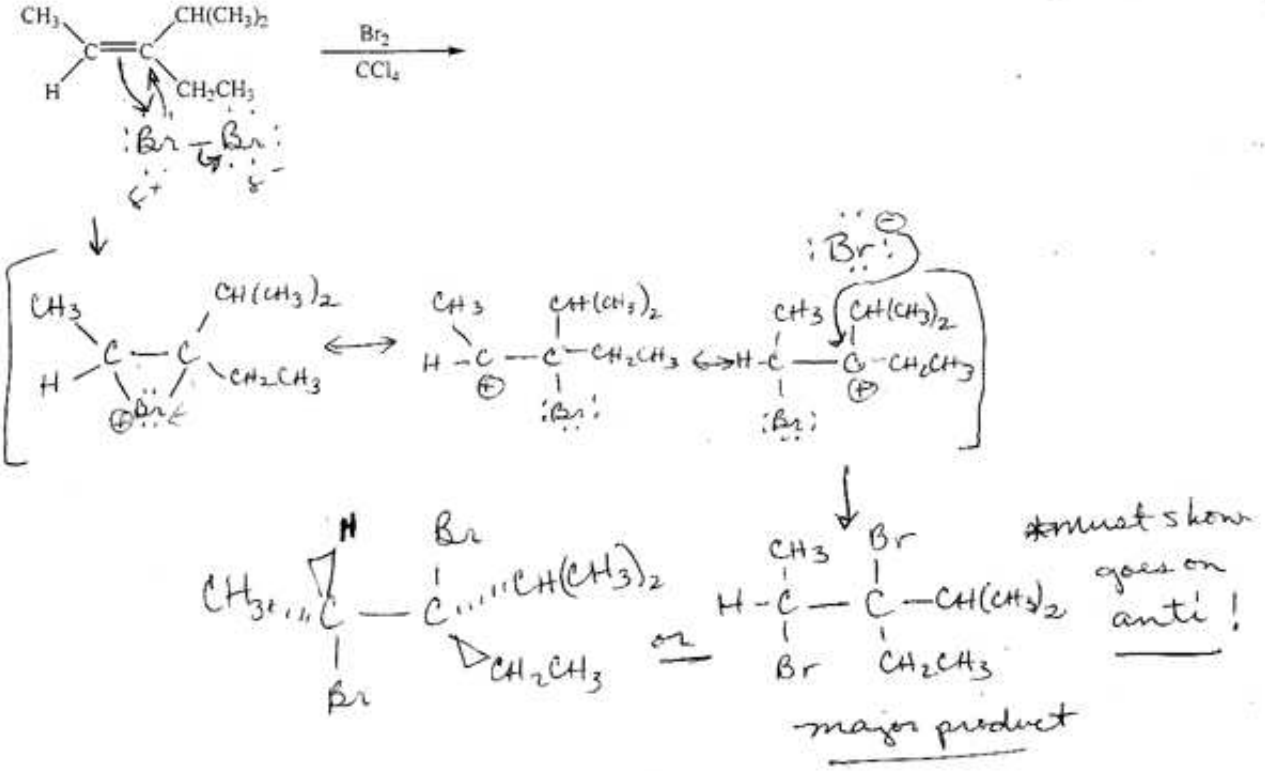
v. little ② dipole-induced dipole effect and

③ dipole-dipole

Lowest

* Should know F-alkanes have b.pts lower than alkanes of similar mw.

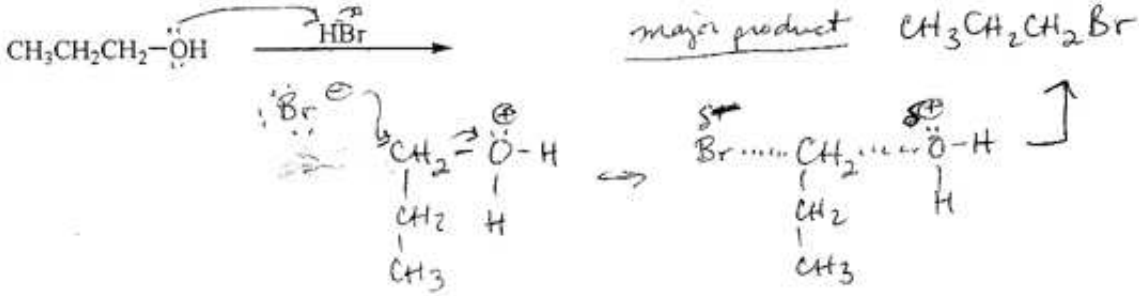
(12 points) 5. What is the major product of the following reaction? What is the mechanism for the following reaction? Be sure to show the stereochemistry of the product.



(4 points) 6. Why are the more substituted alkenes more stable than the less substituted alkenes of similar molecular weight? How does this compare to relative heats of combustion?

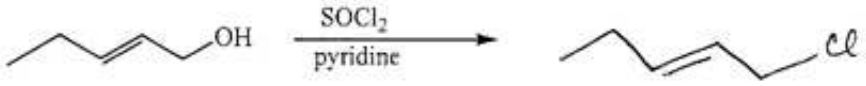
The alkyl groups donate e⊖ density in toward the sp^2 hybrid C's of the double bond. Attached H's do not contribute (interact) as strongly with these C's. More substituted alkenes have lower Heats of combustion → less potential energy within the molecule ⇒ more stable

(6 points) 7. Show the transition state and product for the following reaction.

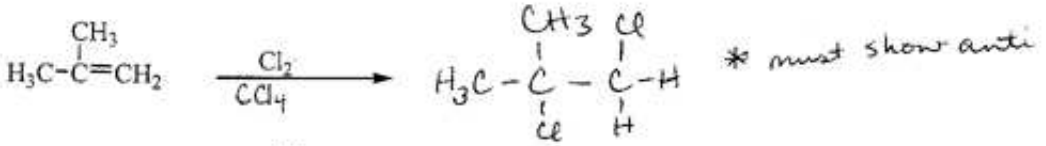


(3 points each) 8. Fill in the missing reactants or **major** products for the following reactions. Be sure to include stereochemistry or regioselectivity when appropriate.

a)



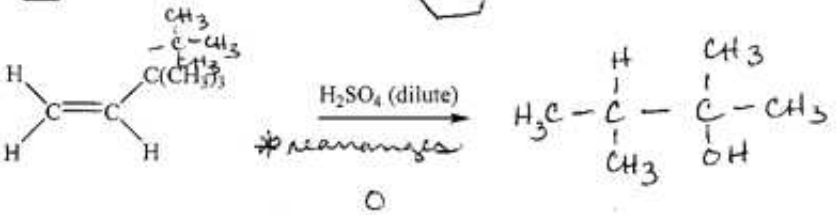
b)



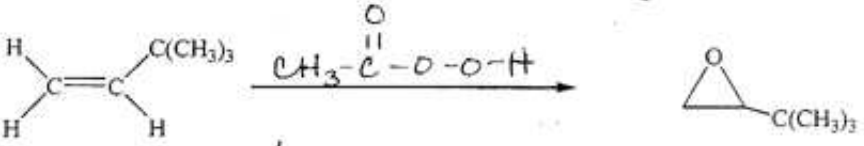
c)

d)

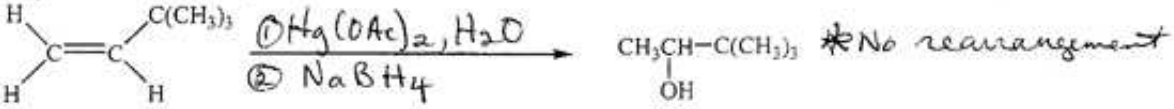
e)



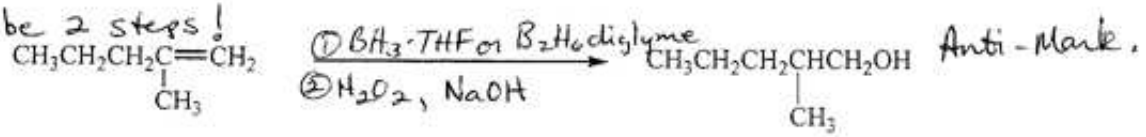
g)



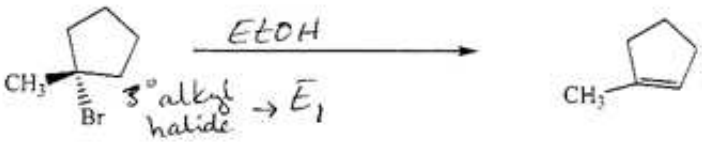
*h) must put as 2 steps!



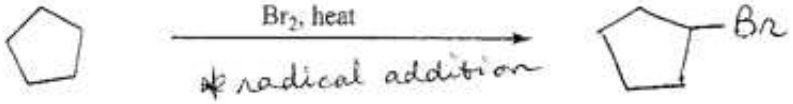
i) must be 2 steps!



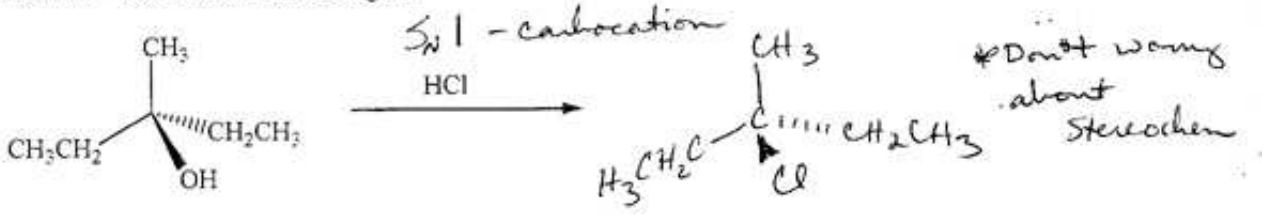
j)

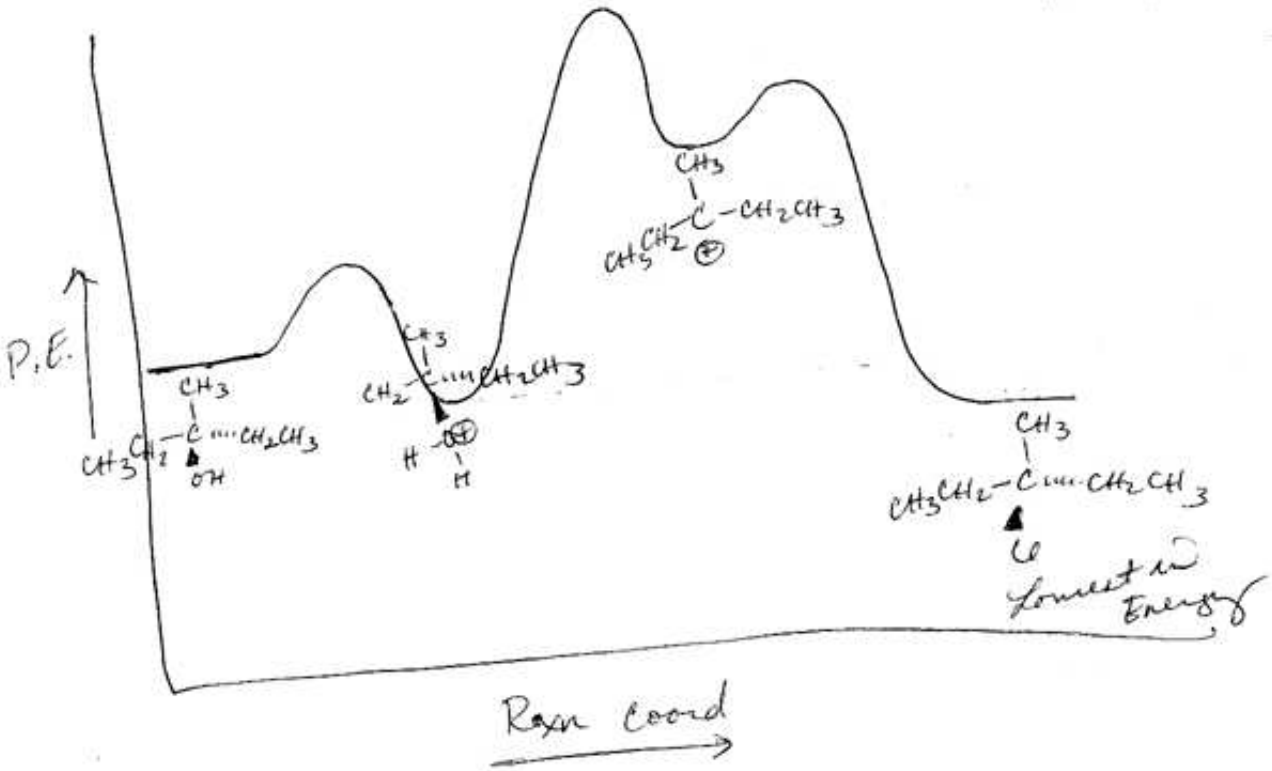


k)



(10 points) 9. What is the product of the reaction shown? Draw the potential energy diagram for the given reaction – label all axes of the diagram.





* Give partial credit for E_1