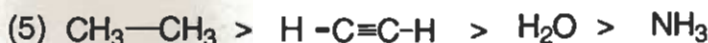
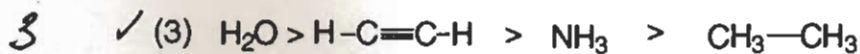
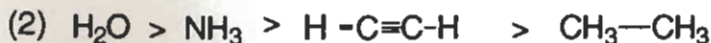


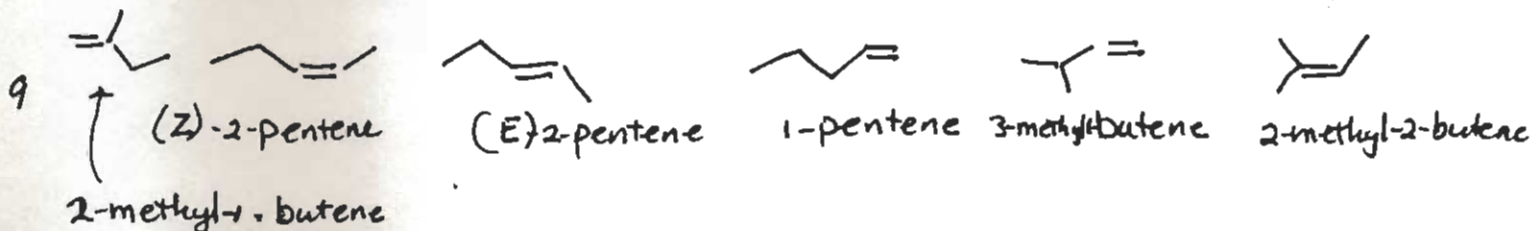
Please use a non-red pen. Answer questions in the provided space. If you write any answers on the back of the page, indicate this on the front of that page. Points appear in parentheses ( ). **Good Luck!**

Question	Max. Pts.	Points
1. 3 + 9 + 3 + 5	=	20
2. 4 (3) + 3 + (2 + 3)	=	20
3. 4 + 3 + 3 + 6 + 4	=	20
4. 5 + 5 + 6 + 6 + 3	=	25
5. 5 (3)	=	15
<b>Total</b>	=	<b>100</b>

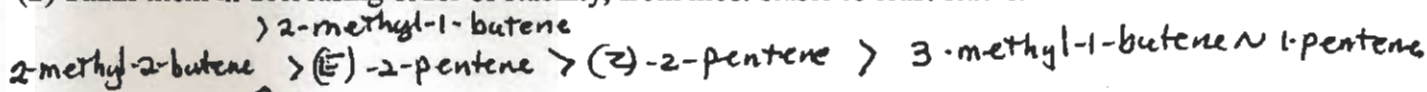
1. (20) a. Which of the following correctly lists the compounds in order of decreasing acidity?



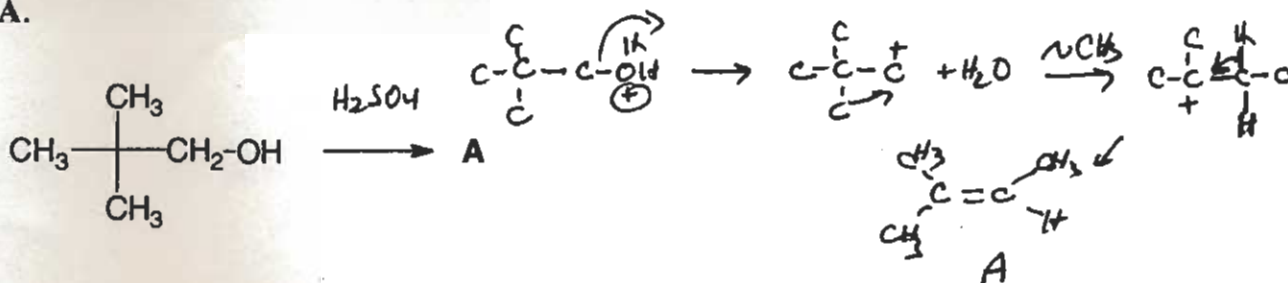
b. (1) Draw the 6 non-cyclic isomers for a compound with the molecular formula  $\text{C}_5\text{H}_{10}$ . Name them by IUPAC nomenclature, including (E) or (Z) designation when appropriate,



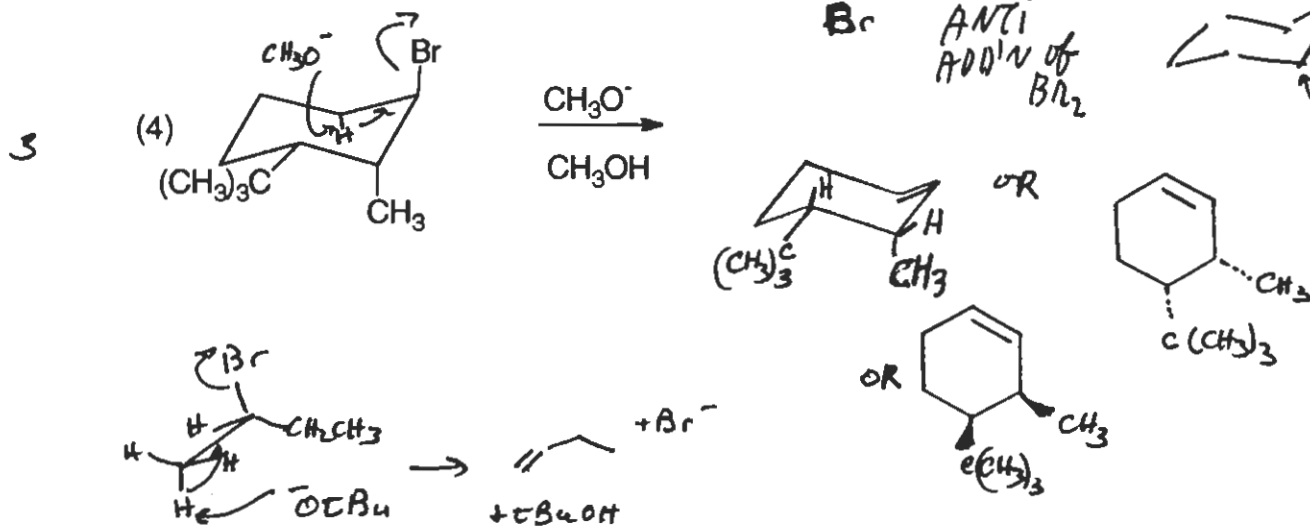
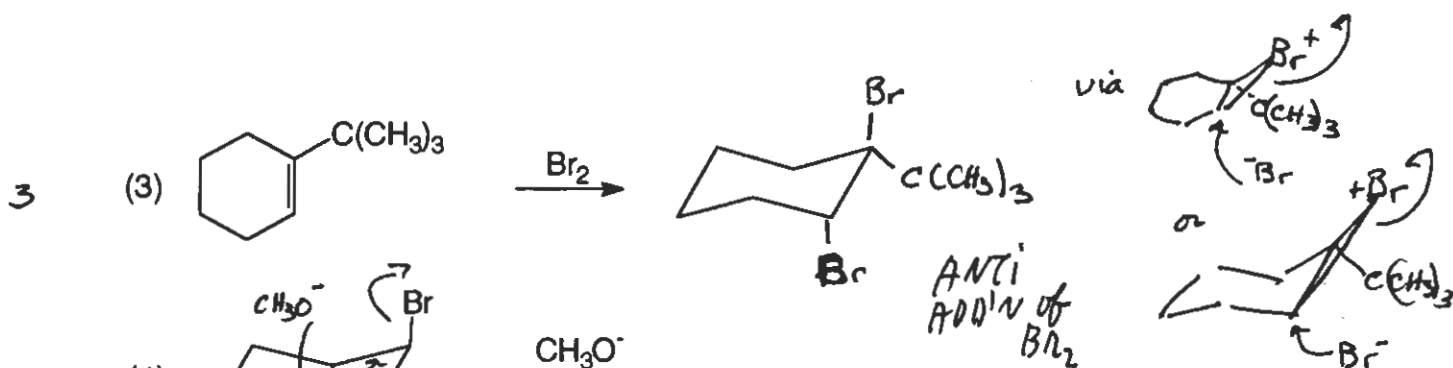
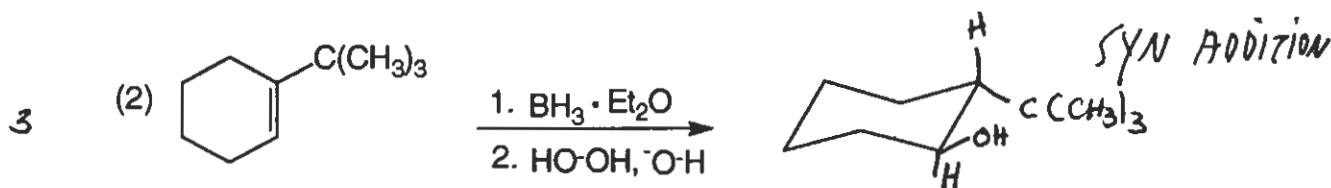
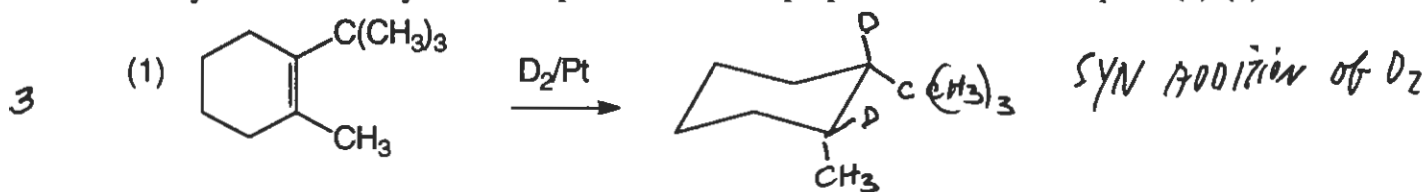
(2) Rank them in decreasing order of stability, from most stable to least stable.



(3) Show the step-by-step mechanism, using arrows to show the direction of electron flow, and the reagents needed to convert the following alcohol into the most stable isomer of  $\text{C}_5\text{H}_{10}$ , compound A.



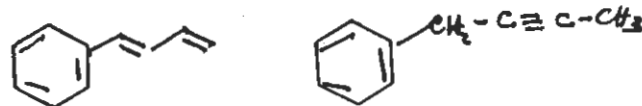
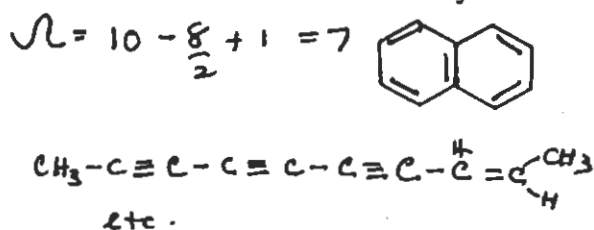
2. (20) Show the products of the following reactions and state the mechanistic interpretation with regard to type of addition or elimination, *syn* or *anti*. Show the particular constitutional or stereoisomer of the cyclohexane or cyclohexene products in their proper conformation in parts (1)-(3).



- b. Your task is to convert 2-bromobutane to 1-butene in highest yield. Which reagents would you use?

- (1) KOH/H<sub>2</sub>O      (2) KOH/CH<sub>3</sub>OH      (3) CH<sub>3</sub>ONa/CH<sub>3</sub>OH  
 (4) CH<sub>3</sub>CH<sub>2</sub>ONa/CH<sub>3</sub>CH<sub>2</sub>OH      ✓(5) (CH<sub>3</sub>)<sub>3</sub>COK/(CH<sub>3</sub>)<sub>3</sub>COH

- c. Compute  $\Omega$ , the index of hydrogen deficiency, for the molecule C<sub>10</sub>H<sub>8</sub>. Draw 1 molecule with just such a molecular formula. Show your calculation.



3. (20) a. Which alkene would be most reactive towards acid-catalyzed hydration? Draw the structures for each of the alkene molecules listed below to guide you in answering the question. Then, state why you chose your answer for the most reactive alkene in this reaction.

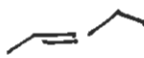
(1) 1-pentene



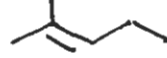
(2) (Z)-2-pentene



(3) (E)-2-pentene



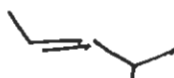
(4) 2-methyl-2-pentene



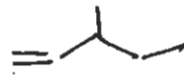
(5) (Z)-4-methyl-2-pentene



(6) (E)-4-methyl-2-pentene

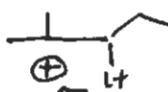
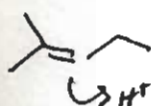


(7) 3-methyl-1-pentene



6 (0.5)

Why?

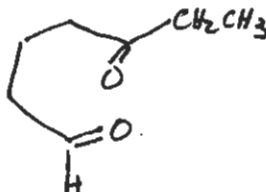
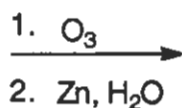
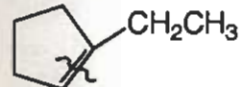


$H^+$  adds to give most stable  $C^+$  ( $3^\circ$ )

b. Fill in the missing reactants, reagents/conditions, intermediates, and products in the following reaction sequences.

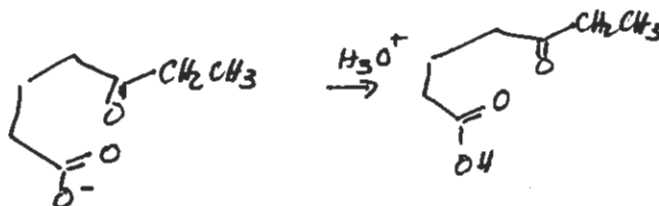
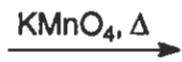
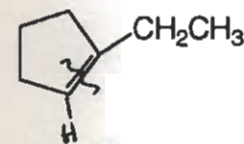
3

(1)



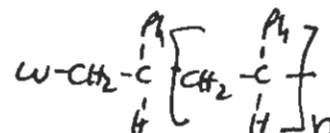
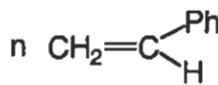
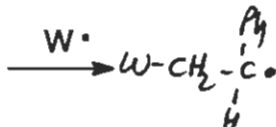
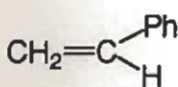
3

(2)



6

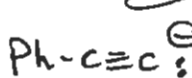
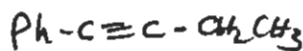
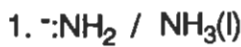
(3)



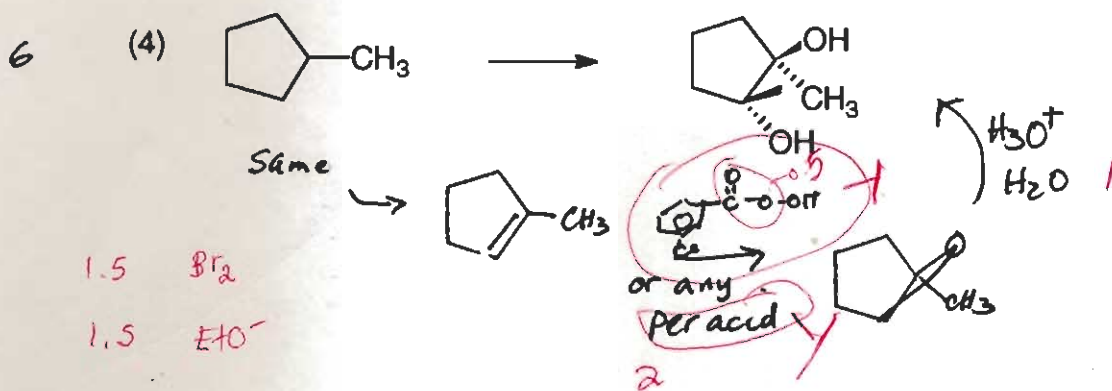
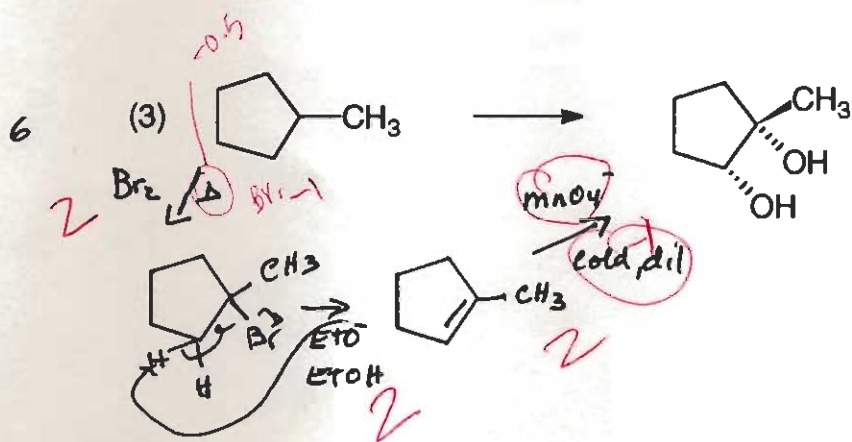
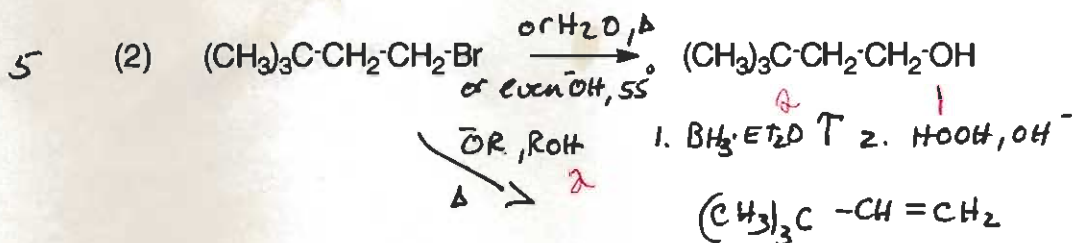
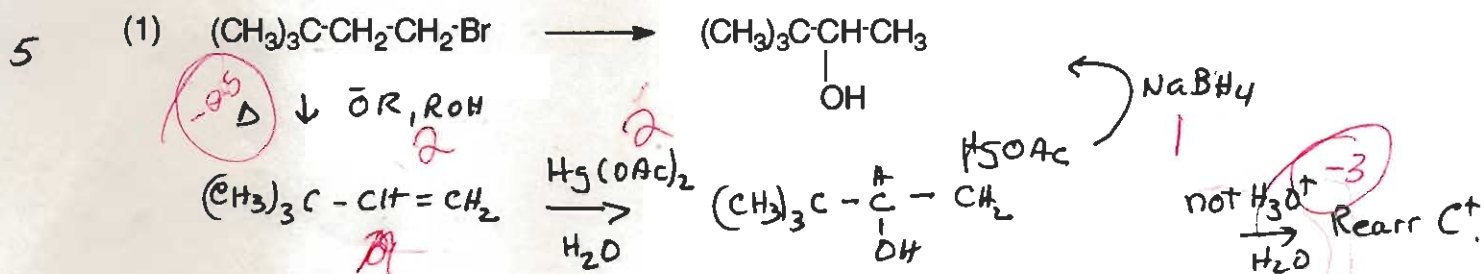
name this polymer: polystyrene

4

(4)  $Ph-C\equiv C-H$



4. (25) a. Complete the following conversions using any inorganic or organic reagents and conditions as needed. Note that more than one step may be needed and that working backwards is a good idea.



3 b. Which reaction of an alkene proceeds with anti addition?

- (1) Hydroboration/Oxidation  
(4) Hydrogenation

- ✓(2) Bromination  
(5) Epoxidation

- (3) Permanganate Oxidation

