

CHEMISTRY 59-135/137

FINAL EXAMINATION

Time 3 hr

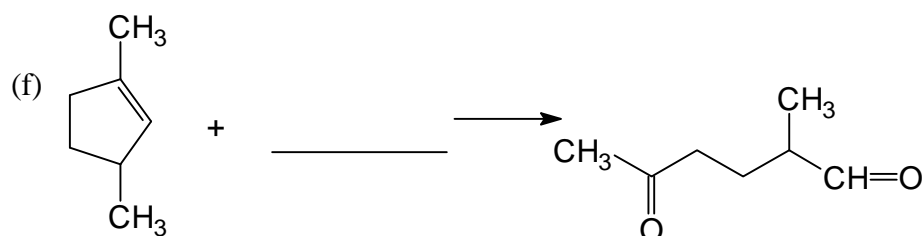
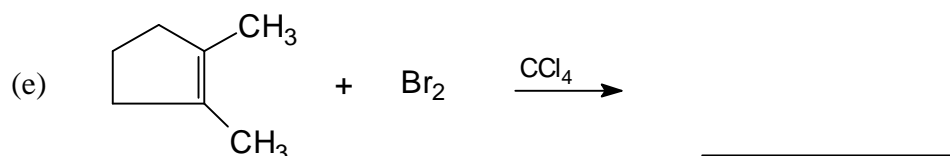
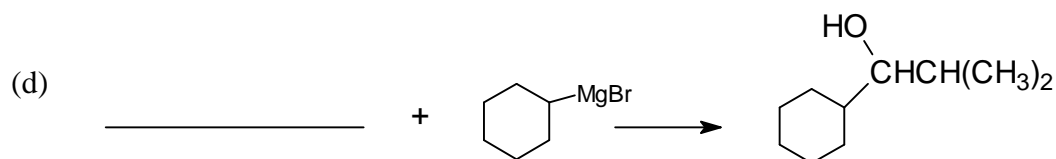
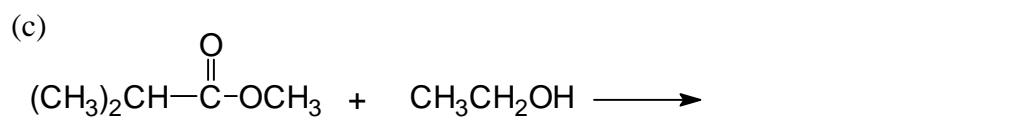
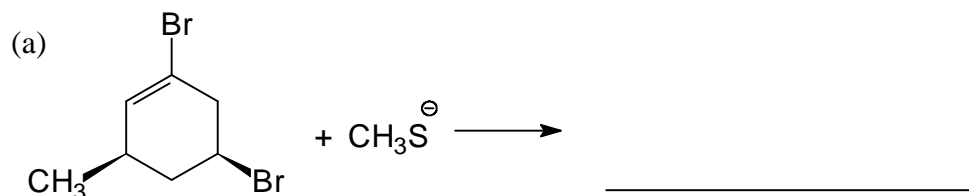
April 26, 1993

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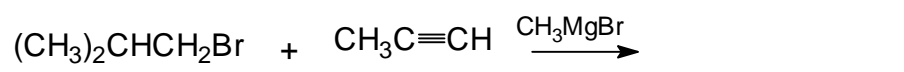
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READ ALL QUESTIONS CAREFULLY AND ANSWER THE QUESTION ASKED!! Answer all questions on the test paper. Extra sheets have been attached for rough work which will not be marked. Only the FIRST answer to any question will be considered. Point values for each question are given. There are 7 questions and 7 pages in this test and the available points total 103 [i.e. there are 3 bonus marks!].

1. In each of the following reactions fill in the blanks with the correct structural formula. If stereochemistry is important, make sure your drawing shows it clearly. If a catalyst is required for a successful reaction, show it over the arrow. [36 points]



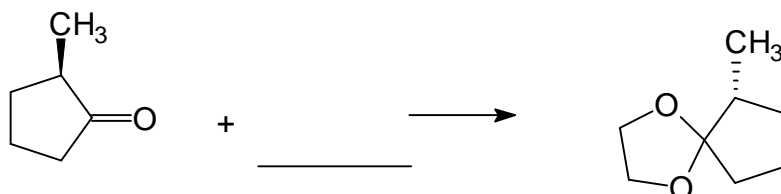
(g)



(h)



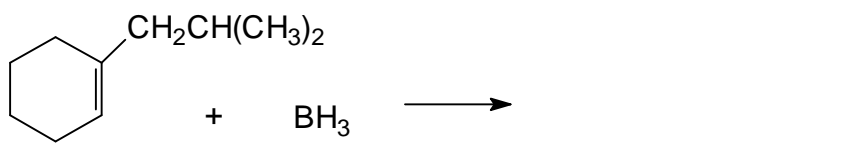
(i)



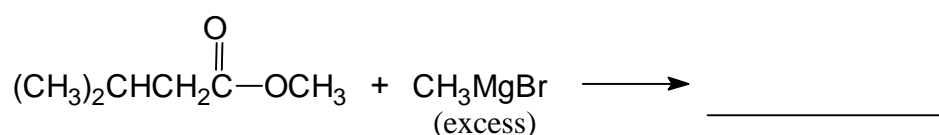
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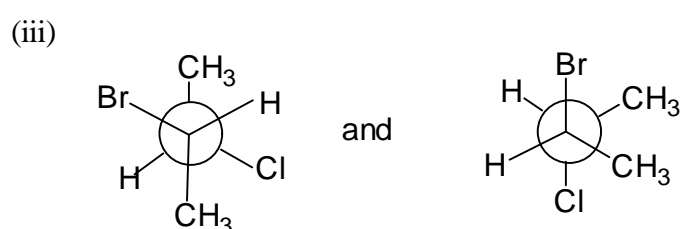
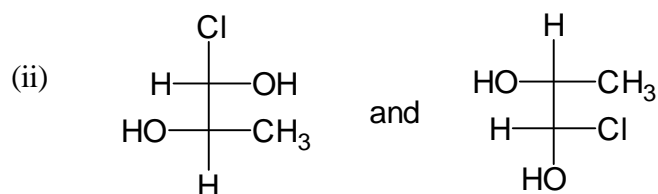
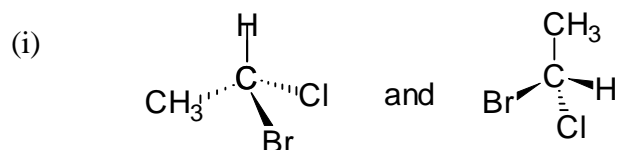
(l)



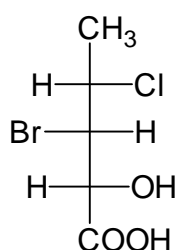
2. (a) Draw the 3-D perspective drawing (NOT the Newman projection) of the least stable configuration of 1,3,5-trichlorocyclohexane in its most stable chair conformation and label the substituents as being axial or equatorial. [3 points]

- (b) Draw the NEWMAN PROJECTION of the least stable chair conformation of trans 1-isopropyl-3-methylcyclohexane and label the substituents as being axial or equatorial. [3 points]

(c) Indicate the term (diastereomer, enantiomer, identical) which correctly describes the relationship between each of the following pairs of compounds. [9 points]



(d) Derive the correct stereochemical designator for each of the chiral centers in the molecule shown below. Give the priorities for the substituents around each center. [6 points]



(e) The addition of bromine to Z 1,2-diphenylethene (stilbene) does not afford a meso form. However, the product that is isolated is not optically active. Explain why this is so. Refer to the mechanism of the reaction and use three-dimensional drawings in your explanation. [5 points]

(f) When a racemic mixture of 2-methylbutanal reacts with methylmagnesium bromide, how many stereoisomers are formed [Draw their structure(s)]. If your answer is more than one, indicate how these are related to each other. [4 points]

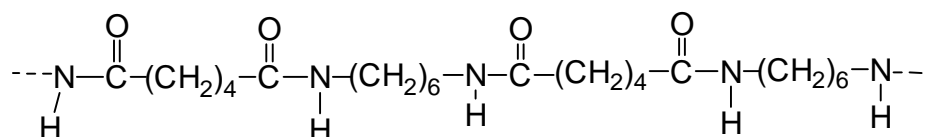
3. Draw the COMPLETE MECHANISM for the acid-catalyzed reaction of 2-methylbutanoic acid with ethanol. Make sure you show which steps are reversible. Give the overall reaction and give the IUPAC name for the product. [7 points]

4. Consider the following facts.
1. Two compounds A and B have the molecular formula $C_4H_8O_4$.
 2. Both give a positive Tollen's Test.
 3. When they are treated with an excess of acetic anhydride, each forms a new compound with the formula $C_{10}H_{14}O_7$.
 4. Both A and B have a positive sign of rotation

(a) Derive one possible structure for each of A and B (more than one correct answer may be possible). [4 points]

(b) According to the above data, what must be the relationship between A and B? [2 points]

5. Polymers are large molecules constructed of repeating units of one or more pieces called monomers, Nylon 66 has the structure



(a) Give the structure of each of the monomers used to make Nylon 66. [4 points]

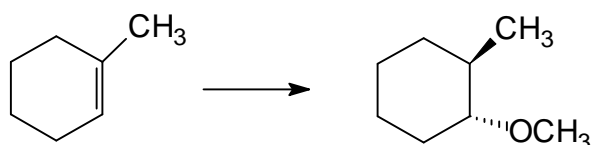
(b) What kind of a bond (i.e. what is the functional group) which joins the monomers and in what other area is this bond of great importance? [3 points]

(c) How would you expect the stability of Nylon to compare with that of a typical polyester in the presence of aqueous sodium hydroxide? [2 points]

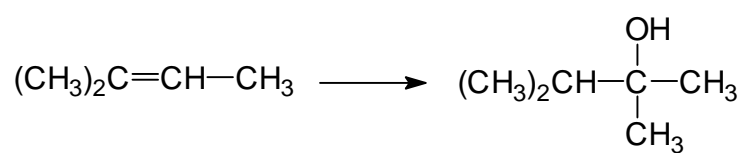
6. NOTE THAT THE FOLLOWING QUESTION INVOLVES A CHOICE

Show by equation how you would carry out ANY THREE of the following transformations, each of which may require up to four steps. Show all reagents you would use. [3 points each]

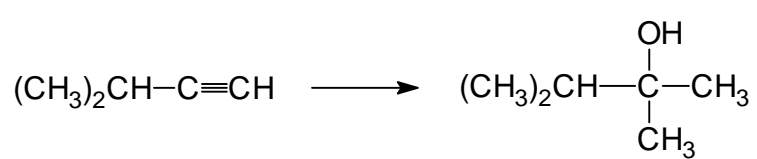
(a)



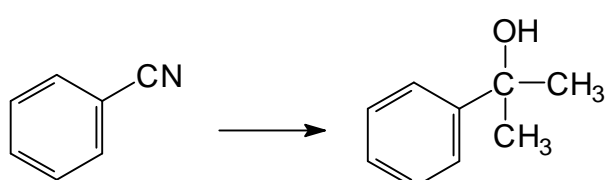
(b)



(c)

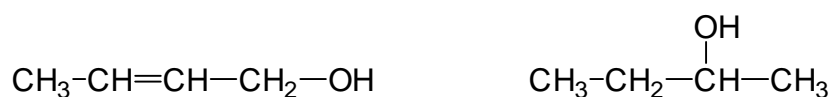


(d)



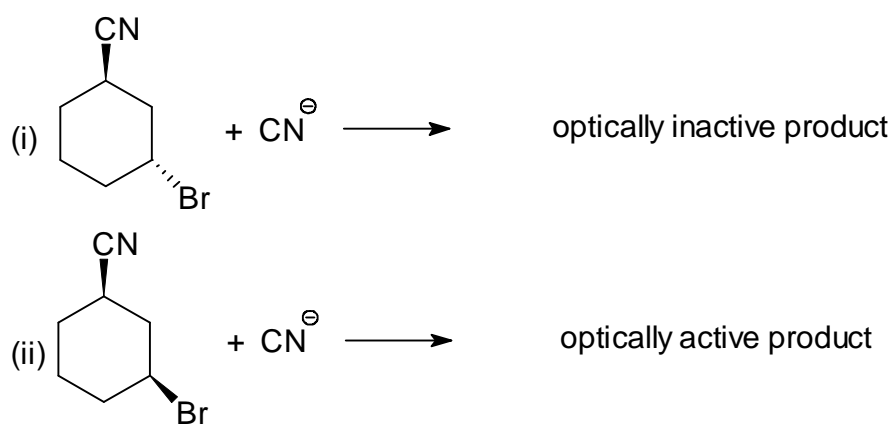
7. Consider each of the following pairs of reactions and answer the question posed in each case. Briefly provide a reason for your answer. [6 points]

(a)

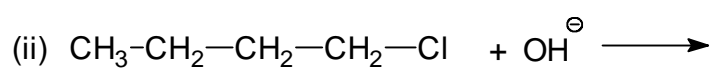
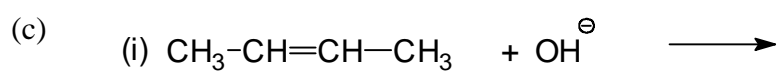


Which compound will react faster with the Lucas reagent AND WHY?

(b)



What mechanism is being followed by these reactions? Indicate how you reached your answer.



Which reaction will proceed faster AND WHY?