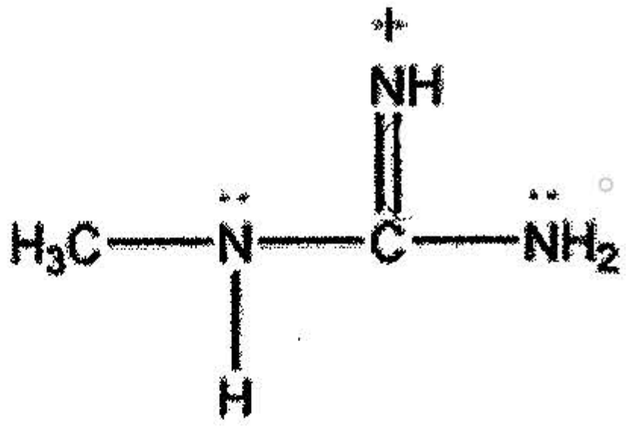
Organic Chemistry I 2016 Fall final exam

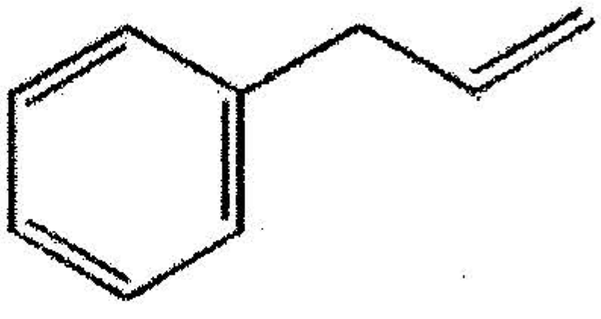
Name_____ Class _____ Student ID_____

(60%) I. SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

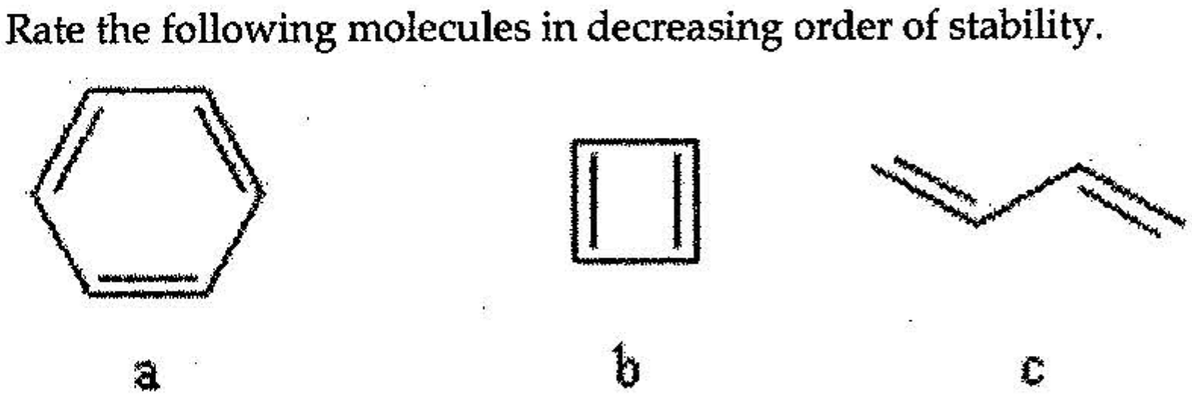
1) Draw the important resonance contributing forms for the structure shown below. 1) _____



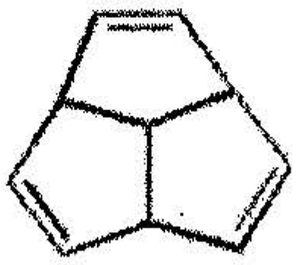
2) Provide the major organic product of the following reaction. 2) _____



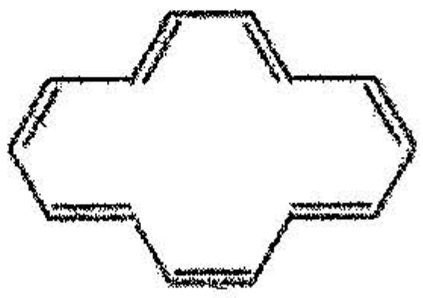
3) Rate the following molecules in decreasing order of stability. 3) _____



4) Is the following molecule aromatic? Explain. 4) _____

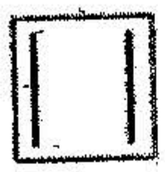


5) Classify the compound below as aromatic, antiaromatic, or nonaromatic. Assume planarity of the π network. 5) _____



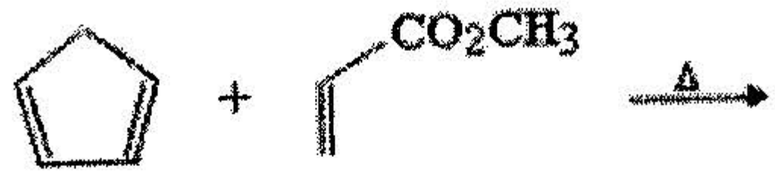
6) Draw the distribution of π electrons in the molecular orbitals of cyclobutadiene.

6) _____



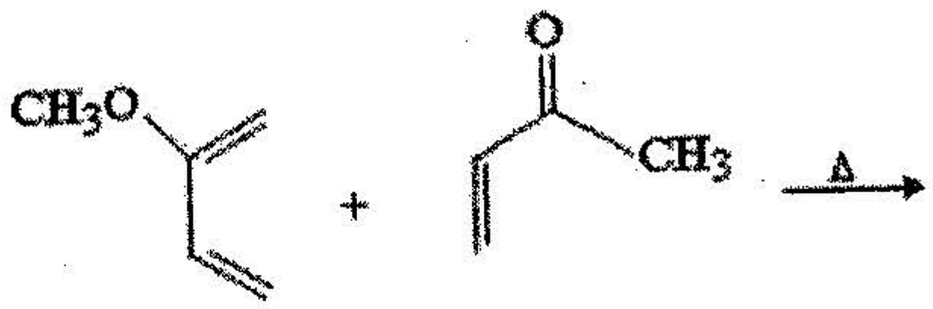
7) Provide the structure of the major organic product in the following reaction.

7) _____



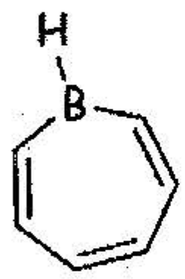
8) Provide the structure of the major organic product in the following reaction.

8) _____



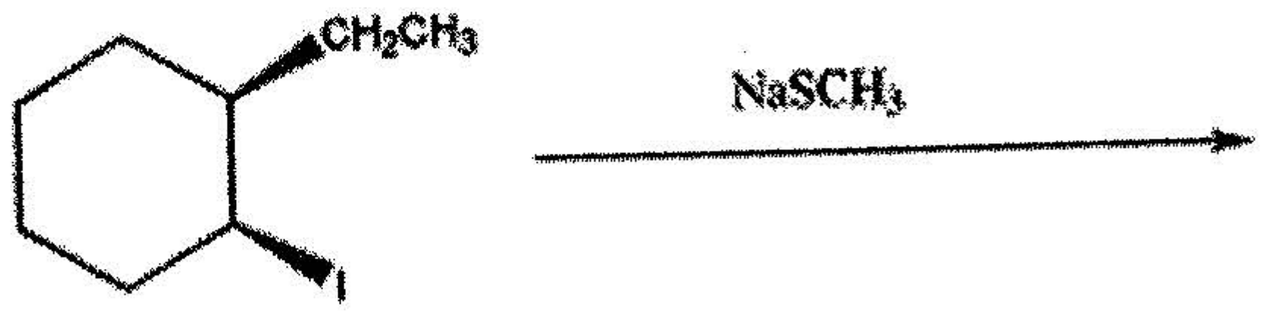
9) Is the following molecule aromatic or antiaromatic? Explain.

9) _____



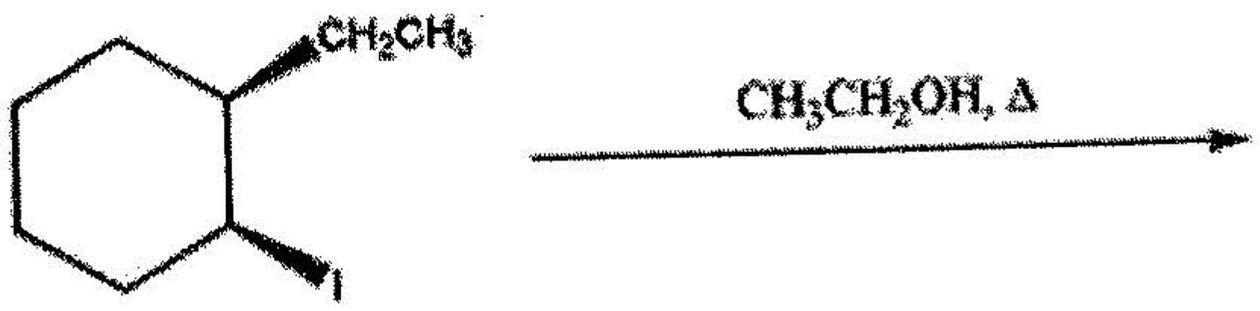
10) Provide the major organic product(s) in the reaction below.

10) _____

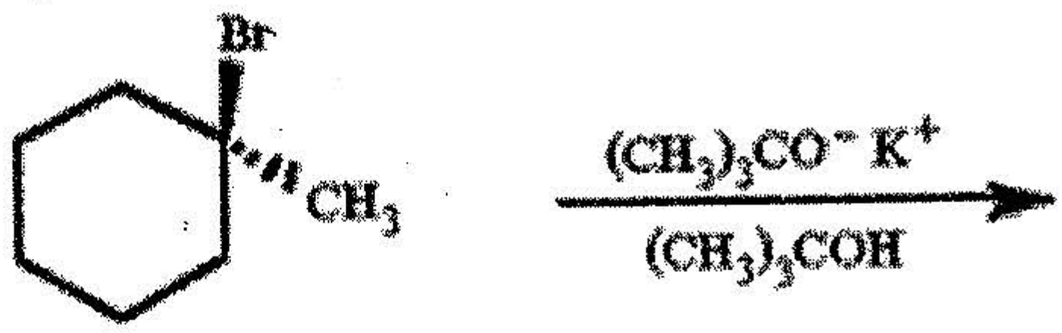


11) Provide the major organic product(s) in the reaction below.

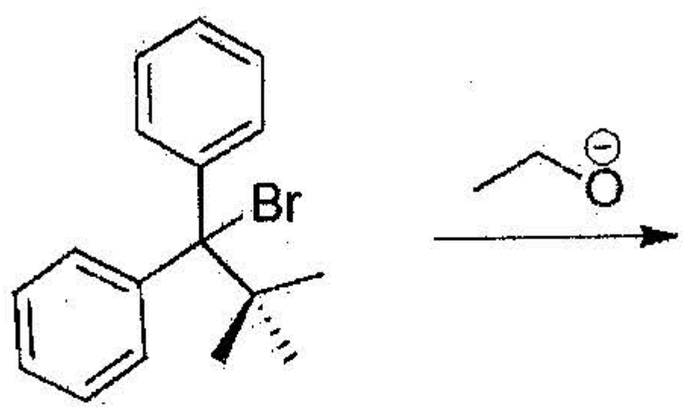
11) _____



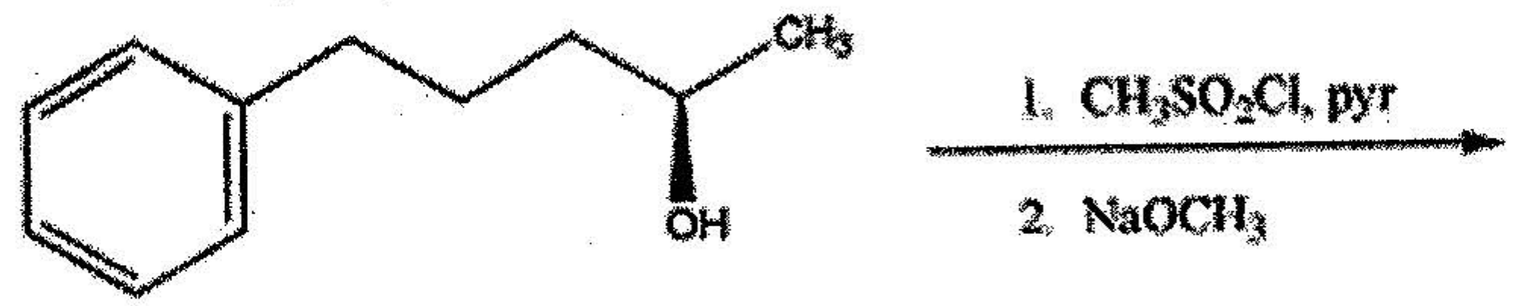
12) Draw all likely alkene products in the following reaction and circle the product you expect to predominate. 12) _____



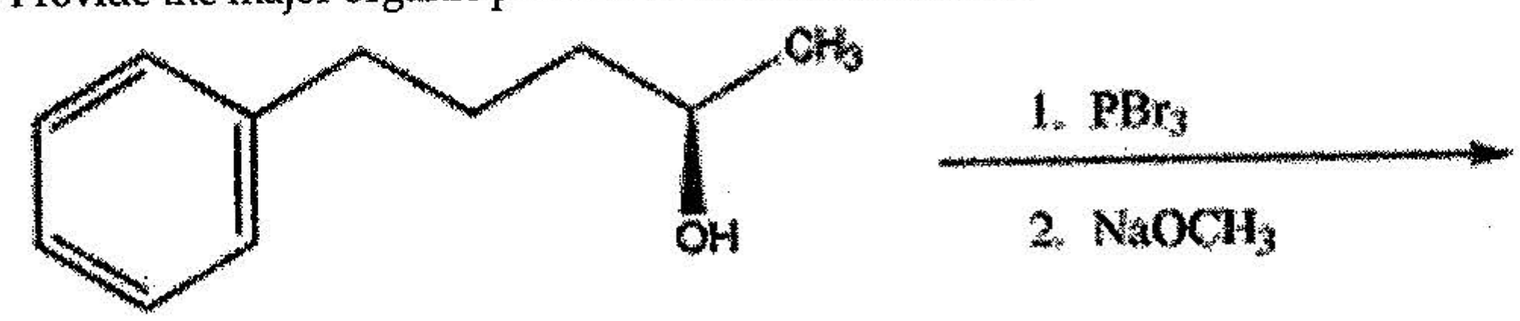
13) What would be the product of this reaction? Also, provide the name of the mechanism (S_N2, S_N1, E2 or E1). 13) _____



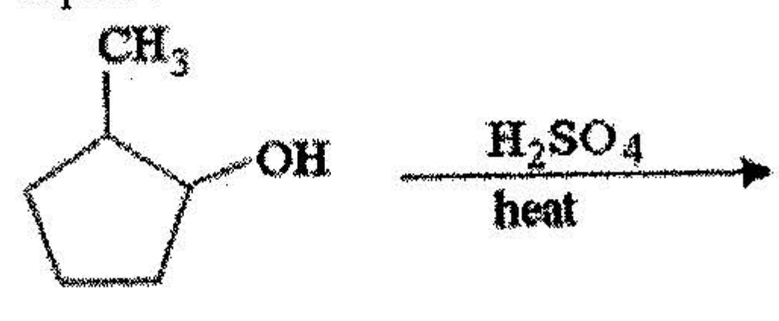
14) Provide the major organic product of the reaction below. 14) _____



15) Provide the major organic product of the reaction below. 15) _____

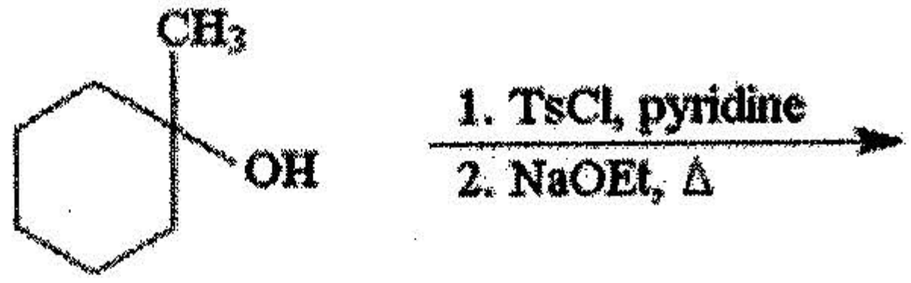


16) Draw all <u>three</u> likely products of the following reaction and circle the product you expect to predominate. 16) _____



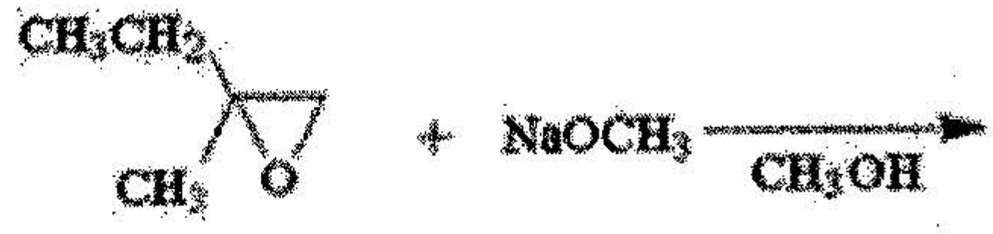
17) Provide the structure of the major organic product in the reaction below.

17) _____



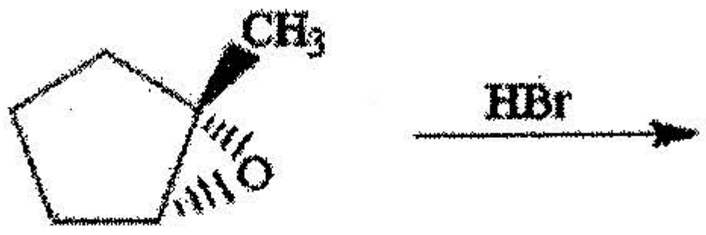
18) Provide the major organic product in the reaction below.

18) _____



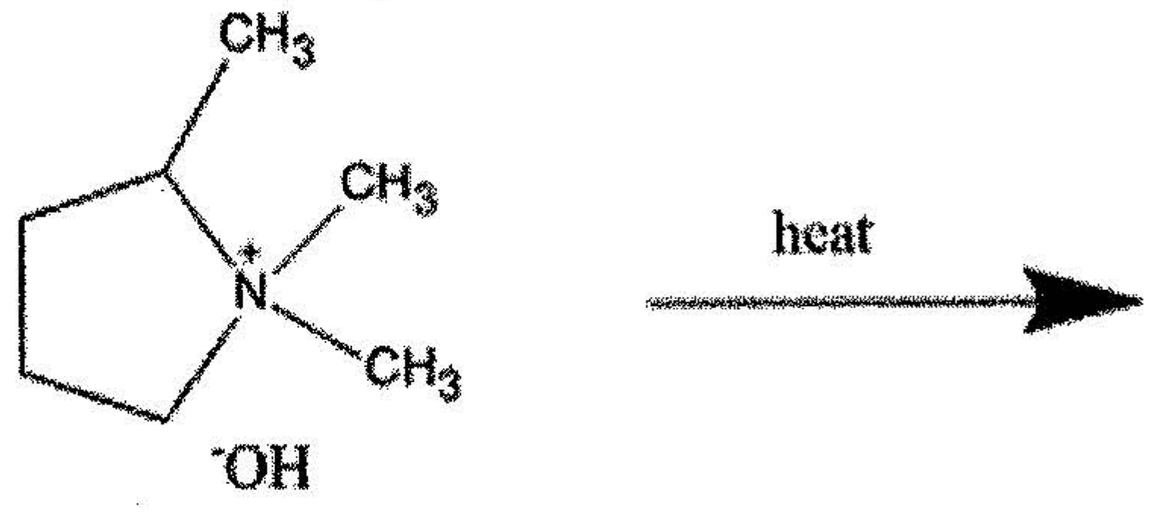
19) Provide the major organic product in the reaction below.

19) _____



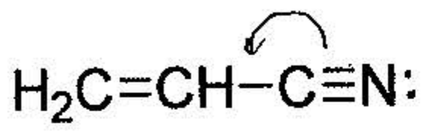
20) Provide the major organic product of the following reaction.

20) _____

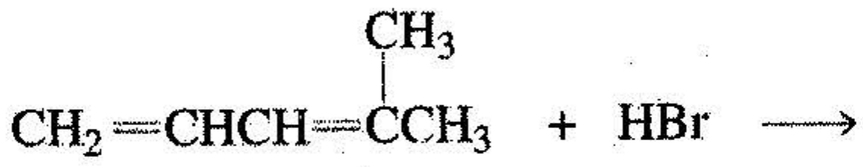


(6%) II. Draw the π Molecular Orbitals of 1,3,5-hexatriene constructed from their six p atomic orbitals, arrange these orbitals according to their relative energy.

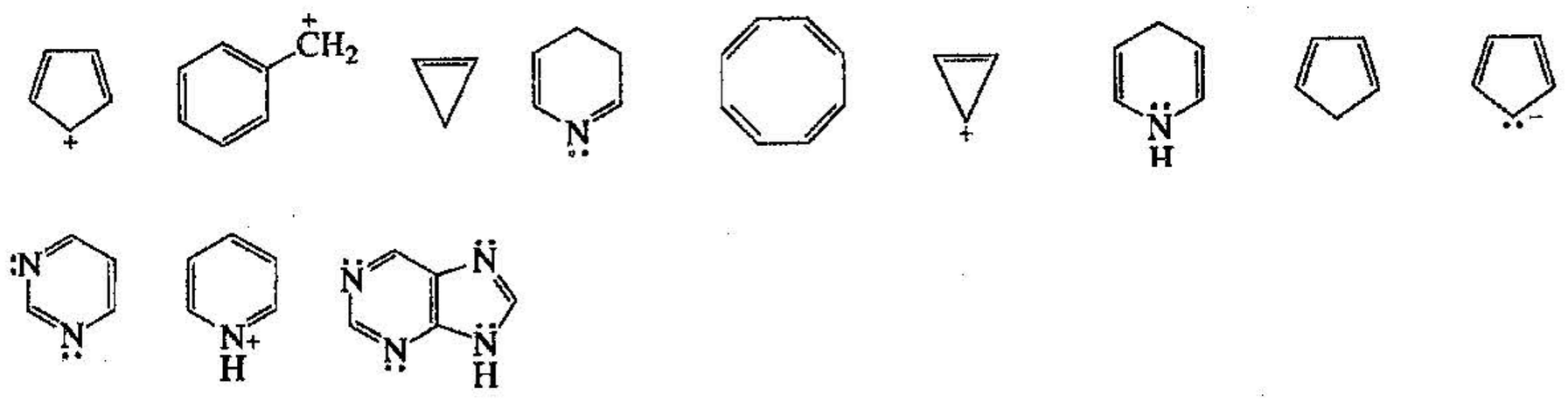
(6%) III. Draw the resonance contributors and the resonance hybrid for the following compound. Please correctly specify the charges.



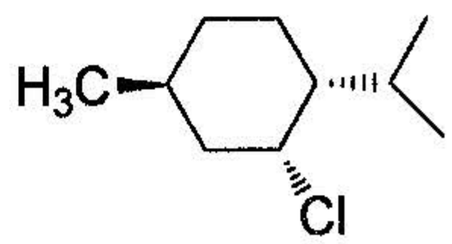
(6%) IV. Predict what are the major 1,2-addition and 1,4-addition products for the following reaction. Indicate which is the thermodynamic product and which is the kinetic product.



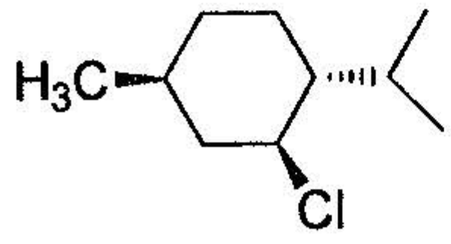
(12%) V. Classify the following species as aromatic, nonaromatic, and antiaromatic:



(10%) VI. Neomenthyl chloride undergoes **E2** reaction with ethoxide ion about 200 times faster than menthyl chloride does. Please **draw** the two chair forms for both compounds, **indicate** which chair form is the more stable form for each compound, **show** the major product for each reaction, **explain** why neomenthyl chloride undergoes **E2** reaction much faster.

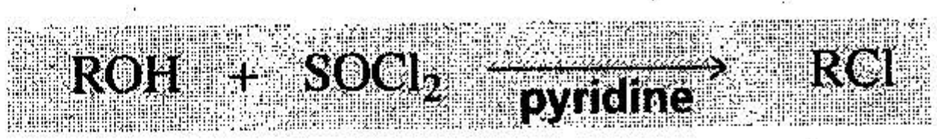


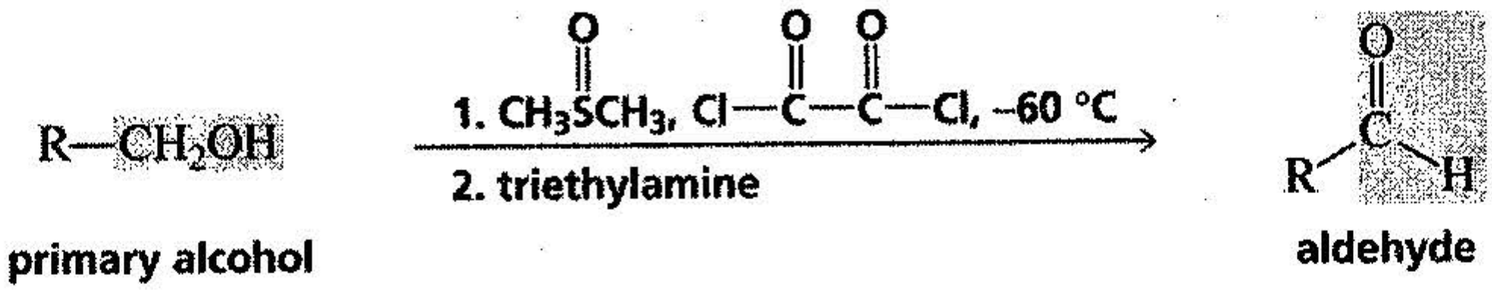
neomenthyl chloride



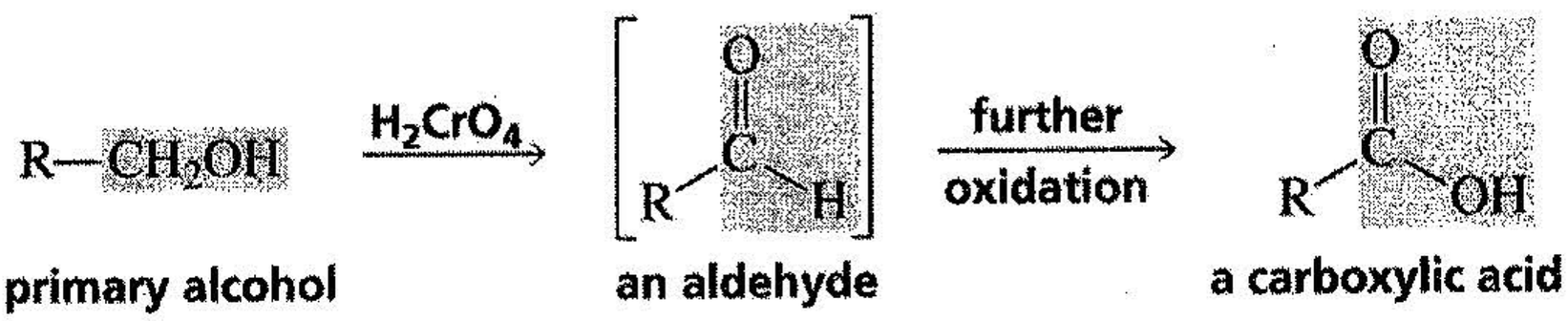
menthyl chloride

(10%) VII. Write the detailed mechanism for the following reactions:

(a) 

(b) 

(10%) VIII. Propose a mechanism for the following reaction.



a primary alcohol — an aldehyde — a carboxylic acid