

National Exams
04-BS-12, Organic Chemistry
May 2012

3 hours duration

Notes

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is a CLOSED BOOK EXAM.
A Casio or Sharp approved calculator is permitted.
3. Candidates may use any non-programmable calculator, ex. a Casio or Sharp model
4. ANSWER ALL FIVE PROBLEMS
5. Each problem is of equal value
6. Note that the questions (a), (b), (c), (d), (e), (f) or (g) of each problem can be treated independently

Problem No. 1 (20 points)

- a) Draw the structures and write the names of the four constitutional isomers with molecular formula C_4H_9Br

(8 points)

- b) Write the balanced equation of the mono-chlorination reaction of propane.

(8 points)

- c) In organic chemistry, when are two molecules said to be enantiomers?

(4 points)

Problem No. 2 (20 points total)

- a) Draw the structure and give the systematic name of a compound with molecular (condensed) formula C_5H_{12} that has:

- (i) One tertiary carbon

(5 points)

- (ii) Three secondary carbons

(5 points)

- (iii) No secondary or tertiary carbons

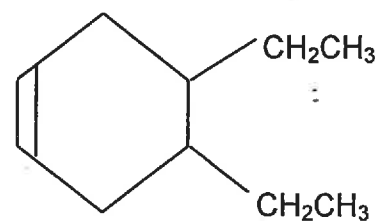
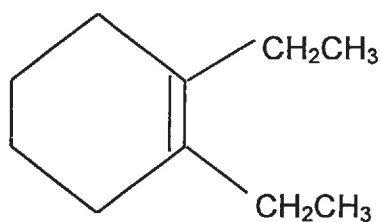
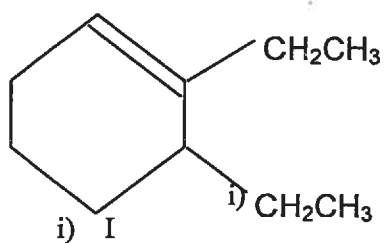
(5 points)

- b) Provide a concise definition of an isomer (also called structural or constitutional isomer).

(5 points)

Problem No. 3 (20 points total)

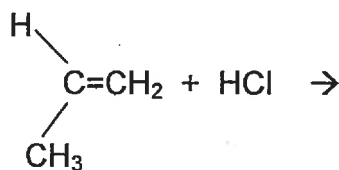
a) Which one of the following three compounds:



(i) Is the most stable?
(5 points)

(ii) Is the least stable?
(5 points)

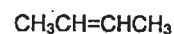
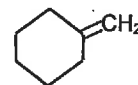
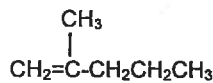
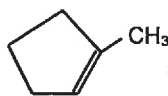
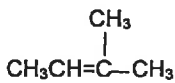
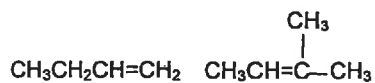
b) Write the balanced equation of the mono-chlorination reaction of the methyl-2 propene as shown below, and explain concisely the mechanism of the reaction.



(10 points)

Problem No. 4 (20 points total)

a) What would be the major product obtained from the addition of HBr to each of the following compounds?



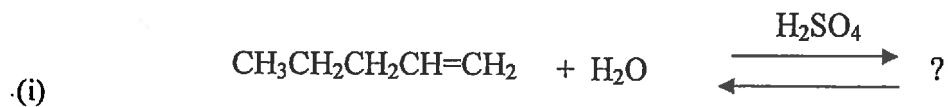
(12 points)

b) Write the balanced equation for the complete combustion of 3-ethyl-3-hexene.

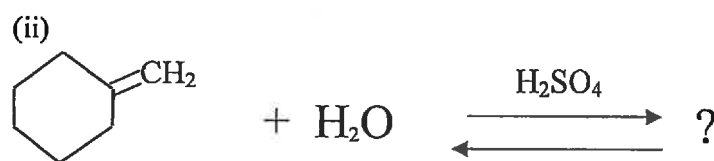
(8 points)

Problem No. 5 (20 points total)

- a) Give the major product obtained from the acid-catalyzed hydration, of each the following alkenes, and explain why?

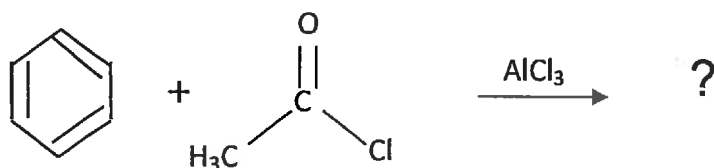


(5 points)



(5 points)

b)



(i) Complete the chemical equation above
(5 points)

(ii) Write the mechanism of the reaction
(5 points)