14 Aug. 2017

MINISTRY OF SCIENCE, RESEARCH AND TECHNOLOGY
NATIONAL ORGANIZATION
FOR
EDUCATIONAL TESTING

22th National and the 10th International Chemistry Olympiad
Summer 2017
Iran

Organic Chemistry
I, II, III and Spectrometric Identification of organic Compounds

Time: 90 minutes

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Question No.	Points for each question	Signature	total score (out of 100)
1	/10		
2	/10		
3	/10		
4	/10		
5	/10		
6	/10		
7	/10		
8	/10		
9	/10		
10	/10		

Important Note:
Please write your personal information only in the appropriate boxes provided on this page. Do not write on any other pages.

10th International Olympiad Summer 2017

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First name:

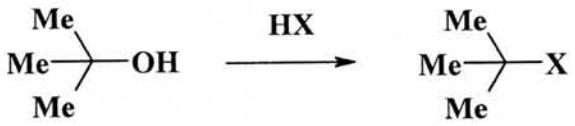
Last name:

Exam title:

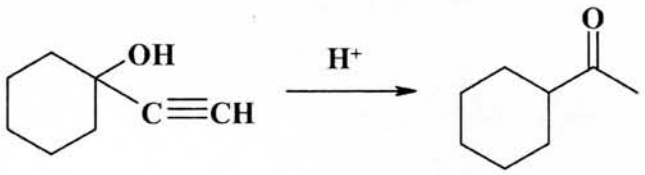
Exam data:

14 Aug. 2017

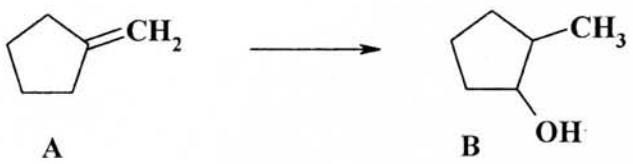
1. **The rate of the following reaction are the same when HX = HCl and or HBr, but the ratio of the products are different. when using the emixture of HCl and HBr Explain the reasoning and predict the major product.**



2. Draw the mechanism of the following reaction.

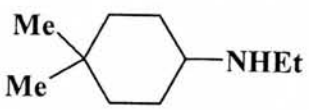


3. Suggest methods for converting A to B



A B

4. **A to E are different compounds. On the basis of the following information provide their structures.**

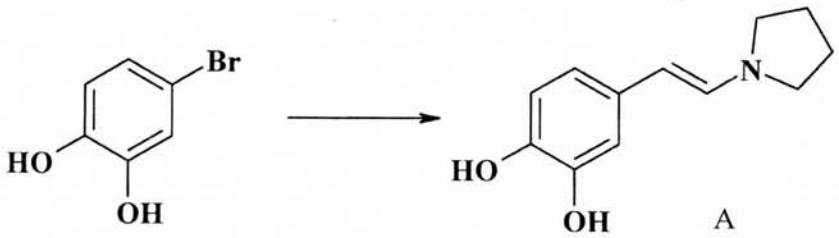


A

$\xrightarrow[2)\ Ag_2O,\ H_2O\ \ 3)\ heat]{1)\ CH_3I\ (excess)}$ B

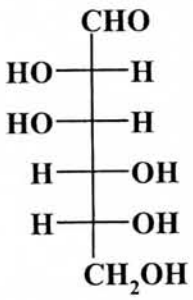
B $\xrightarrow[2)\ Zn,\ H_2O]{1)\ O_3}$ C $\xrightarrow[CH_3OH]{NaOCH_3}$ D $\xrightarrow{[Ag(NH_3)_2]^+\ HO^-}$ E

5. **Provide a reasonable synthesis of A from the given starting material. Provide the reagents and condition (s) in each step.**



A

6- **Indicate the final product of the following reactions.**



1) HCN

→ ?

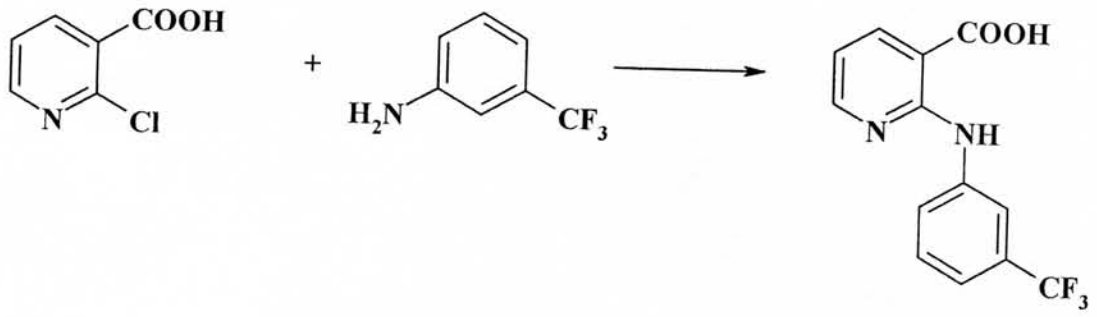
2) $Ba(OH)_2$

3) H_3O

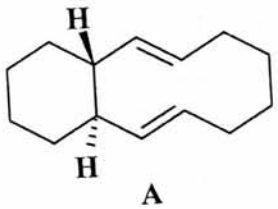
4) Na(Hg), pH<7

5) $NaBH_4$

7- **Provide a reasonable mechanism for the following reaction.**

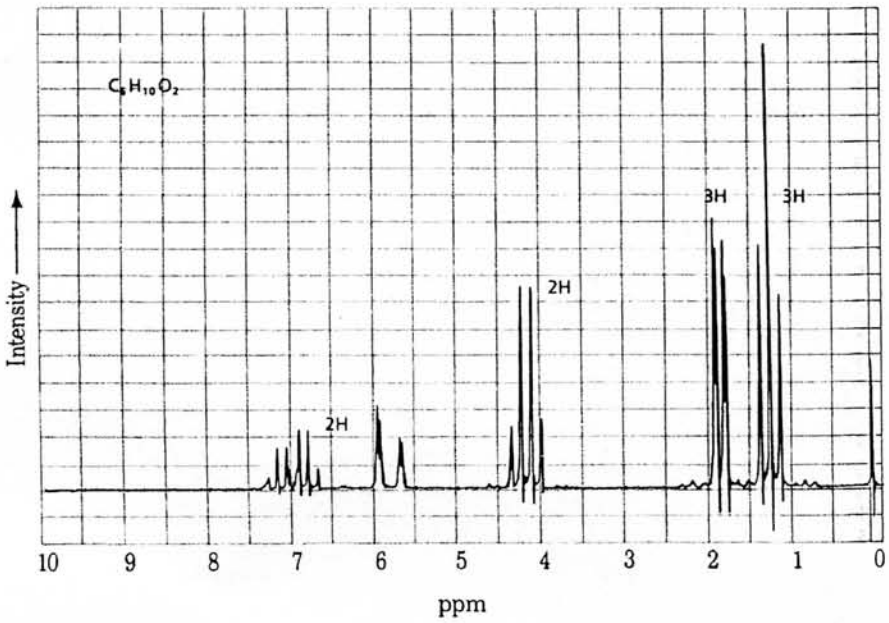


8- **Optically active A racemized on heating at 50°C with a half-life of 24h. Provide a reasonable mechanism.**



A

9- Deduce the structure of the compound from to molecular formula and ^1H NMR spectrum shown below.



10- Analyze the proton NMR spectrum in detail; provide the ^{1}H assignment and the *J* constants.