

KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2010/2011
INSTITUTIONAL BASED PROGRAMME (IBP) – AUGUST SESSION
EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE
(ANALYTICAL CHEMISTRY)

SCH 402: CONCEPTS OF SYNTHESIS

DATE: Monday, 2nd January, 2012

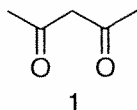
TIME: 4.30 p.m. – 6.30 p.m.

INSTRUCTIONS: Attempt ALL questions.

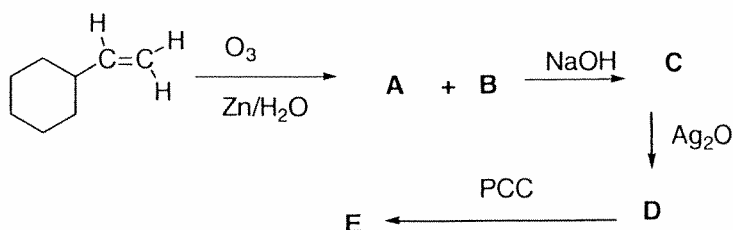
Question 1 [18 mks]

a) Using appropriate equations, explain the following observations

- i) Aldehyde samples that have been badly exposed to oxygen for some time before use are usually contaminated by the corresponding carboxylic acid [3mks]
- ii) Pent-2,4-dione, **1** exists as a tautomeric mixture of 8% keto and 92% enol forms. [3mks]

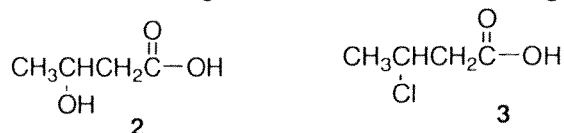


b) Provide structures of the missing products A-E in the reaction scheme below [8mks]



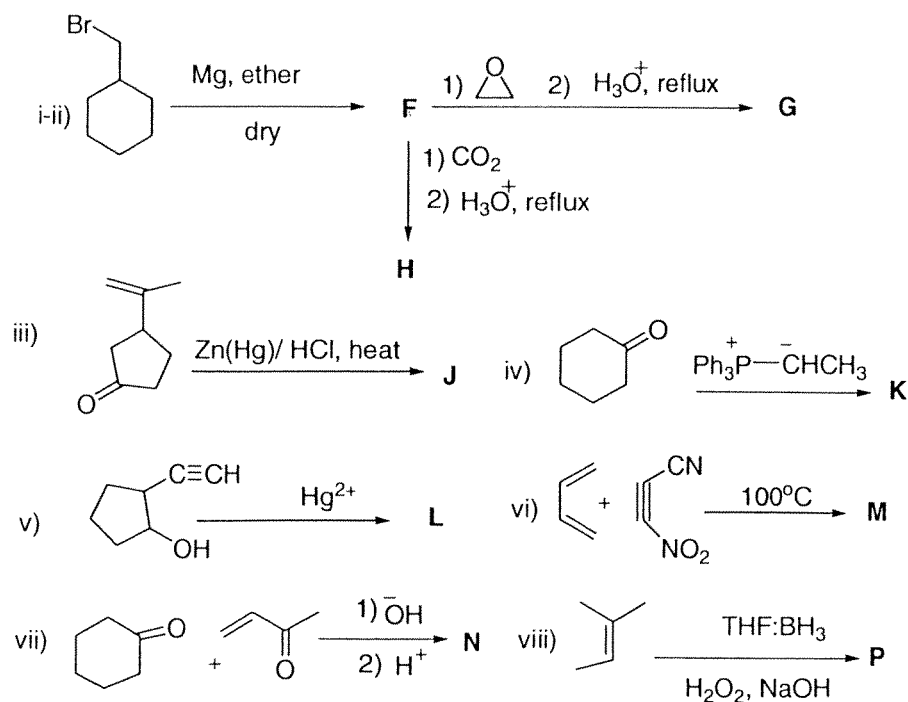
- c) i) In synthesis of polyfunctional molecule, there is need to direct the reaction at specific centre in a molecule, thus need to protect other reactive centers. With this in mind, state any three major characteristics of a good protecting group that you would consider in such a synthesis [1½mks]

ii) Using equations show how to use a protecting group to convert compound **2** to **3** using SOCl_2 as one of the reagents. Assume other reagents are available [2½mks]



Question 2 [19 mks]

a) Provide the structures of the major organic products (**F-P**) from the following reactions and show the stereochemistry where possible [14mks]



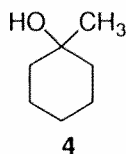
b) i) *Meta*-chloroperoxybenzoic acid (MCPBA) is a common reagent used in organic synthesis. Explain its importance. [2mks]

ii) Using equations illustrate two possible methods for synthesising **Cis** alkenes from alkynes [3mks]

Question 3 [17mks]

a) State any four major things you do when you want to carry out the actual designing or planning a given target molecule (TM) prepare or synthesize [2mks]

b) Compound **4**, was prepared starting from a ketone and other inorganic reagents

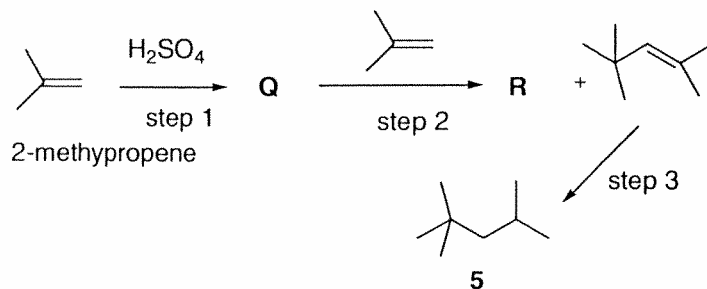


i) Carry out retrosynthetic analysis of compound **4** indicating clearly the synthons and synthetic equivalents [4mks]

ii) Write the synthesis according to your retrosynthetic analysis [1mks]

iii) Write a plausible mechanism for the synthesis [1mks]

c) Isooctane **5** can be prepared using the following sequence of reactions starting from 2-methylpropene



i) Show how an electrophile is generated [1mk]

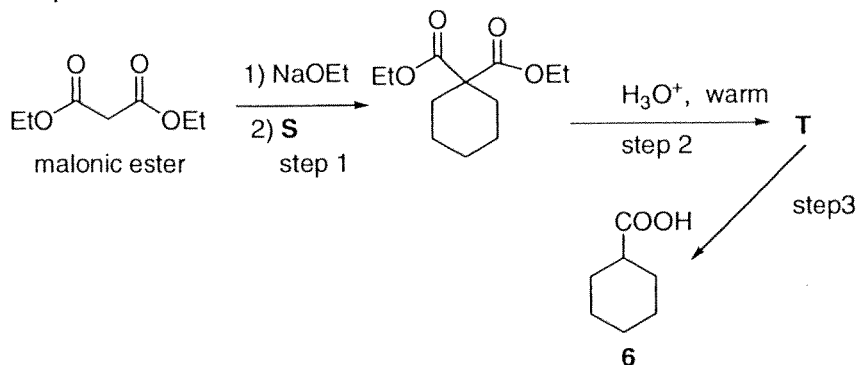
ii) Provide the structures **Q** and **R** as well as the reagents/conditions in step 3 [5mks]

iii) Explain why the yield in the above preparation is likely to be high [2mks]

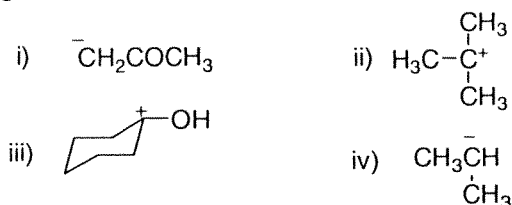
iv) State any one large scale use of compound **5** [1mk]

Question 4 [16mks]

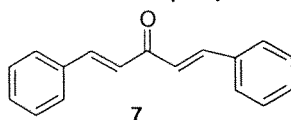
a) Cyclic carboxylic acid, **6** can be prepared using malonic ester and a dihalide using the sequence of reactions shown



- Draw the possible structure of reagent **S** and organic compound **T** [3mks]
 - State what occurs in step 3 [1mk]
 - Write a mechanism to show what takes place in step 1 [4mks]
 - Explain briefly why malonic ester is very important in organic synthesis [4mks]
- b) Provide possible structure of the corresponding synthetic equivalent to each of the following synthons [2mks]



c) Dibenzylacetone **7** can be prepared in laboratory from acetone and benzaldehyde.



- Draw the structure of the reagent that is called carbonyl component [1mk]
- Give the specific name of the type of reaction that takes place to form compound **7** [1mk]
