



096

THE OPEN UNIVERSITY OF SRI LANKA
B.Sc DEGREE PROGRAMME/ STAND ALONE COURSES 2006/2007
LEVEL 5- FINAL EXAMINATION

CHU 3130 / CHE 5130
INTRODUCTION TO NATURAL PRODUCTS CHEMISTRY

(2 1/2 HOURS)

Date: Thursday 23rd November 2006

Time: 9.30 am – 12.00 noon

Answer any four (04) questions only. If more questions are answered only the first four will be marked.

1. a. Give brief answers for the followings.

(i) What are eicosanoids?

(10 marks)

(ii) What is the structural difference of the three sub groups of eicosanoids; prostaglandins, thromboxanes and leukotrienes?

(15 marks)

(iii) What is the common structural feature in prostaglandins, thromboxanes and leukotrienes?

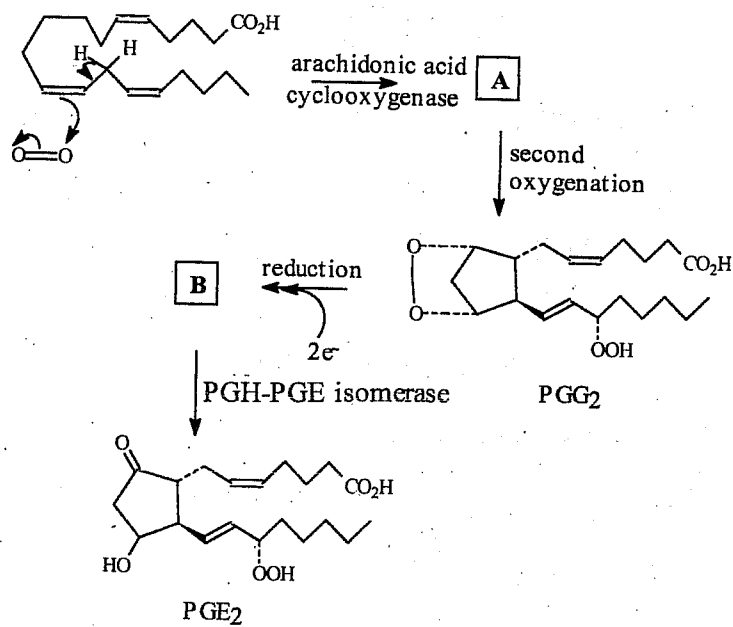
(10 marks)

(iv) From which pathway/s are prostaglandins, thromboxanes and leukotrienes formed.

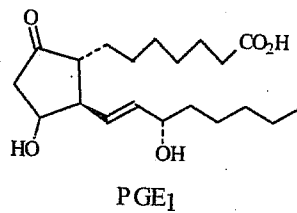
(15 marks)

(v) Following is the biosynthetic pathway for the prostaglandine found in kidney, starting from Arachidonic acid. Give the missing structures; A and B.

(20 marks)



vi. PGE₁ also biosynthesized by a similar pathway to that for PGE₂ above. What fatty acid is the biosynthetic precursor for PGE₁.

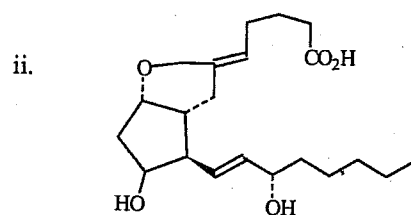
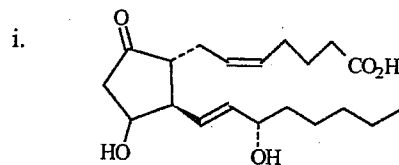


(10 marks)

vii. Identify the carbon atoms expected to be labeled with ¹⁴C, when each of the following substances are biosynthesized from acetate enrich with ¹⁴C in its methyl group.

(*CH₃CO₂H)

(20 marks)



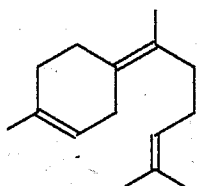
2. i. What are sesquiterpenoids.

(10 marks)

ii. What is the main biosynthetic precursor for sesquiterpenoids

(10 marks)

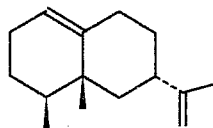
iii. Outline the biosynthesis of the monocyclic sesquiterpenoid, γ -bisobolene starting from *cis* farnesyl pyrophosphate.



γ - bisobolene

(20 marks)

iv. Valencene, is a bicyclic sesquiterpenoid responsible for the aroma and taste of valencia oranges. Outline the biosynthesis of Valencene starting from *trans*- farnesyl pyrophosphate.



Valencene

(50 marks)

v. Name two terpenoids which are important intermediates in steroid biosynthesis.

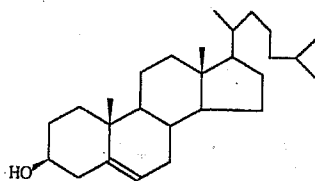
(10 marks)

3. a. The molecular formula of Lycopene is $C_{40}H_{56}$. On catalytic hydrogenation lycopene gives perhydrolycopene, $C_{40}H_{82}$. Ozonolysis of Lycopene gives among other products, acetone and laevulic acid, $OC(CH_3)CH_2CH_2CO_2H$.

Quantitative oxidation of lycopene with chromic acid gives eight molecules of acetic acid per molecule of lycopene. What can you say about the structure of lycopene?

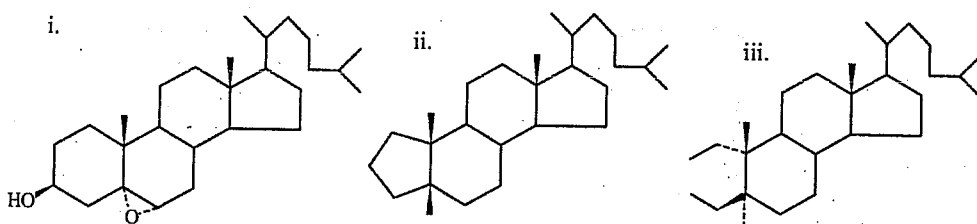
(30 marks)

b.



Cholesterol

Name the following derivatives of Cholesterol.'



(30 marks)

c. Give reasons to show why the following steroids are biologically active.

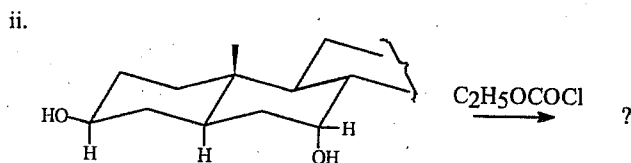
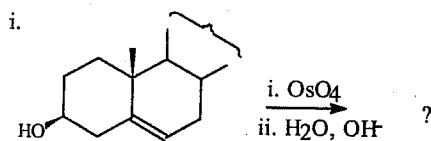
- i. Cardiac glycosides
- ii. Saponins
- iii. Sex hormones

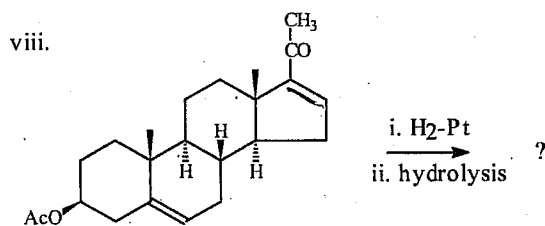
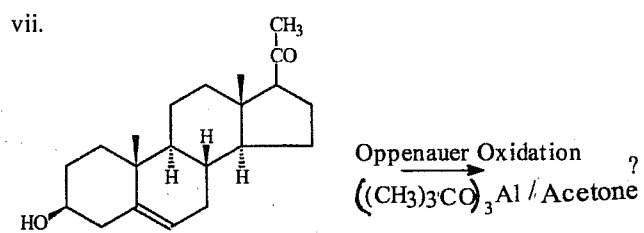
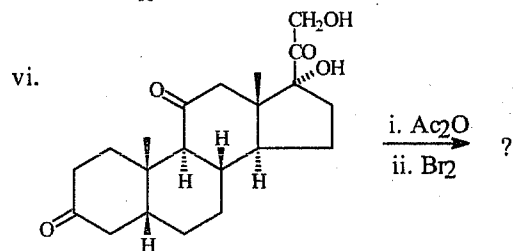
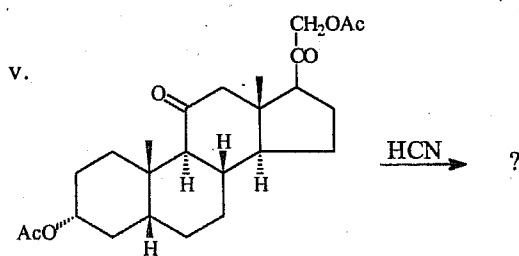
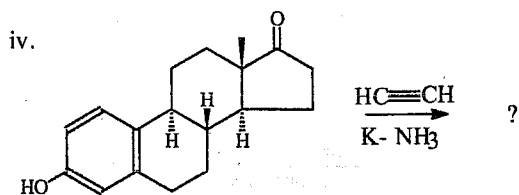
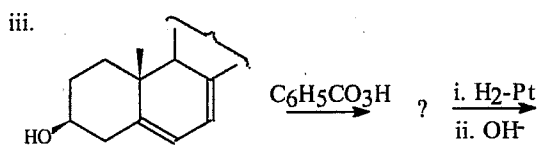
(30 marks)

d. What is the structural difference between natural rubber and gutta percha?

(10 marks)

4. Give the products of the following reactions.





(100 marks)

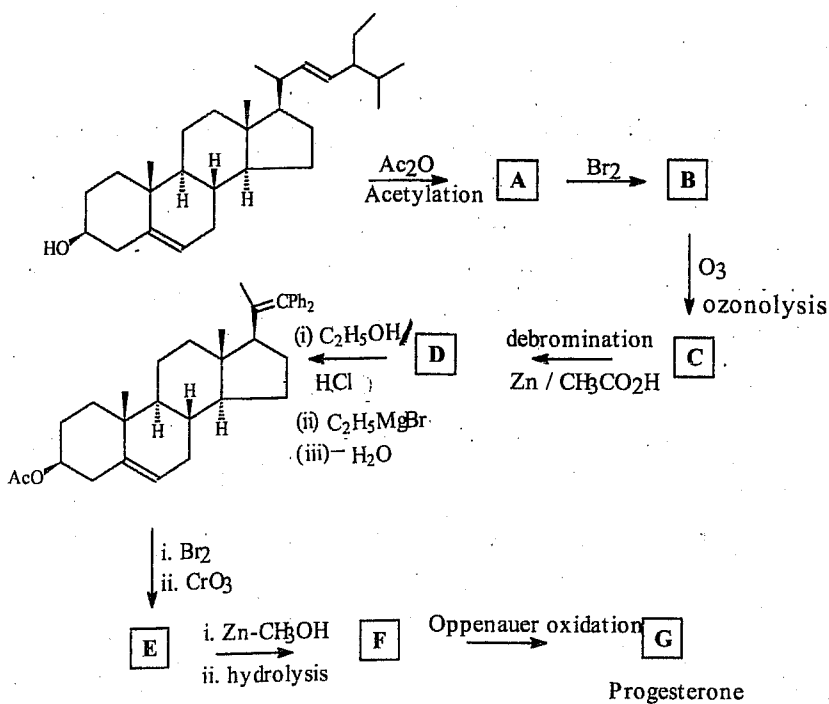
5. a. i. What are pheromones

(5 marks)

ii. Point out the structural differences between the male and female sex hormones.

(10 marks)

iii. Draw the missing structures of the following synthesis of Progesterone.



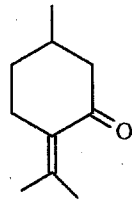
(70 marks)

b. What is meant by the term "partial synthesis"

(15 marks)

6. a. Menthol, $\text{C}_{10}\text{H}_{20}\text{O}$ is a saturated optically active compound. Only the (-)- form of menthol occurs naturally in peppermint oil. What can you say about the structure of menthol from the following information?

- i. Menthol forms esters
- ii. Oxidation converts menthol into menthone, a ketone.
- iii. Reduction with hydrogen iodide gives p-menthane
- iv. (+)-Pulegone gives menthol on reduction.



Pulegone

(40 marks)

b. Describe briefly the role played by the following natural products in animal-animal relationships.

- i. Sex pheromones
- ii. Trail Pheromones
- iii. Aggregation pheromones
- iv. Alarm pheromones
- v. Territorial pheromones
- vi. Oviposition pheromones

(60 marks)