



THE OPEN UNIVERSITY OF SRI LANKA
B. Sc DEGREE PROGRAMME / STAND ALONE COURSE 2008 / 2009
LEVEL 5 - FINAL EXAMINATION
CHU 3130 / CHE 5130
INTRODUCTION TO NATURAL PRODUCTS CHEMISTRY
TIME: 2 1/2 HOURS

Date: 27th December 2008

9.30 a.m. – 12.00 noon

Answer any **FOUR** (04) questions only.

If you have answered more than four questions, only the first four answers will be marked.

1. (a) Fill the table given below by stating the biosynthetic pathway and the precursor from which the given classes of compounds are biosynthesized.

Class of Compound	Biosynthetic Pathway	Precursor
Steroids		
Fatty acids		

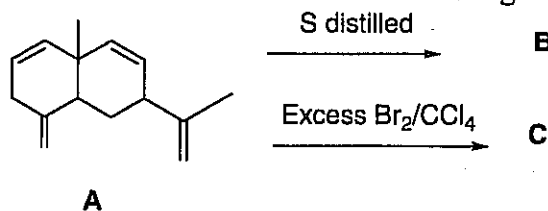
(16 Marks)

- (b) Fill the table given below with the spray reagents that are used to detect the following secondary metabolites and indicate the colour.

Class of Compounds	Spray Reagent	Colour
Amino Acids		
Saponins		

(16 Marks)

- (c) (i) Identify the products **B** and **C** obtained in the following reactions.

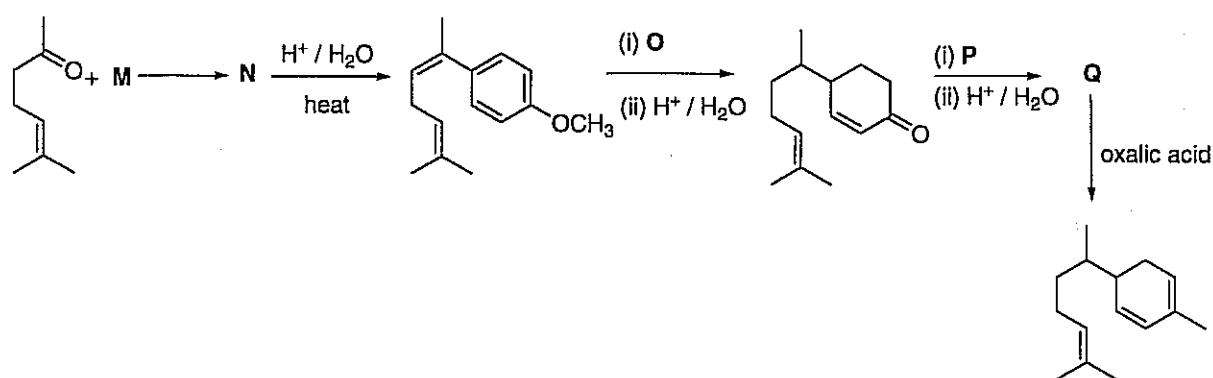


(10 Marks)

- (ii) Identify the products obtained when the compound **A** is ozonolysed. (08 Marks)
- (iii) Dissect the compound **A** given above into isoprene units. Denote the dissecting points by ---- lines. Label the head of the isoprene unit by a circle. (10 Marks)
- (iv) Name the class of terpenoids for which the compound **A** belongs to. (05 Marks)
- (v) Name the precursor containing 15 carbon atoms from which the compound **A** is biosynthesized.

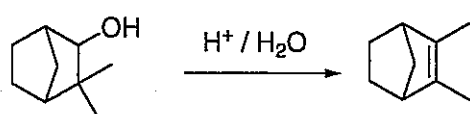
(05 Marks)

3. (a) Identify the missing compounds **M** - **Q** in the synthetic scheme given below.



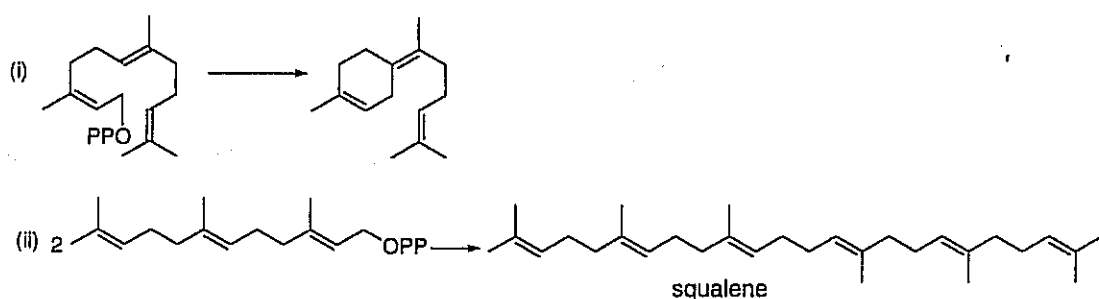
(25 Marks)

(b) Indicate the mechanism involved in the reactions given below.



(20 Marks)

(c) Indicate the mechanism involved in the biosynthetic schemes given below.



(35 Marks)

(d) What are the functions of the following terpenoids in biological systems or pharmaceutical industry.

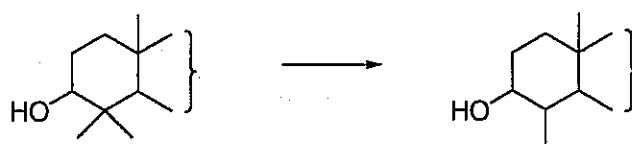
- (i) retinol
- (ii) gibberellin
- (iii) α -santonin
- (iv) juvenile hormone

(20 Marks)

4. (a) Giving appropriate examples, explain what Blanc's rule is? How would you apply Blanc's rule to determine the ring sizes of A and D rings of steroids.

(35 Marks)

(b) Show how one of the methyl group at C-4 of lanosterol is lost during the biosynthesis of cholesterol.

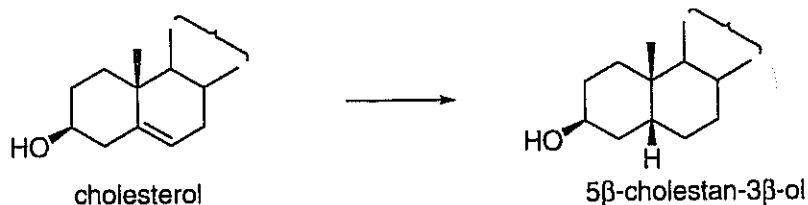


Lanosterol

(35 Marks)

(c) Give the basic skeletons (structure) of cardenolides, bufodienolides and saponins. (15 Marks)

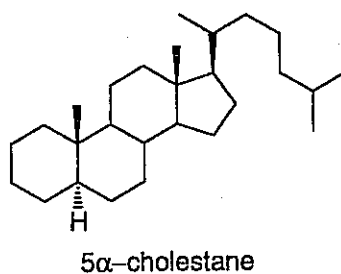
(d) Show how you would effect the conversion of cholesterol into 5 β -cholestan-3 β -ol.



(15 Marks)

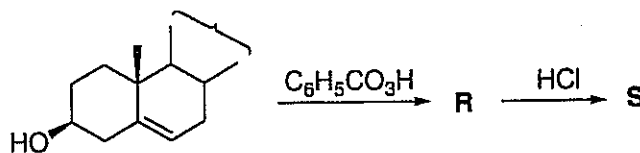
5. (a) Explain why 5 α -cholestan-2 β -ol undergoes oxidation with CrO₃ and glacial acetic acid faster than 5 α -cholestan-2 α -ol under the same conditions.

Hint: Draw appropriate conformations.



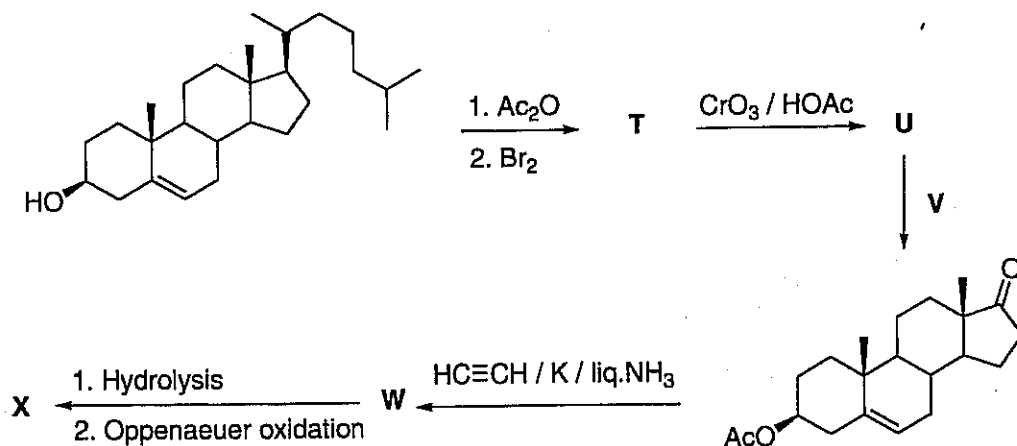
(20 marks)

(b) Give the structures of the products (with their stereochemistry) of the following reaction scheme.



(20 marks)

(c) Given below is a proposed synthetic sequence of norethindrone (X), which is used as an oral contraceptive. Predict the structures of compounds, T, U, W, and X. What is the reagent V?

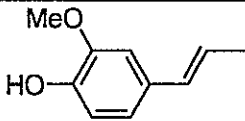
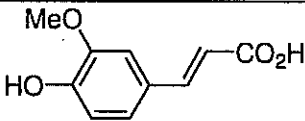


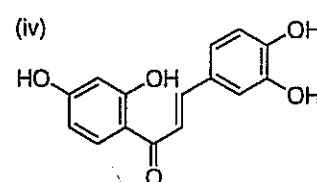
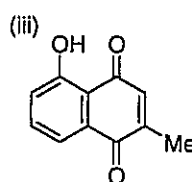
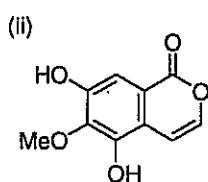
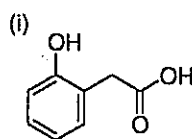
(30 marks)

(d) Explain how the knowledge of sex hormones led to the development of birth control pill.

(30 marks)

6. (a) Clearly state the basic skeleton giving the appropriate carbon number and the class of each of the following compounds. (See the example).

Example		
		
Basic skeleton	C ₆ - C ₃	C ₆ - C ₃
Class	Phenyl propene	Hydroxycinnamic acid

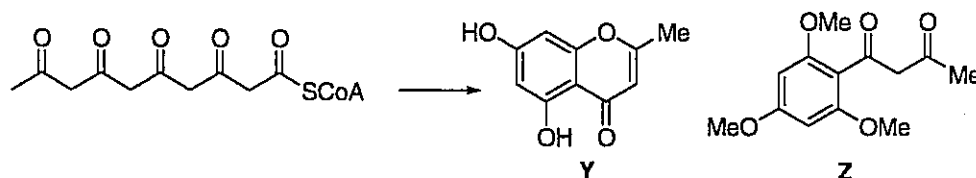


(20 Marks)

(b) Giving appropriate structures show the formation of a polyketide chain starting from acetyl coenzyme A.

(20 Marks)

(c) Give the biosynthetic pathway leading to compounds Y and Z starting from the given polyketide.



(20 Marks)

(d) i. Explain why linoleic acid is considered as an essential fatty acid.

ii. Give the biosynthetic pathway leading to prostaglandin H₂ (PGH₂) from arachidonic acid.



iii. Write a short account on the classification of prostaglandins.

(40 Marks)