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THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. DEGREE PROGRAMME / STAND ALONE COURSE 2013/2014

LEVEL 5-FINAL EXAMINATION

CHU 3130/CHE 5130-INTRODUCTION TO NATURAL PRODUCTS CHEMISTRY

Time: 2 HOURS

Monday 16th June 2014 9.30a.m.- 11.30a.m.

Answer any FOUR questions only.

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

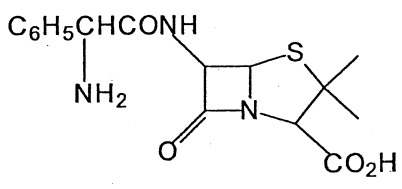
1. (a) Fill the table given below with the spray reagents that can be used to detect the following secondary metabolites by TLC and state the colour observed in each case.

Class of compounds	Spray reagent	Colour observed
Anthraquinones		
Cardiac-glycosides		
Saponins		

(24 marks)

(b)(i) Name the enzyme responsible for causing resistance to β-lactam antibiotic(ampicillin) by microorganisms .

(ii) Write the mechanism of resistance applied by microorganisms to ampicilin.Give two approaches to over come this problem.



ampicillin

(40 marks)

12

(c) Explain the following terms.

(i) Primary structure of a protein.

(ii) Allosteric effect

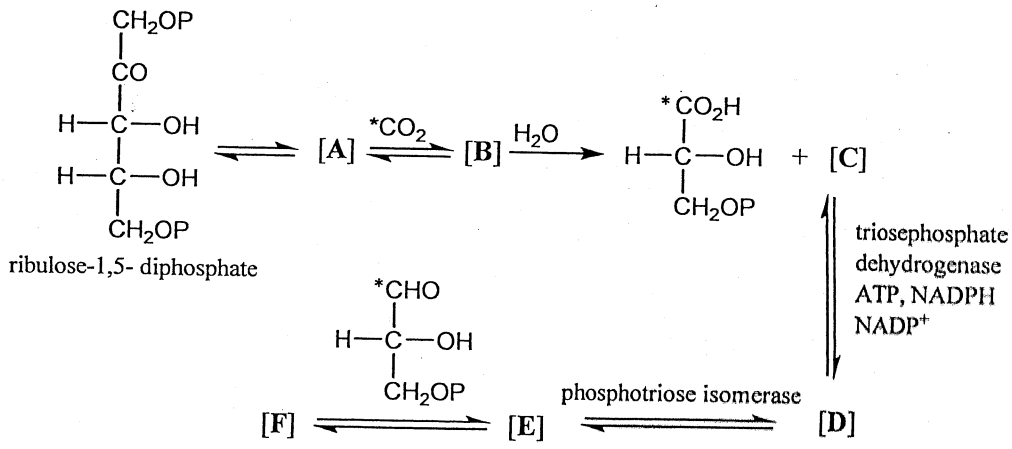
(iii) Competitive inhibitor

(20 marks)

(d) What are the methods that can be used for structure elucidation of natural products?

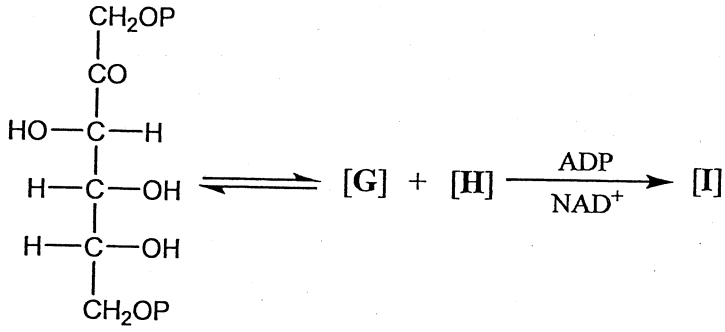
(16 marks)

2.(a) Propose the structures of the products **A**, **B**, **C**, **D**, **E** and **F** when ribulose-1,5-diphosphate under goes the following reaction sequence in the photosynthesis. Indicate the position of the labeled carbon atom(s) if any of the following pathway leading to the biosynthesis of carbohydrate by *.



(48 marks)

(b) Identify the missing compounds **G**, **H** and **I** in the following reaction scheme met in the glycolysis pathway.



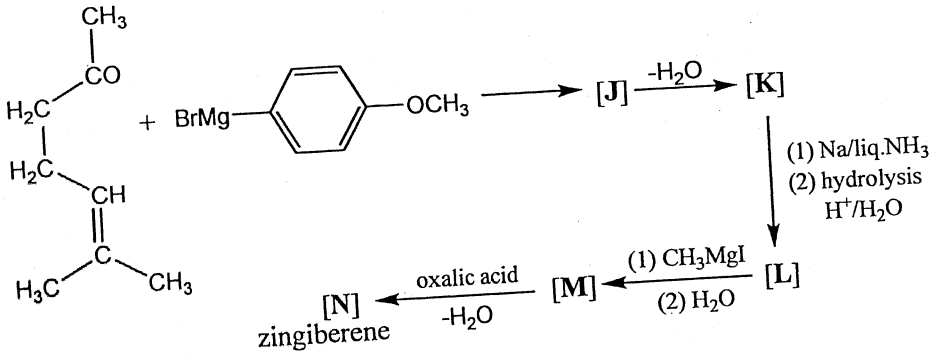
(30 marks)

(c)(i) What are the three processes in which acetyl Coenzyme A acts as the key compound?

(ii) Describe briefly the role of natural products in plant-microorganism interactions.

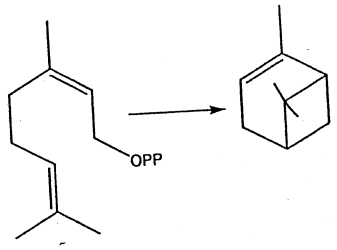
(22 marks)

3. (a) Methylheptenone, $CH_3COCH_2CH_2CH=C(CH_3)_2$ under went the following reaction sequence in the synthesis of Zingiberene [N].



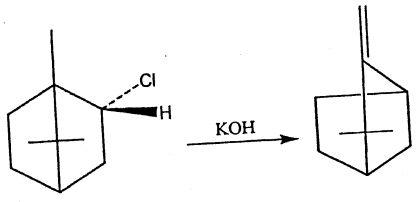
Propose structures for **J**, **K**, **L**, **M** and **N** of this reaction. (50 marks)

(b) Indicate the mechanism involved in the biosynthetic scheme given below.



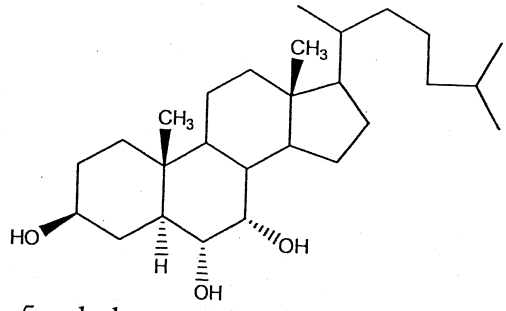
(30 marks)

(c) Outline the mechanism of the following conversion.



(20 marks)

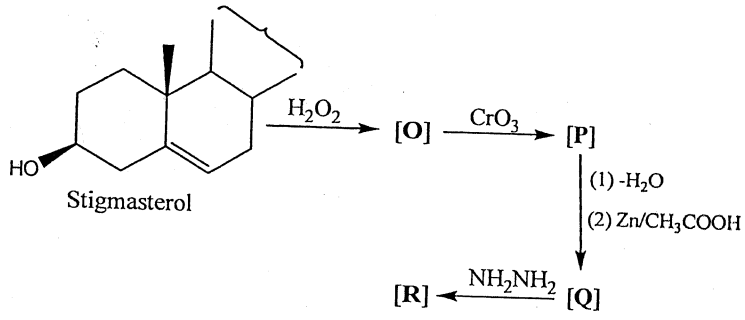
4. (a) Explain why 5α-cholestane-3β,6α,7α-triol undergoes esterification reaction with $ClCOOC_2H_5$ to form 3β,6α-dicathylate. On the other hand the corresponding 5α-cholestane-3β,6α,7β-triol forms the 3β,6α,7β-tricathylate under the same condition.



5α-cholestane-3β, 6α,7α-triol

(30 marks)

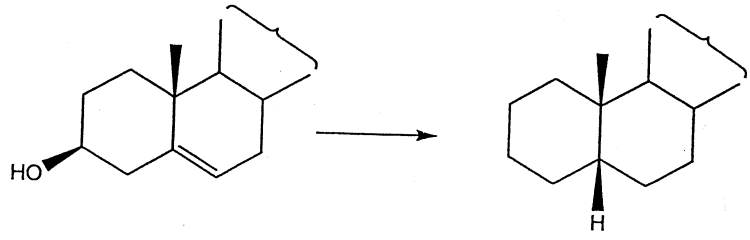
(b) Stigmasterol undergoes the following reaction sequence.



Identify **O**, **P**, **Q** and **R** in the above reaction sequence.

(40 marks)

(c) Show how you would effect the conversion of cholesterol into 5β-cholestane.

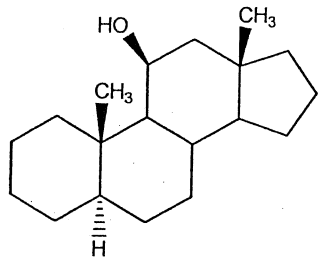


Cholesterol

5β-cholestane

(30 marks)

5. (a) Explain why 5α-androstan11β-ol is oxidized to the ketone by CrO_3-aqueous acetic acid hundred times faster than 5α-androstan-7α-ol.

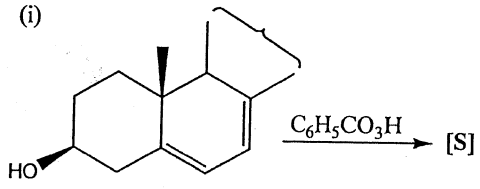


5α-androstan 11β-ol

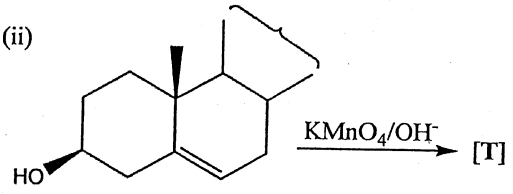
(30 marks)

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

(i)

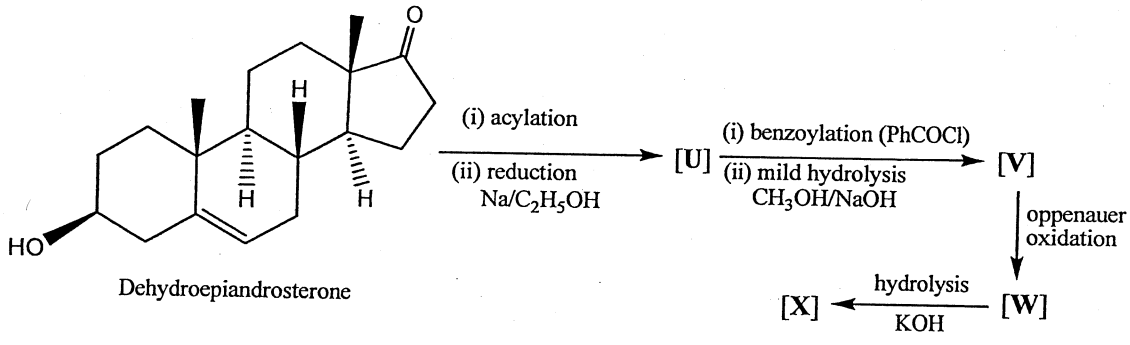


(ii)



(30 marks)

(c) Dehydroepiandrosterone underwent the following reaction sequence.

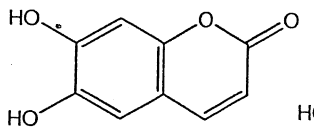


Dehydroepiandrosterone

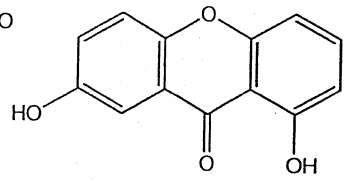
Propose structures for **U**, **V**, **W** and **X** of this reaction.

(40 marks)

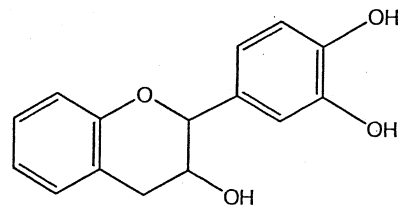
6.(a) Clearly state the basic skeleton giving the appropriate carbon number and the class of the following compounds. (See example worked below).



(i)

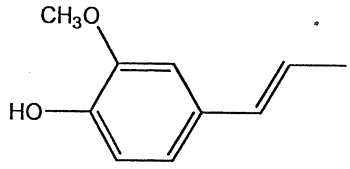


(ii)



(iii)

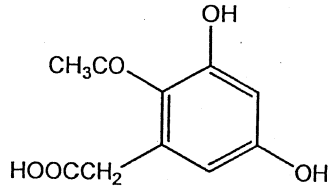
Example



Basic skeleton : C_6-C_3
Class : phenyl propene

(30 marks)

(b) (i) Draw the structure of the polyketide (**Y**) involved in the biosynthesis of



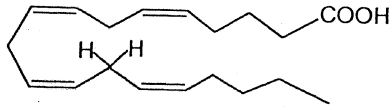
Curvulinic acid.

(ii) Indicate the position of labeling of the polyketide **Y** if it is biosynthesized from labeled acetyl CoA ($CH_3{}^*COSCoA$) and malonyl CoA, ($HOOCCH_2{}^*COSCoA$)

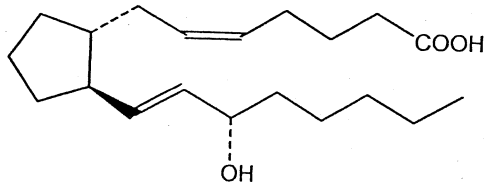
(iii) Indicate the mechanism by which curvunic acid is formed from **Y**.

(25 marks)

(c) (i) Indicate the mechanism of the reactions involved in the biosynthesis of the prostaglandine PGH_2 from arachidonic acid, stating the name of the enzyme involved in the reaction.



arachidonic acid



PGH2

(40 marks)