THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. DEGREE PROGRAMME / STAND ALONE COURSE 2014/2015

LEVEL 5-FINAL EXAMINATION

CHU 3130/CHE 5130-INTRODUCTION TO NATURAL PRODUCTS CHEMISTRY

Time: 2 HOURS

Sunday 10th May 2015 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
Saponins		
Cardiac-glycosides		
Anthraquinones		

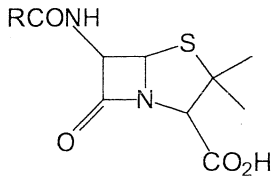
(24 marks)

(b) Fill the table given below by stating the biosynthetic pathway and precursor from which the given class of natural products are biosynthesized.

Class of natural products	Biosynthetic pathway	Precursor
Fatty acids		
Steroids		
Terpenoids		

(18 marks)

(c) Write the mechanism of resistance applied by microorganisms to β-lactam antibiotics. Give two approaches to over come this problem.



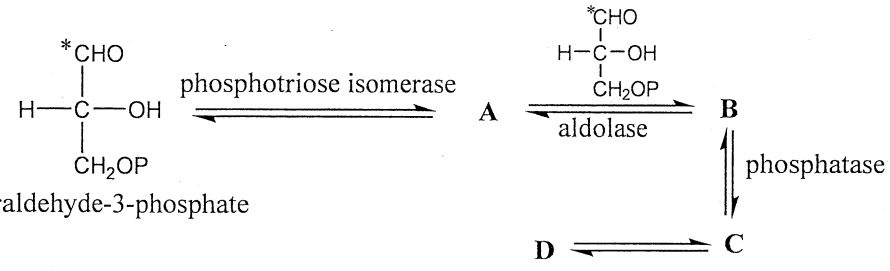
β-lactam antibiotic

(40 marks)

(c) Explain the difference between prosthetic group and a co-substrate.

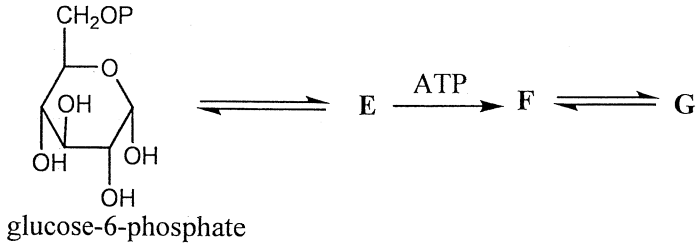
(18 marks)

2.(a) Propose the structures of the products **A**, **B**, **C** and **D** when glyceraldehyde-3-phosphate under goes the following reaction sequence during photosynthesis. Indicate the position(s) of the labeled carbon atoms if any of the following pathway leading to the biosynthesis of carbohydrate by using an asterisk(*).



(40 marks)

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

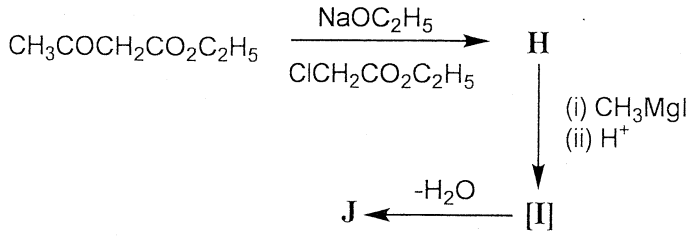


(30 marks)

(c)(i) Name the three process in which acetyl Coenzyme A acts as the key compound.
(ii) What are the pre-infectional and post-infectional allomones?

(30 marks)

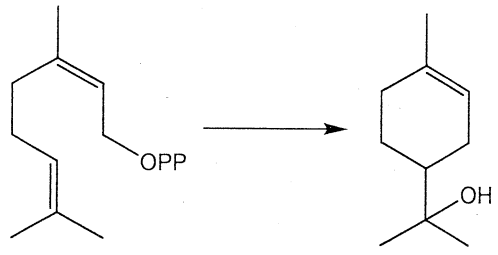
3. (a) $CH_3COCH_2CO_2C_2H_5$ underwent the following reaction sequence in the synthesis of terebic acid **J**.



Propose structures for **H**, **I** and **J** of this reaction.

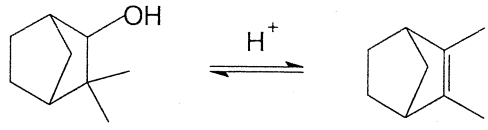
(40 marks)

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



(20 marks)

(c) Outline the mechanism of following conversion.

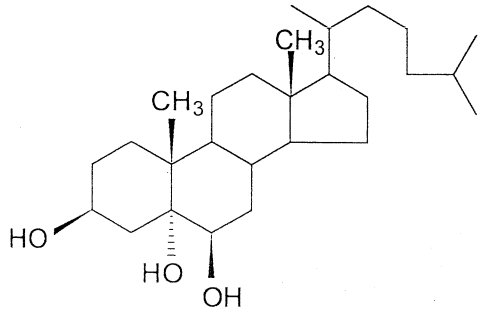


(20 marks)

(d) Give five examples to show that terpenoids are biologically important.

(20 marks)

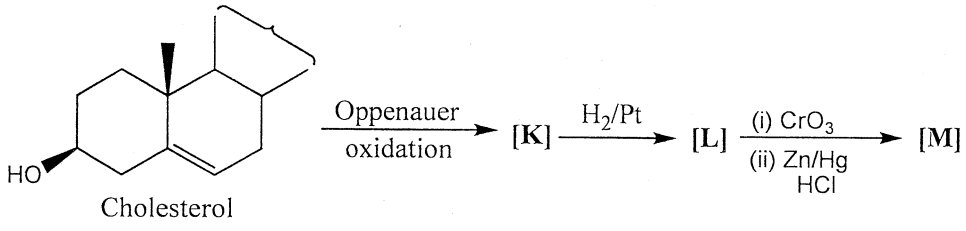
4. (a) Explain why cholestane-3β,5α,6β-diol undergoes esterification reaction with ethylchloroformate ($ClCOOC_2H_5$) to form 3β-monocathylate. On the other hand the corresponding cholestan-3β,5α,6α-diol forms 3β,6α-dicathylate under the same condition. Explain your answer using chemical structures.



Cholestane-3β,5α,6β-triol

(40 marks)

(b) Cholesterol undergoes the following reaction sequence.

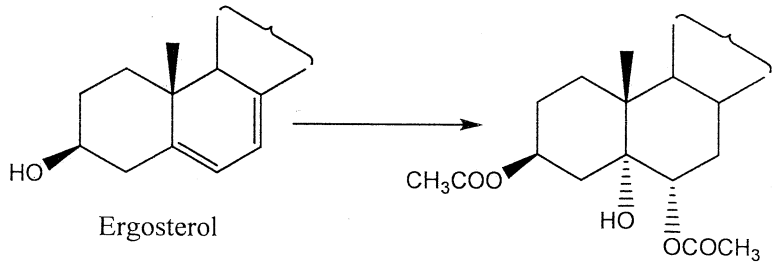


Cholesterol

Identify **K**, **L** and **M** in the above reaction sequence.

(30 marks)

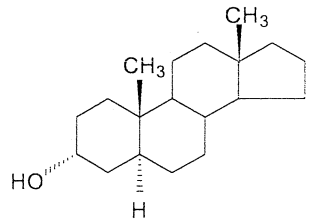
(c) Show how you would affect the following conversion.



Ergosterol

(30 marks)

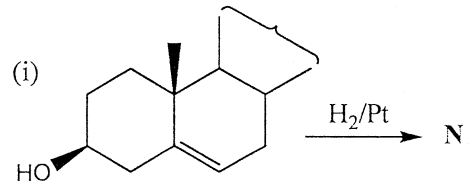
5. (a) Explain why 5α-androstan-3α-ol is more rapidly oxidized than 5α-androstan-3β-ol to the ketone by CrO_3 and glacial acetic acid.

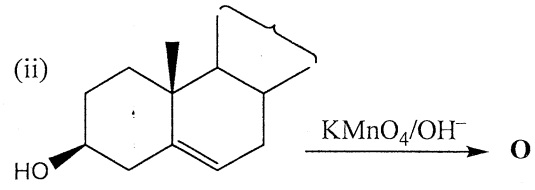


5α-androstan-3α-ol

(30 marks)

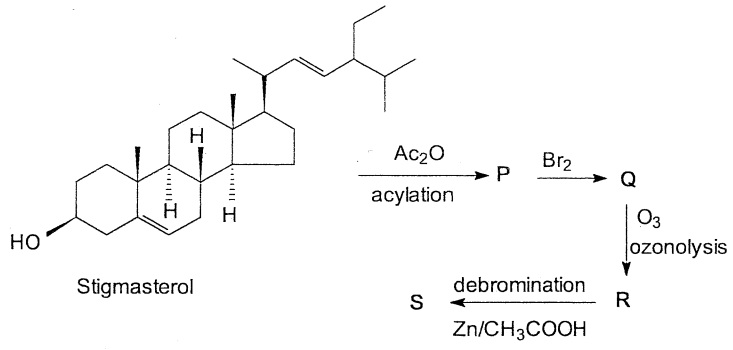
(b) Give the structures of the products (with their stereochemistry) of the following reactions.





(30 marks)

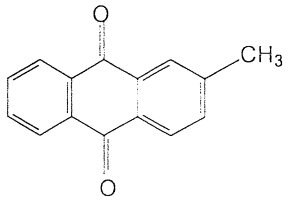
(c) Stigmasterol underwent the following reaction sequence.



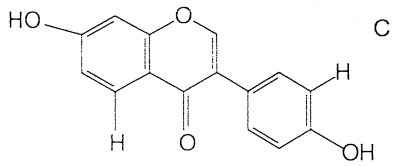
Propose structures for **P**, **Q**, **R** and **S** of this reaction.

(40 marks)

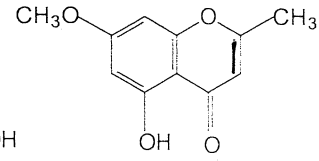
6.(a) Clearly state the basic skeleton giving the appropriate carbon number and the class of the following compounds. (See example worked below).



(i)

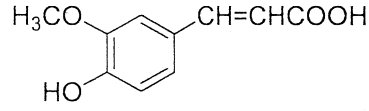


(ii)



(iii)

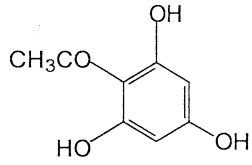
Example



Basic skeleton : C_6-C_3
Class : hydroxycinnamic acid

(30 marks)

(b) (i) Draw the structure of the polyketide (**T**) involved in the biosynthesis of trihydroxyacetophenone.

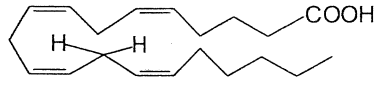


trihydroxyacetophenone

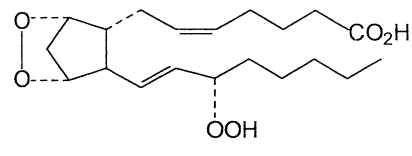
(ii) Indicate the mechanism by which trihydroxyacetophenone is formed from **T**.

(30 marks)

(c) (i) Indicate the mechanism of the reactions involved in the biosynthesis of the prostaglandin PGG_2 from arachidonic acid, stating the name of the enzyme involved in the reaction.



arachidonic acid



PGG_2

(40 marks)