THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. DEGREE PROGRAMME / STAND ALONE COURSE 2011/2012

LEVEL 5-FINAL EXAMINATION

CHU 3130/CHE 5130-INTRODUCTION TO NATURAL PRODUCTS CHEMISTRY

Time: 2 HOURS

Friday 30th December 2011 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.

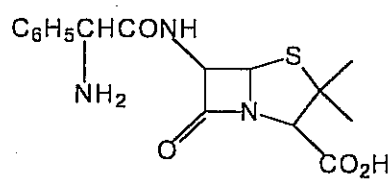
1. (a) Fill the table given below with the spray reagents that can be used to detect the following secondary metabolites by tlc and state the colour observed in each case.

Class of compounds	Spray reagent	Colour observed
Essential oils		
Flavonoids		
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)

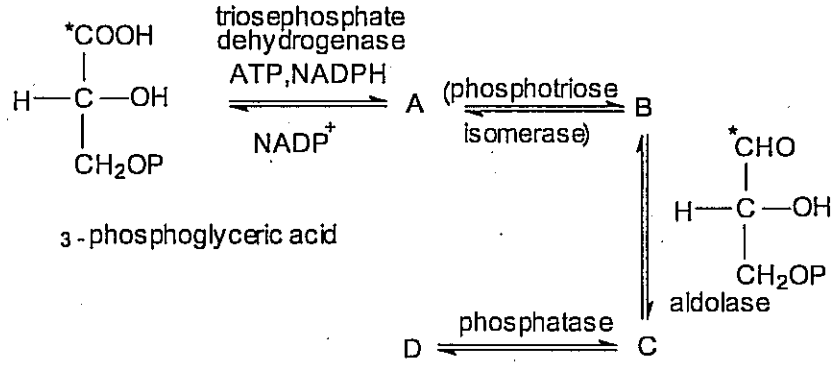
(c) What are co-enzymes? Give three examples with their specific role in biochemical reactions.

(20 marks)

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

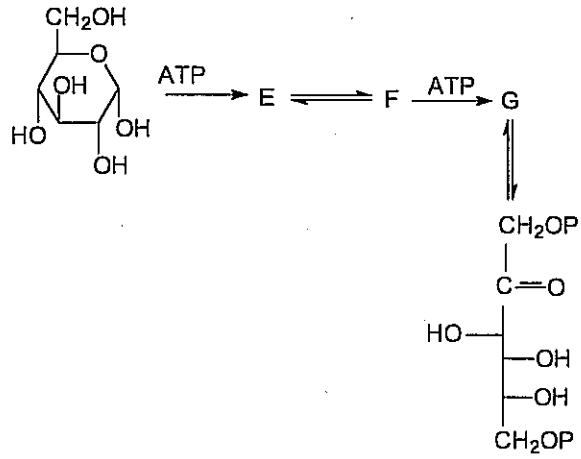
(16 marks)

2.(a) Propose the structures of the products A, B, C and D when 3-phosphoglyceric acid under goes the following reaction sequence during photosynthesis. Indicate the position of the labeled carbon atom(s) in the A, B, C and D formed by *.



(40 marks)

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



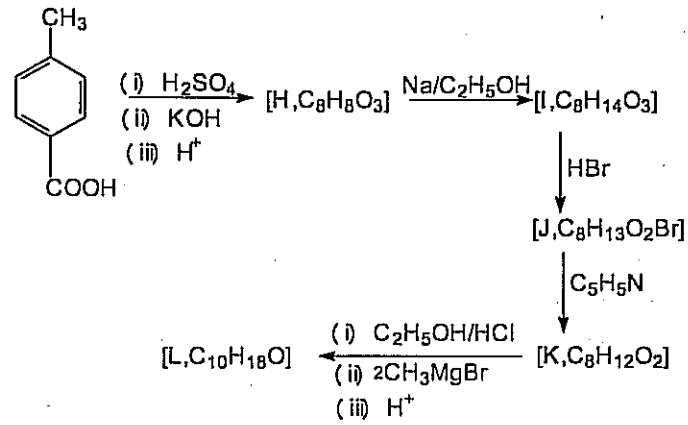
(30 marks)

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

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

(30 marks)

3. (a) p-Toluic acid under went the following reaction sequence.



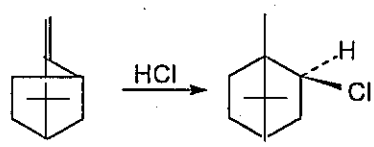
Propose structures for **H, I, J, K** and **L** of this reaction.

(40 marks)

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

(20 marks)

(c) Outline the mechanism of the following conversion.



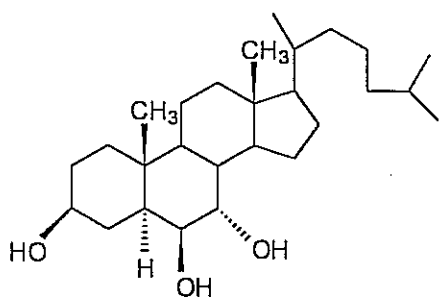
(20 marks)

(d) Give two examples of terpenoids used for the following industrial applications.

(i) perfumery
(ii) flavouring
(iii) colouring
(iv) pharmaceutical

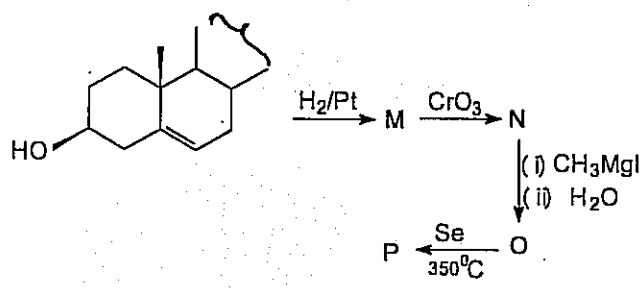
(20 marks)

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



5α-cholestane-3β, 6β,7α-triol (30 marks)

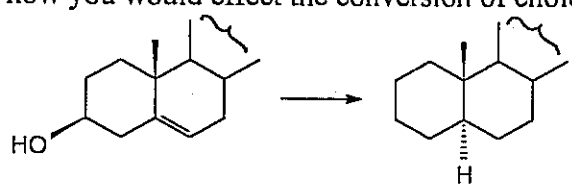
(b) Cholesterol undergoes the following reaction sequence.



Identify **M**, **N**, **O** and **P** in the above reaction sequence.

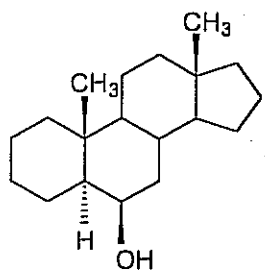
(40 marks)

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



Cholesterol 5α-cholestane (30 marks)

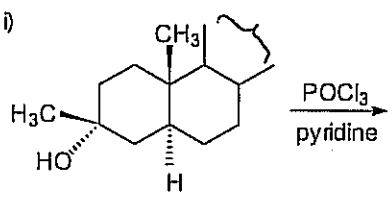
5. (a) Explain why 5α-androstan-6β-ol is oxidized to the ketone by CrO_3-aqueous acetic acid hundred times faster than 5α-androstan-6α-ol.



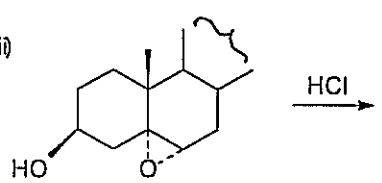
5α-androstan-6β-ol (30 marks)

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

(i)

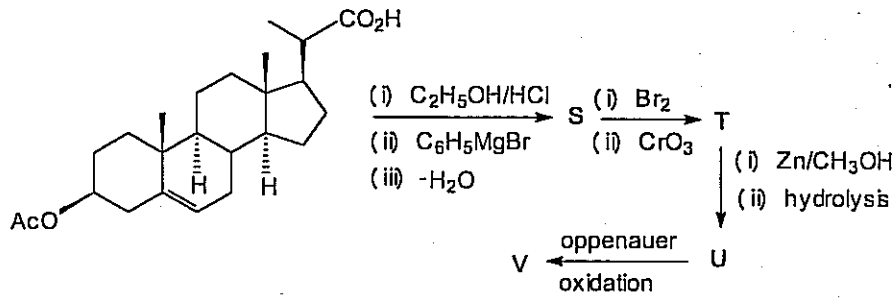


(ii)



(30 marks)

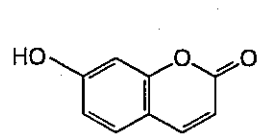
(c) Identify the compounds **S** to **V** in the synthetic scheme given below.



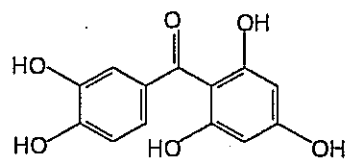
Propose structures for **S**, **T**, **U** and **V** of this reaction.

(40 marks)

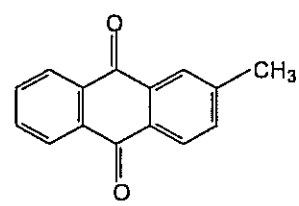
6.(a) Clearly state the basic skeleton giving the appropriate carbon number and the class of the following compounds. (See example worked below).



(i)

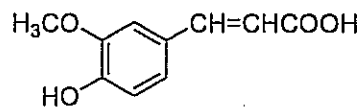


(ii)



(iii)

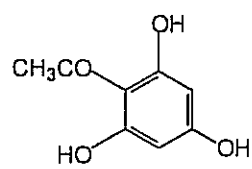
Example



Basic skeleton : C_6-C_3
Class : hydroxycinnamic acid

(30 marks)

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

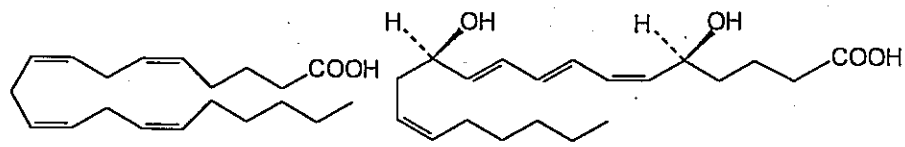


trihydroxyacetophenone

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

(30 marks)

(c) (i) Indicate the mechanism of the reactions involved in the biosynthesis of the leukotriene $B_4(LTB_4)$ from arachidonic acid, stating the name of the enzyme involved in the reaction.



arachidonic acid LTB_4

(40 marks)