THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. DEGREE PROGRAMME / STAND ALONE COURSE 2012/2013

LEVEL 5-FINAL EXAMINATION

CHU 3131/CHE 5131
THE CHEMISTRY OF AMINO ACIDS, SUGARS AND RELATED COMPOUNDS

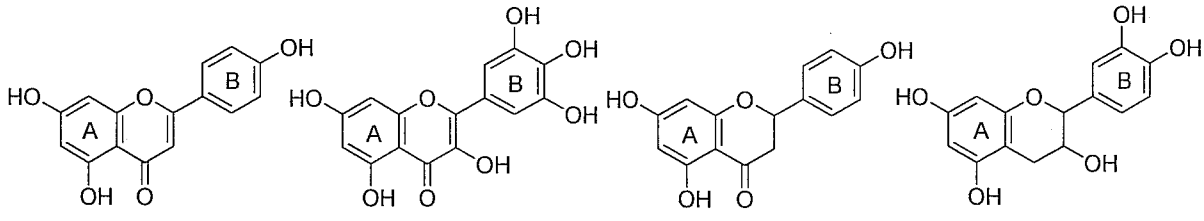
DURATION: 2 HOURS

Wednesday 11th December 2013 9.30a.m.- 11.30 a.m.

Answer any FOUR questions only.

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

1. Structures of some flavonoids are given below.



a) Flavonoids are C_6-C_3-C_6 phenolic compounds.
   i. Classify the above flavonoids into classes according to the oxidation of the C_3 link.
   ii. Indicate the biosynthetic routes that derive rings A and B.
   iii. Give the characteristic hydroxylation patterns of the aromatic rings in each of the biosynthetic route you mentioned above.

(50 marks)

b) UV spectrum of apigenin shows two bands in the regions 330-350 nm (Band I) and 275-280 nm (Band II) in 95% ethanol.

i. Draw the structures of apigenin corresponding to the bands mentioned above.

ii. What change would you observe in the spectrum when it is run with some alcoholic sodium acetate added to the solution?

iii. Give an explanation for the above observation in b) ii

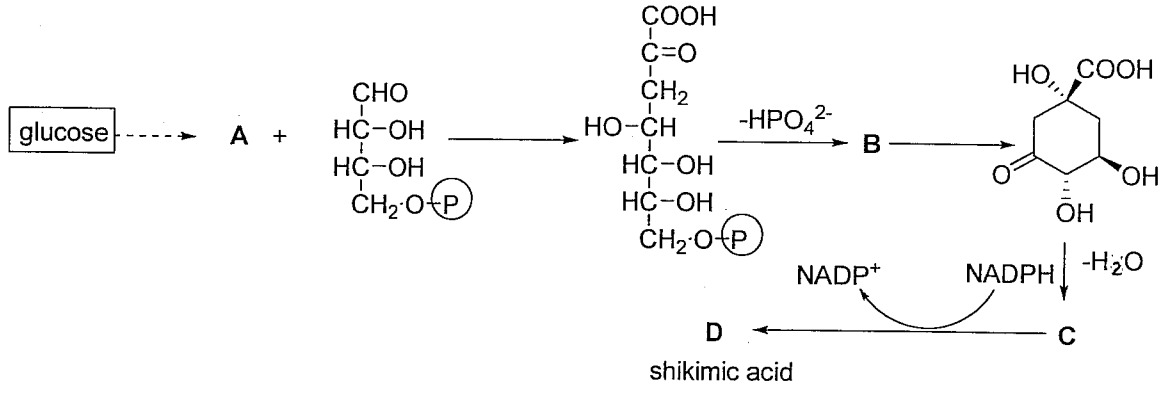
(40 marks)

c) Explain the difference you observe in the ^1H NMR spectra of apigenin and myricetin in relation to coupling of hydrogen atoms.

(10 marks)

2. Shikimic acid pathway produces natural products that contain aromatic rings.

a) Conversion of D-glucose into shikimic acid involves several steps. Complete the reaction scheme given below giving missing compounds labelled as A-D.



(20 marks)

b) Give the sub units of the following polyphenols which they are made up of.

i. Hydrolyzable tannins

ii. Condensed tannins

iii. Lignans

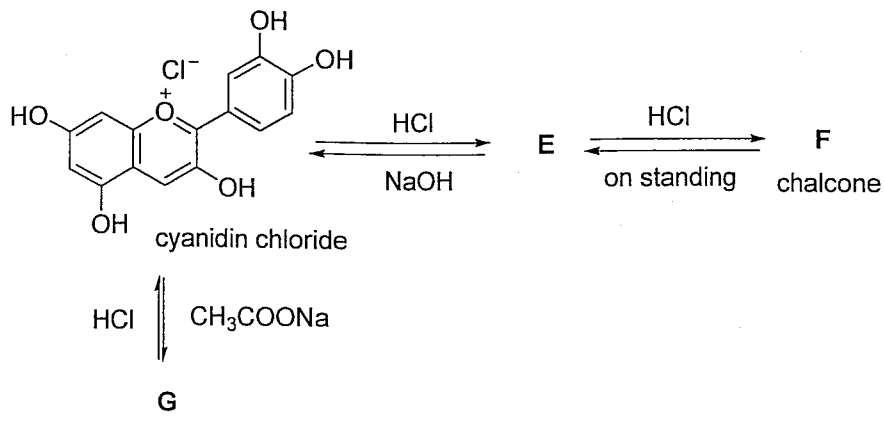
iv. Lignins

(30 marks)

c) List down four pharmacological applications of flavonoids.

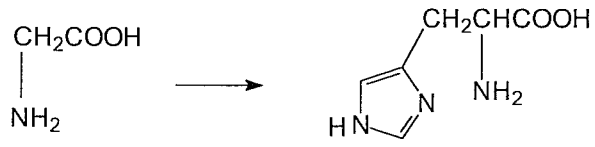
(20 marks)

d) The colours of anthocyanidins are pH dependant. Give the structures of the species labelled as **E – G** that are responsible for different colours.



(30 marks)

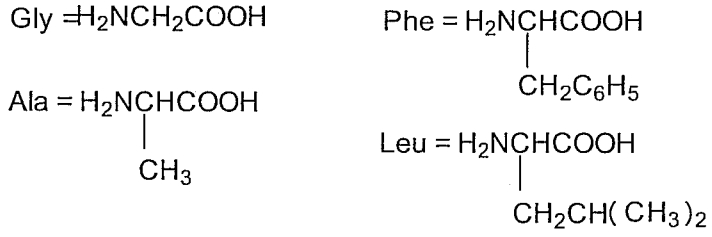
3. (a) How would you effect the following transformation? Give the necessary reagents and write the mechanism for the reaction.



glycine histidine

(30 marks)

(b) (i) Draw the structural formula for the peptide Gly.Gly.Ala.Phe.Leu.

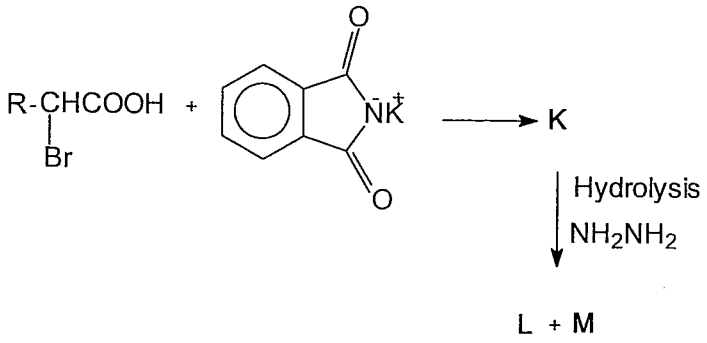


(ii) Give the reaction of the reagent, 1-fluoro-2,4-dinitrobenzene, with the above peptide chain.

(iii) How is this reaction used to identify the N-terminal amino acid of the peptide chain.

(40 marks)

(c) Draw the structures of the products (K-M) you would expect in the following reaction scheme.

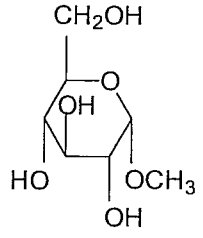


(30 marks)

4. (a)Draw the structures of the major product when methyl-α-D-glucopyranoside is treated with

(i) 8% HCl, H_2O

(ii) $PhCH_2Br/NaH/DMF$



methyl-α-D-glucopyranoside

(30 marks)

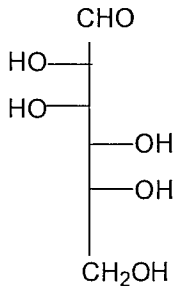
(b) Account for the fact that β-D-glucopyranose is a reducing sugar, while methyl- β-D-glucopyranoside is non reducing.

(20 marks)

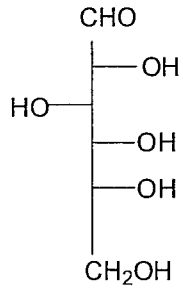
(c) (i) Give the product from the reaction of D-mannose with $PhNHNH_2$, show the intermediates and classify the product.

(iii) Give the product from the same reaction with D-glucose and account for the result.

(iv) What conclusion about epimers can be drawn from this reaction.



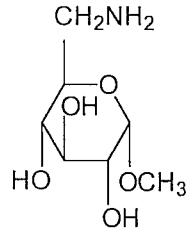
D - mannose



D - glucose

(25 marks)

(d) Show how would you convert D-glucose into the following compound.

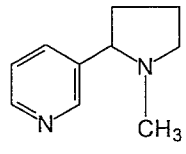


(25 marks)

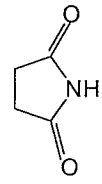
5.(a) A plant extract gave a positive response to the Dragendoff reagent. What group of natural products answer this test? How would you separate this group of compounds from the plant extract?

(20 marks)

(b) Outline the synthesis of nicotine starting from succinimide.



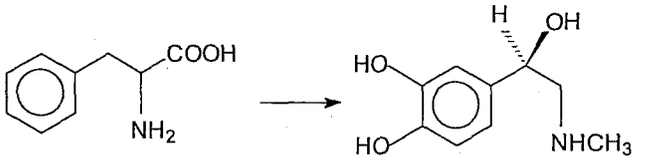
Nicotine



Succinimide

(40 Marks)

(c) Postulate the biosynthetic pathway leading to adrenaline from phenylalanine.



Phenylalanine Adrenaline

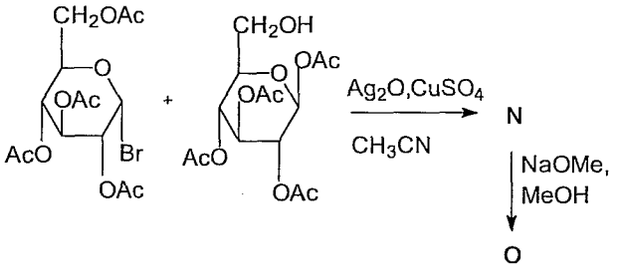
(40 marks)

6.

(a) Nonreducing trehalose, $C_{12}H_{22}O_{11}$ is hyrdolysed by α-glycosidase to D-glucose when trehalose is methylated and hydrolysed, only 2,3,4,6-tetra-O-methyl-D-glucopyranose is obtained. Deduce the structure of trehalose.

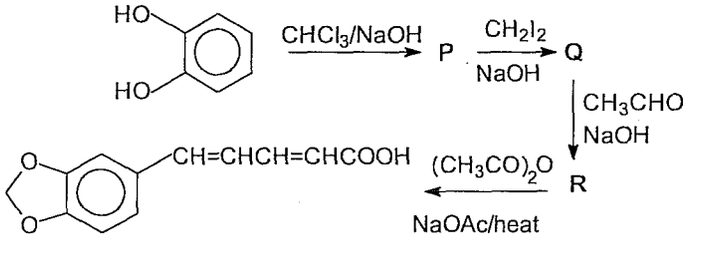
(40 Marks)

(b) Give the structures of compounds **N** and **O** in the following reactions.



(20 marks)

(c) Reactions involved in the synthesis of piperic acid are given below. Identify the compounds **P-R** in the following reaction scheme.



piperic acid

(40 marks)