



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2011/2012
FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE AND BACHELOR OF EDUCATION

SCH 410: INTRODUCTION TO NATURAL PRODUCTS CHEMISTRY

DATE: Wednesday, 30th November, 2011

TIME: 11.00 a.m. – 1.00 p.m.

INSTRUCTIONS: Answer **ALL** questions.

Q1.

With aid of suitable examples, explain the differences between the following pairs as applied in the study of natural products.

- (i) Fatty acids and polyketides
- (ii) Rubber and Gutta Percha
- (iii) Hormones and pheromones
- (iv) Morphine and cocaine
- (v) Testosterone and progesterone

(12 marks)

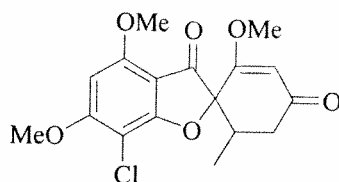
Q2

- (a) Oleic acid (18:1;9C) is one of the most widely distributed fatty acid in nature. Propose and outline the biosynthesis of oleic acid starting with acetic acid.

(8 marks)

- (b) Griseofulvin [1], an antifungal and antibiotic obtained from *Penicillium griseofulvum* is a representative of the heptaketide series. Outline the biosynthesis of **1** from its polyketides.

(10 marks)

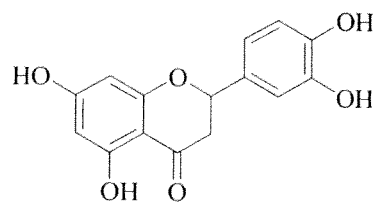


[1]

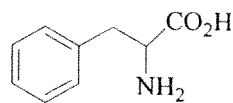
Q3

- (a) Outline the biosynthetic pathway of the flavonone, eriodictyol [2] from phenylalanine [3] and acetic acid.

(6 marks)



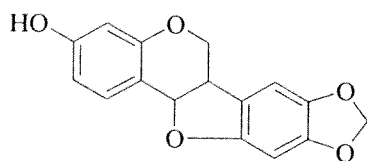
[2]



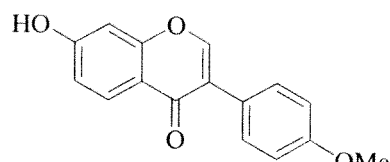
[3]

- (b) Maackiain [5], a pterocarpan, is believed to arise from the isoflavonoid formononetin [6]. Outline a possible biosynthetic pathway for 5 from 6.

(5 marks)



[5]



[6]

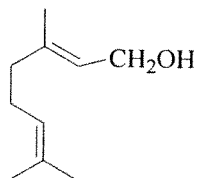
- (c) Explain the importance of ultraviolet (UV) spectroscopy in structural elucidation of flavonoids.

(3 marks)

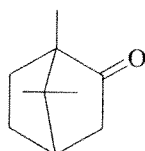
Q4

- (a) Geraniol [7] is a monoterpene that is present in flowers of various roses. Outline the biosynthetic route of geraniol from acetic acid through geranylpyrophosphate.

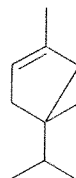
(7 marks)



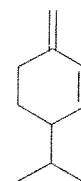
[7]



[8]



[9]



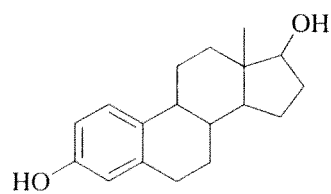
[10]

- (b) Camphor [8], α -thujene [9], and menthene [10] are cyclic monoterpenoids that are formed from geranylpyrophosphate (GPP) by the enzyme prenyl cyclase. Show mechanistically how 8, 9 and 10 are formed from GPP.

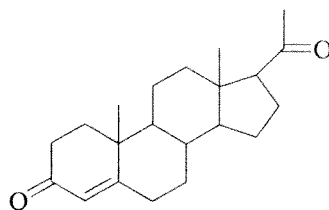
(6 marks)

- (c) Oestradiol [11] is one of the main female sex hormones and is biosynthesized from progesterone [12]. How does the conversion of 12 to 11 take place?

(4 marks)



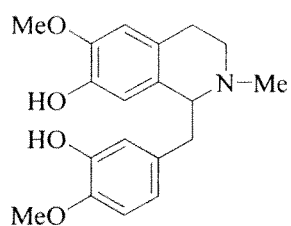
[11]



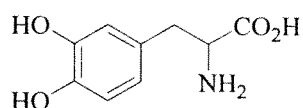
[12]

Q5.

- (a) Reticuline (*N*-methyllaudanosoline) [13] has been implicated in the biosynthesis of opium alkaloids like morphine, codeine and thebaine. Outline step by step the conversion of DOPA [14] to reticuline. (6 marks)

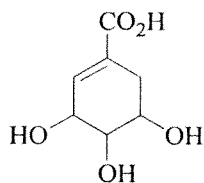


[13]

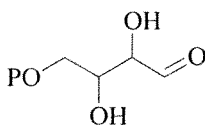


[14]

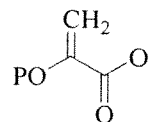
- (b) How is shikimic acid [15] biosynthesized from erythrose phosphate [16] and phosphoenolpyruvate (PEP) [17]? (5 marks)



[15]



[16]



[17]

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