KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2010/2011

INSTITUTIONAL BASED PROGRAMME (IBP) – AUGUST SESSION

EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE

SCH 532: NATURAL PRODUCTS CHEMISTRY

DATE: MONDAY 2ND JANUARY 2012 TIME: 9.00 A.M -12.00 NOON

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

(10 marks)

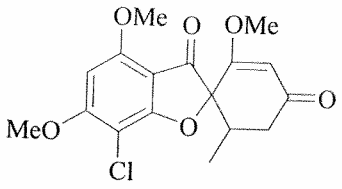
Q2

(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.

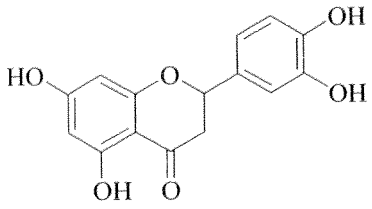
(10 marks)



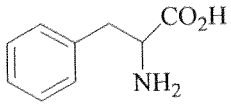
[1]

Q3

(a) Outline the biosynthetic pathway of the flavonone, eriodictyol [**2**] from phenylalanine [**3**] and acetic acid. (7 marks)



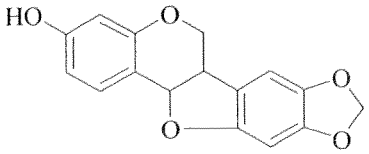
[2]



[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)



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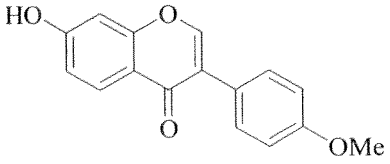


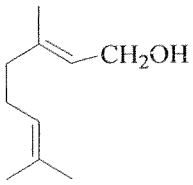
[6]

(c) Explain the importance of ultraviolet (UV) spectroscopy in structural elucidation of flavonoids. (4 marks)

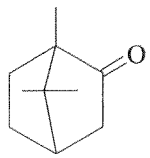
Q4

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

(7 marks)



[7]



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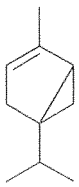

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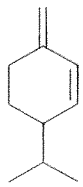
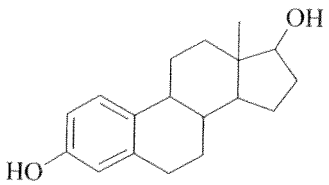


[10]

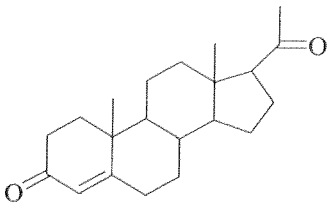
(b) Camphor [8], α-thujene [9], and menthene [10] are cyclic monoterpenoids that are formed from geranylpyrophosphate (GPP) by the enzyme prenylcyclase. Show mechanistically how 8, 9 and 10 are formed GPP. (6 marks)

(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]

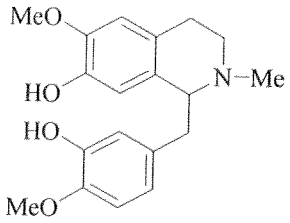


[12]

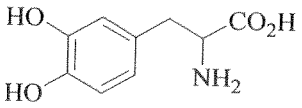
Q5.

(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)



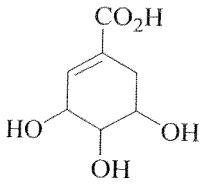
[13]



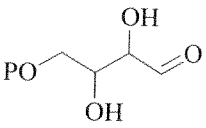
[14]

(b) How is shikimic acid [15] biosynthesized from erythrose phosphate [16] and phosphoenol pyruvate (PEP) [17]?

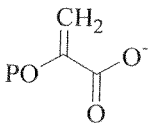
(5 marks)



[15]



[16]



[17]

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