



# KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS  
2019/2020 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER  
EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE

**COURSE CODE:** SCH 431

**COURSE TITLE:** NATURAL PRODUCTS CHEMISTRY

**DATE:** 6<sup>TH</sup> NOVEMBER, 2020

**TIME:** 9:00AM-12:00PM

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## INSTRUCTIONS TO CANDIDATES:

TIME: 3 Hours

Answer **question ONE** and **any TWO** of the remaining

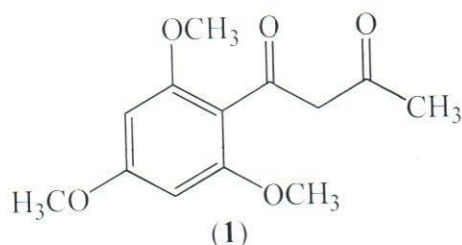
1(a) The isoprene unit is a key precursor in biosynthesis of terpenes. Describe the mechanism of its formation from acetyl CoA [5mks]

(b) Compare malonyl CoA and Acetyl CoA pathway in the synthesis of terpenes [5mks]

(c) Discuss the shikimic [5mks]

(d) Describe the polyketide pathways of biosynthesis of phenols [5mks]

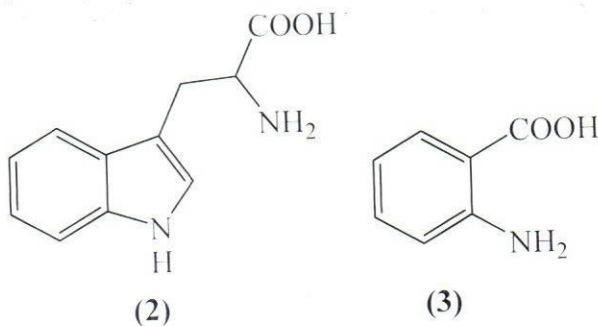
(e) Eugenone (1) can be biosynthesized from acetyl CoA through the polyketide pathway. Outline the correct mechanism of this process [5mks]



(f) Propose a general biosynthetic pathway for alkaloids [5mks]

## QUESTION TWO

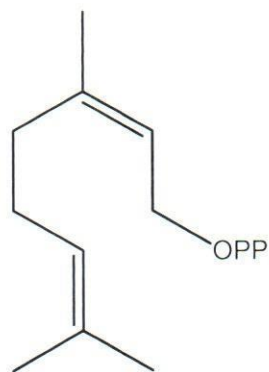
(a) Tryptophan amino acid (2) can be biosynthesized from anthranilic acid (3) through shikimic acid pathway. Show the mechanism of this process [10mks]



(d) Cyclization of squalene in biosynthesis of terpenes generate the C-30 steroid nucleus. Outline the biosynthesis of squalene from acetyl CoA [10mks]

## QUESTION THREE (20 Marks)

3(a) Cyclization of geraniol pyrophosphate (4) through the terpenyl cation intermediate (5) forms limonene (6). Show the mechanism of this reaction [10mks]



(4)

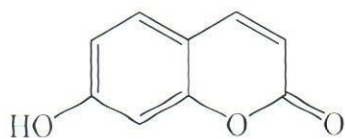


(5)

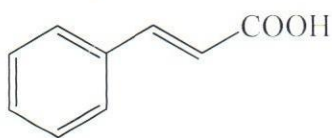


(6)

(b) Umbelliferone (7) can be synthesized from cinamic acid (8) in the shikimic acid pathway. Outline the mechanism of this processes [10mks]



(7)

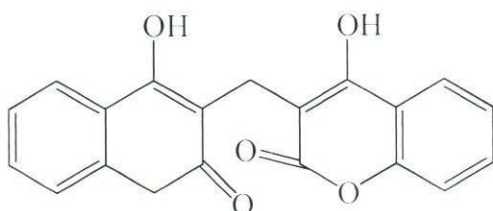


(8)

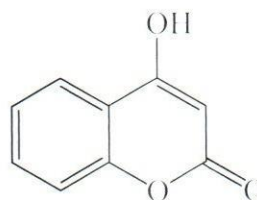
**QUESTION FOUR (20 Marks)**

4(a) With specific examples, outline the application of aldol and claisen condensation reactions in biosynthesis of natural products [10mks]

(b) Dicoumarol (9) can be synthesized from 4-hydroxycoumarin (10) in the shikimic acid pathway. Predict the mechanism for this process [10mks]



(9)



(10)

QUESTION FIVE (20 Marks)

5. Lanosterol is a common triterpenoid in plants. Outline its biosynthetic scheme starting with acetyl CoA [20mks]

KIBU observes ZERO tolerance to examination cheating