

**University of Swaziland**  
**Final Examination – 2017**

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**TITLE OF PAPER : Natural Products I**

**COURSE NUMBER : CHE 605**

**TIME : Three Hours**

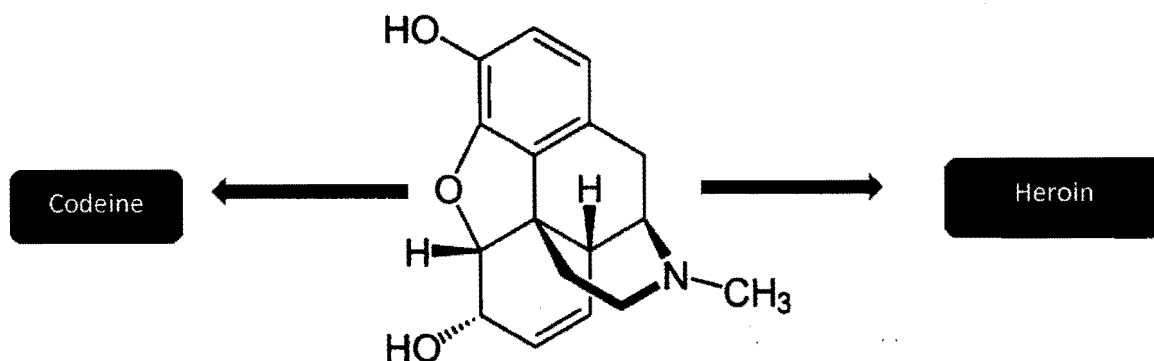
**INSTRUCTIONS:**

**Answer any four (4) questions of the six (6) questions and every question holds 25 marks.**

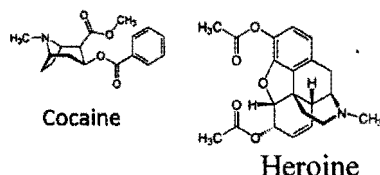
**NB: all questions are to be answered in a separate answer sheet.**

### Question (1)

- i) Morphine is a natural product that is a psychoactive chemical and it is an opioid analgesic drug that directly acts on the nervous system. Compare the bioactivity between morphine, codeine and heroin. What is responsible for the difference in Bioactivity? (10)



- ii) What is the mechanism of action between Heroin and Cocaine? Compare the effect of these two alkaloids and compare them functionally. (9)



- iii) What causes the difference in effect between these two opioids? (6)

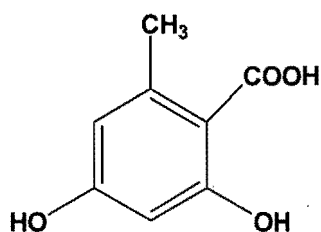
### Question (2)

- i) Significant amount of labor, time and financial resources have been channeled to natural products research. Why are natural products important? Explain Taxol and use Taxol as an example in your explanation. (8)
- ii) The functions of terpenes in plants is generally considered to be both ecological and physiological. Name three functions of terpenes and state the name of the 5-carbon unit that forms the basis of classification of terpenes and draw its basic structure. (8)
- iii) State four classes of terpenes based on the number of the above 5-carbon units. (4)

- iv) How do terpenoids polymerize? Elaborate your answer with an example? (5)

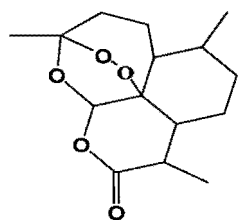
**Question (3)**

- i). what is the difference between biosynthesis, biomimetic synthesis and laboratory synthesis? (8)
- ii). Write down and explain the biosynthesis of mono Terpenoids starting from isoprene unit to Limonene, Terpinol and Cineole. Similarly, write down the biosynthesis of Coniine starting from Acetate and Malonate. (6)
- iii). Propose a biosynthetic pathway for orsellinic acid from acetyl coenzyme A. (5)

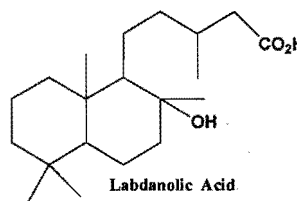


Orsellinic acid

- v) Show how an isopentenyl moiety will be incorporated into the following two Terpenes. (6)



Artemisinin



Labdanolic Acid

**Question (4)**

- i) Plants prepare their own food while animals do not. What does this statement mean chemically? Explain in detail. (8)
- ii) What things do plants do that animals cannot do? (5)
- ii) Why do plants and animals produce secondary metabolites? (7)
- iii) Do humans produce secondary metabolites? (5)

**Question (5)**

Write a short essay on natural alkaloids, terpenoids and flavanoids with focus on the following general aspects.

- i. Definition (5)
- ii. Occurrence, distribution (6)
- iii. Chemical properties (6)
- iv. Biosynthesis (8)

**Question (6)**

- i) Develop a natural products research frame flowchart addressing the different components of research in natural products. (7)
- ii) How do we determine the chemical identity of Natural products? (12)
- iii) What does X-ray contribute in structural identification of natural products? (6)