



## TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF APPLIED AND HEALTH SCIENCES  
DEPARTMENT OF ENVIRONMENT & HEALTH SCIENCES

**UNIVERSITY EXAMINATION FOR:  
BACHELOR OF SCIENCE IN MARINE RESOURCE MANAGEMENT**

**BSMR/13S/YEAR 4/ SEMESTER 2  
AES 4411: MARINE BIOTECHNOLOGY  
END OF SEMESTER EXAMINATION**

**SERIES: JULY 2017**

**TIME: 2 HOURS**

***Instructions to Candidates***

This paper consists of FIVE questions

Answer question ONE (COMPULSORY) and any other TWO questions.

***This paper consists of two printed pages.***

***Mobile phones are NOT allowed in the examination room***

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**QUESTION ONE (30 MARKS)**

- i) Composting (1mark)
- ii) Biopiles (2 marks)
- iii) Bioventing (2 marks)
  
- b) (i) Name four marine phyla groups from which new natural products have been extracted (2 marks)  
  
(ii) Outline three advantages of biophytoremediation (3marks)
  
- c) (i) What is marine bioprospecting? (2 marks)  
(ii) State three reasons why marine organisms produce natural products (3 marks)
  
- d) (i) State two bioactive natural products derived from marine sponges (2 marks)  
  
(ii) List three limitations to a successful biodegradation processes (3 marks)
  
- e) (i) What is the role of microbes in the carbon cycling? (1 marks).  
(ii) State four marine microbes from which natural products that have potential as drugs can be derived (4 marks)

- f) List five marine invertebrates that contribute extracts for biotechnological development (5 marks).

**QUESTION TWO (20 MARKS)**

Discuss five roles of molecular approaches (genetics) in aquaculture (20 marks).

**QUESTION THREE (20 MARKS)**

Marine bioprospecting occurs most frequently in international waters, and hence, the associated issues of cross border conservation, resource management and regulations naturally arise; in view of these concerns; Discuss any five International environmental agreements which a state must sign before undertaking marine bioprospecting.

**QUESTION FOUR (20 MARKS)**

Discuss five industrial or sectoral applications of marine natural products

*Discussion based on:*

**QUESTION FIVE (20 MARKS)**

Explain any five importance of marine biotechnology in bio-economic growth at a global scale