MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2016/2017

THIRD YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN FISHERIES AND AQUACULTURE AND BACHELOR OF SCIENCE IN AQUATIC RESOURCE CONSERVATION & DEVELOPMENT WITH INFORMATION TECHNOLOGY

MAIN CAMPUS

AFN 304: BIOTECHNOLOGY IN FISHERIES SCIENCES

Date: 22nd June, 2017 Time: 8.30 - 11.30am

INSTRUCTIONS:

- Answer ALL Questions in section A and Question 9 and any other THREE in section B.

Section A: Answer ALL questions from this section (40 marks)

1. Define the following terms as applied in Biotechnology:
   a. Animal pharming (2 marks)
   b. Transgenic fish (2 marks)
2. Explain briefly how triploidy is achieved in fish breeding (5 marks)
3. Highlight any FIVE reasons why there has been opposition to patenting of live forms and living organisms, despite the insistence by WTO for countries to do so (5 marks)
4. Using TWO examples, explain the main genetic mechanism that allows inter-specific hybridization of some tilapia species to produce all-male progeny (5 marks)
5. (a). Describe briefly the process of Somatic Cell Nuclear Transfer in Livestock species (2 marks)

   (b). Explain why clones may differ from each other, despite carrying exactly the same genetic information in their chromosomal DNA (3 marks)
6. Highlight any FIVE applications of DNA fingerprinting in Forensic Biotechnology (5 marks)
7. Outline any FIVE characteristics of effective probiotics (5 marks)
8. Distinguish the following terms as applied in biotechnology
   a. Horizontal gene transfer and vertical gene transfer (2 mark)
   b. Meiogen and mitogynote (2 marks)
   c. Restriction enzyme and DNA ligase (2 marks)

Section B: Answer Question 9 (Compulsory) any other THREE questions from this Section (30marks)

9. A research facility specializing in broodstock production has been contracted by a fish farm to produce 80 YY *Oreochromis niloticus* males (Supermales) as part of its 3 year broodstock upgrading program. The research facility does not intend to use any sophisticated equipment/technology in achieving this goal:
   (Where applicable, assume each female broodstock produces 75 offspring that survive to maturity)

   a. As one of the technicians within the facility, describe the technique that would be adopted and the steps that would be involved in achieving the above target. (5 marks)

   b. For the facility to be able to successfully produce the contracted number of Supermales, it needs to target 15% more than the required amount. Calculate the number of feminized (XY) females that would be required in order to achieve this target (4 marks)

10. Discuss any THREE non-reproductive biotechnology applications in Fisheries Sciences (7 marks)

11. Discuss the following methods of gene transfer

    a. Calcium Phosphate mediated DNA transfer (4 marks)
    b. Biolistics (Microprojectiles) (3 marks)

12. Discuss the major public consumer concerns about Biotechnology in regard to:

    a. Animal welfare considerations (4 marks)
    b. Environmental concerns (3 marks)

13. Describe how production of YY *Oreochromis niloticus* males is achieved by integrating endocrine and meiotic gynogenesis techniques (7marks)