

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

FOURTH YEAR EXAMINATION FOR THE AWARD OF DEGREE
OF BACHELOR OF BIOMEDICAL SCIENCE AND TECHNOLOGY

BMED 448: FUNDAMENTALS OF BIOENGINEERING

STREAMS: B.Sc (BMED) Y4S1

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 5/12/2018

8.30 A.M - 10.30 A.M.

INSTRUCTIONS

- Answer question **ONE (COMPULSORY)** and any other **TWO** questions.
- Sketch diagrams may be used whenever they may help to illustrate your answer.
- Do not write anything on the question paper.
- This is a closed book exam. **No** reference materials are allowed in the examination room.
- There will be **No** use of mobile phones or any other unauthorized materials.
- Write your answers legibly and use your time wisely.

QUESTION ONE: [30 MARKS]

- (a) You have been assigned work as a senior scientist in an institution that processes various active pharmaceutical ingredients for commercial purposes.
- (i) Discuss the bioengineering and recovery protocol you would employ when manufacturing penicillin [8 Marks]
 - (ii) Discuss the protocol that you can employ during downstream processing. [7 Marks]
- (b) A researcher from the institution you were working wanted to procure a new biomedical apparatus. He wanted an apparatus with good display and a biosensor
- (i) Briefly discuss some of the several types of display devices that the scientist can find in a biomedical instrumentation in the current market. [8 Marks]

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- (ii) Briefly explain to him some of the major classes of biosensors mentioning the major quantities monitored by them. [7 Marks]

QUESTION TWO: [20 MARKS]

- (a) Streptomycin is a common antibiotic used in management of bacterial infection in modern medicine. Discuss the bioengineering and purification process of streptomycin in a bioengineering laboratory. [8 Marks]
- (b) Briefly discuss some of the major functions performed by a processor in biomedical instrumentation systems. [6 Marks]
- (c) Briefly discuss the meaning of the following terms in relation to bioengineering:
- (i) Biomaterial [2 Marks]
 - (ii) Biological material [2 Marks]
 - (iii) Bio-compatibility [2 Marks]

QUESTION THREE: [20 MARKS]

- (a) During the process of downstream processing it is important to disrupt the cells. Briefly describe the process of cell disruption as it is carried out in downstream processing. [8 Marks]
- (b) A transducer plays a very important role in biomedical instruments. Discuss three general requirements for transducers used in instrumentation systems. [3 Marks]
- (c) Permanent implants are associated with some health problems; enumerate five (5) problems associated with permanent implants. [5 Marks]
- (d) Discuss four (4) advantages of biodegradable implants. [4 Marks]

QUESTION FOUR: [20 MARKS]

- (a) Briefly explain the meaning of the following terms in relation to their application in the field of bioengineering [3 Marks]
- (i) Sensitivity
 - (ii) Stability
 - (iii) Specificity
- (b) Discuss the biocompatible material features of biomaterials used in bioengineering. [4 Marks]
- (c) Briefly explain what is a biodegradable implant. [1 Mark]
- (d) Discuss three (3) main advantages of magnesium based alloys used in bioengineering for

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manufacturing of biomedical important biomaterials.

[3 Marks]

(e) Briefly explain what a biosensor is and explain its uses in the field of bioengineering?

[4 Marks]

(f) Discuss various laboratory test conducted in the implant manufacturing industry to ensure that materials used are of no harm to human.

[5 Marks]

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