NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION : BACHELOR OF SCIENCE (Hon)	
QUALIFICATION CODE:	**LEVEL:** 8
COURSE CODE: AMB821S	**COURSE NAME:** ADVANCED MICROBIOLOGY
SESSION: FEBRUARY 2023	**PAPER:** THEORY
TIME: 3 HOURS	**MARKS:** 100

SECOND OPPORTUNITY/SUPPLEMENTARY EXAMINATIONS QUESTION PAPER	
EXAMINER(S)	**DR MUNYARADZI ZIVUKU**
MODERATOR:	**PROF JANE MISIHAIRABGWI**

Instructions

1. Answer **all** questions
2. Answer the questions in the booklet provided
3. Write clearly and neatly
4. All written work MUST be done in blue or black ink
5. Mark all answers clearly with their respective question numbers

THIS QUESTION PAPER CONSISTS OF 4 PAGES

(INCLUDING THIS FRONT PAGE)

SECTION A (40 MARKS)

QUESTION 1 (20)

You wish to determine the number of bacteria in an actively growing broth culture of *E. coli*. To do this you remove 1.0 ml of the culture from the flask and dilute this in 9 ml of nutrient broth to obtain 10^{-1} dilution. You then serially dilute the sample further until you obtain a range of dilutions between 10^{-2} and 10^{-6}. From each dilution you then spread plate 0.1 ml of suspension onto the nutrient agar and incubate overnight. The next morning you obtain the following results.

Dilution	Colonies on plate
Neat	Too many to count
10^{-1}	Too many to count
10^{-2}	Too many to count
10^{-3}	280
10^{-4}	27
10^{-5}	2
10^{-6}	0

1.1 Determine how many bacterial colonies per ml there were in the original sample taken from overnight culture. Show your working. (4)

1.2 You adjust the density of the cell suspension so that there are 1 x10^{6} bacteria per ml in broth and add 1 ml of this to a new culture flask. Assuming exponential growth and a doubling time of 30 minutes, how many bacteria will be in the flask after 5 hours? Show your working. (4)

1.3 Briefly define the term coliforms and their role in the diagnostics of waste water treatment. (4)

1.4 The occurrence of plasmids in microorganism is a necessary evil. Discuss the statement. (8)

QUESTION 2 (20)

2.1 Briefly outline five factors leading to the emerging of infectious diseases in the 21st century. (10)

2.2 The basic reproductive number, (R_o), defines the mean number of individuals directly infected by an infectious case through the total infectious period, when introduced to a susceptible population, and is given by the equation

- $R_o = p \,.\, c.\, d$

Define the terms p, c, d and how they can be used to combat infections such STI. (4)

2.3 Briefly evaluate the implication of R_o as used in epidemiology. (6)

QUESTION 3 (20)

You have been hired as a consultant for a large multi-corporation specializing in

pharmaceutical products to advise how they can set up a plant to produce an antibiotic for the local farmers.

3.1 Considering that the human resources and financial aspects are taken care of by the organization, what technical information would you advise the management requirements to start the production of the antibiotics? Justify your selection of the requirements needed for fermentation. (5)

3.2 Some board of directors for the new company may be interested in procurement of a large fermenter but are still not sure whether to settle for a batch fermenter or continuous fermenter. Briefly discuss why it will be ideal to purchase a batch fermenter as opposed to a continuous fermenter to produce the antibiotic. (5)

3.3 You are also asked to write a short report of how the antibiotic will be produced in the new proposed plant. Briefly outline how the antibiotic will be produced in your proposed fermentation vat. (10)

QUESTION 4 [20 MARKS]

4.1 Discuss the impact of pollution in the environment and human beings. (6)

4.2 Evaluate the application of genetically engineered strains of microorganism and plants in the clean-up of environments contaminated with pollutants. (6)

4.3 Briefly describe the principle underlying the Disk Diffusion Method of antibiotic sensitivity testing and how it differs from Kirby Baeur Method. (8)

QUESTION 5 (20)

5.1 Briefly explain the conditions necessary for a pathogen to cause disease. (4)

5.2 Outline the pathogenic properties of virus. (5)

5.3 With the aid of an annotated diagram, discuss the role of antigen presenting cell in cell mediated immunity following the entry of an infectious agent in the human body and its eventual removal from the body. (10)

END OF QUESTION PAPER