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SECOND OPPORTUNITY EXAMINATIONS

QUALIFICATION : **BACHELOR of SCIENCES HONOURS**	
QUALIFICATION CODE: **08BOSC**	LEVEL: **8**
COURSE: **ADVANCED MICROBIOLOGY**	COURSE CODE: **AMB821S**
DATE: **NOVEMBER 2024**	SESSION: **1**
DURATION: **3 HOURS**	MARKS: **100**

EXAMINER: *Mr Petrus Tuhafeni Paulus*

MODERATOR: *Prof Jane Misihairabgwi*

INSTRUCTIONS

1. Answer all questions in section A and any **two** questions from section B.
2. Each question must be answered on the separate answer sheet.
3. Please write neatly and legibly.
4. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
5. No books, notes and other additional aids are allowed.
6. Mark all answers clearly with their respective question numbers.

PERMISSIBLE MATERIALS

1. Non-Programmable Calculator

This PAPER consists of 5 pages including this front page

SECTION A: [60 MARKS]

QUESTION 1 (20)

1.1 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.

1.1.1 Considering that the human resources and financial aspects are taken care of by the organization, what technical information would you advise the management, which is needed tostart the operation. Justify your selection of the requirements needed for fermentation. (5)

1.1.2 Some of the 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 for the production of an antibiotic. (5)

1.1.3 You are also asked to write a short report of how the antibiotic will be produced from a simple laboratory experiment. Briefly outline how the antibiotic will be produced in your fermentation vat. (10)

QUESTION 2 (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 serial 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 have 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

2.1 Determine how many bacteria per ml there were in the original sample taken from the overnight culture. Show your working. (3)

2.2 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 anda doubling time of 30 minutes, how many bacteria will be in the flask after 5 hours. Show your working. (3)

2.3 Write short notes on the preservation and maintenance of microorganisms (8)

2.4 Briefly discuss the use of coliforms as diagnostic tools in food and water samples. (6)

QUESTION 3 **(20)**

3.1 Differentiate between transcriptomes and proteomes. (4)

3.2 Explain the importance of measurements of gene expressions. (6)

3.3 Discuss how infectious diseases such Ebola virus can be prevented and controlled. **(10)**

SECTION B [40 MARKS]

Answer only two questions from this section. Each question carries 20 marks

QUESTION 4 **(20)**

4.1 Briefly explain the conditions necessary for a pathogen to cause disease. (5)

4.2 The occurrence of plasmids in microorganism is a necessary evil. Discuss the statement? (5)

4.3 Outline the pathogenic properties of virus. (5)

4.4 Give an account of the application of amylases enzymes in food industry. (5)

QUESTION 5 **(20)**

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

5.2 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 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)

5.3 Briefly evaluate the implication of Ro as used in epidemiology. (6)

QUESTION 6 **(20)**

6.1 Differentiate between exotoxins and endotoxins. (4)

6.2 Write short notes on antigen presenting cells (APC) (4)

6.3 Give the major events in the primary and secondary immune responses. (6)

6.4 Discuss the benefits of human gut microbiome. (6)

QUESTION 7 **(20)**

7.1 Discuss the role of lactic acid bacteria in the production of hard cheese such as Gouda. (10)

7.2 Outline the benefits of human gut microbiome. (10)

END OF EXAM