



MANICALAND STATE UNIVERSITY OF APPLIED SCIENCES

FACULTY OF ENGINEERING

CHEMICAL AND PROCESSING ENGINEERING DEPARTMENT

BIOCHEMICAL ENGINEERING

CODE: HCHE 315

SESSIONAL EXAMINATIONS

DECEMBER 2022

DURATION: 3 HOURS

EXAMINER: ENG P. SIGAUKE

INSTRUCTIONS

1. *Answer ALL questions*
2. *Each question carries 25 marks*

QUESTION 1

- a) Fully describe any **five** applications of biochemistry. [10]
- b) In metabolism, what is meant by *catabolism* and *anabolism*. [3]
- c) Draw structures of straight chain glucose and glucopyranose. [4]
- d) Identify any **four** lipids and state their biological functions. [4]
- e) Give one [1] example of prokaryote and three [3] examples of eukaryotes organisms. [4]

QUESTION 2

- a) What is meant by *bacterial growth*? [2]
- b) Fully describe the processes involved during the five stages of bacterial growth. [10]
- c) Calculate the time needed to double the growth rate of bacteria if the specific growth rate is 2.18 per hour. [3]
- d) What is meant by upstream bioprocessing in bacterial growth context? Identify various steps that are involved in upstream bioprocessing. [5]
- e) Draw a fully labeled schematic diagram batch type bioreactor for growing bacteria. [5]

QUESTION 3

- a) What is meant by the term *bioreactor*? [1]
- b) List **four** key differences between a chemical reactor and a bioreactor. [4]
- c) Outline the advantages and disadvantages of *continuous* bioreactions. [8]
- d) Identify **nine** bioreaction parameters that are important in bioreactor design and explain their importance [12]

QUESTION 4

- a) Describe **two** proposed models explaining the specificity of interaction between enzymes and substrates. Include diagrams [6]

- b) Draw a fully labeled saturation curve for an enzyme showing the variation of substrate concentration with speed of reaction. [6]
- c) Construct Michaelis Menten plots and Lineweaver plots for *competitive*, *noncompetitive* and *uncompetitive* enzyme inhibitors. [6]
- d) Name any **four** inhibitors that are crucial in pharmaceuticals. [4]
- e) Fully describe the action of ethanol as an important enzyme inhibitor in pharmaceutical industry. [3]

END OF EXAM