



UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023**

COURSE NAME	:	PROCESS & SUSTAINABILITY IN BIOTECHNOLOGY
COURSE CODE	:	BNN 20403
PROGRAMME CODE	:	BNN
EXAMINATION DATE	:	JULY/AUGUST 2023
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER ALL QUESTIONS. 2. THIS FINAL EXAMINATION IS A PHYSICAL ASSESSMENT AND CONDUCTED VIA CLOSE BOOK . 3. STUDENTS ARE PROHIBITED TO CONSULT THEIR OWN MATERIAL OR ANY MATERIAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK.

THIS QUESTION PAPER CONSISTS OF **THREE (3)** PAGES

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- Q1** (a) List **SIX (6)** stages of a life cycle of a product. (3 marks)
- (b) Explain what is a “Life Cycle Assessment (LCA)” and explain **THREE (3)** advantages of LCA (6 marks)
- (c) Propose and explain a Life Cycle Assessment of a Fruit Juice product. (12 marks)
- (d) Define the following terms. (4 marks)
- (i) Cummulative risk
 - (ii) Cummulative risk assessment
- Q2** (a) Define the term “industrial ecology” (2 marks)
- (b) Describe the term “material cycling”. (3 marks)
- (c) State what are ecological footprints. (2 marks)
- (d) Consider a “frozen pizza” product. Explain the impact of this product to the environment starting from raw materials to the consumers of the product. You can answer the question by using/constructing a diagram. (18 marks)
- Q3** (a) Define the term “industrial symbiosis”. (2 marks)
- (b) State **SIX (6)** key strategies of designing eco-industrial park. (6 marks)
- (c) Develop an eco industrial park for the following industries/products.
- Industries/Products: Wastewater treatment plant, Fertilizer, Biodiesel, Curry Puff factory, Fruit Cocktail, dairy farm, Cow farm, fast food restaurant, paint chemical industry, papaya farm, power plant, electronic factory.
- You **MUST** choose at least **FIVE (5)** industries/products and arrange the selected industries/products in a correct order. Explain why you have selected the industries and explain the roles of each industry in the developed eco industrial park. (17 marks)
- Q4** (a) Describe **THREE (3)** major areas of biotechnology by using examples. (6 marks)
- (b) Explain how the products below are associated with biotechnology and the concept of green chemistry and sustainability. Give an opinion on the impact of the products to the public health and the environment.
- (i) biopesticides
 - (ii) GMO crops
 - (iii) Antibiotics
 - (iv) Enzymatic cleaner

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- (v) Effective microorganism (15 marks)
- (c) Give **TWO (2)** examples of in vitro applications in biotechnology and explain your answers. (4 marks)

- END OF QUESTION -

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