



FACULTY OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY AND FOOD TECHNOLOGY

NATIONAL DIPLOMA: BIOTECHNOLOGY

MODULE BIC2BMB
MICROBIAL BIOCHEMISTRY 3
CAMPUS DFC

NOVEMBER 2019 SUPPLEMENTARY EXAMINATION PAPER

DATE: 07/01/2020

SESSION: 08:00 –11:00

EXAMINER:

Dr. A.M Abrahams

EXTERNAL MODERATOR:

Dr. N.N Mehlomakulu

DURATION: 3 HOURS

MARKS 100

NUMBER OF PAGES: 3

INSTRUCTIONS: **ANSWER ALL THE QUESTIONS**
 MOBILE PHONES MUST BE SWITCHED OFF
 TAKE CAREFUL NOTE OF THE MARK
 ALLOCATION AND ANSWER ACCORDINGLY

REQUIREMENTS: **ANSWER SHEET**

QUESTION 1 (30 marks)

Define the following terms/concepts

- 1.1 a) Catabolism (2)
- b) Gluconeogenesis (2)
- c) 1st law of thermodynamics (2)
- d) Metabolic Flux (2)
- e) Chemical evolution (2)
- f) Substrate level phosphorylation (2)
- g) Photosynthesis (2)
- h) Fatty acid oxidation (2)
- 1.2) Are viruses considered prokaryotic or eukaryotic? Give a reason for your answer. (2)
- 1.3) What is the difference between a metabolic flux and metabolic system? (4)
- 1.4) Differentiate between Glycogenolysis and Glycogenesis (2)
- 1.5) List and give the function of each of the enzymes involved in Glycogenolysis (6)

QUESTION 2 (25)

- 2.1) Write down in full the three irreversible reactions of glycolysis. In your answer, clearly indicate all metabolites (substrate, enzyme, products formed and any other co-factors) (9)
- 2.2) What are the two “high energy” compounds produced in glycolysis? (2)
- 2.3) Explain how Glucose-6-phosphate (G6P) affects the activity of one of the enzymes mentioned in your answer in **[2.1]**. (4)
- 2.4) Briefly describe how ATP and NADH regulate the activity of isocitrate dehydrogenase and how this regulation has an effect on the activity of phosphofructokinase 1 (PFK 1) (6)
- 2.5) Describe what happens to pyruvate under anaerobic conditions (4)

QUESTION 3 (30)

3.1) Why is the pentose phosphate pathway called a “shunt” and what purpose does this pathway serve? (5)

3.2) Briefly describe with aid of a schematic diagram/pathway, under what conditions will:

3.2.1) **MORE** NADPH be produced?

3.2.2) **MORE** Ribose-5-phosphate be produced?

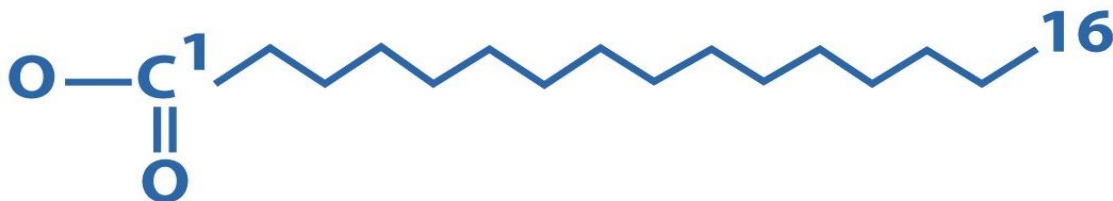
In each of your answers, clearly specify/mention whether the oxidative, non-oxidative or both stages of the pentose phosphate pathway are switched on or off. (10)

3.3) Under gluconeogenic conditions, the body uses non-carbohydrate precursors to generate glucose. Describe how glucose is made from amino acids. Your answer may include a schematic diagram as well to illustrate this. (15)

QUESTION 4 (15)

4.1) The process of electron transport chain (ETC) taking place in the inner mitochondrial membrane is coupled with ATP synthesis. List the four steps involved in this process. (4)

4.2.1) Identify the compound shown below and give the full name of the molecule. (1)



4.2.2) What are the two products that the above molecule forms during breakdown? (2)

4.3) In order for fatty acyl-CoA to cross mitochondrial membrane, –CoA needs to be replaced with a residue so that the transmembrane transport protein recognizes it. What is the name of this residue and the two enzymes that catalyze this reaction? (3)

4.4) Explain why chloroplasts are suited to carry out photosynthesis. In your answer, briefly describe the processes that takes place in these organelles. (5)