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University Examinations 2023/2024

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE IN BIOCHEMISTRY

SHC 3453: METABOLIC REGULATION AND INTEGRATION

DATE: APRIL 2024

TIME: 2 HOURS

INSTRUCTIONS: Answer question *one* and any other *two* questions

QUESTION ONE (30 MARKS)

- a) Explain the role of phosphoribosyl-1-pyrophosphate (PRPP) (2 marks)
- b) Differentiate between red blood cells and other cells and how this affect metabolism (3 marks)
- c) Explain the two compounds that connect the metabolism of carbohydrates, lipids and proteins (2 marks)
- d) Explain the pathways increased under the influence of insulin (3 marks)
- e) Explain the hormone that is released by cells of the small intestine and generates a sense of satiation (2 marks)
- f) Describe the primary target organ of glucagon (2 marks)
- g) Explain the crucial role of AMPK (AMP-activated protein kinase) in energy homeostasis (4 marks)
- h) The viruses are under a constant debate of whether they are living or non-living things. Give a reason to support this statement. (2 marks)

- i) Discuss pyruvate dehydrogenase complex deficiency and phenylketonuria (2 marks)
- j) Release of trypsin and chymotrypsin in their active form can result in the digestion of the pancreas or small intestine itself. What mechanism does the body employ to prevent its self-destruction (2 marks)
- k) In type II diabetes, insulin is produced but is non-functional. These patients are described as "starving in a sea of plenty," because their blood glucose levels are high, but none of the glucose is transported into the cells. Describe how this leads to malnutrition. 2mks
- l) Explain how low-fat or non-fat foods leads to increased fat in the body even though the item is non-fat. (2 marks)

QUESTION TWO

- a) Describe the lac and arabinose operons (10 marks)
- b) Delineate the five stages of glucose homeostasis - sequence of events (10 marks)

QUESTION THREE

- a) Illustrate the role of fructose 2,6- bisphosphate in the regulation of carbohydrate metabolism (10 marks)
- b) Discuss the regulatory steps of heme synthesis (10 marks)

QUESTION FOUR

- a) Explain how the urea cycle prevents toxic concentrations of nitrogen (10 marks)
- b) Describe the metabolic changes that occur during fasting state of an adult man (10 marks)