



MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya.

Tel: +254 (0)799529958, +254 (0)799529959, +254 (0)712524293

Website: www.must.ac.ke Email: info@must.ac.ke

University Examinations 2022/2023

FIRST YEAR, SECOND SEMESTER EXAMINATION FOR THE DEGREE OF MASTERS OF
SCIENCE IN CHEMISTRY

SCH 7137: NATURAL PRODUCTS 1/ PRIMARY METABOLITES

DATE: AUGUST 2023

TIME: 3 HOURS

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

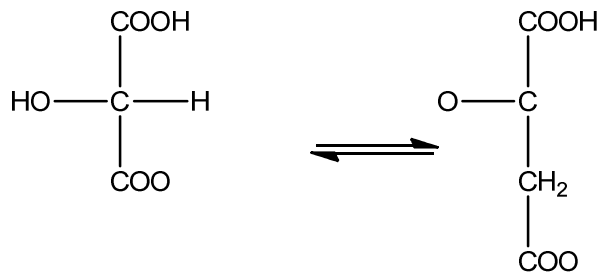
QUESTION ONE (20 MARKS)

- a) Explain briefly the meaning of the following terminologies (5 marks)
- exergonic reaction
 - endergonic reaction
 - translation
 - anticodon
 - anomerism
- b) (i) What is the relationship between the law of thermodynamics and nature of living systems? (4 marks)
- (ii) What is the role of ATP in energy transformation within living organism (5 marks)
- c) Draw the structures of the following compounds (4 marks)
- indol-3-yl-acetic acid (IAA)
 - abscisic acid
 - alanine
 - thymine

- d) A segment of DNA has the following sequence of bases A-C-C-T-C-C-A-G-C-A-T-G-T-C-C-A-T-T. What sequence of bases would appear in mRNA transcribed from this segment? (2 marks)

QUESTION TWO (20 MARKS)

- a) Give a brief explanation of each of the following major classes of lipids (4 marks)
- i) Fats and oils
 - ii) Phospholipids
 - iii) Steroids
 - iv) Waxes
- b) Answer the following questions concerning the TCA cycle



- c) What enzyme is responsible for the reaction in the TCA cycle shown above?
- i. Name the substrate and the product of the reaction
 - ii. What co-factor is necessary for this reaction to proceed?
- d) In the presence of photosynthesis (dark reaction i.e assimilation of CO₂) the end product is usually D-glucose. Explain the process of interconversion of D-glucose to other hexoses like D-galactose (4 mark)
- e) Use a flow diagram to show the biological pathway of fatty acids synthesis (4 mark)
- f) (i) Draw the complete structures of the ribonucleotide codon U-A-C. for what amino does this sequence code? (2 mark)
- (ii) Draw the complete structure of the deoxyribonucleotide sequence from which the mRNA codon in (i) above was transcribed (2 marks)

QUESTION THREE (20 MARKS)

- a) Define the following terms (4 mark)
- i) Base pair
 - ii) Replication

- iii) Codon
 - iv) Heterocycle
- b) (i) Summarize the reactions of kreb cycle in a diagram (7 marks)
- (ii) Why is it advantageous for citrate to inhibit the glycolytic enzyme phosphofructokinase? (2 marks)
- iii. What compound in glycolysis will accumulate when phosphofructokinase is inhibited and describe the most likely fate of the accumulated molecule if the cell has a large supply of energy (2 mark)
- iv. Glucose is frequently administered intravenously to patients as food source. Would you consider the possibility of administering glucose-6-phosphate instead? Explain your answer. (2 mark)
- c) Describe the transcription of genetic code from DNA to nRNA (3 mark)

QUESTION FOUR (20 MARKS)

- a) Discuss the replication of DNA (2 mark)
- b) Give an nRNA and DNA sequences that would code for the synthesis of the following
- a. H-Tyr-Gly-Phe-Met-Ile-OH (2 mark)
 - b. H-Glu-Ser-Cys-Thr-Lys-Asp-Ala-OH (2 mark)
- c) Use a flow diagram to show the biological pathway of fatty acids synthesis (4 mark)
- d) Docosahexaenoic acid (DHA) is an essential fatty acid (EFA) which cannot be synthesized by animals or human and must be supplied in the diet.
- i. Draw the structure of DHA (2 marks)
 - ii. list two important roles of DHA to mankind (1 mark)
 - iii. list two aspects of DHA deficiency in the diet (1 mark)
- e) Draw the following fatty acid structure at pH 7.5. Be sure any double bonds are in the correct configuration
- (i) $18:1\Delta^9$ (2 marks)
 - (ii) $18:1\Delta^{9,12,15}$
 - (iii) Which of the fatty acids (i) and (ii) would you expect to have lower melting temperature and why? (2 Marks)