



**MASENO UNIVERSITY
SCHOOL OF MEDICINE**

MEDICAL BIOCHEMISTRY (MNS 102)

End Term CAT

Date: 23rd June, 2017

Time: 9.00 AM - 12.00 PM

INSTRUCTIONS

1. The exam consists of THREE (3) sections. (Total 150 Marks)
2. Answer ALL questions in sections A, B and C
3. Answer both MCQs and the rest of the questions in the BOOKLET provided.



Section A: MCQs

(60 Marks)

1. A decreased melting temperature of duplex DNA results from a high content of:
A) Cytosine and Thymine
B) Cytosine + Guanine
C) Thymine + Cytosine
D) Cytosine + Adenine
E) Adenine + Thymine
2. Which of the following statements regarding glycolysis is NOT TRUE?
A. ATP is generated during the commitment step of the cycle
B. A molecule of glucose is sequentially split into two molecules of pyruvate
C. Fructose-1,6-biphosphate is split into DHAP and G-3-P.
D. It is a cytosolic process
E. It has three reactions steps that are irreversible
3. The ribonucleotide polymer (5') GTGATCAAGC (3') could only form a double-stranded structure with:
A) (5') CACUTTCGCCC (3')
B) (5') CACUAGUUCG (3')
C) (5') CACT AGTTCG (3')
D) (5') GCTTGA TCAC (3')
E) (5') GCCT AGTUG (3')
4. The following amino acids are directly used in protein synthesis EXCEPT:
A) Glutamine
B) Arginine
C) Ornithine
D) Alanine
E) Tyrosine
5. The primary fatty acid synthesized by fatty acid synthase is?
A) Oleic acid
B) Arachidic acid
C) Palmitic acid
D) Linoleic acid
E) Erucic acid
6. The number of unique enzymes between glycolysis and gluconeogenesis are:
A) 4
B) 2
C) 3
D) 0
E) 1
7. Nucleic acid structure is stabilized by the following EXCEPT:



- A) Low temperatures
 - B) Cumulative Hydrogen bonding
 - C) High G/C content
 - D) Weak electrostatic forces
 - E) Absence of cations
8. The main site for fatty acid synthesis is:
- A) Lactating mammary glands
 - B) Adipose
 - C) Brain
 - D) Liver
 - E) Intestine
9. Which of one the following diseases is associated with the enzyme DNase?
- A) Cystic fibrosis
 - B) Marple syrup urine disease
 - C) Gout (X linked recessive)
 - D) Niemann-Pick disease
 - E) Lesch Nyhan Syndrome
10. Which of he following urea cycle intermediates is solely mitochondrial?
- A) Arginine
 - B) Aspartate
 - C) Carbamoyl phosphate
 - D) Arginosuccinate
 - E) Ornithine
11. Which of the following is unlikely to be a method for *in vivo* regulation of enzyme activity ?
- (A) Denaturation
 - (B) Proteolytic cleavage
 - (C) Phosphorylation
 - (D) Dephosphorylation
 - (E) Transfer of an atom from a donor to an acceptor amino acid
12. The net production of ATP glycolysis is:
- A) 1
 - B) 3
 - C) 2
 - D) 0
 - E) 4
13. The following statements are features of nucleic acids EXCEPT:
- (A) They absorb light strongly in the near UltraViolet (~260nm)
 - (B) Are polymers linked 3'-5' by phosphodiester bonds
 - (C) Sequence is always written and read 3' to 5'
 - (D) Phosphodiester bonds within nucleic acids are susceptible to enzyme attack.
 - (E) Are overall negatively charged



14. Which of the following diseases/disorders/conditions is NOT linked to pyrimidine metabolism?
- A) Gout
 - B) Hyper β -aminoisobutyric aciduria
 - C) Ornithine transcarbamoylase deficiency
 - D) Uridine monophosphate deficiency
 - E) Orotic aciduria
-
15. Which one of the following diseases is due to tyrosinase deficiency:
- A) Citrullinaemia
 - B) Homocistinuria
 - C) Hyperlysinemia
 - D) Albinism
 - E) Alkaptonuria
16. The enzyme alpha-amylase is used to alleviate digestive disorders by targeting which one of the following metabolic reactions?
- A) Collagen hydrolysis
 - B) Starch hydrolysis
 - C) Glycoprotein catabolism
 - D) Protein hydrolysis
 - E) Bilirubin hydroxylase
17. The following statements are true of the DNA double helix EXCEPT:
- (A) Base pairing is mediated by H-bonds
 - (B) The two strands are anti-parallel
 - (C) A-T has two bonds while G-C has three H-bonds
 - (D) Electrostatic repulsion between phosphates stabilize the helix
 - (E) London forces between stacked bases stabilize the helix
18. The reaction of the citric acid cycle yield how many molecules of GTP per molecule of pyruvate:
- A) 1.
 - B) 0
 - C) 2
 - D) 4
 - E) 3
19. The net yield in ATP from β -oxidation of palmitic acid is?
- (A) 126
 - (B) 128
 - (C) 129
 - (D) 130
 - (E) 131
20. Which one of the following statements about DNA is FALSE:
- (A) Exhibits major and minor grooves



- (B) Directs its own duplication
 - (C) Is the template for synthesis of RNA
 - (D) Susceptible to proteolysis
 - (E) Is transcribed to proteins via mRNA
21. Pro-vitamin A (β -carotene) consists of two molecules of _____ linked at their aldehyde ends.
- (A) Retinol
 - (B) Retinal
 - (C) Retinoic acid
 - (D) Rotenone
 - (E) Rotenol
22. *De novo* fatty acid synthesis occurs in the:
- A) Liposome
 - B) Cytosol
 - C) Smooth endoplasmic reticulum
 - D) Mitochondria
 - E) Rough endoplasmic reticulum
23. The following are non-functional plasma enzymes EXCEPT:
- (A) Alkaline Phosphatase.
 - (B) Creatine kinase
 - (C) Cholinesterase.
 - (D) Amylase
 - (E) Acid phosphatase
24. Accumulation of deoxyadenosine is associated with:
- A) Pompe disease
 - B) Renal lithiasis
 - C) Xanthine oxidase deficiency
 - D) Von Gierke disease
 - E) SCID
25. The following are cancer target enzymes are EXCEPT?
- (A) Topoisomerase 1
 - (B) Enolase
 - (C) Dihydrofolate reductase
 - (D) IMP dehydrogenase
 - (E) Steroid 5 α reductase
26. The following amino acids are ketogenic EXCEPT:
- A) Tryptophan
 - B) Alanine
 - C) Tyrosine
 - D) Phenylalanine
 - E) Leucine



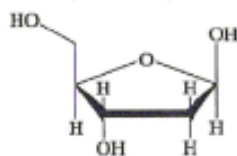
27. Although the side chains of these 20 building blocks vary tremendously in size, shape, and the presence of functional groups, they can however be grouped into a set of;
- (A) 4
 (B) 8
 (C) 7
 (D) 6
 (E) 5

28. The reaction of the citric acid cycle that produces $FADH_2$ is the conversion of:
- A) Citrate to isocitrate.
 B) Succinate to fumarate
 C) Malate to oxaloacetate.
 D) Succinyl-CoA to succinate.
 E) Fumarate to malate.
29. Which of the following hormones is NOT involved in the activation of hormone sensitive lipase during lipolysis?
- (A) Glucagon
 (B) Epinephrine
 (C) Cholecystokinin
 (D) Glucocorticoids
 (E) Growth hormone
30. The synthesis of _____ provides the link between citric acid and urea cycles.
- A) Succinyl CoA
 B) Fumarate
 C) Pyruvate
 D) alpha-ketoglutarate
 E) Oxaloacetate

SECTION B: SAQs. Answer ALL questions

(50 Marks)

31. Use the structure shown below to answer the questions listed below it.
 (5 Marks)



- (a) Number the carbon atoms constituting the structure above (2 Marks)
 (b) Explain the importance of 2' C, 3' C and -OH group on C5 if incorporated in a nucleotide polymer. (3 Marks)
32. Fill in the gaps below with corresponding nucleotide name (1 Mark each)

	Nucleoside	Nucleotide
I	Adenosine	



2	Uridine,	
3	Guanosine,	
4	Cytidine,	
5	Thymidine	

33. Draw and use a substrate-velocity curve to explain the varied affinities exhibited by liver hexokinase and glucokinase in attempt to curb hyperglycemia (5 Marks)
34. i) Define Enthalpy (1 Marks)
 ii) Define Entropy (1 Marks)
 iii) Explain the implication of the following: (3 Marks)
 (1) $\Delta G > 0$
 (2) $\Delta G = 0$
 (3) $\Delta G < 0$
35. i). What are zymogens. (1 Marks)
 ii). List any two mechanisms used in their cellular activation. (3 Marks)
36. List any five metabolic intermediates that are derived from carbon skeletons of the diverse set of 20 fundamental amino acids during their catabolism (5 Marks)
37. What is the importance of the following during dietary lipid digestion;
 (i) Lingual lipase
 (ii) Emulsification
 (iii) Peristalsis
 (iv) Cholecystokinin (in blood)
 (v) Secretin (in blood) (1 Mark each)
38. Briefly discuss how tissue cholesterol is converted to active vitamin D (5 Marks)
39. Briefly discuss the therapeutic role of purine analogues (5 Marks)
40. Briefly explain the metabolic basis of Marple Syrup Urine Disease. 5 Marks)
- SECTION C: LEQ (Answer ALL questions) (40 Marks)**
41. Discuss how the following factors listed below influence enzyme activity;
 (a) pH
 (b) Temperature
 (c) Substrate concentration
 (d) Radiation and Light
 (e) Cofactors (20 Marks)
42. Discuss in detail any FIVE anabolic products of acetyl CoA. (20 Marks)

-----end-----

