



MASENO UNIVERSITY

UNIVERSITY EXAMINATIONS 2012/2013

SECOND YEAR SECOND SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE IN
NUTRITION & HEALTH WITH INFORMATION
TECHNOLOGY
(MAIN CAMPUS)

PML 221: BASIC BIOCHEMISTRY

Date: 19th July, 2013

Time: 2.30 – 4.30 p.m.

PML 221: Basic Biochemistry

BSc Nutrition and Health

SECTION A: MCQS. Answer ALL questions

1. The most abundant protein in mammals is
(A). Albumin (B). Haemoglobin (C). Collagen
(D). Elastin
2. The vitamin required for formation of hydroxyproline (in collagen) is
(A). Vitamin C (B). Vitamin A (C). Vitamin D
(D). Vitamin E
3. A metabolic pathway is a
(A). Route taken by chemicals
(B). Sequence of enzyme facilitated chemical reactions
(C). Route taken by an enzyme from one reaction to another
(D). Sequence of origin of organic molecules
4. In enzyme kinetics K_m is;
(A). The substrate concentration that gives one half V_{max}
(B). The dissociation constant for the enzyme substrate complexes
(C). Concentration of enzyme
(D). Half of the substrate concentration required to achieve V_{max}
5. The general formula of monosaccharides is
(A) $C_nH_{2n}O_n$ (B) $C_nH_2O_{2n}$ (C) $C_{2n}H_2O_n$
(D) $C_nH_{2n}O_{2n}$
6. Proteins contain
(A). Only L- α -amino acids (B). Only D- α -amino acids
(C). DL-Amino acids (D). Both (A) and (B)
7. An amino acid that does not take part in α -helix formation is
(A). Histidine (B). Tyrosine (C). Proline
(D). Tryptophan
8. From the Lineweaver-Burk plot of Michaelis-Menten equation, K_m and V_{max} can be determined when V is the reaction velocity at substrate concentration S , the X-axis experimental data are expressed as
(A). $1/V$ (B). $1/S$ (C). V (D). S
9. Which amino acid does not have optical isomers?

- (A.) Alanine (B). Threonine (C). Histidine
(D). Glycine
10. Steroidal prohormone is
(A). Vitamin A (B). Vitamin C (C). Vitamin D
(D). None of these
11. Collagen is rich in
(A). Glycine (B). Serine (C). Aspartic acid
(D). Glutamic acid
12. Which of the following is an example of group transferring coenzyme?
(A). NAD⁺ (B). FAD (C). NADP⁺ (D). CoA
13. Prothrombin time is prolonged in
(A). Vitamin K deficiency (B). Liver damage
(C). Both (A) and (B) (D). None of these
14. Which one of the following enzymes regulate flux through glycolysis
(A). Phosphofructokinase
(B). Glyceraldehyde-3-phosphate dehydrogenase
(C). Phosphotriose isomerase
(D). Phosphohexose isomerase
15. The initial step of the citric acid cycle is
(A). Conversion of pyruvate to acetyl-CoA
(B). Condensation of acetyl-CoA with oxaloacetate
(C). Conversion of citrate to isocitrate
(D). Formation of α -ketoglutarate catalyzed by isocitrate dehydrogenase
16. Enzymes increase the rate of reactions by
(A). Increasing the free energy of activation
(B). Decreasing the energy of activation
(C). Changing the equilibrium constant of the reaction
(D). Increasing the free energy change of the reaction
17. Bonds that are formed between two cysteine residues is
(A). Disulphide (B). Peptide
(C). Electrostatic (D). Hydrophobic
18. If all the enzymes, intermediates and cofactors of the citric acid cycle as well as an excess of the substrate acetyl- CoA are present and functional in an organelle free solution at the appropriate pH, which of the following factors of the citric acid cycle would be rate limiting?
(A). Molecular oxygen (B). Half-life of enzyme

- (C). Turnover of intermediates (D). Reduction of cofactors
19. Pentose phosphate pathway is of significance because it generates
- (A). NADPH for reductive synthesis
 - (B). Regenerates glucose 6-phosphate
 - (C). Generates fructose 6-phosphate
 - (D). Forms glyceraldehyde 3-phosphate
20. The sites for gluconeogenesis are
- (A) Liver and kidney (B) Skin and pancreas
 - (C) Lung and brain (D) Intestine and lens of eye [1 x 20 marks]

SECTION B: (Short answer questions). Answer ALL questions

21. Explain the following terminologies

- a. Zwitterions
- b. Enzyme unit

[4 marks]

22. For the reaction:



Calculate ΔG° and K'_{eq} at 25°C .

[Free energies of hydrolysis: phosphoenol pyruvate = -14.8 kcal/mol; ATP (to ADP) = -7.3 kcal/mol]

[3 marks]

23. Explain the following inhibition kinetics in enzyme-catalyzed reactions

- a. Uncompetitive inhibition
- b. Noncompetitive inhibition

[4 marks]

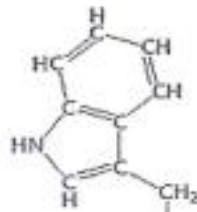
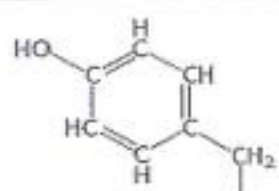
24. Predict whether each of the following would have decreased/ increased effect on the pace of glycolysis in liver cells:

- a. Loss of binding site for fructose 1,6-bisphosphate in pyruvate kinase
- b. Loss of allosteric site for ATP in phosphofructokinase
- c. Loss of the binding site for citrate in phosphofructokinase
- d. Loss of the phosphatase domain of the bifunctional enzyme that controls the level of fructose 1,6-bisphosphate.

[4 marks]

Use the table below to answer Q25 and Q26

The table below depicts the one letter symbol and the corresponding side chain of some amino acids.

Amino acid (one letter symbol)	Side chain
G	H-
K	$\text{H}_2\text{N}-(\text{CH}_2)_4-$
R	$\text{HN}=\text{C}(\text{NH}_2)-\text{NH}-(\text{CH}_2)_3-$
L	$(\text{CH}_2)_2-\text{CH}-\text{CH}_2-$
W	
Y	

Use this table to answer the following questions:

25. The tripeptide, Arg-Gly-Trp is formed from a condensation reaction with three of the amino acids in the above table. Draw the structure of the tripeptide and label its amino and carboxyl terminals. Indicate the number of water molecules involved in this reaction

[3 marks]

26. Predict the possible structure(s) of the resulting products when trypsin acts on the tripeptide, Arg-Gly-Trp.

[2 marks]

SECTION C: (Long answer questions). Answer any TWO questions

27. Using appropriate examples, discuss any three major functions of proteins
[15 marks]
28. Describe how beriberi, a neurological and cardiovascular disorder is caused and explain how the blood levels of pyruvate and α -ketoglutarate may be affected in this disease condition, especially after ingestion of a glucose-rich meal
[15 marks]
29. Discuss the principles that were initially used to name/ classify enzymes and elucidate the Enzyme Commission of the International Union of Biochemists' (IUB) better devised scheme for enzyme nomenclature
[15 marks]