

**W1-2-60-1-6**

**JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2014/2015**

**YEAR I EXAMINATION FOR THE DEGREE OF BACHELOR OF MEDICINE AND BACHELOR OF SURGERY**

**MBC 2101: BIOCHEMISTRY I**

**DATE: AUGUST 2014 TIME: 3 HOURS**

**INSTRUCTIONS: Answer all questions in Section A, ten questions in Section B and only one question in Section C.**

**SECTION A (60 MARKS)**

1. How many regulatory enzymes are present in the Glycolytic pathway?

 a. 1

 b. 2

 c. 3

2. The number of biological roles played by the glycolytic pathway are?

 a. 1

 b. 2

 c. 3

3. PMF is generated at how many sites in the electron transport?

 a. 1

 b. 2

 c. 3

 d. 4

4. Which of the following biomolecules has the highest respiratory quotient (RQ)

 a. Carbohydrates

 b. Proteins

 c. Lipids

5. Which of the following is a Glycogen storage disease?

 a. Von Gierkes

 b. Pompes

 c. Tarui’s

 d. All the above.

6. The Pentose phosphate pathway occurs in two major phases.

 a. True

 b. False

7. Galactosemia may be caused by inherited defects in the following

 a. Galactokunase

 b. Galactose -1- phosphate uridyltransferase

 c. Uridine Diphosphogalactose -4-Epimerase

 d. All of the above.

8. Which of the following compounds does NOT inhibit cyclooxygenase enzyme?

 a. Aspirin

 b. Indomethacin

 c. Imidazole

9. Which of the following is NOT a phospholipid;

 a. Phosphatidyl ethanolamine

 b. Phosphotidylsemine

 c. Phosphatidylglycrol

 d. 3-phosphocholine

10. Which of the following is regulator of cholesterol biosynthesis:

 a. Oxysterol

 b. Insulin

 c. Glucagon

 d. Triparanol

 e. all the above.

11. Which of the following is NOT a constituent of Ketone bodies?

 a. Acetone

 b. AcellylcoA

 c. Acetoacetate

 d. β-Hydroxybutyrate

12. Aspartate is a precursor of ?

 a. Lysine

 b. Methionine

 c. Threonine

 d. Isoleucine

 e. All the above.

13. Tryptophan is a precursor of Nicotinamide?

 a. True

 b. False

14. Deficiency of Vitamin B6 impairs the synthesis of NAD and NADP.

 a. True

 b. False.

15. Purines can be synthesized via both the de-novo and salvage pathways.

 a. True

 b. False

16. Which of the following compounds is an inhibitor of purine biosynthesis?

 a. Azaserine

 b. Diaxonorleucine

 c. Mercaptopurine

 d. Mycophenolic acid

 e. All the above.

17. Which of the following enzymes is defective in Lesch – Nyhan syndrome?

 a. PRPP synthetase

 b. HGPRTase

 c. Purine nucleoside phosphorylase

 d. All the above.

18. Which of the following is an inherited disorder associated with dysfunctional pyrimidine metabolism:

 a. Gout

 b. Xanthinuria

 c. Orotic aciduria

 d. All the above.

19. Which of the following amino acid skeletons is an intermediate for oxaloacetate?

 a. Aspartate

 b. Tyrosine

 c. Isolecicine

 d. Glutamate

 e. All the above.

20. Which of the following enzyme(s) is defective in congenital erythroporetic porphyria?

 a. Uroporphyrinogen oxidase

 b. Coproporphyrinogen oxidase

 c. Proroporphyrinogen oxidase

 d. All the above

21. The following human disorders are due to alterations in autosomes except

 a. Downs syndrome

 b. Patan syndorome

 c. Klinefelter syndrome

 d. Edwards syndrome

22. The following is NOT a characteristics of the Dominant x-linked genes;

 a. Half the sons will be affected

 b. The affected males pass the condition to all their daughters but to none of their sons.

 c. The affected females pass the condition to half their sons and daughters.

 d. An example of an x-lined trait is vitamin D resistant ricket.

23. The fundamental unit of DNA packaging is the

 a. Histone

 b. Nucleosome

 c. Chromatin

 d. Chromosome.

24. You are given the following information on he cystic fibrosis trasmenitrane regulator Tq13-2. What do 1, q, and T represent respectively.

 a. Arm, region, band number

 b. Band, region chromosome number

 c. Chromosome, arm, band number.

 d. Band, arm, chromosome number.

25. You are given the following sequence for mRNA “ACGCGU”. The correct sequence of the template DNA in the 5’-3 direction is;

 a. TGCGCA

 b. GUGUAC

 c. ACGCGT

 d. TGCGCA

26. The following happens during the GAP -1 phase of the cell cycle.

 a. DNA replication occurs.

 b. Determination if the cell can proceed to divide.

 c. Cells synthesize proteins and increase in size.

 d. The cell leaves the cell cycle.

27. The following enzymes are involved in normal DNA replication. Which one is NOT.

 a. DNA ligae

 b. Helicase

 c. Primase

 d. DNA polymerase II

28. The following statements are true which is NOT?

 a. Operator is a region where a transcription factor protein binds.

 b. The repressor and the operator bind at the same site of DNA.

 c. Enhancer are located very close to the transcription site.

 d. Silencers inhibit the transcriptional activity of specific genes.

29. The following statement is true about the mode of action of Diptheria toxin.

 a. It blocks the A site on the ribosome.

 b. It causes misreading of the code.

 c. It ribosylates and inactivates elongation factor 2.

 d. It blocks the peptidyltransferase of the 80s sub unit.

30. Non disjunction of sex chromosome results in the following except;

 a. Patau syndrome

 b. Klinefelter

 c. Turnes syndrome

 d. Trisonny of x.

31. Which of the following vitamins is required for the synthesis of a cofactor required for reactions in the oxidation of pyruvate to carbon dioxide and water?

 a. Biotin

 b. Vitamin K

 c. Pantothenate

 d. Ascorbic acid

 e. Pyridoxine

32. Which of the following conditions is caused by a deficiency characterized by skin disease, mental disease and diarrhea?

 a. Rickets

 b. Scurvy

 c. Pellagra

 d. Beriberi

 e. Osteomallicia.

33. The functionally active form of vitamin D is

 a. Ergocciluferol

 b. Dehydriocholesterol

 c. Calcitonin

 d. Chelecalciferol

 e. Calcitriol

34. Which of the following cannot be synthesized by humans?

 a. Vitamin K

 b. Pantothenic acid

 c. Folic acid

 d. Riboflavin

 e. Ubiquinone

35. Inhibitors of pyridoxine include the following;

 a. Warfarin and sulfoncumides

 b. Trimethoprin and cycloserine

 c. Aminopterin and pyrimethamine

 d. Dicumarol and Heparin

 e. Penicillamine and Isonicotinic and hydrazine.

36. Deficiency of Ascorbic acid may lead to

 a. Swollen joints and diarrhea.

 b. Dermatits and diarrhea.

 c. Low levels of prothrombin

 d. Kidney stones.

37. Absorption of vitamin E requires the following

 a. Monosaccharides

 b. Calcium and phosphates

 c. Bile salts

 d. Tryptophan

 e. Nucleic acids.

38. Ceruloplasmin is a plasma protein which;

 a. Transports cholesterol and Triglycerides to tissues

 b. Transports carbon dioxide from extra from extra pulmonary tissues.

 c. Stabilizers blood pressure.

 d Transports and acts as a temporary store of copper ions in the body.

 e. Behaves as a hormone.

39. During blood clotting fibrinogen is hydrolysed to fibrin by

 a. Kallikren

 b. Trombin

 c. Urokinase

40. Tetracycline is an antibiotic which

 a. Inhibits binding of amino acyl – tRNA to amino acyl site of ribosomes of prokaryotes.

 b. Inhibits peptidyl transferase activity of 50s ribosome sub unit in prokaryotes.

 c. Inhibits initiation of protein synthesis in prokaryotes.

 d. Inhibits peptidyl transferase activity of 60s subunit in Eukaryotes.

 e. Inhibits entry of amino acyl tRNA to A-site of ribosome in prokaryotes.

41. The normal peptide bond of the proteins is formed from;

 a. Two carboxyl groups of adjacent amino acids.

 b. Beta methyl group and alpha carboxyl group of adjacent amino acids.

 c. Two alpha amino beta carboxyl groups of adjacent amino acids.

 d. Alpha amino and beta carboxyl groups of adjacent amino acids.

 e. Alpha carboxyl and alpha amino groups of adjacent amino acids.

42. The tertiary structure of proteins.

 a. Represent a 3 – dimensional structure of the functional protein.

 b. Is associated with folding of a polypeptide chain into regular alpha and beta sheets.

 c. Is characterized by covalent linkages only.

 d. Is observed in proteins with more than one polypeptide chain.

 e. Is associated with non covalent linkage only.

43. The pring pong mechanism of enzyme catalysts is demonstrated.

 a. Where only one substrate is involved.

 b. Where two substrates form one product.

 c. Where one substrate forms two products.

 d. Where all products are formed at the same time

 e. Where one substrate is converted to product before second substrate is bound.

44. Non-competitive inhibitors of enzymes

 a. Resemble the substrate of the enzyme.

 b. Cause irreversible inhibition

 c. Bind the enzyme at different site from the substrate.

 d. Raise the km of the enzyme.

 e. Have no effect on Vmax of the enzyme.

45. Protein synthesis in eukaryotic cells occurs.

 a. In the cytoplasm

 b. In the ribosomes

 c. In the nucleus

 d. On the plasma membrane

 e. Outside the cell.

46. The purine rich shine-Delgano sequence.

 a. Is found on ribosomal RNA in prokaryotes

 b. Inhibits protein synthesis in eukaryotic cells.

 c. Is recognized by peptidyl transferase activity during protein elongation.

 d. Is found on MRNA of prokaryotes and associated with initiation of protein synthesis.

 e. Is recognized by the 40s sub unit of ribosomes in eukaryotes.

47. The sugar in RNA is \_\_\_\_ the sugar in DNA is

 a. Deoxyribose, ribose

 b. Ribose, deoxyribose

 c. Ribose, phosphate

 d. Ribose, uracil

48. Which pyrimidine base contains an amino group at carbon 47

 a. Cytosine

 b. Thymine

 c. Uracil

 d. Adenine.

49. Sucrose is composed of which two sugars.

 a. Glucose and Glucose

 b. Glucose and fructose

 c. Glucose and galactose

 d. Fructose and galactose.

50. What is the molecular formular for glucose

 a. C H3 OH

 b. C12 H22 O11

 c. C6 H12 O6

 d. C6 H12 O5

**SECTION B (50 MARKS)**

1. Using balanced equations, describe three regulatory steps of the Krebs cycle.

 (5 marks)

2. Describe any three inborne errors. (Name and defect) associated wit metabolism of sulphur containing amino acids. (5 marks)

3. Fill in the correct response.

|  |  |
| --- | --- |
| Gene family | Function of encoded protein |
| Ferritin |  |
| Homeobox |  |
| Histone |  |
| Aldolase |  |
| HLA |  |

4. The nucleotide sequence for normal and for the sickle haemoglobin is as follows:

 normal GGG CTT CTT TTT

 Sickle GGG CAT CTT TTT

 The information on the codons is also given

|  |  |
| --- | --- |
| Codon | Amino acid |
| GAA → | Glutamate |
| UUU → | Phanylalanine |
| CCC → | Argine |
| GUA → | Value |

 a. Transcribe and translate these DNA sequences \_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_

 (4 marks)

 b. What type of mutation yields the sickle cell condition? (1 mark)

5. Outline the biochemical functions of vitamin D at different stages. (5 marks)

6. Write short notes on the deficiency of Biotin. (5 marks)

7. Describe briefly the following

 a. Primary structure of proteins. (3 marks)

 b. Factors which affect the rate of an enzyme catalyzed reaction.

 (2 marks)

8. Giving an example of an enzyme in each case, enumerate the five classes of ensures and reactions they catalyse. (5 marks)

9. Briefly explain the structural differences between reducing sugars and non reducing sugars. (5 marks)

10. With an example in each case, explain the various functions of lipids.

 (5 marks)

**SECTION C (20 MARKS)**

1. With help of balanced equations, describe the urea cycle.

2. Write briefly on the translation process and explain how this process is affected by inhibitors.

3. Describe the functions, hyper and hypo vitaminoses of vitamin A.

4. Describe in detail synthesis of proteins in a cell.

5. Give a detailed description for the classification of carbohydrates.

6. a. Explain the following observations by use of appropriate examples and/or structures.

 i. Alcohols have higher points than aldehydes and ketones of comparable molecular weight; however aldehydes and ketones have higher boiling points than hydrocarbons of comparable molecular weight.

 ii. 1-Butanol is water soluble while 1- chlorobutane is not.

 iii. Alkenes and alkynes are reactive compounds while alkanes are not.

 b. Using appropriate examples and diagrams where necessary briefly explain what precision and accuracy mean.