



**FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA  
SCHOOL OF NATURAL AND APPLIED SCIENCES  
DEPARTMENT OF MICROBIOLOGY**

**SECOND SEMESTER EXAMINATION 2013/2014 SESSION**

**COURSE CODE: MCB 323**

**COURSE TITLE: MICROBIAL PHYSIOLOGY AND METABOLISM (3 UNITS)**

**CLASS: 300 LEVELS**

**Instruction: Answer ALL Questions**

**Matriculation number -----**

**SECTION A**

1. Which of the following transport mechanisms functions without the requirement for energy
- A. Binding protein-dependent                      C. Symport  
B. Group translocation                              D. Uniport                      E. Facilitated diffusion

The three transport mechanisms are:

2. .... 3. .... 4. ....

5. The transport mechanism that uses no energy and operates only when the solute is at higher concentration outside that inside the cell is referred to as .....

6. Facilitated diffusion is selective true/false

7. .... is common in aerobic organisms

1. .... catalyze the simultaneous transport of two like-charged compounds in opposite direction.

2. The process of anabolism is one in which
- A. Microbial cells synthesize molecules and structures  
B. Microbial cells transport electrons among electron carriers  
C. Microbial cells break down larger molecules into smaller ones  
D. Glycolysis and the Krebs cycle are key intermediates

3. Among the organic molecules functioning as cofactors of enzymes are
- A. Iron ions                      C. ATP molecules  
B. FAD and NAD                      D. Pyruvic acid molecules and acetaldehyde molecules

4. During a reduction reaction such as occurs in metabolism
- A. Electrons are lost from a substrate molecule  
B. Large amount of energy are usually obtained

- C. Electrons are added to substrate molecule
  - D. The substrate molecule is oxidized
5. During the chemical reactions of glycolysis
- A. Carbohydrates are converted into proteins
  - B. Enzymes do not play a role
  - C. Carbohydrate molecules are produced from carbon dioxide molecules
  - D. Two molecules of pyruvic acid result from a single molecule of glucose
6. The net gain of ATP molecules resulting from glycolysis in microorganisms is
- A. 2
  - B. 4
  - C. 36
  - D. 38
7. Which of the following statements applies to fermentation?
- A. Fermentation occurs in the absence of oxygen
  - B. DNA is needed for fermentation to occur
  - C. A product of fermentation is starch molecules
  - D. Fermentation occurs in most microbial cells
8. The chemical substance that enters the Krebs cycle for further metabolism is
- A. Ethyl alcohol
  - B. Pyruvic acid
  - C. Acetyl-CoA
  - D. Adenosine triphosphate
9. In the electron transport chain
- A. Oxygen is used as fuel acceptor
  - B. Cytochrome molecules do not participate in the electron transfers
  - C. One possible result of the transfers is fermentation
  - D. The source of electrons for electron transport is DNA
10. The process of chemiosmosis accounts for
- A. The conversion of amino acids to carbohydrates
  - B. The breakdown of starch molecules into glucose molecules for glycolysis
  - C. The trapping of energy in ATP molecules
  - D. The synthesis of glucose molecules using light as an energy source
11. In order for the cells to utilize fatty acids for their energy content, the fatty acids are broken down and converted into molecules of
- A. Quinone and ribulose phosphate
  - B. Acetyl-CoA
  - C. Various amino acids
  - D. DHAP molecules
12. Amino acids can be formed from intermediaries of catabolism by
- A. Substituting an acid group where there is a carbon atom on a carbohydrate molecule
  - B. Binding an ATP molecule to a carbohydrate molecule
  - C. Altering the active site of an enzyme molecule
  - D. Replacing an oxygen atom on an intermediary compound with an amine group

13. The energy used to drive the reactions of photosynthesis is obtained from  
 A. Oxidation-reduction reaction                      C. ATP molecules  
 B. The sun    D. Acetyl-CoA molecules
14. The sum of all chemical reactions within a living organism is known as .....
15. .... are proteins produced by living cells
16. When an enzyme and substrate combine, the substrate is transformed while the enzyme is recovered. True/false
17. Enzymes are characterized by ..... which is characterized by their active sites
18. The pH at which enzymatic activity is maximal is known as the ..... pH
19. .... occurs when the end product of a metabolic pathway inhibits an enzyme's activity near the start of the pathway
20.  $\text{NAD}^+$  is the ..... form
21.  $\text{NADH}$  is the ..... Form
22. During oxidative phosphorylation, energy is released as electrons are passed to a series of electron acceptors (an electron transport chain) and finally to  $\text{O}_2$  or another inorganic compound. True/false
23. Phosphorylation only happens in ..... organisms

**SECTION B**

31. All organisms are made up of cells, and all cells derive from other pre-existing cells. This is called .....
32. An organism with several distinct cell types with specialized functions is called .....
33. The distinct cell types which exist in the microbial world are .....
34. Protein synthesis is an exclusive 'metabolic job' achieved by .....
35. 70s ribosomes are found in cytoplasm but are attached to membranes. True/false
36. All life forms can be assigned to the three domains based on ribosomal RNA sequences. List them
37. Basic shapes of bacteria are .....
38. The size of mycoplasma compared to other bacteria is .....
39. Shapes confer advantage. ....shaped bacteria confers capacity to

withstand dehydration

40. The internal structural features of the prokaryotic cell structure are .....
41. Extra-chromosomal elements with capacity to replicate is called .....
42. The smaller subunits of the 70s and 80s ribosomes are .....
43. Magnetosomes are .....
44. Two (2) genera of bacteria that form endospores are .....
45. Enzymes associated with metabolism of nutrients in prokaryotes are located in .....
46. Rigidity in bacteria is aided by a component of the cell wall called .....
47. The function of bactoprenol phosphate is .....
48. A rare amino acid only in prokaryotes is .....
49. Transpeptidases in cell wall synthesis are inhibited by ..... group of antimicrobial agent
50. Acidic polysaccharides in Gram positive cell walls that contain phosphate groups that impart negative charge to cell is .....
51. What are the amino acids attached to N-acetyl Muramic acid?
52. Clockwise rotation of a single flagellum results in .....
53. What makes pilli differ from flagella?
54. The four types of flagella arrangement in bacteria are .....
55. The trace elements required by a bacterium like *E. coli* are .....
56. Physical conditions that may affect bacterium include .....
  
57. The four major nutritional types of prokaryotes based on carbon and energy sources for growth are .....
58. The categories of growth factors are .....
59. A strain of *Staphylococcus aureus* that requires the amino acid valine to grow is designated as .....
60. Active movement of materials into the cell across the membrane from lower to higher concentration is called .....
61. Permeases are required in .....
62. Restrictions towards molecular movement across membrane in diffusion may be due to 3 reasons: .....

63. Organisms that can switch between aerobic and anaerobic types of metabolism are called .....
64. Oxidation of flavoproteins by oxygen results in formation of .....
65. Organisms that live in presence of oxygen contain an enzyme called .....
66. Microorganisms that grow at an optimum pH well below neutrality are called .....
67. ....grows at 0°C but displays optimum growth in mesophile range near room temperature
68. Xerophiles are .....
69. The four phases of bacteria growth in a closed system are .....
70. What is the number of generation if after 100 minutes, 40 cells of *E. coli* replicated exponentially to give 9000 cells .....