

OBAFEMI AWOLowo UNIVERSITY, ILE – IFE, NIGERIA.
FACULTY OF SCIENCE
DEPARTMENT OF MICROBIOLOGY

B.Sc. (Microbiology) Degree Examination.

SEMESTER: Rain 2010/2011 Session

Date: 12th December, 2011

COURSE CODE: MCB 202

Time allowed: 3 h

COURSE TITLE: General Microbiology II

INSTRUCTION: Answer all questions with each section in a separate booklet

Important Notice and Advice

ACADEMIC INTEGRITY: Requires you to uphold a high standard of honesty in this examination and eschew cheating in whatever form. Some examples of violations of this requirement are: *using notes, handouts or books; looking at another person's answer booklet; knowingly allowing another student to look at your answer booklet; and, verbally exchanging information* with another student etc. You are strongly advised to simply put in your best and leave the rest!

SECTION A.

1. (a) Discuss briefly the production of methane from CELLULOSES through the activity of methanogens.
- (b) Why is it possible for ruminants to digest cellulose unlike other mammals? What really happens to this food in the rumen?
- (c) What are the factors that can affect the rate and magnitude of nitrogen-fixation by free nitrogen-fixers?
- (d) Define the following terms:
 - i. Ammonification
 - ii. Mineralization

D.A.A

SECTION B.

- 1a. List the various diluents used for the isolation of microorganisms from various sources.
- b. What are the properties of agar that makes it valuable to microbiology?
- c. With the aid of a graphical illustration, discuss briefly but concisely, the growth curve of bacteria.
- d. Briefly but concisely, describe the principles and positive reactions of the following biochemical test for the identification of bacteria.
 - i) Citrate utilization
 - ii) Starch hydrolysis
 - iii) Oxidation – Fermentation (*Off*) test.
 - iv) Hydrogen sulphide production test
 - v) Sugar fermentation test.

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SECTION C.

1. (a) What is "Identification" of organisms?
- (b) List five biochemical tests that can be used for the identification of a bacterium.
- (c) Describe briefly the ICTV classification scheme for viruses.
- (d) Explain the three groups of Archaeobacteria.

SECTION D.

Choose the SINGLE MOST CORRECT option (A-E) for the following questions.

1. The endosymbiotic theory would suggest that precursor eucaryotic cells acquired flagella by endosymbiosis with a _____ ancestor, and others gained photosynthetic ability from endosymbiosis with a _____ ancestor.

- A) protozoan, algae B) none of the choices is correct
C) spirochete, cyanobacteria
D) archaea, cyanobacteria E) helminth, algae

2. Green algae are eukaryotes containing chlorophyllsand, which enable them to convert carbon dioxide, through sunlight radiation, to sugars,

- A) ab and carbon dioxide B) a and carbon dioxide
C) a; b,
D) b and c, E) b and carbon dioxide,

3. In a stabilization pond for the treatment of sewage, amount of dissolved oxygen can be enhanced by

- A) Air-wave action B) Adding oxygen to the system C) Planting of trees in the pond
D) Throwing stones into the pond E) Diluting the pond water with stream water

4. Biochemical Oxygen Demand (BOD) is a measure of

- A) The total microorganisms present in a sample of water.
B) The amount of undissolved suspended particle in sewage
C) The amount of organic matter present in a water sample.
D) The amount of oxygen required for the total digestion of microorganisms in a water sample.
E) The amount of oxygen available for the microorganisms for respiration.

5. Extreme halophiles are found in

- A) Animal intestines B) Salt lakes C) The Antarctic ice mass
D) Extremely hot places E) In the sodium carbonate salt

6. Which one of the following is the smallest microbe?

- A) Virus B) Chlamydia C) Mycoplasma D) Yeast E) Rickettsia

7. All the following are considered microbes except:

- A) None of the listed B) Worms C) Protozoa D) Bacteria E) Viruses

8. Which of the following is not a kingdom in the five-kingdom system?

- A) Monera B) Fungi C) Viruses D) Animals E) Plants

9. In microbiology, which of the following phenotypic characteristics are used in the classification and identification of bacteria?

- A) Genetic analyses and processing of Staining reactions
B) Colonial and Microscopic Characteristics and rRNA evolutionary relationships
C) Specific enzymatic reactions, Colonial and Microscopic Characteristics
D) All of the above
E) Specific enzymatic reactions, Colonial and Microscopic Characteristics and Genetic analyses

10. Which of the following is not a part of the standard laboratory procedure for identification of bacteria?

- A) Nucleic acid sequencing. B) Biochemical testing.
C) Microscopic morphological examination. D) Serological testing
E) Differential staining.

11. The genetic information of an organism can be found in

- A) All of the listed B) The nucleus and the nuclear membrane
C) The nucleus and the membrane D) The nucleus and nucleiod
E) The cytoplasm

12. Major fermentation end-products of cellulolytic bacteria are

- A) B and C B) Ethanol, Acetic acid and Succinic acid
C) Formic acid and Lactic acid D) Cellobiose and Butyric acid E) CO₂ and H₂

13. Which of the following does not belong with the others?

- A) Halobacteria B) Staphylococci C) Halococci
D) Methanobacteria E) Sulfolobi

14. Cells with a relatively complex morphology that have a true membrane-delimited nucleus are called ...

- A) Nokaryotes B) Urkaryotes C) Eukaryotes D) Melanoma E) Prokaryotes

15. All the following are considered eukaryotes except:

- A) Humans B) None of the listed C) Archaea D) Fungi E) Protozoa

16. A selective medium is one in which

- A) Fungi are differentiated from bacteria and viruses B) The growth of certain viruses is inhibited
C) The growth of certain bacteria is inhibited while the growth of others is encouraged
D) Viruses are differentiated from bacteria
E) Bacteria are differentiated based on some specific reactions

17. An ecosystem is:

- A) Any environment where microbes live B) A community of all the organisms in a defined space
C) A conpedium of living things D) The sum total of all living organisms on Earth
E) The physical space or location where a species lives

18. Which one of the following is a single-celled eukaryote?

- A) Rickettsia B) Protozoan C) Mycoplasma D) Archae E) Bacterium

19. Which of the following organisms take active part in the digestive process in the rumen?

- A) protozoa B) viruses C) bacteria D) fungi E) A, B and C

20. Which of the following have been suggested to be among the first living organisms to have developed?

- A) Organococcus B) Methylococcus C) Methanopyrales
D) Methanococcus E) None of the listed is correct.

21. A genus is best defined as

- A) The most specific taxon
- B) A taxon belonging to a species
- C) A taxon composed of classes of species
- D) A taxon composed of one or more species and below family
- E) A taxon composed of families

22. Thein soils depends on the fixation of atmospheric nitrogen and in one way occurs in the in the roots of legumes

- A) nitrogen cycle; mycorrhiza
- B) elemental cycle; nodules
- C) nitrogen cycle; rhizosphere
- D) nitrogen cycle; nodules
- E) elemental cycle; rhizosphere

23. An important indication of evolutionary relatedness is revealed by the:

- A) size of the periplasmic space
- B) size of the bacterial chromosome
- C) base sequence of ribosomal RNA
- D) size of the ribosomes
- E) similarities of cell membrane proteins



24. In the three domain system of classification, the traditional bacteria are placed in the:

- A) Protista
- B) Eubacteria
- C) Monera
- D) Archaea
- E) Eukarya

25. Acid-utilizing bacteria include

- A) A and B
- B) Succinate utilizers
- C) Formate utilizers
- D) Lactate utilizers
- E) all of the listed

26. Clostridium perfringens is an microorganism that can cause in wounds,

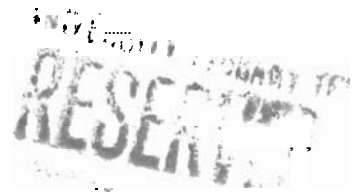
- A) anaerobic; gangrene
- B) aerobic; gangrene
- C) aerobic; prefixed food poison
- D) anaerobic; prefixed food poison
- E) exogenous pathogen; gangrene

27. In which categories are single-celled organisms not found?

- A) Prokaryotes
- B) None of the listed
- C) Archae
- D) Protozoa
- E) Algae

28. Which of the following is not true of rumen protozoa?

- A) they engulf and lyse bacteria
- B) they have slow generation time
- C) Most are ciliated
- D) they are closely associated with methanogenic bacteria
- E) none of the listed



29. Which of the following is a beneficial activity of microorganisms?

- A) Some microorganisms are useful in the treatment of sewage
- B) All of the listed
- C) Some microorganisms produce oxygen.
- D) Some microorganisms produce nitrogen for plants
- E) Some microorganisms are used as food.

30. True rumen microorganisms are

- A) all of the listed
- B) anaerobes
- C) aerobes or facultative aerobes
- D) aerobes
- E) anaerobes or facultative anaerobes

31. Methanogens are potentially of great importance because

- A) They consume methane.
- B) They produce methane.
- C) They consume and produce methane
- D) Methane is an excellent energy source.
- E) They consume methane as an excellent energy source

32. Microorganisms are the main component involved in the principal task oforganic matter and elements in the environment.



- A) recycling; producing B) recycling; perturbing C) degrading; recycling
D) producing; recycling E) producing; degrading

33. Mitochondria are similar to bacteria in several ways. Which of the following is NOT a similarity?

- A) None of the listed B) Both have 70S ribosomes.
C) Both have circular, double stranded DNA. D) Both are about the same size.
E) Both have peptidyl glycan in their cell wall.

34. The bacteria have been on the face of the Earth for approximately:

- A) A thousand years before the earth was formed
B) A million years after the creation of the moon
C) Three-and-a-half billion years and a few months
D) Three-and-a-half billion years E) The same time as humans

35. Which of the following best describes the Archae microorganisms?

- A) They exist in completely anoxygenic environment
B) They are obligate anaerobes and can use carbon dioxide as electron acceptor
C) The phospholipid molecules contain an unusual ether linkage and peptidoglycan cellwall
D) Their cellwall lacks muremic acid and the phospholipid molecules contain an unusual ether linkage
E) None of the listed

36. Eubacteria and Archae groups are similar for which of the following?

- A) None of the listed B) Methionine is the start signal for protein synthesis.
C) Sensitivity to antibiotics. D) They have prokaryotic cells E) Peptidoglycan cell wall.

37. By the analyses of their G + C ratio, organisms A and B have 70 % and 40 % moles respectively. Which of the following conclusions can best be made?

- A) The two organisms make different enzymes B) The two organisms are related
C) The two organisms may be of the same origin
D) The nucleic acids of the two organisms will not hybridize E) The two organisms are unrelated

38. Which of the following is/are not considered eukaryotes?

- A) Baboons B) Protozoa and Archae C) Archaea D) Fungi E) Humans

39. The endosymbiosis hypothesis provides an explanation for how:

- A) Algae developed from protozoa B) Protozoa developed from algae
C) Eukaryotes developed from prokaryotes D) Prokaryotes developed from eukaryotes
E) Modern eukaryotes developed from prokaryotes

40. In the new molecular system of classification, which of the following is/are used?

- A) Phenotypic and Genotypic characteristics B) Examination of the rRNA nucleotide sequence
C) DNA replication process and digestion D) Physiological, Cellwall and Antigenic characteristics
E) Growth, nutritional and ecological characteristics

41. Algal bloom in a pond or waterway is an indication of

- A) An efficient symbiotic degradation of organic matter B) None of the listed
C) A positive effect of efficient treatment of sewage D) A high level organic matter pollution
E) Efficient algal growth

42. Which one of the following is a prokaryote without a cell wall?

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- A) Mycoplasma B) Cyto bacterium C) Rickettsia D) Virus E) Cyanobacterium

43. The term autotroph refers to an organism that:

- A) must obtain organic compounds for its carbon needs B) does not need a carbon source
C) gets energy from sunlight D) uses CO₂ for its carbon source
E) gets energy by oxidizing chemical compounds

44. Blue-green algae (cyanobacteria) are very independent nutritionally since they can perform using

- A) respiration; chlorophyll a B) carbon fixation; oxygen C) photosynthesis; chlorophyll a
D) oxygenation; chloroplast E) oxygenation; carbon dioxide

45. Which of the following is the best evidence for a three-domain system of classification?

- A) There are three distinctly different genetic and cellular chemical compositions
B) There are three distinctly different Gram reactions
C) There are three distinctly different cell structures
D) Some bacteria, plants and animal cells can live in extreme environments
E) Plants and Animals are distinctly different from bacteria

46. Bacteriological water testing for potability relies on the detection of certain indicator organisms known as:

- A) Coliforms B) None of the listed C) Acid-fast bacteria D) Dinoflagellates E) Bacteroids

47. Which of the following shows best the relationship among the Bacteria, Prokaryotes and Archae?

- A) Bacteria is synonymous to prokaryotes and is the antonym of archae
B) Bacteria is a subcategory of prokaryotes distinct from the Archae
C) Archae are prokaryotes but are not bacteria D) Bacteria include both archae and prokaryotes
E) Archae are prokaryotes while bacteria are not

48. The various serial phases of microbial growth in a batch culture are

- A) lag - straight - exponential - stationary - death B) lag - exponential - stationary - death
C) exponential - lag - stable - stationary - death
D) lag - stationary - exponential - continuous - death
E) static decline - stable exponential - stationary - death

49. Bacteria that live within the human digestive system contribute to gut immunity and synthesise vitamins in an relationship and the organisms are referred to as

- A) endosymbiotic; probiotics B) exosymbiotic; probiotics C) paraymbiotic; probiotics
D) endosymbiotic; prebiotics E) exosymbiotic; prebiotics

50. Lipopolysaccharide is an important cell wall component of:

- A) gram negative B) gram positive bacteria C) all of the choices listed
D) acid fast bacteria E) mycoplasmas

51. Archaea are a.

- A) endosymbionts whose structure suggests how eukaryotes arose from prokaryotes.
B) eukaryotic parasites. C) prokaryotes that have become extinct.
D) ancient bacteria that have become extinct. E) prokaryotes that live in extreme environments

52. In testing water for evidence of faecal pollution, the indicator organism(s) is/are

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- A) Streptococcus faecalis and E. coli B) None of the listed C) Staphylococci and Streptococci
D) Staphylococci and E. coli E) Enterococci and staphylococci

53. Ruminants rely on microbes to digest:

- A) Starch and cellulose B) Starch C) Cellulose D) Glucose E) Protein

54. The most commonly encountered bacteria are roughly spherical. The microbiological term describing this shape is

- A) Enterococcus B) Coccus C) Enterococci D) Bacillus E) Pleomorphic

55. Treatment of municipal water supplies is based upon:

- A) Acidification, coagulation, sedimentation B) All of the listed
C) Coagulation, filtration, chlorination D) Filtration, coagulation, chlorination
E) Coagulation, chlorination, filtration

56. Carl Woese and his colleagues are best known for establishing:

- A) The Five Kingdom System B) The Prokaryote-Eukaryote System
C) The Plant-Animal System D) None of the listed E) The Three Domain System

57. All of the following are true of the Archae except

- A) They are prokaryotes B) They lack peptidoglycan in their cellwalls
C) Some produce methane from carbon dioxide and hydrogen
D) Some are thermoacidophiles; others are extreme halophiles
E) They evolved from some unicellular eucaryotes

58. Biological oxygen demand (BOD) of water refers to the:

- A) Number of living organisms that a body of water can support
B) Amount of oxygen used by microbes present in the water
C) Percentage of oxygen left in water after organic matter is removed
D) Concentration of decomposed waste in water E) None of the listed

59. Green algae are still major sources of in the oceans and were likely the life forms that evolved into, which first lived primarily in the oceans

- A) microorganisms; higher organisms B) food ; plants
C) microorganisms; eucaryotes D) food; higher organisms E) food; eucaryotes

60. Which of the following statements is not true?

- A) None of the listed
B) Chloroplasts are probably descendants of some ancient photosynthetic bacteria
C) Mitochondria are probably descendants of some ancient non-photosynthetic bacteria
D) Mitochondria are probably descendants of some ancient aerobic bacteria
E) Mitochondria are probably descendants of some ancient photosynthetic bacteria

61. In binomial system of nomenclature, which of the following is/are not in the correct conventional format? 1. E. coli (italicised) 2. Es. coli 3. Escherichia coli 4. Escherichia coli (italicised) 5. Esch. coli

- A) 1, 2, & 3 correct B) 1, & 3 correct C) 2, & 4 correct
D) 4 only correct E) All correct

62. Proteins are chains of _____ that sometimes function as _____

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- A) Amino acids; enzymes B) None of the listed C) Disaccharides; enzymes
D) Monosaccharides; energy compounds E) Lipids; structural materials

63. In the production of potable water, the process of adding alum to coalesce and settle colloidal materials is called

- A) Blending and blanching B) Precipitation and blanching C) Filtration and sedimentation
D) Flocculation E) Mixing and blending

64. The cell classification of "prokaryote" includes

- A) All bacteria, monera, protozoans and archaea. B) All bacteria, protozoans and archaea
C) All bacteria and archaea. D) All monera and archaea.
E) All bacteria, monera and archaea.

65. Which of the following is not true for the nitrogen cycle?

- A) Ammonium and nitrates are used by bacteria and plants to produce amino acids
B) Microorganisms decompose proteins in dead cells to release amino acids
C) Nitrogen is released to the atmosphere by the nitrogenous bacteria
D) Ammonia is liberated by ammonification of amino acids
E) The nitrogen in ammonia is oxidized by nitrifying bacteria to produce nitrates

66. Chlorination precedes filtration in the normal purification procedures for drinking water

- A) True but filtration must be on sand bed
B) Not True
C) May be true if done by experts
D) True if it does not contain sewage
E) True

67. The Kingdom Eubacteria include all the following lines of descent except the

- A) Cyanobacteria B) Extreme thermoacidophiles C) Sulphate reducers
D) Gram negative bacteria E) Spirochetes

68. Acids that are usually intermediate metabolites of acid-utilizing bacteria in the rumen include

- A) Formic acid B) Succinic acid C) all of the listed D) A and C E) Lactic acid

69. Which of the following is/are classified as prokaryotes?

- A) bacteria and viruses B) bacteria C) bacteriophages
D) viruses of bacterial origin E) fungi

70. In the classical systematics, which is the correct descending order of classifying organisms?

- A) Kingdom-Phyla-Family-Order-Class-Genus-Species
B) Kingdom-Phyla-Family-Order-Class-Genus-Species
C) Kingdom-Phyla-Order-Family-Genus-Class-Species
D) Kingdom-Phyla-Order-Class-Family-Genus-Species
E) Kingdom-Phyla-Class-Order-Family-Genus-Species

71. Compounds produced by the bacterium *Desulfovibrio* can:

- A) Cause corrosion of iron and steel pipes buried in soil
B) Breakdown toxic chemicals, including herbicides and pesticides
C) Pollute streams and rivers with an unsightly yellow precipitate
D) Combine with mineral particles to form humus
E) Are useful for bioremediation

72. Acids that are usually intermediate metabolites of acid-utilizing bacteria in the rumen include

- A) Formic acid B) Succinic acid C) all of the listed D) A and C E) Lactic acid

73. *Vibrio cholerae* is a major cause of in man; it is spread via contaminated

- A) salmonellosis; water and food B) cholera; water C) cholera; water and food
D) salmonellosis; water E) dysentery; food

74. A differential medium is one in which

- A) Bacteria growth is inhibited to promote the growth of yeast B) None of the listed
C) Bacteria are differentiated based on some specific reactions
D) The growth of certain fungi is inhibited while the growth of others is encouraged
E) The growth of certain bacteria is inhibited while the growth of others is encouraged

75. According to Whittaker's system of classification in which of the following group/groups are bacteria placed? I. Monera II. Protista III. Fungi

- A) III only B) I & III only C) I & II only D) II only E) I only

G.O.B

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