82. _____ is a test for the presence of cytochrome c using p-amino dimethyl aniline
   a. Indole test
   b. Oxidase test
   c. Catalase test
   d. Hydrogen sulphide test
   e. Proteolysis

83. In testing for the presence of fecal coliform in water, what medium/media can be used _____
   a. Thiosulphate Citrate Bile Sucrose agar
   b. Slanetz and Bartley agar
   c. Nutrient agar
   d. Lauryl Sulphate agar
   e. Salmonella-Shigella agar

84. An enzyme-linked immunosorbent assay uses which of the following _____?
   a. An enzyme-labelled antibody
   b. A radioactive anti-antibody
   c. An enzyme-labeled antigen
   d. A source of complement
   e. An fluorescent-labeled antibody

85. Which of the following terms is given to an organism that cannot exist in the presenc oxygen _____?
   a. Microaerophilic
   b. Facultative anaerobe
   c. Obligate aerobe
   d. Facultative aerobe
   e. Obligate anaerobe

86. Select the disease that is caused by a virus?
   a. Malaria
   b. Trachoma
   c. SARS-CoV
   d. Thrush
   e. Tuberculosis

87. A microorganism which grows in the presence of very small amounts of oxygen is as _____.
   a. Anoxyphile
   b. Microaerophile
   c. Obligate aerobe
   d. Facultative aerobe
   e. Anaerobe

88. _____ is an example of a Glycocalyx.
   a. Slime layer

a. Spirochetes
b. Spirillum
c. Streptococci
d. Fusobacterium

182. Bacteria motility can be observed by a _____
a. Locomotion test
b. Hanging drop test
c. Flagella staining
d. Catalase test

183. Buruli ulcers are caused by the species of _____.
a. *Mycobacterium*
b. *Escherichia*
c. *Helicobacter*
d. *Staphylococcus*

184. Bacteria are differentiated based on all the following EXCEPT
a. Origin
b. Morphology
c. Chemical composition
d. Source of energy

185. A bacterial culture is growing in a test tube of nutrient broth in an incubator. Through a malfunction over the next twelve hours the machine shakes too vigorously and the seal is lost from the top of the flask. The culture becomes contaminated but cannot support the growth of any _____.
a. Strict anaerobes
b. Facultative anaerobes
c. Microaerophiles
d. Aerotolerant anaerobes

186. Each of the following is used to classify viruses except
a. Carbohydrate makeup
b. Host range
c. Life cycle
d. Size

89. Anthrax is caused by a species of
a. *Bacillus*
b. *Borrelia*
c. *Brucella*
d. *Pseudomonas*

90. Which of the following bacterial groups would you expect to be MOST likely associated with human infections
a. thermophiles
b. psychrophiles
c. halophiles
d. mesophiles

91. Gas gangrene is most likely associated with infection with
a. *Staphylococcus aureus*
b. *Clostridium perfringes*
c. *Streptococcus pyogenes*
d. *Clostridium difficile*

92. An example of a non-communicable disease is
a. leprosy
b. influenza
c. tetanus
d. measles

93. The best descriptive term for resident microflora is
a. Commensals
b. Parasites
c. Pathogens
d. Mutualists

94. Antibiotics are
a. chemical produced by one microbe that inhibits other microbes
b. artificial chemicals used to treat flu infections
c. chemical substances used to treat flu

95. Acne is caused by an inflammatory response to a
a. Bacterium
b. Fungus
c. Protozoan
d. virus

96. The microbe that is mainly used as an indicator of faecal pollution in water is
a. *Escherichia coli*
b. *Clostridium tetani*
c. *Clostridium botulinum*
d. Cyanobacteria

c. Smallpox
d. Lassa fever

188. The first medically useful antibiotic was
a. A sulphur drug
b. Erythromycin
c. Penicillin
d. Tetracycline

189. One species of *Mycobacterium* causes
a. Botulism
b. Gonorrhea
c. Syphilis
d. Tuberculosis

190. Which substance is the mordant of the Gram stain
a. Acetone
b. Gentian violet
c. Iodine
d. Safranin

191. A culture of bacteria produces 5 generations in 2 hours. What is the generation time for the bacterium under these conditions?
a. 15 minutes
b. 24 minutes
c. 30 minutes
d. 1.5 hours
e. 1 hour

192. Incubation and the development of an anaerobic environment to facilitate [illegible] characteristic of which genus?
a. [illegible] ferrum
b. Escherichia
c. Pseudomonas
d. Corynebacterium
e. Clostridium

193. [illegible] can be caused by *Candida albicans*. The organism is a type of
a. Filamentous fungi
b. Yeast
c. Gram positive bacteria
d. Gram negative bacteria

194. Which of the following is often used in the dairy industry in enumerating microbial load?
a. Turbidometry

b. Breakdown of public health infrastructure
c. Construction of dams
d. Mass distribution and importation of food
e. Widespread vaccination programs

All of the following symptoms are characteristic of the AIDS related complex
except
a. Fever
b. Fatigue
c. Diarrhea
d. Blindness
e. Weight loss

What name is given to this arrangement of bacteria

a. Spirochaete
b. Spirillum
c. Streptococcus
d. Diplococcus
e. Staphylococcus

What name is given to this arrangement of bacteria

a. Staphylococcus
b. Sarcina
c. Tetrad
d. Cubelike
e. Diplococcus

Select the disease that is NOT caused by a virus
a. Malaria
b. Polio

b. MPN
c. Total viable count
d. Membrane filtration
e. Direct microscopic count

If you start out with a population density of 200 CFU/ml of a bacterium t. divides every 20 minutes, what will the population density be at the end of two hours assuming the cells are in the log phase of growth?

a. 1200 CFU/ml
b. 26 CFU/ml
c. 3200 CFU/ml
d. 12800 CFU/ml
e. 2006 CFU/m

Which of the following is NOT a protozoan disease

a. Malaria
b. Cryptosporidiosis
c. Amoebiasis
d. Diphtheria

Which genus of bacterium contributes to plaque, caries, gingivitis, and periodontal disease?

a. Streptococcus
b. Staphylococcus
c. Bacillus
d. Escherichia
e. Proteus

Bacteria are differentiated based on all the following EXCEPT

a. Morphology
b. Chemical composition
c. Origin
d. Source of energy

In relation to bacterium's optimal growth requirements, which group would you expect to be MOST likely involved in decomposition of compost piles

a. Acidophiles
b. Psychrophiles
c. Extreme halophiles
d. Mesophiles
e. Thermophiles

d. Lipopolysaccharide

4. Bacterial endospores function in
   a. Reproduction
   b. Protein synthesis
   c. Survival
   d. Storage

5. The major difference between a spirochete and spirillum is the
   a. The presence of flagella
   b. A cell with coils
   c. The nature of motility
   d. Size

6. An organism that can synthesize all its required organic components from CO_2 using the energy from the sun is a
   a. Photoautotroph
   b. Photoheterotroph
   c. Chemoautotroph
   d. Chemoheterotroph

7. The time required for a cell to undergo binary fission is called
   a. Exponential growth rate
   b. Growth curve
   c. Generation time
   d. Lag time

8. Usually bacteria form more endospores in response to
   a. Need for reproduction
   b. Colony formation
   c. Adverse environmental stress
   d. Nutrient surplus
   e. Increased aeration

9. A bacterial cell that assumes several shapes is said to be
   a. Monomorphic
   b. Monogramic
   c. Pleomorphic
   d. Chemomorphic
   e. Pleomorphic

10. The stomach usually contains a very low concentration of bacteria due to
   a. the high pH
   b. the inhibitory action of the bile
   c. the neutral pH
   d. the uninhibitory action of the bile
   e. the low pH

151 B
152 D
153 •
154 D
155 •
156 E
157 B
158 D
159 B
160 •
161 C
162 B
163 C
164 •
165 B
166 C
167 B
168 B
169 A
170 D

171 B
172 D
173 A
174 B
175 D
176 D
177 B
178 B
179 D
180 B
181 A
182 B
183 A
184 A
185 A
186 A
187 B
188 A
189 D
190 D

191 D
192 A
193 A
194 •
195 A
196 B
197 D
198 D
199 D
200 D

1 A
2 C
3 C
4 •
5 D
6 C
7 B
8 A
9 E
10 A
11 D
12 E
13 B
14 A
15 A
16 D
17 C
18 C
19 B
20 A
21 A
22 A
23 C
24 E
25 C

26 A
27 C
28 B
29 C
30 B
31 A
32 C
33 E
34 D
35 •
36 D
37 E
38 B
39 E
40 E
41 B
42 A
43 B
44
45
46
47
48
49
50 A
51 E
52 C

53 B
54 B
55 D
56 A
57 E
58 E
59 E
60 A
61 B
62 B
63 E
64 D
65 C
66 C
67 B
68 D
69 E
70 C
71 B
72 B
73 A
74 E
75 C
76 B
77 D
78 D
79 B
80 E

81 B
82 B
83 D
84 A
85 E
86 C
87 B
88 A
89 D
90 D
91 D
92 D
93 E
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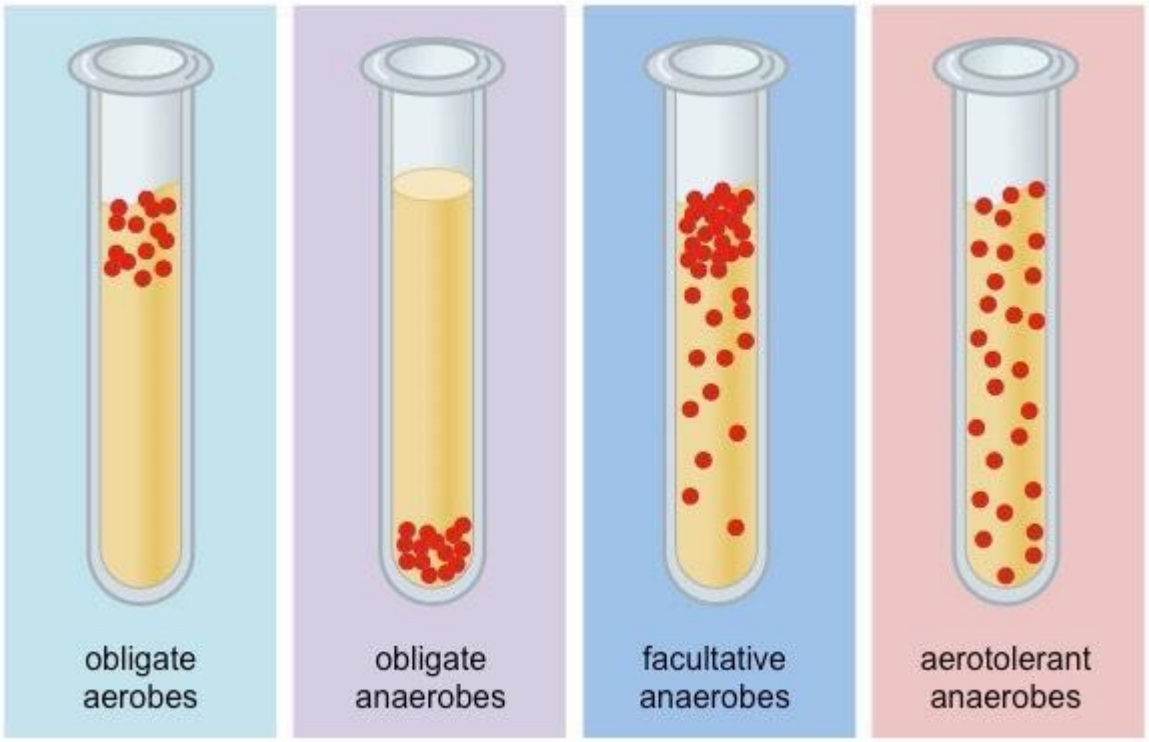
96 D
97 C
98 C
99 B
100 D
101 C
102 D
103 A
104 C
105 D

106 A
107 •
108 B
109 E
110 D
111 A
112 B
113 B
114 B
115 B
116 C
117 C
118 D
119 •
120 E E
121 E
122 E
123 A
124 B
125 C
126 E
127
128 C
129 A
130 B

131 B
132 C
133 A
134 C
135 B
136
137 B
138 B
139 C
140 D
141 A
142 B
143 B
144 B
145 A
146 C
147 C
148 C
149 B
150 B


obligate aerobes
obligate anaerobes
facultative anaerobes
aerotolerant anaerobes

c. Psychrophile, *Proteus*
d. Thermophile, *Clostridium*
e. Hyperthermophile, *Treponema*

7. Microbial growth is measured by what parameter?
   a. increased cell size
   b. increase in total number of cells
   c. increased size of cellular components
   d. b and c
   e. a and b

8. Some bacteria have complex nutritional requirements because they:
   a. Are composed of a large number of different types molecules
   b. Lack many enzymes and must therefore be provided with many of the molecules they need for growth.
   c. Can make a great number of the molecules found in the cell from simple precursors
   d. Have many different enzymes and therefore can make many molecules
   e. Contain unique molecules not normally found in bacterial cells

9. Bacteria that customarily grow near the surface of bodies of water are usually:
   a. Facultative anaerobes
   b. Microaerophiles
   c. Capnophiles
   d. Obligate anaerobes
   e. Obligate aerobes

10. Bacteria that grow at the bottom of water bodies are usually:
   a. Obligate anaerobes
   b. Facultative anaerobes
   c. Obligate aerobes
   d. Microaerophiles
   e. Capnophiles

11. Bacteria that require moderate to large amounts of salt for their survival are known
   a. Acidophiles
   b. Barophiles
   c. Capnophiles
   d. Halophiles
   e. Mesophiles

12. A culture of bacteria produces 4 generations in 2 hours. What is the generation ti
   this bacterium under those conditions?

$\frac{2 \times 60}{4}$

   a. 15 minutes
   b. 20 minutes
   c. 24 minutes
   d. 25 minutes

152. The greatest number of flagella is usually found on a bacterial cell with a (n) _____ arrangement?
a. Monotrichous
b. Amphitrichous
c. Lophotrichous
d. Peritrichous

153. The slope of the exponential phase in a bacterial growth curve against time is directly related to the _____.
a. Synchronization of population increase
b. Prevalent population
c. Size of the individual cells
d. Growth rate

154. For the general formula of exponential growth, where N is 2 and raised to the n power, 13 cell will form _____ cells after six generations.
a. 64
b. 128
c. 256
d. 832

155. Select the bacterium that causes human disease but is not found commonly in the soil.
a. *Clostridium botulinum*
b. *Clostridium tetani*
c. *Pseudomonas aeruginosa*
d. *Staphylococcus aureus*

156. Select the INCORRECT statement about the virus
a. It contains a small packet of nucleic acid
b. It has a protein oat
c. It is a cellular organism
d. Its nucleic acid contains genetic information

INCORRECT statement about coliform bacteria

c. 8.0×10^6
d. 6.4×10^5

189. Which of these diseases has not occurred as an epidemic
a. Cholera
b. Ebola
c. Polio
d. Trachoma

190. The science of classifying and naming organisms was started by
a. Leeuwenhoek
b. Lister
c. Jenner
d. Linnaeus

191. Bacterial endospores function in _____?
a. Protein synthesis
b. Reproduction
c. Storage
d. Survival

192. In the binomial system of nomenclature, which term is always written in lowercase letters
a. Specific epithet
b. Genus
c. Domain
d. Kingdom

193. Which of the following Scientist hypothesized that a bacterial colony arises fr a single bacterial cell
a. Van Leeuwenhoek
b. Louis Pasteur
c. Robert Koch
d. Richard Petri

194. Which of the following methods is best for determining the fecal bacteria lo Voltic Mineral Water to determine the safety of the water for drinking
a. Turbidity
b. Most probable number (MPN)
c. Membrane filtration
d. Total Viable counts

195. This statement "In the laboratory, a sterile molten agar is inoculated with a volume of sample, palmed gently for a few minutes and poured into sterile culture and allowed top set." describes which of the following:
a. Streak plate
b. Pour plate

c. Need for reproduction
d. Nutrient surplus
e. Colony formation

96. A bacterial cell that assumes several shapes is said to be _____.
a. Cleomorphic
b. Monomorphic
c. Pheomorphic
d. Pleomorphic
e. Monogramic

97. Gas gangrene is most likely associated with infection with _____.
a. *Staphylococcus aureus*
b. *Clostridium difficile*
c. *Clostridium perfringes*
d. *Streptococcus pyogenes*
e. *Clostridium botulinum*

98. The low concentration of bacteria in the stomach is due to _____.
a. the inhibitory action of the bile
b. the high pH
c. the low pH
d. the neutral pH
e. competition with other organisms

99. Anthrax is a disease caused by a species of _____.
a. *Brucella*
b. *Bacillus*
c. *Borrelia*
d. *Clostridium*
e. *Pseudomonas*

100. An example of a non-communicable disease is _____
a. Ebola
b. Measles
c. Influenza
d. Asthma
e. Tuberculosis

101. The order of reagents used in Gram stain are
a. Crystal violet, iodine, safranin, alcohol
b. Crystal violet, safranin, alcohol, iodine
c. Crystal violet, iodine, alcohol, safranin
d. Alcohol, Crystal violet, iodine, safranin
e. Iodine, Crystal violet, safranin, alcohol

b. Absorption
c. Penetration
d. Unceasing
e. Replicating

128. The viruses that live as parasites on bacteria are _____
a. Fungi
b. Commensals
c. Bacteriophages
d. Liverworts
e. Cyanobacteria

For the questions below, match the options (A-C) with the following descriptors

A. Solid media B. Liquid media C. Semi solid media

129. Distinct colony can be appreciated B

130. Diffused growth B

131. Continuous culture A

132. Contains approximately 0.5% agar C

133. Microbes are involved in the production of all these food items except
a. Marmite,
b. Yoghurt
c. Sauerkraut
d. Bread
e. Jam

134. When bacteria cells are observed to be colorless against a colored background staining technique is called _____.
a. simple staining
b. capsule staining
c. negative staining
d. Indian ink
e. Endospore staining

135. Filtration may be preferred before a bacteria suspension is cultured. under what circumstances would this be required
a. when the source of the bacteria suspension is too contaminated
b. when the source of bacteria suspension is already too diluted
c. when the bacteria suspension is too concentrated
d. this is done only when bacteria suspension is pathogenic
e. when the bacteria suspension is from the hospital

...ability to hydrolyze protein

196. An organisms that can synthesize all its required organic components from CO_2 using the energy from the sun is a _____.
   a. Chemoheterotroph
   b. Photoautotroph
   c. Chemoautotroph
   d. Photoheterotroph

197. *Saccharomyces cerevisiae* is a _____.
   a. Bacterium
   b. Plant
   c. Virus
   d. Yeasts

198. The most active stage in the sigmoid curve of bacteria in which maximum growth is attained known as
   a. Lag phase
   b. Stationary phase
   c. Decline phase
   d. Log phase

199. An example of a coccus that remain in pairs after division is
   a. *Streptococcus pyogenes*
   b. *Staphylococcus aureus*
   c. *Sarcina ventriculi*
   d. *Neisseria gonorrhoeae*

200. An example of a Halophilic bacteria is
   a. *Vibrio cholera*
   b. *Salmonella paratyphi A*
   c. *Salmonella paratyphi B*
   d. *Halobacterium*

a. Toxoid
b. Attenuated
c. Denatured
d. Dormant
e. Sterile

122. Which of the following is part of the host's specific defense mechanisms
a. Production of mucous membrane
b. Local inflammation
c. The low pH of the stomach
d. Antigen
e. Antibody

123. *Salmonella typhi* has the ability to persist within the gall bladder of humans wh causing no clinical symptoms. The infected individual is still contagious, however, an would be considered a _____
a. Reservoir
b. Pathogen
c. Endemic
d. Nuisance
e. Symptomatic

124. The counter-stain for the acid fast stain is _____.
a. Carbol fuchsin
b. Methylene blue
c. Gentian violet
d. Nigrosin
e. Safranin

125. After three, consecutive one-tenth serial dilutions of a culture in nutrient brot ml of cells is plated on an agar surface and produces 10 colonies. The original cell concentration per ml was?
a. 10
b. 1000
c. 10000
d. 100
e. 1

126. A substance is added to a bacteriophage sample. The substance destroys the activity of the lysozymes in the viruses. This prevents their ability to _____
a. Change their nucleic acid genetically
b. Decrease their metabolism
c. Dissolve the bacterial cell wall
d. Increase their metabolism
e. Penetrate the bacterial cell wall

This will directly interfere

c. Differential
d. Defined
e. Exact

19. An example if an organism that needs little oxygen to grow is
a. *Streptococcus*
b. *Campylobacter spp*
c. *Clostridium dificle*
d. *Mycobacterium tuberculosis*
e. *Lactobacillus*

20. Members of a species can sometimes be subdivided into sub groups called:
a. Strains
b. Kingdoms
c. Families
d. Orders
e. Genera

21. An example of a polyhedral shaped virus is a _____.
a. Herpes simplex virus
b. Adenovirus
c. Polio virus
d. Hepatitis A virus
e. Human Immunodeficiency virus

22. Which of the following test will be most useful in an epidemiological study?
a. ELISA test
b. Fermentation test
c. Phage typing
d. Western Blotting
e. Serological test

23. _____ is to DNA as _____ is to RNA
a. Western Blotting / Northern blotting
b. Western Blotting / Southern blotting
c. Southern Blotting / Northern blotting
d. Northern Blotting / Western blotting
e. Southern Blotting / Western blotting

24. Which of the following is not a condition of Koch's Postulate?
a. Isolate the causative agent of the disease
b. Cultivate the microbe in the lab
c. Inoculate a test animal to observe the disease
d. Grow the organism in pure culture
e. Produce a vaccine

also known as?

allows the detection of lactose fermenting bacteria. Eosin Methylene Blue agar is classified as:

a. Differential, selective
b. Defined, selective, differential
c. Differential
d. Selective, Differential
e. Regulatory, selective

32. Which of the bacterial groups would you not expect to be most likely associated with human infections?

a. Lactophiles
b. Mesophiles
c. Stereothermophiles
d. Psychrophiles
e. Thermophiles

33. The bacteria that multiply in improperly treated, sealed canned food are most likely t

a. Aerobes
b. Carnivores
c. Omnivores
d. Anaerobes
e. Facultative anaerobes

34. Which of the following methods allows determination of the specific number of via cells in a specimen?

a. Turbidity measurement
b. Dry weight measurement
c. Petroff-Hausser bacterial counter
d. Total plate count
e. Total nitrogen measurement

35. Which of the following groups of organisms can the gram stain not distinguish?

a. Gram positive organisms, whose cell walls retain the primary crystal vio
b. Gram variable organisms, which stain unevenly
c. Gram negative organisms, whose cell walls retain the mordant iodine
d. Gram nonreactive organisms which do not stain
e. Gram negative organisms, whose cells do not retain the primary crystal stain.

36. The purpose of serial dilution is to reduce bacteria numbers to a particular ra give accurate estimate when cultured on an agar plate. what is the recommen bacteria numbers that gives accurate estimate

a. 25 - 10
b. 30 - 50
c. 25 - 600

b. Lithotroph
c. Autotroph
d. Heterotroph
e. Phototroph

64. In the _____ phase of a typical bacterial growth curve, the cell decay rate
cell multiplication rate
a. Lag phase
b. Log phase
c. Stationary phase
d. Declining phase
e. Survival phase

65. An original cell concentration in nutrient broth is 3000 per ml. Each step of
dilution reduces the concentration of cells in the suspension by one tenfold.
dilution steps the concentration of cells is ..... per ml
a. 0.03
b. 0.3
c. 3.0
d. 30.0
e. 0.003

66. Speed and accuracy for a plate count occur by choosing growth plates with
colonies. After being diluted to 0.001 of its original concentration, one ml
culture in broth is plated for counting. To achieve an accurate count, the or
concentration in the broth was about .....cells per ml
a. 30,000,000,000
b. 30,000,000
c. 300,000
d. 300
e. 30

67. One species of *Mycobacterium* causes
a. Common cold
b. Leprosy
c. Botulism
d. Gonorrhea
e. Syphilis

50. A non-dividing bacterial cell has _____ chromosomes
   a. One
   b. Two
   c. Three
   d. Four
   e. Many

51. Viruses have a _____ and a _____.
   a. DNA core; carbohydrate coat
   b. DNA or RNA core; plasma membrane
   c. DNA and RNA core; Protein coat
   d. RNA core; carbohydrates coat
   e. DNA or RNA core; protein coat

52. A mushroom is _____.
   a. The food-absorbing part of the fungal body
   b. The part of the fungal body not constructed of hyphae
   c. A reproductive structure
   d. A nonessential part of the fungus
   e. The vegetative structure

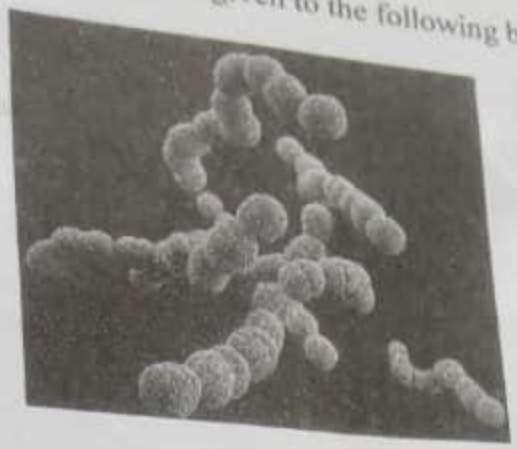
53. Cells used to start a culture is referred to as _____.
   a. Start culture
   b. Inoculum
   c. Seed culture
   d. Sample
   e. Population

54. Keeping food in the refrigerator preserves the food by _____.
   a. Killing microorganisms
   b. Inhibiting the growth of microbial populations
   c. Denaturing proteins
   d. Dehydrating microbial cells
   e. Keeping it cold

55. A few drops of 3% hydrogen peroxide was put on bacteria colonies growing on an plate. The colony produced effervescence. What test is the colony positive for?
   a. Oxidase
   b. Catalase
   c. Indole
   d. Hydrogen Sulphide
   e. Serology

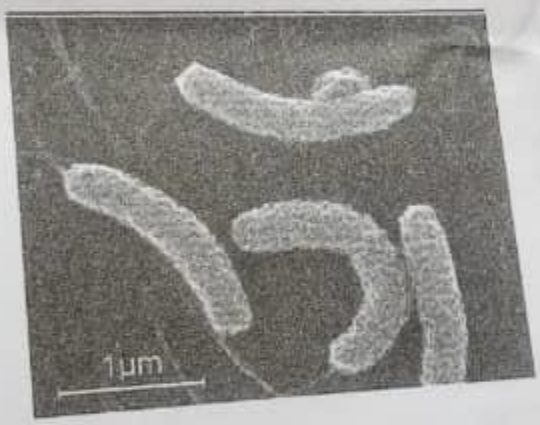
56. Which of the following structures is/are not essential for survival of most bacteria
   a. Cell wall

68. What name is given to the following bacterial arrangements?



a. Staphylococcus
b. Sarcina
c. Tetrad
d. Streptococcus
e. Streptobacillus

69. The bacteria shown in the picture below is a _____.



a. Bacillus
b. Spirilum
c. Coccibacillus
d. Spirochete
e. Vibrio

70.

e. c and d

57. The process used in the laboratory to produce millions of copies of DNA is
    a. Reverse transcriptase
    b. Fluctuation tests
    c. ELISA
    d. In situ polymerization
    e. Polymerase chain reaction

58. Taxonomy is the science of classification of living things and provides
    a. A way of identifying organisms
    b. Arrangement of related organisms
    c. Information on how organisms have evolved
    d. a, b, c are correct
    e. Only a and b

59. Heat fixation of a bacterial smear during staining will _____.
    a. Cause the bacteria to shrink and adhere to the slide
    b. Dry organisms, kill them and cause them to adhere to the slide
    c. More quickly dry the specimen
    d. Cause the bacteria to adhere to the slide
    e. Cause the organisms to adhere to the slide, kill microbes and make them stain more readily

60. What type of bacteria are also called Cyanobacteria?
    a. blue-green algae
    b. Green-green algae
    c. Eubacteria
    d. Archaeobacteria
    e. Protists

61. A bacterial colony count produced 46 discrete colonies at the 10^{10} dilution. What numbers of these organisms can be estimated in two litres of the original culture.
    a. 4.6×10^{15}
    b. 4.6×10^{13}
    c. 4.6×10^{14}
    d. 4.6×10^{16}
    e. 4.6×10^{17}

62. The enzyme catalase is important to the survival of many bacteria. It serves the in function of _____.
    a. Breaking down hydrogen
    b. Breaking down hydrogen peroxide
    c. Catalyzing respiratory reactions
    d. Preventing water loss
    e. Catalyzing salt breakdown

their energy source?

a. Vibrio
b. Coccibacillus
c. Fusobacterium
d. Corynebacterium
e. Bacillus

71.

a. Amphitrichous
b. Peritrichous
c. Lophotricous
d. Monotrichous
e. Megatrichous

72. The most common method of reproduction in bacteria is
a. Binary fusion
b. Binary fission
c. Binary fixing
d. Binary friction
e. None of the above

73. Which is true of antigens?
a. Antibody-generating foreign macromolecules
b. Proteins embedded in the B-cell membranes
c. Proteins that consist of two light and two heavy polypeptide chains
d. Proteins found in the blood that causes foreign blood cells to clump
e. Both a and d are correct

c. Undulate
d. Umbonate

141. The slowest rate of population growth is the _____ phase.
a. Death
b. Lag
c. Log
d. Stationary

142. MacConkey agar contains a .....indicator
a. Salinity
b. pH
c. Sugar
d. Temperature

143. The total destruction of all microbial life forms is termed _____.
a. Disinfection
b. Sterilization
c. Antisepsis
d. Decontamination

144. Select the incorrect association
a. Hanta virus/rodents
b. Rift valley virus/monkeys
c. West Nile virus/birds
d. Nipah virus/bats

145. The Petroff-Hauser counting chamber is used to _____.
a. Count cells
b. Measure cell diameter
c. Remove cells from culture
d. Stain cells

146. The equilibrium phase of population growth is usually the _____ phase.
a. Lag
b. Log
c. Stationary
d. Death

147. Most antibiotics are isolated from _____.
a. Aquatic microorganisms
b. Airborne Viruses
c. Soil borne Microorganisms
d. Soil borne Fungi

_____ flagella arrang

c. Hospital acquired infections
d. Pregnancy related infections
e. Accidental infections

26. Which of the following methods can be used in preparing samples for Western B
    i. Enzymatic digestion
    ii. Gel electrophoresis
    iii. Freeze thawing cycles
    iv. Antibody probing
    v. Detergent lysis
    a. i, ii and iv
    b. only i
    c. i, iii and v
    d. iii, iv and v
    e. All of the above

27. In Microbiology, biochemical tests are conducted to determine _____ and _
    characteristics of bacteria
    a. Morphology and behavior
    b. Metabolic and nutrition
    c. Metabolic and morphology
    d. Arrangement and nutrition
    e. None of the above

28. Prokaryotes and viruses may share one of these characteristics
    a. They may be enclosed in an envelope and have Ribosomes
    b. They may be enclosed in an envelope and have genetic material
    c. They may have a protein coat and Ribosomes
    d. They have Ribosomes and mitochondria
    e. They can only reproduce in a host cell

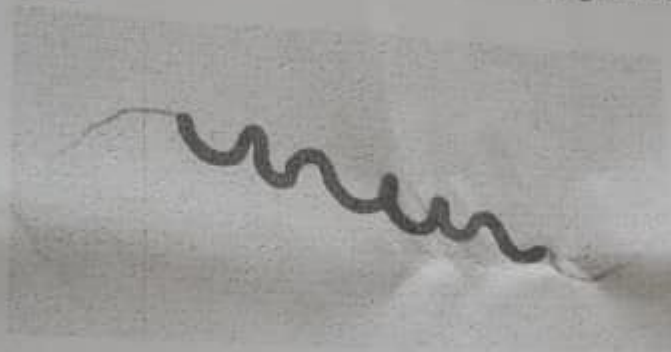
29. If the number of colony forming units on an agar plates is 37 colonies with a
    factor of 1/10,000 dilution what is the total number of bacteria in the original
    a. 320,000
    b. 350,000
    c. 370,000
    d. 0.0037
    e. 0.0032

30. Gram staining is an example of _____.
    a. Simple staining
    b. Differential staining
    c. Negative staining
    d. Positive staining
    e. Irregular staining

(EMB agar) contains the dyes eosin and methyl

a. Monotrichous
b. Amphitrichous
c. Lophotrichous
d. Peritrichous

149. The type of flagella arrangement in the diagram below is referred to as _____.



a. Monotrichous
b. Amphitrichous
c. Lophotrichous
d. Peritrichous

150. Fimbriae

a. Cause bacteria move through fluids.
b. Attach bacteria to various surfaces.

c. A cell wall
d. Fimbrae
e. Mesosome

89. The term culture refers to the _____ growth of microorganisms in _____.
a. Rapid, an incubator
b. Microscopic, the body
c. Macroscopic, media
d. Artificial, colonies
e. Superficial, tubes

90. A subculture is a
a. Culture made in an embryo
b. Colony growing beneath the media surface
c. Culture made from a contaminant
d. Culture made from an isolated colony
e. Culture made from colonies growing on an agar

91. Pili are tubular shafts in _____ bacteria that serve as a means of _____.
a. Every, attachment
b. Gram-positive, attachment
c. Gram-negative, protection
d. Gram-negative, genetic exchange
e. Gram-positive, genetic exchange

92. _____ is present in both Gram positive and Gram negative cell walls.
a. Lipopolysaccharide
b. Teichoic acid
c. An outer membrane
d. Peptidoglycan
e. Capsule

93. Spirochetes are differentiated from spirillums by _____.
a. Size
b. Shape
c. The presence of flagella

13. Which of the following statements about endospores is not true?
    a. Endospore formation in some bacteria occurs because of environmental stresses such as limiting nutrient or extremes in pH.
    b. Endospore formation in bacteria is a means of reproduction
    c. Endospore formation occurs in *Bacillus, Clostridium,* and a few other gram positive genera.
    d. When favorable conditions are restored, endospores undergo germination or development into vegetative cells
    e. a, c, and d

14. Which of the following statements about the Turbidimetry is not true
    a. It is a direct way of estimating bacteria numbers
    b. it is based on the diffraction or scattering of light by bacteria in a broth culture
    c. optical abundance is directly proportional to concentration of bacteria in suspension
    d. measuring turbidity is a practical way of monitoring bacteria growth
    e. as bacteria numbers increase the less light reaches the photovoltaic cells

15. Prokaryotic organisms make up the _____.
    a. Archaebacteria, Eubacteria, and Protists
    b. Archaebacteria and Protists
    c. Protists and Eubacteria
    d. Protists
    e. Eubacteria and Archaebacteria

16. Which type of microscope takes advantage mainly of the difference in refractive ind of materials
    a. Darkfield
    b. Fluorescent
    c. Nomarsky
    d. Phase-contrast
    e. Light microscope

17. Bacteriological media that is composed of ingredients whose exact chemical compo are known are called
    a. designated
    b. exact
    c. defined
    d. selective
    e. aesthetic

18. Blood agar is often used to observe changes in the appearance of the agar around t this medium. This medium could then be:

37. Bacteria may be stained with various dyes to improve contrast for examination unde light microscope. All the following are acidic dyes except
    a. Nigrosine
    b. Picric acid
    c. Eosin
    d. India ink
    e. Malachite green

38. Which of the following statement about the most probable number is NOT TRUE
    a. It is a statistical assay of cell numbers based on the theory of probability
    b. The goals is to successively dilute a sample and determine the point at wh subsequent dilution receive the most number of cells
    c. To determine the MPN 3 sets of 3 or 5 tubes containing the same media a
    d. The 2nd set of tubes receive 10 fold less of the 1st set
    e. The 3rd set receives 100 fold less of the 1st set

39. Which of the following can give you ambiguous results for the gram stain
    a. Decolorizing
    b. Improper heat fixing
    c. Cell density of the smear
    d. b and c
    e. all of the above

40. If a bacterial cell that has a generation time of 20 minutes is placed in a suitable nutrient broth at time 0, then after 3 hours of incubation, which of the following numbers would you expect to count in the broth
    a. 512
    b. 256
    c. 128
    d. 96
    e. 64

41. Which of the following tests is used as confirmatory tests for AIDS?
    a. Double diffusion method
    b. Western blot method
    c. Southern blot method
    d. Northern blot method
    e. Precipitating test method

42. Plant viruses are normally named according to which one of the following?
    a. Disease they cause
    b. Genetic mutation
    c. Host range
    d. Size of their particle
    e. Shape of the virus

43. The Human immunodeficiency virus is believed to have evolved from

b. Capsule, Pili and fimbriae
c. Nuclear membrane, plasma membrane and pili
d. Capsule, cell wall and cell membrane

160. Cells at the edges of a colony on a solid growth surface are usually in the _____ phases.
a. Lag and log
b. Log and stationary
c. lag and Stationary
d. stationary and Death

161. If the gelatinous substance on the surface of bacteria cell is firmly attached to the cell wall, it is called a _____ otherwise, it is called a _____ respectively
a. Cell membrane, capsule
b. Capsule, cell membrane
c. Capsule, slime layer
d. Slime layer, capsule

162. When writing the name of any organism, one should have:
a. Two names-genus and specific epithet
b. The first letter of the genus name capitalized and the second name all in lower cases letters
c. Two names that are both either italized or underlined
d. All of the above

163. The capsule is said to increase the virulence of the bacteria because _____
a. the capsule maintains the shape of bacteria
b. it promotes dehydration of bacteria
c. It protects the bacteria from phagocytosis
d. It blocks attachment to host cells

164. A bacterium retains safranin after the decolorizing agent removes the previously applied Gentian violet of the Gram stain. The bacterium is _____.
a. Gram-positive only
b. Gram-negative only
c. Gram-positive and Gram-negative
d. Gram-negative

1. In the Microbiology lab, staining methods are employed to appreciate the_____.
   a. Shape and arrangement of bacteria
   b. Biochemical and morphological properties of bacteria
   c. Shape and metabolic activities of bacteria
   d. Movement and biochemical properties of bacteria
   e. Metabolic and arrangement of bacteria

2. Which of the following is/are true of Agar?
   i. Obtained from red agar
   ii. Obtained from seaweed
   iii. It has no nutritive value
   iv. It is not affected by the growth of bacteria
   v. It melts at 98°C and sets at 42°C

   a. Only i
   b. Only ii
   c. All except i
   d. iii, iv and v
   e. none of the above

3. During the period of adjustment in the life of a bacterium, ... enzymes are produced all the time
   a. Inducible
   b. Appropriate
   c. Constitutive
   d. Nutritive
   e. Substitutive

4. Which phase of bacteria growth curve is employed for industrial purposes?
   a. Lag phase
   b. Death phase
   c. Stationary phase
   d. Exponential phase
   e. Survival phase

5. Which of the following statements is not true about the Koch' postulates
   a. The organism in question must always be found associated with a particular disease
   b. The organism must be isolated and grown in pure culture
   c. The organism grown in pure culture must be inoculated into a healthy host under favorable conditions and induce a characteristic disease
   d. The disease may also be caused by toxins produced by the bacteria
   e. Both the diseased condition produced by inoculation and the organisms recovere from the inoculated host must correspond to the original diseased condition and the first organisms isolated, respectively.

..... at 0°C are known as ..... and an example is _____

e. Inhibits the growth of fungi

76. The presence of well controlled microbes with a potential for harm is referred to as ____
a. Immunization
b. Colonisation
c. Infection
d. Defence
e. Invasion

77. The ease with which a microbe can spread in a tissue is known as _____
a. Infection
b. Defence
c. Invasion
d. Infectivity
e. Virulence

78. A nosocomial infection can be defined as _____
a. A community acquired infection
b. An infection caused by a fungus
c. An infection transmitted by close relatives
d. An infection acquired by patients in an institution like a hospital
e. An infection caused by a virus

79. In 1876 a Scientist provided convincing evidence associating specific microorganisms with infectious agents. From this work, FOUR hypothesizes were formulated and these have remained as the main criteria for identifying infectious agents causing particular diseases. The scientist on whose work these hypothesizes are based is _____.
a. Joseph Lister
b. Robert Koch
c. Robert Sachs
d. Edward Jenner
e. Louis Pasteur

80. In fermentation tests, the production of gas can be confirmed by the addition of _____prior to inoculation and incubation.
a. Addition of peroxide

115. Select the disease that is NOT caused by a virus
a. Smallpox
b. Diphtheria
c. Parainfluenza
d. Lassa fever
e. Influenza

116. An experiment began with 4 cells and ended with 256 cells. How many generations did the cells go through?
a. 4
b. 5
c. 6
d. 32
e. 64

117. Which of the following would be found in an animal cell, but NOT in a bacterial cell
a. DNA
b. Cell wall
c. Endoplasmic reticulum
d. Plasma membrane
e. Ribosomes

118. What is the relationship among DNA, a gene, and a chromosome?
a. A gene is composed of DNA, but there is no relationship to a chromosome
b. A gene contains hundreds of chromosomes which are composed of DNA
c. A chromosome contains hundreds of genes which are composed of proteins
d. A chromosome contains hundreds of genes which are composed of DNA
e. A gene contains hundreds of chromosomes which are composed of proteins

119. Bacteria can live at temperature extremes that vary as much as _____ degrees C.
a. 40 to 60
b. 20 to 80
c. 0 to 100
d. -20 to 110

b. Disinfection
c. Aseptic techniques
d. Antisepsis

167. A vaccine contains a _____.
a. Chemical in high concentration
b. Weakened form of a microorganism
c. Chemical in low concentration
d. Potent form of a microorganism

168. The minimum pressure used for sterilization by autoclaving is _____.
a. 5 mmHg
b. 15 mmHg
c. 45 mmHg
d. 60 mmHg

169. Nucleic acids in viruses' are _____.
a. DNA or RNA, never both in the same virus
b. DNA and RNA in all viruses
c. DNA in all viruses
d. RNA in all viruses

170. A bacterial cell that normally infects the human urinary tract loses its pili. This mainly affects it ability to _____.
a. Gather nutrients
b. Hold on to body cells
c. Store nutrients
d. Transport materials

171. Serum is the _____.
a. Cellular part of the blood only
b. Liquid part of the blood without cells
c. Liquid part of the blood with cells
d. Mineral part of the blood only

to specifically kill microorganisms on living tissue.

b. Viruses to classify bacteria
c. Bacteria to classify viruses
d. Viruses to classify plant

175. Virions are _____.
a. Intact, non-replicating virus particles
b. Intact, replicating virus particles
c. The DNA core of the virus
d. The protein coat of the virus

176. Select the incorrect statement about *Campylobacter* species
a. They are Gram-negative
b. They are cultivated in microaerophilic conditions
c. They can be human pathogens
d. They have curved-shaped cells

177. Faecal coliforms differ from coliforms by virtue of _____.
a. The ability of faecal coliforms to ferment lactose within 48 hrs and coliforms cannot
b. Fact that faecal coliforms are gram positive rods and coliforms are gram negative rods
c. Are derived from warm blooded animals and can grow at 44.5°C
d. Fact that faecal coliforms are facultatively anaerobic whereas coliforms are obligate anaerobes

178. The discovery of _____ was a major step toward the control of gonorrhea
a. Erythromycin
b. Penicillin
c. Streptomycin
d. Tetracycline

179. A bacterial culture is growing in a flask of nutrient broth. The flask is in a shaking machine. Through a malfunction over the next twelve hours, the machine shakes too vigorously and the seal is lost from the top of the flask. The culture becomes contaminated but cannot support the growth of any_____.
a. Aerotolerant anaerobes

c. Parasites
d. Commensals
e. Germs

103. Microscopic examination of a patient's faecal culture shows comma-shaped bacteria. These bacteria require 2-4% NaCl to grow. The bacteria probably belong to the genus _____.

a. *Vibrio*
b. *Campylobacter*
c. *Salmonella*
d. *Escherichia*
e. *Shigella*

104. If you start out with a population density of 200 CFU/ml of a bacterium that divides every 20 minutes, what will the population density after five generations, assuming the cells are in the log phase of growth?

a. 1200 CFU/ml
b. 2006 CFU/ml
c. 6400 CFU/ml
d. 3200 CFU/ml
e. 12800 CFU/ml

105. Mannitol Salt agar contains a _____ indicator.

a. Temperature
b. Salinity
c. Sugar
d. pH
e. Pressure

106. Antimicrobials are _____.

a. agents produced or synthesized by one microbe to kill or inhibit other microbes
b. chemical substance that can only interfere with cell wall synthesis of the pathogen
c. artificial chemicals used to treat flu infections
d. chemical substances used to treat flu
e. kill or inhibit the growth of bacteria

c. *Streptococcus*
d. *Coccibacillus*
e. *Streptobacillus*

109. A (n) _____ can be defined as a microorganism which_____.
a. Pathogen /Is always commensal
b. Opportunistic pathogen /Is always associated with infections
c. Commensal / Has been isolated from infected tissue
d. Opportunistic pathogen / Is never associated with infections
e. Opportunistic pathogen /Causes disease in a host which has been debilitated some way

110. A method of estimating the number of bacteria in a sample of inoculum is _
a. Slant culture
b. Streak plate
c. Broth culture
d. Pour plate
e. Serial dilution

111. The disease _____ is caused by the bacterium_____.
a. Syphilis / *Treponema pallidum*
b. Tuberculosis/ *Neisseria gonorrhoae*
c. Diphtheria / *Diplococcus gonorrhoae*
d. Legionelosis / *Lactobacillus acidophilus*
e. Influenza /*Shigella*

112. Each of the following is caused by a viral pathogen except _____
a. Rubella
b. Leprosy
c. Herpes
d. Chicken pox
e. Measles

113. Thrush is a superficial infection caused by _____. This organism of _____.
a. *Candida* spp / Filamentous fungi
b. *Candida albicans* / Yeast
c. *Clostridium albicans*/ Yeast
d. *Candida* spp/ Gram-negative bacteria
e. *Candida albus* / Gram-positive bacteria

114. Which of the following is NOT a protozoan disease
a. Giardiasis
b. Cholera

b. Oxidase test
c. Proteolysis
d. Catalase test
e. Hydrogen Sulphide test

What name is given to the bacterial forms, margins or elevations below?

137.

a. Filamentous
b. Rhizoid
c. Irregular
d. Lobate

138.

a. Rhizoid
b. Filamentous
c. Irregular
d. Lobate

139.

a. Undulate
b. Filiform
c. Lobate
d. Filamentous

140.

KWAME NKRUMAH UNIVERSITY OF SCIENCE & TECHNOLOGY, KUMASI

COLLEGE OF SCIENCE
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B.Sc. (Biol. Sci. / Biochem. / Doc. Opt. / Environ. Sci. /Ag. Biotech/Food Sci. / Meat & Dairy Science / D.Vet. Med)

First Semester Examinations, [redacted]

Second Year

BIOL 251 BASIC MICROBIOLOGY

DECEMBER [redacted] TWO HOURS

INDEX NUMBER..... [redacted]

PROGRAMMME OF STUDY..... [redacted]

INSTRUCTION TO CANDIDATES:

a. Answer ALL 200 questions.
b. Please shade the correct answer on the scannable form and also circle on the questio paper
c. Provide your index number and choice of program boldly in the spaces provided
d. At the end of the session, please hand over the question paper and the scannable f the invigilator

CAUTION:

NO PART/PAGE OF THE QUESTION PAPER SHOULD BE TAKEN OUT STUDENT.