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Correct answers located at the end of the chapter.

1) Extant microorganisms are organisms from the fossil record that are no longer present on Earth today.
   - ◎ true
   - ◎ false

2) Microbiologists study a variety of organisms, but all are considered either *Bacteria* or *Archaea.*
   - ◎ true
   - ◎ false

3) All eukaryotes have a membrane-bound nucleus.
   - ◎ true
   - ◎ false

4) Viruses are not generally studied by microbiologists because they are not classified as living organisms.
   - ◎ true
   - ◎ false

5) Viruses constitute the fourth domain of life in current biological classification schemes.
   - ◎ true
   - ◎ false

6) The earliest microbial fossils that have been found are dated from approximately 4.5 million years ago.
   - ◎ true
   - ◎ false

7) Koch's postulates cannot be proved without isolating microbes in pure culture.
   - ◎ true
   - ◎ false



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8) M. J. Berkeley demonstrated that the great potato blight of Ireland was caused by a protozoan (then thought to be a fungus).
   ◎ true
   ◎ false

9) Invisible living creatures were thought to exist and cause disease long before they were ever observed.
   ◎ true
   ◎ false

10) Koch's postulates were instrumental in establishing that the intracellular parasite *Mycobacterium leprae* is the causative organism of leprosy.
   ◎ true
   ◎ false

11) Edward Jenner's work in preventing rabies led to the use of the term vaccination to describe a type of procedure used in the prevention of disease.
   ◎ true
   ◎ false

12) Although developed over 100 years ago, Koch's postulates continue to be used to find the causative organism for all known human infectious diseases.
   ◎ true
   ◎ false

13) Viruses and bacteria were first cultured in the laboratory at about the same time.
   ◎ true
   ◎ false

14) Charles Chamberland developed porcelain filters that allowed other scientists to demonstrate that viruses are smaller than bacteria.
   ◎ true
   ◎ false



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15) The first disease to be identified as being caused by a virus was tobacco mosaic disease.
- ◎ true
- ◎ false

16) John Tyndall demonstrated that microorganisms present in the air are carried on dust particles.
- ◎ true
- ◎ false

17) Agostino Bassi demonstrated that a type of silkworm disease was caused by a fungus and proposed that many diseases are caused by microorganisms.
- ◎ true
- ◎ false

18) The usefulness of growing microbes in pure or anexic culture is limited because this approach does not emulate microbial growth in nature.
- ◎ true
- ◎ false

19) Robert Koch developed a vaccine that could be used to prevent anthrax.
- ◎ true
- ◎ false

20) The endosymbiotic hypothesis is generally accepted as the origin of eukaryotic organelles.
- ◎ true
- ◎ false

21) The relationship between specific bacteria and specific diseases was first demonstrated by Koch.
- ◎ true
- ◎ false



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22) Some microorganisms are useful in bioremediation processes that reduce the effects of pollution.
- ◎ true
- ◎ false

23) It is always possible to complete all four steps of Koh's postulates.
- ◎ true
- ◎ false

24) Protists contain all of the following forms of life EXCEPT _____.
- A) protozoa
- B) fungi
- C) slime molds
- D) algae

25) Cells with a relatively complex morphology that have a true membrane-bound nucleus are called_____.
- A) prokaryotes
- B) eukaryotes
- C) urkaryotes
- D) nokaryotes

26) Cells with a relatively simple cell morphology that do not have a true membrane-bound nucleus are called_____.
- A) prokaryotes
- B) eukaryotes
- C) urkaryotes
- D) nokaryotes



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27) The ribosomal RNA studies that led to the division of prokaryotic organisms into the Bacteria and the Archaea were begun by_____.

A) Pasteur
B) Woese
C) Needham
D) Watson

28) Proteins function in modern cells as _____.

A) catalysts
B) hereditary information
C) structural elements
D) both catalysts and structural elements

29) RNA is a key intermediate molecule involved in the process that uses the information stored in DNA to ultimately produce _____.

A) carbohydrates
B) proteins
C) lipids
D) RNA

30) Which of the following distinguishes the field of microbiology from other fields of biology?

A) The size of the organism studied
B) The techniques used to study organisms regardless of their size
C) Both the size of the organism studied, and the techniques used in their study
D) Neither the size of the organism studied nor the techniques used in their study

31) In the following list of scientists, who developed a set of criteria that could be used to establish a causative link between a particular microorganism and a particular disease?

A) Fracastoro
B) Koch
C) Pasteur
D) Lister



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32) In the following list of scientists, who was the first to observe and accurately describe microorganisms?
A) Pasteur
B) Lister
C) van Leeuwenhoek
D) Tyndall

33) In the following list of scientists, who provided the evidence needed to discredit the concept of spontaneous generation?
A) Pasteur
B) Koch
C) Semmelweiss
D) Lister

34) The concept that living organisms arise from nonliving material is called_____.
A) biogenesis
B) cell theory
C) spontaneous generation
D) germ theory

35) The concept that human and animal diseases are caused by microorganisms is called the_____.
A) cell theory
B) germ theory
C) causative theory
D) disease theory

36) Whose work on spontaneous generation first demonstrated the existence of a very heat-resistant form of bacteria that are called endospores?
A) Schwann
B) Redi
C) Tyndall
D) Pasteur



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37) Antiseptic surgery was pioneered by_____.
A) Pasteur
B) Lister
C) Jenner
D) Kitasato

38) Studies by Emil von Behring and Shibasaburo Kitasato demonstrated in rabbits that inactivated toxins can induce the synthesis of antitoxins (antibodies against toxins) in the blood. These antitoxins
A) protect against disease.
B) cause disease.
C) are harmful.
D) are only made by rabbits.

39) The first surgical antiseptic to be used was_____.
A) iodine
B) ethanol
C) phenol
D) vinegar

40) Bacteria incubated in culture for a long time lose their ability to cause disease and are said to be_____.
A) impotent
B) virulent
C) pathogenic
D) attenuated

41) Who is credited with developing and documenting the first vaccination procedure against smallpox?
A) Koch
B) Pasteur
C) Jenner
D) Lister



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42) Who is credited with developing a vaccine against chicken cholera?
A) Koch
B) Pasteur
C) Jenner
D) Lister

43) Who of the following first discovered that some blood leukocytes could engulf disease-causing bacteria?
A) von Behring
B) Meister
C) Metchnikoff
D) Ivanowski

44) The use of enrichment cultures and selective media was pioneered by_____.
A) Beijerinck
B) Jenner
C) Pasteur
D) von Behring

45) Which of the following provides the best explanation for why viruses are not included in the three-domain system?
A) Viruses are too small.
B) Viruses have either DNA or RNA, not both.
C) Viruses are not a cellular life form.
D) Viruses show no evidence of evolution.

46) A new microbe has been discovered in the rumen of sheep. Microscopy shows no evidence of a nuclear membrane, and biochemical studies of the cell wall demonstrate the lack of peptidoglycan. Metabolic studies show that this microbe generates methane. This microbe would most likely be classified in _____.
A) domain Bacteria
B) domain Archaea
C) domain Eukarya, Kingdom Fungi
D) domain Eukarya, Protists



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47) What is the most compelling reason why “protists” are not considered to be a taxonomic group?
   A) They are not cellular life forms.
   B) They are too small to be included among the eukaryotes.
   C) The group includes both prokaryotic and eukaryotic cell types.
   D) The organisms often included in this group are very diverse and don’t form a cohesive taxon.

48) Scientists study microorganisms on Earth today to search for life forms elsewhere, as well as to explore the origins of life on Earth. These microorganisms that are studied are referred to as _____.
   A) existing
   B) extant
   C) extinct
   D) extirpated

49) Which molecule is believed to have preceded the other two during the evolution of life?
   A) Proteins
   B) DNA
   C) RNA

50) What is the most compelling reason why DNA, rather than RNA, evolved to be the storage repository for genetic information in cellular life forms?
   A) DNA has deoxyribose rather than ribose.
   B) DNA molecules are more chemically stable than RNA molecules.
   C) DNA is double-stranded rather than single-stranded.
   D) DNA molecules are larger than RNA molecules.



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51) Each of the following provides evidence in support of the primary role of RNA in the evolution of life EXCEPT _____.
A) some RNA molecules are catalytic
B) RNA catalyzes peptide bond formation during protein synthesis
C) ATP (energy currency of the cell) is a ribonucleotide
D) RNA is less chemically stable than DNA
E) RNA can regulate gene expression

52) The appearance of organisms that carry out aerobic respiration likely evolved as organisms that release oxygen during photosynthesis gradually changed Earth's atmosphere. These photosynthetic organisms were the precursor for _____.
A) chloroplasts
B) mitochondria
C) the last universal common ancestor
D) eukaryotes

53) Which term is most inclusive? In other words, which term includes all the others?
A) Microbial species
B) Microbial strain
C) Biovars
D) Serovars

54) Which of the processes named here is the least likely to contribute to the evolution of genetic diversity of bacteria and archaea?
A) Mutation
B) Sexual reproduction
C) Binary fission
D) Horizontal gene transfer



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55) A student is observing microorganisms in a sample of pond water. One organism of interest has an obvious nucleus, small oval structures containing a green pigment, and does not appear to be motile. In which of the following groups would this microbe most likely be classified?

A) Eukaryotes (Fungi)
B) Eukaryotes (Algae)
C) Bacteria
D) Archaea
E) Eukaryotes (Protozoa)

56) A student is observing microorganisms in a sample of pond water. One organism of interest has an obvious nucleus and has been moving rapidly during observation and appears to have rows of cilia along its surface. In which of the following groups would this microbe most likely be classified?

A) Eukaryotes (Fungi)
B) Eukaryotes (Algae)
C) Bacteria
D) Eukaryotes (Protozoa)

57) Morphovars, serovars, biovars, and pathovars are examples of terms that refer to microbial _____.

A) species
B) strains
C) types
D) Archaea

58) In a search for new antibiotics, a previously unknown organism has been recovered from the soil. It is nonmotile and is composed of long thread-like structures formed from nucleated cells. It is non-photosynthetic and absorbs its nutrients. This organism will most likely be classified among the _____.

A) bacteria
B) Archaea
C) eukaryotes (fungi)
D) eukaryotes (protozoa)
E) eukaryotes (algae)



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59) Three of the SSU rRNA sequences of three organisms have been compared. For organisms 1 and 2, two of the twelve nucleotides in the sequence are different. For organisms 1 and 3, six of the twelve nucleotides are different. Which organism has a greater evolutionary distance from organism 1?

A) Organism 2
B) Organism 3
C) The evolutionary distance is the same.
D) Evolutionary distance cannot be predicted from this data.

60) Which group of microbes contains organisms necessary for production of wine and bread?

A) Bacteria
B) Archaea
C) Fungi
D) Algae

61) You discover a new microbe while working on a citizen scientist project. The microbe is taken to a lab that specializes in placing organisms in their correct phylogenic niche. In order to determine its evolutionary relatedness to other microbes, the lab carries out_____.

A) SSU rRNA analysis
B) microscopic analysis
C) biochemical tests
D) DNA fingerprinting



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62) You are a medical microbiologist in Dallas, TX. A small population of individuals spread throughout the city has been experiencing alarming yet similar symptoms affecting the liver that have physicians puzzled as to the etiology, although they all suspect it is microbial in nature. What steps would you take to elucidate the organism?

A)

1. 1. Sample the livers from affected patients to culture and compare organisms;
2. 2. Grow the suspected organisms in culture;
3. 3. Inoculate the cultured organisms into a laboratory animal and monitor for similar symptoms;
4. 4. Culture and analyze the organism from the lab animal and determine relatedness.

A)

1. 1. Inoculate all suspected organisms into a laboratory animal and monitor for similar symptoms;
2. 2. Biopsy the original patient's liver to look for organisms;
3. 3. Grow the suspected organisms from the liver in culture;
4. 4. Culture and analyze the organism from the lab animal and determine relatedness.

A) Sample the livers of all sick individuals and culture the organisms, comparing symptoms and microscopic characteristics.

B)

1. 1. Biopsy the patient's liver to look for organisms;
2. 2. Culture the organisms obtained from the liver and run biochemical tests to determine similarities to other known liver pathogens;
3. 3. Inoculate liver pathogens into lab animals to compare symptoms.

63) One hypothesis being explored is that archaea belonging to the_____ group may have engulfed an aerobic bacterium, which eventually became a mitochondrion.

A) Ascard
B) Nanoarcheota
C) Euryarchaeota
D) Archaeota

64) According to the endosymbiosis hypothesis _____.

A) the first endosymbiotic event involved an anaerobic bacterium
B) the first endosymbiont was a fermentative organism
C) the mitochondrion evolved from the same endosymbiont as the hydrogenosome
D) All of the choices are correct.



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65) The ancestors of modern_____ performed the oxygenic photosynthesis responsible for converting our anoxic planet to an oxygenated one.
A) *Crenarchaeota*
B) *Proteobacteria*
C) *Firmicutes*
D) cyanobacteria

66) All of the following are benefits of fungi EXCEPT_____.
A) causing smuts and powdery mildew
B) transferring nutrients to plant roots
C) making bread dough rise
D) decomposing dead organisms

67) The hydrogen hypothesis for mitochondria asserts that cells with an endosymbiont became dependent on that endosymbiont_____.
A) when it produced oxygen and hydrogen as a result of its metabolism
B) when it produced oxygen and carbon dioxide as a result of its metabolism
C) when it produced carbon dioxide and hydrogen as a result of its metabolism
D) when it produced chlorophyll as a result of its metabolism

68) Which of the following has led microbiologists to believe that microbiology is in its second golden age?
A) Advances in genomic and molecular methods used to study microbes
B) Improvements in culture methods for isolating and identifying bacteria
C) Development of novel types of vaccines for combating disease
D) Discovery of microbial life on several planets in the solar system

69) Recent advances in methods used to study microbes have led microbiologists to believe that microbiology is in its_____ golden age.
A) second
B) first
C) final
D) tertiary



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70) Which of the following is NOT a reason that Koch's postulates may be difficult to prove?
A) Some microbes cannot be isolated in pure culture.
B) There are no animal models for some human diseases.
C) It is never possible to alter a pathogen's ability to cause disease.
D) Some diseases, such as gum disease, involve more than one type of microbe.

71) If a pathogen can only grow within host cells, which of Koch's postulates could not be fulfilled?
A) First
B) Second
C) Third
D) Fourth

72) Cholera, a bacterial disease that causes severe diarrhea, is sometimes asymptomatic (the infected individual exhibits no symptoms). In this case, which of Koch's postulates would be difficult to prove?
A) First
B) Second
C) Third
D) Fourth

73) The distance between nodes on a phylogenetic tree is a measure of_____.
A) relatedness between organisms
B) time of divergence of organisms
C) time of divergence and relatedness of organisms
D) amount of RNA in unrelated organisms

74) If the distance between two nodes on a phylogenetic tree is long,_____.
A) the two organisms are less related and more evolutionarily diverged
B) the two organisms are more related and less evolutionarily diverged
C) the two organisms are more related and only recently diverged
D) No information regarding relatedness can be determined.



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75) Which statement regarding unrooted phylogenetic trees is FALSE?
A) Unrooted trees do not indicate which organisms are more primitive relative to others.
B) Unrooted trees indicate which organisms are more primitive relative to others.
C) An unrooted tree can be rooted by adding an outgroup.
D) Unrooted trees are much easier to develop than rooted trees.

76) What is microbial dark matter?
A) Microbes that are only known to exist by nucleotide sequencing and are not cultured.
B) Microbes that are known to exist because they can be cultured but do not have genomes that are sequenced.
C) Microbes that only exist in the black holes but can be cultured.
D) Microbes that exist in the dark matter of the universe and can be cultured.

77) A wide variety of microorganisms are commercially used to manufacture_____ for human consumption.
A) sugars
B) vitamins
C) fatty acids
D) None of the choices are correct.

78) All cellular organisms can be placed into one of three_____, which includes the *Bacteria, Archaea,* and the *Eukarya*.

79) *Archaea*are cellular organisms that have unique cell membrane _____.

80) Elie Metchnikoff discovered_____, which describes the engulfment of disease-causing bacteria by certain white blood cells.

81) An Italian physician,_____, challenged the concept of spontaneous generation by demonstrating that maggots do not arise from decaying meat but rather from developing fly eggs.



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82) The discovery that soil bacteria could oxidize iron, sulfur, and ammonia to obtain energy was made by_____.

83) The first scientist to isolate a root nodule bacterium capable of nitrogen fixation was_____.

84) The branch of microbiology that deals with diseases of humans and animals is called_____ microbiology.

85) The branch of microbiology that deals with the mechanisms by which the human body protects itself from disease-causing organisms is called_____.

86) _____ _____ microbiologists monitor community food establishments and water supplies in order to control the spread of communicable diseases.

87) The branch of microbiology that studies the relationship between microorganisms and their habitats is called _____ _____.

88) The use of microorganisms to make products such as antibiotics, vaccines, steroids, alcohols, vitamins, amino acids, and enzymes is called_____ microbiology.

89) Microbial_____ are scientists who investigate the synthesis of antibiotics and toxins, the production of energy with microorganisms, and the ways in which microorganisms survive harsh environmental conditions.

90) Microbial_____ focuses on the nature of heredity and how it regulates the development and function of cells and organisms.

91) A microbial _____ is a collection of strains that share many stable properties and differ significantly from other groups of strains.



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# Answer Key

Test name: Chapter 01

1) FALSE
2) FALSE
3) TRUE
4) FALSE
5) FALSE
6) FALSE
7) FALSE
8) TRUE
9) TRUE
10) FALSE
11) FALSE
12) FALSE
13) FALSE
14) TRUE
15) TRUE
16) TRUE
17) TRUE
18) TRUE
19) FALSE
20) TRUE
21) TRUE
22) TRUE
23) FALSE
24) B
25) B
26) A
27) B
28) D
29) B
30) C
31) B
32) C
33) A
34) C
35) B
36) C
37) B



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38) A
39) C
40) D
41) C
42) B
43) C
44) A
45) C
46) B
47) D
48) B
49) C
50) B
51) D
52) A
53) A
54) B
55) B
56) D
57) B
58) C
59) B
60) C
61) A
62) A
63) A
64) D
65) D
66) A
67) C
68) A
69) A
70) C
71) B
72) C
73) A
74) A
75) B
76) A
77) B



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78) domains
79) lipids
80) phagocytosis
81) Redi
82) Winogradsky
83) Beijerinck
84) medical
85) immunology
86) Public health
87) microbial ecology
88) industrial
89) physiologists
90) genetics
91) species



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