Exam

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) In relation to eukaryotic cells, prokaryotic cells are generally 1) _____
A) smaller.
B) about the same size.
C) larger.
D) There is no general rule about comparative cell size.

Answer: A
Explanation: A)
B)
C)
D)

2) The most common type of microscopy for laboratory courses in biology and microbiology is done with the 2) _____
A) electron microscope.
B) bright-field microscope.
C) phase-contrast microscope.
D) dark-field microscope.

Answer: B
Explanation: A)
B)
C)
D)

3) The Gram stain differentiates bacterial cells into gram positive and gram negative based on differences in the 3) _____
A) genomic content.
B) cell's metabolic capabilities.
C) presence of a plasmid.
D) cell wall structure.

Answer: D
Explanation: A)
B)
C)
D)

4) Cyanobacteria are most closely related to the 4) _____
A) gram-negative *Bacteria*.
B) *Archaea*.
C) *Eukarya*.
D) gram-positive *Bacteria*.

Answer: D
Explanation: A)
B)
C)
D)

5) Which statement is TRUE about the genus *Natronobacterium*? 5) _____

A) They are halophilic and acidophilic.
B) They are acidophilic but not halophilic.
C) They are halophilic and alkaliphilic.
D) They are alkaliphilic but not halophilic.

Answer: C
Explanation: A)
B)
C)
D)

6) Why is the presence of a cell wall significant from a clinical standpoint? 6) _____

A) Animal cells do not have cell walls, so antibiotics that target cell walls can destroy invading microorganisms.
B) All types of cells have a cell wall, and it makes identification of the causative agent of disease difficult.
C) Only gram-negative *Bacteria* have cell walls.
D) The cell wall protects microorganisms from destruction by the immune system.

Answer: A
Explanation: A)
B)
C)
D)

7) According to our present understanding, mitochondria and chloroplasts are _____ in origin. 7) _____

A) eukaryotic B) viral C) archaeal D) bacterial

Answer: D
Explanation: A)
B)
C)
D)

8) Disease-causing prokaryotes are found exclusively among the 8) _____

A) *Bacteria*. B) *Archaea*. C) fungi. D) viruses.

Answer: A
Explanation: A)
B)
C)
D)

9) The model organism for microbial physiology, biochemistry, and molecular biology is 9) _____

A) *Escherichia coli*.
B) *Azotobacter sp.*
C) *Pseudomonas aeruginosa*.
D) *Candida albicans*.

Answer: A
Explanation: A)
B)
C)
D)

10) What type of energy-yielding metabolism is found ONLY in prokaryotes? 10) _____

A) autotrophy
B) chemolithotrophy
C) phototrophy
D) chemoorganotrophy

Answer: B
Explanation: A)
B)
C)
D)

11) Prokaryotes are made up of which two groups? 11) _____

A) *Archaea* and fungi
B) protozoa and animals
C) *Bacteria* and *Archaea*
D) *Bacteria* and fungi

Answer: C
Explanation: A)
B)
C)
D)

12) Which of the following groups of organisms is NOT gram positive? 12) _____

A) *Clostridium* B) *Lactobacillus* C) *Streptococcus* D) *Pseudomonas*

Answer: D
Explanation: A)
B)
C)
D)

13) Which of the following organisms lives within the host cell as a means of avoiding destruction by the host's immune response? 13) _____

A) *Chloroflexus sp.*
B) *Mycobacterium tuberculosis*
C) *Deinococcus radiodurans*
D) *Streptococcus sp.*

Answer: B
Explanation: A)
B)
C)
D)

14) The eukaryotic fruiting body is generally associated with the 14) _____

A) slime mold. B) trypanosome. C) *Paramecium*. D) yeast.

Answer: A
Explanation: A)
B)
C)
D)

15) Which statement is TRUE? 15) _____

A) All synthetic and most natural compounds can be broken down by one or more microorganisms.
B) All natural and most synthetic compounds can be broken down by one or more microorganisms.
C) Most natural and most synthetic compounds can be broken down by one or more microorganisms.
D) All natural and all synthetic compounds can be broken down by one or more microorganisms.

Answer: B
Explanation: A)
B)
C)
D)

16) If the magnification of an ocular lens of a particular microscope is 10× and the magnification of the objective on the same microscope is 47×, the total magnification achieved is 16) _____

A) 470×. B) 4,700×. C) 57×. D) 4.7×.

Answer: A
Explanation: A)
B)
C)
D)

17) Early branching *Eukarya* lack 17) _____

A) nuclei. B) mitochondria.
C) genetic material. D) ribosomes.

Answer: B
Explanation: A)
B)
C)
D)

18) Protein-coding sequences of DNA are known as 18) _____

A) genes. B) RNA segments. C) histones. D) chromosomes.

Answer: A
Explanation: A)
B)
C)
D)

19) *Bacteria* stain as gram positive or gram negative because of differences in the cell 19) _____

A) cytoplasm. B) chromosome. C) nucleus. D) wall.

Answer: D
Explanation: A)
B)
C)
D)

20) In a lichen, the _____ is the phototrophic component, and the _____ provides the phototroph with an anchor and with protection from the elements. 20) _____

A) fungus / alga
B) fungus / cyanobacterium
C) alga / cyanobacterium
D) alga or cyanobacterium / fungus

Answer: D
Explanation: A)
B)
C)
D)

21) RNA-based phylogenies have influenced which subdiscipline(s) of microbiology? 21) _____

A) clinical diagnostics
B) microbial ecology
C) microbial classification
D) all of the above

Answer: D
Explanation: A)
B)
C)
D)

22) Organisms most likely to be found in extreme environments are 22) _____

A) viruses.
B) *Bacteria*.
C) *Archaea*.
D) fungi.

Answer: C
Explanation: A)
B)
C)
D)

23) The ultimate limit of what we are able to see with a microscope is dictated by 23) _____

A) visual acuity.
B) resolution.
C) light intensity.
D) magnification.

Answer: B
Explanation: A)
B)
C)
D)

24) At the present time, _____ phyla of the *Archaea* have been identified. 24) _____

A) 2
B) 3
C) 4
D) 5

Answer: A
Explanation: A)
B)
C)
D)

25) In which of the following habitats might an extremophile be isolated? 25) _____

A) human skin
B) garden soil at neutral pH
C) boiling hot springs
D) freshwater pond

Answer: C
Explanation: A)
B)
C)
D)

26) Paired chromosomes are found in 26) _____
A) *Archaea*. B) bacteria. C) viruses. D) eukaryotes.

Answer: D
Explanation: A)
B)
C)
D)

27) Which statement is TRUE? 27) _____
A) Both yeasts and molds are fungi.
B) Both yeasts and molds are degenerate plants.
C) Yeasts are fungi, whereas molds are degenerate plants.
D) Yeasts are degenerate plants, whereas molds are fungi.

Answer: A
Explanation: A)
B)
C)
D)

28) A tiny stylus positioned so close to a specimen that weak repulsive forces are established is used in 28) _____
A) dark-field microscopy. B) atomic force microscopy.
C) confocal scanning laser microscopy. D) none of the above.

Answer: B
Explanation: A)
B)
C)
D)

29) How was it determined that mitochondria and chloroplasts of eukaryotes are actually ancestors of specific lineages of *Bacteria*? 29) _____
A) visual inspection B) evolutionary studies
C) clinical diagnosis D) molecular sequencing

Answer: D
Explanation: A)
B)
C)
D)

30) The presence of membrane-enclosed organelles is a characteristic of 30) _____
A) prokaryotic cells. B) all cells.
C) eukaryotic cells. D) viruses.

Answer: C
Explanation: A)
B)
C)
D)

31) Which organism has unusual cell walls, can reassemble its chromosome after it has been damaged, and has an innate resistance to high levels of radiation? 31) _____

A) *Deinococcus* B) *Chlamydia* C) *Lactobacillus* D) *Pseudomonas*

Answer: A

Explanation: A)
B)
C)
D)

32) Ribosomal RNA-based studies reveal that 32) _____

A) all organisms are thought to have diverged from a common ancestral organism (LUCA) or community of organisms.
B) all prokaryotic organisms are related but that all eukaryotic organisms are not necessarily related.
C) all eukaryotic organisms are related but that all prokaryotic organisms are not necessarily related.
D) the *Archaea* are most closely related to the viruses.

Answer: A

Explanation: A)
B)
C)
D)

33) Syphilis and Lyme disease are both caused by 33) _____

A) endospores from the *Bacillus* group. B) toxins from the *Streptomyces*.
C) mycoplasmas. D) spirochetes.

Answer: D

Explanation: A)
B)
C)
D)

34) What type of microscopy has found widespread use in microbial ecology because of its ability to resolve the different layered components of a biofilm? 34) _____

A) confocal scanning laser microscopy (CSLM)
B) dark-field microscopy
C) differential interference contrast (DIC) microscopy
D) scanning electron microscopy

Answer: A

Explanation: A)
B)
C)
D)

35) When the oil-immersion lens is used, 35) _____
A) light rays are scattered so unnecessary background material is not seen.
B) light rays are collected to increase clarity.
C) magnification of objects is increased by about tenfold.
D) objects are held in place on the microscope slide.

Answer: B
Explanation: A)
B)
C)
D)

36) The cytoplasmic membrane is the 36) _____
A) structure that identifies a cell as eukaryotic or prokaryotic.
B) permeability barrier of the cell.
C) source of nutrient production.
D) primary support structure of the cell.

Answer: B
Explanation: A)
B)
C)
D)

37) Mechanisms for controlling gene expression are found 37) _____
A) in some but not all prokaryotes and in some but not all eukaryotes.
B) in all cells, prokaryotic and eukaryotic.
C) only in eukaryotes.
D) only in prokaryotes.

Answer: B
Explanation: A)
B)
C)
D)

38) Fluorescent microscopy is commonly used in 38) _____
A) the detection of chemical contaminants in a solution.
B) radiation biology.
C) cancer therapy.
D) clinical diagnostic microbiology.

Answer: D
Explanation: A)
B)
C)
D)

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

39) The function of the chloroplast is to _____. 39) _____

Answer: carry out photosynthesis in eukaryotic cells
Explanation:

40) Cyanobacteria and their phylogenetic relatives undergo a process known as _____ in which molecular oxygen is liberated. 40) _____

Answer: oxygenic photosynthesis
Explanation:

41) A eukaryotic, chlorophyll-containing organism that can live in environments containing only a few minerals, water, carbon dioxide, and light is a(n) _____. 41) _____

Answer: alga
Explanation:

42) The _____ provides structural strength to plant cells and most microorganisms. 42) _____

Answer: cell wall
Explanation:

43) The difference between chemoorganotrophy and chemolithotrophy is _____. 43) _____

Answer: Answers will vary, but chemoorganotrophs use organic compounds as an energy source and chemolithotrophs use inorganic compounds as an energy source.
Explanation:

44) The entire span of heritable nucleotides, both protein-encoding and non-encoding regions, in an organism is collectively called the _____. 44) _____

Answer: genome
Explanation:

45) The three options by which an organism may obtain energy are: _____, _____, and _____. 45) _____

Answer: organic chemicals / inorganic chemicals / light (any order)
Explanation:

46) _____ are a specialized cell type found in certain filamentous cyanobacteria that carry out a globally important process known as _____. 46) _____

Answer: Heterocysts / nitrogen fixation
Explanation:

47) Two major roles of fungi are _____ and _____. 47) _____

Answer: any two of the following in any order: food / medicine / decay / recycling of nutrients / biodegradation in nature / recycling of organic matter
Explanation:

48) The evolutionary relationships between organisms are studied in the science of _____. 48) _____

Answer: phylogeny
Explanation:

49) To say that an organism is an "obligate intracellular parasite" means _____. 49) _____

Answer: the organism must live inside of another organism to survive
Explanation:

50) The unique feature of the mycoplasmas is the _____. 50) _____

Answer: lack of a cell wall
Explanation:

51) The distinct feature of the Planctomyces group is a(n) _____. 51) _____

Answer: distinct stalk allowing for attachment to a solid substratum
Explanation:

52) The measure of the light-gathering ability of the objective lens is known as the _____. 52) _____

Answer: numerical aperture
Explanation:

53) Lichens are called mutualistic organisms because _____. 53) _____

Answer: they are composed of two organisms that live together for mutual benefit
Explanation:

54) The largest division (or phylum) of *Bacteria* is the _____. 54) _____

Answer: *Proteobacteria*
Explanation:

55) A cell that uses carbon dioxide as its carbon source is a(n)_____. 55) _____

Answer: autotroph
Explanation:

56) One major difference between chromosomes and plasmids is that plasmids generally contain _____ rather than _____ genes. 56) _____

Answer: genes conferring special properties / housekeeping (essential)
Explanation:

57) The two eukaryotic organelles involved in energy generation are _____ and _____. 57) _____

Answer: mitochondria / chloroplasts (either order)
Explanation:

58) The commonality linking the *Aquifex* and *Thermotoga* species is _____. 58) _____

Answer: both groups grow at near-boiling-point temperatures
Explanation:

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

59) The *Picrophilus* are the most alkaliphilic prokaryotes known. 59) _____

Answer: True ✔ False
Explanation:

60) Light microscopy is an effective way of viewing objects in three dimensions. 60) _____

Answer: True ✔ False
Explanation:

61) Organisms of the genus *Halobacterium* can grow within salt crystals. 61) _____

Answer: ✔ True False
Explanation:

62) Prokaryotic chromosomes are generally linear. 62) _____

Answer: True ✔ False
Explanation:

63) Species of *Archaea* are more closely related to *Eukarya* than to *Bacteria*. 63) _____

Answer: True False
Explanation:

64) Ribosomes function primarily in energy production. 64) _____

Answer: True False
Explanation:

65) Viruses necessarily cause disease in the organisms they infect. 65) _____

Answer: True False
Explanation:

66) The evolutionary significance of extreme thermophiles may be that they are modern descendants of very ancient cell lines dating back to a time when the planet was very warm. 66) _____

Answer: True False
Explanation:

67) The cyanobacteria were the first oxygenic phototrophs to evolve on Earth. 67) _____

Answer: True False
Explanation:

68) All known *Archaea* are extremophiles of one sort or another. 68) _____

Answer: True False
Explanation:

69) The waste products of chemoorganotrophs are often used for energy by chemolithotrophs. 69) _____

Answer: True False
Explanation:

70) A differential stain is called "differential" because it does not stain all kinds of cells the same color. 70) _____

Answer: True False
Explanation:

71) In phase-contrast microscopy, the differences in refractive indices between organisms and their environments are utilized for better viewing of living specimens. 71) _____

Answer: True False
Explanation:

72) Endosymbiosis is an explanation for the origin of mitochondria and chloroplasts in eukaryotic cells. 72) _____

Answer: True False
Explanation:

73) Ribosomal RNAs can be used to study phylogenetic relationships between organisms. 73) _____

Answer: True False
Explanation:

74) Phototrophs use light as an energy source. 74) _____

Answer: True False
Explanation:

75) Meiosis is the process by which haploid gametes are formed. 75) _____

Answer: True False
Explanation:

76) In bright-field microscopy, contrast differences arise because different cells and cellular components absorb and scatter light in varying degrees. 76) _____

Answer: True False
Explanation:

77) Microorganisms today are probably a degeneration of the earliest life forms. 77) _____

Answer: True False
Explanation:

78) The genus *Chlamydia* harbors respiratory and sexually transmitted pathogens of humans. 78) _____

Answer: True False
Explanation:

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

79) Compare and contrast the mechanisms of differential interference contrast (DIC) microscopy and confocal scanning laser microscopy (CSLM).

Answer: Answers will vary, but one unifying characteristic is both yield three-dimensional images. Differing features could include computational requirements, staining procedures, and the principles of how an image is observed.

80) Explain why primary producers, especially those that undergo oxygenic photosynthesis, are essential for life on Earth.

Answer: Answers will vary, but a theme should be how oxygen must be cycled back into a usable form for aerobes by organisms that evolve oxygen during photosynthesis as long as aerobic organisms continually use up gaseous oxygen.

81) Compare and contrast algae and cyanobacteria.

Answer: Answers will vary. Possible answers include: Algae are eukaryotes and cyanobacteria are prokaryotes. Both are photosynthetic.

82) In what way are the *Thermoplasma* like the *Mycoplasma*?

Answer: Answers will vary but should include a statement that they both lack a cell wall.

83) Elaborate on how chemolithotrophy and phototrophy have influenced microbial competition and, thus, microbial habitats.

Answer: Answers will vary. One possible discussion could focus on how these different ways of obtaining energy allow microorganisms to thrive in the same habitat and minimize competition for resources by having different physiologies.

84) Why are most of the "early branching" *Eukarya* pathogenic or parasitic?

Answer: Answers should generally include a statement about the organisms being unable to live a free and independent existence.

85) Why are the *Archaea* so difficult to study in the laboratory?

Answer: Answers will vary, but a theme should be the challenge of growing them in the lab due to their distinguishing characteristic of being extremophiles. Examples could include various harsh conditions such as boiling temperatures sustained in a liquid medium.

86) Sketch a phylogenetic tree showing the domains and major branches.

Answer: Answers will vary, but the sketch should resemble "the phylogenetic tree of life" (Figure 2.17) in the textbook.

87) Compare and contrast both the purposes and the functions of the transmission electron microscope and the scanning electron microscope.

Answer: Answers will vary, but a major similarity that should be emphasized is the employment of electrons (rather than a light source) to greatly increase the limit of magnification and resolution. Contrastive examples could include sample preparation requirements and the different cell structures observable in each.

88) Explain the similarities and differences between viruses and true cells.

Answer: Answers will vary, but one similar feature is that both have a nucleic-acid based genome. A difference that should be emphasized is how viruses depend on a host for metabolism.

89) Explain the concept of domain in relation to the tree of life.

Answer: Answers will vary but should include a description of unifying characteristics of a domain and how some characteristics are shared and therefore create a network (tree) of domains.

90) What might you learn by taking a properly stained sample of water and placing it under a light microscope?

Answer: Possible answers include cell abundance, cell associations either with other cells or abiotic particles, cell morphology, diversity estimation, multi-cellular or unicellular presence, and sterility of sample.

91) Explain the role of the methanogens in ecological studies.

Answer: Answers will vary, but methanogens should be highlighted as those microorganisms involved in the final stages of biomass decomposition, where the methane can be assimilated to begin remaking large carbon-containing molecules (in the carbon cycle).

1) A
2) B
3) D
4) D
5) C
6) A
7) D
8) A
9) A
10) B
11) C
12) D
13) B
14) A
15) B
16) A
17) B
18) A
19) D
20) D
21) D
22) C
23) B
24) A
25) C
26) D
27) A
28) B
29) D
30) C
31) A
32) A
33) D
34) A
35) B
36) B
37) B
38) D
39) carry out photosynthesis in eukaryotic cells
40) oxygenic photosynthesis
41) alga
42) cell wall
43) Answers will vary, but chemoorganotrophs use organic compounds as an energy source and chemolithotrophs use inorganic compounds as an energy source.
44) genome
45) organic chemicals / inorganic chemicals / light (any order)
46) Heterocysts / nitrogen fixation
47) any two of the following in any order: food / medicine / decay / recycling of nutrients / biodegradation in nature / recycling of organic matter
48) phylogeny

49) the organism must live inside of another organism to survive
50) lack of a cell wall
51) distinct stalk allowing for attachment to a solid substratum
52) numerical aperture
53) they are composed of two organisms that live together for mutual benefit
54) *Proteobacteria*
55) autotroph
56) genes conferring special properties / housekeeping (essential)
57) mitochondria / chloroplasts (either order)
58) both groups grow at near-boiling-point temperatures
59) FALSE
60) FALSE
61) TRUE
62) FALSE
63) TRUE
64) FALSE
65) FALSE
66) TRUE
67) TRUE
68) FALSE
69) TRUE
70) TRUE
71) TRUE
72) TRUE
73) TRUE
74) TRUE
75) TRUE
76) TRUE
77) FALSE
78) TRUE
79) Answers will vary, but one unifying characteristic is both yield three-dimensional images. Differing features could include computational requirements, staining procedures, and the principles of how an image is observed.
80) Answers will vary, but a theme should be how oxygen must be cycled back into a usable form for aerobes by organisms that evolve oxygen during photosynthesis as long as aerobic organisms continually use up gaseous oxygen.
81) Answers will vary. Possible answers include: Algae are eukaryotes and cyanobacteria are prokaryotes. Both are photosynthetic.
82) Answers will vary but should include a statement that they both lack a cell wall.
83) Answers will vary. One possible discussion could focus on how these different ways of obtaining energy allow microorganisms to thrive in the same habitat and minimize competition for resources by having different physiologies.
84) Answers should generally include a statement about the organisms being unable to live a free and independent existence.
85) Answers will vary, but a theme should be the challenge of growing them in the lab due to their distinguishing characteristic of being extremophiles. Examples could include various harsh conditions such as boiling temperatures sustained in a liquid medium.
86) Answers will vary, but the sketch should resemble "the phylogenetic tree of life" (Figure 2.17) in the textbook.
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88) Answers will vary, but one similar feature is that both have a nucleic-acid based genome. A difference that should be emphasized is how viruses depend on a host for metabolism.

89) Answers will vary but should include a description of unifying characteristics of a domain and how some characteristics are shared and therefore create a network (tree) of domains.
90) Possible answers include cell abundance, cell associations either with other cells or abiotic particles, cell morphology, diversity estimation, multi-cellular or unicellular presence, and sterility of sample.
91) Answers will vary, but methanogens should be highlighted as those microorganisms involved in the final stages of biomass decomposition, where the methane can be assimilated to begin remaking large carbon-containing molecules (in the carbon cycle).