



Brock Biology of Microorganisms, 14e (Madigan et al.)
Chapter 1 The Microbial World

1.1 Multiple Choice Questions

1) Which of the following statements is FALSE?

- A) Microbial cells can exist as single cells.
- B) Microbial cells carry out their life processes of growth independently.
- C) Microbial cells include both bacteria and viruses.
- D) Microbial cells are surrounded by a plasma membrane.

2) Which of the following statements is correct?

- A) Microorganisms are significant contributors to the total biomass on Earth.
- B) Microorganisms represent a much smaller amount of Earth's biomass than plants.
- C) Microorganisms represent a much smaller amount of Earth's biomass than animals.
- D) Microorganisms are significant in number, but not in overall biomass.

3) Differential selection and reproduction of phenotypes occurs during a process called

- A) cellular differentiation.
- B) evolution.
- C) growth.
- D) transformation.

4) In what/which domain(s) of life is/are microorganisms represented?

- A) Archaea
- B) Bacteria
- C) Eukarya
- D) Archaea, Bacteria, and Eukarya

5) Biological catalysts involved in the acceleration of the rate of chemical reactions are called

- A) catalytic converters.
- B) growth agents.
- C) evolutionary molecules.
- D) enzymes.

6) Regarding early life on Earth

- A) microbial life existed for billions of years before plant and animal life.
- B) microbial life existed long before animals but has been around for about the same amount of time as plants.
- C) microbial life, plant life, and animal life all appeared at about the same time.
- D) it is impossible to determine which type of life first appeared.

- 7) The person who described the “wee animalcules” was
- A) Robert Hooke.
 - B) Antoni van Leeuwenhoek.
 - C) Louis Pasteur.
 - D) Ferdinand Cohn.

Chapter Section: 1.5

- 8) Walther Hesse and _____ pioneered the use of agar as a solidifying agent.
- A) Louis Pasteur
 - B) Ferdinand Cohn
 - C) Robert Koch
 - D) Sergei Winogradsky

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- 9) Which of the following is/are characteristic of all cellular organisms?
- A) communication
 - B) evolution
 - C) motility
 - D) communication, evolution, and motility

- 10) Deduce why viruses are excluded from the ribosomal RNA—based tree of life.
- A) Some viruses contain multiple strands of RNA.
 - B) Their genetic elements cannot be sequenced.
 - C) They can infect other organisms, which complicates the genetic comparisons.
 - D) They lack ribosomal RNA (rRNA).

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- 11) Louis Pasteur developed the vaccine(s) for
- A) anthrax only.
 - B) fowl cholera only.
 - C) rabies only.
 - D) anthrax, fowl cholera, and rabies.

Chapter Section: 1.9

- 12) The discovery of antibiotics and other important chemicals led to the field of
- A) industrial microbiology.
 - B) agricultural microbiology.
 - C) marine microbiology.
 - D) aquatic microbiology.

- 13) Microbial sterilization is used to
- A) decrease the possibility of contaminants growing in a culture.
 - B) kill bacteria but not necessarily viruses or other microbes.
 - C) kill all microbes in or on objects.
 - D) clean a work area.

Chapter Section: 1.9

14) Transparent double-sided dishes used for growing microbes are most commonly called

- A) Petri dishes.
- B) baker dishes.
- C) sterilization plates.
- D) culture medium plates.

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15) Microbes playing a role in nitrogen fixation in plants live in _____, while those playing a role in the digestive tract of certain herbivores live in _____.

- A) rumens / nodules
- B) nodules / rumens
- C) nodules / fortrans
- D) fortrans / rumens

16) Which of the following is NOT an accomplishment of Louis Pasteur?

- A) determined that the alcohol-making process was mediated by microbial fermentation and thus refuted the theory of spontaneous generation
- B) developed enrichment culture techniques
- C) developed heat sterilization techniques that involved the creation of a specialized swan-necked flask
- D) developed the first rabies vaccine and treated thousands of individuals

Chapter Section: 1.9

17) The theory of spontaneous generation was refuted by the work of

- A) Louis Pasteur.
- B) Robert Koch.
- C) Robert Hooke.
- D) Antoni van Leeuwenhoek.

Chapter Section: 1.9

18) A Pasteur flask has a(n)

- A) swan neck to prevent particulate matter from getting into the main body of the flask.
- B) double neck so two substances may be added at the same time.
- C) secondary opening at the base to allow for drainage.
- D) inverted upper edge to prevent spillage while swirling.

Chapter Section: 1.9

19) Predict how Pasteur's conclusions on spontaneous generation with swan flasks would have changed if he worked with and maintained the flasks in a sterile laminar flow hood.

- A) Sterilization of the swan flask solutions would not have been necessary to reject spontaneous generation. If he did sterilize the flasks, the spontaneous generation hypothesis would have been supported.
- B) His incubation times would not have been sufficient to refute spontaneous generation.
- C) Pasteur's flasks never would have putrefied, and the experiment would not have refuted spontaneous generation.
- D) Viruses would have still been present, and his conclusion would have been unchanged.

Chapter Section: 1.9

20) A pure culture

- A) is sterile.
- B) is a population of identical cells.
- C) is made of a clearly defined chemical medium.
- D) contains one microbial cell.

Chapter Section: 1.9

21) Martinus Beijerinck was the first to isolate

- A) green algae.
- B) certain nitrogen-fixing root nodule bacteria.
- C) certain sulfate-reducing bacteria.
- D) green algae, certain nitrogen-fixing root nodule bacteria, and certain sulfate-reducing bacteria.

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22) Chemolithotrophy involves

- A) oxidation of organic compounds.
- B) oxidation of inorganic compounds.
- C) reduction of organic compounds.
- D) metabolic autotrophy.

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23) Developments in the fields of immunology and medical microbiology were practical extensions of the work of

- A) Sergei Winogradsky.
- B) Antoni van Leeuwenhoek.
- C) Joseph Lister.
- D) Robert Koch.

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24) Microbial control in wastewaters would most logically be a part of

- A) microbial genetics.
- B) aquatic microbiology.
- C) medical microbiology.
- D) bacterial energetics.

25) Robert Koch contributed to the field of microbiology by being the first person to

- A) develop the tuberculin test only.
- B) formulate four postulates for definitively linking a specific microorganism to a specific disease only.
- C) use agar as a solidifying agent in growth media only.
- D) develop the tuberculin test, formulate four postulates for definitively linking a specific microorganism to a specific disease, and use agar as a solidifying agent in growth media.

Chapter Section: 1.9

26) *Mycobacterium tuberculosis* is very difficult to stain because of the

- A) presence of ribosomes in the cytoplasm.
- B) location of the DNA within the cell.
- C) large amounts of a waxlike lipids present in its cell wall.
- D) lack of a cell wall.

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27) Louis Pasteur's most famous success was his work on

- A) *Mycobacterium tuberculosis*.
- B) the rabies vaccine.
- C) optical isomers.
- D) cultivation of *coli*.

Chapter Section: 1.9

28) Microorganisms play key roles in the cycling of important nutrients in plant nutrition, particularly those of

- A) carbon only.
- B) nitrogen only.
- C) sulfur only.
- D) carbon, nitrogen, and sulfur.

29) Microbial ecology is the study of

- A) microbial processes in the rhizosphere that benefit plant growth.
- B) the diversity and activities of microorganisms.
- C) the grouping and classifying of microorganisms.
- D) microorganisms in their natural environments.

30) The structure that confers structural strength on the cell is known as the

- A) cytoplasmic membrane.
- B) cell wall.
- C) ribosome.
- D) cytoplasm.

31) A microbial cell's membrane is considered_____, because its internal constituents are maintained within the cell. However, it also imports and exports other molecules in response to its environment.

- A) differential
- B) microselective
- C) rigid
- D) semipermeable

32) Some microorganisms can undergo_____in which various cell types can become specialized and arise from one parent cell type.

- A) differentiation
- B) genetic exchange
- C) maturation
- D) mutagenesis

33) Cyanobacteria and purple sulfur bacteria both obtain energy from light. However, only the _____ are capable of releasing _____.

- A) cyanobacteria / organic compounds
- B) cyanobacteria / oxygen
- C) purple bacteria / organic compounds
- D) purple bacteria / oxygen

34) The process whereby microorganisms are used to help clean up pollution created by human activities is known as

- A) bioaugmentation.
- B) biodegradation.
- C) bioengineering.
- D) bioremediation.

35) Robert Koch received the 1905 Nobel Prize in Physiology or Medicine for

- A) developing a smallpox vaccination.
- B) identifying *Mycobacterium tuberculosis* as the causative agent of tuberculosis.
- C) making an effective rabies vaccine.
- D) developing a smallpox vaccination, identifying *Mycobacterium tuberculosis* as the causative agent of tuberculosis, and making an effective rabies vaccine.

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36) *Bacillus anthracis* deficient in its ability to differentiate would not be able to

- A) chemotax towards growth substrates.
- B) create vesicles.
- C) form endospores.
- D) grow without additional supplemented nutrients.

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37) Microbial biochemistry most specifically involves the discovery of microbial _____ and the _____ they perform.

- A) organelles / diffusion
- B) enzymes / organelles
- C) reactions / enzymes
- D) biomolecules / functions

38) Microbial cells first evolved on Earth approximately _____ billion years ago.

- A) 1.6 to 1.8
- B) 3.8 to 4.3
- C) 5.4 to 5.6
- D) 7.0 to 7.2

39) The disease anthrax is caused by the pathogenic bacterium _____, which produces heat-resistant structures known as _____.

- A) *Azotobacter chroococcum* / endospores
- B) *Azotobacter chroococcum* / plasmids
- C) *Bacillus anthracis* / endospores

D) *Bacillus anthracis* / plasmids

40) The first documented description of a microorganism was of a _____ by _____.

- A) bacterium / Ferdinand Cohn
- B) fungus / Robert Koch
- C) mold / Robert Hooke
- D) yeast / Martinus Beijerinck

Chapter Section: 1.5

41) _____ produced by microbial fermentation of glucose from cellulose or cornstarch is becoming a more important component of biofuels in the United States, and specialized _____ are needed to make this a commercially available product.

- A) Biodiesel / biotechnologists
- B) Biodiesel / industrial microbiologists
- C) Ethanol / biotechnologists
- D) Ethanol / industrial microbiologists

42) _____ was the first to describe microorganisms, while _____ was the first person to see bacteria.

- A) Antoni van Leeuwenhoek / Robert Hook
- B) Antoni van Leeuwenhoek / Robert Koch
- C) Robert Hooke / Antoni van Leeuwenhoek
- D) Robert Koch / Antoni van Leeuwenhoek

Chapter Section: 1.5

43) The production of human proteins (e.g., insulin) by genetically engineered microorganisms is an example of _____, a subdiscipline of microbiology.

- A) applied microbiology
- B) biotechnology
- C) industrial microbiology
- D) molecular microbiology

44) Approximately two billion years ago, _____ were primarily responsible for initially oxygenating Earth.

- A) algae
- B) *Archaea*
- C) cyanobacteria
- D) purple sulfur bacteria

45) *Archaea* and *Bacteria* are unified as prokaryotes in lacking _____ which *Eukarya* contain, such as mitochondria.

- A) membranes
- B) nuclei
- C) membrane-enclosed organelles
- D) nuclei and membrane-enclosed organelles