

CHAPTER 1: Microbial Life: Origin and Discovery

MULTIPLE CHOICE

1. Viruses are
 - a. infectious agents that infect exclusively multicellular organisms.
 - b. noncellular particles that take over the metabolism of a cell to generate more virus particles.
 - c. pathogens that replicate in complex growth media.
 - d. cellular particles that belong to the archaea domain.
 - e. microbes that consist of lipid membrane–enclosed genomes.

ANS: B DIF: Easy REF: 1.1
OBJ: 1.1a Recall the definition of a microbe | 1.1b List examples of microbes
MSC: Remembering

2. Analysis of DNA sequences reveals
 - a. the ancient convergence of two cell types (i.e., prokaryotes and eukaryotes).
 - b. that prokaryotes and eukaryotes evolved from a common ancestral cell.
 - c. that bacteria share a common ancestor with archaea but not with eukarya.
 - d. that prokaryotes are cells with a nucleus.
 - e. that the genome of *Haemophilus influenzae* has about 2 billion base pairs.

ANS: B DIF: Easy REF: 1.1
OBJ: 1.1d Explain the implications of microbial genome sequencing
MSC: Understanding

3. Which of these groups are considered to be microbes but NOT considered to be cells?
 - a. viruses
 - b. bacteria
 - c. archaea
 - d. protists
 - e. filamentous fungi

ANS: A DIF: Easy REF: 1.1
OBJ: 1.1a Recall the definition of a microbe | 1.1c Describe some problems with the definition of a microbe
MSC: Understanding

4. A microbe is commonly defined as a _____ that requires a microscope to be seen.
 - a. virus
 - b. bacterium
 - c. single-cellular prokaryote
 - d. multicellular eukaryote
 - e. living organism

ANS: E DIF: Easy REF: 1.1
OBJ: 1.1a Recall the definition of a microbe MSC: Remembering

5. Which one of the following statements regarding microbial cells is FALSE?
 - a. Microbial cells acquire food, gain energy to build themselves, and respond to environmental change.
 - b. Most single-celled organisms require a microscope to render them visible, but some bacterial cells are large enough to be seen with naked eyes.
 - c. Microbes function as individual entities.
 - d. Many microbes form complex multicellular assemblages.
 - e. Viruses are not considered microbial cells.

ANS: C DIF: Easy REF: 1.1

OBJ: 1.1a Recall the definition of a microbe

MSC: Understanding

6. Which of the following statements is FALSE?
- A genome is the total genetic information contained in an organism's chromosomal DNA.
 - If a microbe's genome includes genes for nitrogenase, that microbe probably can fix nitrogen.
 - By comparing DNA sequences of different organisms, we can figure out how closely related they are.
 - Fred Sanger developed the first applicable DNA sequencing method.
 - Fred Sanger completed the sequences of *Haemophilus influenzae*.

ANS: E DIF: Easy REF: 1.1

OBJ: 1.1d Explain the implications of microbial genome sequencing

MSC: Remembering

7. The first cellular genomes to be sequenced were those of
- humans.
 - bacteria.
 - viruses.
 - prions.
 - fungi.

ANS: B DIF: Easy REF: 1.1

OBJ: 1.1d Explain the implications of microbial genome sequencing

MSC: Remembering

8. The environment of early Earth may have contained all of the following EXCEPT
- ferrous iron.
 - methane.
 - ammonia.
 - oxygen.
 - hydrogen gas.

ANS: D DIF: Medium REF: Special Topic 1.1

OBJ: 1.1a Recall the definition of a microbe

MSC: Remembering

9. The development of the theory of the "RNA world" resulted from the discovery of
- archaea.
 - prions.
 - bacteria.
 - ribozymes.
 - endosymbionts.

ANS: D DIF: Medium REF: 1.6

OBJ: 1.6b Explain how studies on microbes fostered our knowledge of DNA function and enhanced DNA technology MSC: Remembering

10. What is the evidence that living cells existed on Earth up to 3.8 billion years ago?
- microfossils
 - 16S ribosomal RNA
 - Miller and Urey's experiments
 - Martian folded rock formations
 - diatom shells

ANS: A DIF: Medium REF: Special Topic 1.1

OBJ: 1.5a Explain why microbes can be challenging to classify taxonomically | 1.5b Outline how microbial classification has changed over time MSC: Remembering

11. What did van Leeuwenhoek discover using microscopic observations before and after drinking hot beverages?
- Heat did not kill microbes.
 - Heat killed microbes.
 - Heat did not kill algae.

- d. Caffeine in coffee killed microbes.
- e. The existence of spiral-shaped microbes.

ANS: B DIF: Medium REF: 1.2

OBJ: 1.2b Explain why the microscope is an important tool in the field of microbiology | 1.2c Identify the contributions of the following individuals: Nightingale, Hooke, van Leeuwenhoek, Pasteur, and Tyndall MSC: Analyzing

12. Tyndall's spontaneous generation experiments occasionally failed due to
- a. nutrient chirality.
 - b. dust.
 - c. fermentation.
 - d. lack of oxygen.
 - e. endospores.

ANS: E DIF: Easy REF: 1.2

OBJ: 1.2d Compare and contrast Spallanzani's, Pasteur's, and Tyndall's experiments that tested spontaneous generation MSC: Analyzing

13. The discovery of microbes occurred in the _____ century?
- a. seventeenth
 - b. eighteenth
 - c. nineteenth
 - d. twentieth
 - e. twenty-first

ANS: C DIF: Easy REF: 1.2

OBJ: 1.2b Explain why the microscope is an important tool in the field of microbiology MSC: Remembering

14. Robert Koch won the Nobel Prize for his contribution to medical bacteriology regarding
- a. *Escherichia coli*.
 - b. *Bacillus subtilis*.
 - c. *Mycobacterium tuberculosis*.
 - d. rabies.
 - e. smallpox.

ANS: C DIF: Medium REF: 1.3 OBJ: 1.3b List Koch's postulates MSC: Remembering

15. How did European invaders to North America kill much of the native population?
- a. tuberculosis
 - b. leprosy
 - c. smallpox
 - d. HIV
 - e. bubonic plague

ANS: C DIF: Medium REF: 1.2

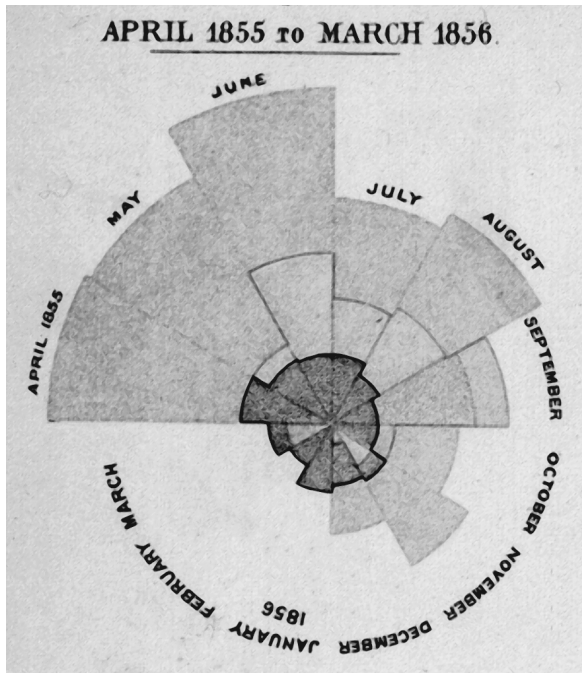
OBJ: 1.2a List both positive and negative impacts that microbes have had on human history MSC: Understanding

16. Florence Nightingale
- a. is best known as the founder of professional nursing.
 - b. was the first to use disinfectant to demonstrate the significance of aseptic technique.
 - c. developed the pie chart of mortality data during the Crimean War.
 - d. performed the first controlled experiment on the chemical conversion of matter, known today as chemotherapy.
 - e. argued that the environment of early Earth contained mainly reduced compounds.

ANS: A DIF: Easy REF: 1.2

OBJ: 1.2a List both positive and negative impacts that microbes have had on human history | 1.2c Identify the contributions of the following individuals: Nightingale, Hooke, van Leeuwenhoek, Pasteur, and Tyndall MSC: Remembering

17. Who developed the concept of medical statistics?



- a. Francis Crick
- b. Florence Nightingale
- c. Edward Jenner
- d. Louis Pasteur
- e. Alexander Fleming

ANS: B DIF: Easy REF: 1.2

OBJ: 1.2c Identify the contributions of the following individuals: Nightingale, Hooke, van Leeuwenhoek, Pasteur, and Tyndall MSC: Remembering

18. The first person to visualize individual microbial cells was

- a. Antonie van Leeuwenhoek.
- b. Robert Hooke.
- c. Louis Pasteur.
- d. Lady Montagu.
- e. Edward Jenner.

ANS: A DIF: Easy REF: 1.2

OBJ: 1.2c Identify the contributions of the following individuals: Nightingale, Hooke, van Leeuwenhoek, Pasteur, and Tyndall MSC: Remembering

19. Semmelweis and Lister noted that many of their patients' deaths were due to

- a. fungi.
- b. *Escherichia coli*.
- c. chlorine.
- d. pathogen transmission by doctors.
- e. *Staphylococcus*.

ANS: D DIF: Medium REF: 1.3

OBJ: 1.3a Describe what constitutes a pure culture and how to obtain one MSC: Understanding

20. What is the standard sterilization method for the controlled study of microbes?

- a. boiling
- b. pasteurization
- c. filter sterilization
- d. autoclaving
- e. irradiation

ANS: D DIF: Medium REF: 1.2

OBJ: 1.2c Identify the contributions of the following individuals: Nightingale, Hooke, van Leeuwenhoek, Pasteur, and Tyndall MSC: Remembering

21. How does the Winogradsky column differ from Koch's plate media?
- Koch's media creates a gradient from oxygen-rich conditions at the surface to highly reduced conditions below.
 - The Winogradsky column is used for culturing viruses.
 - The Winogradsky column is used for growing extremophiles.
 - The Winogradsky column uses the kinds of nutrients that feed humans.
 - The bacteria that Winogradsky isolated can grow only on inorganic minerals.

ANS: E DIF: Easy REF: 1.4

OBJ: 1.4a List Winogradsky's contributions to microbial culture technique | 1.4b Define what distinguishes lithotrophs from other organisms MSC: Understanding

22. Suppose Pasteur's swan-necked flasks containing boiled broth became cloudy twenty-four hours after boiling. Which choice could best explain the turbidity or cloudiness in the broth without supporting spontaneous generation?
- Endospores in the broth survived boiling and grew after the broth cooled.
 - Contaminating organisms in the broth killed by boiling became alive again after the broth cooled.
 - Chemicals in the broth came together to form living organisms.
 - The broth allowed light to pass through it with less interference after boiling.
 - Solid material in the broth dissolved during boiling.

ANS: A DIF: Difficult REF: 1.2

OBJ: 1.2c Identify the contributions of the following individuals: Nightingale, Hooke, van Leeuwenhoek, Pasteur, and Tyndall | 1.2d Compare and contrast Spallanzani's, Pasteur's, and Tyndall's experiments that tested spontaneous generation MSC: Applying

23. Which of the following is NOT considered to be an extremophilic condition for bacteria?
- high alkalinity
 - high salinity
 - high acidity
 - high nutrients
 - high temperature

ANS: D DIF: Medium REF: 1.4

OBJ: 1.4c Explain the role of microbes in geochemical cycling, especially that of nitrogen MSC: Remembering

24. The use of agar as a more robust gelling agent in solid media was suggested by
- Robert Koch.
 - Ignaz Semmelweis.
 - Angelina Hesse.
 - Louis Pasteur.
 - Richard Petri.

ANS: C DIF: Easy REF: 1.3

OBJ: 1.3a Describe what constitutes a pure culture and how to obtain one | 1.3c Assess some of the practical obstacles in applying Koch's postulates MSC: Remembering

25. It took the advent of the polymerase chain reaction to detect the presence of the causative agent for which disease?
- anthrax
 - tuberculosis
 - AIDS
 - rabies
 - smallpox

ANS: C DIF: Difficult REF: 1.3