

Microbiology with Diseases by Body System, 5e (Bauman)
Chapter 1 A Brief History of Microbiology

1.1 Multiple Choice Questions

- 1) Antoni van Leeuwenhoek was the first person in history to
- A) use a magnifying glass.
 - B) develop a taxonomic system.
 - C) view microorganisms and record these observations.
 - D) disprove spontaneous generation.
 - E) use the germ theory of disease.

Answer: C

Bloom's Taxonomy: Knowledge

Section: The Early Years of Microbiology

Learning Outcome: 1.1

- 2) The microbes commonly known as _____ are single-celled eukaryotes that are generally motile.

- A) archaea
- B) bacteria
- C) fungi
- D) protozoa
- E) viruses

Answer: D

Bloom's Taxonomy: Comprehension

Section: The Early Years of Microbiology

Learning Outcome: 1.3

- 3) Which of the following are prokaryotes?

- A) algae
- B) molds
- C) protozoa
- D) archaea
- E) worms

Answer: D

Bloom's Taxonomy: Comprehension

Section: The Early Years of Microbiology

Learning Outcome: 1.5

4) Louis Pasteur demonstrated that fermentation to produce alcohol is caused by

- A) aerobes.
- B) facultative anaerobes.
- C) obligate parasites.
- D) archaea.
- E) prokaryotes.

Answer: B

Bloom's Taxonomy: Knowledge

Section: The Golden Age of Microbiology

Learning Outcome: 1.6

5) Which of the following scientists provided evidence in favor of the concept of spontaneous generation?

- A) Pasteur
- B) Needham
- C) Redi
- D) Buchner
- E) Spallanzani

Answer: B

Bloom's Taxonomy: Knowledge

Section: The Golden Age of Microbiology

Learning Outcome: 1.7

6) Pasteur's experiments on fermentation laid the foundation for

- A) industrial microbiology.
- B) epidemiology.
- C) immunology.
- D) abiogenesis.
- E) antisepsis.

Answer: A

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.10

7) Which of the following statements about fungi is FALSE?

- A) Fungi are eukaryotes.
- B) Molds are multicellular.
- C) Fungi have a cell wall.
- D) Fungi are photosynthetic.
- E) Yeasts are unicellular.

Answer: D

Bloom's Taxonomy: Comprehension

Section: The Early Years of Microbiology

Learning Outcome: 1.3

8) Which of the following contribute to the successful application of Koch's postulates?

- A) the development of the compound microscope
- B) the theory of abiogenesis
- C) the ability to record the appearance of bacteria photographically
- D) the development of simple bacterial staining techniques
- E) the development of techniques for sterile transfer of bacteria

Answer: E

Bloom's Taxonomy: Application

Section: The Golden Age of Microbiology

Learning Outcome: 1.13

9) Which of the following individuals pioneered the use of chemicals to reduce the incidence of infections during surgery?

- A) Nightingale
- B) Snow
- C) Ehrlich
- D) Lister
- E) Semmelweis

Answer: D

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.16

10) The technique developed by Hans Christian Gram is important for bacterial

- A) etiology.
- B) identification.
- C) classification.
- D) isolation.
- E) epidemiology.

Answer: B

Bloom's Taxonomy: Knowledge

Section: The Golden Age of Microbiology

Learning Outcome: 1.15

11) The use of chemical agents to harm or kill microbes is

- A) immunology.
- B) chemotherapy.
- C) epidemiology.
- D) serology.
- E) biotechnology.

Answer: B

Bloom's Taxonomy: Knowledge

Section: The Golden Age of Microbiology

Learning Outcome: 1.18

- 12) Parasitic worms, even meters-long tapeworms, are studied in microbiology because
- A) they are parasites.
 - B) diagnosis usually involves microscopic examination of patient samples.
 - C) the Gram stain can be used to identify them.
 - D) Leeuwenhoek first discovered them.
 - E) no one else wants to study them.

Answer: B

Bloom's Taxonomy: Comprehension

Section: The Early Years of Microbiology

Learning Outcome: 1.4

- 13) Which of the following areas of investigation is considered a major driver of modern microbiology?

- A) microbial classification
- B) industrial microbiology
- C) the etiology of infectious disease
- D) genetics
- E) food preparation

Answer: D

Bloom's Taxonomy: Comprehension

Section: The Modern Age of Microbiology

Learning Outcome: 1.19

- 14) Work by _____ laid the foundations of immunology with the development of vaccines.

- A) Redi and Spallanzani
- B) Koch and Pasteur
- C) Jenner and Pasteur
- D) Lister and Semmelweis
- E) Pauling and Woese

Answer: C

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.17

- 15) According to Kluyver and van Niel, which of the following are TRUE of basic biochemical reactions?

- A) They vary widely among living things.
- B) There are an unlimited number of them.
- C) They all require energy input.
- D) Basic biochemical reactions of life primarily involve transfer of electrons and hydrogen ions.
- E) They primarily involve transfers of chemical groups.

Answer: D

Bloom's Taxonomy: Application

Section: The Modern Age of Microbiology

Learning Outcome: 1.19

16) Semmelweis advocated handwashing as a method of preventing which of the following diseases?

- A) cholera
- B) puerperal fever
- C) smallpox
- D) anthrax
- E) syphilis

Answer: B

Bloom's Taxonomy: Application

Section: The Golden Age of Microbiology

Learning Outcome: 1.16

17) Paul Ehrlich used chemotherapy to treat

- A) cholera.
- B) cancer.
- C) anthrax.
- D) smallpox.
- E) syphilis.

Answer: E

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.18

18) Which of the following is NOT a characteristic of viruses?

- A) They are visible with a light microscope.
- B) They are acellular.
- C) They are composed of genetic material and protein.
- D) They are typically smaller than prokaryotic cells.
- E) They are obligatory parasites.

Answer: A

Bloom's Taxonomy: Comprehension

Section: The Early Years of Microbiology

Learning Outcome: 1.3

19) The first true vaccine protected against disease caused by a(n) _____ pathogen.

- A) bacterial
- B) protozoal
- C) fungal
- D) viral
- E) archaeal

Answer: D

Bloom's Taxonomy: Application

Section: The Golden Age of Microbiology

Learning Outcome: 1.17

20) The work of _____ lead to improvements in sewage control and other public hygiene measures.

- A) John Snow
- B) Lazzaro Spallanzani
- C) Florence Nightingale
- D) Ignaz Semmelweis
- E) Joseph Lister

Answer: A

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.16

21) Which of the following types of microbe was NOT observed by Leeuwenhoek?

- A) fungus
- B) protozoan
- C) prokaryote
- D) alga
- E) virus

Answer: E

Bloom's Taxonomy: Knowledge

Section: The Early Years of Microbiology

Learning Outcome: 1.2

22) Inserting a gene from the hepatitis B virus into yeast so that the yeast produces a viral protein is an example of

- A) etiology.
- B) genetic engineering.
- C) immunology.
- D) microbial genetics.
- E) gene therapy.

Answer: B

Bloom's Taxonomy: Application

Section: The Modern Age of Microbiology

Learning Outcome: 1.19

23) Louis Pasteur's experiments disproving spontaneous generation were different from John Needham's in which important way?

- A) The necks of the flasks Pasteur used were bent into an S-shape and left open to the air.
- B) Pasteur boiled infusions to kill any microbes present.
- C) The necks of Pasteur's flasks were bent into an S-shape and then melted to seal them.
- D) Pasteur used meat broths instead of infusions.
- E) The flasks Pasteur used were sealed with corks.

Answer: A

Bloom's Taxonomy: Application

Section: The Golden Age of Microbiology

Learning Outcome: 1.8

24) Identification of bacteria in the laboratory usually begins with the _____ for placement in one of two large groups of bacteria.

- A) Koch's stain
- B) Gram stain
- C) Pasteur fermentation test
- D) Petri stain
- E) Ehrlich magic test

Answer: B

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.15

25) Which of the following is NOT a characteristic of protozoa?

- A) Most exhibit asexual reproduction.
- B) They are single-celled organisms.
- C) They are eukaryotic organisms.
- D) They are all photosynthetic.
- E) They frequently possess cilia or flagella.

Answer: D

Bloom's Taxonomy: Comprehension

Section: The Early Years of Microbiology

Learning Outcome: 1.4

26) Whose search for chemicals that would kill microbes without harming humans was the foundation for chemotherapy?

- A) Ehrlich
- B) Koch
- C) Gram
- D) Lister
- E) Pasteur

Answer: A

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.18

27) The work of Eduard Buchner and the discovery of enzymes laid the foundations for the field of

- A) biochemistry.
- B) epidemiology.
- C) immunology.
- D) mycology.
- E) genetics.

Answer: A

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.12

28) What is the CORRECT order for the application of Koch's postulates?

I. Inoculate suspect agent into test subject and observe that subject develops disease of interest.

II. Isolate and culture suspect agent in the laboratory.

III. Find suspect agent is every case of disease of interest but not in healthy hosts.

IV. Recover and isolate suspect agent from test subject.

A) III, I, IV, II

B) IV, I, III, II

C) I, II, III, IV

D) III, II, I, IV

E) IV, I, II, III

Answer: D

Bloom's Taxonomy: Analysis

Section: The Golden Age of Microbiology

Learning Outcome: 1.14

29) John Snow's research during a cholera outbreak in London laid the foundation for which of the following branches of microbiology?

A) infection control only

B) epidemiology only

C) immunology only

D) both infection control and epidemiology

E) infection control, epidemiology, and immunology

Answer: D

Bloom's Taxonomy: Application

Section: The Golden Age of Microbiology

Learning Outcome: 1.16

30) Robert Koch was involved in research on all of the following topics EXCEPT

A) the cause of anthrax.

B) the cause of fermentation.

C) development of a method to determine the cause of an infectious disease.

D) the cause of tuberculosis.

E) techniques for isolating microbes in the laboratory.

Answer: B

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.13

31) Which of the following is an INCORRECT pairing?

- A) protozoa; multicellular
- B) fungi; cell walls
- C) algae; aquatic and marine habitats
- D) prokaryotes; no nuclei
- E) viruses; acellular parasites

Answer: A

Bloom's Taxonomy: Comprehension

Section: The Early Years of Microbiology

Learning Outcome: 1.3

32) What was the first disease shown to be bacterial in origin?

- A) yellow fever
- B) cholera
- C) anthrax
- D) malaria
- E) tuberculosis

Answer: C

Bloom's Taxonomy: Application

Section: The Golden Age of Microbiology

Learning Outcome: 1.13

33) The taxonomic system is a way to

- A) demonstrate the relationship between microbes and disease.
- B) classify organisms based on similarities.
- C) identify chemicals which may be toxic to microbes.
- D) demonstrate spontaneous generation.
- E) study disease in human populations

Answer: B

Bloom's Taxonomy: Knowledge

Section: The Early Years of Microbiology

Learning Outcome: 1.3

34) Who discovered penicillin?

- A) Fleming
- B) Ehrlich
- C) Kitasato
- D) Pasteur
- E) Domagk

Answer: A

Bloom's Taxonomy: Knowledge

Section: The Golden Age of Microbiology

Learning Outcome: 1.18

35) The principle of disinfection to reduce HAIs (healthcare associated infections) among patients was initially introduced by

- A) L. Pasteur and R. Koch.
- B) I. Semmelweis and J. Lister.
- C) P. Erhlich and A. Fleming.
- D) J. Snow and R. Koch.
- E) E. Jenner and L. Pasteur.

Answer: B

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.16

36) Microorganisms characterized by the absence of a nucleus are called

- A) fungi.
- B) pathogens.
- C) eukaryotes.
- D) prokaryotes.
- E) viruses.

Answer: D

Bloom's Taxonomy: Knowledge

Section: The Early Years of Microbiology

Learning Outcome: 1.5

37) The hypothesis that cowpox could provide protection against smallpox was tested by _____ and provided the basis for the first vaccine.

- A) Robert Koch
- B) Edward Jenner
- C) Eduard Buchner
- D) Louis Pasteur
- E) Lazzaro Spallanzani

Answer: B

Bloom's Taxonomy: Knowledge

Section: The Golden Age of Microbiology

Learning Outcome: 1.17

38) The experiments conducted by John T. Needham using infusions were interpreted as supporting the theory of

- A) antisepsis.
- B) bioremediation.
- C) spontaneous generation.
- D) etiology.
- E) chemotherapy.

Answer: C

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.7

39) An explanation of observations and data supported by the experimental results of many scientists for many years is

- A) a theory.
- B) a hypothesis.
- C) scientific method.
- D) popular opinion.
- E) a control group.

Answer: A

Bloom's Taxonomy: Knowledge

Section: The Golden Age of Microbiology

Learning Outcome: 1.9

40) The work of _____ on fermentation led to the discovery that enzymes are responsible for the chemical reactions that occur in cells.

- A) Lister
- B) Koch
- C) Pasteur
- D) Buchner
- E) Woese

Answer: D

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.12

41) The term for the use of microorganisms to restore damaged environments is

- A) epidemiology.
- B) bioremediation.
- C) chemotherapy.
- D) serology.
- E) ecology.

Answer: B

Bloom's Taxonomy: Comprehension

Section: The Modern Age of Microbiology

Learning Outcome: 1.20

42) The term _____ involves the study of the blood components that fight infection.

- A) antisepsis
- B) chemotherapy
- C) etiology
- D) serology
- E) bioremediation

Answer: D

Bloom's Taxonomy: Application

Section: The Modern Age of Microbiology

Learning Outcome: 1.21

43) The field of _____ is a thoroughly modern discipline that has led to new ways to treat infectious disease.

- A) recombinant DNA technology
- B) epidemiology
- C) immunology
- D) serology
- E) biochemistry

Answer: A

Bloom's Taxonomy: Comprehension

Section: The Modern Age of Microbiology

Learning Outcome: 1.21

1.2 True/False Questions

1) Protozoa are also called prokaryotes.

Answer: FALSE

Bloom's Taxonomy: Knowledge

Section: The Early Years of Microbiology

Learning Outcome: 1.4

2) Single-celled organisms known as diatoms have glasslike walls and are a type of algae.

Answer: TRUE

Bloom's Taxonomy: Knowledge

Section: The Early Years of Microbiology

Learning Outcome: 1.4

3) The use of *Saccharomyces* as a probiotic is an example of the application of biotechnology.

Answer: FALSE

Bloom's Taxonomy: Comprehension

Section: The Modern Age of Microbiology

Learning Outcome: 1.19

4) Louis Pasteur is considered the Father of Microbiology because of the many carefully conducted experiments and observations he made with microbes.

Answer: TRUE

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.11

5) Gene therapy is a modern approach to preventing infectious disease.

Answer: FALSE

Bloom's Taxonomy: Comprehension

Section: The Modern Age of Microbiology

Learning Outcome: 1.21

6) Koch's postulates can be used to determine the causes of infectious diseases.

Answer: TRUE

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.14

7) Joseph Lister reduced the incidence of wound infections in health care settings by using chlorinated lime water.

Answer: FALSE

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.16

8) Robert Koch sought a "magic bullet" for the treatment of disease caused by bacteria.

Answer: FALSE

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.13

9) Enzymes are required for fermentation.

Answer: TRUE

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.12

10) Lazzaro Spallanzani was the first scientist to provide evidence disproving the spontaneous generation of microorganisms.

Answer: TRUE

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.8

1.3 Short Answer Questions

1) The amateur scientist (Koch/Leeuwenhoek/Pasteur) made his own microscopes and first reported the existence of microbes.

Answer: Leeuwenhoek

Bloom's Taxonomy: Knowledge

Section: The Early Years of Microbiology

Learning Outcome: 1.1

2) A cell that contains a nucleus is called a(n) (prokaryotic/archaeal/eukaryotic) cell.

Answer: eukaryotic

Bloom's Taxonomy: Knowledge

Section: The Early Years of Microbiology

Learning Outcome: 1.5

3) A(n) (photosynthetic/algae/plant) organism makes its own food using light energy.

Answer: photosynthetic

Bloom's Taxonomy: Comprehension

Section: The Early Years of Microbiology

Learning Outcome: 1.3

4) Microbes that cause infectious disease are called (pathogens/germs/viruses).

Answer: pathogens

Bloom's Taxonomy: Knowledge

Section: The Golden Age of Microbiology

Learning Outcome: 1.13

5) Single-celled eukaryotes that feed on other organisms and have a cell wall are (algae/fungi/protozoa).

Answer: fungi

Bloom's Taxonomy: Knowledge

Section: The Early Years of Microbiology

Learning Outcome: 1.4

6) A scientist conducts experiments to test a(n) (observation/hypothesis/theory).

Answer: hypothesis

Bloom's Taxonomy: Knowledge

Section: The Golden Age of Microbiology

Learning Outcome: 1.9

7) The work of (Needham/Redi/Spallanzani) using infusions in sealed vials provided strong evidence that spontaneous generation does not occur.

Answer: Spallanzani

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.8

8) Pasteur's research on anthrax and rabies contributed to the development of the field of epidemiology/immunology/etiology).

Answer: immunology

Bloom's Taxonomy: Knowledge

Section: The Golden Age of Microbiology

Learning Outcome: 1.17

9) A (colony/habitat/biofilm) is a mixed population of microbes growing together on surfaces.

Answer: biofilm

Bloom's Taxonomy: Comprehension

Section: The Modern Age of Microbiology

Learning Outcome: 1.21

10) Spallanzani's experiments contradicted the experiments of (Needham/Redi/Pasteur) on spontaneous generation.

Answer: Needham

Bloom's Taxonomy: Knowledge

Section: The Golden Age of Microbiology

Learning Outcome: 1.8

11) The work of Albert Kluyver and C. B. van Niel contributed to the development of (biochemistry/epidemiology/etiology).

Answer: biochemistry

Bloom's Taxonomy: Knowledge

Section: The Modern Age of Microbiology

Learning Outcome: 1.19

12) A term synonymous with immunization, (vaccination/infection) is derived from the Latin name of the cowpox virus.

Answer: vaccination

Bloom's Taxonomy: Comprehension

Section: The Golden Age of Microbiology

Learning Outcome: 1.17

13) The use of chemicals to treat diseases such as bacterial infections is called (gene/therapy/chemotherapy).

Answer: chemotherapy

Bloom's Taxonomy: Knowledge

Section: The Golden Age of Microbiology

Learning Outcome: 1.18

14) The work of Oswald Avery, George Beadle, Edward Tatum and many others into the role of DNA laid the foundations of (microbial genetics/microbiology/recombinant DNA technology).

Answer: microbial genetics

Bloom's Taxonomy: Comprehension

Section: The Modern Age of Microbiology

Learning Outcome: 1.19

15) The (physiology/metabolism) of an organism is all the chemical reactions that take place in the organism.

Answer: metabolism

Bloom's Taxonomy: Knowledge

Section: The Golden Age of Microbiology

Learning Outcome: 1.12

1.4 Essay Questions

1) You are a young scientist who has just learned about one of the hot topics in microbiology, biofilms. One aspect of the interest in biofilms is that the microbes living within biofilms appear to behave and function differently from their counterparts not living in a biofilm. Devise a way to explore the idea. (Do not focus on the technical details of how this might be accomplished.)

Answer: Many answers are possible. A good answer should have a clear statement of hypothesis and an experimental design that reflects the hypothesis and will provide interpretable quantitative results. An excellent answer may include projections of possible outcomes and/or alternative hypotheses.

Bloom's Taxonomy: Synthesis

Section: The Modern Age of Microbiology

Learning Outcome: 1.9, 1.19

2) Biotechnology can be said to have ancient roots. Explain.

Answer: Biotechnology is the use of microbes to yield beneficial products. Humans have used microbes to their benefit for millennia in producing beer and wine, which were often safer to drink than the available water, and in preserving foods. Examples of the latter include the production of wine, which essentially preserved fruit juices, and of cheese and yogurt, which extended the storage life of milk products. Soy sauce and other fermented sauces were also preserved by fermentation and were later shown to enhance the flavors of certain foods.

Bloom's Taxonomy: Application

Section: The Golden Age of Microbiology

Learning Outcome: 1.10

3) Use the basic steps of the scientific method to describe Pasteur's experiments to investigate spontaneous generation.

Answer: The observation that life seemed to appear from non-life led some scientists to believe in the theory of spontaneous generation. However, Pasteur, among others, believed in biogenesis: that life must come from life. The question Pasteur hoped to answer was "Where do microbes come from?" (step 1). Pasteur's hypothesis (step 2) was that the "parents" of microbes were present in the air on dust particles. In his experiments (step 3), he used swan-necked flasks, which were designed to prevent microbes from entering the sterile broth inside them. He observed that the broth remained sterile in the control flask even though air could move into and out of the flask. The experimental flasks were also swan-necked, but they were tilted to allow the dust that had settled to enter the flask. The control flasks stayed sterile, and the experimental flasks became cloudy. These observations led Pasteur to accept his hypothesis (step 4). He concluded that the microbes came from the dust and that spontaneous generation was therefore not a valid theory.

Bloom's Taxonomy: Application

Section: The Golden Age of Microbiology

Learning Outcome: 1.9

4) Explain how the discipline of biochemistry grew out of the science of microbiology.

Answer: Some of the first experiments in biochemistry are attributed to Louis Pasteur in his research on the causes of fermentation. His research was extended by Eduard Buchner, who showed that enzymes produced by microbial cells are responsible for the phenomenon of fermentation. Later, in the early 20th century, Kluyver and van Niel advocated the use of microbes in research on basic biochemical reactions, which they maintained are common to all living things. Further advances in biochemistry were made as microbiologists such as Beadle and Tatum and Avery and his colleagues explored the nature of the genetic material and its function using microorganisms as model systems.

Bloom's Taxonomy: Analysis

Section: The Modern Age of Microbiology

Learning Outcome: 1.12, 1.19

5) Compare and contrast the three types of eukaryotic microbes.

Answer: The three types of eukaryotic microbes are fungi, protozoa, and algae. Because they are all composed of eukaryotic cells, they have basic similarities in cellular structure, including the presence of a nucleus. However, these types of microbes differ in many ways as well. In terms of their nutrition, fungi and protozoa obtain their food from other organisms, whereas algae can make their own food through photosynthesis (a few protozoa also carry out photosynthesis). Algae and fungi can be multicellular organisms, but protozoa are found only as single-celled organisms. Protozoa are unique among the three in that they are animal-like in their characteristics, including movement. Algae are most like plants and are found in primarily water-based environments.

Bloom's Taxonomy: Analysis

Section: The Early Years of Microbiology

Learning Outcome: 1.4