Exam

Name_____

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

1) Antoni van Leeuwenhoek was the first person in history to
   A) disprove spontaneous generation.
   B) use a magnifying glass.
   C) develop a taxonomic system.
   D) prove the germ theory.
   E) view protozoa and bacteria.

   Answer: E

2) All of the following are characteristics of fungi EXCEPT:
   A) they can be multicellular or unicellular.
   B) they do not possess cell walls.
   C) they can reproduce asexually or sexually.
   D) they are made of eukaryotic cells.
   E) they are nonphotosynthetic organisms.

   Answer: B

3) Which of the following types of microorganisms is noted for its variety of motility structures?
   A) prokaryotes B) algae C) viruses D) fungi E) protozoa

   Answer: E

4) All of the following are associated with algae EXCEPT:
   A) they provide most of the oxygen on Earth.
   B) they are important in the degradation of dead plants and animals.
   C) they are a source of food for aquatic and marine animals.
   D) they are photosynthetic organisms.
   E) the group includes seaweeds and kelps.

   Answer: B

5) Which of the following pairs of scientists performed the same experiment concerning spontaneous generation but with opposite results?
   A) Pasteur and Koch
   B) Pasteur and Needham
   C) Pasteur and Redi
   D) Needham and Spallanzani
   E) Fracastoro and Spallanzani

   Answer: D

6) The microbial formation of alcohol from sugar is known as
   A) abiogenesis.
   B) fermentation.
   C) metabolism.
   D) pasteurization.
   E) antisepsis.

   Answer: B

7) All of the following are true of fungi EXCEPT:
   A) fungi have a cell wall.
   B) molds form hyphae.
   C) fungi are photosynthetic.
   D) fungi are eukaryotes.
   E) yeast are unicellular.

Answer: C

8) Which of the following statements concerning Koch's postulates is false?
   A) All of Koch's postulates must be satisfied before an organism can be proven to cause a particular disease.
   B) Koch's postulates involve the experimental infection of susceptible hosts.
   C) Koch's postulates cannot be used to demonstrate the cause of all diseases.
   D) A suspected pathogen must be found in the majority of individuals with a particular disease.
   E) A suspected pathogen must be able to be grown in the laboratory.

Answer: D

9) Which of the following individuals pioneered the use of chemicals to reduce the incidence of infections during surgery?
   A) Lister B) Semmelweis C) Snow D) Nightingale E) Ehrlich

Answer: A

10) The study of the body's defenses against pathogens is called
   A) molecular biology.
   B) chemotherapy.
   C) etiology.
   D) immunology.
   E) epidemiology.

Answer: D

11) All of the following types of research were begun during the Golden Age of microbiology EXCEPT:
   A) epidemiology.
   B) recombinant DNA technology.
   C) etiology.
   D) biotechnology.
   E) chemotherapy.

Answer: B

12) Pasteur developed a successful vaccine against which of the following diseases?
   A) anthrax
   B) rabies
   C) smallpox
   D) Both A and B are correct.
   E) Both B and C are correct.

Answer: D

13) Which of the following scientists first hypothesized that gene sequences could provide new insights into evolutionary relationships between organisms such as microbes?
   A) Avery B) Ehrlich C) Pauling D) Woese E) Kluyver

Answer: C

14) Some vaccines are
A) substances used to protect against infections during surgery.
B) methods of replacing defective genes.
C) substances used to treat a metabolic disease such as phenylketonuria.
D) weakened strains of a pathogen used to protect against disease.
E) substances used to kill microorganisms differentially.

Answer: D

15) According to Kluyver and van Niel, which of the following are true of basic biochemical reactions?
A) They primarily involve the transfer of electrons and ions.
B) There are an unlimited number of them.
C) They are shared by all living things.
D) Both A and C are correct.
E) A, B, and C are correct.

Answer: D

16) Semmelweis advocated handwashing as a method of preventing which of the following diseases?
A) anthrax
B) smallpox
C) syphilis
D) cholera
E) puerperal fever

Answer: E

17) Paul Ehrlich used chemotherapy to treat
A) syphilis. B) cancer. C) anthrax. D) cholera. E) smallpox.

Answer: A

18) All of the following are characteristics of viruses EXCEPT:
A) they are not visible with a light microscope.
B) they are obligatory parasites.
C) they are composed only of genetic material.
D) they are smaller than prokaryotic cells.
E) they are acellular.

Answer: C

19) All of the following are questions that were asked by researchers in the Modern Age of microbiology EXCEPT:
A) How do genes work?
B) What roles do microorganisms play in the environment?
C) How do we defend against disease?
D) What are the basic biochemical reactions of life?
E) What causes disease?

Answer: E

20) Which of the following individuals pioneered the reform of military hospitals in the 19th century?
A) Lister B) Nightingale C) Semmelweis D) Snow E) Spallanzani

Answer: B

21) *Saccharomyces cerevisiae* is an example of which of the following types of microbes?
A) fungi B) algae C) protozoa D) viruses E) prokaryotes

Answer: A

22) The production of human blood-clotting factor in *E. coli* is an application of which of the following scientific advances?
A) serology
B) gene therapy
C) chemotherapy
D) genome sequencing
E) genetic engineering

Answer: E

23) All of the following are aspects of Pasteur's experiments to disprove spontaneous generation EXCEPT:
A) he boiled the infusions to kill any microbes present.
B) the flasks he used were sealed with corks.
C) the flasks were free of microbes until they were opened.
D) the necks of the flasks he used were bent into an S shape.
E) the flasks were incubated for very long periods of time.

Answer: B

24) Proteins that promote chemical reactions in the cell are called
A) spores. B) flagella. C) enzymes. D) protozoa. E) genes.

Answer: C

25) All of the following are characteristics of protozoa EXCEPT:
A) they are the microbes most similar to plants.
B) they usually possess cilia or flagella.
C) most exhibit asexual reproduction.
D) they are eukaryotic organisms.
E) they are single-celled organisms.

Answer: A

26) The botanist Carolus Linnaeus was responsible for which of the following scientific advances?
A) discovery of algae
B) discovery of enzymes
C) invention of the electron microscope
D) development of the scientific method
E) development of a system for naming and classifying organisms

Answer: E

27) Pasteur made all of the following observations concerning the fermentation of grape juice EXCEPT:
A) yeast can grow with or without oxygen.
B) yeast cells can grow and reproduce in grape juice.
C) yeast can grow in sealed or open flasks of grape juice.
D) pasteurization kills yeast to prevent spoilage of grape juice.
E) bacteria produce acid in grape juice.

Answer: D

28) Put the following events in the history of microbiology in order, from the earliest to the latest:

I. Leeuwenhoek observes microbes using a microscope.
II. Pasteur disproves spontaneous generation.
III. Woese discovers the archaea.
IV. Fracastoro proposes that "germs" cause disease.
V. Ehrlich discovers the first "magic bullet."

A) V, IV, I, III, II B) III, IV, I, II, V C) III, V, II, IV, I D) IV, I, II, V, III E) IV, I, V, II, III

Answer: D

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

A) epidemiology
B) infection control
C) immunology
D) Both A and B are correct.
E) A, B, and C are correct.

Answer: D

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

A) the cause of tuberculosis.
B) the cause of fermentation.
C) development of a method to prove the cause of an infectious disease.
D) techniques for isolation of microbes in the laboratory.
E) the cause of anthrax.

Answer: B

31) Which of the following is an incorrect pairing?

A) viruses: acellular parasites
B) prokaryotes: no nuclei
C) protozoa: unicellular
D) algae: aquatic and marine habitats
E) fungi: photosynthetic

Answer: E

32) The first disease proven to be bacterial in origin was

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

Answer: A

33) Which of the following is an incorrect pairing?

A) Jenner: cowpox
B) Pasteur: anthrax vaccine
C) Lister: carbolic acid
D) Leeuwenhoek: "animalcules"
E) Nightingale: puerperal fever

Answer: E

34) Which of the following scientists demonstrated the existence of infection-fighting chemicals and cells in the blood?

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

Answer: E

35) All of the following were involved in the development of the germ theory of disease EXCEPT:
A) Snow. B) Koch. C) Fracastoro. D) Pasteur. E) Pauling.
Answer: E

MATCHING. Choose the item in column 2 that best matches each item in column 1.

Match the terms on the right with the appropriate description on the left:

36) Another term for spontaneous generation
Answer: E

37) A term that literally means "against putrefaction"
Answer: C

38) Refers to an infection acquired in a health care setting
Answer: D

39) The use of microbes to detoxify polluted environments
Answer: F

A) Pathogens
B) Prokaryote
C) Antisepsis
D) Nosocomial
E) Abiogenesis
F) Bioremediation

Match the terms on the right with the appropriate definition on the left:

40) The study of the causation of disease
Answer: H

41) Commonly known as genetic engineering
Answer: D

42) The study of the blood components that fight infection
Answer: E

43) The study of the occurrence, distribution, and spread of disease
Answer: G

44) The combination of various scientific disciplines to explain cellular function
Answer: C

45) The use of microbes in the manufacture of useful products
Answer: F

A) Biochemistry
B) Bioremediation
C) Molecular biology
D) Recombinant DNA technology
E) Serology
F) Biotechnology
G) Epidemiology
H) Etiology

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

46) Carl Woese demonstrated that there are two major groups of cells: prokaryotes and eukaryotes.
Answer: True False

47) Christian Gram devised a staining technique that divides all bacteria into two groups.
Answer: True False

48) The production of human blood-clotting factor by *E. coli* is an example of bioremediation.
Answer: True False

49) Walter Reed proved that a virus causes yellow fever in humans.
Answer: True False

50) Immunology began with Edward Jenner's experiments on immunization against syphilis.
Answer: True False

51) Koch's postulates can be used to prove the causes of all diseases.
Answer: True False

52) Joseph Lister reduced the incidence of wound infections in health care settings by the use of chlorinated lime water.
Answer: True False

53) In his experiments on fermentation, Louis Pasteur showed that bacteria cause wine to spoil by producing acids from grape juice.
Answer: True False

54) Fermentation requires the presence and activity of living cells.
Answer: True False

55) Louis Pasteur was the first scientist to provide evidence disproving the spontaneous generation of microorganisms.
Answer: True False

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

56) The formal term for one of Leeuwenhoek's "animalcules" is _____.
Answer: microorganism

57) A cell that contains a nucleus is called a(n) _____ cell.
Answer: eukaryotic

58) A(n) _____ organism makes its own food using solar energy.
Answer: photosynthetic

59) Long filaments that make up the body of a mold are called _____.
Answer: hyphae

60) _____ is an asexual method of reproduction associated with yeasts.
Answer: Budding

61) A(n) _____ is a potential answer to a question posed by a scientist studying a phenomenon.
Answer: hypothesis

62) Facultative anaerobes are organisms that can live with or without _____.
Answer: oxygen

63) Robert Koch discovered the cause of _____, a disease of animals that can be spread to humans.
Answer: anthrax

64) A(n) _____ is a mass of cells that are descended from a single cell through successive cell divisions.
Answer: colony

65) _____ are microbes small enough to pass through filters that are designed to trap bacteria.
Answer: Viruses

66) A microorganism intentionally taken to promote good health is termed a(n) _____.
Answer: probiotic

67) Vaccination is a term synonymous with _____.
Answer: immunization

68) _____ is the use of chemicals to cure diseases such as bacterial infections.
Answer: Chemotherapy

69) A(n) _____ was the first type of eukaryotic microbe to have its complete gene sequence published.
Answer: yeast

70) Women who gave birth in 19th-century hospitals often died from puerperal fever; this is an example of a(n) _____ infection.
Answer: nosocomial

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

71) Explain why there was such a long period of time between the era of Leeuwenhoek's work and the beginnings of the Golden Age of microbiology.
Answer: There are many reasons for this large gap between scientific eras. One reason is the inability of the scientists of that time to duplicate the quality of Leeuwenhoek's microscopes, due to his extreme secretiveness. Another reason was the absence of a philosophical framework for the study of microorganisms, one that was not available until after Pasteur's experiments disproving spontaneous generation, showing that microbes were basically similar to other forms of life in their origins. A third reason was the absence of suitable methods for studying microbes. These methods were not developed until the mid-19th century by scientists such as Robert Koch and his colleagues (who devised methods of growing and isolating microbes), and Christian Gram (who devised an important staining technique useful in the classification of microbes).

72) Why was it so difficult for scientists of the 17th and 18th centuries to disprove spontaneous generation?

Answer: One of the reasons spontaneous generation was difficult to disprove is that it was an extremely ancient idea, dating back to the time of Aristotle. A second reason was that this concept was seemingly based on "common sense" explanations of phenomena such as the appearance of toads in mud and maggots on rotting meat, as well as a widespread belief in such nonscientific concepts as a "life force" present in all living things; people were reluctant to revise their thinking in these areas. Using the scientific method, Pasteur could devise an experiment which could not be refuted by the scientists who advocated spontaneous generation.

73) 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 nonlife led some scientists to believe in the theory of spontaneous generation. However, there were some who believed that life must come from life or biogenesis. The question Pasteur hoped to answer was "where do microbes come from?" Pasteur's hypothesis was that the "parents" of microbes came from the air and that spontaneous generation was not a valid theory. In his experiments he used "swan-necked" flasks to prevent microbes from entering the sterile broth. He observed in his control that the flasks stayed sterile 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. Pasteur accepted his hypothesis based upon these observations and concluded that the microbes came from the dust and spontaneous generation was not a valid theory.

74) 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 were 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 were 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.

75) 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 terms of 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, while algae can make their own food through photosynthesis. Algae and fungi can be multicellular organisms, while protozoa are found only as single-celled organisms. Protozoa are unique among the three in being animal-like in their characteristics, including movement. Algae are most like plants, and are found primarily in water-based environments.