

Exam

Name_____

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

1) Work by _____ laid the foundations of the field of environmental microbiology. 1) _____

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

Answer: C

Explanation: A)
B)
C)
D)
E)

2) The term _____ involves the study of the blood components that fight infection. 2) _____

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

Answer: C

Explanation: A)
B)
C)
D)
E)

3) Which of the following is an INCORRECT pairing? 3) _____

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

Answer: B

Explanation: A)
B)
C)
D)
E)

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

4) _____

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

Answer: B

Explanation: A)
B)
C)
D)
E)

5) What must one have before designing and conducting experiments?

5) _____

- A) a hypothesis
- B) a complete set of data
- C) a theory
- D) popular opinion
- E) scientific law

Answer: A

Explanation: A)
B)
C)
D)
E)

6) Which of the following was NOT an aspect of Pasteur's experiments to disprove spontaneous generation?

6) _____

- A) The flasks were incubated for very long periods of time.
- B) The flasks were free of microbes until they were opened.
- C) The flasks he used were sealed with corks.
- D) The necks of the flasks he used were bent into an S-shape.
- E) He boiled the infusions to kill any microbes present.

Answer: C

Explanation: A)
B)
C)
D)
E)

7) Which of the following is NOT an observation Pasteur made concerning the fermentation of grape juice? 7) _____

- A) Pasteurization kills yeast to prevent spoilage of grape juice.
- B) Yeast can grow in sealed or open flasks of grape juice.
- C) Yeast can grow with or without oxygen.
- D) Yeast cells can grow and reproduce in grape juice.
- E) Some bacteria may produce acid in grape juice.

Answer: A

Explanation: A)
B)
C)
D)
E)

8) Inserting a gene from the hepatitis B virus into yeast so that the yeast produces a viral protein is an example of 8) _____

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

Answer: A

Explanation: A)
B)
C)
D)
E)

9) All of the following were involved in developing the germ theory of disease EXCEPT 9) _____

- A) Koch.
- B) Pauling.
- C) Pasteur.
- D) Snow.
- E) Fracastoro.

Answer: B

Explanation: A)
B)
C)
D)
E)

10) Parasitic worms, even meters-long tapeworms, are studied in microbiology because

10) _____

- A) Leeuwenhoek first discovered them.
- B) they are parasites.
- C) the Gram stain can be used to identify them.
- D) no one else wants to study them.
- E) diagnosis usually involves microscopic examination of patient samples.

Answer: E

Explanation: A)
B)
C)
D)
E)

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

11) _____

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

Answer: D

Explanation: A)
B)
C)
D)
E)

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

12) _____

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

Answer: A

Explanation: A)
B)
C)
D)
E)

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

13) _____

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

Answer: C

Explanation: A)
B)
C)
D)
E)

14) The study of the occurrence, distribution, and spread of disease is known as

14) _____

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

Answer: A

Explanation: A)
B)
C)
D)
E)

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

15) _____

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

Answer: C

Explanation: A)
B)
C)
D)
E)

16) What is the correct order for the application of Koch's postulates?

16) _____

- 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 in 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) IV, I, II, III D) I, II, III, IV E) III, II, I, IV

Answer: E

Explanation: A)
B)
C)
D)
E)

17) Who discovered penicillin?

17) _____

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

Answer: C

Explanation: A)
B)
C)
D)
E)

- 18) Paul Ehrlich used chemotherapy to treat
A) smallpox. B) anthrax. C) syphilis. D) cholera. E) cancer. 18) _____
- Answer: C
Explanation: A)
 B)
 C)
 D)
 E)
- 19) Who demonstrated that fermentation could occur in the absence of intact cells?
A) Pasteur B) Koch C) Woese D) Lister E) Buchner 19) _____
- Answer: E
Explanation: A)
 B)
 C)
 D)
 E)
- 20) Which of the following is NOT a characteristic of viruses? 20) _____
- A) They are composed of genetic material and protein.
B) They are obligatory parasites.
C) They are acellular.
D) They are visible with a light microscope.
E) They are smaller than prokaryotic cells.
- Answer: D
Explanation: A)
 B)
 C)
 D)
 E)
- 21) The term for the use of microorganisms to restore damaged environments is 21) _____
- A) ecology.
B) epidemiology.
C) bioremediation.
D) chemotherapy.
E) serology.
- Answer: C
Explanation: A)
 B)
 C)
 D)
 E)

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

22) _____

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

Answer: E

Explanation: A)
B)
C)
D)
E)

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

23) _____

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

Answer: B

Explanation: A)
B)
C)
D)
E)

24) The term that literally means "against putrefaction" is

24) _____

- A) nosocomial.
- B) antisepsis.
- C) prokaryote.
- D) recombinant technology.
- E) chemotherapy.

Answer: B

Explanation: A)
B)
C)
D)
E)

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

25) _____

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

Answer: E

Explanation: A)
B)
C)
D)
E)

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

26) _____

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

Answer: E

Explanation: A)
B)
C)
D)
E)

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

27) _____

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

Answer: C

Explanation: A)
B)
C)
D)
E)

28) Which of the following questions largely stimulated the research of microbes during what is known as the Golden Age of Microbiology?

28) _____

- A) How can microorganisms be seen?
- B) What causes disease, and is spontaneous generation of microbes possible?
- C) How do genes work?
- D) How are microbes related?
- E) How should living organisms be classified?

Answer: B

Explanation: A)
B)
C)
D)
E)

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

29) _____

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

Answer: A

Explanation: A)
B)
C)
D)
E)

30) Which of the following statements concerning Koch's postulates is FALSE?

30) _____

- A) The suspected pathogen may not be present in all cases of the disease being studied.
- B) All of Koch's postulates must be satisfied before an organism can be shown to cause a particular disease.
- C) Koch's postulates cannot be used to demonstrate the cause of all diseases.
- D) Koch's postulates involve the experimental infection of susceptible hosts.
- E) A suspected pathogen must be able to be grown in the laboratory.

Answer: A

Explanation: A)
B)
C)
D)
E)

31) The study of the body's defenses against pathogens is called

31) _____

- A) epidemiology.
- B) chemotherapy.
- C) molecular biology.
- D) etiology.
- E) immunology.

Answer: E

Explanation: A)
B)
C)
D)
E)

32) Antoni van Leeuwenhoek was the first person in history to

32) _____

- A) develop a taxonomic system.
- B) use a magnifying glass.
- C) use the germ theory of disease.
- D) view microorganisms and record these observations.
- E) disprove spontaneous generation.

Answer: D

Explanation: A)
B)
C)
D)
E)

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

33) _____

- A) epidemiology only
- B) infection control only
- C) immunology only
- D) both infection control and epidemiology
- E) infection control, epidemiology, and immunology

Answer: D

Explanation: A)
 B)
 C)
 D)
 E)

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

34) _____

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

Answer: A

Explanation: A)
 B)
 C)
 D)
 E)

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

35) _____

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

Answer: C

Explanation: A)
 B)
 C)
 D)
 E)

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

36) _____

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

Answer: A

Explanation: A)
B)
C)
D)
E)

37) All of the following individuals were involved in improving public health in the 19th century EXCEPT

37) _____

- A) Lister.
- B) Spallanzani.
- C) Snow.
- D) Nightingale.
- E) Semmelweis.

Answer: B

Explanation: A)
B)
C)
D)
E)

38) Which of the following statements about algae is FALSE?

38) _____

- A) They provide most of the oxygen on Earth.
- B) They are a source of food for aquatic and marine animals.
- C) The group includes seaweeds and kelps.
- D) They are photosynthetic organisms.
- E) They are important in the degradation of dead plants and animals.

Answer: E

Explanation: A)
B)
C)
D)
E)

- 39) According to Kluver and van Niel, which of the following are true of basic biochemical reactions? 39) _____
- A) They primarily involve transfers of chemical groups.
 - B) They are shared by all living things.
 - C) Basic biochemical reactions shared by all living things primarily involve transfer of electrons and hydrogen ions.
 - D) There are an unlimited number of them.
 - E) They primarily involve the transfer of electrons and ions.

Answer: C

Explanation: A)
B)
C)
D)
E)

- 40) The work of Lister, Nightingale, and Semmelweis all contributed to controlling infectious disease 40) _____
by
- A) developing methods for reducing nosocomial infections.
 - B) determining the taxonomic relationships among microbes.
 - C) developing vaccines.
 - D) identifying the sources of infectious agents.
 - E) developing techniques for isolating pathogens.

Answer: A

Explanation: A)
B)
C)
D)
E)

- 41) What scientist first hypothesized that gene sequences could provide new insights into evolutionary 41) _____
relationships among all organisms (including microbes)?
- A) Woese B) Kluver C) Avery D) Pauling E) Ehrlich

Answer: D

Explanation: A)
B)
C)
D)
E)

- 42) Which of the following individuals pioneered the use of chemicals to reduce the incidence of 42) _____
infections during surgery?
- A) Ehrlich
 - B) Snow
 - C) Lister
 - D) Nightingale
 - E) Semmelweis

Answer: C

Explanation: A)
B)
C)
D)
E)

43) The term _____ refers to an infection acquired in a health care setting.

43) _____

- A) archaea
- B) spontaneous generation
- C) nosocomial
- D) abiogenesis
- E) bioremediation

Answer: C

Explanation: A)
B)
C)
D)
E)

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

44) A (colony/habitat/biofilm) is a community of microbes growing on surfaces.

44) _____

Answer: biofilm

Explanation:

45) The desire to prevent (infection /disease/sepsis), literally "putrefaction," resulted in many developments leading to modern medicine.

45) _____

Answer: sepsis

Explanation:

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

46) _____

Answer: eukaryotic

Explanation:

47) Ignaz Semmelweis demonstrated the importance of (antisepsis/vaccination/washing) as a means of preventing disease transmission.

47) _____

Answer: washing

Explanation:

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

48) _____

Answer: photosynthetic

Explanation:

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

49) _____

Answer: Leeuwenhoek

Explanation:

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

50) _____

Answer: chemotherapy

Explanation:

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

51) _____

Answer: metabolism

Explanation:

- 52) A scientist conducts experiments to test a(n) (observation/hypothesis/theory). 52) _____
Answer: hypothesis
Explanation:
- 53) A term synonymous with immunization, (vaccination/infection) is derived from the Latin name of the cowpox virus. 53) _____
Answer: vaccination
Explanation:
- 54) Microbes that cause infectious disease are called (pathogens/germs/viruses). 54) _____
Answer: pathogens
Explanation:
- 55) Research done in Robert Koch's laboratory laid the foundation for (epidemiology/immunology/etiology), the study of the body's defenses against disease. 55) _____
Answer: immunology
Explanation:
- 56) The development of molecular biology has made possible the application of (genome sequencing/gene sequences/gene sequencing) to provide a better understanding of the relationships between organisms. 56) _____
Answer: gene sequencing
Explanation:
- 57) Organisms such as bacteria that can convert atmospheric nitrogen into nitrate are often studied in (environmental/bioremediation/ecologic) microbiology. 57) _____
Answer: environmental
Explanation:
- 58) Spallanzani's experiments contradicted the experiments of (Needham/Redi/Pasteur) on spontaneous generation. 58) _____
Answer: Needham
Explanation:

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

- 59) Microbiologists study only single-celled organisms. 59) _____
Answer: True ☒ False
Explanation:
- 60) Fermentation can occur in the absence of living cells. 60) _____
Answer: ☒ True ☐ False
Explanation:
- 61) Robert Koch developed a vaccine to prevent anthrax after identifying the causative agent. 61) _____
Answer: True ☒ False
Explanation:

- 62) Joseph Lister reduced the incidence of wound infections in health care settings by using chlorinated lime water. 62) _____
Answer: True ☒ False
Explanation:
- 63) Christian Gram devised a staining technique that divides all bacteria into two groups. 63) _____
Answer: ☒ True False
Explanation:
- 64) Gene therapy is a modern approach to preventing infectious disease. 64) _____
Answer: True ☒ False
Explanation:
- 65) Louis Pasteur is considered the Father of Microbiology because of the many carefully conducted experiments and observations he made with microbes. 65) _____
Answer: ☒ True False
Explanation:
- 66) Lazzaro Spallanzani was the first scientist to provide evidence disproving the spontaneous generation of microorganisms. 66) _____
Answer: ☒ True False
Explanation:
- 67) The production of human blood-clotting factor by *E. coli* is an example of bioremediation. 67) _____
Answer: True ☒ False
Explanation:
- 68) Koch's postulates can be used only to determine the causes of infectious diseases. 68) _____
Answer: ☒ True False
Explanation:

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

- 69) 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.

70) 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, Kluver 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.

71) 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.

72) 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.

73) 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.

Answer Key
Testname: C1

- 1) C
- 2) C
- 3) B
- 4) B
- 5) A
- 6) C
- 7) A
- 8) A
- 9) B
- 10) E
- 11) D
- 12) A
- 13) C
- 14) A
- 15) C
- 16) E
- 17) C
- 18) C
- 19) E
- 20) D
- 21) C
- 22) E
- 23) B
- 24) B
- 25) E
- 26) E
- 27) C
- 28) B
- 29) A
- 30) A
- 31) E
- 32) D
- 33) D
- 34) A
- 35) C
- 36) A
- 37) B
- 38) E
- 39) C
- 40) A
- 41) D
- 42) C
- 43) C
- 44) biofilm
- 45) sepsis
- 46) eukaryotic
- 47) washing
- 48) photosynthetic
- 49) Leeuwenhoek
- 50) chemotherapy

Answer Key
Testname: C1

- 51) metabolism
- 52) hypothesis
- 53) vaccination
- 54) pathogens
- 55) immunology
- 56) gene sequencing
- 57) environmental
- 58) Needham
- 59) FALSE
- 60) TRUE
- 61) FALSE
- 62) FALSE
- 63) TRUE
- 64) FALSE
- 65) TRUE
- 66) TRUE
- 67) FALSE
- 68) TRUE
- 69) 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.
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