

Registration Form

WET LAB PROCEDURES CEU Training Course \$200.00
48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL \$50.00

Start and Finish Dates: _____ *You will have 90 days from this date in order to complete this course*

Name _____ Signature _____
I have read and understood the disclaimer notice on page 2. Digitally sign XXX

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Home (____) _____ Work (____) _____

Operator ID # _____ Exp. Date _____

Please circle/check which certification you are applying the course CEU's.
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Plumbing ___ Drillers ___ Pump Installer ___ Other _____

Technical Learning College Western Campus
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AFFIDAVIT OF EXAM COMPLETION

I affirm that I personally completed the entire text of the course. I also affirm that I completed the exam without assistance from any outside source. I understand that it is my responsibility to file or maintain my certificate of completion as required by the state or by the designation organization.

Grading Information

In order to maintain the integrity of our courses we do not distribute test scores, percentages or questions missed. Our exams are based upon pass/fail criteria with the benchmark for successful completion set at 70%. Once you pass the exam, your record will reflect a successful completion and a certificate will be issued to you.

For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we've received your assignment and to confirm your identity.

Thank you...

Wet Lab Pro Answer Key

Name _____

Telephone # _____

Please circle, underline or X or bold one correct answer.

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| 272. A B C D E | 286. A B C D E | 300. A B C D E |

Please fax or e-mail the answer key to TLC
Western Campus Fax (928) 272-0747.

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If you need this assignment graded and the results mailed to you within a 48-hour period, prepare to pay an additional rush service handling fee of \$50.00. This fee may not cover postage costs. If you need this service, simply write RUSH on the top of your Registration Form. We will place you in the front of the grading and processing line.

For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we've received your assignment and to confirm your identity.

Thank you...

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Please e-mail or fax this survey along with your final exam

**WET LAB PROCEDURES
CONTINUING EDUCATION COURSE**

CUSTOMER SERVICE RESPONSE CARD

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E-MAIL _____ PHONE _____

PLEASE COMPLETE THIS FORM BY CIRCLING THE NUMBER OF THE APPROPRIATE ANSWER IN THE AREA BELOW.

1. Please rate the difficulty of your course.
Very Easy 0 1 2 3 4 5 Very Difficult
2. Please rate the difficulty of the testing process.
Very Easy 0 1 2 3 4 5 Very Difficult
3. Please rate the subject matter on the exam to your actual field or work.
Very Similar 0 1 2 3 4 5 Very Different

4. How did you hear about this Course? _____

5. What would you do to improve the Course?

How about the price of the course?

Poor _____ Fair _____ Average _____ Good _____ Great _____

How was your customer service?

Poor _____ Fair _____ Average _____ Good _____ Great _____

Any other concerns or comments.

Wet Lab Procedures CEU Training Course Assignment

You will have 90 days from the start of this assignment to successfully complete and submit this assignment back to TLC.

If you need course assistance please call us. You can find an extra copy of this Assignment on TLC's website under the Assignment Page.

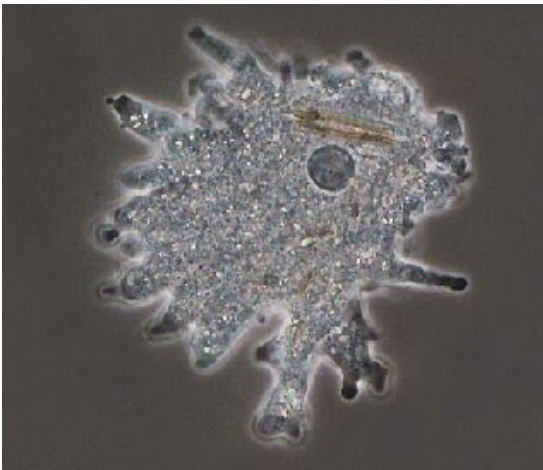
Example Question, fill-in-the blank with one correct answer

Identify the Microorganism

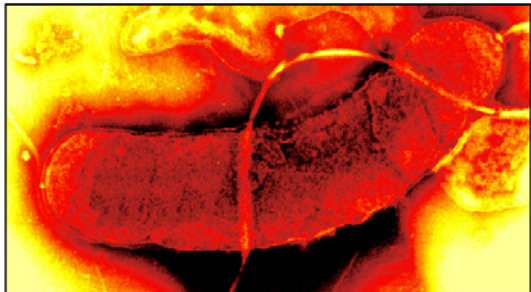
The first 1-5 pictures select the best answer.

- A. Escherichia coli
- B. Protozoa
- C. Ameba
- D. Salmonella typhi
- E. Vibrio cholerae

1.



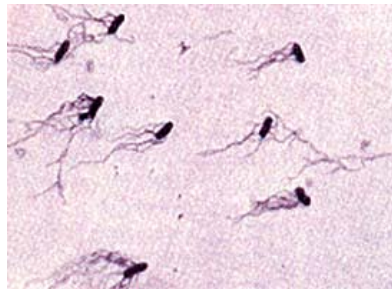
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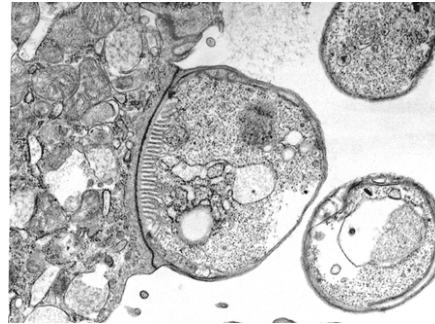


5.



The second set of pictures #6-10 select the best answer.

- A. Shigella
- B. Entamoeba histolytica
- C. Giardia lamblia
- D. Cryptosporidium parvum
- E. Legionella pneumophila



Drinking Water Rules and Disease

11. The first list was called the drinking water _____. CCL contained 60 contaminants/contaminant groups, included 10 pathogens, and was published in the Federal Register on March 2, 1998. A decision concerning whether to regulate ≥ 5 contaminants from CCL was required by August 2001.

- A. Total Coliform Rule (TCR)
- B. 1996 SDWA amendments
- C. Safe Drinking Water Act (SDWA) of 1974
- D. Contaminant Candidate List (CCL)
- E. None of the Above

12. Public water systems are regulated under the _____ and its subsequent 1986 and 1996 amendments. Under SDWA, EPA is authorized to set national standards to protect drinking water and its sources against naturally occurring or man-made contaminants.

- A. Total Coliform Rule (TCR)
- B. 1996 SDWA amendments
- C. Safe Drinking Water Act (SDWA) of 1974
- D. Contaminant Candidate List (CCL)
- E. None of the Above

13. The _____ require EPA to publish a list every 5 years of contaminants that are known or anticipated to occur in public water systems and that might need to be regulated.

- A. Total Coliform Rule (TCR)
- B. 1996 SDWA amendments
- C. Safe Drinking Water Act (SDWA) of 1974
- D. Contaminant Candidate List (CCL)
- E. None of the Above

14. Microbial contamination is regulated under the Total Coliform Rule (TCR) of 1989 and the _____ of 1989.

- A. Total Coliform Rule (TCR)
- B. 1996 SDWA amendments
- C. Safe Drinking Water Act (SDWA) of 1974
- D. Surface Water Treatment Rule (SWTR)
- E. None of the Above

15. _____ covers all water systems that use surface water or groundwater under the direct influence of surface water.

- A. Total Coliform Rule (TCR)
- B. 1996 SDWA amendments
- C. Safe Drinking Water Act (SDWA) of 1974
- D. Surface Water Treatment Rule (SWTR)
- E. None of the Above

16. _____ is intended to protect against exposure to *Giardia intestinalis*, viruses, and *Legionella*, as well as selected other pathogens.

- A. Total Coliform Rule (TCR)
- B. 1996 SDWA amendments
- C. Safe Drinking Water Act (SDWA) of 1974
- D. Surface Water Treatment Rule (SWTR)
- E. None of the Above

17. In 1998, EPA promulgated the _____, which provides additional protection against Cryptosporidium and other waterborne pathogens for systems that serve $\geq 10,000$ persons.

- A. Total Coliform Rule (TCR)
- B. 1996 SDWA amendments
- C. Interim Enhanced Surface Water Treatment Rule (IESWTR)
- D. Long Term 1 Enhanced SWTR (LT1ESWTR)
- E. None of the Above

18. In 2002, EPA finalized the _____ for public water systems that use surface water or groundwater under the direct influence of surface water and serve $< 10,000$ persons.

- A. Total Coliform Rule (TCR)
- B. 1996 SDWA amendments
- C. Interim Enhanced Surface Water Treatment Rule (IESWTR)
- D. Long Term 1 Enhanced SWTR (LT1ESWTR)
- E. None of the Above

19. _____ was proposed in combination with the Filter Backwash Recycling Rule (FBRR), which was finalized in 2001.

- A. Total Coliform Rule (TCR)
- B. Filter Backwash Recycling Rule (FBRR)
- C. Interim Enhanced Surface Water Treatment Rule (IESWTR)
- D. Long Term 1 Enhanced SWTR (LT1ESWTR)
- E. None of the Above

20. The _____ require EPA to develop regulations that require disinfection of groundwater systems as necessary to protect the public health; EPA has proposed the Ground Water Rule (GWR) to meet this mandate.

- A. Total Coliform Rule (TCR)
- B. 1996 SDWA amendments
- C. Interim Enhanced Surface Water Treatment Rule (IESWTR)
- D. Long Term 1 Enhanced SWTR (LT1ESWTR)
- E. None of the Above

21. _____ specifies the appropriate use of disinfection in groundwater and addresses other components of groundwater systems to ensure public health protection. GWR applies to public groundwater systems (systems that have ≥ 15 service connections or regularly serve ≥ 25 persons/day for ≥ 60 days/year).

- A. Total Coliform Rule (TCR)
- B. 1996 SDWA amendments
- C. Interim Enhanced Surface Water Treatment Rule (IESWTR)
- D. Ground Water Rule (GWR)
- E. None of the Above

22. This rule also applies to any system that mixes surface and groundwater if the groundwater is added directly to the distribution system and provided to consumers without treatment. _____ does not apply to privately owned wells.

- A. Total Coliform Rule (TCR)
- B. 1996 SDWA amendments
- C. Interim Enhanced Surface Water Treatment Rule (IESWTR)
- D. Ground Water Rule (GWR)
- E. None of the Above

23. To fill gaps in existing data regarding occurrence of microbial pathogens and other indicators of microbial contamination, occurrence of disinfection byproducts, and characterization of treatment processes, EPA promulgated the _____ in 1996, which required systems serving $\geq 100,000$ persons to provide treatment data and monitor disinfection byproducts and source-water-quality parameters.

- A. Information Collection Rule
- B. 1996 SDWA amendments
- C. Interim Enhanced Surface Water Treatment Rule (IESWTR)
- D. Ground Water Rule (GWR)
- E. None of the Above

24. _____ are also required to monitor for the presence of Cryptosporidium, Giardia, total culturable viruses, and total* and fecal coliforms or Escherichia coli ≥ 1 time/month for 18 months. The required monitoring ended in December 1998, and data were analyzed.

- A. Information Collection Rule
- B. 1996 SDWA amendments
- C. Interim Enhanced Surface Water Treatment Rule (IESWTR)
- D. Ground Water Rule (GWR)
- E. None of the above

25. EPA also made minor changes in 2000 to the _____ to streamline requirements, promote consistent national implementation, and in certain cases, reduce the burden for water systems. The action levels of 0.015 mg/L for lead and 1.3 mg/L for copper remain the same.

- A. Information Collection Rule
- B. Lead and Copper Rule
- C. Interim Enhanced Surface Water Treatment Rule (IESWTR)
- D. Ground Water Rule (GWR)
- E. None of the above

26. A cyst can survive in the environment for short periods of time and be extremely fragile to conventional disinfectants such as chlorine. Effective filtration treatment is not critical to removing these organisms from water sources.

- A. True
- B. False

27. Cryptosporidiosis is a commonly reported protozoan-caused disease. It has also been referred to as "cat scratch fever" and "beaver fever" because of the many cases reported among hikers and others who consume untreated surface water. Symptoms include chronic diarrhea, abdominal cramps, bloating, frequent loose and pale greasy stools, fatigue and weight loss. The incubation period is 5-25 days or longer, with an average of 7-10 days.

- A. True
- B. False

28. Many infections are asymptomatic (no symptoms). Giardiasis occurs worldwide. Waterborne outbreaks in the United States occur most often in communities receiving their drinking water from streams or rivers without adequate disinfection or a filtration system. The organism, Giardia lamblia, has been responsible for more community-wide outbreaks of disease in the U.S. than any other pathogen. Drugs are available for treatment but are not 100% effective.

- A. True
- B. False

29. Giardiasis is an example of a protozoan disease that is common worldwide but was only recently recognized as causing human disease. The major symptom in humans is diarrhea, which may be profuse and watery. The diarrhea is associated with cramping abdominal pain. General malaise, fever, anorexia, nausea and vomiting occur less often.

Symptoms usually come and go, and end in fewer than 30 days in most cases. The incubation period is 1-12 days, with an average of about seven days.

- A. True
- B. False

30. Cryptosporidium organisms have been identified in human fecal specimens from more than 50 countries on six continents. The mode of transmission is fecal-oral, either by person-to-person or animal-to-person. There are several different treatments for Cryptosporidium infections.

- A. True
- B. False

31. All these diseases, with the exception of hepatitis A, have one symptom in common: diarrhea. They also have the same mode of transmission, fecal-oral, whether through person-to-person or animal-to-person contact, and the same routes of transmission, being either foodborne or waterborne. Although most pathogens cause mild, self-limiting disease, on occasion, they can cause serious, even life threatening illness. Particularly vulnerable are persons with weak immune systems such as those with HIV infections or cancer. By understanding the nature of waterborne diseases, the importance of properly constructed, operated and maintained public water systems becomes obvious. While water treatment cannot achieve sterile water (no microorganisms), the goal of treatment must clearly be to produce drinking water that is as pathogen-free as possible at all times. For those who operate water systems with inadequate source protection or treatment facilities, the potential risk of a waterborne disease outbreak is real. For those operating systems that currently provide adequate source protection and treatment, operating and maintaining the system at a high level on a continuing basis is critical to prevent disease.

- A. True
- B. False

Giardiasis Giardia lamblia Chapter

32. Giardia lamblia (intestinalis) is a single celled animal, i.e., a protozoa, that moves with the aid of five flagella.

- A. True
- B. False

33. In Europe, Giardia lamblia is sometimes referred to as Lamblia intestinalis.

- A. True
- B. False

34. It is possible to experience some, not all, of the symptoms, yet still shed _____ and pass the parasite onto others. Typically, the disease runs its course in a week or two, although in some cases, the disease may linger for months, causing severe illness and weight loss. Nonetheless, the basic biology of this parasite--including how it ravages the digestive tract--is poorly understood.

- A. Cysts
- B. Immune system
- C. Parasite
- D. Amitochondrialism
- E. None of the above

35. The organism exists in two different forms--a hardy, dormant _____ that contaminates water or food and an active, disease-causing form that emerges after the parasite is ingested. National Institute of General Medical Sciences grantee Dr. Frances Gillin of the University of California, San Diego and her colleagues cultivated the entire life cycle of this parasite in the lab and identified biochemical cues in the host's digestive system that trigger Giardia's life cycle transformations. They also uncovered several tricks the parasite uses to evade the defenses of the infected organism.

- A. Cysts
- B. Immune system
- C. Parasite
- D. Amitochondrialism
- E. None of the above

36. Giardiasis is the least frequent cause of non-bacterial diarrhea in North America.

- A. True
- B. False

37. Giardia duodenalis, cause of giardiasis, is a one-celled, microscopic parasite that can live in the intestines of animals and people. It is found in every region throughout the world and has become recognized as one of the most common causes of waterborne (and occasionally foodborne) illness often referred to as "Beaver Fever." It is commonly known as "traveler's diarrhea", and referred to as "Montezuma's Revenge" by those who travel to third world countries in the Western Hemisphere.

- A. True
- B. False

38. Approximately one week after ingestion of the Giardia _____, prolonged, greasy diarrhea, gas, stomach cramps, fatigue, and weight loss begin.

- A. Cysts
- B. Immune system
- C. Parasite
- D. Amitochondrialism
- E. None of the above

39. One of Giardia's techniques is to alter the proteins on its surface, which confounds the ability of the infected animal's immune system to detect and combat the _____. This work reveals why Giardia infections are extremely persistent and prone to recur. In addition, these insights into Giardia's biology and survival techniques may enable scientists to develop better strategies to understand, prevent, and treat Giardia infections.

- A. Cysts
- B. Immune system
- C. Parasite
- D. Amitochondrialism
- E. None of the above

40. Recently, Giardia has been found to possess mitochondrial remnants known as 'mitosomes', which suggest that the condition of _____ is not primitive to eukaryotes but instead is a result of reductive evolution.

- A. Cysts
- B. Immune system
- C. Parasite
- D. Amitochondrialism
- E. None of the above

41. The microaerophilic *Giardia* uses these _____ in the maturation of iron-sulfur proteins rather than in ATP synthesis as is the case in mitochondria-possessing eukaryotes.
- Cysts
 - Immune system
 - Parasite
 - Amitochondrialism
 - None of the above
42. Organisms that appear identical to those that cause human illness have been isolated from domestic animals (dogs and cats) and wild animals (beavers and bears). A related but morphologically distinct organism infects rodents, although rodents may be infected with human isolates in the laboratory. Human giardiasis may involve diarrhea within 1 week of ingestion of the _____, which is the environmental survival form and infective stage of the organism.
- Cysts
 - Immune system
 - Parasite
 - Amitochondrialism
 - None of the above
43. The disease mechanism is unknown, with some investigators reporting that the organism produces a toxin while others are unable to confirm its existence. The organism has been demonstrated inside _____ in the duodenum, but most investigators think this is such an infrequent occurrence that it is not responsible for disease symptoms. Mechanical obstruction of the absorptive surface of the intestine has been proposed as a possible pathogenic mechanism, as has a synergistic relationship with some of the intestinal flora.
- Cysts
 - Immune system
 - Host Cells
 - Amitochondrialism
 - None of the Above
44. *Giardia* can be _____, cultured and encysted in vitro; new isolates have bacterial, fungal, and viral symbionts. Classically the disease was diagnosed by demonstration of the organism in stained fecal smears.
- Survival
 - Trophozoite
 - Excysted
 - Proteins
 - None of the Above
45. Several strains of *G. lamblia* have been isolated and described through analysis of their _____ and DNA; type of strain, however, is not consistently associated with disease severity. Different individuals show various degrees of symptoms when infected with the same strain, and the symptoms of an individual may vary during the course of the disease.
- Survival
 - Trophozoite
 - Excysted
 - Proteins
 - None of the Above

46. Giardia lamblia is frequently diagnosed by visualizing the organism, either the _____ (active reproducing form) or the cyst (the resting stage that is resistant to adverse environmental conditions) in stained preparations or unstained wet mounts with the aid of a microscope. A commercial fluorescent antibody kit is available to stain the organism.

- A. Survival
- B. Trophozoite
- C. Excysted
- D. Proteins
- E. None of the Above

47. Giardiasis is more prevalent in children than in adults, possibly because many individuals seem to have a lasting immunity after infection. This organism is implicated in 25% of the cases of gastrointestinal disease and may be present asymptotically.

- A. True
- B. False

48. The disease is also common in child day care centers, especially those in which diapering is done.

- A. True
- B. False

49. Acute outbreaks appear to be common with infants and is not usually associated with water but is related to child care and diaper changing hygiene procedures.

- A. True
- B. False

50. Giardiasis occurs throughout the population, although the prevalence is higher in children than adults. Chronic symptomatic giardiasis is more common in adults than children.

- A. True
- B. False

51. Major outbreaks are associated with contaminated water systems that use sand filtration or reverse osmosis systems.

- A. True
- B. False

Cryptosporidiosis Chapter

52. Until 1993, when over 400,000 people in Milwaukee became ill with diarrhea after drinking water contaminated with the parasite, few people had heard of Cryptosporidium parvum, or the disease it causes, cryptosporidiosis.

- A. True
- B. False

53. Cryptosporidiosis is most particularly a danger for the immunocompromised, especially HIV-positive persons and persons with AIDS. Individuals with CD4 cell counts below 200 are more likely to experience severe complications, including prolonged diarrhea, dehydration, and possible death.

- A. True
- B. False

54. Persons at increased risk for contracting cryptosporidiosis include child care workers; diaper-aged children who attend child care centers; persons exposed to human feces by sexual contact; and caregivers who might come in direct contact with feces while caring for a person infected with cryptosporidiosis.

- A. True
- B. False

55. Transmission is by an oral-fecal route, including hand contact with the stool of infected humans or animals or with objects contaminated with stool.

- A. True
- B. False

56. Transmission is also common from ingestion of food or water contaminated with stool, including water in the recreational water park and swimming pool settings.

- A. True
- B. False

57. Symptoms of cryptosporidiosis include, most commonly, watery diarrhea and cramps, sometimes severe. Weight loss, nausea, vomiting, and fever are also possible.

- A. True
- B. False

58. The severity of symptoms varies with the degree of underlying immunosuppression, with immunocompetent patients commonly experiencing watery diarrhea for a few days to 4 or more weeks and occasionally having a recurrence of diarrhea after a brief period of recovery.

- A. True
- B. False

Cholera Chapter

59. Cholera has been very common in industrialized nations for the last 100 years.

- A. True
- B. False

60. Cholera is always life-threatening, it is easily prevented and treated with chloramines.

- A. True
- B. False

61. In the United States, because of advanced water and sanitation systems, cholera is not a major threat; however, everyone, especially travelers, should be aware of how the disease is transmitted and what can be done to prevent it.

- A. True
- B. False

62. Cholera, which is derived from a Greek term meaning "Running to the bathroom," is caused by *Vibrio cholerae* and is the most feared epidemic diarrheal disease because of its severity. Dehydration and death can occur within a matter of minutes of infection.

- A. True
- B. False

63. In 1883, Louis Pasteur discovered *V. cholerae* during a cholera outbreak in Egypt.

- A. True
- B. False

64. The *V. cholerae* organism is a comma-shaped, gram-negative aerobic bacillus whose size varies from 1-3 mm in length by 0.5-0.8 mm in diameter. Its antigenic structure consists of a flagellar H antigen and a somatic O antigen.

- A. True
- B. False

65. The differentiation of the latter allows for separation into pathogenic and nonpathogenic strains. *V. cholerae* O1 or O139 are associated with epidemic cholera. *V. cholerae* O1 has 2 major biotypes: classic and El Tor.

- A. True
- B. False

66. Currently, El Leche is the predominant cholera pathogen.

- A. True
- B. False

67. A person may get cholera by drinking water or eating food contaminated with the cholera bacterium. In an epidemic, the source of the contamination is usually the feces of an infected person. The disease can spread rapidly in areas with inadequate treatment of sewage and drinking water.

- A. True
- B. False

68. The cholera bacterium may also live in the environment in brackish rivers and coastal waters. Shellfish eaten raw have been a source of cholera, and a few persons in the United States have contracted cholera after eating raw or undercooked shellfish from the Gulf of Mexico. The disease is not likely to spread directly from one person to another; therefore, casual contact with an infected person is not a risk for becoming ill.

- A. True
- B. False

69. Cholera (also called Asiatic flu) is a disease of the respiratory tract caused by the *Vibrio cholerae* bacterium. These bacteria are typically ingested by drinking water contaminated by improper sanitation or by eating improperly cooked fish, especially shellfish.

- A. True
- B. False

70. About one hundred *Vibrio cholerae* bacteria must be ingested to cause cholera in normally healthy adults, although increased susceptibility may be observed in those with a strong immune system, individuals with increased gastric acidity, or those who are malnourished.

- A. True
- B. False

71. *Vibrio cholerae* causes disease by producing a toxin that disables the _____ of G proteins which are part of G protein-coupled receptors in intestinal cells. This has the effect that the G proteins are locked in the "on position" binding GTP (normally, the G proteins quickly return to "off" by hydrolyzing GTP to GDP).

- A. GTPase function
- B. G proteins
- C. Bacterium
- D. Antigenic
- E. None of the Above

72. The _____ then cause adenylate cyclases to produce large amounts of cyclic AMP (cAMP) which results in the loss of fluid and salts across the lining of the gut.

- A. GTPase function
- B. G proteins
- C. Bacterium
- D. Antigenic
- E. None of the Above

73. The resulting diarrhea allows the _____ to spread to other people under unsanitary conditions.
- A. GTPase function
 - B. G proteins
 - C. Bacterium
 - D. Antigenic
 - E. None of the Above
74. When cholera appears in a community it is essential to ensure three things: hygienic disposal of human feces, an _____ supply of safe drinking water, and good food hygiene.
- A. GTPase function
 - B. G proteins
 - C. Bacterium
 - D. Antigenic
 - E. None of the above
75. _____ variation plays an important role in the epidemiology and virulence of cholera. The emergence of the Bengal strain, mentioned above, is an example.
- A. GTPase function
 - B. G proteins
 - C. Bacterium
 - D. Antigenic
 - E. None of the Above
76. The _____ of *V. cholerae* are shared with many water vibrios and therefore are of no use in distinguishing strains causing epidemic cholera.
- A. GTPase function
 - B. Antigenic
 - C. Flagellar antigens
 - D. None of the Above
77. O antigens, however, do distinguish strains of *V. cholerae* into 139 known _____.
- A. Serological strain
 - B. Nonvirulent
 - C. Serotypes
 - D. Phenotype
 - E. None of the above
78. Almost all of these strains of *V. cholerae* are _____.
- A. Serological strain
 - B. Nonvirulent
 - C. Serotypes
 - D. Phenotype
 - E. None of the above
79. Until the emergence of the Bengal strain (which is "non-O1") a single serotype, designated O1, has been responsible for epidemic cholera. However, there are three distinct O1 biotypes, named Ogawa, Inaba and Hikojima, and each biotype may display the "classical" or El Tor _____.
- A. Serological strain
 - B. Nonvirulent
 - C. Serotypes
 - D. Phenotype
 - E. None of the above

80. The Bengal strain is a new _____ with a unique O-antigen which partly explains the lack of residual immunity.

- A. Serological strain
- B. Nonvirulent
- C. Serotypes
- D. Phenotype
- E. None of the above

81. _____ is present in *Vibrio cholerae* as in other Gram-negative bacteria. Fewer details of the chemical structure of *Vibrio cholerae* LPS are known than in the case of *E. coli* and *Salmonella typhimurium*, but some unique properties have been described.

- A. Serological strain
- B. Nonvirulent
- C. Endotoxin
- D. Phenotype
- E. None of the above

82. Most importantly, variations in LPS occur in vivo and _____, which may be correlated with reversion in nature of nonepidemic strains to classic epidemic strains and vice versa.

- A. Toxin
- B. In vitro
- C. Adenylate cyclase enzyme
- D. Enterotoxins
- E. None of the above

83. Cholera toxin activates the _____ in cells of the intestinal mucosa leading to increased levels of intracellular cAMP, and the secretion of H_2O , Na^+ , K^+ , Cl^- , and HCO_3^- into the lumen of the small intestine.

- A. Toxin
- B. In vitro
- C. Adenylate cyclase enzyme
- D. Enterotoxins
- E. None of the above

84. The effect is dependent on a specific receptor, monosialosyl ganglioside (GM1 ganglioside) present on the surface of intestinal mucosal cells. The bacterium produces an invasin, neuraminidase, during the colonization stage which has the interesting property of degrading gangliosides to the monosialosyl form, which is the specific receptor for the _____.

- A. Toxin
- B. In vitro
- C. Adenylate cyclase enzyme
- D. Enterotoxins
- E. None of the above

85. *E. coli* produces a toxin, heat labile toxin (LT) that is very similar to the cholera toxin in structure and mode of action. The DNA that encodes the LT _____ is on a plasmid that can be transferred to other *E. coli* strains and probably to other enteric bacteria, as well.

- A. Toxin
- B. In vitro
- C. Adenylate cyclase enzyme
- D. Enterotoxins
- E. None of the above

86. Close relationships between the genetic code for LT _____ and the cholera toxin undoubtedly exist but have not been documented as yet.

- A. Toxin
- B. In vitro
- C. Adenylate cyclase enzyme
- D. Enterotoxins
- E. None of the above

87. The genetic information for the toxin in *V. cholerae* is located on the bacterial chromosome. Other bacterial _____ related to cholera toxin have been reported in non-group O *Vibrio* strains and a strain of *Salmonella*.

- A. Toxin
- B. In vitro
- C. Adenylate cyclase enzyme
- D. Enterotoxins
- E. None of the above

88. _____, toxins which act in the GI tract, are produced by a wide variety of bacteria. The family of heat-stable (ST) enterotoxins of *E. coli*, which activate guanylate cyclase, are unrelated to LT toxin or cholera toxin.

- A. Toxin
- B. In vitro
- C. Adenylate cyclase enzyme
- D. Enterotoxins
- E. None of the above

89. Other _____, which elicit cytotoxic effects on intestinal epithelial cells, have been described from *Escherichia*, *Klebsiella*, *Enterobacter*, *Citrobacter*, *Aeromonas*, *Pseudomonas*, *Shigella*, *V. parahaemolyticus*, *Campylobacter*, *Yersinia enterocolitica*, *Bacillus cereus*, *Clostridium perfringens*, *C. difficile*, and *Staphylococcus aureus*.

- A. Toxin
- B. In vitro
- C. Adenylate cyclase enzyme
- D. Enterotoxins
- E. None of the above

Legionella Chapter

90. The first discovery of bacteria from genus *Legionella* came in 1976 when an outbreak of _____ at an American Legion convention led to 29 deaths.

- A. Legionnaires' disease
- B. Pneumonia
- C. Pontiac fever
- D. *Legionella pneumophila*
- E. None of the above

91. The causative agent, what would come to be known as _____, was isolated and given its own genus.

- A. Legionnaires' disease
- B. Pneumonia
- C. Pontiac fever
- D. *Legionella pneumophila*
- E. None of the Above

92. The organisms classified in this genus are Gram-negative bacteria that are considered _____.

- A. Legionnaires' disease
- B. Pneumonia
- C. Pontiac fever
- D. Intracellular parasites
- E. None of the above

93. Legionnaires' disease, the more severe form of infection which includes pneumonia, and _____, a milder illness

- A. Legionnaires' disease
- B. Pneumonia
- C. Pontiac fever
- D. Legionella pneumophila
- E. None of the Above

94. The major source is water distribution systems of large buildings including hotels and hospitals. Cooling towers have long been thought to be a major source for _____, but new data suggest that this is an overemphasized mode of transmission.

- A. Legionnaires' disease
- B. Pneumonia
- C. Pontiac fever
- D. Legionella
- E. None of the above

95. Other sources include mist machines, humidifiers, whirlpool spas, and hot springs. Air conditioners are not a source for _____. They were suspected to be the source in the original American Legion outbreak in a Philadelphia hotel, but new data now suggests that the water in the hotel was the actual culprit.

- A. Legionnaires' disease
- B. Pneumonia
- C. Pontiac fever
- D. Legionella pneumophila
- E. None of the Above

96. Legionnaire's disease is caused most commonly by the inhalation of small droplets of water or fine _____ containing Legionella bacteria.

- A. Routine maintenance program
- B. Aspiration
- C. Aerosol
- D. Naturally found
- E. Multiply

97. Legionella bacteria are _____ in environmental water sources such as rivers, lakes and ponds and may colonise man-made water systems that include air conditioning systems, humidifiers, cooling tower waters, hot water systems, spas and pools.

- A. Routine maintenance program
- B. Aspiration
- C. Aerosol
- D. Naturally found
- E. None of the Above

98. _____ is the most common way that bacteria enter into the lungs to cause pneumonia. Aspiration means choking such that secretions in the mouth get past the choking reflexes and instead of going into the esophagus and stomach, mistakenly, enter the lung. The protective mechanisms to prevent aspiration is defective in patients who smoke or have lung disease.

- A. Routine maintenance program
- B. Aspiration
- C. Aerosol
- D. Naturally found
- E. None of the Above

99. Legionella may _____ to high numbers in cooling towers, evaporative condensers, air washers, humidifiers, hot water heaters, spas, fountains, and plumbing fixtures.

- A. Routine maintenance program
- B. Aspiration
- C. Aerosol
- D. Multiply
- E. None of the Above

100. Within one month, Legionella can _____, in warm water-containing systems, from less than 10 per milliliter to over 1,000 per milliliter of water.

- A. Routine maintenance program
- B. Aspiration
- C. Aerosol
- D. Multiply
- E. None of the Above

101. Once high numbers of Legionella have been found, a relatively simple procedure for disinfecting water systems with chlorine and detergent is available. This procedure is not part of a _____ because equipment may become corroded.

- A. Routine maintenance program
- B. Aspiration
- C. Aerosol
- D. Naturally found
- E. None of the Above

102. Currently, there are no United States government regulations concerning _____ numbers of legionella in water systems and there are no federal or state certification programs for laboratories that perform legionella testing of environmental samples.

- A. Serogroups
- B. Permissible
- C. Ultraviolet light
- D. Biocide
- E. None of the Above

103. The epifluorescence microscopy DFA method that most labs use was published in the British Journal, Water Research 19:839-848, 1985 "Disinfection of circulating water systems by _____ and halogenation", R. Gilpin, et al. so we can count viable-but-nonculturable (VBNC) legionella.

- A. Serogroups
- B. Permissible
- C. Ultraviolet light
- D. Biocide
- E. None of the Above

104. Most labs will provide a _____ microscopic analysis of your cooling tower and potable water samples for 14 serogroups of Legionella pneumophila and 15 other Legionella species.

- A. Serogroups
- B. Permissible
- C. Ultraviolet light
- D. Quantitative epifluorescence
- E. None of the Above

105. Heterotrophic bacterial CFU are often inversely proportional to numbers of Legionella in cooling tower samples, in our experience. Routine _____ treatments will not eradicate Legionella bacteria in the environment, only in laboratory studies.

- A. Serogroups
- B. Permissible
- C. Ultraviolet light
- D. Biocide
- E. None of the Above

106. Culture methods are good during outbreaks for biotyping; but culture methods lack sensitivity for routine, _____. Many factors will inhibit growth or identification of legionella on BCYE with or without antimicrobial agents, heat or acid treatment.

- A. Serogroups
- B. Permissible
- C. Ultraviolet light
- D. Quantitative monitoring
- E. None of the Above

107. Culture methods will not identify _____ legionella that can still cause outbreaks (non-culturable, viable legionella have been reported in several peer-reviewed journals). Only DFA tests performed by trained laboratory personnel can identify these legionella.

- A. Aerobic rods
- B. Non-culturable
- C. Ultraviolet light
- D. None of the Above

108. Direct _____ antibody (DFA) tests using a battery of monoclonal antibodies provide more useful routine monitoring information than culture methods.

- A. Aerobic rods
- B. Non-culturable
- C. Ultraviolet light
- D. Fluorescent
- E. None of the Above

109. Legionella species of bacteria cause Legionnaire's disease. They are gram negative (but stain poorly), strictly _____.

- A. Aerobic rods
- B. Non-culturable
- C. Ultraviolet light
- D. Fluorescent
- E. None of the Above

110. Legionnaires' disease is caused by bacteria that belong to the family _____.

- A. Coccobacilli
- B. Legionella genus
- C. Legionellaceae
- D. Serogroups
- E. None of the Above

111. This family now includes 48 species and over 70 _____. Approximately half of these species have been implicated in human disease.

- A. Coccobacilli
- B. Legionella genus
- C. Legionellaceae
- D. Serogroups
- E. None of the Above

112. _____ is responsible for approximately 90% of infections.

- A. Coccobacilli
- B. Legionella genus
- C. Legionellaceae
- D. Legionella pneumophila
- E. None of the Above

113. Most cases are caused by *L. pneumophila*, _____. 1. Legionella species are small (0.3 to 0.9 μm in width and approximately 2 μm in length) faintly staining Gram-negative rods with polar flagella (except *L. oakridgensis*).

- A. Coccobacilli
- B. Legionella genus
- C. Legionellaceae
- D. Serogroup
- E. None of the Above

114. They generally appear as small _____ in infected tissue or secretions. They are distinguished from other saccharolytic bacteria by their requirement for L-cysteine and iron salts for primary isolation on solid media and by their unique cellular fatty acids and ubiquinones.

- A. Coccobacilli
- B. Legionella genus
- C. Legionellaceae
- D. Serogroups
- E. None of the Above

Escherichia Coli Chapter

115. Two types of pathogenic _____, enteropathogenic *E. coli* (EPEC) and enterohemorrhagic *E. coli* (EHEC), cause diarrheal disease by disrupting the intestinal environment through the intimate attachment of the bacteria to the intestinal epithelium.

- A. Enterohemorrhagic
- B. Escherichia coli
- C. *E. coli* O157:H7
- D. Bacterium
- E. None of the Above

116. _____ (bacterium) found in human feces. Symptoms vary with type caused gastroenteritis.

- A. Enterohemorrhagic
- B. Escherichia coli
- C. E. coli O157:H7
- D. Bacterium
- E. None of the above

117. _____ O157:H7 is an emerging cause of foodborne illness. An estimated 73,000 cases of infection and 61 deaths occur in the United States each year. Infection often leads to bloody diarrhea, and occasionally to kidney failure.

- A. Enterohemorrhagic
- B. Escherichia coli
- C. E. coli O157:H7
- D. None of the Above

118. _____ is one of hundreds of strains of the bacterium Escherichia coli. Although most strains are harmless and live in the intestines of healthy humans and animals, this strain produces a powerful toxin and can cause severe illness.

- A. Enterohemorrhagic
- B. Escherichia coli
- C. E. coli O157:H7
- D. Bacterium
- E. None of the above

119. _____ was first recognized as a cause of illness in 1982 during an outbreak of severe bloody diarrhea; the outbreak was traced to contaminated hamburgers. Since then, most infections have come from eating undercooked ground beef.

- A. Enterohemorrhagic
- B. Escherichia coli
- C. E. coli O157:H7
- D. Bacterium
- E. None of the above

120. The combination of letters and numbers in the name of the _____ refers to the specific markers found on its surface and distinguishes it from other types of E. coli.

- A. Enterohemorrhagic
- B. Escherichia coli
- C. E. coli O157:H7
- D. Bacterium
- E. None of the above

121. Currently, there are four recognized classes of enterovirulent E. coli (collectively referred to as the EEC group) that cause gastroenteritis in humans. Among these is the _____ (EHEC) strain designated E. coli O157:H7.

- A. Enterohemorrhagic
- B. Escherichia coli
- C. E. coli O157:H7
- D. Bacterium
- E. None of the Above

122. E. coli is a normal inhabitant of the intestines of all animals, including humans. When _____ are used, E. coli is the dominant species found in feces.

- A. Enterohemorrhagic
- B. Escherichia coli
- C. E. coli O157:H7
- D. Bacterium
- E. None of the above

123. Normally E. coli serves a useful function in the body by suppressing the growth of harmful bacterial species and by synthesizing appreciable amounts of _____.

- A. Safe Drinking Water Act
- B. Vitamins
- C. Shigella dysenteriae
- D. Fecal coliforms
- E. None of the Above

124. A minority of E. coli strains are capable of causing human illness by several different mechanisms. E. coli serotype O157:H7 is a rare variety of E. coli that produces large quantities of one or more related, potent toxins that cause severe damage to the lining of the intestine. These toxins [verotoxin (VT), shiga-like toxin] are closely related or identical to the toxin produced by _____.

- A. Safe Drinking Water Act
- B. Vitamins
- C. Shigella dysenteriae
- D. Fecal coliforms
- E. None of the Above

125. _____ are bacteria that are associated with human or animal wastes. They usually live in human or animal intestinal tracts, and their presence in drinking water is a strong indication of recent sewage or animal waste contamination.

- A. Safe Drinking Water Act
- B. Vitamins
- C. Shigella dysenteriae
- D. Fecal coliforms
- E. None of the Above

126. The water can be treated using _____, ultra-violet light, or ozone, all of which act to kill or inactivate E. coli. Systems using surface water sources are required to disinfect to ensure that all bacterial contamination is inactivated, such as E. coli. Systems using ground water sources are not required to disinfect, although many of them do.

- A. Safe Drinking Water Act
- B. Vitamins
- C. Shigella dysenteriae
- D. Chlorine
- E. None of the Above

127. According to EPA regulations, a system that operates at least 60 days per year, and serves 25 people or more or has 15 or more service connections, is regulated as a public water system under the _____.

- A. Safe Drinking Water Act
- B. Vitamins
- C. Shigella dysenteriae
- D. Fecal coliforms
- E. None of the Above

128. If a system is not a public water system as defined by EPA's regulations, it is not regulated under the _____, although it may be regulated by state or local authorities.

- A. Safe Drinking Water Act
- B. Vitamins
- C. *Shigella dysenteriae*
- D. Fecal coliforms
- E. None of the Above

129. Under the _____, EPA requires public water systems to monitor for coliform bacteria. Systems analyze first for total coliform, because this test is faster to produce results. Any time that a sample is positive for total coliform, the same sample must be analyzed for either fecal coliform or *E. coli*. Both are indicators of contamination with animal waste or human sewage.

- A. Safe Drinking Water Act
- B. Vitamins
- C. *Shigella dysenteriae*
- D. Fecal coliforms
- E. None of the Above

130. The largest public water systems (serving millions of people) must take at least 50 samples per month. Smaller systems must take at least 20 samples a month unless the state has conducted a sanitary survey – a survey in which a state inspector examines system components and ensures they will protect public health – at the system within the last year.

- A. True
- B. False

131. Systems serving 25 to 1,000 people typically take one sample per month. Some states reduce this frequency to quarterly for ground water systems if a recent sanitary survey shows that the system is free of sanitary defects. Some types of systems can qualify for annual monitoring. Systems using surface water, rather than ground water, are required to take extra steps to protect against bacterial contamination because surface water sources are more vulnerable to such contamination. At a minimum, all systems using surface waters must disinfect.

- A. True
- B. False

132. Disinfection will kill *E. coli* O157:H7.

- A. True
- B. False

Related Diseases and Associated Illnesses Chapter

Amebiasis Section *Entamoeba histolytica*

133. The life cycle of *Entamoeba histolytica* involves trophozoites (the feeding stage of the parasite) that live in the host's large intestine and _____ that are passed in the host's feces.

- A. Cysts
- B. Trophozoites
- C. Protozoan parasite
- D. Nuclei
- E. None of the Above

134. Humans are infected by ingesting _____, most often via food or water contaminated with human fecal material (view diagram of the life cycle).
- A. Cysts
 - B. Trophozoites
 - C. Protozoan parasite
 - D. Nuclei
 - E. None of the Above
135. The _____ can destroy the tissues that line the host's large intestine, so of the amoebae infecting the human gastrointestinal tract, *E. histolytica* is potentially the most pathogenic.
- A. Cyst
 - B. Trophozoites
 - C. Protozoan parasite
 - D. Nuclei
 - E. None of the Above
136. *Entamoeba histolytica* is an amoeboid _____ of the intestinal tract and in some cases other visceral organs especially the liver.
- A. Cyst
 - B. Trophozoites
 - C. Protozoan parasite
 - D. None of the Above
137. There are several species in this genus, distinguished by their number of _____ in the cyst and position of the endosome, whether or not they form a cyst, and whether they invade tissues or remain in the intestinal lumen.
- A. Cyst
 - B. Trophozoites
 - C. Protozoan parasite
 - D. Nuclei
 - E. None of the Above
138. *Entamoeba histolytica* has four nuclei in the cyst, a central endosome, forms a cyst, and can be a tissue invader. The amoeboid trophozoites can live in the intestinal _____, feeding on intestinal contents and host tissue, and multiplying by fission.
- A. Crypts
 - B. Trophozoites
 - C. Protozoan parasite
 - D. Nuclei
 - E. None of the Above
139. Within the _____ there are two nuclear divisions resulting in 2 nuclei in the immature cyst and 4 nuclei within the mature cyst. The cyst can resist desiccation for 1-2 weeks.
- A. Cyst
 - B. Trophozoites
 - C. Protozoan parasite
 - D. Nuclei
 - E. None of the Above
140. When the cyst is ingested by another host the parasite excysts in the intestine and undergoes cytoplasmic division to produce 4 _____.
- A. Cyst
 - B. Trophozoites
 - C. Protozoan parasite
 - D. None of the Above

141. In some cases the _____ secrete proteolytic enzymes which destroy the intestinal epithelium allowing the trophozoite to enter the host tissue.

- A. Cyst
- B. Trophozoites
- C. Protozoan parasite
- D. Nuclei
- E. None of the Above

142. These can form large abscesses that may allow the parasite to enter the blood stream and be carried to the liver and other organs. In these extra-intestinal sites the _____ also can cause extensive tissue destruction. If the intestinal tissue has been invaded the feces can be bloody and diarrheic.

- A. Cyst
- B. Trophozoites
- C. Protozoan parasite
- D. Nuclei
- E. None of the Above

143. _____ in diarrheic feces are not stimulated to encyst because the feces are not dehydrating. If they are not encysted they cannot long survive in the external environment. Secondary bacterial infection can complicate an already severe pathology.

- A. Cyst
- B. Trophozoites
- C. Protozoan parasite
- D. Nuclei
- E. None of the Above

144. Accurate diagnosis of this parasite is important to prevent unnecessary treatment of a non-pathogenic strain, and to ensure treating a pathogenic strain. Definitive diagnosis is based on morphological characteristics of the trophozoites and cysts, the presence of _____ in the trophozoites, and clinical symptoms.

- A. Cyst
- B. Trophozoites
- C. Protozoan parasite
- D. Erythrocytes
- E. None of the Above

145. In most infected humans the symptoms of "amoebiasis" (or "amebiasis") are intermittent and mild (various gastrointestinal upsets, including colitis and diarrhea). In more severe cases the gastrointestinal tract hemorrhages, resulting in dysentery.

- A. True
- B. False

146. In some cases the trophozoites will enter the circulatory system and infect other organs, most often the liver (hepatic amoebiasis), or they may penetrate the gastrointestinal tract resulting in acute peritonitis; such cases are often fatal. As with most of the amoebae, infections of *E. histolytica* are often diagnosed by demonstrating cysts or trophozoites in a stool sample.

- A. True
- B. False

Amebic Meningoencephalitis PAM Section *Naegleria fowleri*

147. Primary Amebic Meningoencephalitis (PAM) is a common and usually deadly disease caused by infection with the amoeba (a multi-celled organism that maintains the original shape).

- A. True
- B. False

148. Following an incubation period of 2-15 days, there is a relatively sudden start of severe meningitis-like symptoms, which begin with fever and headache. These are rapidly followed by sensitivity to light, nausea, projectile vomiting, stiff neck, and, in many cases, disturbances to taste and smell. Changes in behavior and seizures may also be present. As conditions worsen the patient falls into a coma. Death usually occurs 3-7 days after the onset of symptoms.

- A. True
- B. False

149. The ameba that causes the infection lives in soil and in freshwater ponds, lakes, rivers, poorly or non-chlorinated pools, discharge or holding basins, and hot springs throughout the world. Naegleria thrives in warm, stagnant bodies of fresh water when temperatures are high, usually above 80 degrees.

- A. True
- B. False

150. Although the ameba is commonly found in the environment, PAM is very rare. In the last 30 years, only a few hundred cases have been reported worldwide.

- A. True
- B. False

151. The ameba is believed to enter the body through the mouth and travel to the stomach. The disease is easily spread from person to person.

- A. True
- B. False

152. The disease is initially suspected based on patient history. The diagnosis is made through the examination of the fluid in the digestive tract or frequently before death through the examination of digestive lining.

- A. True
- B. False

153. PAM is a mild illness that responds to routine treatments. Aggressive use of some antifungal medications have always been successful. Intensive supportive care is rarely necessary along with the medication.

- A. True
- B. False

Schistosomes and Other Trematodes Section

154. Schistosomiasis, also called snail fever or bilharziasis, is thought to cause more illness and disability than any other parasitic disease, except _____.

- A. Cercariae
- B. Hermaphrodites
- C. Malaria
- D. Schistosomiasis
- E. None of the Above

155. Almost unknown in industrialized countries, _____ infects 200 million people in 76 countries of the tropical developing world.

- A. Cercariae
- B. Hermaphrodites
- C. Malaria
- D. Schistosomiasis
- E. None of the Above

156. A Flatworm that spends part of its life in a freshwater snail host causes _____ . Multiplying in the snail, a microscopic infective larval stage is released that can penetrate human skin painlessly in 30 to 60 seconds. The larvae grow to adulthood and migrate to the veins around the intestines or bladder, where mating occurs. The eggs produced may lodge in these tissues and cause disease, or they are passed out in urine or feces, where they reach fresh water and hatch to infect snails.

- A. Cercariae
- B. Hermaphrodites
- C. Malaria
- D. Schistosomiasis
- E. None of the Above

157. Free-swimming larvae (_____) are given off by infected snails. These either penetrate the skin of the human definitive host (schistosomes) or are ingested after encysting as metacercariae in or on various edible plants or animals (all other trematodes).

- A. Cercariae
- B. Hermaphrodites
- C. Malaria
- D. Schistosomiasis
- E. None of the Above

158. After entering a human the larvae develop into adult males and females (schistosomes) or _____ (other flukes), which produce eggs that pass out of the host in excreta. These eggs hatch in fresh water into miracidia which infect snails.

- A. Cercariae
- B. Hermaphrodites
- C. Malaria
- D. Schistosomiasis
- E. None of the Above

159. In _____ , eggs trapped in the tissues produce granulomatous inflammatory reactions, fibrosis, and obstruction. The hermaphroditic flukes of the liver, lungs, and intestines induce inflammatory and toxic reactions.

- A. Cercariae
- B. Hermaphrodites
- C. Malaria
- D. Schistosomiasis
- E. None of the Above

160. Host defenses against schistosomiasis include antibody or complement-dependent _____ and modulation of granulomatous hypersensitivity. The defenses against hermaphroditic flukes are unknown.

- A. Cellular cytotoxicity
- B. Hermaphrodites
- C. Malaria
- D. Schistosomiasis
- E. None of the Above

161. Most infected individuals show no overt disease. In a relatively small proportion of individuals, heavy infections due to repeated exposure to parasitic larvae will lead to the development of _____ .

- A. Cercariae
- B. Hermaphrodites
- C. Malaria
- D. Schistosomiasis
- E. None of the above

162. The distribution of flukes is limited by the distribution of their snail intermediate host. Larvae from snails infect a human by penetrating the skin (schistosomes) or by being eaten (encysted larvae of other _____).

- A. Cercariae
- B. Hermaphrodites
- C. Malaria
- D. Trematodes
- E. None of the Above

163. _____ is suggested by clinical manifestations, geographic history, and exposure to infective larvae. The diagnosis is confirmed by the presence of parasite eggs in excreta.

- A. Cercariae
- B. Hermaphrodites
- C. Malaria
- D. Schistosomiasis
- E. None of the above

164. Signs and symptoms are related largely to the location of the adult worms. Infections with *Schistosoma mansoni* and *S japonicum* (mesenteric venules) result in eosinophilia, hepatomegaly, splenomegaly, and hematemesis. *Schistosoma haematobium* (vesical venules) causes dysuria, hematuria, and uremia. *Fasciola hepatica*, *Clonorchis sinensis*, and *Opisthorchis viverrini* (bile ducts) cause fever, hepatomegaly, abdominal pain, and jaundice. Infections with *Paragonimus westermani* (lungs, brain) result in cough, hemoptysis, chest pain, and epilepsy. *Fasciolopsis buski* (intestines) causes abdominal pain, diarrhea, and edema.

- A. True
- B. False

165. Trematodes are single cellular eukaryotic helminths.

- A. True
- B. False

Gastroenteritis Section

166. _____ means inflammation of the stomach and small and large intestines.

- A. Contagious
- B. Gastroenteritis
- C. Virus(es)
- D. Caliciviruses
- E. None of the above

167. Viral gastroenteritis is an infection caused by a variety of _____ that results in vomiting or diarrhea. It is often called the "stomach flu," although it is not caused by the influenza viruses.

- A. Contagious
- B. Gastroenteritis
- C. Virus(es)
- D. Caliciviruses
- E. None of the above

168. Many different viruses can cause gastroenteritis, including rotaviruses, adenoviruses, _____, astroviruses, Norwalk virus, and a group of Noroviruses. Viral gastroenteritis is not caused by bacteria (such as Salmonella or Escherichia coli) or parasites (such as Giardia), or by medications or other medical conditions, although the symptoms may be similar.

- A. Contagious
- B. Gastroenteritis
- C. Virus(es)
- D. Caliciviruses
- E. None of the above

169. The main symptoms of viral _____ are watery diarrhea and vomiting.

- A. Contagious
- B. Gastroenteritis
- C. Virus(es)
- D. Caliciviruses
- E. None of the above

170. The affected person may also have headache, fever, and abdominal cramps ("stomach ache"). In general, the symptoms begin 1 to 2 days following infection with a virus that causes gastroenteritis and may last for 1 to 10 days, depending on which _____ causes the illness.

- A. Contagious
- B. Gastroenteritis
- C. Virus(es)
- D. Caliciviruses
- E. None of the above

171. Viral gastroenteritis is _____. The viruses that cause gastroenteritis are spread through close contact with infected persons (for example, by sharing food, water, or eating utensils). Individuals may also become infected by eating or drinking contaminated foods or beverages.

- A. Contagious
- B. Gastroenteritis
- C. Virus(es)
- D. Caliciviruses
- E. None of the above

Rotovirus Information Section

172. The incubation period for _____ disease is approximately 2 days. The disease is characterized by vomiting and watery diarrhea for 3 - 8 days, and fever and abdominal pain occur frequently. Immunity after infection is incomplete, but repeat infections tend to be less severe than the original infection.

- A. Rotavirus
- B. Antigen
- C. Genome
- D. Gastroenteritis
- E. None of the above

173. A _____ has a characteristic wheel-like appearance when viewed by electron microscopy (the name rotavirus is derived from the Latin rota, meaning "wheel").

- A. Rotavirus
- B. Antigen
- C. Genome
- D. Gastroenteritis
- E. None of the above

174. Rotaviruses are nonenveloped, double-shelled viruses. The _____ is composed of 11 segments of double-stranded RNA, which code for six structural and five nonstructural proteins. The virus is stable in the environment.

- A. Rotavirus
- B. Antigen
- C. Genome
- D. Gastroenteritis
- E. None of the above

175. The primary mode of transmission is fecal-oral, although some have reported low titers of virus in respiratory tract secretions and other body fluids. Because the virus is stable in the _____, transmission can occur through ingestion of contaminated water or food and contact with contaminated surfaces.

- A. Rotavirus
- B. Antigen
- C. Genome
- D. Gastroenteritis
- E. None of the above

176. Diagnosis may be made by rapid antigen detection of rotavirus in stool specimens. Strains may be further characterized by _____ or reverse transcriptase polymerase chain reaction, but such testing is not commonly done.

- A. Rotavirus
- B. Antigen
- C. Genome
- D. Gastroenteritis
- E. None of the above

177. For persons with healthy immune systems, rotavirus _____ is a self-limited illness, lasting for only a few days. Treatment is nonspecific and consists of oral rehydration therapy to prevent dehydration. About one in 40 children with rotavirus gastroenteritis will require hospitalization for intravenous fluids.

- A. Rotavirus
- B. Antigen
- C. Genome
- D. Gastroenteritis
- E. None of the above

Noroviruses Section

178. Noroviruses (genus *Norovirus*, family *Caliciviridae*) are a group of related, single-stranded RNA, nonenveloped viruses that cause acute gastroenteritis in humans. Norovirus was recently approved as the official genus name for the group of viruses provisionally described as "Norwalk-like viruses" (NLV).

- A. True
- B. False

179. The symptoms of norovirus illness usually include nausea, vomiting, diarrhea, and some stomach cramping. Sometimes people additionally have a low-grade fever, chills, headache, muscle aches, and a general sense of tiredness. The illness often begins suddenly, and the infected person may feel very sick. The illness is usually brief, with symptoms lasting only about 1 or 2 days. In general, children experience more vomiting than adults. Most people with norovirus illness have both of these symptoms.

- A. True
- B. False

180. Illness caused by norovirus infection has several names, including stomach flu – this “stomach flu” is **not** related to the flu (or influenza), which is a respiratory illness caused by influenza virus.

- A. True
- B. False

181. Noroviruses are found in the stool or vomit of infected people. People can become infected with the virus in several ways, including eating food or drinking liquids that are contaminated with norovirus; touching surfaces or objects contaminated with norovirus, and then placing their hand in their mouth; having direct contact with another person who is infected and showing symptoms (for example, when caring for someone with illness, or sharing foods or eating utensils with someone who is ill).

- A. True
- B. False

182. Persons working in day-care centers or nursing homes should pay special attention to children or residents who have norovirus illness. This virus is very contagious and can spread rapidly throughout such environments.

- A. True
- B. False

183. Persons who are infected with norovirus should not prepare food while they have symptoms and for 3 weeks after they recover from their illness. Food that may have been contaminated by an ill person can be eaten.

- A. True
- B. False

Hepatitis Section

184. Hepatitis A is a liver disease caused by the hepatitis A virus (HAV). Hepatitis A can affect anyone. In the United States, hepatitis A can occur in situations ranging from isolated cases of disease to widespread _____.

- A. Epidemics
- B. Preventable
- C. Acute liver failure
- D. Communicable
- E. None of the above

185. Each year, an estimated 100 persons die as a result of _____ in the United States due to Hepatitis A. Approximately 30 - 50,000 cases occur yearly in the United States and the direct and indirect costs of these cases exceed \$300 million.

- A. Epidemics
- B. Preventable
- C. Acute liver failure
- D. Communicable
- E. None of the above

186. The unfortunate aspect of these statistics is that with 21st century medicine, Hepatitis A is totally _____, and isolated cases, and especially outbreaks relegated to food consumption, need not occur.

- A. Epidemics
- B. Preventable
- C. Acute liver failure
- D. Communicable
- E. None of the above

187. Viral Hepatitis is a major public health concern in the United States, and a source of significant morbidity and mortality. The Hepatitis A virus or "HAV" is heat stable and will survive for up to a month at _____ in the environment.

- A. Epidemics
- B. Preventable
- C. Acute liver failure
- D. Communicable
- E. None of the above

188. Hepatitis A is a _____ (or contagious) disease that spreads from person to person. (It is not acquired from animals, insects, or other means.) It is transmitted by the "fecal – oral route." This does not mean, of course, that Hepatitis A transmission requires that fecal material from an infectious individual must come in contact directly with the mouth of a susceptible individual. It is almost always true that the virus infects a susceptible individual when he or she ingests it, but it gets to the mouth by an indirect route.

- A. Epidemics
- B. Preventable
- C. Acute liver failure
- D. Communicable
- E. None of the above

189. Hepatitis A is found in every part of the United States and throughout the world. When water sources such as private wells are contaminated with feces from infected humans, the water will spread the hepatitis A virus. The _____ can enter the water through various ways, including sewage overflows or broken sewage systems.

- A. Epidemics
- B. Preventable
- C. Acute liver failure
- D. Communicable
- E. None of the above

190. Hepatitis ____ is a liver disease caused by the hepatitis ____ virus, a defective virus that needs the hepatitis B virus to exist. Hepatitis ____ virus is found in the blood of persons infected with the virus.

- A. Hepatitis A
- B. Hepatitis B
- C. Hepatitis C
- D. Hepatitis D
- E. None of the Above

191. Hepatitis ____ is a liver disease caused by the hepatitis ____ virus transmitted in much the same way as hepatitis A virus. Hepatitis ____, however, does not occur often in the United States.

- A. Hepatitis A
- B. Hepatitis B
- C. Hepatitis C
- D. Hepatitis E
- E. None of the Above

192. Hepatitis ____ is a serious disease caused by a virus that attacks the liver. The virus, which is called hepatitis ____ virus, can cause lifelong infection, cirrhosis (scarring) of the liver, liver cancer, liver failure, and death.

- A. Hepatitis A
- B. Hepatitis B
- C. Hepatitis C
- D. None of the Above

193. Hepatitis ____ is a liver disease caused by the hepatitis ____ virus, which is found in the blood of persons who have the disease. ____ is spread by contact with the blood of an infected person.

- A. Hepatitis A
- B. Hepatitis B
- C. Hepatitis C
- D. Hepatitis D
- E. None of the Above

History

194. The first experimental transmission of a viral infection was accomplished in about 1880 by the German scientist _____, when he demonstrated that extracts from infected tobacco leaves could transfer tobacco mosaic disease to a new plant, causing spots on the leaves.

- A. Louis Pasteur
- B. Martinus Beijerinck
- C. Dimitri Ivanofsky
- D. Adolf Mayer
- E. None of the Above

195. Because _____ was unable to isolate a bacterium or fungus from the tobacco leaf extracts, he considered the idea that tobacco mosaic disease might be caused by a soluble agent, but he concluded incorrectly that a new type of bacteria was likely to be the cause.

- A. Louis Pasteur
- B. Martinus Beijerinck
- C. Dimitri Ivanofsky
- D. Adolf Mayer
- E. None of the Above

196. The Russian scientist _____ extended Mayer's observation and reported in 1892 that the tobacco mosaic agent was small enough to pass through a porcelain filter known to block the passage of bacteria.

- A. Louis Pasteur
- B. Martinus Beijerinck
- C. Dimitri Ivanofsky
- D. Adolf Mayer
- E. None of the Above

197. In 1917 the French-Canadian scientist _____ discovered that viruses of bacteria, which he named bacteriophage, could make holes in a culture of bacteria.

- A. Louis Pasteur
- B. Robert Koch
- C. Félix H. d'Hérelle
- D. Wendell Meredith Stanley
- E. None of the Above

198. In 1935 the American biochemist _____ crystallized tobacco mosaic virus to demonstrate that viruses had regular shapes, and in 1939 tobacco mosaic virus was first visualized using the electron microscope.

- A. Louis Pasteur
- B. Robert Koch
- C. Félix H. d'Hérelle
- D. Wendell Meredith Stanley
- E. None of the Above

199. In 1898 the German bacteriologists Friedrich August Johannes Löffler and Paul F. Frosch (both trained by _____) described foot-and-mouth disease virus as the first filterable agent of animals.

- A. Louis Pasteur
- B. Robert Koch
- C. Félix H. d'Hérelle
- D. Wendell Meredith Stanley
- E. None of the Above

200. In 1900, the American bacteriologist _____ and colleagues recognized yellow fever virus as the first human filterable agent.

- A. Louis Pasteur
- B. Robert Koch
- C. Félix H. d'Hérelle
- D. Walter Reed
- E. None of the Above

201. For several decades viruses were referred to as filterable agents, and gradually the term virus (Latin for "_____" or "poison") was employed strictly for this new class of infectious agents.

- A. Slimy liquid
- B. Bacteriophages
- C. Cell culture systems
- D. Microorganism
- E. None of the Above

202. Through the 1940s and 1950s many critical discoveries were made about viruses through the study of _____ because of the ease with which the bacteria they infect could be grown in the laboratory.

- A. Slimy liquid
- B. Bacteriophages
- C. Cell culture systems
- D. Microorganism
- E. None of the Above

203. Between 1948 and 1955, scientists at the National Institutes of Health (NIH) and at Johns Hopkins Medical Institutions revolutionized the study of animal viruses by developing _____ that permitted the growth and study of many animal viruses in laboratory dishes.

- A. Slimy liquid
- B. Bacteriophages
- C. Cell culture systems
- D. None of the Above

204. Louis Pasteur along with _____ developed the germ theory of disease which states that "a specific disease is caused by a specific type of microorganism."

- A. Robert Koch
- B. Matthias Schleiden
- C. Rudolph Virchow
- D. Theodore Schwann
- E. None of the Above

205. In 1876, _____ established an experimental procedure to prove the germ theory of disease. This scientific procedure is known as Koch's postulates.

- A. Robert Koch
- B. Matthias Schleiden
- C. Rudolph Virchow
- D. Theodore Schwann
- E. None of the Above

206. _____ postulates not only proved the germ theory but also gave a tremendous boost to the development of microbiology by stressing a laboratory culture and identification of microorganisms.

- A. Robert Koch
- B. Matthias Schleiden
- C. Rudolph Virchow
- D. Theodore Schwann
- E. None of the Above

207. _____ observed small empty chambers in the structure of cork with the help of his crude microscope. He called them cells.

- A. Robert Koch
- B. Matthias Schleiden
- C. Rudolph Virchow
- D. Robert Hooke
- E. None of the Above

208. Two German biologists _____ and Theodore Schwann proposed the 'Cell theory' in 1838. According to this theory, all living things are composed of cells.

- A. Robert Koch
- B. Matthias Schleiden
- C. Rudolph Virchow
- D. Theodore Schwann
- E. None of the Above

209. Bacteria are prokaryotes (Kingdom Monera), which means that they have a large nucleus.

- A. True
- B. False

210. Bacteria do have one chromosome of single-stranded DNA in a ring. They reproduce by binary fission.

- A. True
- B. False

Leptospirosis Section Leptospira

211. _____ is a bacterial disease that affects humans and animals. It is caused by bacteria of the genus *Leptospira*. In humans it causes a wide range of symptoms, and some infected persons may have no symptoms at all.

- A. Serum antibodies
- B. Zoonosis
- C. Leptospirosis
- D. Tetracycline
- E. None of the Above

212. Symptoms of leptospirosis include high fever, severe headache, chills, muscle aches, and vomiting, and may include jaundice (yellow skin and eyes), red eyes, abdominal pain, diarrhea, or a rash. If the disease is not treated, the patient could develop kidney damage, meningitis (inflammation of the membrane around the brain and spinal cord), liver failure, and respiratory distress. In rare cases death occurs. *Leptospira interrogans* causes leptospirosis, a usually mild _____ that may result in liver or kidney failure.

- A. Serum antibodies
- B. Zoonosis
- C. Leptospirosis
- D. Tetracycline
- E. None of the above

213. *Leptospira* is a flexible, spiral-shaped, _____ with internal flagella. *Leptospira interrogans* has many serovars based on cell surface antigens.

- A. Serum antibodies
- B. Zoonosis
- C. Leptospirosis
- D. Tetracycline
- E. None of the above

214. Outbreaks of _____ are usually caused by exposure to water contaminated with the urine of infected animals. Many different kinds of animals carry the bacterium; they may become sick but sometimes have no symptoms.

- A. Serum antibodies
- B. Zoonosis
- C. Leptospirosis
- D. Tetracycline
- E. None of the above

215. *Leptospira* organisms have been found in cattle, pigs, horses, dogs, rodents, and wild animals. Humans become infected through contact with water, food, or soil containing urine from these infected animals. This may happen by swallowing contaminated food or water or through skin contact, especially with mucosal surfaces, such as the eyes or nose, or with _____. The disease is not known to be spread from person to person.

- A. Serum antibodies
- B. Zoonosis
- C. Leptospirosis
- D. Tetracycline
- E. None of the above

***Pseudomonas aeruginosa* Section**

216. *Pseudomonas aeruginosa* is the _____ of an opportunistic pathogen of humans.

- A. Gram-negative bacterium
- B. Cystic fibrosis
- C. Epitome
- D. Uncompromised
- E. None of the Above

217. The bacterium almost never infects _____ tissues, yet there is hardly any tissue that it cannot infect if the tissue defenses are compromised in some manner.

- A. Gram-negative bacterium
- B. Cystic fibrosis
- C. Epitome
- D. Uncompromised
- E. None of the Above

218. *Pseudomonas aeruginosa* is an opportunistic pathogen, meaning that it exploits some break in the host defenses to initiate an infection. It causes urinary tract infections, respiratory system infections, dermatitis, soft tissue infections, bacteremia, bone and joint infections, _____ and a variety of systemic infections, particularly in patients with severe burns and in cancer and AIDS patients who are immunosuppressed.

- A. Gram-negative bacterium
- B. Cystic fibrosis
- C. Epitome
- D. Gastrointestinal infections
- E. None of the Above

219. *Pseudomonas aeruginosa* infection is a serious problem in patients hospitalized with cancer, _____, and burns. The case fatality rate in these patients is 50 percent.

- A. Gram-negative bacterium
- B. Cystic fibrosis
- C. Epitome
- D. Uncompromised
- E. None of the Above

220. *Pseudomonas aeruginosa* is primarily a _____. According to the CDC, the overall incidence of *P. aeruginosa* infections in US hospitals averages about 0.4 percent (4 per 1000 discharges), and the bacterium is the fourth most commonly-isolated nosocomial pathogen accounting for 10.1 percent of all hospital-acquired infections.

- A. Gram-negative bacterium
- B. Cystic fibrosis
- C. Nosocomial pathogen
- D. Uncompromised
- E. None of the Above

221. *Pseudomonas aeruginosa* is a _____ that is noted for its environmental versatility, ability to cause disease in particular susceptible individuals, and its resistance to antibiotics.

- A. Gram-negative bacterium
- B. Cystic fibrosis
- C. Epitome
- D. Uncompromised
- E. None of the Above

222. The most serious complication of _____ is respiratory tract infection by the ubiquitous bacterium *Pseudomonas aeruginosa*.

- A. Gram-negative bacterium
- B. Cystic fibrosis
- C. Epitome
- D. Gastrointestinal infections
- E. None of the Above

223. Cancer and burn patients also commonly suffer serious infections by this organism, as do certain other individuals with _____.

- A. Genome sequence
- B. Metabolic capability
- C. Permanently disrupt
- D. Colonize ecological niches
- E. None of the above

224. Unlike many environmental bacteria, *P. aeruginosa* has a remarkable capacity to cause disease in susceptible hosts. It has the ability to adapt to and thrive in many _____, from water and soil to plant and animal tissues.

- A. Genome sequence
- B. Metabolic capability
- C. Permanently disrupt
- D. Ecological niches
- E. None of the Above

225. The bacterium is capable of utilizing a wide range of organic compounds as food sources, thus giving it an exceptional ability to _____ where nutrients are limited.

- A. Genome sequence
- B. Metabolic capability
- C. Permanently disrupt
- D. Colonize ecological niches
- E. None of the above

226. *P. aeruginosa* can produce a number of toxic proteins which not only cause extensive tissue damage, but also interfere with the human immune system's defense mechanisms. These proteins range from potent toxins that enter and kill host cells at or near the site of colonization to degradative enzymes that _____ the cell membranes and connective tissues in various organs.

- A. Genome sequence
- B. Metabolic capability
- C. Permanently disrupt
- D. Colonize ecological niches
- E. None of the above

227. This bacterium is also noted for _____ to many antibiotics.

- A. Genome sequence
- B. Metabolic capability
- C. Permanently disrupt
- D. Its resistance
- E. None of the Above

228. *P. aeruginosa* is widely studied by scientists who are interested in not only its ability to cause disease and resist antibiotics, but also its _____ and environmental versatility.

- A. Genome sequence
- B. Metabolic capability
- C. Permanently disrupt
- D. Colonize ecological niches
- E. None of the above

229. Analysis of its genome sequence has identified genes involved in locomotion, attachment, transport and utilization of nutrients, antibiotic efflux, _____ and systems involved in sensing and responding to environmental changes.

- A. Genome sequence
- B. Metabolic capability
- C. Permanently disrupt
- D. Colonize ecological niches
- E. None of the Above

230. The typical *Pseudomonas* bacterium in nature might be found in a biofilm, attached to some surface or substrate, or in a planktonic form, as a unicellular organism, actively swimming by means of its _____.

- A. *Pseudomonas aeruginosa*
- B. Antibiotic efflux
- C. Flagellum
- D. Pseudomonads
- E. None of the Above

231. *Pseudomonas* is one of the most vigorous, _____ seen in hay infusions and pond water samples.

- A. *Pseudomonas aeruginosa*
- B. Antibiotic efflux
- C. Flagellum
- D. Fast-swimming bacteria
- E. None of the Above

232. In its natural habitat _____ is not particularly distinctive as a pseudomonad, but it does have a combination of physiological traits that are noteworthy and may relate to its pathogenesis.

- A. *Pseudomonas aeruginosa*
- B. Antibiotic efflux
- C. Flagellum
- D. Pseudomonads
- E. None of the Above

233. *Pseudomonas aeruginosa* has very simple nutritional requirements. It is often observed "growing in distilled water" which is evidence of its minimal nutritional needs. In the laboratory, the simplest medium for growth of _____ consists of acetate for carbon and ammonium sulfate for nitrogen.

- A. *Pseudomonas aeruginosa*
- B. Antibiotic efflux
- C. Flagellum
- D. Fast-swimming bacteria
- E. None of the Above

234. *P. aeruginosa* possesses the metabolic versatility for which _____ are so renowned. Organic growth factors are not required, and it can use more than seventy-five organic compounds for growth.

- A. *Pseudomonas aeruginosa*
- B. Antibiotic efflux
- C. Flagellum
- D. Pseudomonads
- E. None of the Above

235. Its optimum temperature for growth is 37 degrees, and it is able to grow at temperatures as high as 42 degrees. It is tolerant to a wide variety of physical conditions, including temperature. It is _____ of salts and dyes, weak antiseptics, and many commonly used antibiotics.

- A. *Pseudomonas aeruginosa*
- B. Antibiotic efflux
- C. Flagellum
- D. Fast-swimming bacteria
- E. None of the above

236. _____ has a predilection for growth in moist environments, which is probably a reflection of its natural existence in soil and water.

- A. *Pseudomonas aeruginosa*
- B. Antibiotic efflux
- C. Flagellum
- D. Fast-swimming bacteria
- E. None of the Above

237. These natural properties of the bacterium undoubtedly contribute to its ecological success as an _____. They also help explain the ubiquitous nature of the organism and its prominence as a nosocomial pathogen.

- A. *Pseudomonas aeruginosa*
- B. Antibiotic efflux
- C. Opportunistic pathogen
- D. Fast-swimming bacteria
- E. None of the Above

Shigellosis Section Shigella

238. _____ type 1(or bacillary dysentery) is the only cause of epidemic dysentery.

- A. Shiga
- B. *Shigella*
- C. *Shigella sonnei*
- D. *Shigella dysenteriae*
- E. None of the above

239. This organism is generally found in the stool of _____, as well as in contaminated water supplies. It is known to be able to survive on soiled linens for up to seven weeks, in water supplies for 5-11 days, and in kitchen waste for 1-4 days.

- A. Shiga
- B. *Shigella*
- C. *Shigella sonnei*
- D. *Shigella flexneri*
- E. None of the above

240. _____ can even survive in dust particles for six weeks at room temperature.

- A. Shiga
- B. *Shigella*
- C. *Shigella sonnei*
- D. *Shigella flexneri*
- E. None of the above

241. Infected humans act as host for this particular organism, as well as _____.

- A. Shiga
- B. *Shigella*
- C. *Shigella sonnei*
- D. *Shigella flexneri*
- E. None of the above

242. The infections caused by this organism are generally seen in developing countries and areas of poor sanitation. _____ occurs via direct or indirect contact with individuals who are infected by ingesting contaminated water, or food, as well as contact with fecal material.

- A. Shiga
- B. Shigella
- C. Shigella sonnei
- D. Shigella flexneri
- E. None of the above

243. The _____ germ is actually a family of bacteria that can cause diarrhea in humans. They are microscopic living creatures that pass from person to person.

- A. Shiga
- B. Shigella
- C. Shigella sonnei
- D. Shigella flexneri
- E. None of the above

244. Shigella were discovered over 100 years ago by a Japanese scientist named _____, for whom they are named.

- A. Shiga
- B. Shigella
- C. Shigella sonnei
- D. Shigella flexneri
- E. None of the above

245. There are several different kinds of Shigella bacteria: _____, also known as "Group D" Shigella, accounts for over two-thirds of the shigellosis in the United States.

- A. Shiga
- B. Shigella
- C. Shigella sonnei
- D. Shigella dysenteriae
- E. None of the above

246. A second type, _____, or "group B" Shigella, accounts for almost all of the rest.

- A. Shiga
- B. Shigella
- C. Shigella sonnei
- D. Shigella flexneri
- E. None of the above

247. Other types of _____ are rare in this country, though they continue to be important causes of disease in the developing world.

- A. Shiga
- B. Shigella
- C. Shigella sonnei
- D. Shigella flexneri
- E. None of the above

248. One type found in the developing world, _____ type 1, causes deadly epidemics there.

- A. Shiga
- B. Shigella
- C. Shigella dysenteriae
- D. None of the above

249. _____ is a Gram (-), non-spore forming bacillus that survives as a facultative anaerobe. It is part of the family Enterobacteriaceae.

- A. Shiga
- B. Shigella
- C. Shigella sonnei
- D. Shigella dysenteriae
- E. None of the above

250. When testing for it in the laboratory, you can help identify it by the fact that it is non-motile, and _____. This organism, unlike some enterics, does not produce gas when breaking down carbohydrates.

Incubation period

- A. Lactose and lysine (-)
- B. Bacillary dysentery
- C. Bacterium passing
- D. Shigellosis swims
- E. None of above

251. Shigella dysenteriae is the organism responsible for _____.

- A. Lactose and lysine (-)
- B. Bacillary dysentery
- C. Bacterium passing
- D. Shigellosis swims
- E. None of above

252. During this _____, the organism will penetrate the mucosal epithelial cells of the intestine through use of an intestinal adherence factor. This penetration causes severe irritation which is responsible for the cramps and watery, bloody diarrhea. Dehydration can become a complication.

- A. Lactose and lysine (-)
- B. Bacillary dysentery
- C. Bacterium passing
- D. Shigellosis swims
- E. None of above

253. Most Shigella infections are the result of the _____ from stools or soiled fingers of one person to the mouth of another person. This happens when basic hygiene and handwashing habits are inadequate. It is particularly likely to occur among toddlers who are not fully toilet-trained. Family members and playmates of such children are at high risk of becoming infected.

- A. Lactose and lysine (-)
- B. Bacillary dysentery
- C. Bacterium passing
- D. Shigellosis swims
- E. None of above

254. _____ may be acquired from eating contaminated food. Contaminated food may look and smell normal. Food may become contaminated by infected food handlers who forget to wash their hands with soap after using the bathroom.

- A. Lactose and lysine (-)
- B. Bacillary dysentery
- C. Bacterium passing
- D. Shigellosis swims
- E. None of above

255. Vegetables can become contaminated if they are harvested from a field with sewage in it. Flies can breed in infected feces and then contaminate food. Shigella infections can also be acquired by drinking or swimming in contaminated water. Water may become contaminated if sewage runs into it, or if someone with _____ in it.

- A. Lactose and lysine (-)
- B. Bacillary dysentery
- C. Bacterium passing
- D. Shigellosis swims
- E. None of above

Salmonella typhi Section

256. _____ is a life-threatening illness caused by the bacterium Salmonella Typhi.

- A. Salmonella Typhi
- B. Typhoid fever
- C. Bacterium
- D. Carriers
- E. None of the above

257. _____ is still common in the developing world, where it affects about 12.5 million persons each year.

- A. Salmonella Typhi
- B. Typhoid fever
- C. Bacterium
- D. Carriers
- E. None of the above

258. Typhoid fever can be prevented and can usually be treated with _____.

- A. Salmonella Typhi
- B. Typhoid fever
- C. Bacterium
- D. Carriers
- E. None of the above

259. Salmonella Typhi lives only in humans. Persons with typhoid fever carry the bacteria in their bloodstream and intestinal tract. In addition, a small number of persons, called _____, recover from typhoid fever but continue to carry the bacteria. Both ill persons and carriers shed S. Typhi in their feces (stool).

- A. Salmonella Typhi
- B. Typhoid fever
- C. Bacterium
- D. Carriers
- E. None of the above

260. You can get typhoid fever if you eat food or drink beverages that have been handled by a person who is shedding _____ or if sewage contaminated with S. Typhi bacteria gets into the water you use for drinking or washing food. Therefore, typhoid fever is more common in areas of the world where handwashing is less frequent and water is likely to be contaminated with sewage.

- A. Salmonella Typhi
- B. Typhoid fever
- C. Bacterium
- D. Carriers
- E. None of the above

261. Once *S. Typhi* bacteria are eaten or drunk, they _____ into the bloodstream. The body reacts with fever and other signs and symptoms.

- A. *Salmonella Typhi*
- B. Typhoid fever
- C. Bacterium
- D. Carriers
- E. None of the above

These terms will come from the glossary.

262. A virus that infects bacteria; also called a phage.

- A. Balanced polymorphism
- B. B-cell lymphocyte
- C. Bacterium
- D. Bacteriophage
- E. None of the above

263. A lineage of prokaryotes, represented today by a few groups of bacteria inhabiting extreme environments. Some taxonomists place archaeobacteria in their own kingdom, separate from the other bacteria.

- A. Aqueous solution
- B. Apomorphic character
- C. Archaeobacteria
- D. Asymmetric carbon
- E. None of the above

264. A carbon atom covalently bonded to four different atoms or groups of atoms.

- A. Aqueous solution
- B. Apomorphic character
- C. Archaeobacteria
- D. Asymmetric carbon
- E. None of the above

265. A doubly phosphorylated organic compound that can be further phosphorylated to form ATP.

- A. Adsorb
- B. Adhesion
- C. Adaptive radiation
- D. ADP (Adenosine diphosphate)
- E. None of the Above

266. A condition whereby the hydrogen ion concentration of the tissues is increased (and pH decreased). Respiratory acidosis is due to the retention of CO₂; metabolic acidosis by retention of acids due either to kidney failure or diarrhea.

- A. Acidosis
- B. Action potential
- C. Acid
- D. Acoelomate
- E. None of the Above

267. A substance that increases the hydrogen ion concentration in a solution.
- A. Acidosis
 - B. Action potential
 - C. Acid
 - D. Acoelomate
 - E. None of the Above
268. In chemistry, the phenomenon whereby one substance tends to cling to another substance. Water molecules exhibit adhesion, especially toward charged surfaces.
- A. Adsorb
 - B. Adhesion
 - C. Adaptive radiation
 - D. Algae
 - E. None of the Above
269. An informal term used to designate photosynthetic, plantlike members of the Kingdom Protista. Formerly, most of these organisms were considered to be plants.
- A. Adsorb
 - B. Adhesion
 - C. Adaptive radiation
 - D. Algae
 - E. None of the Above
270. A foreign macromolecule that does not belong to the host organism and that elicits an immune response.
- A. Antigen
 - B. Antibody
 - C. Antibiotic
 - D. Anticodon
 - E. None of the Above
271. A derived phenotypic character, or homology, that evolved after a branch diverged from a phylogenetic tree.
- A. Aqueous solution
 - B. Apomorphic character
 - C. Archaeobacteria
 - D. Asymmetric carbon
 - E. None of the above
272. A solution in which water is the solvent.
- A. Aqueous solution
 - B. Apomorphic character
 - C. Archaeobacteria
 - D. Asymmetric carbon
 - E. None of the above
273. Lacking a coelom.
- A. Acidosis
 - B. Action potential
 - C. Acid
 - D. Acoelomate
 - E. None of the Above

274. The concept of spontaneous generation (that life can come from non-life). This idea was refuted by Pasteur.

- A. Abiotic
- B. Abiogenesis
- C. Aboral
- D. Absorption spectrum
- E. None of the Above

275. Any of a class of organic compounds in which one or more - OH groups are attached to a carbon compound.

- A. Alcohol
- B. Aldehyde
- C. Alkaline
- D. Aerobic
- E. None of the above

276. An organic molecule with a carbonyl group located at the end of the carbon skeleton.

- A. Alcohol
- B. Aldehyde
- C. Alkaline
- D. Aerobic
- E. None of the above

277. Having a pH of more than 7. Alkaline solutions are also said to be basic.

- A. Alcohol
- B. Aldehyde
- C. Alkaline
- D. Aerobic
- E. None of the above

278. These factors are the non-living components of an organism's environment. The term abiotic is also used to denote a process which is not facilitated by living organisms.

- A. Abiotic
- B. Abiogenesis
- C. Aboral
- D. Absorption spectrum
- E. None of the Above

279. Pertaining to the region of the body opposite that of the mouth. Normally used to describe radially symmetrical animals.

- A. Abiotic
- B. Abiogenesis
- C. Aboral
- D. Absorption spectrum
- E. None of the Above

280. The range of a material's ability to absorb various wavelengths of light. The absorption spectrum is studied to evaluate the function of photosynthetic pigments.

- A. Abiotic
- B. Abiogenesis
- C. Aboral
- D. Absorption spectrum
- E. None of the Above

281. This is the entry compound for the Krebs cycle in cellular respiration; formed from a fragment of pyruvic acid attached to a coenzyme.
- A. Abiotic
 - B. Abiogenesis
 - C. Aboral
 - D. Acetyl CoA
 - E. None of the Above
282. Results from exposure to foreign substances or microbes (also called natural immunity).
- A. Acidosis
 - B. Action potential
 - C. Acid
 - D. Acoelomate
 - E. None of the above
283. A globular protein that links into chains, two of which twist helically about each other, forming microfilaments in muscle and other contractile elements in cells.
- A. Acidosis
 - B. Action potential
 - C. Acid
 - D. Acoelomate
 - E. None of the above
284. The stimulus- triggered change in the membrane potential of an excitable cell, caused by selective opening and closing of ion channels.
- A. Acidosis
 - B. Action potential
 - C. Acid
 - D. Action potential
 - E. None of the Above
285. A graph which illustrates the relationship between some biological activity and wavelength of light.
- A. Acidosis
 - B. Action potential
 - C. Acid
 - D. Acoelomate
 - E. None of the above
286. An enzyme that couples a low: energy compound with ATP to yield a high-energy derivative.
- A. Activating enzyme
 - B. Active site
 - C. Activation energy
 - D. Active transport
 - E. None of the Above
287. In a chemical reaction, the initial investment required to energize the bonds of the reactants to an unstable transition state that precedes the formation of the products.
- A. Activating enzyme
 - B. Active site
 - C. Activation energy
 - D. Active transport
 - E. None of the Above

288. That specific portion of an enzyme that attaches to the substrate by means of weak chemical bonds.

- A. Activating enzyme
- B. Active site
- C. Activation energy
- D. Active transport
- E. None of the Above

289. The movement of a substance across a biological membrane against its concentration or electrochemical gradient with the help of energy input and specific transport proteins.

- A. Activating enzyme
- B. Active site
- C. Activation energy
- D. Active transport
- E. None of the Above

290. Any genetically controlled characteristic that increases an organism's fitness, usually by helping the organism to survive and reproduce in the environment it inhabits.

- A. Activating enzyme
- B. Active site
- C. Activation energy
- D. Adaptation
- E. None of the Above

291. This refers to the rapid evolution of one or a few forms into many different species that occupy different habitats within a new geographical area.

- A. Adsorb
- B. Adhesion
- C. Adaptive radiation
- D. Algae
- E. None of the Above

292. Hold on a surface.

- A. Adsorb
- B. Adhesion
- C. Adaptive radiation
- D. Algae
- E. None of the Above

293. The condition of requiring oxygen; an aerobe is an organism which can live and grow only in the presence of oxygen.

- A. Alcohol
- B. Aldehyde
- C. Alkaline
- D. Aerobic
- E. None of the above

294. Alternate forms of a gene which may be found at a given location (locus) on members of a homologous set of chromosomes. Structural variations between alleles may lead to different phenotypes for a given trait.

- A. Alcohol
- B. Aldehyde
- C. Alkaline
- D. Aerobic
- E. None of the above

295. The variation in the relative rates of growth of various parts of the body, which helps shape the organism.

- A. All-or- none
- B. Allopatric speciation
- C. Allometric
- D. Allosteric enzyme
- E. None of above

296. A type of speciation which occurs when a population becomes segregated into two populations by some sort of geographic barrier (also called geographic speciation). This phenomenon is presumed to have been the mechanism whereby many species of organisms evolved.

- A. All-or- none
- B. Allopatric speciation
- C. Allometric
- D. Allosteric enzyme
- E. None of above

297. A common type of polyploid species resulting from two different species interbreeding and combining their chromosomes.

- A. All-or- none
- B. Allopatric speciation
- C. Allometric
- D. Allosteric enzyme
- E. None of above

298. An action that occurs either completely or not at all, such as the generation of an action potential by a neuron.

- A. All-or- none
- B. Allopatric speciation
- C. Allometric
- D. Allosteric enzyme
- E. None of above

299. An enzyme that can exist in two or more conformations.

- A. All-or- none
- B. Allopatric speciation
- C. Allometric
- D. Allosteric enzyme
- E. None of above

300. A receptor on an enzyme molecule which is remote from the active site. Binding of the appropriate molecule to the allosteric site changes the conformation of the active site, making it either more or less receptive to the substrate.

- A. Amino acid
- B. Allosteric site
- C. Alternation of generations
- D. Alpha helix
- E. None of the Above

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