

**Registration form**

**WET LAB PROCEDURES \$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*

**List number of hours worked on assignment must match State Requirement.** \_\_\_\_\_

**Name** \_\_\_\_\_ **Signature** \_\_\_\_\_

*I have read and understood the disclaimer notice on page 2. Digitally sign XXX*

**Address** \_\_\_\_\_

**City** \_\_\_\_\_ **State** \_\_\_\_\_ **Zip** \_\_\_\_\_

**Email** \_\_\_\_\_ **Fax ( )** \_\_\_\_\_

**Phone:**  
**Home ( )** \_\_\_\_\_ **Work ( )** \_\_\_\_\_

**Operator ID #** \_\_\_\_\_ **Exp. Date** \_\_\_\_\_

**Class/Grade** \_\_\_\_\_

*Your certificate will be emailed to you in about two weeks.*

**Please circle/check which certification you are applying the course CEU's.**

Water Treatment \_\_\_ Water Distribution \_\_\_ Other \_\_\_\_\_

Lab Analyst \_\_\_ Wastewater Treatment \_\_\_

**Technical Learning College PO Box 3060, Chino Valley, AZ 86323  
Toll Free (866) 557-1746 Fax (928) 272-0747 e-mail info@tlch2o.com**

**If you've paid on the Internet, please write your Customer#** \_\_\_\_\_

**Please invoice me, my PO#** \_\_\_\_\_

**Please pay with your credit card on our website under Bookstore or Buy Now. Or call us and provide your credit card information.**

***We will stop mailing the certificate of completion so we need either your fax number or e-mail address. We will e-mail the certificate to you, if no e-mail address; we will fax it to you.***

## **DISCLAIMER NOTICE**

I understand that it is my responsibility to ensure that this CEU course is either approved or accepted in my State for CEU credit. I understand State laws and rules change on a frequent basis and I believe this course is currently accepted in my State for CEU or contact hour credit, if it is not, I will not hold Technical Learning College responsible. I fully understand that this type of study program deals with dangerous, changing conditions and various laws and that I will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable in any fashion for any errors, omissions, advice, suggestions or neglect contained in this CEU education training course or for any violation or injury, death, neglect, damage or loss of your license or certification caused in any fashion by this CEU education training or course material suggestion or error or my lack of submitting paperwork. It is my responsibility to call or contact TLC if I need help or assistance and double-check to ensure my registration page and assignment has been received and graded. It is my responsibility to ensure all information is correct and to abide with all rules and regulations.

**State Approval Listing Link**, check to see if your State accepts or has pre-approved this course. Not all States are listed. Not all courses are listed. Do not solely trust our list for it may be outdated. It is your sole responsibility to ensure this course is accepted for credit.

**Professional Engineers**; Most states will accept our courses for credit but we do not officially list the States or Agencies. Please check your State for approval.

*You can obtain a printed version of the course manual from TLC for an additional \$69.95 plus shipping charges.*

## **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.

**Some States and many employers require the final exam to be proctored.**

<http://www.abctlc.com/downloads/PDF/PROCTORFORM.pdf>

**Do not solely depend on TLC's Approval list for it may be outdated.**

**All downloads are electronically tracked and monitored for security purposes.**

# Wet Lab Answer Key

Name \_\_\_\_\_

Phone \_\_\_\_\_

**You are solely responsible in ensuring that this course is accepted for credit by your State. No refunds. Did you check with your State agency to ensure this course is accepted for credit?**

**Method of Course acceptance confirmation. Please fill this section  
Do not solely depend on TLC's Approval list for it may be outdated.**

Website \_\_ Telephone Call\_\_ Email\_\_ Spoke to \_\_\_\_\_

What is the approval number if Applicable? \_\_\_\_\_

PA DEP Students are required to complete the original version of the text. \_\_\_\_\_  
Please initial

**Please use Adobe Acrobat DC or Pen to complete this answer Key**

Please Circle, Bold, Underline or X, one answer per question.

- 1. A B C D E F
- 2. A B C D E F
- 3. A B C D E F
- 4. A B C D E F
- 5. A B C D E F
- 6. A B C D E F
- 7. A B C D E F
- 8. A B C D E F
- 9. A B C D E F
- 10. A B C D E F
- 11. A B C D E F
- 12. A B C D E F
- 13. A B C D E F
- 14. A B C D E F
- 15. A B C D E F
- 16. A B C D E F
- 17. A B C D E F
- 18. A B C D E F
- 19. A B C D E F

- 20. A B C D E F
- 21. A B C D E F
- 22. A B C D E F
- 23. A B C D E F
- 24. A B C D E F
- 25. A B C D E F
- 26. A B C D E F
- 27. A B C D E F
- 28. A B C D E F
- 29. A B C D E F
- 30. A B C D E F
- 31. A B C D E F
- 32. A B C D E F
- 33. A B C D E F
- 34. A B C D E F
- 35. A B C D E F
- 36. A B C D E F
- 37. A B C D E F
- 38. A B C D E F

- 39. A B C D E F
- 40. A B C D E F
- 41. A B C D E F
- 42. A B C D E F
- 43. A B C D E F
- 44. A B C D E F
- 45. A B C D E F
- 46. A B C D E F
- 47. A B C D E F
- 48. A B C D E F
- 49. A B C D E F
- 50. A B C D E F
- 51. A B C D E F
- 52. A B C D E F
- 53. A B C D E F
- 54. A B C D E F
- 55. A B C D E F
- 56. A B C D E F
- 57. A B C D E F

58. A B C D E F  
59. A B C D E F  
60. A B C D E F  
61. A B C D E F  
62. A B C D E F  
63. A B C D E F  
64. A B C D E F  
65. A B C D E F  
66. A B C D E F  
67. A B C D E F  
68. A B C D E F  
69. A B C D E F  
70. A B C D E F  
71. A B C D E F  
72. A B C D E F  
73. A B C D E F  
74. A B C D E F  
75. A B C D E F  
76. A B C D E F  
77. A B C D E F  
78. A B C D E F  
79. A B C D E F  
80. A B C D E F  
81. A B C D E F  
82. A B C D E F  
83. A B C D E F  
84. A B C D E F  
85. A B C D E F  
86. A B C D E F  
87. A B C D E F  
88. A B C D E F  
89. A B C D E F  
90. A B C D E F  
91. A B C D E F  
92. A B C D E F  
93. A B C D E F  
94. A B C D E F  
95. A B C D E F  
96. A B C D E F  
97. A B C D E F  
98. A B C D E F  
99. A B C D E F  
100. A B C D E F  
101. A B C D E F  
102. A B C D E F  
103. A B C D E F  
104. A B C D E F  
105. A B C D E F  
106. A B C D E F  
107. A B C D E F  
108. A B C D E F  
109. A B C D E F  
110. A B C D E F  
111. A B C D E F  
112. A B C D E F  
113. A B C D E F  
114. A B C D E F  
115. A B C D E F  
116. A B C D E F  
117. A B C D E F  
118. A B C D E F  
119. A B C D E F  
120. A B C D E F  
121. A B C D E F  
122. A B C D E F  
123. A B C D E F  
124. A B C D E F  
125. A B C D E F  
126. A B C D E F  
127. A B C D E F  
128. A B C D E F  
129. A B C D E F  
130. A B C D E F  
131. A B C D E F  
132. A B C D E F  
133. A B C D E F  
134. A B C D E F  
135. A B C D E F  
136. A B C D E F  
137. A B C D E F  
138. A B C D E F  
139. A B C D E F  
140. A B C D E F  
141. A B C D E F  
142. A B C D E F  
143. A B C D E F  
144. A B C D E F  
145. A B C D E F  
146. A B C D E F  
147. A B C D E F  
148. A B C D E F  
149. A B C D E F  
150. A B C D E F  
151. A B C D E F  
152. A B C D E F  
153. A B C D E F  
154. A B C D E F  
155. A B C D E F  
156. A B C D E F  
157. A B C D E F  
158. A B C D E F  
159. A B C D E F  
160. A B C D E F  
161. A B C D E F  
162. A B C D E F  
163. A B C D E F  
164. A B C D E F  
165. A B C D E F

166. A B C D E F  
167. A B C D E F  
168. A B C D E F  
169. A B C D E F  
170. A B C D E F  
171. A B C D E F  
172. A B C D E F  
173. A B C D E F  
174. A B C D E F  
175. A B C D E F  
176. A B C D E F  
177. A B C D E F  
178. A B C D E F  
179. A B C D E F  
180. A B C D E F  
181. A B C D E F  
182. A B C D E F  
183. A B C D E F  
184. A B C D E F  
185. A B C D E F  
186. A B C D E F  
187. A B C D E F  
188. A B C D E F  
189. A B C D E F  
190. A B C D E F  
191. A B C D E F  
192. A B C D E F  
193. A B C D E F  
194. A B C D E F  
195. A B C D E F  
196. A B C D E F  
197. A B C D E F  
198. A B C D E F  
199. A B C D E F  
200. A B C D E F  
201. A B C D E F  
202. A B C D E F  
203. A B C D E F  
204. A B C D E F  
205. A B C D E F  
206. A B C D E F  
207. A B C D E F  
208. A B C D E F  
209. A B C D E F  
210. A B C D E F  
211. A B C D E F  
212. A B C D E F  
213. A B C D E F  
214. A B C D E F  
215. A B C D E F  
216. A B C D E F  
217. A B C D E F  
218. A B C D E F  
219. A B C D E F  
220. A B C D E F  
221. A B C D E F  
222. A B C D E F  
223. A B C D E F  
224. A B C D E F  
225. A B C D E F  
226. A B C D E F  
227. A B C D E F  
228. A B C D E F  
229. A B C D E F  
230. A B C D E F  
231. A B C D E F  
232. A B C D E F  
233. A B C D E F  
234. A B C D E F  
235. A B C D E F  
236. A B C D E F  
237. A B C D E F  
238. A B C D E F  
239. A B C D E F  
240. A B C D E F  
241. A B C D E F  
242. A B C D E F  
243. A B C D E F  
244. A B C D E F  
245. A B C D E F  
246. A B C D E F  
247. A B C D E F  
248. A B C D E F  
249. A B C D E F  
250. A B C D E F  
251. A B C D E F  
252. A B C D E F  
253. A B C D E F  
254. A B C D E F  
255. A B C D E F  
256. A B C D E F  
257. A B C D E F  
258. A B C D E F  
259. A B C D E F  
260. A B C D E F  
261. A B C D E F  
262. A B C D E F  
263. A B C D E F  
264. A B C D E F  
265. A B C D E F  
266. A B C D E F  
267. A B C D E F  
268. A B C D E F  
269. A B C D E F  
270. A B C D E F  
271. A B C D E F  
272. A B C D E F  
273. A B C D E F

274. A B C D E F  
275. A B C D E F  
276. A B C D E F  
277. A B C D E F  
278. A B C D E F  
279. A B C D E F  
280. A B C D E F  
281. A B C D E F  
282. A B C D E F  
283. A B C D E F  
284. A B C D E F  
285. A B C D E F  
286. A B C D E F  
287. A B C D E F  
288. A B C D E F  
289. A B C D E F  
290. A B C D E F  
291. A B C D E F  
292. A B C D E F  
293. A B C D E F  
294. A B C D E F  
295. A B C D E F  
296. A B C D E F  
297. A B C D E F  
298. A B C D E F  
299. A B C D E F  
300. A B C D E F  
301. A B C D E F  
302. A B C D E F  
303. A B C D E F  
304. A B C D E F  
305. A B C D E F  
306. A B C D E F  
307. A B C D E F  
308. A B C D E F  
309. A B C D E F  
310. A B C D E F  
311. A B C D E F  
312. A B C D E F  
313. A B C D E F  
314. A B C D E F  
315. A B C D E F  
316. A B C D E F  
317. A B C D E F  
318. A B C D E F  
319. A B C D E F  
320. A B C D E F  
321. A B C D E F  
322. A B C D E F  
323. A B C D E F  
324. A B C D E F  
325. A B C D E F  
326. A B C D E F  
327. A B C D E F  
328. A B C D E F  
329. A B C D E F  
330. A B C D E F  
331. A B C D E F  
332. A B C D E F  
333. A B C D E F  
334. A B C D E F  
335. A B C D E F  
336. A B C D E F  
337. A B C D E F  
338. A B C D E F  
339. A B C D E F  
340. A B C D E F  
341. A B C D E F  
342. A B C D E F  
343. A B C D E F  
344. A B C D E F  
345. A B C D E F  
346. A B C D E F  
347. A B C D E F  
348. A B C D E F  
349. A B C D E F  
350. A B C D E F  
351. A B C D E F  
352. A B C D E F  
353. A B C D E F  
354. A B C D E F  
355. A B C D E F  
356. A B C D E F  
357. A B C D E F  
358. A B C D E F  
359. A B C D E F  
360. A B C D E F  
361. A B C D E F  
362. A B C D E F  
363. A B C D E F  
364. A B C D E F  
365. A B C D E F  
366. A B C D E F  
367. A B C D E F  
368. A B C D E F  
369. A B C D E F  
370. A B C D E F  
371. A B C D E F  
372. A B C D E F  
373. A B C D E F  
374. A B C D E F  
375. A B C D E F  
376. A B C D E F  
377. A B C D E F  
378. A B C D E F  
379. A B C D E F  
380. A B C D E F  
381. A B C D E F

382. A B C D E F  
383. A B C D E F  
384. A B C D E F  
385. A B C D E F  
386. A B C D E F  
387. A B C D E F  
388. A B C D E F

389. A B C D E F  
390. A B C D E F  
391. A B C D E F  
392. A B C D E F  
393. A B C D E F  
394. A B C D E F  
395. A B C D E F

396. A B C D E F  
397. A B C D E F  
398. A B C D E F  
399. A B C D E F  
400. A B C D E F

*This course contains general EPA's SDWA federal rule requirements. Please be aware that each state implements water / sampling procedures/safety/ environmental / building regulations that may be more stringent than EPA's regulations. Check with your state environmental/health agency for more information. These rules change frequently and are often difficult to interpret and follow. Be careful to be in full-compliance and do not follow this course for proper compliance.*

**Please fax the answer key to TLC Western Campus Fax (928) 272-0747**  
Backup Fax (928) 468-0675

Always call us after faxing the paperwork to ensure that we've received it.





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

**WET LAB PROCEDURES CEU COURSE  
CUSTOMER SERVICE RESPONSE CARD**

NAME: \_\_\_\_\_

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.

---

---

**Rush Grading Service**

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

## Wet Lab Procedures CEU Training Course Assignment

**The Assignment (Exam) is also available in Word on the Internet for your Convenience, please visit [www.ABCTLc.com](http://www.ABCTLc.com) and download the assignment and e-mail it back to TLC.**

You will have 90 days from the start of this course to complete in order to receive your Professional Development Hours (**PDHs**) or Continuing Education Unit (**CEU**). A score of 70 % is necessary to pass this course. We prefer if this exam is proctored. No intentional trick questions. If you should need any assistance, please email all concerns and the completed answer key to [info@tlch2o.com](mailto:info@tlch2o.com).

We would prefer that you utilize the enclosed answer sheet in the front, but if you are unable to do so, type out your own answer key. Please include your name and address on your assignment and make copy for yourself.

1. Pathogens \_\_\_\_\_ and affect people in a relatively short amount of time.
- |                                 |                          |
|---------------------------------|--------------------------|
| A. Limits the treatment process | D. Will cause fatalities |
| B. Are mild in nature           | E. Will limit the travel |
| C. Cause intestinal illness     | F. None of the Above     |

### **How Diseases Are Transmitted.**

2. Waterborne pathogens are primarily spread by the?
- |   |                       |
|---|-----------------------|
| A. Fecal-oral, or feces-to-mouth, route | D. Influenza route    |
| B. Dermal to fecal route                | E. Waterborne mishaps |
| C. Oral to fecal route                  | F. None of the Above  |
3. A source of waterborne pathogens is the stool of infected humans or animals. The stool can contain the disease-causing bacteria, viruses, and \_\_\_\_\_.
- |                              |                      |
|------------------------------|----------------------|
| A. Fecal Coliform and E coli | D. Cryptosporidiosis |
| B. Protozoa                  | E. Bioslime          |
| C. Macroorganisms            | F. None of the Above |
4. For another person to become infected, he or she must take that pathogen in through the mouth.
- A. True      B. False
5. Which of the following terms are different from the pathogens that cause influenza or the bacteria that cause tuberculosis?
- |                              |                         |
|------------------------------|-------------------------|
| A. Fecal Coliform and E coli | D. Waterborne Pathogens |
| B. Giardia lamblia           | E. Coliform bacteria    |
| C. Microorganisms            | F. None of the Above    |
6. According to the text, \_\_\_\_\_ are spread by secretions which are coughed or sneezed into the air by an infected person.
- |                              |  |
|------------------------------|--|
| A. Fecal Coliform and E coli | D. Influenza virus and tuberculosis bacteria |
| B. Giardia lamblia           | E. Coliform bacteria                         |
| C. Microorganisms            | F. None of the Above                         |

### Chain of Transmission

7. The pathogens must survive in the water depends on the temperature of the water and the length of time the \_\_\_\_\_ are in the water.

- A. Stomach bugs
- B. Turbidity
- C. Microscopic particles
- D. Germs
- E. Pathogens
- F. None of the Above

8. Which pathogen may survive for months such as Giardia or?

- A. Illness
- B. Cryptosporidium
- C. Bacteria
- D. Campylobacteriosis
- E. Tamylobacteriosis
- F. None of the Above

9. For disease to spread, the pathogens must enter the water system's intake, be inadequately treated, and the water must be consumed by a susceptible person.

- A. True
- B. False

10. If the source of feces in water is not infected with \_\_\_\_\_, no disease will result.

- A. Campylobacteriosis
- B. Pathogen
- C. Waterborne illnesses
- D. Fecal-oral material
- E. Contaminated water
- F. None of the Above

### Viral-Caused Diseases

11. Which of the following terms is an example of a common viral disease that may be transmitted through water?

- A. Pathogen
- B. Yersiniosis
- C. Hepatitis A
- D. Campylobacteriosis
- E. Incubation period
- F. None of the Above

12. The onset is usually abrupt with fever, malaise, loss of appetite, nausea and abdominal discomfort, followed within a few days by jaundice.

- A. True
- B. False

13. Which of the following terms in drinking water can be inactivated by chlorine or other disinfectants?

- A. Illnesses
- B. Giardiasis
- C. Viruses
- D. Pathogen(s)
- E. Infections
- F. None of the Above

### The Main Players- History and Biology Chapter 1

#### Circumstances under which Koch's postulates do not easily apply

14. An opportunistic pathogen has to invade a susceptible host for certain \_\_\_\_\_ to develop.

- A. Diseases
- B. Mutations
- C. Carriers
- D. Divide
- E. Reproduction
- F. None of the Above

15. Which of the following terms are caused by dietary deficiencies?

- A. Disease(s)
- B. Mutation(s)
- C. Carriers
- D. Pathogen(s)
- E. Microorganisms
- F. None of the Above

16. Some \_\_\_\_\_ are very difficult to grow in the laboratory.

- A. Disease(s)
- B. Mutation(s)
- C. Carriers
- D. Pathogen(s)
- E. Microbes
- F. None of the Above

17. Fastidious organisms can now be grown in cultures of human or animal cells or in small animals.

- A. True
- B. False

18. Not all laboratory animals are susceptible to all?

- A. Pathogens
- B. Secondary invaders
- C. Microorganisms
- D. Disease
- E. Chemical reactions
- F. None of the Above

19. Which of the following terms may cause diseases such as cancer of the lungs and skin?

- A. Environmental factors
- B. Secondary invaders
- C. Microorganisms
- D. Disease
- E. Chemical reactions
- F. None of the Above

### **Bacteria**

20. Bacteria are prokaryotes (Kingdom Monera), which means that they have no true nucleus and have one chromosome of double-stranded DNA in a ring.

- A. True
- B. False

21. The \_\_\_\_\_ that some bacteria need to do photosynthesis is built into their cell membranes.

- A. Chlorophyll
- B. Organelle
- C. Cellulose
- D. Double-stranded DNA
- E. Bacilli
- F. None of the Above

22. Bacteria have only one \_\_\_\_\_.

- A. Chloroplast
- B. Organelle
- C. Cellulose
- D. Double-stranded DNA
- E. Cell
- F. None of the Above

23. There are some bacteria that can live in temperatures above the boiling point.

- A. True
- B. False

### **Prokaryotes**

24. Prokaryotes are bacteria and archaea. All other life forms have cells with nuclei and are called \_\_\_\_\_.

- A. Bacteria
- B. Peptidoglycan
- C. Bacilli
- D. Eukaryotes
- E. Microorganism
- F. None of the Above

### **Early Origins**

25. Bacteria are basically one of three different shapes, some are rod - or stick-shaped and called Bacilli. Others are shaped like little balls and called cocci (cox-eye).

- A. True
- B. False

26. According to the text, bacterial cells exist as individuals while others cluster together to form?

- A. An organism
- B. An organelle
- C. Cellulose
- D. Pairs, chains, squares or other groupings
- E. Helical or spiral in shape
- F. None of the Above

27. The mitochondria are \_\_\_\_\_ that make energy for your body cells.

- A. Chloroplasts
- B. Organelles
- C. Cellulose
- D. Bacilli
- E. Eukaryote(s)
- F. None of the Above

28. A single teaspoon of topsoil contains more than a billion (1,000,000,000) bacteria.

- A. True
- B. False

### Peptidoglycan

29. The amount and location of the \_\_\_\_\_ are different in the two possible types of cell walls, depending on the species of bacterium.

- A. Capsule
- B. Peptidoglycan
- C. Cytoplasmic granules
- D. Cell membrane/plasma membrane/cytoplasmic membrane
- E. True nucleus
- F. None of the Above

30. Penicillin, inhibit the formation of the chemical cross linkages needed to make?

- A. Disease(s)
- B. Mutation(s)
- C. Carriers
- D. Peptidoglycan
- E. Bacteria
- F. None of the Above

31. If a person stops an antibiotic, any living bacteria could start making \_\_\_\_\_, grow, and reproduce.

- A. Bacteria
- B. Peptidoglycan
- C. Eukaryotes
- D. Germ theory of disease
- E. Microorganism
- F. None of the Above

### Metabolism

32. Which of the following terms describes all the chemical reactions by which food is transformed for use by the cells?

- A. Fastidious
- B. Metabolism
- C. Chemical reactions
- D. Germ theory of disease
- E. Osmosis
- F. None of the Above

33. A cell can grow through its metabolism, reproduce and it can respond to changes in its environment.

- A. True
- B. False

### Gram Stain

34. The two types of \_\_\_\_\_ have different amounts of peptidoglycan.

- A. Bacteria
- B. Peptidoglycan
- C. Gram<sup>+</sup> or Gram<sup>-</sup>
- D. Bacterial cell walls
- E. Gram stain
- F. None of the Above

35. Which type of bacteria often has toxic chemicals in their cell walls and thus tend to cause more severe illness?

- A. Positive
- B. Fastidious
- C. Gram<sup>+</sup> or Gram<sup>-</sup>
- D. Gram<sup>+</sup>
- E. Gram<sup>-</sup>
- F. None of the Above

36. Antibiotics are less effective against \_\_\_\_\_ bacteria, since these bacteria have less peptidoglycan in their cell walls.

- A. Positive
- B. Fastidious
- C. Gram<sup>+</sup> or Gram<sup>-</sup>
- D. Gram<sup>+</sup>
- E. Gram<sup>-</sup>
- F. None of the Above

37. *Pseudomonas aeruginosa* is a \_\_\_\_\_ bacterium.

- A. Positive
- B. Fastidious
- C. Gram<sup>+</sup> or Gram<sup>-</sup>
- D. Gram<sup>+</sup>
- E. Gram negative
- F. None of the Above

38. In the Gram process, the amount of peptidoglycan in the cell walls of the bacteria under study will determine how those bacteria absorb the dyes with which they are stained; thus, bacterial cells can be Gram<sup>+</sup> or Gram<sup>-</sup>.

- A. True
- B. False

39. Which type of bacteria have simpler cell walls with lots of peptidoglycan and stain a dark purple color?

- A. Aerobic
- B. Positive
- C. Gram<sup>+</sup> or Gram<sup>-</sup>
- D. Gram<sup>+</sup>
- E. Gram<sup>-</sup>
- F. None of the Above

40. Which type of bacteria have more complex cell walls with less peptidoglycan, thus absorb less of the purple dye used and stain a pinkish color?

- A. Positive
- B. Fastidious
- C. Gram<sup>+</sup> or Gram<sup>-</sup>
- D. Gram<sup>+</sup>
- E. Gram<sup>-</sup>
- F. None of the Above

41. The Gram-stain appearance of *pseudomonas aeruginosa* is not particularly characteristic although rods are thinner than those of \_\_\_\_\_.

- A. Coliform bacteria
- B. Enteric-like bacteria
- C. Standard plate count
- D. HPC
- E. CFU
- F. None of the Above

### Two types of cells- Prokaryotes and Eucaryotes

42. A \_\_\_\_\_ doesn't have a complex system of membranes and organelles.

- A. Prokaryotic cell
- B. Enteric-like bacteria
- C. Eukaryotic cell
- D. HPC
- E. CFU
- F. None of the Above

43. A \_\_\_\_\_ has a complex structure, contains a true nucleus, and many organelles.
- A. Eukaryotic cell
  - B. Vesicles
  - C. Prokaryotic cell
  - D. Protozoan
  - E. Paramecium
  - F. None of the Above

#### Structure of a Eukaryotic Cell

44. The cell membrane of a eukaryotic cell is composed of large molecules of proteins and \_\_\_\_\_.
- A. Capsule
  - B. Cell wall
  - C. Cytoplasmic granules
  - D. Phospholipids
  - E. True nucleus
  - F. None of the Above
45. The \_\_\_\_\_ of a eukaryotic cell is selectively permeable.
- A. Cytoplasmic granules
  - B. Cell membrane
  - C. Cell wall
  - D. A single circular DNA molecule
  - E. DNA and proteins
  - F. None of the Above

#### Nucleus

46. The \_\_\_\_\_ contains chromosomes that are characteristic of each species.
- A. Chromosomes
  - B. Nucleus
  - C. Cell membrane
  - D. Macromolecular polymer-peptidoglycan
  - E. Cytoplasmic organelles
  - F. None of the Above

47. A single circular DNA molecule consists of many genes. A gene is a coiled unit made up of Cytoplasmic granules and proteins that code for or determine a particular characteristic of an individual organism.
- A. True
  - B. False

#### Cytoplasm

48. One of the cytoplasmic organelles found in cytoplasm is called \_\_\_\_\_.
- A. Chromosomes
  - B. Prokaryotes
  - C. Cell membrane
  - D. Centrioles
  - E. Cytoplasmic organelles
  - F. None of the Above

#### Cell Wall

49. An external structure of plant cells, algae, and fungi is a \_\_\_\_\_.
- A. Cytoplasmic granules
  - B. Cilia
  - C. A cell wall
  - D. A single circular DNA molecule
  - E. DNA and proteins
  - F. None of the Above

#### Cilia and Flagella

50. Some \_\_\_\_\_ cells have long and thin structures called flagella.
- A. Eukaryotic
  - B. Vesicles
  - C. Prokaryotic
  - D. Protozoan
  - E. Paramecium
  - F. None of the Above



51. Flagella and \_\_\_\_\_ are organs of locomotion for eukaryotic cells.
- A. Cytoplasmic granules
  - B. Cilia
  - C. A cell wall
  - D. Flagella
  - E. Hair
  - F. None of the Above

### Structure of a Prokaryotic Cell

52. All bacteria are prokaryotes and they divide by binary fission.
- A. True
  - B. False

### Chromosome

53. The chromosome of a prokaryotic cell serves as the control center of the bacterial cell. The chromosome usually consists of \_\_\_\_\_.
- A. Cytoplasmic granules
  - B. Cilia
  - C. A cell wall
  - D. A single circular DNA molecule
  - E. DNA and proteins
  - F. None of the Above
54. A typical bacterial chromosome contains approximately 10,000 genes.
- A. True
  - B. False

### Cytoplasm

55. Which missing term is a semi-liquid that surrounds the chromosome of a prokaryotic cell and is contained within the plasma membrane?
- A. Chromosomes
  - B. Cytoplasm
  - C. Cell membrane
  - D. Macromolecular polymer-peptidoglycan
  - E. Cytoplasmic organelles
  - F. None of the Above
56. Which of the following terms occur in certain species of bacteria that can be specifically stained and used to identify the bacteria?
- A. Cytoplasm
  - B. Cell wall
  - C. Cytoplasmic granules
  - D. Cell membrane/plasma membrane/cytoplasmic membrane
  - E. True nucleus
  - F. None of the Above

### Cell Membrane

57. The cell membrane of a prokaryotic cell is similar to that of the \_\_\_\_\_.
- A. Chromosomes
  - B. Prokaryotes
  - C. Eukaryotic cell
  - D. Macromolecular polymer-peptidoglycan
  - E. Cytoplasmic organelles
  - F. None of the Above
58. The \_\_\_\_\_ is very thin and controls the substances entering or leaving the cell.
- A. Chromosomes
  - B. Prokaryotes
  - C. Prokaryotic cell membrane
  - D. Macromolecular polymer-peptidoglycan
  - E. Cytoplasmic organelles
  - F. None of the Above

### Capsules

59. Some bacteria have a layer of material outside the?
- A. Capsule
  - B. Cell wall
  - C. Cytoplasmic granules
  - D. Cell membrane/plasma membrane/cytoplasmic membrane
  - E. True nucleus
  - F. None of the Above

60. A highly organized layer of material outside the cell wall of some bacteria is called a? \_\_\_\_\_.

- A. Capsule
- B. Cell wall
- C. Cytoplasmic granules
- D. DNA and proteins
- E. True nucleus
- F. None of the Above

61. Which of the following terms consist of complex sugars or polysaccharides combined with lipids and proteins?

- A. Cytoplasmic granules
- B. Cilia
- C. A cell wall
- D. Capsules
- E. DNA and proteins
- F. None of the Above

62. Which of the following terms is useful in differentiating between different types of bacteria?

- A. Capsule
- B. Cell wall
- C. Cytoplasmic granules
- D. Cell membrane/plasmamembrane/cytoplasmic
- E. True nucleus
- F. None of the Above

63. Which of the following terms are usually detected by negative staining, where the bacterial cell and the background become stained but the capsule remains unstained?

- A. Cytoplasmic granules
- B. Capsules
- C. Encapsulated bacteria
- D. A single circular DNA molecule
- E. DNA and proteins
- F. None of the Above

64. Encapsulated bacteria produce colonies on Flagellated bacteria are smooth, mucoid and glistening, whereas the capsulated bacteria produce rough and dry colonies.

- A. True
- B. False

65. Capsules enable the bacterial species to attach to mucus membranes and protect the bacteria from phagocytosis.

- A. True
- B. False

### **Flagella**

66. Peritrichous bacteria possess?

- A. One flagellum at each end
- B. Tuft of flagella
- C. The entire surface
- D. Genetic material from one bacteria
- E. Flagella over the entire surface
- F. None of the Above

67. Flagella are \_\_\_\_\_ that bacteria use to move.

- A. Cytoplasmic granules
- B. Cilia
- C. Thread-like proteins
- D. False feet
- E. Hair
- F. None of the Above

68. \_\_\_\_\_ are called motile while non-flagellated bacteria are called non-motile.

- A. Bacteria
- B. Peptidoglycan
- C. Gram<sup>+</sup> or Gram<sup>-</sup>
- D. Flagellated bacteria
- E. Microorganism
- F. None of the Above

69. Lophotrichous bacteria-possess at one or both ends?

- A. Forming spores
- B. Spore formation
- C. A single polar flagellum
- D. Tuft of flagella
- E. Cilia
- F. None of the Above

70. Amphitrichous bacteria are bacteria that have \_\_\_\_\_.

- A. One flagellum at each end
- B. A single polar flagellum
- C. The entire surface
- D. Transfer genetic material from one bacteria cell to another
- E. One or both ends
- F. None of the Above

71. Monotrichous bacteria are bacteria that have \_\_\_\_\_.

- A. One flagellum at each end
- B. A single polar flagellum
- C. The entire surface
- D. Transfer genetic material from one bacteria cell to another
- E. One or both ends
- F. None of the Above

### **Pili or Fimbriae**

72. Pili or Fimbriae on gram negative bacteria enable them to attach to other bacteria or to membrane surfaces such as \_\_\_\_\_.

- A. Chromosomes
- B. Intestinal linings or RBC
- C. Cell membrane
- D. Macromolecular polymer-peptidoglycan
- E. Cytoplasmic organelles
- F. None of the Above

73. Gram negative bacteria use \_\_\_\_\_ to transfer genetic material from one bacteria cell to another.

- A. Chromosomes
- B. Pili or Fimbriae
- C. Cell membrane
- D. Macromolecular polymer-peptidoglycan
- E. Cytoplasmic organelles
- F. None of the Above

### **Spores**

74. Some bacteria enclose \_\_\_\_\_ in spores as a means of survival.

- A. Spores
- B. Genetic material
- C. Cytoplasmic granules
- D. Spore formation
- E. Macromolecular polymer-peptidoglycan
- F. None of the Above

75. When the \_\_\_\_\_ lands on a fertile surface, it forms a new vegetative cell.

- A. Spores
- B. Genetic material
- C. Several protein coats
- D. Spore formation
- E. Dried spore
- F. None of the Above

76. Spore formation is related to the survival of bacterial cells, not reproduction.

- A. True
- B. False

### **Bacterial Nutrition**

77. Most cells require significant quantities of \_\_\_\_\_.

- A. Water
- B. Nitrogen
- C. Iron, Zinc, Cobalt
- D. Oxygen
- E. Calcium
- F. None of the Above

78. Which of the following terms all life requires in order to grow and reproduce?

- A. Water
- B. Copper
- C. Iron, Zinc, Cobalt
- D. Oxygen
- E. Calcium
- F. None of the Above

79. Some enzymes require the trace metals \_\_\_\_\_ to function.

- A. Water
- B. Copper
- C. Iron, Zinc, Cobalt
- D. Oxygen
- E. Calcium
- F. None of the Above

80. Sources of energy required by all life includes light or inorganic substances like sulfur, carbon monoxide or ammonia, or preformed organic matter like sugar, protein, and fats.

- A. True
- B. False

81. Which of the following terms may be nitrogen gas, ammonia, nitrate/nitrite, or a nitrogenous organic compound like protein or Nucleic acid?

- A. Water
- B. Nitrogen
- C. Iron, Zinc, Cobalt
- D. Oxygen
- E. Calcium
- F. None of the Above

82. Which of the following terms may be carbon dioxide, methane, carbon monoxide, or a complex organic material?

- A. Water
- B. Carbon
- C. Iron, Zinc, Cobalt
- D. Oxygen
- E. Calcium
- F. None of the Above

83. Which missing term in a bound form is used by all cells?

- A. Water
- B. DNA molecule
- C. Iron, Zinc, Cobalt
- D. Oxygen
- E. Calcium
- F. None of the Above

### **Fastidious**

84. Many \_\_\_\_\_ can make the complex molecules they need from the basic minerals.

- A. Eukaryotes
- B. Bacteria
- C. Prokaryotes
- D. Centrioles
- E. Viruses
- F. None of the Above

85. Fastidious \_\_\_\_\_ require preformed organic molecules like vitamins, amino acids, nucleic acids, carbohydrates.

- A. Eukaryotes
- B. Bacteria
- C. Prokaryotes
- D. Centrioles
- E. Viruses
- F. None of the Above

### **What in the World is an Eukaryote?**

86. \_\_\_\_\_ include multicellular organisms such as animals, plants, and fungi, as well as unicellular protists.

- A. Eukaryotes
- B. Bacteria
- C. Prokaryotes
- D. Centrioles
- E. Viruses
- F. None of the Above

87. \_\_\_\_\_ include other organisms such as bacteria that lack nuclei and other complex cell structures.

- A. Eukaryotes
- B. Bacteria
- C. Prokaryotes
- D. Centrioles
- E. Viruses
- F. None of the Above

88. The eukaryotes share a common origin and are treated as a super kingdom, empire, or domain.

- A. True
- B. False

### Eukaryotic Cells

89. In terms of volume, eukaryotic cells are much larger than \_\_\_\_\_.

- A. Eukaryotes
- B. Bacteria
- C. Prokaryotes
- D. Centrioles
- E. Viruses
- F. None of the Above

90. Many cells ingest food and other materials through a process of osmosis, where the outer membrane invaginates and then pinches off to form a Flagella.

- A. True
- B. False

91. Which of the following terms is surrounded by a double membrane, with pores that allow material to move in and out?

- A. The nucleus
- B. Flagella
- C. DNA molecule
- D. Cilia
- E. Cell wall
- F. None of the Above

92. Which of the following terms represents a variety of internal membranes and structures, called organelles, and a cytoskeleton composed of microtubules and microfilaments?

- A. Eukaryote(s)
- B. Bacteria
- C. Prokaryote(s)
- D. Centrioles
- E. Viruses
- F. None of the Above

93. DNA in \_\_\_\_\_ cells is divided into several bundles called chromosomes.

- A. Eukaryotic
- B. Bacteria
- C. Prokaryotic
- D. Centrioles
- E. Viruses
- F. None of the Above

94. \_\_\_\_\_ include a variety of membrane-bound structures known as the endomembrane system.

- A. Eukaryotic cells
- B. Golgi bodies or dictyosomes
- C. Prokaryotic cells
- D. Centrioles
- E. Eukaryotic
- F. None of the Above

### Protozoan Reservoirs of Disease

95. Which of the following bugs/disease/causes terms represents the causative organism of Legionnaires' disease?

- A. Centrioles
- B. Viruses
- C. Autotrophic
- D. Amoebae
- E. Bacterium Legionella pneumophila
- F. None of the Above

96. Which of the following bugs/disease/causes terms live and reproduce in the cytoplasm of some free-living amoebae?

- A. Centrioles
- B. Viruses
- C. Autotropic
- D. Amoebae
- E. Bacterium Legionella pneumophila
- F. None of the Above

97. The presence of bacteria in the cytoplasm of protozoa is well-known, whereas that of viruses is less frequently reported. Most of these reports simply record the presence of bacteria or viruses and assume some sort of symbiotic relationship between them and the Protozoa.

- A. True
- B. False

98. Which of the following terms were shown to not only survive but also to multiply in the cytoplasm of free-living, nonpathogenic protozoa?

- A. Human pathogens
- B. Foraminifera
- C. Freshwater protozoan
- D. Soil-dwelling protozoa
- E. Marine protozoa
- F. None of the Above

99. Protozoa are the natural habitat for certain pathogenic bacteria.

- A. True
- B. False

### Symbionts

100. Which of the following terms inhabit the rumen and reticulum of ruminates and the cecum and colon of equids?

- A. Protozoa
- B. Foraminifera
- C. Freshwater protozoan
- D. Soil-dwelling protozoa
- E. Ciliates
- F. None of the Above

### Viruses

101. Which term are acellular microorganisms, made up of only genetic material and a protein coat?

- A. Viruses
- B. Genetic material
- C. Poxviruses
- D. Antiviral therapies
- E. Virions
- F. None of the Above

102. Which term depend on the energy and metabolic machinery of the host cell to reproduce?

- A. Fungi
- B. Genetic material
- C. Poxviruses
- D. Virus(es)
- E. Virions
- F. None of the Above

103. Viruses are found in virtually all life forms, including humans, animals, plants, \_\_\_\_\_, and bacteria.

- A. Fungi
- B. Genetic material
- C. Poxviruses
- D. Antiviral therapies
- E. Virions
- F. None of the Above

104. According to the text, viruses consist of genetic material—either \_\_\_\_\_ or ribonucleic acid (RNA)—surrounded by a protective coating of protein, called a capsid, with or without an outer lipid envelope.

- A. Deoxyribonucleic acid (DNA)
- B. Genetic material
- C. Poxviruses
- D. Antiviral therapies
- E. Virions
- F. None of the Above

105. Which of the following terms are between 20 and 100 times smaller than bacteria and hence are too small to be seen by light microscopy?

- A. Viruses
- B. Genetic material
- C. Poxviruses
- D. Fungi
- E. Virions
- F. None of the Above

106. Which of the following terms vary in size from the largest poxviruses of about 450 nanometers in length to the smallest polioviruses of about 30 nanometers?

- A. Viruses
- B. Genetic material
- C. Poxviruses
- D. Bacteria
- E. Virions
- F. None of the Above

107. Which of the following terms are not considered free-living, since they cannot reproduce outside of a living cell; they have evolved to transmit their genetic information from one cell to another for the purpose of replication?

- A. Viruses
- B. Genetic material
- C. Poxviruses
- D. Bacteria
- E. Virions
- F. None of the Above

108. Which of the following terms often damage or kill the cells that they infect, causing disease in infected organisms?

- A. Viruses
- B. Genetic material
- C. Poxviruses
- D. Antiviral therapies
- E. Virions
- F. None of the Above

109. Because of the difficulty in developing antiviral therapies stems from the large number of variant \_\_\_\_\_ that can cause the same disease, as well as the inability of drugs to disable a virus without disabling healthy cells.

- A. Viruses
- B. Genetic material
- C. Poxviruses
- D. Antiviral therapies
- E. Virions
- F. None of the Above

110. With the development of antiviral agents is a major focus of current research, and the study of \_\_\_\_\_ has led to many discoveries important to human health.

- A. Viruses
- B. Genetic material
- C. Poxviruses
- D. Antiviral therapies
- E. Virions
- F. None of the Above

111. A few viruses stimulate cells to grow uncontrollably and produce cancers. Although many infectious diseases, such as the common cold, are caused by viruses, there are no cures for these illnesses.

- A. True
- B. False

### Virions

112. Individual viruses, also called \_\_\_\_\_, contain genetic material consisting of either DNA or RNA.

- A. Podoviruses
- B. Phage's host range
- C. Myovirus bacteriophages
- D. Phage lambda of E. coli
- E. A virion
- F. None of the Above

113. Viral DNA is double-stranded, while viral RNA is single stranded.

- A. True
- B. False

114. The protective shell of a virus is called a capsid.

- A. True
- B. False

### Bacteriophage

115. According to the text, bacteriophages consist of \_\_\_\_\_ enclosing genetic material.

- A. Bacteriophages
- B. Phages
- C. Microbial mats
- D. Peptidoglycan
- E. An outer protein hull
- F. None of the Above

116. One of the densest natural sources for phages and other viruses is sea water, where up to  $9 \times 10^8$  virions per milliliter have been found in \_\_\_\_\_ at the surface, and up to 70% of marine bacteria may be infected by phages.

- A. Bacteriophages
- B. Phages
- C. Microbial mats
- D. Peptidoglycan
- E. Virions
- F. None of the Above

117. The genetic material can be ssRNA (single stranded RNA), dsRNA, ssDNA, or dsDNA between 5 and 500 kilo base pairs long with linear arrangement. Bacteriophages are much smaller than the Plasma membrane they destroy - usually between 20 and 200 nm in size.

- A. True
- B. False

118. Which creature or substance is estimated to be the most widely distributed and diverse entities in the biosphere?

- A. Bacteriophages
- B. Phages
- C. Microbial mats
- D. Peptidoglycan
- E. Virions
- F. None of the Above

119. Which creature or substance is ubiquitous and can be found in all reservoirs populated by bacterial hosts, such as soil or the intestine of animals?

- A. Host cell secretion
- B. Phage(s)
- C. Lysogenic
- D. Plasma membrane
- E. Bacterial hosts
- F. None of the Above

120. Phages may be released via cell lysis or by?

- A. Host cell secretion
- B. Phage(s)
- C. Lysogenic
- D. Plasma membrane
- E. Bacterial hosts
- F. None of the Above



121. Which phages does not kill the host but rather become long-term parasites and make the host cell continually secrete more new virus particles?

- A. Host cell secretion
- B. Phage(s)
- C. Lysogenic
- D. Plasma membrane
- E. Bacterial hosts
- F. None of the Above

**Protozoa**

122. When protozoa are in the form of \_\_\_\_\_, they actively feed and grow.

- A. Cysts
- B. Trophozoites
- C. Pathogens
- D. Hermaphroditic
- E. Apicomplexans
- F. None of the Above

123. Which bug/creature/organism/species play a role both as herbivores and as consumers in the decomposer link of the food chain?

- A. Protozoa
- B. Malaria parasites
- C. Microinvertebrates
- D. Algal production
- E. Trophozoites and cysts
- F. None of the Above

124. Which bug/creature/organism/species are an important food source for microinvertebrates?

- A. Meiofauna
- B. Malaria parasites
- C. Microinvertebrates
- D. Algal production
- E. Protozoa
- F. None of the Above

125. An important ecological role of protozoa is the transfer of bacterial and \_\_\_\_\_ to successive trophic levels.

- A. Protozoa
- B. Malaria parasites
- C. Microinvertebrates
- D. Algal production
- E. Trophozoites and cysts
- F. None of the Above

126. According to the text, the process by which the protozoa takes its cyst form is called encystation, while the process of transforming back into \_\_\_\_\_ is called excystation.

- A. Cysts
- B. Trophozoite
- C. Pathogens
- D. Hermaphroditic
- E. Apicomplexans
- F. None of the Above

127. Protozoa occupy a range of trophic levels, as predators, they prey upon unicellular or filamentous algae, bacteria, and?

- A. Microfungi
- B. Malaria parasites
- C. Microinvertebrates
- D. Algal production
- E. Trophozoites and cysts
- F. None of the Above

128. Most protozoa exist in 5 stages of life which are in the form of \_\_\_\_\_.

- A. Protozoa
- B. Malaria parasites
- C. Microinvertebrates
- D. Algal production
- E. Trophozoites and cysts
- F. None of the Above

129. Which bug/creature/organism/species can survive harsh conditions, such as exposure to extreme temperatures and harmful chemicals, or long periods without access to nutrients, water, or oxygen for a period of time?

- A. Protozoa
- B. Malaria parasites
- C. Microinvertebrates
- D. Algal production
- E. Trophozoites and cysts
- F. None of the Above

130. An individual protozoan is?

- A. Cysts
- B. Trophozoite
- C. Pathogens
- D. Hermaphroditic
- E. Apicomplexans
- F. None of the Above

131. Which bug/creature/organism/species are around 10–50 micrometer, but can grow up to 1 mm and can easily be seen under a microscope?

- A. Protozoa
- B. Malaria parasites
- C. Microinvertebrates
- D. Algal production
- E. Trophozoites and cysts
- F. None of the Above

132. Which bug/creature/organism/species exist throughout aqueous environments and soil?

- A. Protozoa
- B. Malaria parasites
- C. Microinvertebrates
- D. Algal production
- E. Trophozoites and cysts
- F. None of the Above

### Ecological Role of Protozoa

133. \_\_\_\_\_ play an important role in many communities where they occupy a range of trophic levels, although they are frequently overlooked,

- A. Protozoa
- B. Foraminifera
- C. Freshwater protozoan
- D. Fossil foraminifera
- E. Marine protozoa
- F. None of the Above

134. According to the text, these are predators of unicellular or filamentous algae, \_\_\_\_\_, and microfungi, protozoa play a role both as herbivores and as consumers in the decomposer link of the food chain.

- A. Bacteria
- B. Many ecological conditions
- C. Amazingly diverse organisms
- D. Pathogenic bacteria
- E. Bacterium
- F. None of the Above

135. The ecological role of Foraminifera in the transfer of bacterial and algal production to successive trophic levels is important.

- A. True
- B. False

### Factors Affecting Growth and Distribution

136. \_\_\_\_\_ multiply by cell division.

- A. Most free-living protozoa
- B. Foraminifera
- C. Freshwater protozoan
- D. Fossil foraminifera
- E. Marine protozoa
- F. None of the Above

### Wastewater Bug Section

137. In the Activated Sludge process, the \_\_\_\_\_ are also called waste activated sludge.

- A. Organisms
- B. Settled bugs
- C. Mixed liquor
- D. Secondary treatment
- E. Sludge Volume Index
- F. None of the Above

138. The waste sludge is treated separately and the remaining wastewater is now much cleaner. In fact, after primary and \_\_\_\_\_, about 85% or more of all pollutants in the wastewater has been removed and it goes on to Disinfection.

- A. Oxygen
- B. Settled bugs
- C. Activated sludge
- D. Secondary treatment
- E. Settleable Solids
- F. None of the Above

139. The first group of bugs is the bacteria that eats the \_\_\_\_\_.

- A. Dissolved organic compounds
- B. Settled bugs
- C. Activated sludge
- D. Secondary treatment
- E. Total Dissolved Solids
- F. None of the Above

140. Microorganisms known as the free-swimming and \_\_\_\_\_ make up the second and third groups of bugs. These larger bugs eat the bacteria and are heavy enough to settle by gravity.

- A. Mixed liquor
- B. Suctorina
- C. Stalked ciliates
- D. Bacteria
- E. Volatile Solids
- F. None of the Above

141. The fourth group of bugs is a microorganism known as \_\_\_\_\_, which feed on the larger bugs and assist with settling.

- A. Water bear
- B. Suctorina
- C. Activated sludge bugs
- D. Rotifer
- E. Vorticella
- F. None of the Above

142. The bacteria that eat the dissolved organics have a sticky fat layer on \_\_\_\_\_, which is what the organics adhere to.

- A. Fur
- B. Feet
- C. Eyes
- D. The outside of their body
- E. Cilia
- F. None of the Above

143. Once the bacteria have “contacted” their food, they start the digestion process by sending out a chemical enzyme through the cell wall to break up the \_\_\_\_\_.

- A. Mixed liquor
- B. Organic compounds
- C. Activated sludge
- D. Bacteria
- E. Total Dissolved Solids
- F. None of the Above

144. The cell is highly engineered and because of this hydrolytic enzyme, it breaks the organic molecules into small units which are able to pass through the cell wall of the?

- A. Mixed bugs
- B. Compound
- C. Organism
- D. Bacteria
- E. Protozoan
- F. None of the Above

145. The \_\_\_\_\_ process in wastewater treatment uses bacteria-eating-bugs in the presence of oxygen to reduce the organics in water.

- A. Mixed liquor
- B. Oxidation
- C. Activated sludge
- D. Reduction
- E. Settleable Solids
- F. None of the Above

146. The contact of the bacteria with the organic compounds, the first step in the activated sludge process, takes about \_\_\_\_\_.

- A. 24 hours
- B. 2 Hours
- C. 1 Hour
- D. 30 Minutes
- E. 72 Hours
- F. None of the Above

147. In the activated sludge process, the bugs "bump" into each other and their fat sticks together, causing flocculation of the \_\_\_\_\_.

- A. Mixed liquor
- B. Floc
- C. Non-organic solids and biomass
- D. WAS
- E. Settleable Solids
- F. None of the Above

148. What environments are they adaptable to survive and multiply in?

- A. Either anaerobic or aerobic conditions
- B. Anaerobic only
- C. Facultative
- D. Aerobic only
- E. Volatile
- F. None of the Above

149. The \_\_\_\_\_ is used again by returning it to the influent of the aeration tank.

- A. Carry over
- B. RAS
- C. Solids biomass
- D. Super WAS
- E. Sludge Volume Index
- F. None of the Above

150. We need to be able to properly identify the bugs and this common bugs are a medium size to large swimming Ciliate, commonly observed in activated sludge, sometimes in abundant numbers.

- A. Vorticella
- B. Euglypha
- C. Paramecium
- D. Euchlanis
- E. Rotifer
- F. None of the Above

### **Giardiasis Giardia lamblia**

151. Giardia lamblia is a protozoa that moves with the aid of five flagella. In Europe, it is sometimes referred to as \_\_\_\_\_.

- A. Chronic cases
- B. The organism
- C. Lamblia intestinalis
- D. Typically, the disease
- E. Morphologically distinct organism
- F. None of the Above

152. Giardiasis is the most frequent cause of non-bacterial diarrhea in North America. 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."

- A. True
- B. False

153. Greasy diarrhea, gas, stomach cramps, fatigue, and weight loss begin approximately one week after ingestion of the \_\_\_\_\_.

- A. Intestinal flora
- B. Giardia cysts
- C. Human giardiasis
- D. Various degrees of symptoms
- E. The microaerophilic Giardia
- F. None of the Above

154. The basic biology of this \_\_\_\_\_--including how it ravages the digestive tract--is poorly understood.

- A. Chronic case
- B. Organism
- C. Parasite
- D. Disease
- E. Morphologically distinct organism
- F. None of the Above

155. The \_\_\_\_\_ uses mitosomes in the maturation of iron-sulfur proteins.

- A. Intestinal flora
- B. The disease mechanism
- C. Human giardiasis
- D. Various degrees of symptoms
- E. Microaerophilic Giardia
- F. None of the Above

### Nature of Disease

156. \_\_\_\_\_ that cause human and animal illness appear to be identical.

- A. Chronic cases
- B. The organism
- C. *Lamblia intestinalis*
- D. Typically, the disease
- E. Organisms
- F. None of the Above

157. Which of the following terms may involve diarrhea within 1 week of ingestion of the cyst, which is the environmental survival form and infective stage of the organism?

- A. Intestinal flora
- B. The disease mechanism
- C. Human giardiasis
- D. Various degrees of symptoms
- E. The microaerophilic Giardia
- F. None of the Above

158. Chronic cases, both those with defined \_\_\_\_\_ and those without, are difficult to treat.

- A. Immune deficiencies
- B. The organism
- C. *Lamblia intestinalis*
- D. Typically, the disease
- E. Morphologically distinct organism
- F. None of the Above

159. The \_\_\_\_\_ of giardiasis is unknown, though some investigators believe that the organism produces a toxin.

- A. Intestinal flora
- B. Disease mechanism
- C. Human giardiasis
- D. Various degrees of symptoms
- E. Microaerophilic Giardia
- F. None of the Above

160. \_\_\_\_\_ that causes giardiasis has been found inside host cells in the duodenum.

- A. Intestinal flora
- B. The organism
- C. *Lamblia intestinalis*
- D. Typically, the disease
- E. Morphologically distinct organism
- F. None of the Above

161. Which of the following terms 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?

- A. Intestinal flora
- B. The disease mechanism
- C. Human giardiasis
- D. Various degrees of symptoms
- E. Mechanical obstruction
- F. None of the Above

162. \_\_\_\_\_ can be excysted, cultured, and encysted in the laboratory.

- A. Intestinal flora
- B. The organism
- C. *Lambliia intestinalis*
- D. Typically, the disease
- E. *Giardia*
- F. None of the Above

163. \_\_\_\_\_ have been described through analysis of their proteins and DNA.

- A. Several strains of *G. lamblia*
- B. The disease mechanism
- C. Human giardiasis
- D. Various degrees of symptoms
- E. The microaerophilic *Giardia*
- F. None of the Above

164. The same strain of *G. Lamblia* will cause \_\_\_\_\_ in different individuals.

- A. Intestinal flora
- B. Disease mechanism
- C. Human giardiasis
- D. Various degrees of symptoms
- E. Course of the disease
- F. None of the Above

### **Giardiasis *Giardia lamblia* Chapter 2**

#### **Diagnosis of Human Illness**

165. *Giardia lamblia* is frequently diagnosed by visualizing the the trophozoite or the cyst in stained preparations or unstained wet mounts with the aid of a microscope.

- A. True
- B. False

166. Which of the following terms may be concentrated by sedimentation or flotation; however, these procedures reduce the number of recognizable organisms in the sample?

- A. Organisms
- B. Infective cysts
- C. Acute outbreaks
- D. Giardiasis
- E. Recognizable organisms in the sample
- F. None of the Above

167. \_\_\_\_\_ that detects excretory secretory products of the organism may also be used to diagnose *Giardia lamblia*.

- A. Bac-T
- B. An enzyme
- C. Lab array
- D. Infective cysts
- E. An enzyme linked immunosorbant assay (ELISA)
- F. None of the Above

#### **Relative Frequency of Disease**

168. Since many individuals seem to have a lasting immunity after infection, \_\_\_\_\_ is more prevalent in children than in adults.

- A. *Cryptosporidium*
- B. An enzyme
- C. Giardiasis
- D. Infective cysts
- E. Trophozoite
- F. None of the Above

169. Which of the following terms is implicated in 25% of the cases of gastrointestinal disease and may be present asymptotically, the overall incidence of infection is estimated at 2% of the population.

- A. Cryptosporidium
- B. An enzyme
- C. Giardiasis
- D. Infective cysts
- E. Trophozoite
- F. None of the Above

170. \_\_\_\_\_ of giardiasis are common with infants, not because of the water, but because of diaper changing hygiene procedures at childcare centers.

- A. Flagyl
- B. Infective cysts
- C. Acute outbreaks
- D. Giardiasis
- E. Intestinal flora
- F. None of the Above

171. According to the text, this is an example of infectious diarrhea due to \_\_\_\_\_ infection of the small intestine.

- A. This organism
- B. Giardia lamblia
- C. Giardiasis
- D. Infective cysts
- E. The small pear-shaped trophozoites
- F. None of the Above

172. Which of the following terms in immunodeficient and normal individuals are frequently refractile to drug treatment?

- A. This organism
- B. An enzyme
- C. Giardiasis
- D. Infective cysts
- E. Chronic cases of giardiasis
- F. None of the Above

173. \_\_\_\_\_ is very effective in terminating infections.

- A. Flagyl
- B. Infective cysts
- C. Acute outbreaks
- D. Giardiasis
- E. Recognizable organisms in the sample
- F. None of the Above

### Target Populations

174. \_\_\_\_\_ occurs throughout the population, but is more prevalent in children than adults.

- A. This organism
- B. An enzyme
- C. Giardiasis
- D. Infective cysts
- E. The small pear-shaped trophozoites
- F. None of the Above

175. Adults are more likely to suffer from chronic symptomatic giardiasis than children.

- A. True
- B. False

### Cryptosporidiosis Cryptosporidium Chapter 3

176. Which bug or disease term describes the following symptoms, watery diarrhea and cramps, sometimes severe, weight loss, nausea, vomiting, and fever are also possible?

- A. Agammaglobulinemia
- B. Toxoplasmosis
- C. Malaise
- D. Cryptosporidiosis
- E. Anti-water Infection
- F. None of the Above

177. Cryptosporidium is a protozoan pathogen of the Phylum Apicomplexa and causes a diarrheal illness called?

- A. Cryptosporidium parvum
- B. Cryptosporidiosis
- C. AIDS
- D. Congenital agammaglobulinemia
- E. Cryptosporidium
- F. None of the Above

178. Apicomplexan pathogens include the malaria parasite Plasmodium, and Toxoplasma, the causative agent of?

- A. Cryptosporidium parvum
- B. Cryptosporidiosis
- C. Toxoplasmosis
- D. Congenital agammaglobulinemia
- E. Cryptosporidium
- F. None of the Above

179. Few people had heard of \_\_\_\_\_, or the disease it causes, cryptosporidiosis that until 1993, when over 400,000 people in Milwaukee became ill with diarrhea after drinking water contaminated with the parasite.

- A. Cryptosporidium parvum
- B. Cryptosporidiosis
- C. AIDS
- D. Congenital agammaglobulinemia
- E. Cryptosporidium
- F. None of the Above

180. Which of the following is most particularly a danger for the immunocompromised, especially HIV-positive persons and persons with AIDS?

- A. Giardia lamblia
- B. Giardiasis
- C. Malaise
- D. Cryptosporidiosis
- E. Anti-water Infection
- F. None of the Above

181. Immunosuppression if severe enough, can lead to chronic?

- A. Cryptosporidium parvum
- B. Giardiasis
- C. Malaise
- D. Cryptosporidiosis
- E. Anti-water Infection
- F. None of the Above

182. Which of the following organism/disease related terms was first identified as a human pathogen, diagnosis was made by a biopsy of intestinal tissue?

- A. C. parvum
- B. Cryptosporidiosis
- C. Giardiasis
- D. Congenital agammaglobulinemia
- E. Cryptosporidium
- F. None of the Above

183. Staining methods were developed to detect and identify the oocysts directly from stool samples.

- A. True
- B. False

184. The modified acid-fast stain is traditionally used to most reliably and specifically detect the presence of?

- A. Cryptosporidium parvum
- B. Cryptosporidiosis
- C. Cryptosporidial oocysts
- D. Giardiasis
- E. Cryptosporidium
- F. None of the Above



185. According to the text, even though persons who are taking immunosuppressive drugs may develop chronic and/or severe \_\_\_\_\_, the infection usually resolves when these drugs are decreased or stopped.

- A. Cryptosporidium parvum
- B. Cryptosporidiosis
- C. AIDS
- D. Congenital agammaglobulinemia
- E. Cryptosporidium
- F. None of the Above

186. The following persons 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?

- A. Cryptosporidium parvum
- B. Cryptosporidiosis
- C. AIDS
- D. Congenital agammaglobulinemia
- E. Cryptosporidium
- F. None of the Above

187. Which term below does not utilize an insect vector and is capable of completing its life cycle within a single host, resulting in cyst stages which are excreted in feces and are capable of transmission to a new host?

- A. Cryptosporidium parvum
- B. Giardiasis
- C. Malaise
- D. Cryptosporidiosis
- E. Anti-water Infection
- F. None of the Above

#### **Cholera *Vibrio cholerae* Chapter 4**

#### **Cholera *Vibrio cholerae***

188. Cholera is an infection of the small intestine that causes a large amount of watery diarrhea.

- A. True
- B. False

189. According to the text, Cholera is an infection in the small intestine caused by?

- A. Amoebiasis
- B. Cholera
- C. The bacterium *Vibrio cholerae*
- D. Rapid dehydration and electrolyte imbalance
- E. Diarrheal disease
- F. None of the Above

190. Which of the following terms is protected from the severe effects of cholera because they do not lose water as quickly?

- A. Blood types
- B. Thin people
- C. Antibacterial drugs
- D. Carriers of the cystic fibrosis gene
- E. Carriers of rabies
- F. None of the Above

191. Which of the following terms appears in a community it is essential to ensure three things: hygienic disposal of human feces, an adequate supply of safe drinking water, and good food hygiene?

- A. Cryptosporidium parvum
- B. Cryptosporidiosis
- C. Cholera
- D. El Tor
- E. Cryptosporidium
- F. None of the Above

192. Because of the severity of the diarrhea and vomiting can lead to rapid dehydration and electrolyte imbalance, and?

- A. Amoebiasis
- B. Cholera
- C. Antibacterial drugs
- D. Death
- E. Diarrheal disease
- F. None of the Above

193. To shorten its duration and severity, antibacterial drugs are beneficial in those with?

- A. Amoebiasis
- B. Cholera
- C. Severe disease
- D. Rapid dehydration and electrolyte imbalance
- E. Diarrheal disease
- F. None of the Above

194. Which of the following organism/disease related terms has been very rare in industrialized nations for the last 100 years?

- A. Amoebiasis
- B. Cholera
- C. Mexicana cholera
- D. Entamoeba histolytica
- E. Cystic fibrosis gene
- F. None of the Above

195. Which of the following organism/disease related terms is the most feared epidemic diarrheal disease because of its severity?

- A. Amoebiasis
- B. Vibrio cholerae
- C. Bacterial meningitis
- D. Entamoeba histolytica
- E. Cystic fibrosis
- F. None of the Above

196. Which of the following organism/disease related terms is a disease of the gastrointestinal tract caused by the Vibrio cholerae bacterium and is also known as?

- A. Amoebic cholera
- B. Amoebiasis
- C. Mexicana cholera
- D. European cholera
- E. Asiatic cholera
- F. None of the Above

197. Cholera has been found in only two other animal populations: shellfish and plankton.

- A. True
- B. False

198. Which of the following terms is rarely spread directly from person to person?

- A. Cryptosporidium parvum
- B. Cryptosporidiosis
- C. Cholera
- D. El Tor
- E. Cryptosporidium
- F. None of the Above

199. Cholera has two strains, toxic and nontoxic.

- A. True
- B. False

200. Which of the following organism/disease related terms was prevalent in the 1800s but has been virtually eliminated by modern sewage and water treatment systems?

- A. Amoebic cholera
- B. Cholera
- C. Mexicana cholera
- D. European cholera
- E. Asiatic cholera
- F. None of the Above

201. Genetic research has determined that a person's susceptibility to cholera and other diarrheas) is affected by their blood type.

- A. True
- B. False

202. Those with type A blood are the most susceptible.

- A. True
- B. False

203. Those with type O are the most resistant, virtually immune. Between these two extremes are the O and O negative blood types.

- A. True      B. False

204. The mode of transmission of \_\_\_\_\_ by water was proven in 1849 by John Snow.

- A. Cryptosporidium parvum      D. El Tor  
B. Cryptosporidiosis      E. Cryptosporidium  
C. Cholera      F. None of the Above

205. Cholera is typically transmitted by either contaminated food or water. With seafood being the usual cause, while in the developing world it is more often water.

- A. True      B. False

### **Cholera Treatment**

206. When consumed, most bacteria do not survive the?

- A. Stomach acid      D. Resistance  
B. Lack of nutrients      E. Antibiotic treatments  
C. Antibacterial drugs      F. None of the Above

207. During the passage through the stomach, few surviving bacteria conserve their energy and stored nutrients by shutting down much?

- A. Life support      D. Resistance  
B. Protein production      E. Antibiotic treatments  
C. Reproduction      F. None of the Above

208. Surviving Cholera bacteria exit the stomach and reach the small intestine; they need to propel themselves through the thick mucus that lines the small intestine to get to the intestinal walls, where they can thrive.

- A. True      B. False

209. *V. cholerae* bacteria start up production of the hollow cylindrical protein flagellin to make flagella, the cork-screw helical fibers they rotate to propel themselves through the mucus of the small intestine.

- A. True      B. False

210. If Cholera bacteria reach the intestinal wall, they will no longer need?

- A. Lamblia      D. Cyst  
B. Shell      E. Flagella  
C. Case      F. None of the Above

211. On reaching the intestinal wall, *V. cholerae* start producing the Antibiotic treatments that give the infected person a watery diarrhea.

- A. True      B. False

212. This carries the multiplying new generations of *V. cholerae* bacteria out into the drinking water of the next host if even if proper sanitation measures are in place.

- A. True      B. False

213. Which of the following terms can be administered for one to three days shorten the course of the disease and reduce the severity of the symptoms?

- A. Verotoxin
- B. Antibiotic treatments
- C. Antibacterial drugs
- D. Resistance
- E. Aspirin
- F. None of the Above

214. If sufficient hydration is maintained, people will recover without drugs.

- A. True
- B. False

215. Which of the following terms is typically used first line, although some strains of *V. cholerae* that have shown resistance?

- A. Verotoxin
- B. Doxycycline
- C. Antibacterial drugs
- D. Resistance
- E. Aspirin
- F. None of the Above

216. Rapid diagnostic assay methods are available for the identification of?

- A. Cholera bacteria-resistant cases
- B. Multiple drug-resistant cases
- C. Antibacterial drugs
- D. Resistance
- E. Antibiotic treatments
- F. None of the Above

217. Cholera remains a pandemic in many areas of the world.

- A. True
- B. False

218. According to the text, little is known about the mechanisms behind the spread of cholera, this has not led to a full understanding of what makes cholera outbreaks happen in some places and not others.

- A. True
- B. False

219. The term Cholera morbus was used to describe both nonepidemic cholera and other gastrointestinal diseases (sometimes epidemic) that resembled cholera.

- A. True
- B. False

### **El Tor**

220. El Tor strain has a low degree of "epidemic virulence," allowing it to spread across the world as previous strains have done. First, the ratio of cases to carriers is much less than in *Giardia lamblia* due to classic biotypes (1: 30-100 for El Tor vs. 1: 2 - 4 for "classic" biotypes).

- A. True
- B. False

### **Legionnaires' Disease Legionella Chapter 5**

221. The first discovery of bacteria was from the \_\_\_\_\_ that came in 1976 when an outbreak of pneumonia at an American Legion convention led to 29 deaths.

- A. Legionnaire's disease
- B. Legionella pneumophila
- C. Legionella bacteria
- D. Genus Legionella
- E. Legionella species
- F. None of the Above

222. The causative agent of Legionnaires' Disease, would come to be known as *Legionella pneumophila*, was isolated and given its own genus.

- A. True
- B. False

223. Which of the terms are classified in this genus are Gram-negative bacteria that are considered intracellular parasites?

- A. Legionnaire's disease
- B. Legionella pneumophila
- C. Legionella bacteria
- D. Organisms
- E. Legionella species
- F. None of the Above

224. Which of the terms is caused most commonly by the inhalation of small droplets of water or fine aerosol containing Legionella bacteria?

- A. Legionnaire's disease
- B. Legionella pneumophila
- C. Legionella bacteria
- D. Legionella
- E. Legionella species
- F. None of the Above

225. Which of the terms are naturally found in environmental water sources such as rivers, lakes and ponds and may colonize manmade water systems?

- A. Legionnaire's disease
- B. Legionella pneumophila
- C. Legionella bacteria
- D. Legionella
- E. Legionella species
- F. None of the Above

226. Which of the terms is responsible for approximately 90% of infections?

- A. Legionnaire's disease
- B. Legionella pneumophila
- C. Legionella bacteria
- D. Legionella
- E. Legionella species
- F. None of the Above

227. Most Legionnaire's disease cases are caused by \_\_\_\_\_, serogroup

1. Legionella species are small (0.3 to 0.9  $\mu\text{m}$ )

- A. Legionnaire's disease
- B. Legionella pneumophila
- C. Legionella bacteria
- D. L. pneumophila
- E. Legionella species
- F. None of the Above

### Chlorine Dioxide

228. Which term provides good Giardia and virus protection but its use is limited by the restriction on the maximum residual of 0.5 mg/L ClO<sub>2</sub>/chlorite/chlorate allowed in finished water?

- A. Dry sodium chlorite
- B. Chlorine dioxide
- C. Chlorinated byproducts
- D. Ammonia residual(s)
- E. Free and/or combined chlorine
- F. None of the Above

229. Chlorine dioxide may be used for either taste or odor control or as a?

- A. Chloramine
- B. T10 value
- C. Free chlorine
- D. Chlorine dioxide
- E. Pre-disinfectant
- F. None of the Above

### Escherichia Coli Chapter 6

#### E-Coli Section – Some information may be in the Appendix.

230. Escherichia coli. There are several pathogenic strains of Escherichia coli, which are classified under enterovirulent E. coli.

- A. True
- B. False

231. Escherichia coli. are enterohemorrhagic, enteroinvasive, enterotoxigenic, enteropathogenic, and enteroaggregative.

- A. True
- B. False

232. *Escherichia coli*. In its most severe form, it can cause?  
 A. Hemorrhagic colitis                      D. *Pseudomonas*  
 B. *Escherichia coli* O157:H7            E. Salmonellosis  
 C. Beaver fever                                F. None of the Above
233. Prevention strategies for *E. coli* O157:H7 include \_\_\_\_\_, halogenation of water, or boiling water for one minute.  
 A. Primary protection                      D. Eliminating snails with a molluscicide  
 B. Source protection                        E. Backflow prevention  
 C. Sodium chlorite                         F. None of the Above
234. What is the bacterial disease caused by the *Salmonella* species that causes diarrheal illness?  
 A. Beaver fever                                D. *Pseudomonas*  
 B. *Escherichia coli* O157:H7            E. Salmonellosis  
 C. Bacteria                                      F. None of the Above
235. Prevention strategies for *Salmonella* include source protection, halogenation of water, and also?  
 A. KNMO4                                      D. Eliminating snails with a molluscicide  
 B. Source protection                        E. Boiling water for one minute  
 C. Chlorine dioxide                         F. None of the Above

**Waterborne Pathogens and Disease Review**

**How Diseases Are Transmitted.**

236. Waterborne pathogens are primarily spread by the?  
 A. Fecal-oral, or feces-to-mouth, route            D. Influenza route  
 B. Dermal to fecal route                              E. Waterborne mishaps  
 C. Oral to fecal route                                 F. None of the Above
237. When infected humans or animals pass the bacteria, viruses, and \_\_\_\_\_ in their stool, pathogens may get into water and spread disease.  
 A. Fecal Coliform and *E coli*                      D. Cryptosporidiosis  
 B. Protozoa    E. Bioslime  
 C. Macroorganisms                                    F. None of the Above
238. For another person to become infected, he or she must take that pathogen in through the mouth.  
 A. True            B. False
239. This term means when in nature it is different from other types of pathogens such as the viruses that cause influenza (the flu) or the bacteria that cause tuberculosis.  
 A. Fecal Coliform and *E coli*                      D. Waterborne Pathogen(s)  
 B. *Giardia lamblia*                                    E. Coliform bacteria  
 C. Microorganism(s)                                F. None of the Above
240. According to the text, \_\_\_\_\_ are spread by secretions that are coughed or sneezed into the air by an infected person.  
 A. Fecal Coliform and *E coli*                      D. Influenza virus and tuberculosis bacteria  
 B. *Giardia lamblia*                                    E. Coliform bacteria  
 C. Microorganisms                                    F. None of the Above

### **Bacterial Diseases**

241. Other diseases caused by bacteria in water are cholera, Legionellosis, salmonellosis, \_\_\_\_\_, and yersiniosis.

- A. Shigellosis
- B. Cysts
- C. Hepatitis A
- D. Campylobacteriosis
- E. HIV
- F. None of the Above

242. Which of the following organism/disease related terms - polio, and viral gastroenteritis (Norwalk agent) and this one are other viral diseases that can be transmitted through water?

- A. Pathogens
- B. Bacterial diseases
- C. Aseptic meningitis
- D. Foodborne or waterborne illnesses
- E. Amebiasis
- F. None of the Above

243. According to the text, few viruses in drinking water can be inactivated by chlorine or other disinfectants.

- A. True
- B. False

244. A susceptible person must drink the water that contains the pathogen in order for illness (disease) to occur.

- A. True
- B. False

245. Which of the following organism/disease terms will is the most common diarrheal illness caused by bacteria?

- A. Aseptic meningitis
- B. Campylobacteriosis
- C. Pathogens
- D. Giardia or Cryptosporidium
- E. Tuberculosis bacteria
- F. None of the Above

### **Amebiasis– Some information may be in the Appendix.**

246. Amebiasis is an infection of the intestines caused by?

- A. Pathogens
- B. Bacterial diseases
- C. Norwalk agent
- D. Foodborne or waterborne illnesses
- E. The parasite Entamoeba histolytica
- F. None of the Above

247. Amoebiasis, or Amebiasis, refers to infection caused by?

- A. Amoebiasis
- B. Cholera
- C. Antibacterial drugs
- D. The amoeba Entamoeba histolytica
- E. Cystic fibrosis gene
- F. None of the Above

248. Which of the following organism/disease related terms is usually transmitted by the fecal-oral route, but it can also be transmitted indirectly through contact with dirty hands or objects as well as by anal-oral contact?

- A. Amoebiasis
- B. Cholera
- C. Antibacterial drugs
- D. Rapid dehydration and electrolyte imbalance
- E. Diarrheal disease
- F. None of the Above

249. Any non-encysted amoebae, or \_\_\_\_\_, die quickly after leaving the body?

- A. Amoebiasis
- B. Cholera
- C. Trophozoites
- D. Electrolytes
- E. Cystic fibrosis gene
- F. None of the Above

250. Which of the following organism/disease terms that may or may not be symptomatic and can remain latent in an infected person for several years?

- A. Gastrointestinal infection
- B. Cholera
- C. Antibacterial drugs
- D. Rapid dehydration and electrolyte imbalance
- E. Diarrheal disease
- F. None of the Above

251. Which of the following organism/disease terms can live in the large intestine (colon) without causing disease?

- A. Amoebiasis
- B. Cholera
- C. Antibacterial drugs
- D. Entamoeba histolytica
- E. Cystic fibrosis gene
- F. None of the Above

### Hepatitis Section

252. Which of the following hepatitis types affects only those who also have hepatitis B, and hepatitis E is extremely rare in the United States?

- A. Type B
- B. Type A
- C. Type C
- D. Type D
- E. Type E hepatitis
- F. None of the Above

253. Which of the following hepatitis can be passed through contact with infected blood, contaminated needles, or by sexual contact with an HIV-infected person?

- A. Type A hepatitis
- B. Type B hepatitis
- C. Type C hepatitis
- D. Type D hepatitis
- E. Type E hepatitis
- F. None of the Above

254. Which of the following hepatitis types is most likely to be transmitted in feces, through oral contact, or in water that has been contaminated?

- A. Type B hepatitis
- B. Type A hepatitis
- C. Type C hepatitis
- D. Type D hepatitis
- E. Type E hepatitis
- F. None of the Above

255. Which of the following hepatitis types is contracted through anal-oral contact, by coming in contact with the feces of someone with it, or by eating or drinking hepatitis contaminated food or water?

- A. Type A hepatitis
- B. Type B hepatitis
- C. Type C hepatitis
- D. Type D hepatitis
- E. Type E hepatitis
- F. None of the Above

256. Which of the following hepatitis types can be contracted from infected blood, seminal fluid, vaginal secretions, or contaminated drug needles, including tattoo or body-piercing equipment.

- A. Type A hepatitis
- B. Type B hepatitis
- C. Type C hepatitis
- D. Type D hepatitis
- E. Type E hepatitis
- F. None of the Above



257. Which of the following hepatitis types is not easily spread through sex?

- A. Type B hepatitis
- B. Type A hepatitis
- C. Type C hepatitis
- D. Type D hepatitis
- E. Type E hepatitis
- F. None of the Above

**Shigella dysenteriae– Some information may be in the Appendix.**

258. Some strains produce enterotoxin and Shiga toxin, similar to the verotoxin of *E. coli* O157:H7. Both Shiga toxin and verotoxin are associated with causing hemolytic uremic syndrome.

- A. True
- B. False

259. Which term invades the host through epithelial cells of the large intestine?

- A. Bacillary dysentery
- B. Shigellae
- C. *S. dysenteriae*
- D. Shigella
- E. Verotoxin
- F. None of the Above

260. Which term is diarrhea, fever, nausea, vomiting, stomach cramps, and straining to have a bowel movement?

- A. Bacillary dysentery
- B. Shigellae
- C. *S. dysenteriae*
- D. Shigella infection
- E. Verotoxin
- F. None of the Above

261. *Shigella dysenteriae* is a species of the ball-shaped bacterial genus *Shigella*.

- A. True
- B. False

262. Which term can cause shigellosis AKA bacillary dysentery?

- A. Bacillary dysentery
- B. Shigella
- C. *S. dysenteriae*
- D. Infection
- E. Verotoxin
- F. None of the Above

263. Which term are Gram-negative, non-spore-forming, facultatively anaerobic, non-motile bacteria?

- A. Bacillary dysentery
- B. Shigellae
- C. *S. dysenteriae*
- D. Shigella
- E. Verotoxin
- F. None of the Above

264. According to the text, *S. dysenteriae*, spread by contaminated water and food, causes the most severe dysentery because of its potent and deadly \_\_\_\_\_, but other species may also be dysentery agents.

- A. Bacillary dysentery
- B. Shigellae
- C. *S. dysenteriae*
- D. Shiga toxin
- E. Verotoxin
- F. None of the Above

265. Which term is typically via ingestion (fecal–oral contamination); depending on age and condition of the host as few as ten bacterial cells can be enough to cause an infection?

- A. Bacillary dysentery
- B. Shigellae
- C. *S. dysenteriae*
- D. Shigella infection
- E. Verotoxin
- F. None of the Above

266. Which term causes dysentery that result in the destruction of the epithelial cells of the intestinal mucosa in the cecum and rectum?

- A. Bacillary dysentery
- B. Shigellae
- C. *S. dysenteriae*
- D. Shigella
- E. Verotoxin
- F. None of the Above

267. Which term usually last for several days, but can last for weeks. Shigella is implicated as one of the pathogenic causes of reactive arthritis worldwide?

- A. Bacillary dysentery
- B. Shigellae
- C. Symptoms
- D. Shigella infection
- E. Verotoxin
- F. None of the Above

### Shigellosis

268. Which term is an infectious disease caused by a group of bacteria called Shigella?

- A. Typhoid fever
- B. Gastric fever
- C. Shigellosis
- D. Gram-negative short bacillus
- E. A positive reaction
- F. None of the Above

269. Those who are infected with Shigella develop diarrhea, fever, and stomach cramps starting a week or two after they are exposed to the bacteria. The diarrhea is often watery.

- A. True
- B. False

270. Which term usually resolves in 5 to 7 days?

- A. Typhoid fever
- B. Gastric fever
- C. Shigellosis
- D. Gram-negative short bacillus
- E. A positive reaction
- F. None of the Above

271. Persons with shigellosis in the United States often require hospitalization.

- A. True
- B. False

272. According to the text, some persons who are infected may have no symptoms at all, but may still pass the \_\_\_\_\_ to others.

- A. Typhoid fever
- B. Gastric fever
- C. Shigellosis
- D. Gram-negative short bacillus
- E. Shigella bacteria
- F. None of the Above

273. Which term is an acute bacterial infection of the lining of the intestines?

- A. Typhoid fever
- B. Gastric fever
- C. Shigellosis
- D. Gram-negative short bacillus
- E. A positive reaction
- F. None of the Above

### Typhoid

274. Typhoid fever, also known as Typhoid, is a common worldwide bacterial disease, transmitted by the ingestion of food or water contaminated with the feces of an infected person, which contain the bacterium *Salmonella typhi*, Serovar Typhi.

- A. True
- B. False

275. *Salmonella typhi* is a Gram-negative short bacillus that is motile due to its peritrichous flagella.

- A. True
- B. False

276. Salmonella typhi grows best at 37°C / 98.6°F – human body temperature.

- A. True      B. False

277. This fever received various names, such as gastric fever, \_\_\_\_\_, infantile remittent fever, slow fever, nervous fever, pythogenic fever, etc.

- A. Typhoid fever      D. Gram-negative short bacillus  
B. Gastric fever      E. A positive reaction  
C. Abdominal typhus      F. None of the Above

278. Typhoid fever is unrelated to?

- A. Typhoid flu      D. Typhus  
B. Gastric fever      E. Typhoid hurricane  
C. Shigellosis      F. None of the Above

279. Which term is divided into 4 individual stages, each lasting approximately 1 week. In the 1st week, the temperature rises slowly and fever fluctuations are seen with relative bradycardia, malaise, headache, and cough?

- A. Typhoid fever      D. Gram-negative short bacillus  
B. Gastric fever      E. A positive reaction  
C. Shigellosis      F. None of the Above

280. According to the text, there is leukopenia, with eosinopenia and relative lymphocytosis, a positive reaction and blood cultures are positive for?

- A. Typhoid fever      D. Salmonella typhi or paratyphi  
B. Gastric fever      E. A positive reaction  
C. Shigellosis      F. None of the Above

### **How is typhoid fever spread?**

281. Salmonella Typhi lives only in humans. Persons with typhoid fever carry the bacteria in their bloodstream and intestinal tract.

- A. True      B. False

282. Typhoid fever is spread through food or drink beverages that have been handled by a person who is shedding \_\_\_\_\_ or if sewage contaminated with Salmonella Typhi bacteria gets into the water you use for drinking or washing food.

- A. Typhoid bugs      D. Salmonella Typhi  
B. Gastric fever      E. A positive reaction  
C. Shigellosis      F. None of the Above

283. Which term when eaten or drunk, will multiply and spread into the bloodstream, the body reacts with fever and other signs and symptoms?

- A. Typhoid fever      D. Gram-negative short bacillus  
B. Gastric fever      E. Salmonella Typhi  
C. Shigellosis      F. None of the Above

**EPA Regulations Chapter 8  
Disinfection Rule Review**

284. Chlorine is the most widely used water disinfectant due to its effectiveness and cost. Using chlorine as a drinking water disinfectant has prevented millions of water borne diseases, such as typhoid, cholera, dysentery, and diarrhea. Most states require community water systems to use chlorination.

- A. True      B. False

285. These compounds are called disinfection by-products (DBPs). All disinfectants form DBPs in one of two reactions: Chlorine and chlorine-based compounds (halogens) react with organics in water causing the chlorine atom to substitute other atoms resulting in?

- A. Chlorine                                      D. Halogenated by-products  
B. Organic sulfide(s)                      E. HOCl  
C. Calcium carbonate                      F. None of the Above

286. Oxidation reactions, where chlorine oxidizes \_\_\_\_\_ present in water. Secondary by-products are also formed when multiple disinfectants are used.

- A. Carbon                                      D. Chlorine and chlorine-based compounds (halogens)  
B. Surface water                              E. Secondary by-products  
C. Compounds                                      F. None of the Above

287. Which of the following terms requires systems using public water supplies from either surface water or groundwater under the direct influence of surface water to disinfect?

- A. TTHM and HAA5 Rule                      D. Disinfection byproducts (DBPs) Rule  
B. DBP MCLs Rule                              E. Surface Water Treatment Rule (SWTR)  
C. A community water system (CWS)                      F. None of the Above

288. Since some disinfectants produce chemical by-products, the dual objective of disinfection is to provide the required level of organism destruction and remain within the maximum contaminant level (MCL) for the SWTR disinfection set by EPA.

- A. True      B. False

289. At this time, an MCL is set for only \_\_\_\_\_, and proposed for additional disinfection byproducts.

- A. TTHM and HAA5 Rule                      D. Disinfection byproducts (DBPs) Rule  
B. DBP MCLs Rule                              E. Total Trihalomethanes  
C. A community water system (CWS)                      F. None of the Above

290. Which of the following rules apply to all community and non-community water systems using a disinfectant such as chlorine, chloramines, ozone and chlorine dioxide?

- A. TTHM and HAA5 Rule                      D. Disinfection byproducts (DBPs) Rule  
B. DBP MCLs Rule                              E. Disinfectants and Disinfection Byproducts (DBP)  
C. A community water system                      F. None of the Above

291. The Long Term 2 Enhanced Surface Water Treatment Rule (LT2) rule applies to all water systems using \_\_\_\_\_ under the influence of a surface water, as well as groundwater/surface water blends.

- A. Surface water, groundwater
- B. DBP MCLs Rule
- C. A community water system (CWS)
- D. Disinfection byproducts (DBPs) Rule
- E. Total Trihalomethanes
- F. None of the Above

### Public Health Concerns

292. While disinfectants are effective in controlling many microorganisms, they react with natural organic and inorganic matter in source water and distribution systems to form?

- A. DBPs
- B. Chlorine and chloramine
- C. Stage 2 DBPR
- D. Classes of DBPs
- E. Ultraviolet light
- F. None of the Above

293. Which term is used to express (e.g., chlorite, bromodichloromethane, and certain haloacetic acids) have also been shown to cause adverse reproductive or developmental effects in laboratory animals?

- A. DBPs
- B. Chlorine and chloramine
- C. Stage 2 DBPR
- D. Classes of DBPs
- E. Ultraviolet light
- F. None of the Above

294. Several epidemiology studies have suggested a weak association between certain cancers or reproductive and developmental effects, and exposure to chlorinated surface water.

- A. True
- B. False

295. More than 200 million people consume water that has been disinfected, because of the large population exposed, health risks associated with \_\_\_\_\_, even if small, need to be taken seriously.

- A. DBPs
- B. Chlorine and chloramine
- C. Stage 2 DBPR
- D. Classes of DBPs
- E. Ultraviolet light
- F. None of the Above

296. Which Rule and Disinfection Byproduct Rule updates and supersedes the 1979 regulations for total trihalomethanes? In addition, it will reduce exposure to three disinfectants and many disinfection byproducts.

- A. DBPs
- B. The Stage 1 Disinfectant
- C. SDWA in 1996
- D. Stage 3 Disinfectant and Disinfection Byproduct
- E. The LT2 requirements
- F. None of the Above

### Stage 2 DBP Rule Federal Register Notices

297. The Microbial and Disinfection Byproducts Rules (MDBPs) are a set of interrelated regulations that address risks from microbial pathogens and disinfectants/disinfection byproducts. The \_\_\_\_\_ is one part of these rules.

- A. Groundwater Rule (GWR)
- B. Compliance Rule
- C. Stage 2 DBP Rule
- D. Total Coliform Rule
- E. ICR Rule
- F. None of the Above

298. The \_\_\_\_\_ limits exposure to DBPs, specifically total trihalomethanes (TTHM) and five haloacetic acids (HAA5).
- A. Disinfectant used                      D. LT2 Enhanced Surface Water Treatment Rule  
 B. DBP exposure                          E. Traditional disinfection practices  
 C. Stage 2 DBP Rule                      F. None of the Above
299. The Stage 2 DBP Rule applies to water systems that add a primary or residual disinfectant other than \_\_\_\_\_.
- A. Ultraviolet (UV) light                D. Chlorine  
 B. The open-channel system              E. Chloramine  
 C. Ozone                                      F. None of the Above
300. Which of the following rules has been highly effective in protecting public health and has also evolved to respond to new and emerging threats to safe drinking water?
- A. Stage 2 DBPR                          D. Long Term 2 Enhanced Surface Water Treatment Rule  
 B. DBP exposure                          E. Safe Drinking Water Act (SDWA)  
 C. The Stage 2 DBP rule                F. None of the Above
301. There are specific microbial pathogens, such as \_\_\_\_\_, which can cause illness, and are highly resistant to traditional disinfection practices.
- A. Enteric virus(es)    D. C. perfringens  
 B. Oocyst(s)            E. E. coli host culture  
 C. Cryptosporidium    F. None of the Above
302. Amendments to the SDWA in 1996 require EPA to develop rules to balance the risks between microbial pathogens and disinfection byproducts (DBPs).
- A. True            B. False
303. The Stage 1 Disinfectants and Disinfection Byproducts Rule and \_\_\_\_\_, promulgated in December 1998, were the first phase in a rulemaking strategy required by Congress as part of the 1996 Amendments to the Safe Drinking Water Act.
- A. Major health advances    D. Amendments to the SDWA in 1996  
 B. The Stage 2 DBPR            E. Interim Enhanced Surface Water Treatment Rule  
 C. This final rule                F. None of the Above
304. The Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) builds upon the \_\_\_\_\_ to address more stringent protection measures for higher risk public water systems
- A. Stage 2 DBPR    D. Long Term 2 Enhanced Surface Water Treatment Rule  
 B. DBP exposure    E. Traditional disinfection practices  
 C. Stage 1 DBPR    F. None of the Above
305. The \_\_\_\_\_ and the Long Term 2 Enhanced Surface Water Treatment Rule are the second phase of rules that address disinfectants/disinfection byproducts and microbial pathogens.
- A. Major public health advances    D. Amendments to the SDWA in 1996  
 B. The Stage 2 DBPR                  E. Primary or residual disinfectant  
 C. Final rule                              F. None of the Above

306. The \_\_\_\_\_ will reduce the risk of cancer and reproductive and developmental health issues caused by disinfection byproducts (DBPs) in drinking water.

- A. Stage 3 DBPR
- B. DBP exposure
- C. Stage 2 DBPR
- D. Long Term 2 Enhanced Surface Water Treatment Rule
- E. Traditional disinfection practices
- F. None of the Above

307. The \_\_\_\_\_ tightens compliance monitoring requirements for trihalomethanes (TTHM) and haloacetic acids (HAA5).

- A. Major public health advances
- B. Stage 3 DBPR
- C. Stage 2 Disinfection Byproducts Rule
- D. Amendments to the SDWA in 1996
- E. Primary or residual disinfectant
- F. None of the Above

308. The \_\_\_\_\_ builds incrementally upon the Stage 1 DBPR to reduce DBP exposure and related health risks.

- A. Stage 3 DBPR
- B. Stage 2 DBPR
- C. Stage 1 DBP rule
- D. Long Term 2 Enhanced Surface Water Treatment Rule
- E. Stage 4 DBPR
- F. None of the Above

309. The \_\_\_\_\_ and the Long Term 2 Enhanced Surface Water Treatment Rule are being promulgated at the same time to address concerns about risk tradeoffs between pathogens and DBPs.

- A. Major public health advances
- B. Stage 2 DBPR
- C. Final rule
- D. Amendments to the SDWA in 1996
- E. Primary or residual disinfectant
- F. None of the Above

**What does the rule require?**

310. The \_\_\_\_\_ will require systems to conduct an Initial Distribution System Evaluation (IDSE) to identify the locations with high disinfection byproduct concentrations.

- A. Stage 2 DBPR
- B. DBP exposure
- C. Stage 1 DBP rule
- D. Long Term 2 Enhanced Surface Water Treatment Rule
- E. Traditional disinfection practices
- F. None of the Above

311. Compliance with the maximum contaminant levels for TTHM and HAA5 will be calculated for each monitoring location in the distribution system. This approach is referred to as the \_\_\_\_\_.

- A. TTHM and HAA5
- B. DBP MCLs
- C. Locational running annual average (LRAA)
- D. Disinfection byproducts (DBPs)
- E. Trihalomethanes and haloacetic acids
- F. None of the Above

312. Which Rule requires each system to determine if they have exceeded an operational evaluation level, which is identified using their compliance monitoring results?

- A. Stage 2 DBPR
- B. DBP exposure
- C. The Stage 1 DBP rule
- D. Long Term 2 Enhanced Surface Water Treatment Rule
- E. Traditional disinfection practices
- F. None of the Above

313. If an operational evaluation level is exceeded, the system is required to review its operational practices and identify actions that may be taken to mitigate future high

- \_\_\_\_\_.
- A. TTHM5 and HTAA5
  - B. Halos
  - C. DBP levels
  - D. UV
  - E. Amounts of rainfall
  - F. None of the Above

**Who must comply with the rule?**

314. The \_\_\_\_\_ regulates community and nontransient noncommunity water systems that treat their water with a primary or residual disinfectant other than ultraviolet light.

- A. DBPs from chlorination
- B. Chlorine and chloramine
- C. Stage 2 DBPR
- D. Total Coliform Rule
- E. TTHM and HAA5
- F. None of the Above

315. A public water system that serves year-round residents of a community, subdivision, or mobile home park that has at least 15 service connections or an average of at least 25 residents is called \_\_\_\_\_.

- A. NTNCWS
- B. A non-community water system
- C. A community water system (CWS)
- D. Trailer park
- E. A nontransient water system
- F. None of the Above

316. A water system that serves at least 25 of the same people more than six months of the year, but not as primary residence, such as schools, businesses, and day care facilities is called \_\_\_\_\_.

- A. Trailer park
- B. A non-community water system
- C. A community water system (CWS)
- D. A nontransient non-community water system (NTNCWS)
- E. A nontransient water system
- F. None of the Above

**What are Disinfection Byproducts (DBPs)?**

317. Which term forms when disinfectants used to treat drinking water react with naturally occurring materials in the water (e.g., decomposing plant material)?

- A. Disinfectants
- B. DBLs
- C. Humic
- D. Disinfection byproducts (DBPs)
- E. Sodium Thiosulfate
- F. None of the Above

318. Total trihalomethanes and haloacetic acids are widely occurring \_\_\_\_\_ formed during disinfection with chlorine and chloramine.

- A. Sodium Thiosulfate
- B. Chlorine and chloramine
- C. Stage 2 DBPR
- D. Classes of DBPs
- E. Trihalomethanes and haloacetic acids
- F. None of the Above

319. The amount of \_\_\_\_\_ can change daily, depending on the season, water temperature, amount of disinfectant added, and the amount of plant material in the water.

- A. Thiols
- B. Chlorine and chloramine
- C. Stage 2 DBPR
- D. Classes of DBPs
- E. Trihalomethanes and haloacetic acids
- F. None of the Above



**Are THMs and HAAs the only disinfection byproducts?**

320. \_\_\_\_\_ act as indicators for DBP occurrence. They typically occur at higher levels than other known or unknown DBPs.
- A. DBPs from chlorination
  - B. Chlorine and chloramine
  - C. Stage 2 DBPR
  - D. Classes of DBPs
  - E. TTHM and HAA5
  - F. None of the Above

**Stage 2 DBP Rule Federal Register Notices**

321. Chlorine and its \_\_\_\_\_ are neutrally charged and therefore easily penetrate the negatively charged surface of pathogens.
- A. Halogen
  - B. Water chlorination
  - C. Chlorine as a disinfectant
  - D. Hydrolysis product hypochlorous acid
  - E. Hypochlorous acid
  - F. None of the Above
322. There are specific microbial pathogens, such as \_\_\_\_\_, which can cause illness and is resistant to traditional disinfection practices.
- A. Cryptosporidium
  - B. Sodium hypochlorite
  - C. Bromoform
  - D. Emerging threats to safe drinking water
  - E. Hypochlorous acid (HOCl), and hydrochloric acid (HCl)
  - F. None of the Above

**Water Sampling and Laboratory Procedures Chapter 9**

**Arsenic**

323. Long-term exposure to \_\_\_\_\_ in drinking water may cause cancer in humans.
- A. Arsenic
  - B. Copper
  - C. Basalt
  - D. THHMMS
  - E. Silica
  - F. None of the Above
324. The EPA limit for \_\_\_\_\_ in drinking water is 10 ppb.
- A. Arsenic
  - B. Trihalomethanes
  - C. Disinfection
  - D. Copper
  - E. Disinfection byproducts (DBPs)
  - F. None of the Above
325. \_\_\_\_\_ in water supplies comes from the erosion of rocks, minerals, and soil.
- A. Arsenic
  - B. Trihalomethanes
  - C. Disinfection byproducts
  - D. Basalt
  - E. Granite
  - F. None of the Above

**ICR**

326. The ICR data will be used by EPA to support future regulation of microbial contaminants, disinfectants, and disinfection byproducts.
- A. True
  - B. False
327. The rule is intended to provide EPA with information on chemical byproducts that form when disinfectants used for microbial control react with chemicals already present in source water Disease-causing microorganisms, including Cryptosporidium; and engineering data to control these contaminants.
- A. True
  - B. False

### Disinfection Byproduct Regulations

328. Which compound/element/substance are a group of chemicals that are formed along with other disinfection byproducts when chlorine or other disinfectants are used?

- A. Disinfectant residual
- B. Chlorite
- C. Haloacetic Acids (HAA5)
- D. Giardia and viruses
- E. Disinfection By-Products (DBPs)
- F. None of the Above

329. \_\_\_\_\_ is a disinfection byproduct that forms when ozone reacts with with naturally occurring bromide in the source water.

- A. Bromate
- B. Counter pathogens
- C. Monobromoacetic acid
- D. From the results of coliform testing
- E. Bacteria, Virus and Intestinal parasites
- F. None of the Above

330. Under the \_\_\_\_\_, total trihalomethanes (TTHM) are regulated at a maximum allowable annual average level of 80 ppb for large surface water public water systems.

- A. Cryptosporidium Rules
- B. Disinfection Rules
- C. Disinfection byproduct
- D. Total Trihalomethane Rule
- E. Stage 1 DBPR
- F. None of the Above

331. The new TTHM standards in the \_\_\_\_\_ became effective in December 2001 for large surface water public water systems, and in December 2003 for small surface water and all ground water systems.

- A. Cryptosporidium Rules
- B. Disinfection Rules
- C. Disinfection byproduct
- D. Total Trihalomethane Rule
- E. Stage 1 DBPR
- F. None of the Above

332. When disinfectants used in water treatment plants react with bromide and/or natural organic matter in the source water, \_\_\_\_\_ are formed.

- A. Cryptosporidium
- B. Trihalomethanes
- C. Chlorine byproduct
- D. Total Trihalomethane
- E. Disinfection byproducts (DBPs)
- F. None of the Above

333. Different types or amounts of \_\_\_\_\_ are produced by different disinfectants.

- A. Cryptosporidium
- B. Giardia
- C. Chlorine byproducts
- D. Regulations
- E. Disinfection byproducts (DBPs)
- F. None of the Above

334. Disinfection byproducts that have been indentified in drinking water include trihalomethanes, \_\_\_\_\_, bromate, and chlorite.

- A. Cryptosporidium
- B. Giardia
- C. Haloacetic acids
- D. Chlorine
- E. Disinfection byproducts (DBPs)
- F. None of the Above

335. Chloroform, bromodichloromethane, dibromochloromethane, and bromoform are \_\_\_\_\_. These chemicals form when chlorine or other disinfectants are used to control microbial contaminants in drinking water.

- A. Trihalomethanes (THM)
- B. Chlorites
- C. Haloacetic Acids (HAA5)
- D. Giardia and viruses
- E. Disinfection Byproducts (DBPs)
- F. None of the Above

### Microbial Regulations

336. The Surface Water Treatment Rule was implemented by USEPA to counter pathogens in drinking water.

- A. True      B. False

337. The \_\_\_\_\_ specifies treatment criteria that include turbidity limits, disinfectant residual, and disinfectant contact time conditions.

- A. Long Term 1 Rule      D. Surface Water Treatment Rule  
B. Maximum Contaminant Level Goal (MCLG)      E. Interim Enhanced Surface Water  
C. Stage 1 Byproducts Rule      F. None of the Above

338. The Total Coliform Rule (TCR) of 1989 and the \_\_\_\_\_ regulate microbial contamination of drinking water sources. The SWTR covers all water systems that use surface water or groundwater under the direct influence of surface water.

- A. Long Term 1 Enhanced Surface Water Treatment Rule  
B. Maximum Contaminant Level Goal (MCLG)  
C. Stage 1 Disinfectants/Disinfection Byproducts Rule  
D. Surface Water Treatment Rule  
E. Interim Enhanced Surface Water Treatment Rule  
F. None of the Above

339. The EPA established a MCL of 0.0010 for all public water systems and a 99% removal requirement for Cryptosporidium in filtered public water systems that serve at least 100,000 people. The new rule tightened turbidity standards back in December 2001.

- A. True      B. False

340. Color is an indicator of the physical removal of particulates, including pathogens.

- A. True      B. False

### Bacteriological Monitoring Section

341. \_\_\_\_\_ are usually harmless, occur in high densities, and are easily cultured.

- A. Indicator bacteria      D. Microbiological analysis  
B. Bacteria tests      E. Presence of an indicator  
C. Contaminate      F. None of the Above

342. Commonly used indicators for routine monitoring of drinking water include total coliforms, fecal coliforms, and \_\_\_\_\_.

- A. Sample container      D. Escherichia coli (E. coli)  
B. Bacteria tests      E. Iron bacteria  
C. Coliform bacteria      F. None of the Above

343. The routine microbiological analysis of drinking water is for \_\_\_\_\_, which is an indicator organism used to determine the biological quality of the water.

- A. Indicator bacteria      D. Coliform bacteria  
B. Bacteria tests      E. Presence of an indicator  
C. Contamination      F. None of the Above

344. Which of the following terms is used as an indicator organism to determine the biological quality of your water?

- A. Microbiological analysis
- B. Bac-T
- C. Coliform bacteria
- D. Escherichia coli (E. coli)
- E. Presence of an indicator
- F. None of the Above

345. The presence of an indicator or \_\_\_\_\_ in drinking water is an important health concern because of the risk of waterborne diseases and illnesses.

- A. Indicator bacteria
- B. Pathogenic bacteria
- C. Contaminate
- D. Microbiological analysis
- E. Presence of an indicator
- F. None of the Above

346. If \_\_\_\_\_ are present, the water may be contaminated with fecal material and, therefore, pathogens.

- A. Indicator bacteria
- B. Pathogenic bacteria
- C. Contaminate
- D. Microbiological analysis
- E. Presence of an indicator
- F. None of the Above

### **Bacteria Sampling**

347. Water samples for what process must always be collected in a sterile container?

- A. Indicators
- B. Bacteria tests
- C. Contamination
- D. pH analysis
- E. Presence of an indicator
- F. None of the Above

348. Refrigerate the sample and transport it to the testing laboratory within eight hours (in an ice chest). Many labs will accept bacteria samples on Friday. Mailing Indicator bacteria is not recommended because laboratory analysis results are not as reliable.

- A. True
- B. False

349. A water test is not needed to identify \_\_\_\_\_. It forms an obvious reddish-brown slime on the inside of pipes and fixtures.

- A. Colonies
- B. Algae
- C. Coliform bacteria
- D. Escherichia coli (E. coli)
- E. Iron bacteria
- F. None of the Above

350. The presence of \_\_\_\_\_ in drinking water indicates that the water may be contaminated with disease-causing organisms.

- A. Diseases
- B. Germs
- C. Coliform bacteria
- D. Escherichia coli (E. coli)
- E. Iron bacteria
- F. None of the Above

### **Laboratory Procedures**

351. One of four methods approved by the USEPA which may be used by the laboratory to perform the \_\_\_\_\_.

- A. Colilert
- B. Coliform
- C. Sample time
- D. Total coliform analysis
- E. Pathogen test
- F. None of the Above

## Methods

352. The MMO-MUG test, marketed as \_\_\_\_\_, is the most common method used for total coliform analysis.

- A. Colilert
- B. Coliform
- C. Sample stuff
- D. Total coliform analysis
- E. Pathogen media
- F. None of the Above

353. If coliforms are present, the laboratory will analyze the sample further to determine if these are \_\_\_\_\_ and \_\_\_\_\_ and report their presence or absence.

- A. Colilert, E. coli
- B. Coliforms, E. coli
- C. Fecal coliforms, E. coli
- D. Total coliform analysis, Pathogens
- E. Pathogens, Total coliform analysis
- F. None of the Above

## Types of Water Samples

354. The type of \_\_\_\_\_ you are collecting must be properly identified on the laboratory form.

- A. Colilert
- B. Coliforms
- C. Sample
- D. Total coliform analysis
- E. Pathogens
- F. None of the Above

## The three (3) types of samples are:

355. Samples collected following a coliform present' routine sample. The number of repeat samples to be collected is based on the number of \_\_\_\_\_ samples you normally collect.

- A. Repeat
- B. Special
- C. QA QC
- D. Total coliform analysis
- E. Routine
- F. None of the Above

356. A sample collected after repairs to the system and before it is placed back in operation is an example of a \_\_\_\_\_ sample.

- A. Repeat
- B. Special
- C. Sample
- D. Total coliform analysis
- E. Routine
- F. None of the Above

357. \_\_\_\_\_ samples are collected routinely in accordance with an approved sampling plan to monitor for contamination.

- A. Repeat
- B. Special
- C. Sample
- D. Total coliform analysis
- E. Routine
- F. None of the Above

## Repeat Sampling

358. If a \_\_\_\_\_ is total coliform or fecal coliform present, a set of repeat samples must be collected within 24 hours after being notified by the laboratory.

- A. MCL compliance
- B. Distribution system
- C. Routine sample
- D. Original sampling location
- E. Repeat sample(s)
- F. None of the Above

**The follow-up for repeat sampling is:**

359. If a system collects only one \_\_\_\_\_ per month or quarter, it must collect four (4) repeat samples.

- A. Special sample
- B. Routine sample
- C. Repeat sample
- D. Coliform present
- E. Original sampling location
- F. None of the Above

360. For systems collecting two (2) or more routine samples per month, three (3) \_\_\_\_\_ must be collected.

- A. Compliance sample
- B. Distribution sample
- C. Routine sample
- D. QA/QC Split
- E. Repeat sample(s)
- F. None of the Above

361. Repeat samples must be collected from: Within five (5) service connections upstream from the?

- A. MCL compliance
- B. Distribution system
- C. Routine sample
- D. Original sampling location
- E. Repeat sample(s)
- F. None of the Above

362. One of the repeat samples must be collected from within five (5) service connections downstream from the \_\_\_\_\_.

- A. Special Sample
- B. Routine sample
- C. Repeat sample(s)
- D. Coliform present
- E. Original sampling location
- F. None of the Above

363. Repeat samples must be collected from: If the system has only one service connection, the \_\_\_\_\_ must be collected from the same sampling location over a four-day period or on the same day.

- A. Special Sample
- B. Routine sample
- C. Repeat sample(s)
- D. Coliform present
- E. Original sampling location
- F. None of the Above

364. Repeat samples must be collected from: All \_\_\_\_\_ are included in the MCL compliance calculation.

- A. Special Sample
- B. Routine sample
- C. Repeat sample(s)
- D. Coliform present
- E. Original sampling location
- F. None of the Above

**Sampling Procedures**

365. What must be followed and all operating staff must be clear on how to follow the sampling plan?

- A. Seal individual samples
- B. Chain of custody
- C. Distribution system
- D. Sample siting plan
- E. Positive for total coliform
- F. None of the Above

366. In order to properly implement the sample-siting plan, staff must understand the required sampling frequency and the \_\_\_\_\_ to be used for collecting the samples.

- A. Multiple sources
- B. Sample siting plan
- C. Total coliform rule
- D. Proper procedures and sampling containers
- E. Laboratory containers
- F. None of the Above

367. According to the text, proper procedures must be followed for repeat sampling whenever a routine sample result is?

- A. Seal individual samples
- B. Chain of custody
- C. Distribution system
- D. Sample siting plan
- E. Positive for total coliform
- F. None of the Above

**Chain of Custody Procedures**

368. If you have physical possession of a sample, have it in view, or have physically secured it to prevent tampering then it is defined as being in "custody."

- A. True
- B. False

369. Which of the following terms begins when the sample containers are obtained from the laboratory?

- A. Multiple sources
- B. Sample siting plan
- C. Total coliform
- D. Chain of custody record
- E. Sampling containers
- F. None of the Above

370. In addition to a \_\_\_\_\_, each custody sample may require a seal.

- A. Custody sample
- B. Chain of custody record
- C. Distribution system
- D. Sample siting plan
- E. Positive for total coliform
- F. None of the Above

371. Since a sample may be used as physical evidence, \_\_\_\_\_ procedures are used to maintain and document sample possession.

- A. Multiple sources
- B. Sample siting plan
- C. Total coliform
- D. TCR
- E. Chain of custody
- F. None of the Above

372. If both parties involved in the transfer must sign, date and note the time on the chain of custody record, this is known as?

- A. Multiple sources
- B. Sample siting plan
- C. Total coliform
- D. Samples transfer possession
- E. Sampling containers
- F. None of the Above

373. The recipient will then attach the \_\_\_\_\_ showing the transfer dates and times to the custody sheets.

- A. Seal individual samples
- B. Chain of custody
- C. Shipping invoices
- D. Sample siting plan
- E. Positive for total coliform
- F. None of the Above

374. If the samples are delivered to after-hours night drop-off boxes, the custody record should note such \_\_\_\_\_ and be locked with the sealed samples inside sealed boxes.

- A. Multiple sources
- B. Sample siting plan
- C. Total coliform
- D. TCR
- E. A transfer
- F. None of the Above

### Heterotrophic Plate Count HPC

375. Heterotrophic Plate Count (HPC) --- formerly known as the Standard Plate Count, is a procedure for estimating the number of live heterotrophic bacteria and measuring changes during water treatment and distribution in water or in swimming pools.

- A. True            B. False

376. The term " \_\_\_\_\_ " (CFU) refers to the chains, clusters, or single cells that form colonies of bacteria.

- A. Coliform bacteria units    D. HPC units  
B. MCLs units                    E. Colony-forming units  
C. Standards                      F. None of the Above

### Spread Plate Method

377. During this method, colonies are on the \_\_\_\_\_ where they can be distinguished readily from particles and bubbles.

- A. Agar surface                    D. Bottom  
B. Surface growth area        E. Material  
C. Top                                F. None of the Above

378. During the Spread Plate Method, \_\_\_\_\_ can easily be discerned and compared to published descriptions.

- A. Colonies growth                D. Heterotrophic organisms will grow  
B. Surface growth                E. Colony morphology  
C. Low counts                      F. None of the Above

### Membrane Filter Method

379. Large volumes of \_\_\_\_\_ can be tested by the Membrane Filter Method, and this method is preferred for low-count waters.

- A. Colonies                         D. Heterotrophic organisms  
B. Surface water                    E. MCL  
C. Low-turbidity water            F. None of the Above

### Heterotrophic Plate Count (Spread Plate Method)

380. \_\_\_\_\_ use inorganic carbon sources as their substrate. The heterotrophic Plate Count provides a technique to quantify the bacteriological activity of a sample.

- A. Colonies                         D. Heterotrophic organisms  
B. Surface growth                E. Autotrophic organisms  
C. AGAR                              F. None of the Above

381. Which term provides a technique to quantify the bacteriological activity of a sample?

- A. Colonies                         D. Heterotrophic Plate Count  
B. Heat                                E. MCL  
C. Agar                                F. None of the Above

382. The R2A agar provides a medium that will support a large variety of?

- A. Colonies                         D. Heterotrophic bacteria  
B. Bugs                                E. MCL  
C. Germs                              F. None of the Above



### Total Coliforms

383. According to the text, The MCL is based on the presence of total coliforms, and compliance is on a daily or weekly basis, depending on your water system type and state rule.

- A. True      B. False

384. According to the text, for systems which collect fewer than \_\_\_\_\_ samples per month.

- A. 5              D. 200  
B. 10             E. 40  
C. 100           F. None of the Above

385. For systems which collect \_\_\_\_\_ or more samples per month, no more than five (5) percent may be Positive.

- A. 5              D. 200  
B. 10             E. 40  
C. 100           F. None of the Above

### Acute Risk to Health (Fecal coliforms and E. coli)

386. If a routine analysis shows total coliform present, and a follow-up repeat analysis indicates fecal coliform or E. coli present, \_\_\_\_\_ has occurred.

- A. A routine analysis violation      D. An acute risk to human health violation  
B. A drinking violation                E. Fecal coliform or E. coli present  
C. A water penalty                      F. None of the Above

387. If routine analysis shows \_\_\_\_\_, and a follow-up repeat analysis indicates total coliform present, an acute risk to human health violation has occurred.

- A. A routine analysis violation      D. Presence of bacteria  
B. A drinking violation                E. Total and fecal coliform or E. coli present  
C. A MCL violation                      F. None of the Above

388. A water system is required to provide public notice via radio and television stations in the area when \_\_\_\_\_ occurs.

- A. A routine analysis violation      D. A human health violation  
B. A drinking water rule violation    E. An acute health risk violation  
C. A MCL violation                      F. None of the Above

389. According to the text, the type of contamination can pose an immediate threat to human health and notice must be given as soon as possible, but no later than 24 hours after notification from your laboratory of the test results.

- A. True      B. False

### Public Notice

390. A public notice must be issued by a water system whenever it fails to comply with an applicable MCL or \_\_\_\_\_.

- A. Routine analysis                      D. Human health violation  
B. Drinking water rule                  E. Fecal coliform or E. coli present  
C. Treatment technique                 F. None of the Above

391. Whenever a water system fails to comply with its monitoring and/or reporting requirements, a \_\_\_\_\_ is required.

- A. Routine analysis
- B. Drinking water rule
- C. MCL violation
- D. Public notice
- E. Fecal coliform or E. coli present count
- F. None of the Above

392. Each public notice must be issued properly and in a timely manner, and must contain certain information and \_\_\_\_\_.

- A. Legal analysis
- B. Drinking water rule information
- C. NOVs
- D. Mandatory language
- E. Fecal language
- F. None of the Above

393. The timing and place of posting of the public notice will depend on whether \_\_\_\_\_ is present to water users.

- A. A routine analysis
- B. A drinking water rule
- C. An acute risk
- D. Legal analysis
- E. Fecal coliform or E. coli
- F. None of the Above

**The following are acute violations:**

394. Which is violation of nitrate?

- A. Presence
- B. MCL
- C. MCLG
- D. Count
- E. Acute violations
- F. None of the Above

395. Any violation of the \_\_\_\_\_ for total coliforms, when fecal coliforms or E. coli are present, is an acute violation.

- A. Presence
- B. MCL
- C. MCLG
- D. Count
- E. Acute violations
- F. None of the Above

**Waterborne Microorganisms and Bacteria Appendix  
Classification**

396. Protozoa were commonly grouped in the kingdom of Protista together with the plant-like algae and fungus-like water molds and slime molds. In the 21st-century systematics, protozoans, along with ciliates, mastigophorans, and apicomplexans, are arranged as animal-like protists. However, protozoans are neither Animalia nor Metazoa (with the possible exception of the enigmatic, moldy Myxozoa).

- A. True
- B. False

397. These pseudopods are also used to capture prey; they simply engulf the food. They can detect the kind of prey and use different?

- A. Mechanisms
- B. Methods
- C. Chemistry
- D. Engulfing tactics
- E. Strategies
- F. None of the Above

398. A unique group of obligate, intracellular parasitic protozoa is \_\_\_\_\_.

- A. Foraminifera
- B. Protozoan fauna
- C. Cytoplasm of protozoa
- D. Soil biomass
- E. Microsporidia
- F. None of the Above

399. The \_\_\_\_\_ in protozoa collect and expel excess water.

- A. Flagella
- B. Contractile vacuoles
- C. Vacuole or tonoplast
- D. Free-living amoebae
- E. Cell's cytoplasm
- F. None of the Above

400. According to the text, which bug/creature/organism are entirely distinct from prokaryotic flagella?

- A. Eukaryotes
- B. Bacteria or viruses
- C. Protozoa
- D. Free-living amoebae
- E. Centrioles
- F. None of the Above