

**Registration form**

**Pathogens 101 CEU Training Course \$250.00**  
**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** \_\_\_\_\_

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

Wastewater Collection \_\_\_\_\_ Wastewater Treatment \_\_\_\_\_ Distribution \_\_\_\_\_

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

*Your certificate will be e-mailed to you in about two weeks.*

Technical Learning College TLC PO Box 3060 Chino Valley, AZ 86323  
Toll Free (866) 557-1746 Fax (928) 272-0747 [info@tlch2o.com](mailto: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. You are solely responsible to ensure this course is accepted for credit.

## **State Approval Listing URL...**

<http://www.tlch2o.com/PDF/CEU%20State%20Approvals.pdf>

*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.

## **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. This fee may not cover postage costs. If you need this service, simply write RUSH on the top of your Registration Form. We will place you in the front of the grading and processing line.

**Additional certificate for another Agency – additional fee \$50**

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

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

# Pathogens 101 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**

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

Did you receive the approval number, if applicable? \_\_\_\_\_

What is the course approval number, if applicable? \_\_\_\_\_

**You are responsible to ensure that TLC receives the Assignment and Registration Key. Please call us to ensure that we received it.**

**You can electronically complete this assignment in Adobe Acrobat DC.**

**Please circle, underline, bold or X only one correct answer**

- |                 |                 |                 |
|-----------------|-----------------|-----------------|
| 1. A B C D E F  | 15. A B C D E F | 29. A B C D E F |
| 2. A B C D E F  | 16. A B C D E F | 30. A B C D E F |
| 3. A B C D E F  | 17. A B C D E F | 31. A B C D E F |
| 4. A B C D E F  | 18. A B C D E F | 32. A B C D E F |
| 5. A B C D E F  | 19. A B C D E F | 33. A B C D E F |
| 6. A B C D E F  | 20. A B C D E F | 34. A B C D E F |
| 7. A B C D E F  | 21. A B C D E F | 35. A B C D E F |
| 8. A B C D E F  | 22. A B C D E F | 36. A B C D E F |
| 9. A B C D E F  | 23. A B C D E F | 37. A B C D E F |
| 10. A B C D E F | 24. A B C D E F | 38. A B C D E F |
| 11. A B C D E F | 25. A B C D E F | 39. A B C D E F |
| 12. A B C D E F | 26. A B C D E F | 40. A B C D E F |
| 13. A B C D E F | 27. A B C D E F | 41. A B C D E F |
| 14. A B C D E F | 28. A B C D E F | 42. A B C D E F |

43. A B C D E F      74. A B C D E F      105. A B C D E F  
44. A B C D E F      75. A B C D E F      106. A B C D E F  
45. A B C D E F      76. A B C D E F      107. A B C D E F  
46. A B C D E F      77. A B C D E F      108. A B C D E F  
47. A B C D E F      78. A B C D E F      109. A B C D E F  
48. A B C D E F      79. A B C D E F      110. A B C D E F  
49. A B C D E F      80. A B C D E F      111. A B C D E F  
50. A B C D E F      81. A B C D E F      112. A B C D E F  
51. A B C D E F      82. A B C D E F      113. A B C D E F  
52. A B C D E F      83. A B C D E F      114. A B C D E F  
53. A B C D E F      84. A B C D E F      115. A B C D E F  
54. A B C D E F      85. A B C D E F      116. A B C D E F  
55. A B C D E F      86. A B C D E F      117. A B C D E F  
56. A B C D E F      87. A B C D E F      118. A B C D E F  
57. A B C D E F      88. A B C D E F      119. A B C D E F  
58. A B C D E F      89. A B C D E F      120. A B C D E F  
59. A B C D E F      90. A B C D E F      121. A B C D E F  
60. A B C D E F      91. A B C D E F      122. A B C D E F  
61. A B C D E F      92. A B C D E F      123. A B C D E F  
62. A B C D E F      93. A B C D E F      124. A B C D E F  
63. A B C D E F      94. A B C D E F      125. A B C D E F  
64. A B C D E F      95. A B C D E F      126. A B C D E F  
65. A B C D E F      96. A B C D E F      127. A B C D E F  
66. A B C D E F      97. A B C D E F      128. A B C D E F  
67. A B C D E F      98. A B C D E F      129. A B C D E F  
68. A B C D E F      99. A B C D E F      130. A B C D E F  
69. A B C D E F      100. A B C D E F      131. A B C D E F  
70. A B C D E F      101. A B C D E F      132. A B C D E F  
71. A B C D E F      102. A B C D E F      133. A B C D E F  
72. A B C D E F      103. A B C D E F      134. A B C D E F  
73. A B C D E F      104. A B C D E F      135. A B C D E F

136. A B C D E F      167. A B C D E F      198. A B C D E F  
137. A B C D E F      168. A B C D E F      199. A B C D E F  
138. A B C D E F      169. A B C D E F      200. A B C D E F  
139. A B C D E F      170. A B C D E F      201. A B C D E F  
140. A B C D E F      171. A B C D E F      202. A B C D E F  
141. A B C D E F      172. A B C D E F      203. A B C D E F  
142. A B C D E F      173. A B C D E F      204. A B C D E F  
143. A B C D E F      174. A B C D E F      205. A B C D E F  
144. A B C D E F      175. A B C D E F      206. A B C D E F  
145. A B C D E F      176. A B C D E F      207. A B C D E F  
146. A B C D E F      177. A B C D E F      208. A B C D E F  
147. A B C D E F      178. A B C D E F      209. A B C D E F  
148. A B C D E F      179. A B C D E F      210. A B C D E F  
149. A B C D E F      180. A B C D E F      211. A B C D E F  
150. A B C D E F      181. A B C D E F      212. A B C D E F  
151. A B C D E F      182. A B C D E F      213. A B C D E F  
152. A B C D E F      183. A B C D E F      214. A B C D E F  
153. A B C D E F      184. A B C D E F      215. A B C D E F  
154. A B C D E F      185. A B C D E F      216. A B C D E F  
155. A B C D E F      186. A B C D E F      217. A B C D E F  
156. A B C D E F      187. A B C D E F      218. A B C D E F  
157. A B C D E F      188. A B C D E F      219. A B C D E F  
158. A B C D E F      189. A B C D E F      220. A B C D E F  
159. A B C D E F      190. A B C D E F      221. A B C D E F  
160. A B C D E F      191. A B C D E F      222. A B C D E F  
161. A B C D E F      192. A B C D E F      223. A B C D E F  
162. A B C D E F      193. A B C D E F      224. A B C D E F  
163. A B C D E F      194. A B C D E F      225. A B C D E F  
164. A B C D E F      195. A B C D E F      226. A B C D E F  
165. A B C D E F      196. A B C D E F      227. A B C D E F  
166. A B C D E F      197. A B C D E F      228. A B C D E F

229. A B C D E F      260. A B C D E F      291. A B C D E F  
230. A B C D E F      261. A B C D E F      292. A B C D E F  
231. A B C D E F      262. A B C D E F      293. A B C D E F  
232. A B C D E F      263. A B C D E F      294. A B C D E F  
233. A B C D E F      264. A B C D E F      295. A B C D E F  
234. A B C D E F      265. A B C D E F      296. A B C D E F  
235. A B C D E F      266. A B C D E F      297. A B C D E F  
236. A B C D E F      267. A B C D E F      298. A B C D E F  
237. A B C D E F      268. A B C D E F      299. A B C D E F  
238. A B C D E F      269. A B C D E F      300. A B C D E F  
239. A B C D E F      270. A B C D E F      301. A B C D E F  
240. A B C D E F      271. A B C D E F      302. A B C D E F  
241. A B C D E F      272. A B C D E F      303. A B C D E F  
242. A B C D E F      273. A B C D E F      304. A B C D E F  
243. A B C D E F      274. A B C D E F      305. A B C D E F  
244. A B C D E F      275. A B C D E F      306. A B C D E F  
245. A B C D E F      276. A B C D E F      307. A B C D E F  
246. A B C D E F      277. A B C D E F      308. A B C D E F  
247. A B C D E F      278. A B C D E F      309. A B C D E F  
248. A B C D E F      279. A B C D E F      310. A B C D E F  
249. A B C D E F      280. A B C D E F      311. A B C D E F  
250. A B C D E F      281. A B C D E F      312. A B C D E F  
251. A B C D E F      282. A B C D E F      313. A B C D E F  
252. A B C D E F      283. A B C D E F      314. A B C D E F  
253. A B C D E F      284. A B C D E F      315. A B C D E F  
254. A B C D E F      285. A B C D E F      316. A B C D E F  
255. A B C D E F      286. A B C D E F      317. A B C D E F  
256. A B C D E F      287. A B C D E F      318. A B C D E F  
257. A B C D E F      288. A B C D E F      319. A B C D E F  
258. A B C D E F      289. A B C D E F      320. A B C D E F  
259. A B C D E F      290. A B C D E F      321. A B C D E F

322. A B C D E F      353. A B C D E F      384. A B C D E F  
323. A B C D E F      354. A B C D E F      385. A B C D E F  
324. A B C D E F      355. A B C D E F      386. A B C D E F  
325. A B C D E F      356. A B C D E F      387. A B C D E F  
326. A B C D E F      357. A B C D E F      388. A B C D E F  
327. A B C D E F      358. A B C D E F      389. A B C D E F  
328. A B C D E F      359. A B C D E F      390. A B C D E F  
329. A B C D E F      360. A B C D E F      391. A B C D E F  
330. A B C D E F      361. A B C D E F      392. A B C D E F  
331. A B C D E F      362. A B C D E F      393. A B C D E F  
332. A B C D E F      363. A B C D E F      394. A B C D E F  
333. A B C D E F      364. A B C D E F      395. A B C D E F  
334. A B C D E F      365. A B C D E F      396. A B C D E F  
335. A B C D E F      366. A B C D E F      397. A B C D E F  
336. A B C D E F      367. A B C D E F      398. A B C D E F  
337. A B C D E F      368. A B C D E F      399. A B C D E F  
338. A B C D E F      369. A B C D E F      400. A B C D E F  
339. A B C D E F      370. A B C D E F      401. A B C D E F  
340. A B C D E F      371. A B C D E F      402. A B C D E F  
341. A B C D E F      372. A B C D E F      403. A B C D E F  
342. A B C D E F      373. A B C D E F      404. A B C D E F  
343. A B C D E F      374. A B C D E F      405. A B C D E F  
344. A B C D E F      375. A B C D E F      406. A B C D E F  
345. A B C D E F      376. A B C D E F      407. A B C D E F  
346. A B C D E F      377. A B C D E F      408. A B C D E F  
347. A B C D E F      378. A B C D E F      409. A B C D E F  
348. A B C D E F      379. A B C D E F      410. A B C D E F  
349. A B C D E F      380. A B C D E F      411. A B C D E F  
350. A B C D E F      381. A B C D E F      412. A B C D E F  
351. A B C D E F      382. A B C D E F      413. A B C D E F  
352. A B C D E F      383. A B C D E F      414. A B C D E F

415. A B C D E F      446. A B C D E F      477. A B C D E F  
416. A B C D E F      447. A B C D E F      478. A B C D E F  
417. A B C D E F      448. A B C D E F      479. A B C D E F  
418. A B C D E F      449. A B C D E F      480. A B C D E F  
419. A B C D E F      450. A B C D E F      481. A B C D E F  
420. A B C D E F      451. A B C D E F      482. A B C D E F  
421. A B C D E F      452. A B C D E F      483. A B C D E F  
422. A B C D E F      453. A B C D E F      484. A B C D E F  
423. A B C D E F      454. A B C D E F      485. A B C D E F  
424. A B C D E F      455. A B C D E F      486. A B C D E F  
425. A B C D E F      456. A B C D E F      487. A B C D E F  
426. A B C D E F      457. A B C D E F      488. A B C D E F  
427. A B C D E F      458. A B C D E F      489. A B C D E F  
428. A B C D E F      459. A B C D E F      490. A B C D E F  
429. A B C D E F      460. A B C D E F      491. A B C D E F  
430. A B C D E F      461. A B C D E F      492. A B C D E F  
431. A B C D E F      462. A B C D E F      493. A B C D E F  
432. A B C D E F      463. A B C D E F      494. A B C D E F  
433. A B C D E F      464. A B C D E F      495. A B C D E F  
434. A B C D E F      465. A B C D E F      496. A B C D E F  
435. A B C D E F      466. A B C D E F      497. A B C D E F  
436. A B C D E F      467. A B C D E F      498. A B C D E F  
437. A B C D E F      468. A B C D E F      499. A B C D E F  
438. A B C D E F      469. A B C D E F      500. A B C D E F  
439. A B C D E F  
440. A B C D E F  
441. A B C D E F  
442. A B C D E F  
443. A B C D E F  
444. A B C D E F  
445. A B C D E F



# PATHOGENS 101

## CEU TRAINING 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.

**Additional certificate for another Agency – additional fee \$50**

**Please fax the answer key to TLC  
(928) 272-0747**

**Always call to confirm that we've received your paperwork.**

# Pathogens 101 CEU Training Course Assignment

*The Assignment (Exam) is also available in Word on the Internet for your Convenience, please visit [www.ABCTL.com](http://www.ABCTL.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 manual 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 Answer Key and make copy for yourself. You can e-mail or fax your Answer Key along with the Registration Form to TLC. **(S) Means answer may be plural or singular. Multiple Choice Section, One answer per question and please use the answer key.**

## Waterborne Pathogens Section

1. Pathogens \_\_\_\_\_ and affect people in a relatively short amount of time.

- A. Limits the treatment process
- B. Are mild in nature
- C. Cause intestinal illness
- D. Will cause fatalities
- E. Limit the travel of pathogens
- 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
- B. Dermal to fecal route
- C. Oral to fecal route
- D. Influenza route
- E. Waterborne mishaps
- F. None of the Above

3. A source of waterborne pathogens is the stool of infected humans or animals. The stool contains the disease-causing bacteria, viruses, and \_\_\_\_\_.

- A. Fecal Coliform and E coli
- B. Protozoa
- C. Macroorganisms
- D. Cryptosporidiosis
- E. Bioslime
- 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. \_\_\_\_\_ are different from the pathogens that cause influenza or the bacteria that cause tuberculosis.

- A. Fecal Coliform and E coli
- B. Giardia lamblia
- C. Microorganisms
- D. Waterborne Pathogen(s)
- E. Coliform bacteria
- F. None of the Above

6. \_\_\_\_\_ are spread through the air when an infected person coughs or sneezes.

- A. Fecal Coliform and E coli
- B. Giardia lamblia
- C. Microorganisms
- D. Influenza virus and tuberculosis bacteria
- E. Coliform bacteria
- F. None of the Above

### Bacterial Diseases

7. What is the most common diarrhea illness caused by bacteria?

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

8. \_\_\_\_\_ has most often been associated with food and un-chlorinated water.

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

### Types of Bacteria

9. \_\_\_\_\_ can also cause "travelers' diarrhea."

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

10. Cholera, Legionellosis, salmonellosis, \_\_\_\_\_, and yersiniosis are other bacterial diseases that can be transmitted through water.

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

11. Chlorine kills or inactivates \_\_\_\_\_ in water.

- A. Cysts
- B. Cryptogiardia
- C. Bacteria
- D. Viral Plaques
- E. Oocysts
- F. None of the Above

### Viral-Caused Diseases

12. \_\_\_\_\_ is a viral disease that may be spread through water.

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

13. Most \_\_\_\_\_ 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

### Protozoan Caused Diseases

14. Which of the following bugs is larger than bacteria and viruses but still microscopic; they invade and inhabit the gastrointestinal tract?

- A. HIV infections
- B. Symptoms
- C. Giardiasis
- D. Hepatitis A
- E. Protozoan pathogens
- F. None of the Above

15. A few of the parasites enter the environment in a dormant form, with a protective cell wall, called a?
- A. Lamblia      D. Cyst  
 B. Shell      E. Infection  
 C. Case      F. None of the Above
16. Which of the following terms can survive in the environment for long periods and is extremely resistant to conventional disinfectants such as chlorine?
- A. HIV      D. Hepatitis A cyst  
 B. Symptoms      E. Cyst  
 C. Infection      F. None of the Above
17. Which of the following terms is a commonly reported protozoan-caused disease, it has also been referred to as backpacker's disease?
- A. Giardia lamblia      D. Cryptosporidiosis  
 B. Giardiasis      E. Anti-water Infection  
 C. Malaise      F. None of the Above
18. The backpacker's disease incubation period is 5-25 days or longer, with an average of 7-10 days, many infections are?
- A. Total      D. Asymptomatic  
 B. Weak      E. Unisymptomatic  
 C. Strong      F. None of the Above
19. Which of the following bugs/disease terms occurs worldwide primarily because customers are receiving their drinking water from streams or rivers without adequate disinfection or a filtration system?
- A. HIV infections      D. Hepatitis A symptoms  
 B. Symptoms      E. Cryptosporidiosis symptoms  
 C. Giardiasis      F. None of the Above

**Microbes**

20. Coliform bacteria are common in the environment and are considered harmful.
- A. True    B. False
21. The presence of coliform bacteria in drinking water indicates that the water may be contaminated with germs that can cause disease.
- A. True    B. False
22. \_\_\_\_\_ in human or animal wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms.
- A. Microbes      D. Cryptosporidiosis  
 B. Giardia lamblia      E. Coliform bacteria  
 C. Microorganisms      F. None of the Above
23. The presence of \_\_\_\_\_ bacteria indicates that the water may be contaminated with fecal matter from humans or animals.
- A. Fecal Coliform and E coli      D. Bac-T  
 B. Protozoa      E. Coliform bacteria  
 C. Thermophilic      F. None of the Above
24. What is the parasite that enters lakes and rivers through sewage and animal waste? It causes cryptosporidiosis, a mild gastrointestinal disease?
- A. Fecal Coliform and E coli      D. Cryptosporidiosis  
 B. Giardia lamblia      E. Cryptosporidium  
 C. Microorganisms      F. None of the Above

25. Giardia lamblia is a parasite that enters drinking water sources through sewage and animal waste, this parasite causes \_\_\_\_\_.
- A. Fecal Coliform and E coli                      D. Cryptosporidiosis  
 B. Gastrointestinal illness                      E. Coliform bacteria  
 C. Microorganisms                                  F. None of the Above
26. An opportunistic pathogen has to invade a susceptible host for certain \_\_\_\_\_ to develop.
- A. Diseases    D. Divide  
 B. Mutations                                        E. Reproduction  
 C. Carriers                                         F. None of the Above
27. Which of the following terms are caused by dietary deficiencies?
- A. Disease(s)                                      D. Pathogen(s)  
 B. Mutation(s)                                    E. Microorganisms  
 C. Carriers                                         F. None of the Above
28. Some \_\_\_\_\_ are very difficult to grow in the laboratory.
- A. Diseases                                         D. Pathogens  
 B. Mutations                                       E. Microbes  
 C. Carriers                                         F. None of the Above
29. Fastidious organisms can now be grown in cultures of human or animal cells or in small animals.
- A. True   B. False
30. All \_\_\_\_\_ do not affect all laboratory animals.
- A. Pathogens                                        D. Disease  
 B. Secondary invaders                         E. Chemical reactions  
 C. Microorganisms                                F. None of the Above
31. Some of diseases are inherited or are caused by abnormality in chromosomes are influenced by?
- A. Environmental factors                        D. Disease  
 B. Secondary invaders                         E. Chemical reactions  
 C. Microorganisms                                F. None of the Above

**Metabolism**

32. A cell's \_\_\_\_\_ includes all the chemical reactions by which food is transformed for use by the cell.
- A. Fastidious                                      D. Germ theory of disease  
 B. Metabolism                                     E. Osmosis  
 C. Chemical reactions                         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

**Bacteria**

34. "Bacteria" is a plural word. The singular for this word is "bacterium" (bacter = rod, staff). Bacteria are prokaryotes (Kingdom Monera), which means that they have No true nucleus. They do have one chromosome of double-stranded DNA in a ring.
- A. True   B. False

35. The \_\_\_\_\_ that some bacteria need to do photosynthesis is built into their cell membranes.
- A. Chlorophyll                      D. Double-stranded DNA  
 B. Organelle                        E. Bacilli  
 C. Cellulose                         F. None of the Above
36. Bacteria have only one \_\_\_\_\_.
- A. Chloroplast                      D. Double-stranded DNA  
 B. Organelle                        E. A single cell  
 C. Cellulose                         F. None of the Above
37. There are some bacteria that can live in temperatures above the boiling point.
- A. True   B. False

### Introduction to Pathogens

38. Because of emerging waterborne diseases, a new dimension to the global epidemiology of cholera-an ancient scourge-was provided by the emergence of?
- A. Cholera                            D. Vibrio cholerae O139  
 B. Legionella pneumophila       E. Campylobacter  
 C. Shigellosis                       F. None of the Above
39. Water authorities are reassessing the adequacy of current water-quality regulations because of outbreaks of chlorine-resistant \_\_\_\_\_.
- A. Campylobacter                  D. Cryptosporidium  
 B. Pathogen                         E. Shigella dysenteriae  
 C. Pontiac fever                    F. None of the Above
40. All of the following have been associated with waterborne illnesses: hepatitis viruses (including hepatitis E virus), Campylobacter jejuni, microsporidia, cyclospora, \_\_\_\_\_, calciviruses and environmental bacteria like Mycobacterium spp, aeromonads, Legionella pneumophila and multidrug-resistant Pseudomonas aeruginosa.
- A. Yersinia enterocolitica        D. Emergence of disinfection resistant variants  
 B. Legionella pneumophila       E. Campylobacter  
 C. Shigellosis                       F. None of the Above
41. Areas of water quality concerns include life cycles, mechanisms of infection, protective or dormant states, emergence of disinfection resistant variants, \_\_\_\_\_, regrowth in distribution lines.
- A. Optimal pathogen removal techniques      D. Primary methods used for the disinfection  
 B. Disinfection process                            E. Extensive waterborne disease research  
 C. Environmental and regulatory impact        F. None of the Above
42. Humans are the reservoir for the Salmonella typhi pathogen, which causes diarrheal illness, and also known as?
- A. Campylobacter                  D. Typhoid fever  
 B. Pathogen                         E. Shigella dysenteriae  
 C. Pontiac fever                    F. None of the Above
43. Salmonella typhi. Prevention strategies for this pathogen include source protection, halogenation of water, and \_\_\_\_\_.
- A. Adding chlorine                  D. Adding NH<sub>4</sub>  
 B. Adding sodium chlorite        E. Boiling water for one minute  
 C. Adding KNO<sub>4</sub>                    F. None of the Above

44. *Shigella* species, in the United States two-thirds of the shigellosis in the U.S. is caused by *Shigella sonnei*, and the remaining one-third is caused by *Shigella flexneri*.  
A. True B. False
45. *Campylobacter*, the basics. It's a bacterium. It causes diarrheal illness. *Campylobacter* is primarily associated with poultry, animals, and humans.  
A. True B. False
46. *Vibrio cholerae*, the basics. It's a virus. It causes diarrheal illness, also known as cholera. It is typically associated with aquatic environments, shell stocks, and human. *Vibrio cholerae* has also been associated with ship ballast water.  
A. True B. False
47. Legionnaire's disease, which causes a severe pneumonia, and the second, \_\_\_\_\_, which is a nonpneumonia illness; it's typically an influenza-like illness, and it's less severe.  
A. *Campylobacter* D. Typhoid fever  
B. Pathogen E. *Shigella dysenteriae*  
C. Pontiac fever F. None of the Above
48. Which pathogen is naturally found in water, both natural and artificial water sources?  
A. *Campylobacter* D. Typhoid fever  
B. *Legionella* E. *Hydrodysenteriae*  
C. Pontiac fever F. None of the Above
49. *Legionella*, prevention. *Legionella* in water systems. Hot water in tanks should be maintained between \_\_\_\_\_ degrees Centigrade.  
A. 81 to 100 D. 71 and 77  
B. 110 to 210 E. 75 and 85  
C. 75 – 212 F. None of the Above
50. *Pseudomonas*, the basics. It's a protozoon. It is caused by visual contact with water. It can cause dermatitis, which is an inflammation of the skin, or it can cause otitis, which is an infection of the ear.  
A. True B. False
51. \_\_\_\_\_ is typically associated with soil and water.  
A. Hepatitis A virus D. *Pseudomonas*  
B. Diarrheal illness E. Waterborne outbreaks  
C. *Cryptosporidium* F. None of the Above
52. *Pseudomonas* prevention. Proper maintenance and disinfection of recreational water systems is important in preventing \_\_\_\_\_.  
A. Pathogen D. *Pseudomonas*  
B. *Cryptosporidium* E. Salmonellosis  
C. Hepatitis A virus F. None of the Above
53. Hepatitis A, the basics. It's a virus. It causes inflammation of the liver. And the reservoir for \_\_\_\_\_ is humans.  
A. Hepatitis A virus D. Hepatitis B  
B. Diarrheal illness E. Waterborne outbreaks  
C. *Cryptosporidium* F. None of the Above



54. Hepatitis A virus is resistant to combined chlorines and fecal matter can shield \_\_\_\_\_ from chlorine.
- A. Hepatitis A virus      D. Hepatitis B  
 B. Diarrheal illness      E. Waterborne outbreaks  
 C. Cryptosporidium      F. None of the Above
55. Humans are the reservoir for the Norovirus; prevention strategies for this pathogen include \_\_\_\_\_.
- A. Maintaining water systems      D. Containment protection  
 B. Source protection      E. Internal protection  
 C. Chlorine monoxide      F. None of the Above
56. Cryptosporidium causes diarrheal illness known as?
- A. Vomiting      D. Cryptosporidiosis  
 B. Hemorrhagic colitis      E. Salmonellosis  
 C. Diarrhea      F. None of the Above
57. Cryptosporidium is typically associated with animals and humans, and it can be acquired through consuming fecally contaminated food, contact with fecally contaminated soil and water.
- A. True    B. False
58. Cryptosporidium, prevention. Prevention strategies for this pathogen include source protection. A CT value of .96 is required when dealing with fecally accidents. CT equals a concentration, in parts per million, while time equals a contact time in minutes. Pseudomonas can also be prevented or eliminated by boiling water for one minute.
- A. True    B. False
59. Filtration with an "absolute" pore size of one micron or smaller can eliminate \_\_\_\_\_.
- A. Pathogen      D. Pseudomonas  
 B. Cryptosporidium      E. Salmonellosis  
 C. Hepatitis A virus      F. None of the Above
60. Giardia prevention strategies for this pathogen include \_\_\_\_\_; filtration, coagulation, and halogenation of drinking water.
- A. Maintaining hot water systems      D. Primary protection  
 B. Source protection      E. Secondary measurements  
 C. Sulfur dioxide      F. None of the Above
61. Schistosomatidae, the basics. It is a parasite. It is acquired through dermal contact, cercarial dermatitis and is commonly known as?
- A. Swimmer's itch      D. Pseudomonas  
 B. Beaver fever      E. Salmonellosis  
 C. Hemorrhagic colitis      F. None of the Above
62. Schistosomatidae prevention strategies for this pathogen include \_\_\_\_\_ or interrupting the life cycle of the parasite by treating birds with an anthelmintic drug.
- A. Maintaining clarifiers      D. Eliminating snails with a molluscicide  
 B. Source protection      E. Boiling  
 C. Placing boric acid on berms      F. None of the Above

63. Bacterial diseases that can be transmitted through water, Cholera, Legionellosis, salmonellosis, shigellosis, and?

- A. Yersiniosis
- B. HIV
- C. Hepatitis
- D. Foodborne or waterborne illnesses
- E. Amebiasis
- F. None of the Above

64. Which of the following organism/disease related term polio, and viral gastroenteritis (Norwalk agent) and this one are other 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

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

- A. True
- B. False

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

- A. True
- B. False

67. Which of the following organism/disease term 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**

68. 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

69. 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

70. Which of the following organism/disease related term 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

71. 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

72. Which of the following organism/disease term 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

73. Which of the following organism/disease term 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

### **Amebic Meningoencephalitis PAM Section Naegleria fowleri**

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

- A. True
- B. False

75. The incubation period for PAM is 2-15 days, after which severe meningitis-like symptoms suddenly start. As conditions worsen the patient falls into a coma, and usually dies 3-7 days after the onset of symptoms.

- A. True
- B. False

76. The PAM infection is caused by an amoeba that lives in soil and in freshwater ponds, lakes, and rivers.

- A. True
- B. False

77. PAM is very rare even though the amoeba that causes the infection is commonly found in the environment.

- A. True
- B. False

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

- A. True
- B. False

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

- A. True
- B. False

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

- A. True
- B. False

### **Noroviruses Section**

81. Noroviruses are a group of related viruses that cause acute gastroenteritis in humans.

- A. True
- B. False

82. A person with a norovirus illness may experience a low-grade fever, chills, headache, muscle aches, and a general sense of tiredness.

- A. True
- B. False

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

- A. True
- B. False

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

- A. True
- B. False

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

A. True B. False

86. Norovirus illnesses are very contagious and can spread rapidly through day-care centers or nursing homes.

A. True B. False

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

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

A. True B. False

88. 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

89. Which of the following terms is protected from the severe effects of cholera because they don't 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

90. \_\_\_\_\_ 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

91. 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

92. 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

93. \_\_\_\_\_ has been very rare in industrialized nations for the last 100 years.

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

94. Which of the following organism/disease related term 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

95. Which of the following organism/disease related term 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

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

- A. True
- B. False

97. 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

98. Cholera has two strains, toxic and nontoxic.

- A. True
- B. False

99. \_\_\_\_\_ 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

100. Genetic research has determined that a person's susceptibility to cholera and other diarrheas) is affected by their blood type. Those with type A blood is the most susceptible. 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

### **Cholera Treatment**

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

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

102. On reaching the intestinal wall, V. cholerae start producing the Antibiotic treatments that give the infected person a watery diarrhea. This carries the multiplying new generations of V. cholerae bacteria out into the drinking water of the next host if proper sanitation measures are not in place.

- A. True
- B. False

103. 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

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

- A. True
- B. False

105. 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

106. 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

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

- A. True
- B. False

108. 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

109. The term Cholera morbus was used to describe both nonepidemic cholera and other gastrointestinal diseases (sometimes epidemic) that resembled cholera. That term is not in current use, but is found in many older references.

- A. True
- B. False

### **Cryptosporidiosis Cryptosporidium**

110. 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

111. *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

112. 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

113. 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

114. Which of the following terms 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

115. 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

116. 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

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

- A. True
- B. False

118. 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

119. 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

120. 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

121. 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 that 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

### El Tor

122. 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

### Entamoeba histolytica

123. About one in 10 people who are infected with \_\_\_\_\_ becomes sick from the infection.

- A. Cytotoxic
- B. E. histolytica
- C. Symptoms
- D. Lamblia intestinalis
- E. El Tor strain
- F. None of the Above

124. Which term is associated to describe that the infected person illness is quite mild and can include loose stools, stomach pain, and stomach cramping?

- A. Illness
- B. Symptoms
- C. Bacteria
- D. Ameba
- E. Transmission of disease
- F. None of the Above

125. *E. histolytica* rarely invades the liver and forms an abscess. Even less commonly, it spreads to other parts of the body, such as the lungs or brain.

- A. True
- B. False

126. Which term is a severe form of amebiasis associated with stomach pain, bloody stools, and fever?

- A. Cytotoxic
- B. *E. histolytica*
- C. Symptoms
- D. *Lambliia intestinalis*
- E. Amebic dysentery
- F. None of the Above

127. Another waterborne pathogen is *Entamoeba histolytica*, which can cause diarrhea or a more serious invasive liver abscess, and when in contact with human cells, these amoebae are?

- A. Cytotoxic
- B. Malaise
- C. Symptoms
- D. *Lambliia intestinalis*
- E. Toxoplasmosis
- F. None of the Above

128. Because of the infection, internal organization is disrupted, organelles lyse, and the cell dies. The \_\_\_\_\_ may eat the dead cell or just absorb nutrients released from the cell.

- A. Illness
- B. *Cryptosporidium*
- C. Bacteria
- D. Ameba
- E. Transmission of disease
- F. None of the Above

### Hepatitis

129. 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

130. 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

131. Which of the following hepatitis is most likely to be transmitted in feces, through oral contact, or in water that's 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

132. Which of the following hepatitis 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



133. Which of the following hepatitis 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

134. Which of the following hepatitis 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

### Legionnaires' Disease - Legionella

135. 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

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

- A. True
- B. False

137. Which term is 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

138. The inhalation of small droplets of water or fine aerosol containing \_\_\_\_\_ is the most common cause of Legionnaires disease.

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

139. \_\_\_\_\_ are naturally found in rivers, lakes and ponds and may colonize manmade water systems such as air conditioning systems and cooling towers.

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

140. 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

141. 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

## Noroviruses

142. Which of the terms are a genetically diverse group of single-stranded RNA, non-enveloped viruses in the Caliciviridae family?

- A. Typhoid fever
- B. Salmonellosis
- C. Salmonella enterocolitis
- D. Salmonella infection
- E. Noroviruses
- F. None of the Above

143. Which of the terms have been traced to food that was handled by one infected person?

- A. Amebic dysentery
- B. Salmonella infection
- C. Typhoidal Salmonella
- D. Many norovirus outbreaks
- E. Nonbacterial outbreaks of gastroenteritis
- F. None of the Above

144. \_\_\_\_\_ is rapidly inactivated by either sufficient heating or by chlorine-based disinfectants, but the virus is less susceptible to alcohols and detergents, as it does not have a lipid envelope.

- A. Typhoid fever
- B. Salmonellosis
- C. Salmonella enterocolitis
- D. Salmonella infection
- E. Norovirus
- F. None of the Above

145. This genus name norovirus is derived from?

- A. Norovirus outbreaks
- B. Salmonella infection
- C. Typhoidal Salmonella
- D. Norwalk virus
- E. Nonbacterial outbreaks of gastroenteritis
- F. None of the Above

146. Which of the terms are transmitted by fecally contaminated food or water, by person-to-person contact, and via aerosolization of the virus and subsequent contamination of surfaces?

- A. Norovirus outbreaks
- B. Salmonella
- C. Typhoidal Salmonella
- D. Viruses
- E. Nonbacterial outbreaks of gastroenteritis
- F. None of the Above

147. Which of the terms are the most common cause of viral gastroenteritis in humans?

- A. Typhoid fever
- B. Salmonellosis
- C. Salmonella enterocolitis
- D. Salmonella infection
- E. Norovirus
- F. None of the Above

148. According to the text, after infection, immunity to \_\_\_\_\_ is usually incomplete and temporary.

- A. Norovirus outbreaks
- B. Salmonella infection
- C. Typhoidal Salmonella
- D. Incomplete and temporary
- E. Norovirus
- F. None of the Above

149. Which of the terms outbreaks will often occur in closed or semiclosed communities, such as long-term care facilities, overnight camps, hospitals, prisons, dormitories, and cruise ships, where the infection spreads very rapidly either by person-to-person transmission or through contaminated food?

- A. Typhoid fever
- B. Salmonellosis
- C. Salmonella enterocolitis
- D. Salmonella infection
- E. Norovirus infection
- F. None of the Above

## Salmonellosis

150. Which of the following terms in which Salmonella enterocolitis occurs?

- A. Salmonella
- B. Salmonellosis
- C. Salmonella enterocolitis
- D. Salmonella infection
- E. Norovirus
- F. None of the Above

151. Which of the following terms is an infection with Salmonella bacteria?

- A. Typhoid fever
- B. Salmonellosis
- C. Salmonella enterocolitis
- D. Salmonella infection
- E. Norovirus
- F. None of the Above

152. According to the text, most people infected with \_\_\_\_\_ develop diarrhea, fever, vomiting, and abdominal cramps 12 to 72 hours after infection. In most cases, the illness lasts four to seven days, and most people recover without treatment.

- A. Norovirus outbreaks
- B. Salmonella
- C. Typhoidal Salmonella
- D. Incomplete and temporary
- E. Nonbacterial outbreaks of gastroenteritis
- F. None of the Above

153. At the hospital, the patient may receive intravenous fluids to treat the dehydration, and may be given medications to provide symptomatic relief, such as fever reduction. In severe cases, the nonbacterial outbreaks of gastroenteritis may spread from the intestines to the blood stream, and then to other body sites, and can cause death unless the person is treated promptly with antibiotics.

- A. True
- B. False

154. Which term is a form of Salmonella can lead to typhoid fever?

- A. Typhoidal
- B. Salmonellosis
- C. Salmonella enterocolitis
- D. Salmonella infection
- E. Salmonella
- F. None of the Above

155. Typhoid fever is a life-threatening illness, and about 400 cases are reported each year in the United States, and 75% of these are acquired while traveling out of the country.

- A. True
- B. False

156. Typhoid fever is carried only by humans and is usually contracted through direct contact with the fecal matter of an infected person.

- A. True
- B. False

157. Which term is more commonly found in poorer countries, where unsanitary conditions are more likely to occur?

- A. Norovirus outbreaks
- B. Salmonella infection
- C. Typhoidal Salmonella
- D. Incomplete and temporary
- E. Nonbacterial outbreaks of gastroenteritis
- F. None of the Above

**Causes, incidence, and risk factors**

158. \_\_\_\_\_ is one of the most common types of food poisoning. It occurs when you swallow food or water that contains the salmonella bacteria.

- A. Typhoid fever
- B. Salmonellosis
- C. Salmonella enterocolitis
- D. Salmonella infection
- E. Norovirus
- F. None of the Above

159. Which term may get into the food you eat in several ways?

- A. Typhoid fever
- B. Salmonellosis
- C. Salmonella enterocolitis
- D. Salmonella infection
- E. Salmonella germs
- F. None of the Above

## Symptoms

160. Which term is an infection with bacteria called Salmonella. Most persons infected with Salmonella develop diarrhea, fever, and abdominal cramps 12 to 72 hours after infection?

- A. Norovirus outbreaks
- B. Salmonella infection
- C. Typhoidal Salmonella
- D. Salmonellosis
- E. Nonbacterial outbreaks of gastroenteritis
- F. None of the Above

161. The Salmonelle illness usually lasts 4 to 7 days, and most persons recover without treatment.

- A. True
- B. False

## Shigella dysenteriae

162. 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

163. 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

164. Which term are 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

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

- A. True
- B. False

166. Which term can cause shigellosis (bacillary dysentery)?

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

167. 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

168. 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

169. 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

170. 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

171. Which term is one of the pathogenic causes of reactive arthritis worldwide?

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

### Shigellosis

172. 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

173. 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

174. 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

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

- A. True
- B. False

176. 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

177. 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

178. 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

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

- A. True
- B. False

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

- A. True
- B. False

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

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

182. Typhoid fever is unrelated to?

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

183. 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
- B. Gastric fever
- C. Shigellosis
- D. Gram-negative short bacillus
- E. A positive reaction
- F. None of the Above

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

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

### How is typhoid fever spread?

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

- A. True
- B. False

186. 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
- B. Gastric fever
- C. Shigellosis
- D. Salmonella Typhi
- E. A positive reaction
- F. None of the Above

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

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

### Viruses

188. 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

189. \_\_\_\_\_ 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

190. 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

191. 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

192. 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

193. \_\_\_\_\_ 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

194. 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

195. 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

196. 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

197. 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

198. 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

### Giardiasis Giardia lamblia

199. Giardia lamblia is a protozoon 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

200. The most frequent cause of non-bacterial diarrhea in North America is giardiasis.

- A. True
- B. False

### Nature of Disease

201. \_\_\_\_\_ 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

202. 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

### Diagnosis of Human Illness

203. 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

204. In order to use a fluorescent antibody kit for staining, \_\_\_\_\_ may be concentrated by sedimentation or flotation.

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

205. \_\_\_\_\_ 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

206. 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

207. The overall incidence of \_\_\_\_\_ in the United States is estimated to be 2% of the population.

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



208. \_\_\_\_\_ 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

209. 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

210. 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

211. \_\_\_\_\_ 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

212. \_\_\_\_\_ 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

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

- A. True
- B. False

### Legionnaires' Disease Section

214. What is the causative agent come to be known as?

- A. Legionella
- B. Pontiac fever
- C. Aerosolized water
- D. Legionnaire's disease
- E. Legionella pneumophila
- F. None of the Above

215. The more severe form of the disease caused by Legionella bacteria is called Legionnaires' disease, and this infection includes pneumonia. The milder form of the disease is called \_\_\_\_\_.

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

### What have been the water sources for Legionnaires' disease?

216. Legionnaire's disease is caused most commonly by the inhalation of small droplets of water or fine aerosol containing \_\_\_\_\_.

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

217. \_\_\_\_\_ are naturally found in environmental water sources such as rivers, lakes and ponds and may colonize manmade water systems that include air conditioning systems, humidifiers, cooling tower waters, hot water systems, spas and pools.

- A. Legionella bacteria
- B. Pontiac fever
- C. Aerosolized water
- D. Legionnaire's disease
- E. Legionella pneumophila
- F. None of the Above

### How do people contract Legionella?

218. Routine biocide treatments will not eradicate \_\_\_\_\_ in the environment, only in laboratory studies.

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

219. \_\_\_\_\_ can multiply rapidly in warm water-containing systems, from less than 10 per milliliter to over 1,000 per milliliter of water in a period of one month.

- A. Legionella bacteria
- B. Pontiac fever
- C. Monoclonal antibodies
- D. Legionnaire's disease
- E. Legionella pneumophila
- F. None of the Above

220. A relatively simple procedure is available for disinfecting water systems when high numbers of \_\_\_\_\_ are found. This procedure uses chlorine and detergent.

- A. Legionella bacteria
- B. Pontiac fever
- C. Monoclonal antibodies
- D. Legionnaire's disease
- E. Pneumophila
- F. None of the Above

221. Which is the most common way that Legionella bacteria enter into the lungs to cause pneumonia?

- A. Choking
- B. Pontiac fever
- C. Aspiration
- D. Breathing
- E. Coffee drinking
- F. None of the Above

222. Culture methods are not sensitive enough for routine, quantitative monitoring.

- A. True
- B. False

223. Many factors will inhibit growth or identification of Legionella on BCYE with or without antimicrobial agents, heat or acid treatment.

- A. True
- B. False

224. Outbreaks of the disease can still be caused by \_\_\_\_\_ that culture methods will not identify.

- A. Legionella
- B. Bugs
- C. Microbial mats
- D. Legionnaire's disease
- E. Non-culturable legionella
- F. None of the Above

225. Direct fluorescent antibody (DFA) tests using a battery of \_\_\_\_\_ are more useful for routine monitoring than culture methods.

- A. Legionella
- B. Laboratory studies
- C. Microbial mats
- D. Legionnaire's disease
- E. Monoclonal antibodies
- F. None of the Above

226. Legionella species of bacteria, these bugs are strictly aerobic rods and are considered?

- A. Legionella
- B. Microbial mats
- C. Gram negative
- D. Legionnaire's disease
- E. Legionella pneumophila
- F. None of the Above

### Quick Review

227. Which of the following bugs has been responsible for more community-wide outbreaks of disease in the U.S. than any other, drug treatment is not 100% effective?

- A. HIV infection
- B. Giardia lamblia
- C. Giardiasis
- D. Hepatitis A
- E. Cryptosporidiosis
- F. None of the Above

228. The mode of transmission of this bug is fecal-oral, either by person-to-person or animal-to-person, there is no specific treatment.

- A. HIV infection
- B. Giardia lamblia
- C. Giardiasis
- D. Hepatitis A
- E. Cryptosporidiosis
- F. None of the Above

229. All of these diseases, with the exception of this bug, have one symptom in common: diarrhea. They also have the same mode of transmission, fecal-oral, whether through person-to-person or animal-to-person contact.

- A. HIV infection
- B. Giardia lamblia
- C. Giardiasis
- D. Hepatitis A
- E. Cryptosporidiosis
- F. None of the Above

230. Which of the following is an example of a protozoan disease that is common worldwide, but was only recently recognized as causing human disease?

- A. HIV infection
- B. Giardia lamblia symptom
- C. Giardiasis
- D. Hepatitis A
- E. Cryptosporidiosis
- F. None of the Above

231. Which of the following usually come and go, and end in fewer than 30 days in most cases, the incubation period is 1-12 days, with an average of about seven days?

- A. HIV infections
- B. Symptoms
- C. Giardiasis
- D. Hepatitis A
- E. Cryptosporidiosis
- F. None of the Above

### Safe Drinking Water Act Section

232. Which of the following rules contained 60 contaminants/contaminant groups, included 10 pathogens, and was published in the Federal Register on March 2, 1998. A decision concerning whether to regulate  $\geq 5$  contaminants from CCL was required by August 2001?

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

233. Which of the following rules, the EPA is authorized to set national standards to protect drinking water and its sources against naturally occurring or man-made contaminants?

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

234. Which of the following rules require the EPA to publish a list every 5 years of contaminants that are known or anticipated to occur in public water systems and that might need to be regulated?
- A. Total Coliform Rule (TCR)
  - B. 1996 SDWA amendments
  - C. Safe Drinking Water Act (SDWA) of 1974
  - D. Contaminant Candidate List (CCL)
  - E. Surface Water Treatment Rule (SWTR)
235. Microbial contamination is regulated under the Total Coliform Rule (TCR) of 1989 and the \_\_\_\_\_ of 1989.
- A. Total Coliform Rule (TCR)
  - B. 1996 SDWA amendments
  - C. Safe Drinking Water Act (SDWA) of 1974
  - D. Contaminant Candidate List (CCL)
  - E. Surface Water Treatment Rule (SWTR)
  - F. None of the Above
236. Which of the following rules covers all water systems that use surface water or groundwater under the direct influence of surface water?
- A. Total Coliform Rule (TCR)
  - B. 1996 SDWA amendments
  - C. Safe Drinking Water Act (SDWA) of 1974
  - D. Contaminant Candidate List (CCL)
  - E. Surface Water Treatment Rule (SWTR)
  - F. None of the Above
237. Which of the following rules is intended to protect against exposure to *Giardia intestinalis*, viruses, and *Legionella*, as well as selected other pathogens?
- A. Total Coliform Rule (TCR)
  - B. 1996 SDWA amendments
  - C. Safe Drinking Water Act (SDWA) of 1974
  - D. Contaminant Candidate List (CCL)
  - E. Surface Water Treatment Rule (SWTR)
  - F. None of the Above
238. Which of the following rules which provides additional protection against *Cryptosporidium* and other waterborne pathogens for systems that serve  $\geq 10,000$  persons?
- A. Total Coliform Rule (TCR)
  - B. 1996 SDWA amendments
  - C. Interim Enhanced Surface Water Treatment Rule (IESWTR)
  - D. Long Term 1 Enhanced SWTR (LT1ESWTR)
  - E. Surface Water Treatment Rule (SWTR)
  - F. None of the Above
239. Which of the following rules for public water systems that use surface water or groundwater under the direct influence of surface water and serve  $< 10,000$  persons?
- A. Total Coliform Rule (TCR)
  - B. 1996 SDWA amendments
  - C. Interim Enhanced Surface Water Treatment Rule (IESWTR)
  - D. Long Term 1 Enhanced SWTR (LT1ESWTR)
  - E. Surface Water Treatment Rule (SWTR)
  - F. None of the Above

240. Which of the following rules was proposed in combination with the Filter Backwash Recycling Rule (FBRR), which was finalized in 2002?

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

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

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

### Gram Stain

242. 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

243. In the Gram process, the amount of peptidoglycan in the cell walls of the bacteria under study will determine their color when stained, thus identifying the bacterial cells as Gram<sup>+</sup> or Gram<sup>-</sup>.

- A. True
- B. False

244. Which type of bacteria stain a dark purple color because they have simpler cell walls with lots of peptidoglycan?

- 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

245. 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

246. 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

247. \_\_\_\_\_ have less peptidoglycan; antibiotics like penicillin are less effective against them.

- 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

248. *Pseudomonas aeruginosa* is a strictly aerobic, oxidase positive, non-fermentative bacterium are?
- A. Positive
  - B. Fastidious
  - C. Gram<sup>+</sup> or Gram<sup>-</sup>
  - D. Gram<sup>+</sup>
  - E. Gram negative
  - F. None of the Above

249. 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- Procaryotes and Eucaryotes

250. 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

251. 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

252. Which of the following terms 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

253. 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

254. Each chromosome consists of many genes. A gene is a coiled unit made up of cytoplasmic granules.
- A. True
  - B. False

### Cytoplasm

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

256. 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

257. Which of the following terms are also organs of locomotion but are shorter and more numerous?

- A. Cytoplasmic granules
- B. Cilia
- C. A cell wall
- D. Flagella
- E. Hair
- F. None of the Above

258. All bacteria are procaryotes and are simple cells and they divide by binary fission.

- A. True
- B. False

259. 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

260. A typical bacterial chromosome contains approximately 10,000 genes.

- A. True
- B. False

261. Which of the following terms is a semi-liquid that surrounds the chromosome 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

262. 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

263. The cell membrane is similar to that of the?

- A. Chromosomes
- B. Procaryotes
- C. Eukaryotic cell membrane
- D. Macromolecular polymer-peptidoglycan
- E. Cytoplasmic organelles
- F. None of the Above

264. Which of the following is selectively permeable and controls the substances entering or leaving the cell?

- A. Chromosomes
- B. Procaryotes
- C. Eukaryotic cell membrane
- D. Macromolecular polymer-peptidoglycan
- E. Cytoplasmic organelles
- F. None of the Above

265. 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

266. 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

267. 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

268. \_\_\_\_\_ is useful in differentiating between different types of bacteria.

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

269. 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

270. 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

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

- A. True
- B. False

272. 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

273. \_\_\_\_\_ 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

274. Peritrichous bacteria have \_\_\_\_\_.

- 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

275. Lophotrichous bacteria have a \_\_\_\_\_ 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

276. Amphitrichous bacteria-bacteria with \_\_\_\_\_.

- 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

277. 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



278. 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

279. 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

280. 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

281. Which of the following terms lands on a nutrient rich surface, can form a new vegetative cell?

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

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

- A. True
- B. False

### **Bacterial Nutrition**

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

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

284. All life requires \_\_\_\_\_ to grow and reproduce.

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

285. 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

286. 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

287. The nutrient \_\_\_\_\_ may be in the form of 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

288. 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

289. Which of the following terms may require gaseous air?

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

290. 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

291. 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?

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

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

293. \_\_\_\_\_ include other organisms such as bacteria which lack nuclei and other complex cell structures.

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

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

- A. True
- B. False

295. According to the text, Eukaryotic cells are generally much larger than \_\_\_\_\_, typically with a thousand times their volumes.

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

296. Many cells ingest food through the process of osmosis.

- A. True
- B. False

297. The \_\_\_\_\_ of a eukaryotic cell 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

298. \_\_\_\_\_ have a variety of organelles and a cytoskeleton composed of microtubules and microfilaments.

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

299. 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

300. \_\_\_\_\_ 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

### Bacteria Sampling

301. A sterile container must always be used to collect water samples for \_\_\_\_\_.

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

302. Bacteria samples must be refrigerated and transported to the testing laboratory within 24 hours.

- A. True
- B. False

303. 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

### Laboratory Procedures

304. One of four methods approved by the USEPA 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

305. 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

### Types of Water Samples

306. 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:**

307. Repeat samples must be collected following a 'coliform present' routine sample. The number of repeat samples required is based on the number of \_\_\_\_\_ samples the water system normally collects.

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

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

308. 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

**Chain of Custody Procedures**

309. A \_\_\_\_\_ begins when the sample containers are obtained from the laboratory. After that, a chain of custody record will accompany the sample containers.

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

**Heterotrophic Plate Count HPC**

310. Heterotrophic Plate Count (HPC) is a procedure for estimating the number of live heterotrophic bacteria and measuring changes during water treatment and distribution.

- A. True
- B. False

**Spread Plate Method**

311. During the Spread Plate Method, all colonies are on the \_\_\_\_\_ where they can be distinguished readily from particles and bubbles.

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

**Membrane Filter Method**

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

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

**Heterotrophic Plate Count (Spread Plate Method)**

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

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

**Total Coliforms**

314. Compliance with the MCL for total coliforms is on a daily basis.

- A. True
- B. False

315. For systems which collect fewer than \_\_\_\_\_ samples per month, no more than one sample per month may be total-coliform positive.

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

316. For systems that collect \_\_\_\_\_ or more samples per month, no more than five (5) percent may be Positive, check with your state drinking water section or health department for further instructions.

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

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

317. 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
- B. A drinking violation
- C. A water penalty
- D. An acute risk to human health violation
- E. Fecal coliform or E. coli present
- F. None of the Above

318. A routine analysis shows \_\_\_\_\_ is followed by a repeat analysis that indicates total coliform present.

- A. Routine analysis
- B. Drinking water violation
- C. MCL violation
- D. Presence
- E. Total and Fecal coliform or E. coli present
- F. None of the Above

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

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

320. A public notice for an acute health risk violation must be given as soon as possible, but no later than 24 hours after notification from the laboratory of the test results.

- A. True
- B. False

### Disinfection Essentials

321. Selecting the right \_\_\_\_\_ requires understanding several factors governing the particular site and the water or wastewater to be treated.

- A. Operating costs
- B. Disinfection weapon
- C. UV device
- D. Operating method
- E. Net-positive environmental benefit
- F. None of the Above

322. \_\_\_\_\_ should be made for the effects of both intentional and unintentional releases to the environment even if the disinfectant is considered relatively safe to use.

- A. Operating costs
- B. Other than chlorine
- C. Considerations
- D. Dosage
- E. Net-positive environmental benefit
- F. None of the Above

323. An operator's treatment intent should be to reduce the levels of pathogens to acceptable standards and understanding how effective the disinfectant system is in achieving \_\_\_\_\_.

- A. Target levels
- B. Narrow tolerance
- C. Desired parameters
- D. Net-positive environmental benefit
- E. Acceptable standards
- F. None of the Above

## Chlorine

324. Which is the only halogen is needed in relatively large amounts (as chloride ions) by humans?

- A. Chlorine
- B. Chlorine dioxide
- C. Iodine
- D. Halogen(s)
- E. Inhibitory transmitter GABA
- F. None of the Above

## Halogens

325. All halogens have 7 electrons in their outer shells, giving them an oxidation number of -1. The halogens exist, at room temperature, in all three states of matter:

- A. True
- B. False

## Chlorine Gas Section

### Chlorine Exposure Limits

326. The OSHA PEL (Permissible Exposure Limit) for chlorine is \_\_\_\_\_.

- A. 10 PPM
- B. 1 PPM
- C. 00.1 PPM
- D. 1,000 PPM
- E. 100 PPM
- F. None of the Above

327. The chemical equation that best describes the reaction when \_\_\_\_\_ is added to water is:  $\text{Cl}_2 + \text{H}_2\text{O} \rightarrow \text{H}^+ + \text{Cl}^- + \text{HOCl}$ .

- A. Chlorine gas
- B. Cl
- C. HOCl and OCl-
- D. Combined Available Chlorine
- E. Monochloramine
- F. None of the Above

## Reactivity

328. According to the text, chlorine is also incompatible with \_\_\_\_\_.

- A. Air
- B. Ammonia
- C. Sodium Chloride
- D. Hydrogen sulfide
- E. Moisture, steam, and water
- F. None of the Above

## What Happens to Chlorine When it Enters the Environment?

329. When chlorine is released to soil, chlorine will react with moisture forming?

- A. Free oxygen radicals
- B. Chlorine gas
- C. Hydrochloric acid
- D. A greenish-yellow, noncombustible gas
- E. Hypochlorous acid and hydrochloric acid
- F. None of the Above

## Disinfectant Qualities

330. Chlorine is so important in poultry processing that the US Department of Agriculture requires an almost constant chlorine rinse for much of the cutting equipment. In fact, no proven economical alternative to chlorine disinfection exists for use in Meat and poultry processing facilities.

- A. True
- B. False

## Chlorine's Effectiveness

331. The effectiveness of chlorination depends on the \_\_\_\_\_ of the water, the concentration of the chlorine solution added, the time that chlorine is in contact with the organism, and water quality.

- A. Chlorine residual
- B. Color change
- C. Chlorine demand
- D. Chlorination
- E. Required contact time
- F. None of the Above

332. Chlorination is more effective as?

- A. Chlorine residual
- B. Colors change
- C. Chlorine demand
- D. Water cools down
- E. Water temperature increases
- F. None of the Above

### Chemistry of Chlorination

333. Although the ratio of \_\_\_\_\_ is greater at lower temperatures, pathogenic organisms are actually harder to kill.

- A. Hypochlorous acid
- B. The amount of chlorine
- C. Chlorine Demand
- D. Total chlorine
- E. pH value and temperature
- F. None of the Above

334. The disassociation of chlorine gas

(OCI<sup>-</sup>): HOCl H<sup>+</sup> + OCI<sup>-</sup> Also expressed HOCl → H<sup>+</sup> + OCI<sup>-</sup>  
(hypochlorous acid) (hydrogen) (hypochlorite ion)

- A. True
- B. False

### Types of Residual

335. Total chlorine residual = free + \_\_\_\_\_.

- A. Chlorine residual
- B. Chlorine demand
- C. Free chlorine
- D. Combined chlorine residual
- E. Total chlorine residual
- F. None of the Above

336. Which term is used where the chlorine demand has been satisfied and any additional chlorine will be considered free chlorine?

- A. Chlorine residual
- B. Chlorine demand
- C. Free chlorine
- D. Break-point chlorination
- E. Total chlorine residual
- F. None of the Above

### Residual Concentration/Contact Time (CT) Requirements

337. Since monitoring for very low levels of pathogens in treated water is analytically very difficult, utilizing the \_\_\_\_\_ is recommended to demonstrate satisfactory treatment.

- A. Free chlorine
- B. Total residual
- C. Free chlorine residual
- D. "CT" disinfection concept
- E. T10 of the process unit
- F. None of the Above

### Calculation and Reporting of CT Data

338. Reduction Ratio should be reported, along with the appropriate pH, temperature, and?

- A. Reduction Ratio
- B. CT actual
- C. Free chlorine residual
- D. Disinfectant residual
- E. T10 of the process unit
- F. None of the Above

### Chlorine Review

339. What term describes the minimum amount of Chlorine needed to react in a water purification system; used as a monitoring measurement by system operators?

- A. Chlorine Demand
- B. Liquid
- C. Total chlorine
- D. Monitoring measurement
- E. Ammonia or organic amines
- F. None of the Above

### Chlorine-Based Disinfectants Chloramines

#### Chloramine Disadvantages

340. Which residual in tap water can pass through membranes in dialysis machines and directly induce oxidant damage to red blood cells?

- A. Free chlorine
- B. Chloramine
- C. Dichloramine
- D. Monochloramine
- E. Ammonia and chlorine compounds
- F. None of the Above

## Chloramine Section

341. \_\_\_\_\_ :  $\text{NH}_3 + \text{HOCl} \rightarrow \text{NH}_2\text{Cl} + \text{H}_2\text{O}$

- A. Free chlorine
- B. Trichloramine
- C. Dichloramine
- D. Monochloramine
- E. Ammonia and chlorine compounds
- F. None of the Above

## Alternative Disinfectants

### Ultraviolet Disinfection

342. The basic design flow of water of certain UV units is in the order of \_\_\_\_\_ for each inch of the lamp. Further, the units are designed so that the contact or retention time of the water in the unit is not less than \_\_\_\_\_.

- A. 2.0 gpm - 60 seconds
- B. 20 gpm - 15 seconds
- C. 2.0 gpm - 100 seconds
- D. 1.5 gpm - 60 seconds
- E. 2.0 gpm - 15 seconds
- F. None of the Above

## Chlorine Dioxide

343. 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

344. Total residual oxidants (including chlorine dioxide and chlorite, but excluding Chlorine dioxide) shall not exceed 0.50 mg/L during normal operation or 0.30 mg/L (including chlorine dioxide, chlorite and chlorate) during periods of extreme variations in the raw water supply.

- A. True
- B. False

## Ozone

345. Ozone does not produce chlorinated byproducts (such as trihalomethanes) but it may cause an increase in such byproduct formation if it is fed ahead of free chlorine; ozone may also produce its own oxygenated byproducts such as  $\text{Cl}_2 + \text{NH}_4$ .

- A. True
- B. False

346. Which system must include adequate ozone leak detection alarm systems, and an ozone off-gas destruction system?

- A. Dry sodium chlorite
- B. Chlorine dioxide
- C. T10 value
- D. Ammonia residual(s)
- E. Ozonation
- F. None of the Above

## Waterborne Microorganisms and Bacteria Appendix

### Protozoa

347. 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

348. 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



349. 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

350. 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

351. 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

352. 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

353. 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

354. 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

355. An individual protozoan is?

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

356. 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

357. 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

## Classification

358. 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

359. Trophozoite usually have non-specific routes by which they are transmitted, and these routes may depend on the type of cells and tissue that a particular agent targets.

A. True B. False

360. Once in the air, the viruses can infect another person who is unlucky enough to inhale air containing the Virus particles.

A. True B. False

361. Agents vary greatly in their stability in the environment. Some viruses may survive for only a few minutes outside of a host, while some Apicomplexans are extremely durable and may survive in a dormant state for a week or more.

A. True B. False

## Protozoa Section

362. The organisms that carry out all of their life functions within a single eukaryotic are called \_\_\_\_\_.

- |                    |                      |
|--------------------|----------------------|
| A. Eukaryotic cell | D. Marine ciliates   |
| B. Protozoa(ns)    | E. Cytoplasm         |
| C. Amoeba(s)       | F. None of the Above |

363. Paramecium, \_\_\_\_\_, and Amoeba are well-known examples of protozoa.

- |                           |                      |
|---------------------------|----------------------|
| A. Eukaryotes             | D. Euglena           |
| B. Enterovirulent E. coli | E. Cytoplasm         |
| C. Marine ciliates        | F. None of the Above |

364. Some \_\_\_\_\_ can be closely related to animals or plants, while others are relatively unique.

- |                     |                      |
|---------------------|----------------------|
| A. Eukaryotic cells | D. Marine ciliates   |
| B. Protozoa         | E. Cytoplasm         |
| C. Amoebas          | F. None of the Above |

365. Which bug/creature/organism/species are sometimes also called algae and are addressed elsewhere?

- |                           |  |
|---------------------------|--|
| A. Eukaryotes             | D. Marine ciliates                     |
| B. Enterovirulent E. coli | E. Unicellular photosynthetic protozoa |
| C. Amoeba(s)              | F. None of the Above                   |

## Free-living Protozoa

366. Many free-living \_\_\_\_\_ may be collected in similar microhabitats worldwide.

- |                     |                      |
|---------------------|----------------------|
| A. Eukaryotic cells | D. Marine ciliates   |
| B. Protozoa         | E. Cytoplasm         |
| C. Amoebas          | F. None of the Above |

367. \_\_\_\_\_ live in the interstices of sediment and beach sands, surfaces, and in cold Antarctic environments.

- |               |                      |
|---------------|----------------------|
| A. Eukaryotes | D. Marine ciliates   |
| B. Protozoa   | E. Cytoplasm         |
| C. Amoebas    | F. None of the Above |

368. \_\_\_\_\_ live in all moist habitats within the United States.
- A. Eukaryotes
  - B. Protozoans
  - C. Amoebas
  - D. Marine ciliates
  - E. Cytoplasma
  - F. None of the Above

### Amoebas

#### How does an amoeba locomote?

369. \_\_\_\_\_ locomote by movement of their cytoplasm.
- A. Eukaryotes
  - B. Protozoas
  - C. Amoebas
  - D. Marine ciliates
  - E. E. coli
  - F. None of the Above

370. The \_\_\_\_\_ have false feet with which they 'flow' over a surface.
- A. Eukaryotes
  - B. Protozoas
  - C. Amoebas
  - D. Marine ciliates
  - E. E. coli
  - F. None of the Above

371. These pseudopods are also used to capture prey; they simply engulf the food. They can detect the kind of prey and use different?
- A. Eukaryotic cell
  - B. Protozoa(ns)
  - C. Amoeba(s)
  - D. 'Engulfing tactics'
  - E. Cytoplasma
  - F. None of the Above

### Protozoa Information

372. \_\_\_\_\_ have been found in almost every type of soil and in every kind of environment, from peat bogs to the dry sands of deserts.
- A. Foraminifera
  - B. Protozoan fauna
  - C. Soil-dwelling protozoa
  - D. Soil-loving Amoeba
  - E. Microsporidia
  - F. None of the Above

373. The \_\_\_\_\_ exist in greater numbers in freshwater habitats than in marine habitats.
- A. Foraminifera
  - B. Testate amoebae
  - C. Cytoplasm of protozoa
  - D. Soil biomass
  - E. Microsporidia
  - F. None of the Above

### Environmental Quality Indicators

374. A rich and characteristic \_\_\_\_\_ can often be found in polluted waters.
- A. Foraminifera
  - B. Protozoan fauna
  - C. Cytoplasm of protozoa
  - D. Soil biomass
  - E. Microsporidia
  - F. None of the Above

### Symbiotic Protozoa

#### Parasites

375. 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

376. \_\_\_\_\_ are diverse organisms that are capable of infecting a variety of plant, animal, and even other protist hosts.
- A. Foraminifera
  - B. Protozoan fauna
  - C. Cytoplasm of protozoa
  - D. Soil biomass
  - E. Microsporidia
  - F. None of the Above

377. Worldwide infections in AIDS patients caused by four different genera of microsporidia (Encephalitozoon, Nosema, Pleistophora, and \_\_\_\_\_) have increased since 1985.

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

### Protozoan Reservoirs of Disease

378. It is well known that bacteria can be present in the \_\_\_\_\_?

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

379. The presence of viruses in the cytoplasm of \_\_\_\_\_ is less frequently reported.

- A. Flagella
- B. Bacteria or viruses
- C. Protozoa
- D. Free-living amoebae
- E. Cell's cytoplasm
- F. None of the Above

380. Certain human pathogens have been shown to not only survive but also to reproduce in the cytoplasm of free-living, \_\_\_\_\_.

- A. Amoeba
- B. Organisms
- C. Beneficial symbionts
- D. Nonpathogenic protozoa
- E. Various protozoa
- F. None of the Above

381. The causative organism of Legionnaires' disease is \_\_\_\_\_.

- A. Amoeba
- B. Bacteria or viruses
- C. Protozoa
- D. Free-living amoebae
- E. Bacterium Legionella pneumophila
- F. None of the Above

### Symbionts

382. Some \_\_\_\_\_ can be beneficial symbionts.

- A. Amoeba
- B. Viruses
- C. Protozoa
- D. Free-living amoebae
- E. Bacterium Legionella pneumophila
- F. None of the Above

### Contractile Vacuoles

383. 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

384. A central vacuole takes up most of a cell's volume in higher plants, which maintains the cell's \_\_\_\_\_.

- A. Kinetosome or centriole
- B. Vacuole or tonoplast
- C. Osmotic pressure
- D. Nonpathogenic protozoa
- E. Various microtubular roots
- F. None of the Above

385. Many \_\_\_\_\_ have slender motile projections that are called flagella when long and cilia when short.

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

386. \_\_\_\_\_ are involved in movement, feeding, and sensation of the cell.

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

387. \_\_\_\_\_ and prokaryotic flagella are entirely distinct from each other.

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

388. Flagella also may have hairs or mastigonemes, scales, connecting membranes, and internal rods, their interior is continuous with the?

- A. Flagella
- B. Bacteria or viruses
- C. Haptonema
- D. Free-living amoebae
- E. Cell's cytoplasm
- F. None of the Above

### Centrioles

389. Centrioles are often found in cells that do not have flagella. They generally occur in groups of one or two, called \_\_\_\_\_.

- A. Kinetosome or centriole
- B. Kinetids
- C. Beneficial symbionts
- D. Nonpathogenic protozoa
- E. Various microtubular roots
- F. None of the Above

390. Centrioles form a primary component of the \_\_\_\_\_.

- A. Vacuole or tonoplast
- B. Haptonema
- C. Cyst
- D. Cytoskeletal structure
- E. Cytoplasm
- F. None of the Above

391. Which of the following terms may also be associated in the formation of a spindle during nuclear division?

- A. Contractile vacuoles
- B. Centrioles
- C. Paramecium
- D. Microtubule-supported organelles
- E. Vacuole or tonoplast
- F. None of the Above

392. \_\_\_\_\_ produces axopodia that is used in flotation or to capture prey, and the haptophytes, which have a peculiar flagellum-like organelle called the haptonema.

- A. Paramecium
- B. Haptonema
- C. Paramecium
- D. Protozoan pathogens
- E. Radiolaria and heliozoa
- F. None of the Above

### Paramecium

393. \_\_\_\_\_ are single-celled organisms in the kingdom Protista that live in fresh water.

- A. Kinetosome or centriole
- B. E-coli
- C. Paramecium
- D. Eukaryotes
- E. Bacterium Legionella pneumophila
- F. None of the Above

394. The osmotic concentration in the external environment of paramecium is much lower than that in their \_\_\_\_\_.

- A. Contractile vacuoles
- B. Haptonema
- C. Cyst
- D. Protozoan pathogens
- E. Cytoplasm
- F. None of the Above

394. Paramecium exist in an environment in which the osmotic concentration in their external environment is much lower than that in their?

- A. Contractile vacuoles
- B. Haptonema
- C. Cyst
- D. Protozoan pathogens
- E. Cytoplasm
- F. None of the Above

395. Paramecium are subjected to a continuous influx of water, as water diffuses inward to a region of higher \_\_\_\_\_ concentration.

- A. Contractile vacuoles
- B. Cytoplasm
- C. Homeostasis
- D. Osmotic
- E. Hypotonic to their cytoplasm
- F. None of the Above

396. Water in Paramecium must be continually pumped out of the cell at the same rate at which it moves in to maintain \_\_\_\_\_.

- A. Life
- B. Happiness
- C. Homeostasis
- D. Osmotic
- E. Cytoplasm
- F. None of the Above

397. The osmoregulation process in Paramecium is carried out by two organelles known as \_\_\_\_\_.

- A. Contractile vacuoles
- B. Cytoplasm
- C. Homeostasis
- D. Microtubule-supported organelles
- E. Osmosis
- F. None of the Above

### Protozoan Diseases

398. Which bug/creature/organism are larger than bacteria and viruses, but still microscopic?

- A. Paramecium(s)
- B. Parasite(s)
- C. Amoeba
- D. Protozoan pathogens
- E. Centriole(s)
- F. None of the Above

399. \_\_\_\_\_ invades and inhabits the gastrointestinal tract.

- A. Paramecium(s)
- B. Parasite(s)
- C. Amoeba
- D. Protozoan pathogens
- E. Centriole(s)
- F. None of the Above

### Giardiasis

400. Which bug/creature/organism has also been referred to as “Backpacker’s disease” and “beaver fever” because of the many cases of drinking untreated surface water?

- A. Giardia lamblia
- B. Cytoplasm disease
- C. Paramecium disease
- D. Giardiasis
- E. Protozoan-caused disease
- F. None of the Above

401. Symptoms of this disease include chronic diarrhea, abdominal cramps, bloating, frequent loose and pale greasy stools, fatigue and weight loss.

- A. Giardia lamblia
- B. Cytoplasm disease
- C. Paramecium disease
- D. Giardiasis
- E. Protozoan-caused disease
- F. None of the Above

### Cryptosporidiosis

402. Which bug/creature/organism has symptoms that usually come and go, and end in fewer than 30 days in most cases?

- A. Giardia lamblia
- B. Incubation period
- C. Animal-to-person contact
- D. Cryptosporidiosis
- E. Giardiasis
- F. None of the Above

403. Which bug/creature/organism have been identified in human fecal specimens from more than 50 countries on six continents?

- A. E-coli
- B. Giardia lamblia
- C. Cryptosporidium organisms
- D. Giardia trophozoites
- E. Hepatitis A
- F. None of the Above

404. The mode of transmission is fecal-oral, either by person-to-person or animal-to-person. There is no specific treatment for?

- A. Giardia lamblia treatment
- B. Incubation period
- C. Animal-to-person contact
- D. Major symptom
- E. Cryptosporidium infections
- F. None of the Above

### **Giardia Lamblia**

405. Which bug/creature/organism absorb their nutrients from the lumen of the small intestine, and are anaerobes?

- A. Water-borne sources
- B. Giardia trophozoites
- C. Giardia cysts
- D. Giardia infections
- E. Giardia parasites
- F. None of the Above

406. \_\_\_\_\_ can occur through ingestion of dormant cysts in contaminated water, or by the fecal-oral route (through poor hygiene practices).

- A. Giardiasis
- B. Giardia trophozoites
- C. Cytoplasm
- D. Giardia infection
- E. Trophozoites and cysts
- F. None of the Above

407. Which bug/creature/organism/disease is (synonymous with *Lamblia intestinalis* and *Giardia duodenalis*) is a flagellated protozoan parasite that colonizes and reproduces in the small intestine?

- A. Giardia trophozoites
- B. Incubations
- C. Animal-to-person contact
- D. Giardia lamblia
- E. Cryptosporidium infections
- F. None of the Above

408. \_\_\_\_\_ can survive for weeks to months in cold water and therefore can be present in contaminated wells and water systems.

- A. Water-borne sources
- B. Giardia trophozoites
- C. Giardia cyst
- D. Giardia infections
- E. Giardia parasite
- F. None of the Above

409. Which bug/creature/organism/disease is also possible, and therefore Giardia infection is a concern for people camping in the wilderness or swimming in contaminated streams?

- A. Giardiasis
- B. Infected
- C. Cytoplasm
- D. Giardia infection
- E. Zoonotic transmission
- F. None of the Above

410. \_\_\_\_\_ can also occur, for example in day care centers, where children may have poorer hygiene practices.

- A. Water-borne sources
- B. Giardia trophozoites
- C. Giardia cyst
- D. Giardia infections
- E. Fecal-oral transmission
- F. None of the Above

411. Which bug/creature/organism/disease is not symptomatic, so some people can unknowingly serve as carriers of the parasite?

- A. Water-borne illness sources
- B. Giardia trophozoites
- C. Giardia problems
- D. Giardia infections
- E. Parasites
- F. None of the Above

412. A distinguishing characteristic of the cyst is 4 nuclei and a \_\_\_\_\_.

- A. Large eye
- B. Foot
- C. Cytoplasm
- D. Retracted cytoplasm
- E. Trophozoites and cysts
- F. None of the Above

413. Once ingested by a host, the \_\_\_\_\_ emerges to an active state of feeding and motility.

- A. Host
- B. Trophozoite
- C. Giardia cyst
- D. Giardia infection
- E. Giardia parasite
- F. None of the Above

414. Which bug/creature/organism/disease then passes through the digestive system in the feces?

- A. Giardiasis
- B. Infected host
- C. Cytoplasm
- D. Giardia infection
- E. Trophozoites and cysts
- F. None of the Above

415. Which bug/creature/organism/disease may be found in the feces, only the cysts are capable of surviving outside of the host?

- A. Giardiasis
- B. Infected host
- C. Cytoplasm
- D. Giardia infection
- E. Trophozoites
- F. None of the Above

416. Distinguishing features of the trophozoites are \_\_\_\_\_ and lack of peripheral chromatin, giving the two nuclei a halo appearance.

- A. Large karyosomes
- B. Giardia trophozoites
- C. Giardia cyst
- D. Giardia infections
- E. Giardia parasite symptoms
- F. None of the Above

417. Cysts are distinguished by a retracted?

- A. Tubular sheath
- B. Shell
- C. Cytoplasm
- D. Viroids and prions
- E. Trophozoites
- F. None of the Above

418. Which bug/creature/organism/disease is not primitively amitochondrial and that it has retained a functional organelle derived from the original mitochondrial endosymbiont"?

- A. Giardiasis
- B. Tubular sheath
- C. Cytoplasm
- D. Giardia
- E. Trophozoites and cysts
- F. None of the Above

### **Cryptosporidium**

419. According to the text, municipal drinking water utilities may meet federal standards for safety and quality of drinking water, but complete protection from \_\_\_\_\_ is not guaranteed.

- A. Symptoms
- B. Ameba
- C. Cryptosporidial infection
- D. Prokaryotes
- E. Entamoeba histolytica or E. histolytica
- F. None of the Above



420. All waterborne outbreaks of \_\_\_\_\_ have occurred in communities where the local utilities met all state and federal drinking water standards.
- A. Cyst of *C. parvum*                      D. Cryptosporidiosis  
 B. Outbreaks                                E. *Entamoeba histolytica* or *E. histolytica*  
 C. *C. parvum*                                F. None of the Above
421. Which bug/creature/organism/disease was first identified as a human pathogen, diagnosis was made by a biopsy of intestinal tissue?
- A. Cyst of *C. parvum*                      D. *Entamoeba histolytica* or *E. histolytica*  
 B. Outbreaks                                E. Cryptosporidial oocysts  
 C. *C. parvum*                                F. None of the Above
422. Sometime this method of testing can give false negatives due the "patchy" nature of the intestinal?
- A. *Entamoeba histolytica* or *E. histolytica*                      D. Cryptosporidiosis  
 B. Parasite                                      E. Parasitic infection  
 C. Cryptosporidial infection                      F. None of the Above
423. The modified acid-fast stain is traditionally used to most reliably, and specifically detect the presence of?
- A. Cyst of *C. parvum*                      D. *Entamoeba histolytica*  
 B. Outbreaks                                E. Cryptosporidial oocysts  
 C. *C. parvum*                                F. None of the Above
424. There have been at least six major outbreaks of \_\_\_\_\_ in the United States as a result of contamination of drinking water.
- A. *E. Coli*                                      D. Cryptosporidiosis  
 B. *Entamoeba histolytica*                      E. Shigellosis (bacillary dysentery)  
 C. Cryptosporidial infection                      F. None of the Above
425. *Cryptosporidium* is a protozoan pathogen of the Phylum Apicomplexa and causes a diarrheal illness called?
- A. *Cryptosporidium*                      D. Cryptosporidiosis  
 B. Macroscopic runs                      E. Parasitic infection  
 C. Cryptosporidial infection                      F. None of the Above
426. Which bug/creature/organism/disease does not utilize an insect vector and is capable of completing its life cycle within a single host?
- A. Cyst of *C. parvum*                      D. Shigellosis (bacillary dysentery)  
 B. *Cryptosporidium*                      E. Cryptosporidial oocysts  
 C. *C. parvum*                                F. None of the Above
427. Which bug/creature/organism/species/disease infects mammals. In humans, the main causes of disease are *C. parvum* and *C. hominis*?
- A. *Cryptosporidium*                      D. Cryptosporidiosis  
 B. Parasites                                      E. Parasitic infection  
 C. Shigellosis (bacillary dysentery)                      F. None of the Above
428. Which bug/creature/organism/species/disease is typically an acute short-term infection but can become severe and non-resolving in children and immunocompromised individuals?
- A. Cyst of *C. parvum*                      D. Cryptosporidiosis  
 B. Outbreaks                                E. Shigellosis (bacillary dysentery)  
 C. *Entamoeba histolytica*                      F. None of the Above

429. Bacteriophages, which use bacteria as their hosts often resemble an insect with an icosahedral head attached to a \_\_\_\_\_.

- A. Shell
- B. Tubular sheath
- C. Normal protein
- D. Appendage
- E. Viroids and prions
- F. None of the Above

430. The parasite is transmitted by environmentally hardy cysts ( \_\_\_\_\_ ) that, once ingested, excyst in the small intestine and result in an infection of intestinal epithelial tissue.

- A. Cryptosporidium
- B. Parasite
- C. Oocysts
- D. Cryptosporidiosis
- E. Parasitic infection
- F. None of the Above

431. Swimming pools and water park wave pools have also been associated with outbreaks of?

- A. Cryptosporidium
- B. Parasite
- C. Shigellosis (bacillary dysentery)
- D. Cryptosporidiosis
- E. Entamoeba histolytica
- F. None of the Above

432. According to the text, the highly environmentally resistant cyst of \_\_\_\_\_ allows the pathogen to survive various drinking water filtrations and chemical treatments such as chlorination.

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

### **Entamoeba histolytica**

433. Which bug/creature/organism/species/disease invades the liver and forms an abscess. Even less commonly, it spreads to other parts of the body, such as the lungs or brain?

- A. Symptoms
- B. Ameba
- C. Cryptosporidiosis
- D. Shigellosis (bacillary dysentery)
- E. Entamoeba histolytica or E. histolytica
- F. None of the Above

434. Which bug/creature/organism/species/disease may eat the dead cell or just absorb nutrients released from the cell?

- A. Symptoms
- B. Ameba
- C. Endoplasmic reticulum
- D. Prokaryotes
- E. Cells
- F. None of the Above

435. Which bug/creature/organism/species/disease on the average, only about one in ten people who are infected will become sick from the infection?

- A. Cyst of C. parvum
- B. Shigellosis (bacillary dysentery)
- C. E. histolytica
- D. Cryptosporidiosis
- E. Cryptosporidial oocysts
- F. None of the Above

436. Which bug/creature/organism/species/disease can cause diarrhea or a more serious invasive liver abscess?

- A. Cyst of C. parvum
- B. Shigellosis (bacillary dysentery)
- C. Entamoeba histolytica
- D. Cryptosporidiosis
- E. Cryptosporidial oocysts
- F. None of the Above

437. There is a rapid influx of \_\_\_\_\_ into the contacted cell, it quickly stops all membrane movement save for some surface blebbing. Internal organization is disrupted, organelles lyse, and the cell dies.

- A. Zinc
- B. Calcium
- C. Glucosamine
- D. Iron
- E. Magnesium
- F. None of the Above

438. Amebic dysentery is a severe form of \_\_\_\_\_ associated with stomach pain, bloody stools, and fever.

- A. Cyst of *C. parvum*
- B. Amebiasis
- C. *C. parvum*
- D. Cryptosporidiosis
- E. Amebic dysentery
- F. None of the Above

### Bacteria Section Mitochondria

439. Which term means that the bacterial cell is surrounded by a lipid membrane, or cell membrane, which encloses the contents of the cell and acts as a barrier to hold nutrients?

- A. Ciliate group
- B. Unicellular ciliate protozoa
- C. Endoplasmic reticulum
- D. Prokaryotes
- E. Cytoplasm
- F. None of the Above

440. Which bug/creature/organism/species/disease do not tend to have membrane-bound organelles in their cytoplasm and thus contain few large intracellular structures?

- A. Ciliate group
- B. Unicellular ciliate protozoa
- C. Endoplasmic reticulum
- D. Prokaryotes
- E. Bacterial cell
- F. None of the Above

441. Which bug/creature/organism/species/disease lack a nucleus, mitochondria, chloroplasts and the other organelles present in eukaryotic cells, such as the Golgi apparatus and endoplasmic reticulum?

- A. Ciliate group
- B. Unicellular ciliate protozoa
- C. Endoplasmic reticulum
- D. Prokaryotes
- E. Bacterial cell
- F. None of the Above

### Paramecia

442. According to the text, Paramecia are a group of unicellular ciliate protozoa formerly known as \_\_\_\_\_ from their slipper shape.

- A. Ciliate group
- B. Unicellular ciliate protozoa
- C. Slipper animalcules
- D. Prokaryotes
- E. Bacterial cell
- F. None of the Above

443. According to the text, Paramecia are commonly studied as a representative of the?

- A. Ciliate group
- B. Unicellular ciliate protozoa
- C. Endoplasmic reticulum
- D. Prokaryotes
- E. Bacterial cell
- F. None of the Above

444. \_\_\_\_\_ covers the body which allows the cell to move with a synchronous motion (like a caterpillar).

- A. Paramecia
- B. Osmoregulation
- C. Unicellular organism
- D. Compound oral cilia
- E. Simple cilia
- F. None of the Above

445. There is also a deep oral groove containing inconspicuous \_\_\_\_\_ (as found in other peniculids) that is used to draw food inside.

- A. Paramecia
- B. Osmoregulation
- C. Unicellular organism
- D. Compound oral cilia
- E. Acidic conditions
- F. None of the Above

446. Osmoregulation is carried out by a pair of \_\_\_\_\_, which actively expel water absorbed by osmosis from their surroundings.

- A. IpaB and IpaC proteins
- B. Osmoregulation
- C. Unicellular organism
- D. Compound oral cilia
- E. Contractile vacuoles
- F. None of the Above

447. Which bug/creature/organism/species/disease are widespread in freshwater environments, and are especially common in scums?

- A. Shigella
- B. Bacteria
- C. *S. dysenteriae*
- D. Paramecia
- E. Shigellosis (bacillary dysentery)
- F. None of the Above

448. Paramecia are attracted by?

- A. Paramecia
- B. Osmoregulation
- C. Natural condition
- D. Basic conditions
- E. Acidic conditions
- F. None of the Above

449. Which bug/creature/organism/species/disease such as Paramecium, are examples for exceptions to the universality of the genetic code?

- A. Paramecia
- B. Bacteria
- C. Unicellular organism
- D. Amoeboids
- E. Eukaryotes
- F. None of the Above

### Amoeba

450. Amoeba (sometimes amœba or ameba, plural amoebae) is a genus of protozoa that moves by means of pseudopods, and is well-known as a?

- A. Paramecia
- B. Pleomorphic bacteria
- C. Unicellular organism
- D. Amoeboids
- E. Non-motile bacteria
- F. None of the Above

451. The word amoeba or ameba is variously used to refer to it and its close relatives, now grouped as the Amoebozoa, or to all protozoa that move using pseudopods, otherwise termed \_\_\_\_\_.

- A. Paramecia
- B. Osmoregulation
- C. Unicellular organism
- D. Compound oral cilia
- E. Amoeboids
- F. None of the Above

### Bacteria Section

#### Peritrichous Bacteria

452. Microbiologists broadly classify Bacteria according to their shape: spherical, rod-shaped, and spiral-shaped.

- A. True
- B. False

453. Pleomorphic bacteria can assume a variety of shapes.

- A. True
- B. False

454. Bacteria may be further classified according to whether they require oxygen (aerobic or anaerobic) and how they react to a test with Gram's stain.

- A. True
- B. False

455. Bacteria in which alcohol washes away Gram's stain is called gram-negative, while bacteria in which alcohol causes the bacteria's walls to absorb the stain are called Gram-positive.

- A. True
- B. False

#### Shigella dysenteriae

456. *Shigella dysenteriae* is a species of the rod-shaped bacterial genus Shigellosis (bacillary dysentery).

- A. True
- B. False

457. Enterotoxin and Shiga toxin can cause shigellosis (bacillary dysentery).

- A. True
- B. False

458. Shigellae are Gram-negative, non-spore-forming, facultatively anaerobic, Pleomorphic bacteria.

A. True B. False

459. Salmonella is spread by contaminated water and food, causes the most severe dysentery because of its potent and deadly Shiga toxin, but other species may also be dysentery agents.

A. True B. False

460. Amebiasis 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. True B. False

461. Shigella causes dysentery that result in the destruction of the Epithelial cells of the intestinal mucosa in the cecum and rectum.

A. True B. False

462. Shiga toxin and verotoxin are associated with causing \_\_\_\_\_.

- A. Shigellae
- B. Gram's stain
- C. Enterotoxin and Shiga toxin
- D. Gram-negative bacterium
- E. Hemolytic uremic syndrome
- F. None of the Above

### Salmonella

463. Salmonella is a \_\_\_\_\_.

- A. Gram-negative bacterium
- B. Microscopic organism
- C. Fecal matter
- D. Fecal coliform bacteria
- E. Conditions are favorable for growth
- F. None of the Above

464. Because they cause \_\_\_\_\_ and are greatly outnumbered by the bacteria normally found in the healthy bowel, primary isolation requires the use of a selective medium.

- A. Bacteria levels
- B. Fecal coliform bacteria
- C. Salmonellae
- D. Bacterial concentrations
- E. Intestinal infections
- F. None of the Above

465. Which of the following terms may be so low in clinical samples that stools are routinely also subjected to "enrichment culture"?

- A. Enrichment culture
- B. Microscopic organisms
- C. Fecal matter
- D. Salmonella
- E. Conditions are favorable for growth
- F. None of the Above

466. Salmonellae usually do not ferment lactose; most of them produce hydrogen sulfide which, in media containing \_\_\_\_\_, reacts to form a black spot in the center of the creamy colonies.

- A. Ferric ammonium citrate
- B. Fecal coliform bacteria
- C. Salmonellae
- D. Bacterial concentrations
- E. Fecal matter
- F. None of the Above

### Bacteriophage

467. 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

468. One of the densest natural sources for phages and other viruses is seawater, 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

469. 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

470. 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

471. \_\_\_\_\_ 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

472. 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

473. 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

### **Escherichia Coli Section**

#### **Fecal Coliform Bacteria**

474. A microscopic organism that lives in the intestines of warm-blooded animals is \_\_\_\_\_.

- A. Enrichment culture
- B. Microscopic organisms
- C. Fecal matter
- D. Fecal coliform bacteria
- E. Conditions are favorable for growth
- F. None of the Above

475. If fecal coliform bacteria are present in high numbers in a water sample, it means that the water has been contaminated with \_\_\_\_\_.

- A. Bacteria levels
- B. Fecal coliform bacteria
- C. Salmonellae
- D. Bacterial concentrations
- E. Fecal matter
- F. None of the Above

476. Although \_\_\_\_\_ do not necessarily cause disease, they are indicators that other disease-carrying organisms may be present.

- A. Enrichment culture
- B. Microscopic organisms
- C. Fecal matter
- D. Fecal coliform bacteria
- E. Conditions are favorable for growth
- F. None of the Above

### Reasons for Natural Variation

477. \_\_\_\_\_ are living organisms, unlike other drinking water quality parameters.

- A. Bacteria levels
- B. Fecal coliform bacteria
- C. Salmonellae
- D. Bacterial concentrations
- E. Fecal matter
- F. None of the Above

478. Fecal coliform counts are difficult to predict because \_\_\_\_\_ are dependent on specific conditions for growth that can change quickly.

- A. Bacteria levels
- B. Fecal coliform bacteria
- C. Salmonellae
- D. Bacterial concentrations
- E. Fecal matter
- F. None of the Above

479. Although winter rains may wash more \_\_\_\_\_ into a river or stream, cool water temperatures may cause a major die-off of fecal coliform bacteria.

- A. Enrichment culture
- B. Microscopic organisms
- C. Fecal matter
- D. Fecal coliform bacteria
- E. Favorable for growth
- F. None of the Above

### Expected Impact of Pollution

480. Wastewater treatment plant discharges, failing septic systems and animal waste all contribute \_\_\_\_\_ to fresh water.

- A. Enrichment culture
- B. Microscopic organisms
- C. Fecal matter
- D. Fecal coliform bacteria
- E. Conditions are favorable for growth
- F. None of the Above

481. Bacteria levels do not necessarily decrease as a watershed develops from rural to urban. Instead, urbanization usually generates?

- A. Bacteria levels
- B. Fecal coliform bacteria
- C. New sources of bacteria
- D. Bacterial concentrations
- E. Fecal matter
- F. None of the Above

482. Surprisingly high \_\_\_\_\_ have been found in stormwater runoff in urbanized areas because other sources are present such as pets and leaking sanitary sewers.

- A. Enrichment culture
- B. Microscopic organisms
- C. Fecal matter
- D. Fecal coliform bacteria concentrations
- E. Conditions are favorable for growth
- F. None of the Above

### Indicator Connection Varies

483. The microbiological quality of water can be assessed by measuring the levels of certain " \_\_\_\_\_ " organisms such as general coliforms, E. Coli, and Enterococcus bacteria.

- A. Pathogens
- B. General coliforms
- C. Fecal coliforms
- D. Enterococcus bacteria
- E. Indicator
- F. None of the Above

### What are these Indicators?

484. Which bug/creature/organism/species may indicate that there are feces from warm blooded animals in the water.

- A. Pathogens
- B. General coliforms
- C. Fecal coliforms
- D. Enterococcus bacteria
- E. Fecal streptococci
- F. None of the Above

485. \_\_\_\_\_ is a type of Fecal streptococci.
- A. Pathogens                                  D. Enterococcus  
 B. General coliforms                        E. Fecal streptococci  
 C. Fecal coliforms                            F. None of the Above
486. According to studies conducted by the EPA, \_\_\_\_\_ have a greater correlation with swimming-associated gastrointestinal illness.
- A. Pathogens                                  D. Gastroenteritis  
 B. General coliforms                        E. Enterococci  
 C. Fecal coliforms                            F. None of the Above
487. There is not currently a quantitative method for measuring specifically \_\_\_\_\_ (expensive genetic studies can give a presence/absence result).
- A. Pathogens                                  D. Human fecal bacteria  
 B. General coliforms                        E. Gastroenteritis  
 C. Fecal coliforms                            F. None of the Above
488. Which term represents that the water has come in contact with plant or animal life?
- A. Pathogen are present                    D. Enterococcus bacteria  
 B. General coliforms                        E. Biological  
 C. Fecal coliforms                            F. None of the Above
489. \_\_\_\_\_ are universally present, including in pristine spring water.
- A. Pathogens                                  D. Enterococcus bacteria  
 B. General coliforms                        E. Shigella dysenteriae  
 C. Fecal coliforms                            F. None of the Above
490. \_\_\_\_\_ at very high levels they indicate there is what amounts to a lot of compost in the water, which could easily include (Ten thousand general coliform bacteria will get you a beach closure, compared to two or four hundred fecal coliforms, or fifty enterococcus).
- A. Pathogens                                  D. Enterococcus bacteria  
 B. General coliforms                        E. Shigella dysenteriae  
 C. Fecal coliforms                            F. None of the Above
491. Which bug/creature/organism/species/disease, particularly E. coli, indicate that there are mammal or bird feces in the water?
- A. Pathogens                                  D. Enterococcus bacteria  
 B. General coliforms                        E. Shigella dysenteriae  
 C. Fecal coliforms                            F. None of the Above
492. The more closely related the animal, the more likely \_\_\_\_\_ excreted with their feces can infect us.
- A. Pathogens                                  D. Enterococcus bacteria  
 B. General coliforms                        E. Gastroenteritis  
 C. Fecal coliforms                            F. None of the Above
- E. coli O157:H7**
493. E. coli O157:H7 is found in human feces and causes \_\_\_\_\_ when consumed.
- A. Shigella dysenteriae                    D. E. coli  
 B. Bacterium                                  E. Gastroenteritis  
 C. Enterococcus bacteria                  F. None of the Above



494. \_\_\_\_\_ has been identified as a cause of foodborn illness.

- A. Preventive measures
- B. Escherichia coli O157:H7
- C. Enterovirulent E. coli
- D. Gastroenteritis
- E. Person-to-person contact
- F. None of the Above

495. Illnesses caused by \_\_\_\_\_ have been associated with eating undercooked, contaminated ground beef.

- A. Shigella dysenteriae
- B. Bacterium
- C. Most illnesses
- D. E. coli
- E. E. coli O157:H7
- F. None of the Above

496. Which term is used to express that in families and childcare centers are an important mode of transmission and that infection can also occur after drinking raw milk and after swimming in or drinking sewage-contaminated water?

- A. Preventive measures
- B. E. coli O157:H7
- C. Enterovirulent E. coli
- D. A cause of illness
- E. Person-to-person contact
- F. None of the Above

### **What is Escherichia coli O157:H7?**

497. Systems serving 25 to 1,000 people typically take one sample per month. Some states reduce this frequency to quarterly for ground water systems if a recent sanitary survey shows that the system is free of sanitary defects.

- A. True
- B. False

498. The largest public water systems must take at least 50 samples per month.

- A. True
- B. False

499. Systems using surface water, rather than ground water, are required to take extra steps to protect against bacterial contamination because surface water sources are more vulnerable to such contamination.

- A. True
- B. False

500. At a minimum, all systems using surface waters must properly treat the water; this will kill E. coli O157:H7.

- A. True
- B. False