

Registration form

**Wastewater Treatment 202 CEU Training Course \$150.00
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.

Collection _____ Wastewater Treatment _____ Other _____

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

**Technical Learning College PO Box 3060, Chino Valley, AZ 86323
Toll Free (866) 557-1746 Fax (928) 272-0747 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 we need your e-mail address. We will e-mail the certificate to you, if no e-mail address; we will mail 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.

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

State Approval Listing URL...

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

You can obtain a printed version of the course from TLC for an additional \$59.95 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.

All downloads are electronically tracked and monitored for security purposes.

Wastewater Treatment 202 CEU Course Answer Key

Name _____

Telephone # _____

You are solely responsible 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 can also fill this assignment out electronically in Adobe Acrobat DC

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

- | | | |
|-----------------|-----------------|-----------------|
| 1. A B C D E F | 19. A B C D E F | 37. A B C D E F |
| 2. A B C D E F | 20. A B C D E F | 38. A B C D E F |
| 3. A B C D E F | 21. A B C D E F | 39. A B C D E F |
| 4. A B C D E F | 22. A B C D E F | 40. A B C D E F |
| 5. A B C D E F | 23. A B C D E F | 41. A B C D E F |
| 6. A B C D E F | 24. A B C D E F | 42. A B C D E F |
| 7. A B C D E F | 25. A B C D E F | 43. A B C D E F |
| 8. A B C D E F | 26. A B C D E F | 44. A B C D E F |
| 9. A B C D E F | 27. A B C D E F | 45. A B C D E F |
| 10. A B C D E F | 28. A B C D E F | 46. A B C D E F |
| 11. A B C D E F | 29. A B C D E F | 47. A B C D E F |
| 12. A B C D E F | 30. A B C D E F | 48. A B C D E F |
| 13. A B C D E F | 31. A B C D E F | 49. A B C D E F |
| 14. A B C D E F | 32. A B C D E F | 50. A B C D E F |
| 15. A B C D E F | 33. A B C D E F | 51. A B C D E F |
| 16. A B C D E F | 34. A B C D E F | 52. A B C D E F |
| 17. A B C D E F | 35. A B C D E F | 53. A B C D E F |
| 18. A B C D E F | 36. A B C D E F | 54. A B C D E F |

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

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

259. A B C D E F
260. A B C D E F
261. A B C D E F
262. A B C D E F
263. A B C D E F
264. A B C D E F
265. A B C D E F
266. A B C D E F
267. A B C D E F
268. A B C D E F
269. A B C D E F
270. A B C D E F
271. A B C D E F
272. A B C D E F
273. A B C D E F
274. A B C D E F
275. A B C D E F
276. A B C D E F
277. A B C D E F
278. A B C D E F
279. A B C D E F
280. A B C D E F
281. A B C D E F
282. A B C D E F
283. A B C D E F
284. A B C D E F
285. A B C D E F
286. A B C D E F
287. A B C D E F
288. A B C D E F
289. A B C D E F
290. A B C D E F
291. A B C D E F
292. A B C D E F
293. A B C D E F
294. A B C D E F
295. A B C D E F
296. A B C D E F
297. A B C D E F
298. A B C D E F
299. A B C D E F
300. A B C D E F
301. A B C D E F
302. A B C D E F
303. A B C D E F
304. A B C D E F
305. A B C D E F
306. A B C D E F
307. A B C D E F
308. A B C D E F
309. A B C D E F
310. A B C D E F
311. A B C D E F
312. A B C D E F
313. A B C D E F
314. A B C D E F
315. A B C D E F
316. A B C D E F
317. A B C D E F
318. A B C D E F
319. A B C D E F
320. A B C D E F
321. A B C D E F
322. A B C D E F
323. A B C D E F
324. A B C D E F
325. A B C D E F
326. A B C D E F
327. A B C D E F
328. A B C D E F
329. A B C D E F
330. A B C D E F
331. A B C D E F
332. A B C D E F
333. A B C D E F
334. A B C D E F
335. A B C D E F
336. A B C D E F
337. A B C D E F
338. A B C D E F
339. A B C D E F
340. A B C D E F
341. A B C D E F
342. A B C D E F
343. A B C D E F
344. A B C D E F
345. A B C D E F
346. A B C D E F
347. A B C D E F
348. A B C D E F
349. A B C D E F
350. A B C D E F
351. A B C D E F
352. A B C D E F
353. A B C D E F
354. A B C D E F
355. A B C D E F
356. A B C D E F
357. A B C D E F
358. A B C D E F
359. A B C D E F
360. A B C D E F

- | | | |
|------------------|------------------|------------------|
| 361. A B C D E F | 376. A B C D E F | 391. A B C D E F |
| 362. A B C D E F | 377. A B C D E F | 392. A B C D E F |
| 363. A B C D E F | 378. A B C D E F | 393. A B C D E F |
| 364. A B C D E F | 379. A B C D E F | 394. A B C D E F |
| 365. A B C D E F | 380. A B C D E F | 395. A B C D E F |
| 366. A B C D E F | 381. A B C D E F | 396. A B C D E F |
| 367. A B C D E F | 382. A B C D E F | 397. A B C D E F |
| 368. A B C D E F | 383. A B C D E F | 398. A B C D E F |
| 369. A B C D E F | 384. A B C D E F | 399. A B C D E F |
| 370. A B C D E F | 385. A B C D E F | 400. A B C D E F |
| 371. A B C D E F | 386. A B C D E F | |
| 372. A B C D E F | 387. A B C D E F | |
| 373. A B C D E F | 388. A B C D E F | |
| 374. A B C D E F | 389. A B C D E F | |
| 375. A B C D E F | 390. A B C D E F | |

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

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. Thank you...

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

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

**WASTEWATER TREATMENT 202 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.

Please rate the difficulty of your course.

Very Easy 0 1 2 3 4 5 Very Difficult

Please rate the difficulty of the testing process.

Very Easy 0 1 2 3 4 5 Very Difficult

Please rate the subject matter on the exam to your actual field or work.

Very Similar 0 1 2 3 4 5 Very Different

How did you hear about this Course? _____

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.

Wastewater Treatment 202 CEU Course Assignment

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

You'll 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.

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**

Clean Water Act Introduction

33 U.S.C. s/s 1251 et seq. (1977)

- The CWA requirements will help communities improve some of water quality standards—by requiring facilities to develop and implement new capacity, management, operation, and maintenance programs and public notification programs.
A. True B. False
- Which of the following terms are focused upon toxic pollutants?
A. Clean Water Act or CWA D. Water quality standard(s)
B. EPA E. The 1977 amendments
C. Congress F. None of the Above
- The CWA provisions for the delegation by _____ of many permitting, administrative, and enforcement aspects of the law to state governments.
A. Clean Water Act or CWA D. EPA
B. Water quality levels E. Valuable wetlands and other aquatic habitats
C. Clean water legislation F. None of the Above
- The Clean Water Act is a 1977 amendment to the _____, which set the basic structure for regulating discharges of pollutants to waters of the United States.
A. Clean Water Act or CWA D. EPA
B. Federal Water Pollution Control Act of 1972 E. Valuable wetlands
C. Clean water legislation F. None of the Above
- Which of the following terms gave the authority to set effluent standards on an industry basis and continued the requirements to set water quality standards for all contaminants in surface waters?
A. Clean Water Act or CWA D. Water quality standard(s)
B. EPA E. Public notification program(s)
C. Congress F. None of the Above
- The CWA makes it unlawful for any person to discharge any pollutant from a point source into navigable waters unless a permit (NPDES) is obtained under the?
A. Act D. EPA
B. Water quality levels E. OSHA
C. Clean water legislation F. None of the Above

7. Which of the following terms requires major industries to meet performance standards to ensure pollution control, charges states and tribes with setting specific water quality criteria appropriate for their waters and developing pollution control programs?

- A. Clean Water Act
- B. Water quality levels
- C. Clean water legislation
- D. EPA still retains oversight responsibilities
- E. Valuable wetlands and other aquatic habitats
- F. None of the Above

8. Which of the following terms is the primary federal law that protects our nation's waters, including lakes, rivers, aquifers, and coastal areas?

- A. Clean Water Act
- B. EPA
- C. Congress
- D. Water quality standard(s)
- E. Public notification program(s)
- F. None of the Above

9. Which of the following terms primary objective is to restore and maintain the integrity of the nation's waters?

- A. Clean Water Act
- B. Water quality levels
- C. Clean water legislation
- D. EPA oversight responsibilities
- E. Valuable wetlands and other aquatic habitats
- F. None of the Above

10. Which of the following terms focuses on improving the quality of the nation's waters?

- A. Clean Water Act
- B. EPA
- C. Congress
- D. Water quality standard(s)
- E. Public notification program(s)
- F. None of the Above

The Future

11. All Americans will enjoy clean water that is safe for fishing and swimming. We will achieve a net gain of wetlands by preventing additional losses and restoring hundreds of thousands of acres of wetlands.

- A. True
- B. False

Basic Wastewater Treatment Processes

12. Physical processes were some of the earliest methods to remove solids from wastewater, usually by passing wastewater through screens to remove debris and solids. In addition, solids that are heavier than water will settle out from wastewater by gravity.

- A. True
- B. False

13. In wastewater treatment, particles along with _____, will float to the top of wastewater and can be removed?

- A. Biosolid(s)
- B. Activated Sludge
- C. Chemical(s)
- D. Organic material
- E. Entrapped air
- F. None of the Above

Biological

14. The bacteria normally present in wastewater must have oxygen to do their part in breaking down the sewage.

- A. True
- B. False

15. According to the text, excess microbiological growth can be removed from the wastewater by physical processes.

- A. True
- B. False

16. The process of saturating sewage with air and microorganisms to break down the organic matter is called _____.

- A. Biosolid(s)
- B. Activated Sludge
- C. Chemical(s)
- D. Organic material
- E. Entrapped air
- F. None of the Above

17. Wastewater treatment levels beyond secondary treatment are referred to as _____.

- A. Oxygen
- B. Carbon dioxide
- C. Gravity
- D. Advanced Treatment
- E. Physical separation step
- F. None of the Above

18. Bacteria naturally found in water will consume organic matter in sewage, turning it into new bacterial cells, _____, and other by-products.

- A. Oxygen
- B. Carbon dioxide
- C. Gravity
- D. Secondary treatment
- E. Physical separation step
- F. None of the Above

19. In the 1920s, scientists figured out how to contain and accelerate _____ to remove organic material from wastewater.

- A. These natural biological processes
- B. Activated Sludge
- C. Chemical(s)
- D. Organic material
- E. Entrapped air
- F. None of the Above

20. Masses of microorganisms grow and will rapidly metabolized organic pollutants because of the addition of _____ to wastewater?

- A. Oxygen
- B. Carbon dioxide
- C. Gravity
- D. Secondary treatment
- E. Physical separation step
- F. None of the Above

Chemical

21. Alum, lime, or iron salts are _____ that can be added to wastewater to cause certain pollutants to floc or bunch together. The resulting large, heavier masses can be removed faster through physical processes.

- A. Biosolid(s)
- B. Activated Sludge
- C. Simple chemicals
- D. Organic materials
- E. Entrapped air
- F. None of the Above

22. Polymers are _____ that have been developed to further improve the physical separation step in wastewater treatment.

- A. Biosolids
- B. Activated Sludge
- C. Simple Chemicals
- D. Organic materials
- E. Synthetic inert chemicals
- F. None of the Above

23. _____ are added to improve the settling of excess microbiological growth or biosolids in the later stages of treatment.

- A. Biosolid(s)
- B. Activated Sludge
- C. Chemical(s)
- D. Organic materials
- E. Polymers
- F. None of the Above

24. Chemicals can be added to change pollutants into new forms that can be removed by physical processes.

- A. True B. False

Organic Matter

25. _____, such as proteins, carbohydrates, or fats, can cause pollution of receiving waters.

- A. Long chained compounds D. Wastewater-related sources
B. Organics E. Oxygen compounds
C. Inorganic materials F. None of the Above

26. Organisms use dissolved oxygen in the water to break down biodegradable materials. This process is dangerous to aquatic life because the _____ in the water is reduced or depleted.

- A. Sediment D. Graywater and blackwater
B. Supply of oxygen E. Nitrogen
C. Hydrogen F. None of the Above

27. The _____ of wastewater is the amount of oxygen that organisms need to break down the biodegradable materials in the wastewater.

- A. Biochemical oxygen demand (BOD) D. Wastewater-related source(s)
B. Biodegradable material(s) E. Oxygen
C. Organic material(s) F. None of the Above

28. Many _____ used by agriculture and industries cannot be quickly broken down by organisms, making treatment more difficult.

- A. Inorganic substances D. Graywater and blackwater
B. Organic materials E. Synthetic organic compounds
C. Organic compounds F. None of the Above

29. Certain synthetic organics, such as _____, are toxic to humans, fish, and aquatic plants.

- A. BOD D. Pesticides and herbicide(s)
B. Most inorganic substances E. Turbidity
C. Nitrogen and phosphorus F. None of the Above

30. Solvents and pesticides contain toxic _____ such as benzene and toluene.

- A. Nutrients from wastewater D. Excessive grease
B. Inorganic materials E. Organic compounds
C. Inorganic minerals F. None of the Above

Inorganics

31. Organisms in wastewater cannot easily break down _____, since these substances are relatively stable.

- A. Most organic substances D. Pesticides and herbicides
B. Most inorganic substances E. Petroleum-based waste oils
C. Nitrogen and phosphorus F. None of the Above

32. The removal of _____ from industrial wastewater sources often requires additional treatment steps.

- A. Nutrients from wastewater
- B. Inorganic materials
- C. Organic materials
- D. BOD
- E. DON
- F. None of the Above

33. Heavy metals in industrial wastewater discharges are difficult to remove by conventional treatment methods.

- A. True
- B. False

34. Which of the following wastewater terms are metals, and compounds, such as sodium, potassium, calcium, magnesium, cadmium, copper, lead, nickel, and zinc are common in wastewater from both residential and nonresidential sources?

- A. Nutrients from wastewater
- B. Inorganic materials
- C. Inorganic minerals
- D. Excessive grease
- E. Pesticides and herbicide(s)
- F. None of the Above

Preliminary Treatment

35. Preliminary treatment includes coarse screening, raw influent pumping, static fine screening, grit removal, and selector tanks.

- A. True
- B. False

36. The _____ from the collection system enters into the coarse screening process.

- A. Solid material
- B. Finer debris
- C. Grit and gravel
- D. Raw wastewater
- E. Dissolved organic and inorganic constituents
- F. None of the Above

37. After coarse screening, the wastewater may flow into a grit chamber to remove sand, grit, cinders, and small stones.

- A. True
- B. False

38. It is very important to remove _____ that washes off city streets or land during storms, especially in cities with combined sewers.

- A. Very fine solids
- B. Grit and gravel
- C. Pollutant(s)
- D. Primary sludge
- E. Grit and screenings
- F. None of the Above

39. Treatment plant pumps and other equipment can be damaged by large amounts of _____ entering the plant.

- A. Solids
- B. Finer debris
- C. Inorganics
- D. Grit and sand
- E. Dissolved organic and inorganic constituents
- F. None of the Above

40. In some wastewater treatment plants, another finer screen is used after the grit chamber to remove additional material that may damage equipment.

- A. True
- B. False

41. After the raw influent pumping process, the _____ passes into the static fine screening process to remove finer debris not captured by the coarse screens.
- A. Solid(s) D. Flow
 B. Finer debris E. Dissolved organic and inorganic constituents
 C. Grit and gravel F. None of the Above
42. After the static fine screening process, the wastewater flows into the _____ process which consists of two vortex grit separators that remove the finest grit debris.
- A. Very fine solids D. Primary sludge
 B. De-gritted wastewater E. Grit and screenings
 C. Grit Removal F. None of the Above
43. Which of the following terms must be periodically collected and trucked to a landfill for disposal or are incinerated?
- A. Very fine solids D. Primary sludge
 B. Wastewater E. Grit and screenings
 C. Pollutant(s) F. None of the Above
44. The coarse screening is provided by a basket shaped bar screen. The screen collects larger debris which are then removed and sent to a landfill for disposal.
- A. True B. False
45. The _____ removed by the preliminary treatment processes must be collected and disposed of in a landfill or incinerated.
- A. Liquids D. Debris
 B. Finer debris E. Dissolved organic and inorganic constituents
 C. Compounds F. None of the Above
46. Which of the following terms - passes into the Raw Influent Pumping process that consists of submersible centrifugal pumps?
- A. Wastewater D. Dissolved organic and inorganic constituents
 B. Split samples E. Grit and gravel
 C. Duplicate samples F. None of the Above

Primary Sedimentation

47. Pollutants that are dissolved or are very fine and remain suspended in the wastewater are easily removed effectively by gravity settling.
- A. True B. False
48. When the wastewater flow is slowed down in a sedimentation tank, the suspended solids gradually sink to the bottom. The resulting mass of solids is called _____.
- A. Very fine solids D. Primary sludge
 B. Wastewater pollution E. Grit and screenings
 C. Pollutants F. None of the Above
49. When the screening completed and the grit removed, wastewater is clear of dissolved organic and inorganic constituents along with suspended solids.
- A. True B. False

50. Which of the following wastewater treatment terms consist of minute particles of matter that can be removed from the wastewater with further treatment such as sedimentation or gravity settling, chemical coagulation, or filtration?

- A. Solid(s)
- B. Suspended solids
- C. Grit and gravel
- D. Suspended growth process(es)
- E. Dissolved organic and inorganic constituents
- F. None of the Above

Secondary Treatment

51. The wastewater enters from Preliminary Treatment into the clarifier process which is a biological process consisting of large oval shaped basins that are capable of removing finer solids.

- A. True
- B. False

52. The _____ (which are primarily organic) are consumed by microorganisms within the oxidation basins. The microorganisms also adhere to the solids themselves.

- A. Total Solids
- B. TDS
- C. Very fine solids
- D. Grit and screenings
- E. Sludges
- F. None of the Above

53. The microorganisms in the oxidation basins consume and adhere to the finer solids. This causes _____ to form, which can be physically separated.

- A. Solids
- B. Finer debris
- C. Grit and gravel
- D. Larger and heavier aggregates
- E. Dissolved organic and inorganic constituents
- F. None of the Above

54. After the primary treatment processes, the _____ flows to the secondary treatment processes.

- A. Very fine solids
- B. Wastewater
- C. Pollutant load
- D. Primary sludge
- E. Grit
- F. None of the Above

55. The _____ and the suspended growth processes are the most common conventional methods used to achieve secondary treatment.

- A. Solid(s)
- B. Finer debris
- C. Attached growth processes
- D. Unsuspended growth process(es)
- E. Organic matter
- F. None of the Above

56. The secondary treatment stage includes a biological process, such as _____, and a physical process known as secondary clarification.

- A. Wildlife habitat
- B. Oxidation Ditches
- C. Denitrification
- D. Phosphorus-reduction system(s)
- E. Excessive sludge production
- F. None of the Above

57. After preliminary treatment, the _____ are still present in the wastewater, since they cannot be removed by physical processes.

- A. Very fine solids
- B. Coarse debris
- C. Grit and gravel
- D. Suspended growth processes
- E. Larger debris
- F. None of the Above

Bacteria Section

58. Bacteria shapes can be round spheres (cocci), cylindrical (rods), or twisted, bent, or curved rods (spirilla).

- A. True B. False

59. Bacteria do not live alone, but live together in clumps, chains, or planes.

- A. True B. False

60. Tightly coiled up bacteria are called _____.

- A. Cocci D. Spiral
B. Rods E. Spirochaetes
C. Balls F. None of the Above

61. _____ live in chains, one after the other, and often have long thin cells.

- A. Biofilm bacteria D. Activated sludge bacteria
B. Filamentous bacteria E. Omnivores
C. Some bacteria F. None of the Above

62. A plane or thin layer of bacteria over the surface of an object is called _____.

- A. Filamentous Bacteria D. Either anaerobic or aerobic conditions
B. A biofilm E. Anaerobic to aerobic state
C. Application-specific bacteria F. None of the Above

63. _____ secrete sticky substances that form the gel in which they live.

- A. Biofilm bacteria D. Activated sludge bacteria
B. Filamentous bacteria E. Omnivores
C. Some bacteria F. None of the Above

Filamentous Bacteria

64. The floc structure created by filamentous bacteria keeps the floc from breaking up or shearing due to the turbulence from pumps, aeration, or transfer of the water.

- A. True B. False

65. Filamentous bacteria found in wastewater function similar to _____. They degrade BOD well and add stability and backbone to the floc structure.

- A. Biofilm bacteria D. Activated sludge
B. Filamentous bacteria E. Floc forming bacteria
C. Some bacteria F. None of the Above

66. According to the text, filaments are _____ that grow in long thread-like strands or colonies.

- A. Bacteria D. Bacteria and fungi
B. Facultative Bacteria E. Anaerobic to aerobic state Bacteria
C. Application-specific bacteria F. None of the Above

Site Specific Bacteria

67. Aeration and biofilm building are the key operational parameters that contribute to the efficient degradation of organic matter (BOD/COD removal).

- A. True B. False

68. _____ become site-specific over time as the biofilm develops and matures. The site-specific bacteria are even more effective in treating the waste stream at that particular treatment plant.
- A. Anaerobic action D. Aerobic bacteria
 B. Absence of free oxygen E. Application-specific bacteria
 C. Facultative bacteria F. None of the Above

Facultative Bacteria

69. Facultative bacteria can survive and multiply in either anaerobic or aerobic conditions.
 A. True B. False
70. Facultative bacteria will be _____ unless oxygen is added to the water.
 A. Anaerobic D. Aerobic
 B. Site-specific bacteria E. Application-specific bacteria
 C. Facultative bacteria F. None of the Above
71. When oxygen is added to the environment of facultative bacteria, the metamorphosis from _____ takes place within a couple of hours.
 A. Filamentous bacteria D. Site-specific bacteria
 B. Facultative bacteria E. Anaerobic to aerobic state
 C. Application-specific bacteria F. None of the Above

Anaerobic Bacteria

72. _____ live and reproduce when free oxygen is absent.
 A. Site-specific bacteria D. Aerobic bacteria
 B. Anaerobic bacteria E. Application-specific bacteria
 C. Facultative bacteria F. None of the Above
73. Organic material in an anaerobic treatment system must be exposed to _____ and/or detained for a much longer period of time to remove a given amount of organic material.
 A. Nitrogen D. Aerobic bacteria
 B. Free oxygen E. A significantly higher quantity of bacteria
 C. Air F. None of the Above
74. Septic tanks use _____ to break down organic material.
 A. Filamentous organisms D. Anaerobic bacteria
 B. Floc particles E. Biosurfactant trehalose
 C. Organic material F. None of the Above
75. _____ can be hazardous because they release hydrogen sulfide and methane gas.
 A. Filamentous Bacteria D. Either anaerobic or aerobic conditions
 B. Anaerobic bacteria E. Aerobic bacteria
 C. Application-specific bacteria F. None of the Above
76. Because of _____, hydrogen sulfide or explosive methane gas can accumulate in the collection system and be life-threatening.
 A. Anaerobic action D. Aerobic bacteria
 B. Free oxygen E. Application-specific bacteria
 C. Facultative bacteria F. None of the Above

Aerobic Bacteria

77. Aerobic bacteria live and multiply in the presence of free oxygen.

- A. True B. False

78. Facultative bacteria become aerobic when oxygen is present.

- A. True B. False

79. Since the metabolism of aerobes is much higher than _____, organic material can be removed with 90% fewer organisms or in 90% less time compared to the anaerobic process.

- A. Anaerobic action D. Aerobic bacteria
B. Anaerobes E. Application-specific bacteria
C. Facultative bacteria F. None of the Above

80. The by-products of _____ are carbon dioxide and water.

- A. Anaerobic action D. Aerobic bacteria
B. Absence of free oxygen E. Application-specific bacteria
C. Facultative bacteria F. None of the Above

81. Which of the following terms or bugs live in colonial structures called floc?

- A. Anaerobic action D. Aerobic bacteria
B. Absence of free oxygen E. Application-specific bacteria
C. Facultative bacteria F. None of the Above

82. With the mechanical nature of the _____, maintenance and operator oversight are required.

- A. Aerobic digestion process D. Either anaerobic or aerobic conditions
B. Facultative E. Anaerobic to aerobic state
C. Application-specific bacteria F. None of the Above

Protozoans and Metazoans

83. In a wastewater treatment system, the next higher life form above bacteria is?

- A. Nematodes and rotifers D. Protozoan and metazoan
B. Metazoan(s) E. Aerobic floc
C. Protozoan(s) F. None of the Above

84. Which of the following terms or bugs are also indicators of biomass health and effluent quality?

- A. Organic material D. Biomass health and effluent quality
B. Protozoans E. Aerobic flocs
C. Macroinvertebrates F. None of the Above

85. Which of the following terms or bugs are very similar to protozoans except that they are usually multi-celled animals?

- A. Nematodes and rotifers D. Protozoan and metazoan
B. Metazoan(s) E. Aerobic floc
C. Protozoan(s) F. None of the Above

86. Which of the following terms or bugs are typically found only in a well-developed biomass?

- A. Nematodes and rotifers D. Protozoan and metazoan
B. Metazoan(s) E. Macroinvertebrates
C. Protozoan(s) F. None of the Above

87. Which of the following terms or bugs and the relative abundance of certain species can be a predictor of operational changes within a treatment plant?
- A. Nematodes and rotifers
 - B. Metazoan(s)
 - C. Protozoan(s)
 - D. Protozoans and metazoans
 - E. Macroinvertebrates
 - F. None of the Above

Dispersed Growth

88. Dispersed growth is material suspended within the activated sludge process that has not been adsorbed into the floc particles. This material consists of very small quantities of colloidal (too small to settle out) bacteria as well as organic and inorganic particulate material.

- A. True
- B. False

89. According to the text, while a small amount of _____ between the floc particles is normal, excessive amounts can be carried through a secondary clarifier.

- A. Denitrification process
- B. Organic material
- C. Bulking sludge
- D. Dispersed growth
- E. Anaerobic sludge
- F. None of the Above

Hydrogen Sulfide and Ammonia

90. Hydrogen sulfide and _____ are gasses that can be toxic and pose asphyxiation hazards.

- A. Ammonia
- B. Wastewater odors
- C. Air
- D. Oxygen
- E. Less oxygen
- F. None of the Above

Pollutants, Oxygen-Demanding Substances

91. Aquatic life needs _____ in the water to survive.

- A. Dissolved oxygen
- B. Oxygen-demand
- C. Magnesium hydroxide
- D. Biochemical oxygen demand, or BOD
- E. Wastewater odors
- F. None of the Above

92. The biochemical oxygen demand (BOD) of the effluent is not an indicator of how well a sewage treatment plan is working.

- A. True
- B. False

93. If the wastewater treatment plant effluent has a high content of organics or ammonia, more _____ will be demanded from the receiving water. This will leave less oxygen to support fish and aquatic plants.

- A. Slime bacteria
- B. Wastewater odors
- C. Hydrogen sulfide
- D. Nitrogen
- E. Oxygen
- F. None of the Above

94. Both organic matter and _____ are called “oxygen-demanding” substances.

- A. Dissolved oxygen
- B. Ammonia
- C. Magnesium hydroxide
- D. Biochemical oxygen demand or BOD
- E. Wastewater odor(s)
- F. None of the Above

95. Domestic sewage and _____ all contribute oxygen-demanding substances to wastewater.

- A. Slime bacteria
- B. Wastewater odors
- C. Hydrogen sulfide or H₂S problem(s)
- D. The lack of oxygen
- E. Agricultural and industrial wastes
- F. None of the Above

96. If there is sufficient oxygen present in the water, oxygen-demanding substances are usually destroyed or converted to other compounds by the _____ in the water.
- A. Dissolved oxygen
 - B. Nitrogen
 - C. Magnesium hydroxide
 - D. Biochemical oxygen demand or BOD
 - E. Bacteria
 - F. None of the Above

Pathogens

97. Modern disinfection techniques for wastewater and drinking water have greatly reduced the danger of waterborne disease.
- A. True
 - B. False

Nutrients

98. The chief nutrients present in natural water that are essential to living organisms are _____.
- A. Oxygen
 - B. Ecology
 - C. Nutrient enrichment
 - D. Carbon, nitrogen, and phosphorus
 - E. Phosphorus and nitrogen
 - F. None of the Above

99. Aquatic plants and animals are harmed when uncontrolled algae growth blocks out the sunlight, thereby depleting _____ in the water at night.
- A. Pathogen(s)
 - B. Dissolved oxygen
 - C. Nutrient enrichment
 - D. Excessive growth of algae
 - E. Phosphorus and nitrogen
 - F. None of the Above

100. When a waterbody cannot assimilate all of the nutrients, the resulting condition is called?
- A. Toxic
 - B. Ecology
 - C. Nutrient enrichment
 - D. Eutrophication or cultural enrichment
 - E. Oxygen and organic waste
 - F. None of the Above

101. Phosphorous and nitrogen cannot be substantially removed by conventional?
- A. Biofilm
 - B. Contaminants
 - C. Secondary treatment
 - D. Secondary biological treatment processes
 - E. Oxygen and organic waste
 - F. None of the Above

102. Wastewater normally contains an excess of available nutrients since organisms only require small amounts of nutrients during biological treatment.
- A. True
 - B. False

103. An excess of nitrogen and phosphorous causes water plants to grow slowly.
- A. True
 - B. False

104. Large amounts of nutrients, primarily _____ but sometimes nitrogen, cause nutrient enrichment that leads to excessive algae growth.
- A. Phosphorus
 - B. Heavy metals
 - C. Nutrient enrichment
 - D. Excessive growth of algae
 - E. Nitrogen
 - F. None of the Above

Inorganic and Synthetic Organic Chemicals

105. Some inorganic and synthetic organic chemicals are _____ at very low concentrations.
- A. Highly poisonous
 - B. Ecology
 - C. Nutrient rich
 - D. Safe for aquatic life
 - E. Non-toxic to humans
 - F. None of the Above

Thermal

106. The capacity of water to retain oxygen is reduced by _____.
- A. Heat
 - B. Heavy metals
 - C. Nutrient enrichment
 - D. Excessive growth of algae
 - E. Phosphorus and nitrogen
 - F. None of the Above

107. The ecology of a lake or stream can be seriously altered by uncontrolled discharges of _____.
- A. Toxics
 - B. Waste heat
 - C. Nutrients
 - D. Oxygen
 - E. Phosphorus and nitrogen
 - F. None of the Above

108. According to the text, even discharges from wastewater treatment plants and storm water retention ponds affected by winter can be released at temperatures below that of the receiving water, and lower the stream temperature.
- A. True
 - B. False

Primary Treatment

109. The initial stage in the treatment of domestic wastewater is known as the bar screens.
- A. True
 - B. False

110. The primary treatment stage removes coarse solids from the wastewater. In some treatment plants, the _____ are combined into one operation.
- A. Solid(s)
 - B. Finer debris
 - C. Grit and gravel
 - D. Suspended growth process(es)
 - E. Primary and secondary stages
 - F. None of the Above

111. Many wastewater treatment plants have preliminary treatment units before primary and secondary treatment begins.
- A. True
 - B. False

112. _____ are used in the secondary treatment stage to further purify wastewater.
- A. Very fine solids
 - B. Biological processes
 - C. Pollutant(s)
 - D. Primary sludge
 - E. Grit and screenings
 - F. None of the Above

Secondary Clarification Process

113. The SCP provides quiescent conditions which allow the larger aggregates of solids and microorganisms to settle out for collection.
- A. True
 - B. False

114. In the SCP, the majority of microorganism-rich underflow is re-circulated to Tanks as Return Sludge to help sustain the microorganism population in the?
- A. Trickling filter(s)
 - B. Oxidation Ditches
 - C. Nitrogen removal system(s)
 - D. Aerobic nitrification processes
 - E. Recirculating sand filters (RSFs)
 - F. None of the Above

Fixed Film Systems

115. Which of the following wastewater terms grow microorganisms on substrates such as rocks, sand or plastic?

- A. Mature biofilm
- B. Activated sludge system
- C. Advanced treatment technologies
- D. Application-specific microbiology
- E. Fixed film systems
- F. None of the Above

116. The wastewater is spread over the substrate, allowing the wastewater to flow past the film of microorganisms fixed to the substrate.

- A. True
- B. False

117. Which of the following wastewater terms along with rotating biological contactors, and sand filters are examples of fixed film systems?

- A. Trickling filter(s)
- B. Oxidation Ditches
- C. Nitrogen removal system(s)
- D. Aerobic nitrification processes
- E. Recirculating sand filters (RSFs)
- F. None of the Above

Suspended Film Systems

118. As the microorganisms absorb organic matter and nutrients from the wastewater, they grow in size and number. After the microorganisms have been suspended in the wastewater for several hours, they are settled out as sludge.

- A. True
- B. False

119. Which of the following wastewater terms stir and suspend microorganisms in wastewater?

- A. Nitrogen removal system(s)
- B. Tertiary process
- C. Microorganism(s)
- D. Suspended film system(s)
- E. Recirculating sand filters (RSFs)
- F. None of the Above

120. Activated sludge, _____, oxidation ditch, and sequential batch reactor systems are all examples of suspended film systems.

- A. Trickling filter(s)
- B. Extended aeration
- C. Nitrogen removal system(s)
- D. Aerobic nitrification processes
- E. Recirculating sand filters (RSFs)
- F. None of the Above

Lagoon Systems

121. Lagoon systems are shallow basins that hold the wastewater for several months to allow for the natural degradation of sewage.

- A. True
- B. False

122. Lagoon systems take advantage of _____ and microorganisms in the wastewater to renovate sewage.

- A. Nitrogen removal system(s)
- B. Tertiary process
- C. Natural aeration
- D. Suspended film system(s)
- E. Recirculating sand filters (RSFs)
- F. None of the Above

Other Important Wastewater Characteristics

123. Wastewater characteristics can affect public health, the environment, and the design, cost, and?

- A. Treatment processes
- B. Total dissolved solids (TDS)
- C. Quality of the water
- D. The environment
- E. Effectiveness of treatment
- F. None of the Above

Temperature

124. Temperatures ranging from 77 to 95 degrees Fahrenheit are probably best for wastewater treatment.

- A. True B. False

125. While warm temperatures accelerate biological processes and cool temperatures slow them down, _____ can stop treatment processes altogether.

- A. Oxygen D. Total Suspended Solids (TSS)
B. High TSS E. Extreme hot or cold
C. Settling sediments F. None of the Above

126. Hot water is a byproduct of many manufacturing processes and is not considered a pollutant. When discharged in large quantities, it can raise the temperature of receiving streams improving the natural balance of aquatic life.

- A. True B. False

pH

127. The acidity or alkalinity of wastewater affects both treatment and the environment.

- A. True B. False

128. Low pH indicates increasing acidity while a low pH indicates increasing alkalinity.

- A. True B. False

129. In order to protect organisms in the biological process, the _____ of the wastewater needs to remain between 6 and 9.

- A. Total Solids D. Elevated Hardness, Salty Taste, or Corrosiveness
B. TDS E. Wastewater temperature
C. pH F. None of the Above

130. Industrial or commercial discharges containing acids and other substances can alter the _____ of the wastewater and inactivate treatment processes.

- A. Total Solids D. Elevated Hardness, Salty Taste, or Corrosiveness
B. TDS E. Wastewater temperature
C. pH F. None of the Above

Activated Sludge Process Section

Key Terms

131. When free or dissolved oxygen is present in the aquatic environment, this condition is called aerobic.

- A. True B. False

132. Aerobic bacteria require an environment containing oxygen in which to live and reproduce.

- A. True B. False

133. Aerobes can use chemically combined oxygen, such as in water molecules, for respiration.

- A. True B. False

134. When free or dissolved oxygen is not present in the aquatic environment, this condition is called anaerobic.

- A. True B. False

135. Anaerobic bacteria need oxygen to thrive.

- A. True B. False

136. Saprophytic bacteria break down complex solids to volatile acids.

- A. True B. False

137. The volatile acids are broken down by bacteria known as methane fermenters to form methane, carbon dioxide, and water.

- A. True B. False

138. The addition of oxygen, removal of hydrogen, or removal of an electron to/from an element or compound in a chemical reaction is called oxidation.

- A. True B. False

139. The removal of oxygen, addition of hydrogen, or addition of electrons to/from an element or compound in a chemical reaction is called reduction.

- A. True B. False

140. Sulfur compounds or elemental sulfur are reduced to H₂S or sulfide ions under anaerobic conditions in wastewater.

- A. True B. False

Activated Sludge Methods-Organic Load

141. The organic loading from primary treatment processes enters the reactor (aeration basin) where the active microbial population is present.

- A. True B. False

142. The mixture of wastewater, oxygen, and microorganisms flows from the aeration basin to a secondary clarifier where the cells (microorganisms) are settled. The settled microorganisms are also called waste activated sludge.

- A. True B. False

143. The flocculating characteristics of the cells improve the longer they are retained in the system, since they start to produce extra cellular slime which favors _____.

- A. Secondary settling D. Organic load
B. High degradation rate E. Settled biomass
C. Flocculating F. None of the Above

Common Types

144. In the conventional activated sludge process, baffles in the aeration tank cause the wastewater to circulate along the aeration tank in _____.

- A. Plug flow mode D. Higher organic load
B. Laminar flow mode E. Settled biomass
C. 24 to 48 hours F. None of the Above

145. In the completely mixed activated sludge process, wastewater inflow streams enter the aeration basin at several points to facilitate the homogeneity of the mixing.

- A. True B. False

Activated Sludge Aerobic Flocs

146. Aerobic flocs in a healthy state are referred to as activated sludge. While aerobic floc has a metabolic rate approximately 10 times higher than anaerobic sludge, it can be increased even further by exposing the bacteria to an abundance of oxygen.

- A. True B. False

147. Wastewater treatment efficiencies and removal levels are so much improved that additional downstream treatment components are?

- A. Denitrification process D. Insufficient aeration in the reactor
B. Organic material E. Dramatically reduced or totally eliminated
C. Bulking sludge F. None of the Above

Problems may appear during the operation of activated sludge systems, including:

148. Which of the following terms' content in clarified effluent, which may be due to too high or too low solids retention time and to growth of filamentous microorganisms?

- A. Organic material D. Biomass health and effluent quality
B. High solids E. Aerobic flocs
C. Macroinvertebrates F. None of the Above

149. Which of the following wastewater treatment related terms occurs when sludge that normally settles rises back to the surface after having settled?

- A. Denitrification process D. Insufficient aeration in the reactor
B. Organic material E. Rising sludge
C. Bulking sludge F. None of the Above

150. Which of the following wastewater treatment related terms settles too slowly and is not compactable, and caused by the predominance of filamentous organisms?

- A. Denitrification process D. Insufficient aeration in the reactor
B. Organic material E. Anaerobic sludge
C. Bulking sludge F. None of the Above

Basic System Components of Activated Sludge

151. In the activated sludge process, the wastewater enters an aerated tank where previously developed biological floc particles are brought into contact with the organic matter of the wastewater.

- A. True B. False

152. Organic matter in the wastewater mixes with previously developed biological floc particles and oxygen in the aeration tank. The organic matter is a food and energy source for the microorganisms, and is converted into cell tissue. The oxidized end-product is mainly carbon dioxide, CO₂.

- A. True B. False

153. The mixture of wastewater and organisms in the aeration tank is referred to as mixed liquor.

- A. True B. False

Other Wastewater Treatment Components

Biochemical Oxygen Demand

154. Biochemical Oxygen Demand (BOD or BOD₅) is an indirect measure of biodegradable organic compounds in water, and is determined by measuring the dissolved oxygen decrease in a controlled water sample over a five-day period.

- A. True B. False

164. Inorganic salts and some small amounts of organic matter that are dissolved in water are referred to as _____.

- A. Treatment processes
- B. Total dissolved solids (TDS)
- C. Quality of the water
- D. Both treatment and the environment
- E. Universal solvent
- F. None of the Above

165. Total dissolved solids in drinking water come from natural sources, sewage, urban run-off, industrial wastewater, and water treatment chemicals.

- A. True
- B. False

166. The TDS test provides only a qualitative measure of the amount of dissolved ions. The test does not provide the nature or ion relationships.

- A. True
- B. False

167. Natural environmental features causing elevated _____ include mineral springs, carbonate deposits, salt deposits, and seawater intrusion.

- A. Total Solids
- B. TDS
- C. pH
- D. Hardness, Salty Taste, or Corrosiveness
- E. Wastewater temperature
- F. None of the Above

168. The sum of the cations and anions in the water is the definition of _____.

- A. Treatment processes
- B. Total dissolved solids (TDS)
- C. Quality of the water
- D. Both treatment and the environment
- E. Universal solvent
- F. None of the Above

169. Water quality issues such as elevated hardness, salty taste, or _____ cannot be evaluated using the TDS test.

- A. Total Solids
- B. TDS
- C. pH
- D. Corrosiveness
- E. Wastewater temperature
- F. None of the Above

Total Solids

170. Which of the following wastewater terms refers to matter suspended or dissolved in water or wastewater, and is related to both specific conductance and turbidity?

- A. Total Solids
- B. TDS
- C. pH
- D. Elevated Hardness, Salty Taste, or Corrosiveness
- E. Wastewater temperature
- F. None of the Above

171. Which of the following wastewater terms is used for material left inside a container after evaporation and drying of a water sample?

- A. Treatment processes
- B. Total dissolved solids (TDS)
- C. Quality of the water
- D. Total solids
- E. pH
- F. None of the Above

172. Which of the following wastewater terms includes both total suspended solids, the portion of total solids retained by a filter and total dissolved solids?

- A. Total Solids
- B. TDS
- C. pH
- D. Elevated Hardness, Salty Taste, or Corrosiveness
- E. Wastewater
- F. None of the Above

173. Which of the following wastewater terms can be measured by evaporating a water sample in a weighed dish, and then drying the residue in an oven at 103 to 105° C?

- A. Treatment processes
- B. Total dissolved solids (TDS)
- C. Quality of the water
- D. Total Suspended solids
- E. Wastewater
- F. None of the Above

174. The increase in weight of the dish represents the total solids. Instead of total solids, laboratories often measure total suspended solids and/or total dissolved solids.

- A. True
- B. False

Total Suspended Solids (TSS)

175. _____ can damage the aquatic habitat by filling in spaces between rocks that could have been homes to aquatic organisms.

- A. Oxygen
- B. Organic material
- C. Settling sediments
- D. Hydrogen sulfide
- E. Suspended sediments
- F. None of the Above

176. Silt, decaying plant and animal matter, industrial wastes, and sewage are all included in _____.

- A. Total Solids
- B. TDS
- C. pH
- D. TSS
- E. Wastewater
- F. None of the Above

177. _____ can reduce the amount of light passing through the water to reach submerged vegetation, slowing down photosynthesis.

- A. Total Solids
- B. TDS
- C. pH
- D. Hydrogen sulfide
- E. High TSS
- F. None of the Above

178. Solids in water that can be trapped by a filter are called Total Suspended Solids (TSS).

- A. True
- B. False

179. Because the suspended particles absorb heat and light, _____ can raise the surface water temperature. Warmer water can hold less dissolved oxygen, which in turn can harm aquatic life.

- A. Oxygen
- B. High TSS
- C. Settling sediments
- D. Hydrogen sulfide
- E. Suspended sediment
- F. None of the Above

180. These secondary treatment steps that harness natural self-purification processes contained in bioreactors for the biodegradation of organic matter and bioconversion of _____ in the wastewater.

- A. Biofilm
- B. Some contaminants
- C. Secondary treatment effluent
- D. Soluble nutrients
- E. Oxygen and organic waste
- F. None of the Above

Application Specific Microbiology

181. Wastewater treatment plants use a methodology known as _____ to achieve the most efficient biological nutrient removal.

- A. Mature biofilm
- B. Activated sludge system
- C. Advanced treatment technologies
- D. Application-specific microbiology
- E. Pretreatment and pollution prevention
- F. None of the Above

182. Application-specific microbiology involves using the right laboratory prepared bugs in the right growth environment to maximize the efficiency of organics removal.

- A. True B. False

183. When starting up an activated sludge process, _____ can be purchased to reduce the time for growing a mature biofilm.

- A. Mature biofilms D. Application specific bacterial cultures
B. Activated sludge system E. Pretreatment and pollution prevention
C. Advanced treatment technologies F. None of the Above

Advanced Methods of Wastewater Treatment

184. As our country and the demand for clean water have grown, it has become more important to produce cleaner wastewater effluents, yet _____ are more difficult to remove than others.

- A. Biofilm D. Soluble nutrients
B. Some contaminants E. Oxygen and organic waste
C. Secondary treatment effluent F. None of the Above

185. Pretreatment and pollution prevention which helps limit _____ discharged to the sanitary sewer system.

- A. Types of wastes D. Application-specific microbiology
B. Activated sludge system E. Pretreatment and pollution prevention
C. Advanced treatment technologies F. None of the Above

186. All WWTPs provide a minimum of?

- A. Biofilm D. Pretreatment and pollution prevention
B. Secondary treatment E. Oxygen and organic waste
C. Secondary treatment effluent F. None of the Above

Advanced Treatment Technologies

187. Treatment levels beyond secondary are called advanced treatment.

- A. True B. False

188. Which of the following terms can be extensions of conventional secondary biological treatment to further stabilize oxygen-demanding substances?

- A. Mature biofilm D. Application-specific microbiology
B. Activated sludge system E. Pretreatment and pollution prevention
C. Advanced treatment technologies F. None of the Above

189. Advanced treatment may include physical-chemical separation techniques such as adsorption, flocculation/precipitation, membranes for advanced filtration, _____, and reverse osmosis.

- A. Denitrification process D. Aeration in the reactor
B. Organic material E. Application-specific microbiology
C. Ion exchange F. None of the Above

Nitrogen Control

190. Nitrogen in wastewater is usually not removed by secondary treatment.

- A. True B. False

191. Ammonia in wastewater is not toxic to aquatic life.

- A. True B. False

192. Nitrogen in the form of _____ can consume oxygen or stimulate algae growth.

- A. Nitrification
- B. Ammonia
- C. Nitrogen
- D. Nitrogen in the nitrate form
- E. Ammonia to the non-toxic nitrate
- F. None of the Above

193. A biological treatment process beyond the secondary stage uses nitrifying bacteria to convert ammonia to non-toxic nitrate. This process is called _____.

- A. Nitrification
- B. Denitrification
- C. Nitrogen
- D. Nitrogen in the nitrate form
- E. Biological treatment
- F. None of the Above

194. To remove nitrate from wastewater effluent, another _____ process can be added to convert nitrate to nitrogen gas.

- A. Nitrification
- B. Chemical
- C. Nitrogen
- D. Primary
- E. Biological
- F. None of the Above

Conversion of Nitrate to Nitrogen Gas

195. Nitrate can be converted to _____ by bacteria in a process known as denitrification.

- A. Nitrogen gas
- B. Phosphorus
- C. Nitrogen
- D. Nitrate nitrogen
- E. Methanol
- F. None of the Above

196. Which of the following wastewater treatment terms are added or a small stream of raw wastewater is mixed in with the nitrified effluent?

- A. Nitrogen gas
- B. Phosphorus
- C. Nitrogen
- D. Nitrate nitrogen
- E. Methanol
- F. None of the Above

197. Which of the following wastewater treatment terms comprises almost 80 percent of the air in the earth's atmosphere?

- A. Phosphorus
- B. Phosphorus
- C. Nitrogen
- D. Nitrate nitrogen
- E. Methanol
- F. None of the Above

Biological Phosphorus Control

198. Phosphorous needs to be removed from wastewater effluent to prevent excessive algal growth in the receiving waters.

- A. True
- B. False

199. One way to remove _____ is the addition of chemicals and a coagulation-sedimentation process.

- A. Nitrification
- B. Phosphorus
- C. Nitrogen
- D. Nitrate nitrogen
- E. Oxygen
- F. None of the Above

200. Biological nutrient removal (BNR) processes can remove _____.

- A. Both nitrogen and phosphorus
- B. Phosphorus
- C. Nitrogen
- D. Nitrate nitrogen
- E. Oxygen
- F. None of the Above

201. BNR processes are modified suspended growth treatment systems. The bacteria in these systems also convert _____ to inert nitrogen gas, and cause phosphorous to be trapped in the solids that are subsequently removed.

- A. Both nitrogen and phosphorus
- B. Phosphorus
- C. Nitrogen
- D. Nitrate nitrogen
- E. Oxygen
- F. None of the Above

Coagulation-Sedimentation Process

202. Solids heavier than water settle out of wastewater by gravity. With the addition of specific chemicals, solids can become heavier than water and will settle.

- A. True
- B. False

203. Which of the following wastewater treatment terms is used to increase the removal of solids from effluent after primary and secondary treatment?

- A. Carbon adsorption
- B. An advanced process
- C. A form of stabilization
- D. Chemical coagulation-sedimentation
- E. Processed wastewater solids ("sewage sludge")
- F. None of the Above

204. Which of the following wastewater treatment terms when added to wastewater removes phosphorus?

- A. Other alkaline materials
- B. A form of stabilization
- C. Sewage solids, or sludge
- D. Alum, lime, or iron salts are chemicals
- E. Phosphate
- F. None of the Above

205. Which of the following wastewater treatment terms is considered an advanced process because it is not routinely applied to the treatment of municipal wastewater?

- A. Carbon adsorption
- B. An advanced process
- C. Coagulation-sedimentation
- D. A form of stabilization
- E. Processed wastewater solids ("sewage sludge")
- F. None of the Above

Carbon Adsorption

206. Carbon adsorption technology can remove organic materials from wastewater that resist removal by?

- A. Denitrification process
- B. Biological treatment
- C. Bulking sludge
- D. Insufficient aeration in the reactor
- E. Anaerobic sludge
- F. None of the Above

207. Which of the following wastewater treatment terms consists of passing the wastewater effluent through of activated carbon granules or powder?

- A. Carbon adsorption
- B. An advanced process
- C. Carbonic dioxide
- D. A form of stabilization
- E. Super treatment
- F. None of the Above

The Use or Disposal of Wastewater Residuals and Biosolids

208. When pollutants are removed from water, there may be the _____ that settle to the bottom of sedimentation tanks.

- A. Other alkaline materials
- B. Solids
- C. Sewage solids, or sludge
- D. Biosolids
- E. Rags and sticks
- F. None of the Above

209. The utilization and disposal of the residual process solids is addressed by the CWA, Resource Conservation and Recovery Act (RCRA), and other federal laws.
A. True B. False

Processed Wastewater Solids

210. Which of the following wastewater treatment terms are considered biosolids and need to meet rigorous standards allowing safe reuse for beneficial purposes?
A. Other alkaline materials D. Processed wastewater solids
B. A form of stabilization E. Rags and sticks
C. Sewage solids, or sludge F. None of the Above

Biosolids Stabilization

211. Prior to utilization or disposal, _____ are stabilized to control odors and reduce the number of disease-causing organisms.
A. Biosolids D. Other alkaline materials
B. An advanced process E. Processed wastewater solids (“sewage sludge”)
C. Sewage solids, or sludge F. None of the Above

212. Which of the following wastewater treatment terms when separated from the wastewater, contain around 98 percent water?
A. Biosolids D. Other alkaline materials
B. An advanced process E. Processed wastewater solids (“sewage sludge”)
C. Sewage solids, or sludge F. None of the Above

Dewatering Processes

213. To improve dewatering effectiveness, the solids can be pretreated with chemicals such as lime, ferric chloride, or polymers to produce larger particles which are easier to remove.
A. True B. False

214. Which of the following wastewater treatment terms include drying beds, belt filter presses, plate and frame presses, and centrifuges?
A. Dewatering processes D. Stabilization of solids
B. A form of stabilization E. Digestion
C. Sewage solids, or sludge F. None of the Above

Digestion

215. Digestion is a form of _____ where the volatile material can decompose naturally and the potential for odor production is reduced.
A. Dewatering processes D. Stabilization of solids
B. Release E. Stabilization
C. Sewage solids, or sludge F. None of the Above

216. Which of the following wastewater treatment terms inside an enclosed tank has the added benefit of producing methane gas which can be recovered and used as a source of energy?
A. Dewatering processes D. Stabilization of solids
B. Digestion without air E. Digestion
C. Sewage solids, or sludge F. None of the Above

217. Which of the following wastewater treatment terms may also be accomplished by composting, heat treatments, drying or the addition of lime or other alkaline materials?

- A. Dewatering processes
- B. A form of stabilization
- C. Sewage solids, or sludge
- D. Stabilization of solids
- E. Digestion
- F. None of the Above

Water Quality Criteria

218. According to the Clean Water Act, water quality criteria developed by the EPA must accurately reflect the latest scientific knowledge about the effects of pollutants on aquatic life and human health.

- A. True
- B. False

219. When developing water quality criteria, EPA examines the effects of specific pollutants on aquatic life, plant life, aesthetics, and recreation in any body of water.

- A. True
- B. False

Human Health Criteria

220. Humans can be exposed to water pollutants by drinking untreated surface water or eating fish or wildlife that have been contaminated by pollutants in surface water.

- A. True
- B. False

Aquatic Life Criteria

221. Allowable concentrations provide protection for plants and animals that are found in surface waters.

- A. True
- B. False

222. Aquatic life criteria do not provide protection for saltwater aquatic organisms.

- A. True
- B. False

223. _____ protect aquatic organisms from death, slower growth, reduced reproduction, and the accumulation of toxic chemicals in their tissues.

- A. Aquatic life criteria
- B. Water pollutants
- C. Water quality standards
- D. Concentrations of pollutants
- E. Pollutant levels
- F. None of the Above

Sediment Quality Criteria Guidance

224. Which of the following wastewater treatment terms provide a habitat for many living organisms?

- A. Allowable concentrations
- B. Water quality
- C. Sediments
- D. Acute (short term) and chronic (long term)
- E. Human health and aquatic life criteria
- F. None of the Above

Pollutants in the Sediment

225. Bottom dwelling species can be protected by controlling the _____ in the sediment. This prevents harmful toxins from accumulating in animals at higher levels in the food chain.

- A. Nitrogen level
- B. Phosphorous level
- C. Oxygen level
- D. Concentration of pollutants
- E. Bacteria
- F. None of the Above

226. Which of the following wastewater treatment terms in the sediment that does not harm snails of small fish may bioaccumulate in the food chain?

- A. Aquatic life criteria
- B. Water pollutant(s)
- C. Water quality standard(s)
- D. Concentration of pollutant(s)
- E. A pollutant level
- F. None of the Above

227. Which of the following wastewater treatment terms - The EPA developed on the concentrations or amounts of individual chemicals which can be present in river, lake, or stream sediments

- A. Toxic quality criteria guidance
- B. Food chain quality guidance
- C. Biological integrity guidance
- D. Biological treatment(s) quality criteria guidance
- E. Sediment quality criteria guidance
- F. None of the Above

Biological Criteria

228. The natural condition of a water body is to be free from _____, habitat loss, and other negative stressors.

- A. Allowable concentrations
- B. The harmful effects of pollution
- C. Water quality standards
- D. Human activity
- E. Aquatic life criteria
- F. None of the Above

229. States can use methodologies developed by EPA to develop protective _____ for their waters.

- A. Toxic pollutants
- B. Food chains
- C. Biological integrity
- D. Biological treatments
- E. Water quality standards
- F. None of the Above

230. EPA methodologies describe _____ for determining the health of an aquatic community.

- A. Allowable concentrations
- B. Water quality criteria
- C. A healthy aquatic community
- D. Scientific methods
- E. Human health and aquatic life criteria
- F. None of the Above

Summary

231. Biological wastewater treatment goals are to remove the non-settling solids and the dissolved organic load from the effluents by using microbial populations.

- A. True
- B. False

232. Biological treatments are generally part of secondary treatment systems.

- A. True
- B. False

233. The microorganisms used are responsible for the degradation of _____ and the stabilization of organic wastes.

- A. Allowable concentrations
- B. Water quality
- C. In a healthy aquatic community
- D. Organic matter
- E. Human health and aquatic life criteria
- F. None of the Above

234. Some of the microorganisms present in wastewater treatment systems use the _____ of the wastewater as an energy source to grow?

- A. Toxic pollutant(s)
- B. Food chain
- C. Biological integrity
- D. Biological treatment(s)
- E. Organic content
- F. None of the Above

Genera

235. In a single aerobic system, members of the genera Pseudomonas, Nocardia, Flavobacterium, Achromobacter and Zooglea may be present, together with filamentous organisms.

- A. True
- B. False

236. In a well-functioning system, protozoas and rotifers are usually present and are useful in consuming dispersed _____ or non-settling particles.

- A. Bacteria
- B. Attached growth processes
- C. Protozoas and rotifers
- D. Suspended growth processes
- E. Food-to-microorganism ratio, F/M
- F. None of the Above

237. The organic load present is incorporated in part as represented by _____ by the microbial populations, and almost all the rest is liberated as gas.

- A. Biological denitrification
- B. Organic load
- C. Bacteria
- D. Biomass
- E. Aerobic and facultative microorganisms
- F. None of the Above

238. Unless the cell mass formed during the biological treatment is removed from the wastewater the treatment is largely incomplete, because the biomass itself will appear as organic load in the effluent and the only pollution reduction accomplished is that fraction liberated as gases.

- A. True
- B. False

239. The biological treatment processes used for wastewater treatment are broadly classified as aerobic in which aerobic and facultative microorganisms predominate or anaerobic which use?

- A. Biological denitrification
- B. Organic load
- C. Anaerobic microorganism
- D. Nitrogen and phosphorus
- E. Aerobic and facultative microorganisms
- F. None of the Above

240. Which of the following terms means the microorganisms that are attached to a surface over which they grow are called "attached growth processes"?

- A. Carbonaceous BOD
- B. Attached growth processes
- C. Protozoans and rotifers
- D. Suspended growth processes
- E. Food-to-microorganism ratio, F/M
- F. None of the Above

Nitrogen and Phosphorus Removal Technologies

241. Small system owners and operators should work closely with their program staff as well as engineers to ensure that the technologies selected will work effectively in combination to achieve the goals related to?

- A. Effluent
- B. Oxidation
- C. Optimal DO levels
- D. Trickling filter FFSS
- E. A portion of the denitrified effluent
- F. None of the Above

Nutrient Removal Technologies

Fixed-film systems - Aerobic/anaerobic trickling filter package plant

242. Which of the following terms are biological treatment processes that employ a medium such as rock, plastic, wood, or other natural or synthetic solid material that will support biomass on its surface?

- A. Trickling filter(s)
- B. Fixed-film systems (FFSs)
- C. Nitrogen removal system(s)
- D. Aerobic nitrification processes
- E. Recirculating sand filters (RSFs)
- F. None of the Above

243. Which of the following terms are typically constructed as beds of media through which wastewater flows?

- A. A closed loop
- B. Nitrogen removal system(s)
- C. Optimal DO levels
- D. Trickling filter FFSs
- E. A portion of the denitrified effluent
- F. None of the Above

244. Which of the following terms represents removal typically varies from 0 to 35 percent although removal percentages as high as 65%?

- A. Nitrified effluent
- B. Nitrogen
- C. Total Nitrogen (TN)
- D. Nitrogen and phosphorus levels
- E. Activated sludge
- F. None of the Above

245. Phosphorus removal is typically 1 to 1.5 percent.

- A. True
- B. False

246. Multi-pass systems result in higher treatment quality and assist in removing _____ levels by promoting nitrification in the aerobic media bed and denitrification in the anaerobic septic tank.

- A. Total Solids
- B. TDS
- C. pH
- D. Elevated Hardness, Salty Taste, or Corrosiveness
- E. Total Nitrogen (TN)
- F. None of the Above

247. According to the text, some of the factors affecting performance include influent wastewater characteristics, hydraulic and organic loading, medium type, maintenance of optimal DO levels, and?

- A. Wildlife habitat
- B. Recirculation rates
- C. Denitrification
- D. Phosphorus-reduction system(s)
- E. Excessive sludge production
- F. None of the Above

248. Commercial on-site systems use synthetic media and receive wastewater from overlying sprayheads for anaerobic treatment and de-nitrification.

- A. True
- B. False

249. Which of the following terms returns to the anoxic zone to mix with either septic tank contents or incoming septic tank effluent for denitrification?

- A. Filamentous organisms
- B. Floc particles
- C. Organic material
- D. Nitrified effluent
- E. Biosurfactant trehalose
- F. None of the Above

250. Which of the following terms is discharged for disposal or further treatment?

- A. Ammonia oxidation
- B. Phosphorus removal
- C. Nitrate removal
- D. Denitrified effluent
- E. Oxygen demand of wastewater
- F. None of the Above

251. According to the text, currently typical trickling filters systems are capable of producing effluent _____ concentrations of 5 to 40 mg/L.

- A. Nitrified effluent
- B. Nitrogen
- C. Total Nitrogen (TN)
- D. Nitrogen and phosphorus levels
- E. BOD and TSS
- F. None of the Above

Sequencing batch reactor (SBR)

252. According to the text, the SBR process is a sequential suspended growth process in which all major steps occur in the same tank in sequential order.

- A. True
- B. False

Recirculating Sand Filters (RSF)

253. Recirculating filters using _____ provide advanced secondary treatment of settled wastewater or septic tank effluent.

- A. Sand, gravel, or other media
- B. Wastewater
- C. Denitrification
- D. Phosphorus-reduction system(s)
- E. Excessive sludge production
- F. None of the Above

254. Which of the following terms collects and recycles the filter effluent to the recirculation tank for further processing or discharge?

- A. Underdrain system
- B. Free water surface (FWS) systems
- C. Oxygen
- D. Conventional recirculation tank
- E. Anaerobic septic tank effluent
- F. None of the Above

255. The basic components of recirculating filters include a recirculation/dosing tank, pump and controls, distribution network, filter bed with an underdrain system, and a return line.

- A. True
- B. False

256. The returned aerobic filtrate in the recirculation tank, mixes with the anaerobic septic tank effluent before being reapplied to the?

- A. Underdrain system
- B. Free water surface (FWS) systems
- C. Filter
- D. Conventional recirculation tank
- E. Anaerobic septic tank effluent
- F. None of the Above

257. Which of the following terms can be used for a broad range of applications, including single-family residences, large commercial establishments, and small communities?

- A. Trickling filter(s)
- B. Oxidation Ditches
- C. Nitrogen removal system(s)
- D. Aerobic nitrification processes
- E. RSFs
- F. None of the Above

258. Denitrification also has not been shown to occur in RSFs.

- A. True
- B. False

Natural Systems

259. According to the text, wetland systems are typically described in terms of the position of the water surface and/or the type of vegetation grown.

- A. True
- B. False

260. FWS wetlands with long detention times can remove minor amounts of _____ through plant uptake, adsorption, complexation, and precipitation.
- A. Total Solids D. Elevated Hardness, Salty Taste, or Corrosiveness
 B. TDS E. Phosphorus
 C. pH F. None of the Above
261. Which of the following terms is typically greater in the first year or two because of soil absorption?
- A. Ammonia oxidation D. An aerobic wastewater treatment facility
 B. Phosphorus removal E. Oxygen demand of wastewater
 C. Nitrate removal F. None of the Above
262. Which of the following terms is also possible with the use of an addition process, such as chemical addition and mixing prior to a final deep settling pond?
- A. Ammonia oxidation D. An aerobic wastewater treatment facility
 B. Phosphorus removal E. Oxygen demand of wastewater
 C. Nitrate removal F. None of the Above
263. Subsurface flow wetlands are specifically designed to treat or polish _____ and are typically constructed as a bed or channel containing appropriate media.
- A. Ammonia oxidation D. Wastewater
 B. Phosphorus removal E. Oxygen demand of wastewater
 C. Nitrate removal F. None of the Above
264. As with tank designs, in the natural system, bacteria break down organic matter in the wastewater, aerobically, anoxically and anaerobically.
- A. True B. False
265. Which of the following terms treat wastewater by bacterial decomposition, settling, and filtering?
- A. Underdrain system D. Conventional recirculation tank
 B. Free water surface (FWS) systems E. Anaerobic septic tank effluent
 C. Wetlands F. None of the Above
266. Oxygen for _____ is supplied by the plants growing in the wetland.
- A. Ammonia oxidation D. An aerobic wastewater treatment facility
 B. Phosphorus removal E. Aerobic decomposition
 C. Nitrate removal F. None of the Above
267. The wetland, effluent after two weeks is usually discharged by gravity to an unlined wetland bed, if these systems discharge effluent to oxidation ditches, they do not require a NPDES permit.
- A. True B. False
268. Solids are filtered and finally settle out of the wastewater within the?
- A. Underdrain system D. Conventional recirculation tank
 B. Free water surface (FWS) systems E. Anaerobic septic tank effluent
 C. Wetland F. None of the Above
269. The emergent macrophytes can transmit the amount of oxygen from the leaves to their roots is negligible compared to the oxygen demand of wastewater, therefore _____ are devoid of oxygen.
- A. Ammonia oxidation D. An aerobic wastewater treatment facility
 B. Phosphorus removal E. Subsurface flow wetlands
 C. Nitrate removal F. None of the Above

270. Which of the following terms are a modification of subsurface flow wetlands that contain gravel or coarse sand and are loaded intermittently at the top surface?

- A. Trickling filter(s)
- B. Oxidation Ditches
- C. Nitrogen removal system(s)
- D. Vertical flow wetland beds
- E. Recirculating sand filters (RSFs)
- F. None of the Above

271. Which of the following terms in a subsurface flow wetland can be rapid and effective because the anoxic conditions and carbon sources?

- A. Wastewater temperature
- B. Phosphorus removal
- C. Nitrate removal
- D. An aerobic wastewater treatment facility
- E. Oxygen demand of wastewater
- F. None of the Above

272. Which of the following terms have been used for a number of years to treat wastewater for various purposes?

- A. Duckweed
- B. Free water surface (FWS) systems
- C. Oxygen
- D. Conventional recirculation tank
- E. Anaerobic septic tank effluent
- F. None of the Above

273. Duckweed can grow about six months per year in most U.S. climates. High levels of BOD and _____ removal have been observed from duckweed systems. To achieve secondary treatment most duckweed systems are coupled with either facultative or aerated ponds.

- A. Total Solids
- B. TDS
- C. pH
- D. Elevated Hardness, Salty Taste, or Corrosiveness
- E. TSS
- F. None of the Above

Proprietary Filters/Improved and Emerging Technologies Sustainable Nutrient Recovery

274. Studies have shown that about 80 percent of the _____ and 50 percent of the phosphorus in wastewater are derived from urine?

- A. Total Solids
- B. TDS
- C. pH
- D. Nitrogen
- E. Wastewater temperature
- F. None of the Above

275. Which of the following wastewater terms and pollution, nutrients could be recycled for agricultural use, and could be removed before being mixed with wastewater and released to the environment?

- A. Total Solids
- B. TDS
- C. pH
- D. Nitrogen
- E. Nitrogen and phosphorus
- F. None of the Above

276. If you could separate 50 to 60 percent of urine, this could reduce in-plant carbon dioxide gas discharges and result in fewer impurities in methane captured from sludge digestion.

- A. True
- B. False

277. According to the text, one benefit would be reduced energy consumption at WWTPs as a result of reduced treatment requirements for?

- A. Total Solids
- B. TDS
- C. pH
- D. Nitrogen
- E. Nitrogen and phosphorus
- F. None of the Above

Nutrient Removal for Small Communities and Decentralized Wastewater Treatment Systems

278. Which of the following wastewater terms – treat and dispose of effluent on the same property that produces the wastewater?

- A. Groundwater recharge
- B. Community drainfield(s)
- C. High-aluminum mud(s)
- D. Onsite septic systems
- E. Small volumes of wastewater
- F. None of the Above

279. According to the text, wastewater from several homes is pretreated onsite by individual septic tanks before being transported through alternative sewers to _____ treatment unit that is relatively simple to operate and maintain.

- A. An offsite decentralized
- B. Wastewater
- C. Denitrification
- D. Phosphorus-reduction system(s)
- E. Excessive sludge production
- F. None of the Above

280. _____ Wastewater systems such as community drainfields, irrigation systems, and _____ are being installed to reduce infrastructure investment and minimize adverse environmental impacts.

- A. Wildlife habitat
- B. Package plants
- C. Denitrification
- D. Phosphorus-reduction system(s)
- E. Excessive sludge production
- F. None of the Above

281. Additional alternatives that include _____, sand filters, and constructed wetlands can be used to reduce nutrient pollution?

- A. Groundwater recharge
- B. Community drainfield(s)
- C. High-aluminum mud(s)
- D. Aerobic tanks
- E. Small volumes of wastewater
- F. None of the Above

Phosphorus Removal

282. Few phosphorus removal processes are well developed for which application?

- A. Onsite wastewater systems
- B. Wastewater
- C. Denitrification
- D. Phosphorus-reduction system(s)
- E. Excessive sludge production
- F. None of the Above

283. The controlled addition of chemicals such as aluminum, iron, and calcium compounds with subsequent flocculation and sedimentation has had only limited success because of inadequate operation and maintenance of mechanical equipment and excessive sludge production.

- A. True
- B. False

284. Studies of high-iron sands and _____ indicate that 50 to 95 percent of the phosphorus can be removed?

- A. Groundwater recharge
- B. Community drainfield(s)
- C. High-aluminum mud(s)
- D. Nitrogen and phosphorus pollution
- E. Small volumes of wastewater
- F. None of the Above

Nitrogen Removal

285. Processes that remove 75 to 100 percent of total nitrogen include aerobic biological systems and media filters, especially recirculating filters.

- A. True
- B. False

286. The vast majority of on-site and cluster nitrogen-removal systems employ nitrification and?

- A. Groundwater recharge
- B. Community drainfield(s)
- C. High-aluminum mud(s)
- D. Denitrification biological reactions
- E. Small volumes of wastewater
- F. None of the Above

287. SBRs, and an array of _____ combined with an anoxic/anaerobic process to perform denitrification.

- A. Trickling filter(s)
- B. Oxidation Ditches
- C. Nitrogen removal system(s)
- D. Aerobic nitrification processes
- E. Recirculating sand filters (RSFs)
- F. None of the Above

288. There are systems that utilize membrane solids separation following _____ are capable of removing total nitrogen down to very low concentrations.

- A. Nitrogen removal system(s)
- B. Tertiary process
- C. Biological nitrification and denitrification
- D. Suspended film system(s)
- E. Recirculating sand filters (RSFs)
- F. None of the Above

289. Which of the following terms are located last in the treatment train prior to subsurface wastewater infiltration system (SWIS) disposal or surface water disposal?

- A. Trickling filter(s)
- B. Oxidation Ditches
- C. Nitrogen removal system(s)
- D. Aerobic nitrification processes
- E. Recirculating sand filters (RSFs)
- F. None of the Above

Aerobic Bacteria

290. Three bacteria groups occur: freely dispersed, single bacteria; floc-forming bacteria; and filamentous bacteria. All function similarly to oxidize organic carbon to produce CO₂ and new bacteria.

- A. True
- B. False

291. All groups of aerobic bacteria oxidize organic carbon to produce CO₂ and new bacteria.

- A. True
- B. False

292. Which of the following bugs or terms that degrade wastes grow as single bacteria dispersed in the wastewater?

- A. Strict aerobes
- B. Predators
- C. Bacteria
- D. Heterotrophic bacteria
- E. Many bacterial species
- F. None of the Above

293. _____ grow in a large aggregate (floc).

- A. Treatment organism(s)
- B. Aerobic bacteria
- C. Stalked ciliate(s)
- D. Floc-forming bacteria
- E. Filamentous bacteria
- F. None of the Above

294. The floc-forming bacteria degrade _____ and settle at the end of the process, resulting in a low TSS effluent.

- A. Anaerobic bacteria
- B. Dissolved oxygen
- C. BOD
- D. Aerobic bacteria
- E. Application-specific bacteria
- F. None of the Above

295. _____ can be found in lagoons at specific growth locations.

- A. Anaerobic action
- B. Absence of free oxygen
- C. Filamentous bacteria
- D. Anaerobic bacteria
- E. Application-specific bacteria
- F. None of the Above

296. Filamentous bacteria do not cause operational problems in lagoons, but cause filamentous bulking and _____ in activated sludge processes.

- A. Strict aerobes
- B. Predators
- C. Bacteria
- D. Poor sludge settling
- E. Many bacterial species
- F. None of the Above

297. Anaerobic BOD removal generally proceeds well from pH 6.5 to 9.0 and at temperatures from 3-4°C to 60-70°C (Aerobic bacteria are replaced by Mesophilic bacteria at temperatures above 35°C).

- A. True
- B. False

298. BOD removal increases rapidly below 3-4°C and ceases at 1-2°C.

- A. True
- B. False

299. Ammonia can be oxidized to nitrate by _____.

- A. Strict aerobes
- B. Predators
- C. Nitrifying bacteria
- D. Heterotrophic bacteria
- E. Many bacterial species
- F. None of the Above

Aerated Lagoons

300. The aerated lagoons are basins, normally excavated in earth and operated without Solids recycling into the system. This is the major difference with respect to activated sludge systems.

- A. True
- B. False

Anaerobic Bacteria

301. Which of the following bugs or related terms commonly occur in lagoons are involved in methane formation and in sulfate reduction?

- A. Nitrifying bacteria
- B. Methane forming bacteria
- C. Only two bacteria
- D. Aerobic bacteria
- E. Anaerobic, heterotrophic bacteria
- F. None of the Above

302. Anaerobic methane formation involves _____ bacteria.

- A. Three different groups of anaerobic
- B. Methane fermentation
- C. Methane bacteria
- D. Organic overloading conditions
- E. Acid-forming bacteria
- F. None of the Above

303. Which of the following bugs or related terms many genera of anaerobic bacteria hydrolyze proteins, fats, and polysaccharides present in wastewater to amino acids?

- A. Nitrifying bacteria
- B. Methane forming bacteria
- C. General anaerobic degraders
- D. Aerobic bacteria
- E. Anaerobic, heterotrophic bacteria
- F. None of the Above

Photosynthetic Organisms

304. Which of the following bugs or related terms includes this diverse group of bacteria converts products from above under anaerobic conditions to simple alcohols and organic acids?

- A. BOD and sulfate
- B. Methane fermentation
- C. Methane bacteria
- D. Organic overloading and anaerobic conditions
- E. Acid-forming bacteria
- F. None of the Above

305. Which of the following bugs or related terms these bacteria convert formic acid, methanol, methylamine, and acetic acid under anaerobic conditions to methane?

- A. Nitrifying bacteria
- B. Methane forming bacteria
- C. General anaerobic degraders
- D. Aerobic bacteria
- E. Anaerobic, heterotrophic bacteria
- F. None of the Above

306. A problem exists at times where the acid formers overproduce organic acids, lowering the pH below where the methane bacteria can function (a pH < 6.5). This can stop methane formation and lead to a buildup of sludge in a lagoon with a low pH. In an anaerobic fermenter, this is called a "stuck digester".

- A. True
- B. False

307. Which of the following bugs or related terms are environmentally sensitive and have a narrow pH range of 6.5-7.5 and require temperatures > 14° C.

- A. BOD and sulfate
- B. Methane fermentation
- C. Methane bacteria
- D. Organic overloading and anaerobic conditions
- E. Acid-forming bacteria
- F. None of the Above

308. Which of the following bugs or related terms that the products of these bugs become the substrate for the methane producers?

- A. Nitrifying bacteria
- B. Methane forming bacteria
- C. Acid formers (principally acetic acid)
- D. Aerobic bacteria
- E. Anaerobic, heterotrophic bacteria
- F. None of the Above

309. Which of the following bugs or related terms ceases at cold temperature?

- A. BOD and sulfate
- B. Methane fermentation
- C. Methane bacteria
- D. Organic overloading and anaerobic conditions
- E. Acid-forming bacteria
- F. None of the Above

310. Which of the following bugs or related terms can use sulfate as an electron acceptor, reducing sulfate to hydrogen sulfide?

- A. Nitrifying bacteria
- B. Methane forming bacteria
- C. Sulfate reducing bacteria
- D. Aerobic bacteria
- E. Anaerobic, heterotrophic bacteria
- F. None of the Above

311. Which of the following bugs or related terms is a major cause of odors in ponds?

- A. Sulfate reduction
- B. Methane fermentation
- C. Methane bacteria
- D. Organic overloading and anaerobic conditions
- E. Acid-forming bacteria
- F. None of the Above

312. Which of the following bugs or related terms are represented by about 28 genera, oxidize reduced sulfur compounds using light energy to produce sulfur and sulfate?
- A. Nitrifying bacteria
 - B. Methane forming bacteria
 - C. Red and green sulfur bacteria
 - D. Aerobic bacteria
 - E. Anaerobic, heterotrophic bacteria
 - F. None of the Above

Treatment Lagoon

313. Which of the following related terms at a treatment lagoon is determined by the various chemical species of alkalinity that are present?

- A. Bicarbonate ion (HCO_3)
- B. CO_2
- C. Carbonate ion (CO_2^3)
- D. pH
- E. Phosphorus
- F. None of the Above

314. High amounts of _____ yield a low lagoon pH, while high amounts of CO_2^3 yield a high lagoon pH.

- A. Alkalinity and pH
- B. CO_2
- C. BOD
- D. Algal growth
- E. Phosphorus
- F. None of the Above

315. Bacterial growth on BOD releases CO_2 that subsequently dissolves in water to yield?

- A. Bicarbonate ion (HCO_3)
- B. CO_2
- C. Carbonate ion (CO_2^3)
- D. Carbonic acid (H_2CO_3)
- E. Phosphorus
- F. None of the Above

316. According to the text, algal growth in lagoons has the opposite effect on lagoon _____, raising the pH due to algal use for growth of inorganic carbon (CO_2 and HCO_3).

- A. Alkalinity and pH
- B. CO_2
- C. BOD
- D. pH
- E. Phosphorus
- F. None of the Above

317. Which of the following related terms, removal by natural chemical precipitation is greatly enhanced at pH values greater than pH = 8.5?

- A. Alkalinity and pH
- B. CO_2
- C. BOD
- D. Algal growth
- E. Phosphorus
- F. None of the Above

Protozoans and Microinvertebrates

318. Many higher life forms (animals) develop in lagoons. These include protozoans and microinvertebrates such as rotifers, daphnia, annelids, chironomids, and mosquito larvae.

- A. True
- B. False

319. Which of the following bugs or related terms best describe the most common higher life forms in lagoons with about 250 species identified in lagoons to date?

- A. Mosquitoes
- B. Bacteria and algae
- C. Protozoans
- D. Rotifers and daphnia
- E. *Culex tarsalis*
- F. None of the Above

320. Which of the following bugs or related terms best describe important at controlling algal overgrowth and these often "bloom" when algal concentrations are high?

- A. Mosquitoes
- B. Bacteria and algae
- C. Protozoans
- D. Rotifers and daphnia
- E. Culex tarsalis
- F. None of the Above

321. Which of the following bugs or related terms best describe relatively slow growing and only occur in systems with a detention time of >10 days?

- A. Mosquitoes
- B. Bacteria and algae
- C. Protozoans
- D. Rotifers and daphnia
- E. Microinvertebrates
- F. None of the Above

322. The requirement for a minimum lagoon bank slope and removal of shoreline vegetation by most regulatory agencies is based on the public health need to reduce mosquito vectors.

- A. True
- B. False

Filamentous Bacteria Identification

323. Filamentous Identification should be used as a tool to monitor the health of the biomass when a floating scum mat is suspected.

- A. True
- B. False

324. Filamentous Identification is used to determine the type of filaments present so that a cause can be found and corrections can be made to the system to alleviate future problems.

- A. True
- B. False

325. Which of the following wastewater treatment related terms usually have a process control variation associated with the type of filament present that can be implemented to change the environment present?

- A. Filamentous organisms
- B. Floc particles
- C. Organic material
- D. All filamentous bacteria
- E. Biosurfactant trehalose
- F. None of the Above

326. Which of the following wastewater treatment related terms change must be made or the filaments will return with time eventually?

- A. Larger floc particles
- B. Activated sludge process
- C. Floating scum mat
- D. Biomass
- E. A process
- F. None of the Above

Nocardia amarae

327. *Nocardia amarae*, a common cause of Gram-positive, chemoautotrophic, filamentous in waste treatment plants, is a slow growing, usually gram-positive, chemoautotrophic, filamentous, strict aerobe that produces the biosurfactant trehalose.

- A. True
- B. False

328. *N. amarae*, member of the Actinomycetes family, is very motile, so it doesn't rely on movement of the water to carry it through the system.

- A. True
- B. False

329. The foam from *Nocardia amarae* is usually a _____ unless algae are entrapped in it, in which case it appears green and brown.

- A. Viscous brown color
- B. Staining gram-positive
- C. Mixotrophic
- D. Gram-positive, chemoautotrophic, filamentous
- E. Disruptive foaming
- F. None of the Above

Nostocoida limicola

330. *Nostocoida limicola* is yet another common cause of disruptive foaming in waste treatment plants, motile in its Hormogonia and sometimes Trichome phases. This oxygenic phototrophic species often forms multicellular rigid filaments, forming non-symbiotic relationships with other species.

- A. True
- B. False

Thiothrix

331. *Thiothrix* spp., the primary cause of disruptive foaming in wastewater treatment plants appears as straight to slightly curved cells with rectangular shape form filaments up to 1000 microns in length, in multicellular rigid filaments staining gram-positive, with obligately aerobic respiration.

- A. True
- B. False

332. *Thiothrix* are considered which term, using several small organic carbons and reduced inorganic sulfur sources for growth and energy?

- A. Viscous brown color
- B. Staining gram-positive
- C. Mixotrophic
- D. Gram-positive, chemoautotrophic, filamentous
- E. Disruptive foaming
- F. None of the Above

333. According to the text, *Thiothrix* II produces rectangular filaments up to 200 microns in length and is easily identified by their _____ using phase contrast microscopy at 400 to 1000x magnification.

- A. Stain gram-negative
- B. Not casease
- C. Slower growing filaments
- D. Starburst effect formations
- E. Multicellular rigid filaments
- F. None of the Above

Microthrix parvicella

334. *Microthrix parvicella* is another common cause of?

- A. Viscous brown color
- B. Staining gram-positive
- C. Mixotrophic
- D. Gram-positive, chemoautotrophic, filamentous
- E. Disruptive foaming
- F. None of the Above

335. Cells are straight to slightly curved, up to 1000 microns in length and?

- A. Stain gram-negative
- B. Not casease
- C. Slower growing filaments
- D. Disruptive foaming
- E. Multicellular rigid filaments
- F. None of the Above

336. A low F/M ratio favors filamentous organisms, because their higher ratio of surface area to volume provides them with a selective advantage for?

- A. Viscous brown color
- B. Staining gram-positive
- C. Mixotrophic
- D. Gram-positive, chemoautotrophic, filamentous
- E. Securing nutrients in nutrient limited environments
- F. None of the Above

337. Which of the following terms requires high levels of oxygen are necessary?

- A. Stain gram-negative
- B. A strict aerobe
- C. Slower growing filaments
- D. Disruptive foaming
- E. Multicellular rigid filaments
- F. None of the Above

Filamentous Bacteria

338. A problem that often frustrates the performance of activated sludge is bulking sludge due to the growth of filamentous bacteria. Sludge bulking can often be solved by careful process modifications.

- A. True
- B. False

Wastewater and Pretreatment Compliance Monitoring

339. There are two types of _____ that are performed as part of compliance monitoring for permitted industries: unscheduled and demand.

- A. Discharge concentrations
- B. Pollutants of concern
- C. Plant sampling activity
- D. Sampling activities
- E. Manual collection of grab samples
- F. None of the Above

Non-permitted Industrial Users (User Rate Charge Program) Policy Example

340. On a periodic basis, commercial and minor industrial users are sampled to determine?

- A. Discharge concentrations
- B. Pollutants of concern
- C. Plant sampling activity
- D. Discharge concentrations of various pollutants
- E. Manual collection of grab samples
- F. None of the Above

Wastewater Treatment Plant Sampling

341. POTW samples are collected in accordance with the National Pollutant Discharge Elimination System permit which sets discharge limits for certain pollutants and specifies sampling frequencies and?

- A. An analysis
- B. Split samples
- C. Duplicate samples
- D. Taste test
- E. Sample types
- F. None of the Above

342. The POTW is responsible for coordinating the plant sampling activity with laboratory personnel who prepare any special sampling bottles and laboratory appurtenances necessary to complete the?

- A. Flow-proportional sampling
- B. POTW samples
- C. BOD and SS levels
- D. Composite and grab samples
- E. Sampling objectives
- F. None of the Above

343. Which of the following terms will prompt recording of information necessary for demonstrating compliance with applicable requirements?

- A. Flow-proportional sampling
- B. POTW samples
- C. Standardized forms
- D. Composite and grab samples
- E. Unannounced monitoring visits
- F. None of the Above

Co-Removal of Emerging Contaminants

344. Two groups of emerging pollutants that are not a threat to the systems are Endocrine Disrupting Chemicals and pharmaceutical and personal care products.

- A. True
- B. False

345. Which of the following terms may interfere with the endocrine systems by damaging hormone-producing tissues?

- A. PPCPs
- B. EDCs
- C. Ammonia oxidizing bacteria
- D. Longer activated sludge SRTs
- E. Slower growing bacteria
- F. None of the Above

Removal of Emerging Contaminants by Nutrient Removal Technologies

346. Removal efficiencies were enhanced for several investigated contaminants at longer SRTs, with critical _____ for some beyond which removal rates did not improve.

- A. SRTs
- B. PPCPs
- C. Nitrifying bacteria
- D. Any microbiological organisms
- E. Endocrine disrupting chemicals (EDCs)
- F. None of the Above

347. Which of the following terms allow for the establishment of slower growing bacteria, which in turn provide a more diverse community of microorganisms with broader physiological capabilities?

- A. PPCPs
- B. Longer SRTs
- C. Ammonia oxidizing bacteria
- D. Longer activated sludge SRTs
- E. Slower growing bacteria
- F. None of the Above

Role of Solids Retention Time in Removal Efficiency

348. Which of the following terms allow for the establishment of slower growing bacteria which in turn provide a more diverse community of microorganisms with broader physiological capabilities?

- A. Ammonia oxidation
- B. Phosphorus removal
- C. Longer activated sludge SRTs
- D. An aerobic wastewater treatment facility
- E. Oxygen demand of wastewater
- F. None of the Above

POTW's Wastewater Sampling

General

349. Which of the following sampling terms - is an individual sample collected in less than 15 minutes without regard for flow or time of day.

- A. Entire batch discharge
- B. The volume of sample
- C. A grab sample
- D. An individual sample
- E. Proportional composite sampling
- F. None of the Above

Wastewater Grab Samples

350. Which of the following sampling terms are normally taken manually, but can be pumped?

- A. Quantify the pollutants
- B. Grab samples
- C. Hand composites
- D. Time proportional composite sampling methods
- E. Flow proportional composites
- F. None of the Above

A grab sample is usually taken when a sample is needed to:

351. Which of the following sampling terms not amenable to compositing such as pH, temperature, dissolved oxygen, chlorine, purgeable organics and sulfides, oil and grease, coliform bacteria, and sulfites?

- A. Quantify the pollutants
- B. Grab samples
- C. Hand composites
- D. Monitor parameters
- E. Flow proportional composites
- F. None of the Above

Timed Composites

352. Which of the following sampling terms are usually taken in instances where the intention is to characterize the wastes over a period of time without regard to flow?

- A. Timed samples
- B. Grab samples
- C. Hand composites
- D. Time proportional composite sampling methods
- E. Flow proportional composites
- F. None of the Above

Flow Proportional Composites

353. Which of the following sampling terms are taken at varying time intervals, or continuous samples taken over a period of time based on the flow?

- A. Entire batch discharge
- B. The volume of sample
- C. Concentration of pollutants
- D. An individual sample
- E. Samples
- F. None of the Above

Wastewater Sample Preservation

354. One or more unstable pollutants that require immediate analysis or preservation until _____ can be made.

- A. An analysis
- B. Split samples
- C. Duplicate samples
- D. Taste test
- E. Blanks
- F. None of the Above

355. According the text, sample preservation is needed for _____, for example, which may be stored for as long as 24 hours prior to transferring them to the laboratory?

- A. Nitrified effluent
- B. Composite samples
- C. Total Nitrogen (TN)
- D. Nitrogen and phosphorus levels
- E. Activated sludge
- F. None of the Above

Quality Assurance/Quality Control Policy - Example

356. Any contamination detected in the _____ would result from field exposure that could in turn affect collected samples.

- A. An analysis
- B. Split samples
- C. Duplicate samples
- D. Taste test
- E. Blanks
- F. None of the Above

Chain-of-Custody

357. If sampling is performed for the Pretreatment program, any sampling data may be used as evidence in court proceedings in this case _____ becomes critical.

- A. Sampling crew
- B. Duplicate samples
- C. Pre-preserved bottles
- D. Documentation
- E. Noncompliant industrial user
- F. None of the Above

Proper Sample Handling

358. The proper handling of _____ also includes wearing gloves.

- A. Other parameters
- B. Pre-preserved bottles
- C. Preservatives
- D. Some samples
- E. Water quality samples
- F. None of the Above

Field Parameters

359. Be sure to measure and record the field parameters of temperature, electrical conductivity, pH and _____ in an undisturbed section of stream flow.

- A. Nitrified effluent
- B. Nitrogen
- C. Total Nitrogen (TN)
- D. Dissolved oxygen
- E. Activated sludge
- F. None of the Above

Dissolved Oxygen

360. Aerobic means without air and some bacteria thrive under these conditions and utilize the nutrients and chemicals available to exist.

- A. True
- B. False

Methods of Determination

361. Temperature, atmospheric pressure, salinity, biological activity and pH all have an effect on the (DO) content.

- A. True
- B. False

Iodometric Test

362. Which of the following wastewater terms are highly dependent on the source and characteristics of the sample?

- A. Methods of analysis
- B. DO analysis
- C. Carbon dioxide
- D. Frequent dissolved oxygen measurement
- E. Aerobic conditions
- F. None of the Above

Sludge Volume Index (SVI)

363. The higher the (SVI), the better is the settling quality of the aerated mixed liquor, low (SVI) of 50 or less is considered a good settling sludge.

- A. True
- B. False

364. The Sludge Volume Index (SVI) of activated sludge is defined as the volume in milliliters occupied by _____ after settling for 30 minutes.

- A. A closed loop
- B. 1g of activated sludge
- C. Optimal DO levels
- D. Trickling filter FFSS
- E. A portion of the denitrified effluent
- F. None of the Above

Pathogens/Disinfection/Chlorine Section

Chlorine's Appearance and Odor

365. Chlorine is a greenish-yellow gas it will condense to an amber liquid at approximately _____ F or at high pressures.

- A. 32 degrees
- B. - 100 degrees
- C. 129 degrees
- D. 29 degrees
- E. -29.2 degrees
- F. None of the Above

366. Prolonged exposures to chlorine gas may result in?

- A. Exposure to chlorine
- B. Odor thresholds
- C. A corrosive material
- D. Olfactory fatigue
- E. Moisture, steam, and water
- F. None of the Above

Reactivity

367. Cylinders of chlorine may burst when exposed to elevated temperatures. When there is Chlorine in solution, this forms?

- A. Hydrogen sulfide
- B. Oxomonosilane
- C. Ammonia
- D. A characteristic pungent odor
- E. A corrosive material
- F. None of the Above

368. What is formed when chlorine is in contact with combustible substances (such as gasoline and petroleum products, hydrocarbons, turpentine, alcohols, acetylene, hydrogen, ammonia, and sulfur), reducing agents, and finely divided metals?

- A. Exposure to chlorine
- B. Odor thresholds
- C. A corrosive material
- D. Fires and explosions
- E. Moisture, steam, and water
- F. None of the Above

Chlorine Basics

What Happens to Chlorine When it Enters the Environment?

369. Chlorine reacts with water to form hypochlorous acid and hydrochloric acid. The hypochlorous acid breaks down rapidly. The hydrochloric acid also breaks down; its breakdown products will raise the pH of the water (makes it more basic).

- A. True
- B. False

Disinfectant Qualities

370. 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

Properties

371. Because it is highly reactive, chlorine is usually found in nature bound with other elements like sodium, potassium, and magnesium.

- A. True
- B. False

372. Various states of chlorine include when chlorine is isolated as a free element, chlorine is a greenish yellow gas, which is?

- A. 2.5 times heavier than water
- B. 2.5 times lighter than air
- C. 10 times heavier than air
- D. 2.5 times heavier than air
- E. 25 times heavier than air
- F. None of the Above

Chlorine Exposure Limits

373. OSHA Cl₂'s PEL?

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

374. Physical and chemical properties: A yellowish green, nonflammable and liquefied gas with an unpleasant and irritating smell.

- A. Cl₃
- B. Chlorine
- C. HOCl and OCl⁻
- D. Combined Available Chlorine
- E. Monochloramine
- F. None of the Above

375. The gas can be readily compressed into a clear, amber-colored liquid, a _____, and a strong oxidizer.

- A. Cl₂
- B. Cl
- C. HOCl and OCl-
- D. Combined Available Chlorine
- E. Noncombustible gas
- F. None of the Above

376. Solid chlorine is about _____ times heavier than water and gaseous chlorine is about 2.5 times heavier than air.

- A. 1.5
- B. 1.0
- C. 0.5
- D. 2.5
- E. 3.0
- F. None of the Above

377. Cl₂'s IDLH?

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

378. Cl₂'s Fatal Exposure Limit?

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

379. The current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for chlorine is 10 PPM (3 milligrams per cubic meter (mg/m³)) as a ceiling limit. A worker's exposure to chlorine shall at no time exceed this ceiling level.

- A. True
- B. False

Chlorine's Effectiveness

380. 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

381. Chlorine may not be available for disinfection because _____ in the water (like iron, manganese, hydrogen sulfide, and ammonia).

- A. pH increases
- B. Chlorine level and water quality
- C. Free chlorine residual
- D. Required contact time
- E. Part of it combines with other chemicals
- F. None of the Above

382. The amount of chlorine required to achieve disinfection and that reacts with the other chemicals is the?

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

383. Which term is used to disinfect decreases, as the concentration of the chlorine increases.

- A. pH increases
- B. Chlorine level and water quality
- C. Free chlorine residual
- D. Required contact time
- E. Not available for disinfection
- F. None of the Above

384. Chlorination is more effective as?
A. Chlorine residual D. Water cools down
B. Colors change E. Water temperature increases
C. Chlorine demand F. None of the Above

385. Chlorination becomes more alkaline and is less effective as the?
A. Water's pH increases D. Required contact time is maximized
B. Water quality increases E. Contact time
C. Free chlorine residual drops F. None of the Above

386. Chlorination is less effective in?
A. Clear water D. Day time
B. Color change E. Cloudy (turbid) water
C. Warm temps F. None of the Above

387. By adding a little more chlorine to what is already sufficient, this action will generally result in _____ that can be measured easily.
A. pH increases D. Required contact time
B. Chlorine level and water quality E. A free chlorine residual
C. Chlorine demand F. None of the Above

Chemistry of Chlorination

388. The hypochlorite ion is a much weaker disinfecting agent than Hypochlorous acid, about 100 times less effective.
A. True B. False

389. According to the text, pH and temperature affect the ratio of hypochlorous acid to hypochlorite ions. As the temperature is decreased, the _____ increases.
A. Reduction Ratio D. "CT" disinfection concept
B. CT actual E. Ratio of hypochlorous acid
C. Free chlorine residual F. None of the Above

390. Under normal water conditions, hypochlorous acid will also chemically react and break down into the hypochlorite ion.
A. True B. False

Waterborne Microorganisms and Bacteria Appendix Protozoa

391. When protozoa are in the form of _____, they actively feed and grow.
A. Cysts D. Hermaphroditic
B. Trophozoites E. Apicomplexans
C. Pathogens F. None of the Above

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

Classification

393. 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

Protozoa Section

394. The diverse assemblage of organisms that carry out all of their life functions within the confines of a single, complex _____ are called protozoa.
A. Eukaryotic cell D. Marine ciliates
B. Protozoa(ns) E. Cytoplasm
C. Amoeba(s) F. None of the Above

395. Which bug/creature/organism/species are found in all moist habitats within the United States, but we know little about their specific geographic distribution?
A. Eukaryotes D. Marine ciliates
B. Protozoa(ns) E. Cytoplasm
C. Amoeba(s) F. None of the Above

396. According to the text, Paramecia are a group of unicellular ciliate protozoa formerly known as _____ from their slipper shape.
A. Ciliate group D. Prokaryotes
B. Unicellular ciliate protozoa E. Bacterial cell
C. Slipper animalcules F. None of the Above

397. Which bug/creature/organism/species/disease are widespread in freshwater environments, and are especially common in scums?
A. Shigella D. Paramecia
B. Bacteria E. Shigellosis (bacillary dysentery)
C. S. dysenteriae F. None of the Above

Protozoan Reservoirs of Disease

398. Which of the following bugs/disease/causes terms represents the causative organism of Legionnaires' disease?
A. Centrioles D. Amoebae
B. Viruses E. Bacterium Legionella pneumophila
C. Autotrophic F. None of the Above

Symbionts

399. Which of the following terms inhabit the rumen and reticulum of ruminates and the cecum and colon of equids?
A. Protozoa D. Soil-dwelling protozoa
B. Foraminifera E. Ciliates
C. Freshwater protozoan F. None of the Above

Ecological Role of Protozoa

400. According to the text, these are predators of unicellular or filamentous algae, _____, and microfungi, protozoa play a role both as herbivores and as consumers in the decomposer link of the food chain.
A. Bacteria D. Pathogenic bacteria
B. Many ecological conditions E. Bacterium
C. Amazingly diverse organisms F. None of the Above