446. The biochemical treatment of sewage effluents is essentially a process of
(*a*) oxidation (*b*) dehydration
(*c*) reduction (*d*) alkalinization

447. In the design of grit chambers
(*a*) baffles are essential
(*b*) temperature is an important factor
(*c*) the detention period should be at least 30 minutes
(*d*) the maximum velocity of flow is 30 cm per second

448. The two main gases liberated from an anaerobic sludge digestion tank would include
(*a*) ammonia and carbon dioxide
(*b*) carbon dioxide and methane
(*c*) methane and hydrogen sulphide
(*d*) ammonia and methane

449. Ventilation of sewer lines is necessary to
(*a*) avoid building up of sewer gases.
(*b*) ensure atmospheric pressure in the waste water surface.
(*c*) ensure the safety of sewer maintenance people.
(*d*) all of these

450. Which of following parameters are taken into consideration for determining organic strength of a waste?
(*a*) Volatile solids
(*b*) Chemical oxygen demand
(*c*) Biochemical oxygen demand
(*d*) All of these

451. Function of algae in an oxidation pond is to
(*a*) provide a mat over the surface of the oxidation pond so as to prevent evaporation of water
(*b*) provide oxygen for bacteria to degrade organicmatter
(*c*) provide a greenish appearance to the pond
(*d*) prevent the odour nuisance

452. When a sewage is disposed off in a river, the rate of depletion of dissolved oxygen of the river mainly depends on
(*a*) biochemical oxygen demand of the sewage
(*b*) chemical oxygen demand of the sewage
(*c*) total organic carbon present in the sewage
(*d*) dissolved oxygen present in the sewage

453. When sewage enters a flowing river, the rapid depletion of dissolved oxygen is due to
(*a*) change in temperature in river water
(*b*) the suspended particles in river and waste
(*c*) respiratory activity of aquatic plants in the river
(*d*) microbial activity

454. In a high-rate trickling filter, the problem of ponding can be solved by
(*a*) flooding and raking
(*b*) chlorination and supply of air
(*c*) raking and chlorination
(*d*) flooding and supply of air

455. Sewage may be disposed of without treatment into a water body if the available dilution is
(*a*) less than 150 (*b*) more than 150
(*c*) more than 300 (*d*) more than 500

456. A sewer is commonly designed to attain self-cleansing velocity at
(*a*) Peak hourly rate of flow
(*b*) Average hourly rate of flow
(*c*) Minimum hourly rate of flow
(*d*) Sewer running half full

457. A primary sedimentation tank is not required for
(*a*) Activated sludge system
(*b*) Extended aeration system
(*c*) Trickling filtration system
(*d*) Tapered activated sludge process using pure oxygen for aeration

458. Building manholes must be provided at
(*a*) every change of alignment, gradient or diameter.
(*b*) head of all sewers.
(*c*) every junction of two or more sewers
(*d*) all of these

459. In aerobic conditions, the microbial decomposition of organics results in the formation of
(*a*) stable and objectionable end products
(*b*) unstable and objectionable end products
(*c*) unstable and acceptable end products
(*d*) stable and unobjectionable end products

460. In dissolved oxygen sag curve, the sag results because
(*a*) it is a function of a rate of addition of oxygen to the stream
(*b*) it is a function of a rate of addition of oxygen from the stream
(*c*) it is a function of both addition and depletion of oxygen from the stream
(*d*) rate of addition of oxygen is linear, but the rate of depletion is non-linear

461. A combined sewer is one, which transports domestic sewage and
(*a*) storm water
(*b*) industrial wastes
(*c*) overhead flow
(*d*) industrial wastes and storm water

462. Presence of nitrogen in a waste water sample is due to the decomposition of

(*a*) Carbohydrates (*b*) Proteins

(*c*) Fats (*d*) Vitamins

463. Which of the following pairs are correctly matched ?

(*a*) Ringelmann .... To grade density chart of smoke

(*b*) Pneumoconiosis .... Disease caused due to coaldust

(*c*) PAN .... Secondary air pollutant

(*d*) All of these

464. Which of the following pairs are correctly matched ?

(*a*) NIPTS ..... Responsible for permanent hearing loss

(*b*) Sound foci ..... Formed when sound waves are reflected from concave surface

(*c*) TTS ..... Responsible for temporary hearing loss

(*d*) All of these

465. Acoustics of an auditorium is considered to be excellent when its reverberation time is between

(*a*) 0.50 and 1.50 s (*b*) 1.50 and 2.00 s

(*c*) 2.00 and 3.00 s (*d*) 3.00 and 5.00 s

466. Which of the following is correct sound intensity expression with usual notations ?

(a) $dB = 10 \log_{10} (I/I_0)^2$ (b) $dB = 10 \log_{10} (I/I_0)$

(c) $dB = 10 \log_{10} (I\text{-}I_0)^2$ (d) $dB = 10 \log_{10} (I\text{-}I_0)$

467. What type of noise can be abated by providing lining on walls and ceiling with sound absorbing materials ?

(*a*) Source noise

(*b*) Reflection noise

(*c*) Structural noise

(*d*) Direct air-borne noise

EXERCISE - II

(Questions From Previous SSC CPWD Exams)

2008

1. Water supply includes

(*a*) Collection, transportation and treatment of water

(*b*) Distribution of water consumers

(*c*) Provision of hydrants for fire fighting

(*d*) All the above

2. Gauge pressure at a point is equal to

(*a*) Absolute pressure plus atmospheric pressure

(*b*) Absolute pressure minus atmospheric pressure

(*c*) Vacuum pressure plus absolute pressure

(*d*) None of the above

3. Disinfection of drinking water is done to remove

(*a*) Turbidity (*b*) Odour

(*c*) Colour (*d*) Bacteria

4. Permanent hardness of water can be removed by

(*a*) Adding alum (*b*) Adding lime

(*c*) Adding chlorine (*d*) Zeolite process

2009

5. The % of chlorine in fresh bleaching powder is about.

(*a*) 10 to 20 (*b*) 20 to 25

(*c*) 30 to 35 (*d*) 40 to 50

6. Sewage treatment units are normally designed for:

(*a*) 5-10 years. (*b*) 15-20 years.

(*c*) 30-40 years. (*d*) 40-50 years.

2010

7. The maximum permissible limit for fluoride in drinking water is:

(*a*) 0.1 mg/l (*b*) 1.5 mg/l

(*c*) 5 mg/l (*d*) 10 mg/l

8. Resins are:

(*a*) Not soluble in water

(*b*) Soluble in spirit

(*c*) Used in varnishes

(*d*) Left behind on evaporation of oil

9. Primary treatment of sewage consists of:

(*a*) Removal of floating materials.

(*b*) Removal of sand and grit.

(*c*) Removal of organic materials.

(*d*) All the above.

10. A sewer which receives the discharge of a number of house sewers is called

(*a*) House sewer (*b*) Lateral sewer

11. The commonly used lime in white washing is

(*a*) Quick lime (*b*) Fat lime

(*c*) Hydraulic lime (*d*) All the above

12. The total water consumption including domestic, commercial and industrial demands for average Indian people is:

(*a*) 135 lpcd (*b*) 210 lpcd

(*c*) 240 lpcd (*d*) 270 lpcd

2011

13. Hardness of water is caused by the presence of the following in water :

(*a*) Chlorides and sulphates

(*b*) Calcium and magnesium

(*c*) Nitrites and nitrates

(*d*) Sodium and potassium

14. The product of 11^{+} ions and OIL^{-} ions in a strong alkali is

(*a*) 0 (*b*) 1

(*c*) 10^{-1} (*d*) 10^{-14}

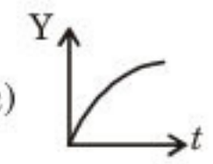
15. The minimum dissolved oxygen which should always be present in water in order to save the aquatic life is

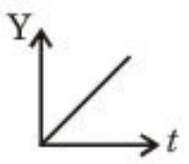
(*a*) 1 ppm (*b*) 4 ppm

(*c*) 10 ppm (*d*) 40 ppm

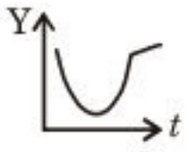
2012

16. The correct graphical representation of BOD (y) and time (t) is given by

(*a*) 

(*b*) 

(*c*) 

(*d*) 

17. The most suitable solid waste disposal method for rural areas is

(*a*) Land filling (*b*) Deep well injection

(*c*) Composting (*d*) Incineration

2013

18. The permissible limit of arsenic in drinking water as per the guidelines of WHO is

(*a*) 0.01 ppm (*b*) 0.01 ppb

(*c*) 0.05 ppm (*d*) 0.05 ppb

19. Which one of the following sequences is the most suitable for treating raw surface water to make it suitable for drinking purpose?

(*a*) Screening → filtration → sedimentation → disinfection

(*b*) Screening → disinfection → sedimentation → filtration

(*c*) Screening → sedimentation → disinfectioin → filtration

(*d*) Screening → sedimentation → filtration → disinfection

2014

20. Calcium chloride added in concrete acts as:

(*a*) retarder

(*b*) accelerator

(*c*) air entraining agent

(*d*) plasticizer

21. To prevent sulphate attack in concrete, for preparing concrete mix, water pH must be within

(*a*) 7–10 (*b*) 4 – 6

(*c*) 5 – 7 (*d*) 6 – 9

22. BOD test is conducted at a temperature of :

(*a*) Ambient temperature

(*b*) 15°C

(*c*) 20°C

(*d*) 27°C

23. The standard 5-day BOD at 20°C, when compared to ultimate BOD is about

(*a*) 60% (*b*) 68%

(*c*) 80% (*d*) 90%

24. The global warming is caused mainly by

(*a*) NO_X (*b*) SO_X

(*c*) CO_2 (*d*) O_2

2015

25. Pollution potential of domestic sewage generated in a town and its industrial sewage can be compared with reference to

(*a*) their BOD value

(*b*) population equivalent

(*c*) their volume

(*d*) the relative density

26. The valve which protects the water meter from the damages of water hammer

(*a*) pressure relief valve

(*b*) stop cock

(*c*) reflux valve

(*d*) water hammer valve

27. Connecting pipe in mm for septic tank should not be less than

(*a*) 150

(*b*) 100

(*c*) 50

(*d*) 25

ANSWERS

EXERCISE - I

1. (*b*)	**2.** (*a*)	**3.** (*d*)	**4.** (*d*)	**5.** (*b*)	**6.** (*c*)	**7.** (*d*)	**8.** (*b*)	**9.** (*a*)	**10.** (*b*)
11. (*d*)	**12.** (*a*)	**13.** (*a*)	**14.** (*a*)	**15.** (*d*)	**16.** (*d*)	**17.** (*c*)	**18.** (*d*)	**19.** (*d*)	**20.** (*a*)
21. (*d*)	**22.** (*c*)	**23.** (*d*)	**24.** (*b*)	**25.** (*c*)	**26.** (*c*)	**27.** (*b*)	**28.** (*d*)	**29.** (*a*)	**30.** (*a*)
31. (*d*)	**32.** (*d*)	**33.** (*d*)	**34.** (*a*)	**35.** (*c*)	**36.** (*b*)	**37.** (*d*)	**38.** (*b*)	**39.** (*c*)	**40.** (*a*)
41. (*d*)	**42.** (*b*)	**43.** (*d*)	**44.** (*a*)	**45.** (*c*)	**46.** (*b*)	**47.** (*d*)	**48.** (*d*)	**49.** (*a*)	**50.** (*a*)
51. (*b*)	**52.** (*b*)	**53.** (*d*)	**54.** (*b*)	**55.** (*c*)	**56.** (*b*)	**57.** (*c*)	**58.** (*c*)	**59.** (*c*)	**60.** (*b*)
61. (*c*)	**62.** (*b*)	**63.** (*d*)	**64.** (*a*)	**65.** (*a*)	**66.** (*b*)	**67.** (*a*)	**68.** (*c*)	**69.** (*c*)	**70.** (*b*)
71. (*b*)	**72.** (*a*)	**73.** (*d*)	**74.** (*a*)	**75.** (*a*)	**76.** (*d*)	**77.** (*d*)	**78.** (*d*)	**79.** (*d*)	**80.** (*d*)
81. (*a*)	**82.** (*b*)	**83.** (*a*)	**84.** (*c*)	**85.** (*a*)	**86.** (*b*)	**87.** (*b*)	**88.** (*a*)	**89.** (*a*)	**90.** (*c*)
91. (*b*)	**92.** (*a*)	**93.** (*a*)	**94.** (*a*)	**95.** (*c*)	**96.** (*d*)	**97.** (*d*)	**98.** (*a*)	**99.** (*c*)	**100.** (*c*)
101. (*b*)	**102.** (*b*)	**103.** (*d*)	**104.** (*d*)	**105.** (*b*)	**106.** (*a*)	**107.** (*d*)	**108.** (*c*)	**109.** (*b*)	**110.** (*b*)
111. (*b*)	**112.** (*c*)	**113.** (*a*)	**114.** (*b*)	**115.** (*b*)	**116.** (*d*)	**117.** (*a*)	**118.** (*b*)	**119.** (*c*)	**120.** (*b*)
121. (*a*)	**122.** (*c*)	**123.** (*d*)	**124.** (*c*)	**125.** (*c*)	**126.** (*c*)	**127.** (*b*)	**128.** (*d*)	**129.** (*b*)	**130.** (*d*)
131. (*d*)	**132.** (*c*)	**133.** (*b*)	**134.** (*c*)	**135.** (*d*)	**136.** (*c*)	**137.** (*c*)	**138.** (*c*)	**139.** (*c*)	**140.** (*a*)
141. (*a*)	**142.** (*a*)	**143.** (*c*)	**144.** (*d*)	**145.** (*e*)	**146.** (*b*)	**147.** (*d*)	**148.** (*b*)	**149.** (*c*)	**150.** (*b*)
151. (*b*)	**152.** (*b*)	**153.** (*c*)	**154.** (*d*)	**155.** (*a*)	**156.** (*b*)	**157.** (*a*)	**158.** (*d*)	**159.** (*d*)	**160.** (*b*)
161. (*c*)	**162.** (*d*)	**163.** (*d*)	**164.** (*b*)	**165.** (*c*)	**166.** (*d*)	**167.** (*d*)	**168.** (*c*)	**169.** (*d*)	**170.** (*c*)
171. (*b*)	**172.** (*b*)	**173.** (*b*)	**174.** (*b*)	**175.** (*c*)	**176.** (*a*)	**177.** (*c*)	**178.** (*d*)	**179.** (*e*)	**180.** (*c*)
181. (*b*)	**182.** (*d*)	**183.** (*c*)	**184.** (*d*)	**185.** (*c*)	**186.** (*c*)	**187.** (*d*)	**188.** (*a*)	**189.** (*)	**190.** (*c*)
191. (*c*)	**192.** (*d*)	**193.** (*c*)	**194.** (*b*)	**195.** (*d*)	**196.** (*c*)	**197.** (*a*)	**198.** (*c*)	**199.** (*b*)	**200.** (*b*)
201. (*a*)	**202.** (*a*)	**203.** (*b*)	**204.** (*d*)	**205.** (*c*)	**206.** (*a*)	**207.** (*d*)	**208.** (*d*)	**209.** (*b*)	**210.** (*a*)
211. (*d*)	**212.** (*b*)	**213.** (*a*)	**214.** (*b*)	**215.** (*a*)	**216.** (*d*)	**217.** (*a*)	**218.** (*b*)	**219.** (*c*)	**220.** (*d*)
221. (*c*)	**222.** (*d*)	**223.** (*b*)	**224.** (*c*)	**225.** (*d*)	**226.** (*d*)	**227.** (*d*)	**228.** (*b*)	**229.** (*b*)	**230.** (*b*)
231. (*c*)	**232.** (*a*)	**233.** (*a*)	**234.** (*a*)	**235.** (*a*)	**236.** (*a*)	**237.** (*b*)	**238.** (*b*)	**239.** (*d*)	**240.** (*e*)
241. (*b*)	**242.** (*b*)	**243.** (*b*)	**244.** (*c*)	**245.** (*c*)	**246.** (*b*)	**247.** (*b*)	**248.** (*c*)	**249.** (*c*)	**250.** (*c*)
251. (*c*)	**252.** (*c*)	**253.** (*e*)	**254.** (*d*)	**255.** (*b*)	**256.** (*b*)	**257.** (*a*)	**258.** (*c*)	**259.** (*a*)	**260.** (*d*)
261. (*a*)	**262.** (*b*)	**263.** (*b*)	**264.** (*b*)	**265.** (*a*)	**266.** (*)	**267.** (*c*)	**268.** (*c*)	**269.** (*a*)	**270.** (*d*)
271. (*a*)	**272.** (*b*)	**273.** (*b*)	**274.** (*b*)	**275.** (*a*)	**276.** (*c*)	**277.** (*c*)	**278.** (*b*)	**279.** (*c*)	**280.** (*c*)
281. (*d*)	**282.** (*c*)	**283.** (*a*)	**284.** (*c*)	**285.** (*b*)	**286.** (*a*)	**287.** (*b*)	**288.** (*b*)	**289.** (*d*)	**290.** (*b*)
291. (*d*)	**292.** (*d*)	**293.** (*d*)	**294.** (*a*)	**295.** (*d*)	**296.** (*c*)	**297.** (*c*)	**298.** (*b*)	**299.** (*b*)	**300.** (*d*)
301. (*a*)	**302.** (*b*)	**303.** (*b*)	**304.** (*d*)	**305.** (*d*)	**306.** (*b*)	**307.** (*b*)	**308.** (*d*)	**309.** (*a*)	**310.** (*d*)
311. (*a*)	**312.** (*d*)	**313.** (*c*)	**314.** (*c*)	**315.** (*c*)	**316.** (*b*)	**317.** (*a*)	**318.** (*d*)	**319.** (*c*)	**320.** (*a*)
321. (*d*)	**322.** (*d*)	**323.** (*c*)	**324.** (*c*)	**325.** (*a*)	**326.** (*a*)	**327.** (*c*)	**328.** (*a*)	**329.** (*c*)	**330.** (*c*)
331. (*b*)	**332.** (*d*)	**333.** (*c*)	**334.** (*c*)	**335.** (*c*)	**336.** (*a*)	**337.** (*a*)	**338.** (*d*)	**339.** (*a*)	**340.** (*b*)
341. (*d*)	**342.** (*b*)	**343.** (*b*)	**344.** (*d*)	**345.** (*b*)	**346.** (*c*)	**347.** (*b*)	**348.** (*a*)	**349.** (*d*)	**350.** (*c*)
351. (*c*)	**352.** (*c*)	**353.** (*c*)	**354.** (*b*)	**355.** (*b*)	**356.** (*c*)	**357.** (*b*)	**358.** (*a*)	**359.** (*c*)	**360.** (*a*)
361. (*a*)	**362.** (*b*)	**363.** (*b*)	**364.** (*b*)	**365.** (*a*)	**366.** (*a*)	**367.** (*a*)	**368.** (*d*)	**369.** (*b*)	**370.** (*c*)
371. (*b*)	**372.** (*c*)	**373.** (*d*)	**374.** (*b*)	**375.** (*c*)	**376.** (*a*)	**377.** (*b*)	**378.** (*a*)	**379.** (*a*)	**380.** (*d*)
381. (*a*)	**382.** (*c*)	**383.** (*d*)	**384.** (*a*)	**385.** (*a*)	**386.** (*c*)	**387.** (*b*)	**388.** (*a*)	**389.** (*d*)	**390.** (*a*)
391. (*b*)	**392.** (*a*)	**393.** (*c*)	**394.** (*d*)	**395.** (*b*)	**396.** (*d*)	**397.** (*b*)	**398.** (*b*)	**399.** (*b*)	**400.** (*a*)
401. (*c*)	**402.** (*a*)	**403.** (*c*)	**404.** (*d*)	**405.** (*b*)	**406.** (*c*)	**407.** (*b*)	**408.** (*b*)	**409.** (*d*)	**410.** (*a*)
411. (*b*)	**412.** (*c*)	**413.** (*b*)	**414.** (*b*)	**415.** (*d*)	**416.** (*c*)	**417.** (*b*)	**418.** (*c*)	**419.** (*b*)	**420.** (*b*)

421. (*a*)	**422.** (*b*)	**423.** (*a*)	**424.** (*a*)	**425.** (*b*)	**426.** (*b*)	**427.** (*b*)	**428.** (*a*)	**429.** (*b*)	**430.** (*a*)
431. (*b*)	**432.** (*d*)	**433.** (*d*)	**434.** (*a*)	**435.** (*d*)	**436.** (*b*)	**437.** (*b*)	**438.** (*b*)	**439.** (*b*)	**440.** (*b*)
441. (*c*)	**442.** (*b*)	**443.** (*b*)	**444.** (*d*)	**445.** (*b*)	**446.** (*a*)	**447.** (*d*)	**448.** (*b*)	**449.** (*d*)	**450.** (*b*)
451. (*b*)	**452.** (*a*)	**453.** (*d*)	**454.** (*c*)	**455.** (*d*)	**456.** (*c*)	**457.** (*b*)	**458.** (*c*)	**459.** (*d*)	**460.** (*c*)
461. (*d*)	**462.** (*b*)	**463.** (*d*)	**464.** (*b*)	**465.** (*a*)	**466.** (*b*)	**467.** (*b*)			

EXERCISE - II

1. (*d*)	**2.** (*b*)	**3.** (*d*)	**4.** (*d*)	**5.** (*c*)	**6.** (*b*)	**7.** (*b*)	**8.** (*)	**9.** (*c*)	**10.** (*b*)
11. (*b*)	**12.** (*d*)	**13.** (*b*)	**14.** (*d*)	**15.** (*b*)	**16.** (*a*)	**17.** (*c*)	**18.** (*a*)	**19.** (*d*)	**20.** (*b*)
21. (*d*)	**22.** (*c*)	**23.** (*b*)	**24.** (*c*)	**25.** (*b*)	**26.** (*c*)	**27.** (*b*)			

EXPLANATIONS

EXERCISE - I

435. Sewage consists of 99.9% water and 0.1% solid and its specific gravity is 1.001 but the sewage and water are considered identical for design.

437. $V = \sqrt{KD(G-1)}$

439. Normally fresh sewage is alkaline and tends to become acidic as it becomes state.

440. *BOD% removal in*

Oxidation pond = 90%

Oxidation ditch = 98%

Aerated laggons = 90 – 95%

Trickling filter = 80 – 90%

443. In 98% :

$98x \rightarrow$ water, $2x \rightarrow$ solid

In 96%, $48x$ is water

$\therefore$ Total sludge = $50x = \frac{x}{2}$

447. D.T. = 40 – 60 seconds

EXERCISE - II

1. Water supply includes-

- collection, transportation and treatment of water
- distribution of water to consumers
- provision of hydrants for fire fighting

2. Gage Pressure = Absolute Pressure – Atm Pressure

3. Disinfection of drinking water is done to remove bacteria.

4. Permanent hardness of water can be removed by Zeolite process.

5. The bleaching powder is a white powder and it contains about 30 to 35 per cent of available chlorine

6. Sewage treatment units are normally designed for 15-20 years.

7. Maximum permissible limit for fluoride in drinking water is 1.5 mg/l

9. In primary treatment of sewage unit firstly removal of suspended organic solid materials.

10. The sewer obtaining its discharge directly from building is known as a lateral.

11. Fat lime is suitable for **whitewashing** and plastering.

Hydraulic lime is suitable for making mortar and used for massonary construction.

12.

Use	Demand (lpcd)
(*a*) Domestic use	200
(*b*) Industrial use	50
(*c*) Commercial use	20
Total	270 per capita demand

14. Product of concentration of H^+ ions and OH^{-1} ions in water solution is constant and equal to 10^{-14} moles/ liter.

19. Screening $\rightarrow$ Sedimentation $\rightarrow$ filteration $\rightarrow$ disinfection

20. Calcium chloride ($CaCl_2$) added in concrete acts as Accelerator or it is a admixtures result in early setting and hardening or concrete and increased shrinkage.

21. To prevent sulphate attack in concrete, for preparing concrete mix, water pH must be within 6-9.

25. Population equivalent

$$= \frac{\text{B.O.D. Industrial (5 days)}}{\text{B.O.D. domestic sewage/person/day}}$$

26. Brinnell Hardness No. $= \dfrac{P}{\frac{\pi D}{2}\left[D - \sqrt{D^2 - d^2}\right]}$

$P \rightarrow$ Load

$D \rightarrow$ Diameter of hard steel ball

Ablity of matrial to Resist indentation.

■■