

Waste water engineering

1. The minimum recommended diameter of sewers, is

- A. 5 cm
- B. 10 cm
- C. 15 cm
- D. 20 cm.

Answer: Option C

2. Aerobic bacterias

- A. flourish in the presence of free oxygen
 - B. consume organic matter as their food
 - C. oxidise organic matter in sewage
 - D. **All the above.**
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3. The rate of accumulation of sludge in septic tanks is recommended as

- A. 30 litres/person/year
- B. 25 litres/person/year
- C. 30 litres/person/month
- D. 25 litres/person/month.

Answer: Option A

4. If 2% solution of a sewage sample is incubated for 5 days at 20°C and depletion of oxygen was found to be 5 ppm, B.O.D. of the sewage is

- A. 200 ppm
- B. 225 ppm
- C. 250 ppm
- D. None of these.

Answer: Option C

5. If D is the diameter of upper circular portion, the overall depth of a standard egg shaped section, is

- A. D
- B. $1.25 D$
- C. $1.5 D$
- D. $1.75 D$
- E. $2 D$.

Answer: Option C

6. If the diameter of sewer is 225 mm, the gradient required for generating self cleansing velocity, is

- A. 1 in 60
- B. 1 in 100

- C. 1 in 120
- D. none of these.

Answer: Option C

7. Pick up the correct statement from the following :
- A. pH value indicates acidity and alkalinity of sewage
 - B. In acidic sewage, the pH value is less than 7
 - C. In alkaline sewage, the pH value is more than 7
 - D. Fresh sewage is generally alkaline
 - E. All the above.

Answer: Option E

8. The non-clog pump which permits solid matter to pass out with the liquid sewage, is
- A. centrifugal pump
 - B. reciprocating pump
 - C. pneumatic ejector
 - D. none of these.

Answer: Option A

9. Assertion (A) : Discharging the effluents from the oxidation ponds just up stream of lakes or reservoirs is undesirable. Reason (R) : The discharged algae get settled in the reservoirs and cause anaerobic decomposition and other water qualities.
- A. Both A and R are true and R is the correct explanation of A
 - B. Both A and R are true but R is not a correct explanation of A
 - C. A is true but R is false
 - D. A is false but R is true.

Answer: Option A

10. The width of a rectangular sewer is twice its depth while discharging 1.5 m/sec. The width of the sewer is
- A. 0.68 m
 - B. 0.88 m
 - C. 1.36 m
 - D. 1.76 m.

Answer: Option C

11. Pick up the correct statement from the following :
- A. In treated sewage, 4 PPM of D.O. is essential
 - B. Only very fresh sewage contains some dissolved oxygen
 - C. The solubility of oxygen in sewage is 95% that is in distilled water
 - D. All the above.

Answer: Option D

12. In olden days the type of section adopted in trunk and out fall sewers was

- A. parabolic shaped
- B. horse shoe shaped
- C. egg shaped
- D. circular shaped.

Answer: Option B

13. For the survival of fish in a river stream, the minimum dissolved oxygen is prescribed

- A. 3 PPM
- B. 4 PPM
- C. 5 PPM
- D. 10 ppm.

Answer: Option B

14. In a fully mechanised composting plant, involves

- A. mechanized receipt
- B. mechanized segregation
- C. mechanized pulverising of refuse
- D. all of these.

Answer: Option D

15. Self-cleansing velocity is

- A. velocity at dry weather flow
- B. velocity of water at flushing
- C. velocity at which no accumulation remains in the drains
- D. velocity of water in a pressure filter.

Answer: Option C

16. If the over land flow from the critical point to the drain is 8 km and the difference in level is 12.4 m, the inlet time is

- A. 2 hours
- B. 3 hours
- C. 4 hours
- D. 5 hours.

Answer: Option C

17. An inverted siphon is designed generally for

- A. one pipe
- B. two pipes
- C. three pipes

D. four pipes.

Answer: Option C

18. A rainfall may be classified as acidic if its pH value is less or equal to

A. 6

B. 7

C. 5

D. 6.5

Answer: Option C

19. When drainage to sewage ratio is 20, the peak dry weather flow is

A. 20% of the design discharge

B. slightly less than 5% of the design discharge

C. slightly more than 5% of the design discharge

D. none of these.

Answer: Option B

20. For treating the sewage of a large city, you will recommend

A. a sedimentation tank and an activated sludge treatment plant

B. a plant consisting of Imhoff tanks with low rate trickling filters

C. sedimentation tanks with high rate trickling filters

D. none of these.

Answer: Option A

21. The detention time of a circular tank of diameter d and water depth H , for receiving the sewage Q per hour, is

A.
$$\frac{d^2 (0.011d + 0.785H)}{Q}$$

B.
$$\frac{d (0.022d + 0.085H)}{Q}$$

C.
$$\frac{d (0.785d + 0.011H)}{Q}$$

D.
$$\frac{d (0.285d + 0.011H)}{Q}$$

Answer: Option A

22. The dimensions of a rectangular settling tank are : length 24 m, width 6 m and depth 3 m. If 2 hour detention period for tanks is recommended, the rate of flow of sewage per hour, is

A. 204 cu m

B. 208 cu m

C. 212 cu m

D. 216 cu m

E. 220 cu m.

Answer: Option D

23. The screens are fixed

A. perpendicular to the direction of flow

B. parallel to the direction of flow

C. at an angle 30° to 60° to the direction of flow

D. none of these.

Answer: Option C

24. In primary sedimentation, the 0.2 mm inorganic solids get separated if specific gravity is

A. 2.25

B. 2.50

C. 2.55

D. 2.65

E. 2.75

Answer: Option D

25. Pick up the in-correct statement from the following :

A. Manholes are provided in sewer pipes at suitable intervals

B. Catch basins are generally provided in sewers for carrying drainage discharge

C. Inlets are generally provided in all sewers

D. None of these.

Answer: Option C

26. Clogging of sewers, is caused due to

A. silting

B. low discharge

C. greasy and oily matters

D. domestic wastes thrown in manholes

E. all the above.

Answer: Option E

27. A sewer pipe contains 1 mm sand particles of specific gravity 2.65 and 5 mm organic particles of specific gravity 1.2, the minimum velocity required for removing the sewerage, is

A. 0.30 m/sec

B. 0.35 m/sec

C. 0.40 m/sec

D. 0.45 m/sec

E. 0.50 m/sec.

Answer: Option D

28. The coagulant widely used for sewage treatment, is

- A. alum
- B. ferric chloride
- C. ferric sulphate
- D. chlorinated copperas.

Answer: Option B

29. House connections to the laterals is generally made by

- A. R.C.C.
- B. P.C.C.
- C. Cast iron
- D. Glazed stonewares.

Answer: Option D

30. The ratio of maximum sewage flow to average sewage flow for mains up to 1 m in diameter, is

- A. 1.5
- B. 2.0
- C. 3.0
- D. 4.0

Answer: Option B

31. Dilution method of disposing off sewage, is not preferred to

- A. when sewage is fresh
- B. when diluting water has high dissolved oxygen content
- C. when diluting water is used for water supply near the point of sewage disposed
- D. when the diluting water is having flow currents
- E. none of these.

Answer: Option C

32. For house drainage minimum gradient is

- A. 1 in 60
- B. 1 in 80
- C. 1 in 10
- D. 1 in 400

Answer: Option A

33. If the side of a square sewer is 1000 mm, the diameter of a hydraulically equivalent circular section, is

- A. 1045 mm
- B. 1065 mm
- C. 1075 mm
- D. 1095 mm.

Answer: Option D

34. The ratio of minimum hourly flow to the average flow of sewage is

- A. 1/4
- B. 1/3
- C. 1/2
- D. 3/4

Answer: Option B

35. Bio-chemical oxygen demand (BOD) for the first 20 days is generally referred to

- A. initial demand
- B. first stage demand
- C. carbonaceous demand
- D. all of these.

Answer: Option D

36. Flocculated particles do not change their

- A. size
- B. shape
- C. weight
- D. none of these.

Answer: Option D

37. For non-scouring velocity 5 m/sec, the type of sewers generally preferred to, is

- A. cast iron sewers
- B. cement concrete sewers
- C. glazed bricks sewers
- D. stone ware sewers.

Answer: Option C

38. Disposal to sewage in large cities, is done in

- A. irrigation
- B. dilution
- C. oxidation
- D. putrefaction.

Answer: Option B

39. For the COD test of sewage, organic matter is oxidised by $K_2Cr_2O_7$ in the presence of

- A. H_2SO_4
- B. HNO_3
- C. HCl
- D. none of these.

Answer: Option A

40. In R.C. sewer pipes, the percentage longitudinal reinforcement to the cross-sectional area of concrete is kept

- A. 10.0
- B. 5.0
- C. 2.0
- D. 0.25

Answer: Option D

1. The asbestos cement pipes are generally laid

- A. horizontally
- B. vertically
- C. at an angle of 30°
- D. at an angle of 60° .

Answer: Option B

42. Chlorination of water is done for the removal of

- A. bacterias
- B. suspended solids
- C. sediments
- D. hardness.

Answer: Option A

43. For evaporation and measurement of settleable solids, the apparatus used, is

- A. a jar
- B. a breaker
- C. a test tube
- D. an Imhoff cone.

Answer: Option D

44. In SI units the power of sound is represented in

- A. kgs

- B. joules
- C. neutons
- D. watts.

Answer: Option D

45. A rain sanitary sewer is constructed to carry

- A. sanitary sewage
- B. storm sewage
- C. surface water
- D. ground water
- E. all the above.

Answer: Option A

46. The sewage is pumped up

- A. from low lying areas
- B. from flat areas
- C. from basements
- D. across a high ridge
- E. all the above.

Answer: Option E

47. Removal of oil and grease from sewage, is known

- A. screening
- B. skimming
- C. filtration
- D. none of these.

Answer: Option B

48. The gas which may cause explosion in sewers, is

- A. carbondioxide
- B. methane
- C. ammonia
- D. carbon monoxide.

Answer: Option B

49. In sewers the effect of scouring is more on

- A. top side
- B. bottom side

C. horizontal side

D. all sides.

Answer: Option B

Section 2

2. If the depletion of oxygen is found to be 2.5 mg/litre after incubating 2.5 ml of sewage diluted to 250 ml for 5 days at 20°C, B.O.D. of the sewage is

A. 50 mg/l

B. 100 mg/l

C. 150 mg/l

D. 200 mg/l

E. 250 mg/l.

Answer: Option E

3. The clarigesters are

A. circular septic tanks

B. rectangular septic tanks

C. circular Imhoff double tanks with bottom hoppers

D. circular Imhoff double storey tanks without bottom hoppers.

Answer: Option D

4. Rate of flow of sewage is generally assumed

A. more than the rate of water supply

B. equal to the rate of water supply

C. less than the rate of water supply

D. at 150 litres per capita.

Answer: Option C

5. Maximum permissible velocity 1.5 m/sec, is adopted in drains

A. with beds of rocks and gravels

B. lined with stones

C. both (a) and (b)

D. neither (a) nor (b).

Answer: Option C

6. The digested sludge from septic tanks, is removed after a maximum period of

A. 3 years

B. 3.5 years

C. 4 years

D. 5 years.

Answer: Option A

7. For providing an Indian type W.C., the R.C.C. slabs in the toilet portion
- A. should be sunk by 20 cm
 - B. should be kept 20 cm above the adjacent portion
 - C. should be sunk by 50 cm
 - D. need not be sunk.

Answer: Option C

8. The gradient of sewers depends upon
- A. velocity of flow
 - B. diameter of the sewer
 - C. discharge
 - D. all the above.

Answer: Option D

9. The settling velocity of the particles larger than 0.06 mm in a settling tank of depth 2.4 is 0.33 m per sec. The detention period recommended for the tank, is
- A. 30 minutes
 - B. 1 hour
 - C. 1 hour and 30 minutes
 - D. 2 hours
 - E. 3 hours.

Answer: Option D

10. The drop man holes are generally provided in sewers for
- A. industrial areas
 - B. large town ships
 - C. hilly town ships
 - D. cities in plains.

Answer: Option C

11. Sewer ventilating columns are generally placed at
- A. distances 150 m to 300 m
 - B. upper ends of branch sewers
 - C. every change in the size of sewers
 - D. all the above.

Answer: Option D

12. In case of Imhoff tanks,
- A. the shape is rectangular
 - B. detention period is 2 hours

- C. the velocity of flow is restricted to 0.30 m/minute
- D. surface loading is limited to 30, 000 litres/m of plan area per day
- E. All the above.

Answer: Option E

13. If the depth of partial flow in a sewer of diameter 2 m, is 50 cm, its wetted perimeter is

- A. π
- B. $\frac{\pi}{2}$
- C. $\frac{\pi}{3}$
- D. $\frac{2\pi}{3}$
- E. $\frac{3\pi}{2}$

Answer: Option D

14. A drop manhole is provided if

- A. a sewer drops from a height
- B. a branch sewer joins the main sewer at higher level
- C. a lamp is inserted to check obstruction
- D. none of these.

Answer: Option B

15. In a city the ratio of the drainage to sewage is 20, the percentage discharge passing through non-monsoon periods, is

- A. 5
- B. 10
- C. 15
- D. 20

Answer: Option D

16. Pick up the correct statement from the following :

- A. Indore method of composting involves decomposition under aerobic conditions
- B. Bangalore method of composting involves decomposing under anaerobic conditions
- C. Fully stabilised refuse by the Bangalore method of composting is a powdery mass called humus
- D. all of these.

Answer: Option D

17. The liquid wastes from kitchens, bath rooms and wash basins, is not called

- A. liquid waste
- B. sullage

- C. sewage
- D. none of these.

Answer: Option C

18. The presence of free ammonia in sewage, is detected by
- A. boiling
 - B. adding potassium permanganate
 - C. adding sulphuric acid
 - D. phenol-di-sulphuric acid.

Answer: Option A

19. The amount of oxygen consumed by the aerobic bacterias which cause the aerobic biological decomposition of sewage, is known
- A. Bio-Chemical Oxygen Demand (B.O.D.)
 - B. Dissolved Oxygen (D.O.)
 - C. Chemical Oxygen Demand (C.O.D.)
 - D. None of these.

Answer: Option B

20. The standard B.O.D. of water is taken for
- A. 1 day
 - B. 2 days
 - C. 3 days
 - D. 5 days
 - E. 10 days.

Answer: Option D

21. To prevent settling down of sewage both at the bottom and on the sides of a large sewer, self-cleaning velocity recommended for Indian conditions, is
- A. 0.50 m/sec
 - B. 0.60 m/sec
 - C. 0.70 m/sec
 - D. 0.75 m/sec
 - E. 1.0 m/sec.

Answer: Option D

22. Pick up the correct statement from the following :
- A. Turbidity is more in strong sewage
 - B. The black colour indicates septic sewage
 - C. The fresh sewage is practically odourless

- D. The sewage omits offensive odours after four hours
- E. All the above.

Answer: Option E

23. In sewers the gas generally found, is

- A. Hydrogen sulphide (H₂S)
- B. Carbon dioxide (CO₂)
- C. Methane (CH₄)
- D. Petrol vapours
- E. All the above.

Answer: Option E

24. A sewer running partially full and hurried with back filled, fails in compression due to

- A. weight of the pipe
- B. weight of the back fill
- C. superimposed traffic loads
- D. all the above.

Answer: Option D

25. A manhole is classified as shallow if its depth is between

- A. 0.4 to 0.5 m
- B. 0.5 to 0.7 m
- C. 0.7 to 0.9 m
- D. 0.9 to 1.20 m
- E. 1.2 to 1.50 m.

Answer: Option C

26. For a circular sewer of diameter D running partially full with central angle α ,

A. $\frac{d}{D} = \frac{1}{2} \left(1 - \cos \frac{\alpha}{2} \right)$

B. $\frac{a}{A} = \left[\frac{\pi}{360^\circ} - \frac{\sin \alpha}{2\pi} \right]$

C. $\frac{p}{P} = \frac{\alpha}{360^\circ}$

D. $\frac{r}{R} = \left[1 - \frac{360^\circ \sin \alpha}{2\pi \alpha} \right]$

- E. all the above.

Answer: Option E

27. For design purposes, the normal rate of infiltration of ground water into the sewer, is

- A. 500 litres/km/cm
- B. 1000 litres/km/cm
- C. 1500 litres/km/cm
- D. 2000 litres/km/cm
- E. 2500 litres/km/cm.

Answer: Option D

28. The effluent of a septic tank is

- A. fit for discharge into any open drain
- B. foul and contains dissolved and suspended solids
- C. as good as that from a complete treatment
- D. none of these.

Answer: Option A

29. The drainage area of a town is 12 hectares. Its 40% area is hard pavement ($K = 0.85$), the 40% area is unpaved streets ($K = 0.20$) and the remaining is wooded areas ($K = 0.15$). Assuming the time of concentration for the areas as 30 minutes and

using the formula $P_s = \frac{900}{t + 60}$ the maximum run off is

- A. 0.10 cumec
- B. 0.12 cumec
- C. 0.15 cumec
- D. 0.20 cumec.

Answer: Option C

30. The detention period for plain sedimentation water tanks, is usually

- A. 4 to 8 hours
- B. 8 to 16 hours
- C. 16 to 24 hours
- D. 24 to 36 hours.

Answer: Option A

31. Fresh sewage may become stale in

- A. one hour
- B. two to three hours
- C. three to four hours
- D. six hours.
- E. ten hours.

Answer: Option C

32. The small sewers are cleaned by

- A. flushing
- B. cane rodding
- C. wooden pills
- D. none of these.

Answer: Option A

33. Dry water flow in a combined sewer, is

- A. industrial sewage
- B. domestic sewage
- C. storm water
- D. inclusive of domestic and industrial sewage but excludes storm water.

Answer: Option D

34. Which one of the following tests is used for testing sewer pipes :

- A. water test
- B. ball test
- C. mirror test
- D. all of these.

Answer: Option D

35. Nitrogen cycle of sewage, is

- A. Liberation of ammonia-formation of nitrites-formation of nitrates-liberation of nitrogen
- B. Liberation of nitrogen-liberation of ammonia-formation of nitrites- formation of nitrates
- C. Liberation of nitrogen-formation of nitrates-formation of nitrites-liberation of ammonia
- D. Formation of nitrates-formation of nitrites-liberation of nitrates-liberation of nitrates
- E. None of these.

Answer: Option A

36. In sewers the highest non-scouring velocity is achieved in

- A. glazed bricks sewers
- B. cast iron sewers
- C. cement concrete sewers
- D. stone ware sewers.

Answer: Option A

37. In sewage having fully oxidised organic matter, the nitrogen exists in the form of

- A. nitrites
- B. nitrates
- C. free ammonia

- D. aluminoid nitrogen
- E. none of these.

Answer: Option B

38. It is customary to design a sewer for D.W.F. on the basis of
- A. average demand
 - B. twice the average demand
 - C. thrice the average demand
 - D. four times the average demand.

Answer: Option C

39. During preliminary treatment of a sewage
- A. Oil and grease are removed from skimming tanks
 - B. Floating materials are removed by screening
 - C. Grit and sand are removed by grit chambers
 - D. All the above.

Answer: Option D

40. Pick up the correct statement from the following :
- A. The larger the sewer in size, more will be velocity
 - B. The smaller the sewer in size, less will be velocity
 - C. The larger the sewer in size, no deposition will take place
 - D. The larger the sewer in size, deposition will take place.

Answer: Option D

41. In septic tanks,
- A. free board of 0.3 m may be provided
 - B. the baffles or tees are extended up to top level of scum
 - C. the clear space between the baffle top and covering slab is about 7.5 cm
 - D. the inlet is kept 30 cm below the sewage line and outlet is kept at a level 40% depth of the sewage
 - E. all the above.

Answer: Option E

42. The sewer pipe which carries sewage from a building for immediate disposal is
- A. house sewer
 - B. lateral sewer
 - C. intercepting sewer
 - D. main sewer.

Answer: Option A

43. The algae dies out in the zone of

- A. degradation
- B. active decomposition
- C. recovery
- D. cleaner water.

Answer: Option A

44. The recommended detention period for grit chambers is

- A. 1 minute
- B. 2 minutes
- C. 3 minutes
- D. 5 minutes.

Answer: Option A

45. Pick up the correct statement from the following :

- A. The materials separated by screens, is called screenings
- B. The screenings are disposed off either by burning or by burial or by dumping
- C. The process of burning the screenings, is called incineration
- D. The process of burning the screenings, is known as composting
- E. All the above.

Answer: Option E

46. The ratio of the diameter of a circular section and the side of a square section hydraulically equivalent, is

- A. 1.095
- B. 1.085
- C. 1.075
- D. 1.065

Answer: Option A

47. Pick up the correct statement from the following :

- A. The maximum rate of storm run off is called peak drainage discharge
- B. Rational method of estimating peak run off, may be used precisely for areas less than 50 hectares
- C. The period after which the entire area starts contributing to the run off, is called the time of concentration
- D. The time required by water to reach the outlet of a catchment from the most remote point, is called time of concentration
- E. All the above.

Answer: Option E

48. For trunk and out-fall, the type of sewers generally used, is

- A. standard egg shaped

- B. circular shaped
- C. horse shoe shaped
- D. parabolic shaped
- E. semi-elliptical shaped.

Answer: Option C

49. Pick up the incorrect statement from the following :

- A. Septic tanks are horizontal continuous flow type of sedimentation tanks
- B. Septic tanks are generally provided a detention period of 12 to 36 hours
- C. Septic tanks are completely covered and high vent shafts are provided for the escape of foul gases
- D. Septic tanks are generally classified as tanks which work on the principle of anaerobic decomposition
- E. None of these.

Answer: Option E

50. Hydraulic mean radius is

- A. mean radius of sewer
- B. difference in heads between two points in circular pipes
- C. mean of radii in a pipe line of varying cross-sections
- D. cross-sectional area/wetted perimeter.

Answer: Option D

Section 3

1. The pH value of fresh sewage is usually

- A. equal to 7
- B. more than 7
- C. less than 7
- D. equal to zero.

Answer: Option B

2. The moisture content of a sludge is reduced from 90% to 80% in a sludge digestion tank. The percentage decrease in the volume of sludge, is

- A. 25%
- B. 50%
- C. 10%
- D. 5%.

Answer: Option B

3. Inter-distance between ventilation columns in a sewer line is kept

- A. 25 to 50 m
- B. 50 m to 100 m

C. 100 m to 150 m

D. 150 m to 300 m.

Answer: Option D

4. If q is the average sewage flow from a city of population P , the maximum sewage flow

A. $Q = \frac{4 + \sqrt{P}}{18 + \sqrt{P}} q$

B. $Q = \frac{18 + P}{4 + \sqrt{P}} q$

C. $Q = \frac{18 + \sqrt{P}}{4 + \sqrt{P}} q$

D. $Q = \frac{5 + \sqrt{P}}{15 + \sqrt{P}} q$

Answer: Option C

5. The factor responsible for purification of sewage in river is

A. Hydrology

B. Dissolved oxygen in water

C. Temperature

D. Turbulence

E. All the above.

Answer: Option E

6. If the peak discharge of a storm water drain (S.W. Drain) is expected to exceed 150 cumecs, the free board to be provided, is

A. 100 cm

B. 90 cm

C. 80 cm

D. 50 cm.

Answer: Option A

7. P_H value of sludge during alkaline regression stage, is

A. more than 7

B. less than 7

C. less than 6

D. more than 6.

Answer: Option A

8. Depletion of ozone layer in the outer atmosphere may cause

A. lung cancer

- B. skin cancer
- C. bronchitis
- D. heart disorder.

Answer: Option B

9. The spacing of bars of perforations of fine screens used for the treatment of sewage, is

- A. 2 to 3 mm
- B. 3 to 5 mm
- C. 5 to 8 mm
- D. 8 to 10 mm.

Answer: Option A

10. The self-cleansing velocity of water flowing through pipe lines, is

- A. 2 metres/sec
- B. 1 metre/sec
- C. 0.5 metre/sec
- D. 0.25 metre/sec.

Answer: Option A

11. Ventilating shafts are provided to a sewer line at every

- A. 100 m
- B. 150 m
- C. 200 m
- D. 300 m
- E. 500 m.

Answer: Option D

12. Which one of the following part of human body withstands minimum radiation

- A. thyroid
- B. kidneys
- C. eyes
- D. ovaries/testis.

Answer: Option D

13. The water carried sewerage system removes

- A. domestic sewage
- B. industrial sewage
- C. storm sewage
- D. all the above.

Answer: Option D

14. Stoneware sewers are available in size

- A. 10 cm
- B. 15 cm
- C. 20 cm
- D. 25 cm
- E. all the above.

Answer: Option E

15. The sludge does not contain waste water from

- A. bath rooms
- B. wash basins
- C. kitchen sinks
- D. toilets.

Answer: Option D

16. If the depth of flow in a circular sewer is $\frac{1}{4}$ th of its diameter D , the wetted perimeter is

- A. $\frac{\pi D}{2}$
- B. $\frac{\pi D}{4}$
- C. $\frac{\pi D}{3}$
- D. πD .

Answer: Option C

17. The maximum diameter of sewers adopted in the designs is

- A. 1.0 m
- B. 2.0 m
- C. 3.0 m
- D. 4.0 m.

Answer: Option C

18. Sludge banks are formed if sewage is disposed of in

- A. rivers
- B. seas
- C. lakes
- D. none of these.

Answer: Option B

19. Design period of 40 to 50 years is adopted for

- A. branch sewers
- B. main sewers
- C. trunk sewers
- D. all the above.

Answer: Option D

20. The pH value of sewage is determined with the help of

- A. Imhoff Cone
- B. turbidimeter
- C. potentiometer
- D. none of these.

Answer: Option C

21. Lead caulked joints are used for laying

- A. stone ware pipes
- B. earthen ware pipes
- C. C.I. pipes
- D. G.I. pipes.

Answer: Option B

22. Pick up the correct statement from the following :

- A. The water supply pipes carry pure water free from solid particles
- B. The water supply pipes get clogged if flow velocity is less than self cleansing velocity
- C. The sewers may be carried up and down the hills and valleys
- D. The sewer pipes are generally laid along level hills
- E. None of these.

Answer: Option A

23. For trunk sewers more than 1.25 m in diameter, the ratio of the maximum daily sewage flow to the average daily sewage flow is assumed

- A. 1.5
- B. 2.0
- C. 2.5
- D. 3.0
- E. 3.5

Answer: Option A

24. At the junction of sewers

- A. top of smaller sewer is kept lower
- B. top of larger sewer is kept lower

- C. tops of both the sewers are at the same level
- D. none of these.

Answer: Option D

25. Primary treatment of sewage consists of removal of
- A. large suspended organic solids
 - B. oil and grease
 - C. sand and grit
 - D. floating materials
 - E. none of these.

Answer: Option A

26. The rainfall at any place may be determined by
- A. its intensity
 - B. its direction
 - C. its frequency
 - D. all the above.

Answer: Option D

27. In trickling filter, B.O.D. is reduced to
- A. 30 to 40%
 - B. 40 to 60%
 - C. 60 to 80%
 - D. 80 to 90%
 - E. 95%.

Answer: Option C

28. Which one of the following gases is most significant as air pollutant
- A. Carbondioxide
 - B. Oxygen
 - C. Nitrogen
 - D. Sulphurdioxide.

Answer: Option D

29. Which one of the following statements regarding septic tanks is wrong :
- A. a gap of 7.5 cm between the bottom of the covering slab and the top level of scum is provided
 - B. the outlet invert level is kept 5 to 7.5 cm below the inlet invert level
 - C. the minimum width of septic level is 90 cm
 - D. the depth of tank is kept equal to its width.

Answer: Option D

30. In circular sewers if depth of flow is 0.2 times the full depth, the nominal gradient,

- A. is only provided
- B. is doubled
- C. is trebled
- D. is not enough.

Answer: Option B

31. The maximum spacing of manholes specified by Indian standard in sewers upto 0.3 m diameter is

- A. 20 m
- B. 30 m
- C. 45 m
- D. 75 m.

Answer: Option C

32. The design period in years for pumping plants, is

- A. 1
- B. 2 to 3
- C. 3 to 5
- D. 5 to 10

Answer: Option D

33. The Chezy's constant C in the formula $V = C rs$ depends upon

- A. size of the sewer
- B. shape of the sewer
- C. roughness of sewer surface
- D. hydraulic characteristics of sewer
- E. all the above.

Answer: Option E

34. Afive day B.O.D. at 15°C of the sewage of a town is 100 kg/day. If the 5 day B.O.D. per head at 15°C for standard sewage is 0.1 kg/day, the population equivalent is

- A. 100
- B. 1000
- C. 5000
- D. 10000

Answer: Option D

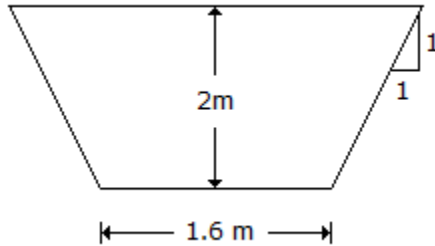
35. The density of population over 40 hectares is 250/hectare. If water supply demand per day is 200 litres and sewage discharge is 80% of water supply, the sewage flow in sewers of separate system, is

- A. 0.05552 cumec

- B. 0.05554 cumec
- C. 0.05556 cumec
- D. 0.0556 cumec
- E. 0.0558 cumec.

Answer: Option C

36. For the open drain ($N = 0.025$) shown in the below figure, the discharge is



- A. 26.88 cumecs
- B. 27.88 cumecs
- C. 28.88 cumecs
- D. 29.88 cumecs.

Answer: Option C

37. If the diameter of a sewer is 150 mm, the gradient required for generating self cleansing velocity, is

- A. 1 in 60
- B. 1 in 100
- C. 1 in 120
- D. none of these.

Answer: Option B

38. The average temperature of sewage in India, is

- A. 10°C
- B. 15°C
- C. 20°C
- D. 25°C
- E. 30°C.

Answer: Option C

39. The most widely used pump for lifting sewage is

- A. centrifugal pump
- B. reciprocating pump
- C. pneumatic ejector
- D. air pressure pump.

Answer: Option A

40. The sewer which resists sulphide corrosion, is

- A. Brick sewer
- B. Cast iron sewer
- C. R.C.C. sewer
- D. Lead sewer
- E. None of these.

Answer: Option D

41. For large sewers, maximum distance between manholes may be

- A. 50 m
- B. 100 m
- C. 200 m
- D. 300 m
- E. 400 m.

Answer: Option D

42. The first stage of neutral process of sludge digestion, is

- A. acid fermentation
- B. acid regression
- C. alkaline fermentation
- D. none of these.

Answer: Option A

43. Lead acetate test in sewer manhole is done to test the presence of

- A. Methane gas
- B. Hydrogen sulphide
- C. Carbondioxide gas
- D. Diesel vapours.

Answer: Option B

44. Dried sewage after treatment is used as

- A. fertilizer
- B. building material
- C. chemical for lowering B.O.D.
- D. base material for paints.

Answer: Option A

45. The use of coarse screens for the disposal of sewage, may be dispensed with by

- A. comminutor

- B. shredder
- C. both (a) and (b)
- D. neither (a) nor (b).

Answer: Option C

46. Sewer pipes are designed for maximum discharge with 25% to 33% vacant cross-sectional area for

- A. unexpected large scale infiltration of stream water
- B. unexpected increase in the population
- C. under estimates of maximum and average flows
- D. All of the above.

Answer: Option D

47. 5 days-biochemical oxygen demand (BOD_5) is taken at a temperature of

- A. 0°C
- B. 15°C
- C. 20°C
- D. 25°C.

Answer: Option C

48. Water content of sewage is about

- A. 90%
- B. 95%
- C. 99.9%
- D. 9.9%.

Answer: Option C

49. Imhoff cone is used to measure

- A. total organic solids
- B. total solids
- C. total inorganic solids
- D. settleable solids.

Answer: Option D

50. For a grit chamber, if the recommended velocity of flow is 0.2 m/sec and detention period is 2 minutes, the length of the tank, is

- A. 16 m
- B. 20 m
- C. 24 m
- D. 30 m.

Answer: Option C

1. A nuisance is experienced in diluting water if dilution factor is less than
- A. 100
 - B. 60
 - C. 40
 - D. 20
 - E. 10

Answer: Option D

2. Traps
- A. are water seals which prevent the entry of foul gases
 - B. are used to trap the rats entering sewers
 - C. dissolve the foul gases
 - D. create syphonic action to increase the quick disposal of sewerage.

Answer: Option A

3. For estimating the peak run off the rational formula $Q = 0.0278 KpA$ was evolved by
- A. Kinchling
 - B. Lloyd Davis
 - C. Frubling
 - D. all the above.

Answer: Option D

4. Pick up the correct statement from the following :
- A. Inlets are provided on the road surface at the lowest point for draining rain water
 - B. Inlets are generally provided at an interval of 30 m to 60 m along straight roads
 - C. Inlets having vertical openings, are called curb inlets
 - D. Inlets having horizontal openings, are called horizontal inlets
 - E. All the above.

Answer: Option E

5. Pick up the correct statement from the following :
- A. The boning rod is used for checking the levels of the sewer inverts
 - B. Manhole covers are made circular for the convenience of the cleaning staff
 - C. A manhole is classified as deep manhole if its depth is more than 1.5 m
 - D. A manhole is classified as shallow manhole if its depth is. less than 0.9 m
 - E. All the above.

Answer: Option E

6. 3.0 ml of raw sewage is diluted to 300 ml. The D.O. concentration of the diluted sample at the beginning of the test was 8 mg/l. After 5 day-incubation at 20°C, the DO. concentration was 5 mg/l. The BOD of raw sewerage is

- A. 100 mg/l
- B. 200 mg/l
- C. 300 mg/l
- D. 400 mg/l.

Answer: Option C

7. The arrangement made for passing the sewer line below an obstruction below the hydraulic gradient lines called
- A. inverted syphon
 - B. depressed sewer
 - C. sag pipe
 - D. all of these.

Answer: Option D

8. The angle subtended by the surface of sewer water with partial flow, at sewer centre is 120° , the depth of sewerage is
- A. 20 cm
 - B. 25 cm
 - C. 40 cm
 - D. 50 cm
 - E. 60 cm.

Answer: Option D

9. Imhoff cone is used to determine
- A. settleable solids
 - B. suspended solids
 - C. dissolved solids
 - D. none of these.

Answer: Option A

10. The sewage discharge in a detritus tank of a treatment plant is 576 litres/sec with flow velocity of 0.2 m/sec. If the ratio of width to depth is 2, the depth is
- A. 100 cm
 - B. 110 cm
 - C. 120 cm
 - D. 150 cm.

Answer: Option C

11. The sewer which received discharge from two or more main sewers, is known as
- A. a trunk sewer
 - B. an outfall sewer
 - C. a main sewer

- D. an intercepting sewer.

Answer: Option A

12. A well oxidized sewage contains nitrogen mainly as

- A. nitrates
- B. nitrites
- C. free ammonia
- D. none of these.

Answer: Option A

13. A safety lamp when inserted in the upper portion of a manhole causes flames. It indicates the presence of

- A. Carbondioxide gas
- B. Hydrogen sulphide gas
- C. Methane gas
- D. Petrol vapours.

Answer: Option C

14. Assertion (A) : A free board of 0.3 m is provided above the top sewage line in septic tanks.
Reason (R) : It helps to accommodate the scum in the septic tank.

- A. Both A and R are true and R is the correct explanation of A
- B. Both A and R are true but R is not a correct explanation of A
- C. A is true but R is false
- D. A is false but R is true.

Answer: Option A

15. If D is the diameter of upper circular portion, the area of cross-section of a standard egg shaped sewer, is

- A. $\frac{(18 + 5\pi)}{32} D^2$
- B. $\frac{(12 + 5\pi)}{32} D^2$
- C. $\frac{(18 + 5\pi)}{16} D^2$
- D. $\frac{(82 + 5\pi)}{32} D^2$

Answer: Option A

16. Drop manholes at the junctions of sewer lines, are provided if

- A. invert level of a branch sewer is more than 60 cm that of the main sewer
- B. sewer line runs along a main road
- C. ordinary manhole cannot be built
- D. two sewer lines intersect.

Answer: Option A

17. The most effective arrangement for diverting excess storm water into a natural drainage, is
- A. leaping weir
 - B. overflow weir
 - C. siphon spill way
 - D. none of these.

Answer: Option C

18. Large diameter sewers subjected to external pressure alone, are reinforced
- A. near the inner surface of the pipe
 - B. near the outer surface of the pipe
 - C. both (a) and (b)
 - D. with elliptical cage
 - E. none of these.

Answer: Option D

19. Pick up the correct statement from the following :
- A. The ratio of the quantity of the diluting water to that of the sewage, is known as dilution factor
 - B. The automatic purification of polluted water, is known self purification phenomenon
 - C. The photosynthesis is carried out in the presence of sun light
 - D. Grab sample is generally obtained from the surface where turbulence mixes the sewage particles
 - E. All the above.

Answer: Option E

20. In sewage, the solids in mg per litre is
- A. 100 to 500
 - B. 500 to 1000
 - C. 1000 to 1500
 - D. 1500 to 2000

Answer: Option B

21. In a residential colony, sewers of diameters 100 mm, 150 mm and 225 mm were laid with a gradient 1 in 120. Which portion of the sewage system does not choke in due course of time
- A. 100 mm dia.
 - B. 150 mm dia.
 - C. 225 mm dia.
 - D. all of these.

Answer: Option C

22. If D is the diameter of upper circular portion, the overall depth of New Egg shaped sewer section, is
- A. $1.250 D$
 - B. $1.350 D$
 - C. $1.425 D$
 - D. $1.625 D$.

Answer: Option D

23. During putrifaction process of sewage the gas given off, is
- A. carbon dioxide
 - B. hydrogen
 - C. ammonia
 - D. methane
 - E. all the above.

Answer: Option E

24. A circular sewer section is preferred to because
- A. it is cheaper in construction
 - B. it provides maximum area for a given perimeter
 - C. it provides maximum hydraulic mean depth
 - D. all the above.

Answer: Option D

25. Assertion (A) : The minimum self cleansing velocity in the sewer, at least once a day, must be generated.
Reason (R) : If certain deposition takes place and is not removed, it obstructs free flow and causes further deposition leading to complete blocking of the sewer.
- A. Both A and R are true and R is the correct explanation of A
 - B. Both A and R are true but R is not a correct explanation of A
 - C. A is true but R is false
 - D. A is false but R is true.

Answer: Option A

26. If the grit in grit chambers is 4.5 million litres per day, its cleaning is done
- A. manually
 - B. mechanically
 - C. hydraulically
 - D. electrically.

Answer: Option A

27. The gas evolved in sewers is
- A. Carbondioxide
 - B. Hydrogen sulphide

- C. Methane
- D. All of these.

Answer: Option D

28. The maximum depth of sedimentation tanks, is kept

- A. 3 m
- B. 3.5 m
- C. 4 m
- D. 4.5 m.

Answer: Option A

29. The reduced levels of the string at the consecutive sight rails A and B are 203.575 m, 203.475 m respectively. If the difference of their R.D.s is 10 m, the gradient of the sewer line is

- A. 1 in 100 upward
- B. 1 in 500 upward
- C. 1 in 100 downward
- D. 1 in 503 upward.

Answer: Option C

30. The detention time (t) of a settling tank, may be defined as the time required for

- A. a particle to travel along its length
- B. a particle to travel from top surface to bottom sludge zone
- C. the flow of sewage to fill the tank
- D. none of these.

Answer: Option C

31. Discrete or granular particles change their

- A. size
- B. shape
- C. weight
- D. none of these.

Answer: Option D

32. For a peak discharge of 0.0157 cumec, with a velocity of 0.9 m/sec, the diameter of the sewer main, is

- A. 10 cm
- B. 12 cm
- C. 15 cm
- D. 18 cm
- E. 20 cm.

Answer: Option C

33. For design of sewers, percentage of sewage discharge is assumed

- A. 65 to 70%
- B. 70 to 75%
- C. 75 to 80%
- D. 85%.

Answer: Option C

34. In case of sewer lines

- A. water test is carried out to check water tightness of the joints
- B. test for straightness is carried out with the help of a lamp and mirror
- C. obstruction test is carried out with the help of smooth ball of diameter 13 mm
- D. all the above.

Answer: Option D

35. The sewerage system originates from

- A. house sewers
- B. lateral sewers
- C. branch sewers
- D. main sewers
- E. out fall sewers.

Answer: Option A

36. In sewers the velocity of flow should not be

- A. more than the self-cleansing velocity
- B. less than the self-cleansing velocity
- C. less than 10 m/sec
- D. more than 20 m/sec.

Answer: Option B

37. If D is the diameter of a circular sewer and D' is the top horizontal diameter of an equivalent egg shaped section, the relationship which holds good, is

- A. $D' = 0.64 D$
- B. $D' = 0.74 D$
- C. $D' = 0.84 D$
- D. $D' = 0.94 D$.

Answer: Option C

38. If a paper moistened with lead acetate for five minutes when placed in manhole turns black. The sewer certainly contains

- A. Hydrogen sulphide
- B. Carbon dioxide

- C. Methane
- D. Oxygen
- E. None of these.

Answer: Option A

39. The design period of sewage treatment works is normally

- A. 5 - 10 years
- B. 15 - 20 years
- C. 30 - 40 years
- D. 40 - 50 years.

Answer: Option B

40. The porosity of sediments in sewer pipes, is usually taken as

- A. 0.010
- B. 0.011
- C. 0.012
- D. 0.013
- E. 0.020

Answer: Option D

41. In septic tanks, decomposition of organic bacteria, is done by

- A. anaerobic bacteria
- B. aerobic bacteria
- C. both types of bacteria
- D. none of these.

Answer: Option A

42. The stone ware sewers

- A. are used for carrying sewage and drainage from houses
- B. are manufactured from clays and shales
- C. after casting are dried and burnt at temperature 150°C, 700°C and 1200°C
- D. are generally provided with a water proof cover by vaporising sodium chloride
- E. all the above.

Answer: Option E

43. 'Cowl' is provided at

- A. lower end of ventilating column
- B. upper end of ventilating column
- C. upper end of the manhole

D. first step in manhole.

Answer: Option B

44. The sewer which transports the sewage to the point of treatment, is called

- A. house sewer
- B. out-fall sewer
- C. branch sewer
- D. lateral
- E. main sewer.

Answer: Option B

45. Kjeldahl nitrogen is a mixture of

- A. ammonia and nitrogen
- B. nitrogen and organic nitrogen
- C. organic nitrogen and ammonia
- D. all the above.

Answer: Option D

46. Pick up the incorrect statement from the following :

- A. The process of decomposing the organic matter under controlled anaerobic conditions, is called sludge digestion
- B. Sludge digestion is carried out in sludge tank
- C. The gases produced in sludge digestion process, contain 75% carbon dioxide
- D. The gases produced in sludge digestion process, contain 75% methane.

Answer: Option C

47. Pick up the correct statement from the following :

- A. The circular section of sewers provides maximum hydraulic mean depth
- B. The circular sewers are provided for separate sewerage system
- C. The circular sewers work efficiently if the sections run at least half full
- D. Two sewers of different shapes are said to be hydraulically equivalent if they discharge at the same rate while running full on the same grade
- E. All the above.

Answer: Option E

48. You are asked to design sewer pipes of diameters 0.4 m to 0.9 m at maximum flow, you will assume the sewer flow running at

- A. full depth
- B. half full
- C. two third full
- D. three fourth full.

Answer: Option B

49. The ratio of depths at partial flow with central angle α and at full flow of a sewer, is

A. $1 - \sin \frac{\alpha}{2}$

B. $1 - \cos \frac{\alpha}{2}$

C. $\frac{1}{2} \left(1 - \cos \frac{\alpha}{2} \right)$

D. $\frac{1}{2} \left(1 - \sin \frac{\alpha}{2} \right)$

E. $\frac{1}{2} \left(1 - \tan \frac{\alpha}{2} \right)$

Answer: Option C

50. For sewer mains of 0.5 to 1 m diameter, the ratio of maximum daily sewage flow to the average daily sewage flow is assumed

A. 1.5

B. 2.0

C. 2.5

D. 3.0

Answer: Option B

Section 5

1. Sewer pipes need be checked for

A. minimum flow

B. maximum flow

C. both (a) and (b)

D. none of these.

Answer: Option C

2. If D.O. concentration falls down to zero in any natural drainage, it indicates the zone of

A. degradation

B. active decomposition

C. recovery

D. cleaner water

E. none of these.

Answer: Option B

3. The ratio of design discharge to the surface area of a sedimentation tank is called

A. surface loading

B. overflow rate

C. overflow velocity

D. all of these.

Answer: Option D

4. The value of Chezy's constant

$$C = \frac{\left(23 + \frac{0.00155}{s}\right) + \frac{1}{n}}{1 + \left(23 + \frac{0.00155}{s}\right) \frac{n}{\sqrt{r}}}$$

is used in

A. Chezy's formula

B. Bazin's formula

C. Kutter's

D. Manning's formula.

Answer: Option C

5. In the activated sludge process

A. aeration is continued till stability

B. aeration is done with an admixture of previously aerated sludge

C. sludge is activated by constant stirring

D. water is removed by centrifugal action.

Answer: Option B

The minimum diameter of a sewer is kept

A. 10 cm

B. 15 cm

C. 20 cm

D. 25 cm

E. 30 cm.

Answer: Option B

7. The minimum diameter of sewer to be adopted is

A. 10 cm

B. 12.5 cm

C. 15 cm

D. 25 cm.

Answer: Option C

8. To test chemical oxygen demand (C.O.D.) of sewage, organic matter is oxidised by potassium dichromate in the presence of

A. Hydrochloric acid

B. Sulphuric acid

C. Nitric acid

D. Citric acid.

Answer: Option B

9. The discharge per unit plan area of a sedimentation tank, is generally called

A. over flow rate

B. surface loading

C. over flow velocity

D. all the above.

Answer: Option D

10. In a sedimentation tank (length L , width B , depth D) the settling velocity of a particle for a discharge Q , is

A. $\frac{Q}{B \times D}$

B. $\frac{Q}{L \times D}$

C. $\frac{Q}{L}$

D. $\frac{Q}{B \times L}$

Answer: Option D

11. D is the diameter of a circular sewer and α is the side of a square section sewer. If both are hydraulically equivalent, the relationship which holds good, is

A. $\pi D^{8/3} = 4 b^{8/3}$

B. $\pi D^{3/8} = 4 b^{3/8}$

C. $\pi D^{2/3} = 4 b^{2/3}$

D. $\pi D^{3/2} = 4 b^{3/2}$

E. none of these.

Answer: Option A

12. For detecting the nitrites in the sewage, the matching colour may be developed by adding

A. Pottassium permanganate

B. Sulphuric acid and naphthamine

C. Phenol-di-sulphuric acid pottassium hydroxide

D. None of these.

Answer: Option B

13. The suitable cross-section of sewers to carry combined flow, is

A. circular

- B. egg shaped
- C. rectangular
- D. horse shoe shaped.

Answer: Option B

14.

$$V_s = 418 (G_s - G_w) d \left[\frac{3T + 70}{100} \right]$$

Hazin's formula

is used for the settlement velocity of the particles of diameter

- A. less than 0.01 mm
- B. less than 0.05 mm
- C. less than 0.1 mm
- D. greater than 0.1 mm.

Answer: Option D

15. If the diameter of a sewer is 100 mm, the gradient required for generating self cleansing velocity, is

- A. 1 in 60
- B. 1 in 100
- C. 1 in 120
- D. none of these.

Answer: Option A

16. Stone ware pipes are

- A. highly resistant to sulphide corrosion
- B. highly impervious
- C. hydraulically efficient because of their smooth interior surface
- D. specially suited to pressure pipes
- E. none of these.

Answer: Option D

17. Skimming tanks are

- A. used to remove the grease and oil
- B. those from which sludge is skimmed out
- C. tanks provided with self-cleansing screens
- D. improved version of grit chambers.

Answer: Option A

18. In a sludge digestion tank if the moisture content of sludge V_1 litres is reduced from p_1 % to p_2 % the volume V_2 is

A. $\frac{100 + p_1}{100 - p_2} V_1$

B. $\left(\frac{100 - \rho_1}{100 + \rho_2}\right) V_1$

C. $\left(\frac{100 - \rho_1}{100 - \rho_2}\right) V_1$

D. $\left(\frac{100 + \rho_2}{100 - \rho_1}\right) V_1$

Answer: Option C

19. Assertion (A) : The determination of pH value of sewerage is important.
Reason (R) : The efficiency of certain treatment methods depends upon the availability of pH value.

- A. Both A and R are true and R is the correct explanation of A
- B. Both A and R are true but R is not a correct explanation of A
- C. A is true but R is false
- D. A is false but R is true.

Answer: Option A

20. With self cleansing velocity in sewers

- A. silting occurs at bottom
- B. scouring occurs at bottom
- C. both silting and scouring occur at bottom
- D. neither silting nor scouring occurs at bottom.

Answer: Option D

21. Aerobic activity is maximum

- A. in freshly produced sewage
- B. at sewer pipes
- C. in sewer treatment plants
- D. none of these.

Answer: Option A

22. In sewers designed with self cleansing velocity,

- A. the bottom is silted
- B. the bottom is scoured
- C. both silting and scouring occur at the bottom
- D. neither silting nor scouring occurs at the bottom.

Answer: Option D

23. Which one of the following resists hydrogen sulphide corrosion

- A. R.C.C.
- B. Glazed stone wares

C. Asbestos cement

D. Glazed ware.

Answer: Option D

24. The sewerage system consists of

A. house sewer

B. lateral sewer

C. branch sewer

D. main sewer

E. all of these.

Answer: Option E

25. Hume steel pipes are

A. steel pipes

B. R.C.C. pipes

C. steel shell coated from inside with cement mortar

D. steel shell coated from outside with cement mortar

E. both (c) and (d).

Answer: Option E

26. Drop manholes are the manholes

A. without entry ladders

B. without manhole covers

C. with depths more than 3.5 m

D. having drains at different levels.

Answer: Option D

27. Boussinesq's equation for ascertaining unit pressure at a depth H on sewers due to traffic loads, is

A.
$$p_t = \frac{3 H^3 P}{2 \pi Z^5}$$

B.
$$p_t = \frac{2 H^3 P}{3 \pi Z^5}$$

C.
$$p_t = \frac{3 H^3 P}{2 Z^5}$$

D.
$$p_t = \frac{2 \pi H^3 P}{3 Z^5}$$

E. none of these.

Answer: Option A

28. The laying of sewers is done with

- A. magnetic compass
- B. theodolite
- C. level
- D. clinometer
- E. plane table.

Answer: Option C

29. The rational formula for peak drainage discharge, was evolved by

- A. Fruhling
- B. Lloyd David
- C. Kuichling
- D. All of these.

Answer: Option D

30. The sewage treatment in septic tanks is due to

- A. anaerobic decomposition
- B. aerobic decomposition
- C. parasitic decomposition
- D. none of these.

Answer: Option A

31. In 1000 kg of sewage, the total solids approximate

- A. 0.5 to 1.0 kg
- B. 1 kg to 2.0 kg
- C. 5 kg to 7.5 kg
- D. 7.5 kg to 10 kg.

Answer: Option A

32. Pathogens (or pathogenic bacterias) in water may cause

- A. typhoid
- B. cholera
- C. dysentery
- D. infectious hepatitis
- E. all the above.

Answer: Option E

33. Sewer manholes are generally provided at

- A. the change of gradient

- B. the change of direction
- C. the junctions of sewers
- D. all of these.

Answer: Option D

34. The sewers

- A. must be of adequate size to avoid over flow
- B. must flow under gravity $\frac{1}{2}$ to $\frac{3}{4}$ full
- C. must be laid at least 2 to 3 m deep to collect /water from the basements
- D. all the above.

Answer: Option D

35. Before discharging the foul sewage into rivers, it is generally treated by

- A. screening
- B. sedimentation
- C. oxidation
- D. sludge digestion and disinfection
- E. all the above.

Answer: Option E

36. The settlement of a particle in sedimentation tank, is affected by

- A. velocity of flow
- B. viscosity of water
- C. size and shape of solid
- D. specific gravity of solid
- E. all the above.

Answer: Option E

37. If the length of overland flow from the critical point to the mouth of drain is 13.58 km and difference in level between the critical point and drain mouth is 10 m, the inlet time is

- A. 2 hours
- B. 4 hours
- C. 6 hours
- D. 8 hours.

Answer: Option D

38. Oxidation process results in the formation of

- A. carbon dioxide
- B. nitrates

- C. sulphates
- D. all the above.

Answer: Option D

39. Dry weather flow is :
- A. average daily rate of flow
 - B. average monthly rate of flow
 - C. average annual rate of flow
 - D. water supply allowance per capita
 - E. none of these.

Answer: Option D

40. As compared to fresh river water, sea water contains oxygen
- A. 10% less
 - B. 20% less
 - C. 10% more
 - D. 20% more.

Answer: Option B

41. The settlement velocity of a solid (diameter 0.5 mm, specific gravity 1.75) in water having temperature 10°C, is
- A. 213.5 cm/sec
 - B. 313.5 cm/sec
 - C. 413.5 cm/sec
 - D. 500 cm/sec.

Answer: Option B

42. If γ_w is the unit weight of water, r the hydraulic mean depth of the sewer and S the bed slope of the sewer, then the tractive force exerted by flowing water, is
- A. $\gamma_w \cdot r \cdot S$
 - B. $\gamma_w r^{1/2} \cdot S$
 - C. $\gamma_w r S$
 - D. $\gamma_w r^{2/3} S$

Answer: Option A

43. In detritus tanks,
- A. flow velocity is kept 0.09 m/sec
 - B. detention period is kept 3 to 4 minutes
 - C. organic and inorganic materials are separated
 - D. all the above.

Answer: Option D

44. The width of a settling tank with 2 hour detention period for treating sewage 378 cu m per hour, is

- A. 5 m
- B. 5.5 m
- C. 6 m
- D. 6.5 m
- E. 7 m.

Answer: Option E

45. In areas where rainy season is limited to a few months, the type of sewerage system recommended is

- A. combined system
- B. partially separate system
- C. separate system
- D. none of these.

Answer: Option C

6. $\frac{3}{4}$ rd or $\frac{1}{4}$ th extra space is left in sewer pipes at maximum discharge for

- A. low estimates of the average and maximum flows
- B. large scale infiltration of storm water
- C. unexpected increase in population
- D. all the above.

Answer: Option D

47. If n is the rugosity coefficient, r is the hydraulic depth, s is the bed slope of sewer, the velocity of flow in m/sec may be

obtained by the formula $V = \frac{1}{n} r^{2/3} s^{1/2}$ evolved by

- A. Chezy
- B. Manning
- C. Bazin
- D. Kutter.

Answer: Option B

48. Pick up the correct statement from the following :

- A. anaerobic bacteria flourish in the absence of oxygen
- B. aerobic bacteria flourish in the presence of oxygen
- C. facultative bacteria flourish with or without oxygen
- D. all the above.

Answer: Option D

49. Antisiphonage pipe is fitted

- A. at the end of septic tanks
- B. on manholes
- C. with a W.C. trap
- D. at the beginning of sewer line.

Answer: Option C

50. For drains up to 15 cumecs, the depth d and width B are related by

- A. $d = 0.2 B$
- B. $d = 0.5 B$
- C. $B = 0.2 d$
- D. $B = 0.5 d$.

Answer: Option B

Section 6

1. To maintain aerobic biological activity, the moisture content of the compost mass should be about

- A. 45%
- B. 50%
- C. 55%
- D. 60%.

Answer: Option C

2. The sewer that unloads the sewage at the point of treatment is called

- A. main sewer
- B. outfall sewer
- C. branch sewer
- D. house sewer.

Answer: Option B

3. No treatment of the sewage is given if dilution factor is

- A. less than 150
- B. between 150 to 200
- C. between 200 to 300
- D. between 400 to 500
- E. more than 500

Answer: Option E

4. R.M.O. expenses include

- A. running expenses
- B. maintenance expenses

C. operation expenses

D. all the above.

Answer: Option D

5. For drainage pipes in buildings the test applied before putting them to use, is

A. water test

B. smoke test

C. straightness test

D. all the above.

Answer: Option B

6. In normal conditions, the period for sludge digestion, is

A. 10 days

B. 20 days

C. 30 days

D. 60 days

E. 90 days.

Answer: Option C

7. The bottom of the sewage inlet chamber of septic tanks, is provided an outward slope

A. 1 in 5

B. 1 in 10

C. 1 in 15

D. 1 in 20

E. 1 in 25

Answer: Option B

8. For a continuous flow type of sedimentation tanks

A. width of the tank is normally kept about 6 m

B. length of the tank is normally kept 4 to 5 times the width

C. maximum horizontal flow velocity is limited to 0.3 m/minute

D. capacity of the tank for 24 hours, is kept equal to maximum daily flow of sewage

E. all the above.

Answer: Option E

9. The temperature affects the

A. biological activity of bacterias in sewage

B. solubility of gases in sewage

C. viscosity of sewage

- D. all the above.

Answer: Option D

10. Which of the following pumps is used to pump sewage solids with liquid sewage without clogging the pump is

- A. centrifugal pump
- B. pneumatic ejector
- C. reciprocating pump
- D. none of these.

Answer: Option A

11. For having central angle α , the area of cross-section of sewers running partially full, is

A. $A = \frac{D^2}{2} \left[\frac{\pi \alpha}{180^\circ} - \frac{\sin \alpha}{2} \right]$

B. $A = \frac{D^2}{4} \left[\frac{\pi \alpha}{360^\circ} - \frac{\sin \alpha}{2} \right]$

C. $A = \frac{D^2}{4} \left[\frac{\pi \alpha}{360^\circ} - \frac{\cos \alpha}{2} \right]$

D. $A = \frac{D^2}{2} \left[\frac{\pi \alpha}{360^\circ} - \frac{\cos \alpha}{2} \right]$

Answer: Option B

12. The pressure exerted by

- A. the sewage when running full from inside, is called internal pressure
- B. the internal pressure if any, causes tensile stress in the pipe material
- C. pressure sewers are designed to be safe in tension
- D. All the above.

Answer: Option D

13. A cylindrical ejector having its height 2 m fills after every 10 minutes with a peak sewage discharge of 0.0157 cumec. The diameter of the ejector chamber, is

- A. 2.30 m
- B. 2.40 m
- C. 2.45 m
- D. 2.50 m.

Answer: Option C

14. The flow velocity in detritus tanks is

- A. 0.05 m/sec
- B. 0.09 m/sec

- C. 1.25 m/sec
- D. none of these.

Answer: Option B

15. The following is the physical characteristic of sewage

- A. turbidity
- B. colour
- C. odour
- D. temperature
- E. all the above.

Answer: Option E

16. The normal value of over flow rates for plain primary sedimentation tanks, ranges between

- A. 25, 000 to 35, 000 litres/sqm/day
- B. 40, 000 to 50, 000 litres/sqm/day
- C. 50, 000 to 60, 000 litres/sqm/day
- D. 80, 000 to 100, 000 litres/sqm/day
- E. none of these.

Answer: Option B

17. The asbestos cement sewers are

- A. light in weight
- B. not structurally strong to bear large compressive stress
- C. susceptible to corrosion by sulphuric acid
- D. All the above.

Answer: Option D

18. Bottom openings 15 cm x 15 cm in the standing baffle wall are provided

- A. 15 cm c/c
- B. 22.5 cm c/c
- C. 30 cm c/c
- D. 50 cm c/c.

Answer: Option B

19. Faculative bacterias survive in

- A. the presence of oxygen
- B. the absence of oxygen
- C. both cases (a) and (b)
- D. neither (a) nor (b).

Answer: Option C

-
20. The ratio of maximum sewage flow to average sewage flow for trunk mains having diameters more than 1.25 m, is
- A. 1.5
 - B. 2.0
 - C. 3.0
 - D. 4.0

Answer: Option A

21. Acid regression stage of sludge digestion at a temperature 21°C extends over a period of
- A. 15 days
 - B. 30 days
 - C. 60 days
 - D. 90 days.

Answer: Option D

-
22. If the pH value of sewage is 7
- A. it is acidic
 - B. it is alkaline
 - C. it is neutral
 - D. none of these.

Answer: Option C

-
23. Pick up the correct statement from the following :
- A. Maximum daily flow = 2 times the average daily flow
 - B. Maximum daily flow = $\frac{2}{3}$ x average daily flow
 - C. Sewers are designed for minimum permissible velocity at minimum flow
 - D. All the above.

Answer: Option D

-
24. Pick up the incorrect statement from the following :
- A. The mixture of water and waste products, is called sewage
 - B. The treated sewage effluents, are generally used for irrigating the crops
 - C. The process of collecting, treating and disposing off the sewage, is called sewerage
 - D. The old conveyency system was definitely better than water carried sewerage system
 - E. None of these.

Answer: Option D

-
25. Pick up the correct statement from the following :
- A. Hydrogen sulphide gas in excess, may cause corrosion of concrete sewers

- B. 4 ppm of Dissolved Oxygen (D.O.) is ensured before discharging the treated sewage in river
- C. Solubility of oxygen in sewage is 95% of that of distilled water
- D. Dissolved oxygen content of sewage, may be determined by Winkler's method
- E. All the above.

Answer: Option E

26. Pick up the correct statement from the following :

- A. Small sewers are cleaned by flushing
- B. Medium sewers are cleaned by cane rodding
- C. Medium sewers may be cleaned by pills
- D. Large sewers are cleaned by removing the deposited materials
- E. All the above.

Answer: Option E

27. Cement concrete sewers are only suitable if non-scouring velocity is between

- A. 2.5 to 3.0 m/sec
- B. 3.0 to 4.0 m/sec
- C. 3.5 to 4.5 m/sec
- D. 4.5 to 5.5 m/sec.

Answer: Option A

28. The grit chambers of sewage treatment plants, are generally cleaned after

- A. 2 days
- B. 5 days
- C. 7 days
- D. 12 days
- E. 14 days.

Answer: Option E

29. The spacing of bars for perforations in coarse screens used for the treatment of sewage, is

- A. 20 mm
- B. 30 mm
- C. 40 mm
- D. 50 mm
- E. 100 mm.

Answer: Option D

30. In very first stage of decomposition of the organic matter in sewage

- A. nitrites are formed

- B. nitrates are formed
- C. carbondioxide is formed
- D. ammonia is formed.

Answer: Option D

31. For sewers, inverted siphon is provided for

- A. one pipe
- B. two pipes
- C. three pipes
- D. four pipes.

Answer: Option C

32. The coagulant which is generally not used for treating the sewage, is

- A. alum
- B. ferric chloride
- C. ferric sulphate
- D. chlorinated copperas.

Answer: Option A

33. Fresh sewage is generally

- A. alkaline
- B. acidic
- C. highly decomposed
- D. a source of objectionable odour.

Answer: Option A

34. In a trickling filter

- A. filtration process is used
- B. biological action is used
- C. neither (a) nor (b)
- D. both (a) and (b).

Answer: Option B

35. If the flame of a miner's safety lamp in a manhole extinguishes within 5 minutes, the sewer certainly contains

- A. Hydrogen sulphide
- B. Carbon dioxide
- C. Methane
- D. Oxygen
- E. None of these.

Answer: Option B

36. The layers of vegetable wastes and night soil alternatively piled above the ground to form a mound, is called
- A. a heap
 - B. plateau
 - C. windrow
 - D. none of these.

Answer: Option D

37. If the discharge of a sewer running half full is 628 l.p.s., $i = 0.001$, and $n = 0.010$, the diameter of the sewer, is
- A. 1.39 m
 - B. 1.49 m
 - C. 1.59 m
 - D. 1.69 m
 - E. 1.79 m.

Answer: Option D

38. For efficient working of a sewer, it must be ensured that
- A. minimum velocity of 0.45 m/sec, is maintained at its minimum flow
 - B. a maximum velocity of 0.90 m/sec, is maintained at its maximum flow
 - C. both (a) and (b)
 - D. neither (a) nor (b).

Answer: Option C

39. A manhole is generally provided at each
- A. bend
 - B. junction
 - C. change of gradient
 - D. change of sewer diameter
 - E. all the above.

Answer: Option E

40. Pick up the correct statement from the following :
- A. Rate of digestion of sludge is more at higher temperature
 - B. Thermophilic organisms digest the sludge if the temperature ranges from 40° to 60°C
 - C. Mesophilic organisms digest the sludge if the temperature is between 25° and 40°C
 - D. 90% of digestion takes place in 30 days at 29°C, the optimum mesophilic temperature
 - E. All the above.

Answer: Option E

41. In Chezy's formula $V = C \sqrt{R}$ for calculating the velocity of flow in circular sewer of diameter D running full, the value of hydraulic mean radius is

A. D

B. $\frac{D}{2}$

C. $\frac{D}{3}$

D. $\frac{D}{4}$

E. $\frac{D}{5}$

Answer: Option D

42. The sewer which collects the discharge from a collecting system and delivers it to a treatment plant, is known

A. house sewer

B. lateral sewer

C. branch sewer

D. sewer outfall.

Answer: Option D

43. If the depletion of oxygen is found to be 5 ppm after incubating a 2.5% solution of sewage sample for 5 days at 21°C, B.O.D. of the sewage is

A. 50 ppm

B. 100 ppm

C. 150 ppm

D. 200 ppm

E. 250 ppm.

Answer: Option D

44. Setting out the alignments of sewers may start from

A. city

B. out-fall

C. tail end

D. any point.

Answer: Option C

45. If the flame of a miner's safety lamp in the upper layers of the sewer forms an explosive, the sewer certainly contains

A. Hydrogen sulphide

B. Carbon dioxide

C. Methane

D. Oxygen

E. None of these.

Answer: Option C

46. The underground sewers are more subjected to

A. tensile force

B. compressive force

C. bending force

D. shearing force.

Answer: Option B

47. Pick up the correct statement from the following :

A. the sewer pipes of sizes less than 0.4 m diameter are designed as running full at maximum discharge

B. the sewer pipes of sizes greater than 0.4 m diameter are designed as running 2/3rd or 3/4th full at maximum discharge

C. the minimum design velocity of sewer pipes is taken as 0.8 m/sec

D. all the above.

Answer: Option D

48. The sewer pipes

A. carry sewage as gravity conduits

B. are designed for generating self-cleansing velocities at different discharge

C. should resist the wear and tear caused due to abrasion

D. all the above.

Answer: Option D

49. The normal values of over flow rates for secondary sedimentation tanks, ranges between

A. 25, 000 to 35, 000 litres/sqm/day

B. 40, 000 to 50, 000 litres/sqm/day

C. 50, 000 to 60, 000 litres/sqm/day

D. 80, 000 to 10, 000 litres/sqm/day

E. none of these.

Answer: Option A

50. The Brake Horse power of the motor (efficiency 60%) required for a pump of capacity 0.075 cumec for a total lift of 12 m, is

A. 10

B. 15

C. 20

D. 25

Answer: Option C

Section 7

1. In areas where light rains are uniformly distributed throughout the year, the type of sewerage system to be adopted is

- A. separate system
- B. combined system
- C. partially combined system
- D. none of these.

Answer: Option B

2. For detecting the nitrates in sewage, the colour may be developed by adding
- A. Pottassium permanganate
 - B. Sulphuric acid and naphthamine
 - C. Phenol-di-sulphuric acid and pottassium hydroxide
 - D. None of these.

Answer: Option C

3. The value of Chezy's constant

$$C = \frac{157.6}{1.81 + \frac{K}{\sqrt{r}}}$$

is used in

- A. Chezy's formula
- B. Bazin's formula
- C. Kutter's formula
- D. Manning's formula.

Answer: Option B

4. The formula which accepts the value of rugosity coefficient $n = 0.012$ to be used in Manning's formula, is given by
- A. Bazin
 - B. Crimp and Bruge
 - C. William-Hazen
 - D. Kutter.

Answer: Option B

5. For laying a sewer line in a trench of 2 m width, an offset line is marked on the ground parallel to the given centre line at a distance of
- A. 100 cm
 - B. 120 cm
 - C. 140 cm
 - D. 160 cm
 - E. 180 cm.

Answer: Option D

6. The formula $V = \frac{1}{n} r^{2/3} \sqrt{S}$ used for determining flow velocities in sewers, is known as

- A. Chezy's formula
- B. Bazin's formula
- C. Kutter's formula
- D. Manning's formula.

Answer: Option D

7. The sewage treatment units in which anaerobic decomposition of organic matter is used, are called
- A. imhoff tanks
 - B. trickling filters
 - C. sludge sedimentation tanks
 - D. none of these.

Answer: Option B

8. The spacing of man holes along a straight portion of a sewer is 300 m, the diameter of the sewer may be
- A. 0.9 cm
 - B. 1.2 m
 - C. 1.5 m
 - D. > 1.5 m.

Answer: Option D

9. The most efficient cross section of sewers in a separate sewerage system is
- A. parabolic
 - B. circular
 - C. rectangular
 - D. new egged.

Answer: Option B

10. If a 2% solution of sewage sample is incubated for 5 days at 20°C and the dissolved oxygen depletion was found to be 8 mg/l. The BOD of the sewage is
- A. 100 mg/l
 - B. 200 mg/l
 - C. 300 mg/l
 - D. 400 mg/l.

Answer: Option D

11. Pick up the incorrect statement from the following for allowing workers to enter sewers
- A. The particular manhole and one manhole on up stream and one manhole on down stream should remain open for 30 minutes
 - B. Proper tests for the presence of poisonous gases must be carried out
 - C. The men entering the manhole should be advised to smoke in the sewer

- D. Warning signals should be erected
- E. None of these.

Answer: Option C

12. The settling velocity of a spherical particle of diameter less than 0.1 mm as per Stock's law, is

- A. $V_s = 418 (G_s - G_w)d \left[\frac{3T + 70}{100} \right]$
- B. $V_s = 418 (G_s - G_w)d^2 \left[\frac{3T + 70}{100} \right]$
- C. $V_s = 218 (G_s - G_w)d^2 \left[\frac{3T + 70}{100} \right]$
- D. $V_s = 218 (G_s - G_w)d \left[\frac{3T + 70}{100} \right]$

Answer: Option B

13. In a grit chamber of a sewage treatment plant,

- A. flow velocity 0.15 m to 0.3 m/sec is kept
- B. depth of 0.9 m to 1.20 m is kept
- C. one minute of detention period is kept
- D. all the above.

Answer: Option D

14. The rate of accumulation of sludge per person per year, is

- A. 10 litres
- B. 15 litres
- C. 20 litres
- D. 25 litres
- E. 30 litres.

Answer: Option C

15. The disintegrating pump in which solid matter is broken up before passing out, is

- A. centrifugal pump
- B. reciprocating pump
- C. pneumatic ejector
- D. none of these.

Answer: Option A

16. The quantity of liquid waste which flows in sewers during the period of rainfall, is known

- A. sanitary sewage

- B. industrial waste
- C. storm sewage
- D. none of these.

Answer: Option C

17. The most efficient cross-section of sewers in a combined sewerage system is

- A. parabolic
- B. circular
- C. rectangular
- D. new egged.

Answer: Option B

18. Pick up the incorrect size of stone ware sewers

- A. 52.5 cm
- B. 67.5 cm
- C. 82.5 cm
- D. 90 cm
- E. none of these.

Answer: Option E

19. The grit and silt of the grit chambers, may not be used for

- A. raising low lying areas by dumping
- B. concreting
- C. both (a) and (b)
- D. neither (a) nor (b).

Answer: Option B

20. In a sludge tank, the gas mainly produced, is

- A. Oxygen
- B. Nitrogen
- C. Hydrogen
- D. Carbon dioxide
- E. Methane.

Answer: Option E

21. The intensity of rain is expressed in

- A. cm/minute
- B. cm/hour
- C. cm/day

D. none of these.

Answer: Option B

22. 1000 kg of sewage contains

A. 0.112 kg in suspension

B. 0.112 kg in solution

C. 0.225 kg in solution

D. 0.450 kg in suspension

E. both (a) and (c) of above.

Answer: Option E

23. The normal values of over flow rates for sedimentation tanks using coagulent, ranges between

A. 25, 000 to 35, 000 litres/sqm/day

B. 40, 000 to 50, 000 litres/sqm/day

C. 50, 000 to 60, 000 litres/sqm/day

D. 80, 000 to 100, 000 litres/sqm/day

E. none of these.

Answer: Option C