60714

ROLL No. | | | | | |

TEST BOOKLET No. 11

TEST FOR POST GRADUATE PROGRAMMES

**ENGINEERING SCIENCE**

Time: 2 Hours | Maximum Marks: 450

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**INSTRUCTIONS TO CANDIDATES**

1. You are provided with a Test Booklet and an Optical Mark Reader (OMR) Answer Sheet to mark your responses. Do not soil the Answer Sheet. Read carefully all the instructions given on the Answer Sheet.

2. Write your Roll Number in the space provided on the top of **this page**.

3. Also write your Roll Number, Test Code, and Test Subject in the columns provided for the same on the **Answer Sheet**. Darken the appropriate bubbles with a **Ball Point Pen.**

4. The paper consists of 150 objective type questions. All questions carry equal marks.

5. Each question has four alternative responses marked **A, B, C** and **D** and you have to **darken** the bubble fully by a **Ball Point Pen** corresponding to the correct response as indicated in the example shown on the Answer Sheet.

6. Each correct answer carries **3** marks and each wrong answer carries 1 minus mark.

7. Space for rough work is provided at the end of this Test Booklet.

8. You should return the Answer Sheet to the Invigilator before you leave the examination hall. However, you can retain the Test Booklet.

9. Every precaution has been taken to avoid errors in the Test Booklet. In the event of any such unforeseen happenings, the same may be brought to the notice of the Observer/Chief Superintendent in writing. Suitable remedial measures will be taken at the time of evaluation, if necessary.

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SEAL

60714



## ENGINEERING SCIENCE

1. Which of the following factors affect per capita water consumption of a locality?
   i) climatic conditions
   ii) quality of water
   iii) residual pressure

   (A) i
   (B) i and ii
   (C) ii and iii
   (D) i and iii

2. Which of the following causes a decrease in per capita water consumption?

   (A) metering system
   (B) quality of water
   (C) status of the people
   (D) climatic condition

3. If average daily water consumption of a city is 1,00,000 $m^3$, the maximum daily consumption on peak hourly demand will be

   (A) 1,00,000 $m^3$
   (B) 1,50,000 $m^3$
   (C) 1,80,000 $m^3$
   (D) 2,70,000 $m^3$

4. The devices which are installed for drawing water from the sources are called

   (A) aquifers
   (B) aquitar
   (C) intakes
   (D) aquiclude

5. The type of valve, which is provided on the suction pipe in tube well is about

   (A) pressure relieve valve
   (B) globe valve
   (C) reflux valve
   (D) drain valve

6. The polluted water is the one which contains

(A) pathogenic organisms
(B) undesirable substances rendering it unfit for drinking and domestic use
(C) high TDS concentration
(D) high TDS and BOD values

7. EDTA (Ethylene Diamine Tetra Acetic acid) is used to determine the

(A) hardness of water
(B) chlorides concentration
(C) BOD value
(D) residual chlorine

8. Presence of bacterial contamination in chlorinated water can be ascertained easily by performing

(A) MPN test
(B) membrane filter technique
(C) residual chlorine test
(D) available chlorine test

9. The product of $H^+$ and $OH^-$ ions in a stronger alkali solution is

(A) $10^0$
(B) $10^{-1}$
(C) $10^{-7}$
(D) $10^{-14}$

10. Orthotolidine test is carried out to determine

(A) dissolved oxygen
(B) residual chlorine
(C) sodium absorption ratio
(D) sulphate concentration

11. Velocity of flow of water in a sedimentation tank is about

(A) 5 to 10 cm/sec
(B) 50 to 80 cm/sec
(C) 15 to 30 cm/minute
(D) 15 to 30 cm/sec

12. Assertion A: Slow sand filters are more efficient in removing bacteria than rapid sand filters
Reason R: Filtration rate of rapid sand filters is higher than that of slow sand filters
Select the answer according to the coding system given below.

(A) Both A and R are true. R is the correct explanation to A
(B) Both A and R are true. But R is not the correct explanation to A
(C) A is true but R is false.
(D) A is false but R is true

13. Treatment of water with bleaching powder is known as

(A) super chlorination
(B) hypho chlorination
(C) residual chlorination
(D) double chlorination

14. Match with List-I and List-II and select the correct answer using the codes given below the list

| List – I (Disinfection Treatment) | List – II (Advantage / Disadvantage) |
|---|---|
| a. U-V radiation | 1. Residual concentration |
| b. ozonation | 2. No alteration in taste |
| c. chlorination | 3. Hardness removal |
| d. boiling | 4. Low turbidity requirement |

(A) a4, b3, c2, d1
(B) a2, b3, c1, d4
(C) a4, b2, c1, d3
(D) a2, b4, c1, d3

15. For chlorination, at higher pH values contact period required will be ..... than /of that required at lower pH values

(A) higher
(B) lesser
(C) same
(D) None of the above

16. For controlling algae, the chemical usually used is

(A) alum (B) cetyl alcohol
(C) calcium hypochlorite (D) copper sulphate

17. Sewer shape preferable for the combined sewer system

(A) rectangular sewer (B) circular sewer
(C) egg shaped sewer (D) semi-circular

18. An egg shaped sewer section

(A) is more easy to construct
(B) is more stable than circular sewer
(C) is more economical than circular sewer
(D) can provide self-cleansing velocity even at low discharges

19. The velocity of flow in a sewer does not depend on

(A) wetted perimeter (B) area of flow
(C) shape of the sewer (D) length of sewer

20. Characteristics of fresh and septic sewage respectively are

(A) acidic and alkaline (B) alkaline and acidic
(C) both being acidic (D) both being septic

21. Different oxygen demands required in the decomposition of sewage are denoted as
Chemical oxygen demand (COD
Bio-chemical oxygen demand (BOD) and
Theoretical oxygen demand (TOD)
The correct relation between the TOD, BOD and COD is

(A) BOD>TOD>COD (B) TOD>BOD>COD
(C) BOD>COD>TOD (D) TOD>COD>BOD

22. The BOD contribution by a town is 18000 kg/days (and BOD per capita per day is 0.08 kg) then population equivalent of town is

(A) 1,440
(B) 18,000
(C) 1,87,200
(D) 2,25,000

23. If 20 ml of an odourous water sample needed 190 ml of odour free water to become odour free, then the threshold odour number (TON) will be

(A) 10.5
(B) 9.5
(C) 95
(D) 210

24. Excess alkalinity is undesirable in swimming pools because

(A) nervous system is affected
(B) causes skin infections
(C) causes eye irritation
(D) makes more hair loss

25. Laxative effect in water is because of

(A) NaCl
(B) $MgSO_4$
(C) $MgCl_2$
(D) $CaSO_4$.

26. The economical diameter of a pipe, through which a discharge of 0.25 $m^3$ / sec is to be passed is

(A) 0.5m
(B) 0.75m
(C) 1.0 m
(D) 1.2m

27. Colour of water sample is expressed in

(A) silica scale
(B) turbidity scale
(C) cobalt scale
(D) activated carbon scale

28. If the temperature of water in a sedimentation tank increases the settling velocity of settleable particle will

(A) increase
(B) remain unaffected
(C) gets altered
(D) decrease

29. Assertion A: In biological treatment units monitoring, BOD is more preferable than the COD
Reason R: BOD estimation gives more accurate measure on non-biodegradable organic matter than COD and the BOD test takes more time for its completion
Select the answer according to the coding system given below.

(A) Both A and R are true. R is not the correct explanation to A
(B) Both A and R are true. But R is not the correct explanation to A
(C) A is true but R is false
(D) A is false but R is true

30. Biological treatment units are normally designed for

(A) maximum flow
(B) minimum flow
(C) dry weather flow
(D) constant flow

31. The ratio between 5 day BOD to the ultimate BOD is around

(A) one third
(B) three fourth
(C) two third
(D) one fourth

32. Match with List-I and List-II and select the correct answer using the codes given below the list

| List – I (Parameter) | List – II (Unit of measurement) |
|---|---|
| a. Colour | 1. NTU |
| b. Odour | 2. cobalt scale |
| c. Turbidity | 3. ppm |
| d. Hardness | 4. no unit |

(A) a4, b3, c1, d2
(B) a2, b3, c1, d4
(C) a4, b2, c1, d3
(D) a2, b4, c1, d3

33. Match with List-I and List-II and select the correct answer using the codes given below the list

| List – I | List – II |
|---|---|
| a. Colour | 1. Bayli's instrument |
| b. Odour | 2. Versenate method |
| c. Turbidity | 3. Osmoscope |
| d. Hardness | 4. Burgers scale |

(A) a4, b3, c1, d2
(B) a2, b3, c1, d4
(C) a2, b4, c1, d3
(D) a4, b2, c1, d3

34. Laying of sewers is usually carried out with the help of

(A) sight rails and boning rods
(B) compus
(C) leveling instrument
(D) theodalite

35. Septic tank functions as

i) skimming tank
ii) decomposition unit
iii) sedimentation tank
iv) continuous flow stirred tank reactor
v) filter unit

(A) i, ii, iii
(B) ii, iv, v
(C) ii, iii, iv
(D) ii, iii, v

36. Oxidation ponds are designed for a detention time of usually

(A) 1 - 2 hours
(B) one month
(C) 24 - 48 hours
(D) 10 - 15 days

37. If the diameter of the pumping main adopted is lesser than the economical diameter, then

i) cost of pipe will be lesser
ii) pumping cost will reduce
iii) self-cleansing velocity will be lesser
iv) head loss will be high
v) discharge will be decreasing

(A) i, ii, iii
(B) i, iv
(C) i, ii, iii, iv
(D) i, ii, iv, v

38. Adverse impact of electrostatic precipitators used in pollution control is the release of

(A) $SO_2$
(B) $NO_X$
(C) $O_3$
(D) RSPM

39. The rain will be referred as acid rain if the pH value of the rain water is below

(A) 7.0
(B) 1.75
(C) 3.50
(D) 5.26

40. To express the sound levels in decibels, sound pressure levels are usually adopted on a reference scale of

(A) 10 $\mu$Pa
(B) 15 $\mu$Pa
(C) 20 $\mu$Pa
(D) 30 $\mu$Pa

41. Permissible levels for $SO_2$ and $NO_X$ as per IS air quality standards are

(A) 80 and 200 $\mu g/m^3$
(B) 80 and 80 $\mu g/m^3$
(C) 200 and 80 $\mu g/m^3$
(D) 200 and 200 $\mu g/m^3$

42. Two water samples A and B have pH values of 6.5 and 7.5 respectively. Water sample A is ..... times ..... than the water sample B

(A) 10, acidic
(B) 1, alkaline
(C) 10, alkaline
(D) 100, alkaline

43. Identify the treatment units which remove the organic materials
i) grit chamber
ii) secondary treatment
iii) activated sludge process
iv) plain sedimentation tank
v) oxidation ditch

(A) i, iii, v
(B) iii, iv, v
(C) ii, iii, v
(D) ii

44. Septic tank effluent is to be discharged into ..... only.

(A) Drainage
(B) Soak pit
(C) Sewer
(D) Oxidation pond

45. Identify the treatment units which remove the dissolved inorganic solids
i) grit chamber
ii) reverse osmosis plant
iii) lime – soda process
iv) plain sedimentation tank
v) electro dialysis
vi) demineralisation unit

(A) ii, iii, iv
(B) ii, iv, v
(C) ii, v, vi
(D) ii

46. A City Municipal Corporation treats 1,00,000 cubic meters of water per day for meeting its water demand with bleaching powder having 40 % available chlorine. If it is required to treat with a chlorine dosage of 0.8 mg/l, then the requirement of bleaching powder per day will be

(A) 32 kg
(B) 200 kg
(C) 320 kg
(D) 50 kg

47. Service connection for the water supply by the water supply authorities to a house being made with the connection of the service pipe with the municipal water mains. If the components of the service connection pipe are referred as comprises:

i) reflux vale
ii) goose neck
iii) ferrule and
iv) water meter

The correct sequence of these connections is

(A) i, ii, iii and iv
(B) iv, iii, i and ii
(C) iii, ii, i and iv
(D) i, ii, iv and iii

48. Sewage sickness is the

(A) increase in toxicity of the soil
(B) reduction in the crop yield of a soil
(C) clogging of the soil and leading to the obstruction of aeration and septic conditions
(D) reduction of the waste assimilating capacity of sewage

49. Match with List-I and List-II and select the correct answer using the codes given below the list

| List – I (Treatment unit) | List – II (Detention Time) |
|---|---|
| a. Activated Sludge process | 1. 4 hours |
| b. Plain sedimentation Tank | 2. 3 hours |
| c. Grit chamber | 3. 2 days |
| d. Septic tank | 4. 1.5 minutes |

(A) a4, b2, c1, d3
(B) a2, b3, c1, d4
(C) a4, b1, c2, d3
(D) a2, b1, c4, d3

50. Identify which of the followings is not correctly matched

(A) Lime soda process – softening
(B) Activated Carbon – colour removal
(C) Coagulation – Ferric chloride
(D) Nalgonda Technique – Chloride removal

51. Maximum mixing depth (MMD) means

(A) height of the stack
(B) no dispersion of pollutant
(C) height at which complete dispersion of pollutant occurs
(D) None of the above

52. Match with List-I and List-II and select the correct answer using the codes given below the list

| List – I | List – II |
|---|---|
| a. Cast iron pipe | 1. Coller joint |
| b. Asbestos cement pipe | 2. Spigot and socket joint |
| c. G.I pipe | 3. Screwed joint |
| d. Cement concrete pipes | 4. Victualic joint |

(A) a1, b3, c2, d4
(B) a2, b1, c4, d3
(C) a3, b4, c2, d1
(D) a4, b2, c1, d3

53. Match List-I and List-II and select the correct answer using the codes given below the list

| List – I | List – II |
|---|---|
| a. Deficiency of fluorides | 1. Blue baby |
| b. Excessive nitrate | 2. Staining of teeth |
| c. Absence of iodine | 3. Weaker teeth |
| d. Excess flouride | 4. Goitre |

(A) a1, b3, c2, d4
(B) a2, b1, c4, d3
(C) a3, b1, c4, d2
(D) a4, b2, c1, d3

54. The oxygen demand during the first 20 days, which occurs due to oxidation of organic matter, is called

(A) Nitrogenous demand
(B) Carbonaceous demand
(C) Ammonia demand
(D) None of the above

55. Fire water demand for a city is calculated based on

(A) population density
(B) total area of the city
(C) population of the city
(D) land use map of the city

56. Permissible horizontal velocity of flow in a primary sedimentation tank is

(A) 0.5 m/second
(B) 0.3 m/second
(C) 1.0 m/second
(D) 0.3 m/minute

57. Bacterial cell removal in a rapid sand filter can be expected to a maximum value of

(A) 100 %
(B) 95.00 %
(C) 99.9 %
(D) 90 %

58. The economical diameter of a pumping main is the one which ensures the reduction of

(A) the initial cost of pipe
(B) the cost of pumping
(C) both the initial cost of pipe and pumping cost
(D) total of initial cost of pipe and pumping cost to the minimum

59. The amount of backwash water required for back washing of filter media in a rapid sand filter unit is

(A) 0.5 - 2.0 %
(B) 2.0 - 4.0 %
(C) 5.0 %
(D) 10.0 %

60. Algae dies out, though fish life may survive, in a river zone, known as

(A) zone of clear water
(B) zone of degradation
(C) zone of active decomposition
(D) zone of recovery

61. Which of the following is not influencing the settling velocity of settleable particle in a sedimentation tank?

(A) sedimentation tank depth
(B) water temperature
(C) particle size
(D) particle specific gravity

62. Residual chlorine is to be made available in chlorinated water in order to
i) take care of the bacterial cell which enters the water main, storage reservoir or distribution network
ii) impart odour to water
iii) have the pleasant taste in water by the formation of chlorides in water
iv) kill bacteria very effectively
v) ensure the killing of all bacterial cells after the chlorination
Consider the above points; identify the correct choices using the code given below

(A) ii, iii, iv
(B) i, ii, iii, iv
(C) i, v
(D) i, iv, v

63. Which of the following statements are correct?
i) Sub surface water is generally free from suspended impurities
ii) Suspended impurities in surface sources of water contain often bacteria
iii) Design period of subsurface sources is higher than that of surface sources
iv) Sub surface water is having more dissolved impurities due to over exploitation
v ) Lake water contamination with microscopic organisms is due to domestic sewage mixing
Select the correct answer using the code given below

(A) i, ii, iv, v
(B) i, ii, iii, iv
(C) i, v
(D) i, iv

64. The safe permissible limit of concentration of iron in domestic water supplies is

(A) 0.05 ppm
(B) 0.1 ppm
(C) 0.5 ppm
(D) 1.0 ppm

65. The maximum permissible limit for fluoride in drinking water is

(A) 0.1 mg/l
(B) 1.5 mg/l
(C) 0.5 mg/l
(D) 10 mg/l

66. The safe permissible limit of sulphate in domestic water supplies is

(A) 100 mg/l
(B) 200 mg/l
(C) 400 mg/l
(D) 1000 mg/l

67. Which of the following is not a water borne disease?

(A) jaundice
(B) malaria
(C) dysentery
(D) cholera

68. The treatment which is generally given to treat water follow the sequence

(A) sedimentation, disinfection, filtration, aeration
(B) sedimentation, disinfection aeration, filtration
(C) aeration, sedimentation, filtration, disinfection
(D) sedimentation, aeration, disinfection, filtration

69. The surface overflow rate preferable for horizontal flow circular sedimentation tanks using coagulants is about

(A) 15 to 30 $m^3/m^2$/day
(B) 30 to 60 $m^3/m^2$/day
(C) 40 to 80 $m^3/m^2$/day
(D) 50 to 60 $m^3/m^2$/day

70. For a plain rectangular batch type sedimentation tanks the detention time ranges form

(A) 4 to 6 hours
(B) 6 to 8 hours
(C) 12 to 18 hours
(D) 4 to 8 hours

71. Identify the correct statements related to the lime-soda process of water softening

i) it is very much suitable for turbid and acidic water
ii) huge amount of precipitate is formed which creates a disposal problem
iii) the effluent of zero hardness cannot be obtained
iv) it is unsuitable for softening water of excessive hardness

(A) i, iii, iv
(B) ii, iii, iv
(C) ii
(D) i, ii, iv

72. In the design of distribution system there should be a minimum residual pressure head of ..... is to be maintained

(A) 0 –5m
(B) 5 – 10m
(C) 10 – 15m
(D) 15 – 20m

73. Scour valves are provided

(A) at street corners to control the flow of water
(B) at every depression and dead ends to drain out the silt that collected there
(C) at the foot of rising main along the slope to prevent back running of water
(D) at every summit of rising main

74. Settling velocity of a discrete particle in a sedimentation tank depends upon

i) particle diameter
ii) TDS of water
iii) plan area of the tank
iv) flow rate
v) water temperature
vi) specific gravity of particle

(A) ii, iii, iv, v
(B) i, ii, iii, iv, v, vi
(C) i, v, vi
(D) i, iii, iv, v, vi

75. The efficiency of a grit chamber depends upon
i) detention time
ii) functioning of velocity control device
iii) suspended solids concentration
iv) depth of flow
v) length of the chamber
vi) horizontal velocity of water

(A) i, ii, iii, vi
(B) i, ii, iii, iv, v, vi
(C) i, ii, v, vi
(D) i, iii, iv, v

76. Recalcitrant organics are

(A) easily biodegradable
(B) non-biodegradable
(C) inorganic elements
(D) None of the above

77. In distribution pipes, air valves are provided at

(A) lowest elevation points
(B) higher elevation points
(C) junction points
(D) dead ends

78. Surge tanks are used

(A) for storing water
(B) to increase the velocity of flow in a pipe
(C) as overflow valves
(D) to guard against water hammer

79. In a metered, well monitored and maintained water supply system, water loses against leakages and theft or illegal connections would be

(A) 5%
(B) 0 %
(C) 15%
(D) 25%

80. A pipe which carries the sullage in the house drainage system is called as

(A) vent pipe
(B) antisiphonage pipe
(C) waste pipe
(D) soil pipe

81. The distribution system, where analysis will be easier is

(A) dead end system
(B) radial system
(C) grid iron system
(D) ring system

82. Equivalent pipe of a network is a pipe having

i) the same velocity of flow
ii) the same flow carrying capacity
iii) the same diameter
iv) the same slope
v) the same head loss
vi) the same length, diameter, flow carrying capacity and velocity of flow

(A) ii, v
(B) i, ii, iii, iv, v
(C) ii, vi
(D) i, ii, iv, v

83. Zone, where DO concentration may fall to zero, causing anaerobic conditions in a river reach, is known as

(A) Zone of degradation
(B) Zone of active decomposition
(C) Zone of recovery
(D) Zone of clear water

84. Which of the following method is not used for land disposal of sewage?

(A) Broad irrigation
(B) Lagoon irrigation
(C) Sprinkler irrigation
(D) Sub surface irrigation

85. If the self purification constant of a large stream flowing with low velocity is 2.4 and its reoxygenation co-efficient is 0.288 then its deoxygenation co-efficient will be

(A) 0.12
(B) 0.08
(C) 0.06912
(D) 0.18

86. Which of the following action does not help in self purification of streams?

(A) sunlight
(B) sedimentation
(C) oxidation
(D) demineralisation

87. When dilution factor available in a sewage receiving water body is less than 150, the treatment to be carried out for the sewage is

(A) no treatment
(B) plain sedimentation
(C) chemical sedimentation
(D) complete treatment

88. Which of the following is not a unit operation?

(A) Filtration
(B) Precipitation
(C) Sedimentation
(D) Screening

89. In the relative stability test conducted at 20°C for sewage, if the period of test completion is 10 days, the percentage of relative stability of sample is

(A) 98.04%
(B) 90.04%
(C) 88.04%
(D) 80.04%

90. Coincident demand of water during fire fighting is represented by

(A) maximum hourly demand + fire demand
(B) maximum hourly demand
(C) maximum daily demand + fire demand
(D) greater of (a) and (c).

91. The atmospheric condition that facilitates the dispersion of pollutants is

(A) stable
(B) neutral
(C) unstable
(D) inversion

92. Gases which are generally evolved during anaerobic decomposition of sewage, are

(A) $CO_2+NH_3+H_2S$ (B) $CO_2+NH_3+H_2S+CH_4$
(C) $CO_2+NH_3+SO_2$ (D) $CO_2+NH_3+SO_2+CH_4$

93. The percentage of rejects that result from a reverse osmosis process is around

(A) 40 (B) 10
(C) 90 (D) 70

94. Reverse osmosis is a treatment where

i) the TDS is removed
ii) water is to be maintained in acidic range
iii) water is to be maintained in alkaline range
iv) the bacterial removal is carried out
v) the suspended organic material removal is carried out
vi) the disposal of reject is a major environmental issue

(A) ii, v (B) i, ii, vi
(C) i, ii, iv, vi (D) i, ii, iv, v

95. At lower pH value of water, the contact period required for chlorination,

(A) gets reduced (B) gets increased
(C) same (D) becomes nil

96. Match List-I with List-II and select the correct answer using the codes given below the lists:

| List – I (Organism) | List – II (Disease Transmitted) |
|---|---|
| a. bacteria | 1. infectious Hepatitis |
| b. viruses | 2. amoebic dysentery |
| c. protozoa | 3. paratyphoid |
| d. helminthes | 4. guinea – worm infection |

(A) a3, b1, c4, d2 (B) a3, b1, c2, d4
(C) a1, b3, c4, d2 (D) a1, b3, c2, d4

97. Solids concentration in sea water

(A) 30,000 mg/l
(B) 30 %
(C) 10 %
(D) 10,000 mg/l

98. The reactor configuration of a UASB system is

(A) plug flow
(B) completely mixed
(C) batch
(D) None of the above

99. The sewerage system originates from

(A) house sewers
(B) out fall sewer
(C) main sewers
(D) lateral sewers

100. The sewerage system does not include

(A) sewer appurtenances
(B) pumping units
(C) storm sewers
(D) sewage treatment units

101. For treating the flow of 5 MLD (million litres per day) of water with a detention of 4 hours, the surface area of a rectangular sedimentation tank to remove all particles having settling velocity of 0.2 m/minute is

(A) 28.90 $m^2$
(B) 20000 $m^2$
(C) 173.611 $m^2$
(D) 4000 $m^2$

102. Activated carbon treatment can do the removal of

(A) colour
(B) odour
(C) colour and odour
(D) ozone

103. Iron and manganese can be removed from water by

(A) boiling
(B) aeration followed by coagulation
(C) chlorination
(D) activated carbon addition

104. Match List-I with List-II and select the correct answer using the codes given below the lists

| List – I (Water purification) | List – II (Chemical/processes) |
|---|---|
| a. Removal iron and manganese | 1. phosphate coagulation |
| b. Removal of taste and odour | 2. aeration |
| c. Removal of strontium radioactivity | 3. activated carbon |
| d. Control of algal cells in water | 4. copper sulphate |

(A) a2, b3, c1, d4 (B) a2, b3, c4, d1
(C) a3, b2, c1, d4 (D) a3, b2, c4, d1

105. The denitrification process is

(A) anoxic (B) anaerobic
(C) aerobic (D) facultative

106. Factors affecting per capita water demand of a city are
i) population
ii) size of the city
iii) quality of water
iv) method of water supply
v) climatic condition
vi) number of industries

(A) ii, iii, iv, v (B) i, iii, v
(C) ii, iii, iv, v, vi (D) i, iii, iv, vi

107. Sewer laying is generally started from the

(A) outfall end (B) higher RL end
(C) trunk sewer location (D) house sewer

108. Velocity of flow in a sewer depends upon
i) length of sewer
ii) size of the sewer
iii) gradient of sewer
iv) hydraulic mean depth
v) specific gravity of suspended particle

(A) ii, iii, iv, v
(B) iii, iv, v
(C) ii, iii, v
(D) i, iii, iv, v

109. Dissolved oxygen content (DO) of river water gets increased with

(A) decrease in temperature
(B) laminar flow nature of river
(C) increased biological decomposition
(D) decrease in the sediments loading

110. The amount of settleable solids present in the sewage can be determined easily with the help of

(A) turbidimeter
(B) imhoff cone
(C) china dish
(D) settling chamber

111. Absence of biological life is the specific feature in the

(A) zone of mixing
(B) zone of active decomposition
(C) zone of recovery
(D) zero DO zone

112. Sewage disposal into a water body without any treatment can be made if dilution factor available in river is

(A) more then 1000
(B) between 150 to 300
(C) between 300 to 500
(D) more than 500

113. The catalytic converters fitted to automobile exhaust decompose

(A) $SO_2$
(B) hydrocarbons
(C) $NO_X$
(D) ammonia

114. The symbiotic relationship between bacteria and algae is utilised in the operation of

(A) anaerobic contact
(B) UASB
(C) oxidation pond
(D) aerobic baffled reactor

115. Dechlorination can be done by adding

(A) potassium permanganate
(B) potassium dichromate
(C) sodium thiosulphate
(D) barium chloride

116. A foot valve is provided at the end of suction pipe of a centrifugal pump to

(A) prevent water from leaving and emptying the pump casing
(B) prevent back flow of lifted water in the delivery pipe into the pump casing
(C) prevent sudden and full loading of motor
(D) prevent entry debris and sand into the pump

117. Which of the following methods is effective for the removal of emulsified oil from waste water?

(A) Sedimentation
(B) Coagulation
(C) Dissolved air flotation
(D) Filtration

118. Which of the following is not a green-house gas?

(A) Water vapour
(B) $CO_2$
(C) $SO_2$
(D) $CH_4$

119. The settling velocity of particle in a sedimentation tank depends upon
i) particle diameter
ii) size of the tank
iii) quality of water
iv) flow rate
v) specific gravity of particle
vi) water temperature

(A) ii, iii, iv, v
(B) i, ii, iii, iv, v, vi
(C) i, v, vi
(D) i, iii, iv, v, vi

120. The overflow rate for sedimentation tanks using coagulants is about

(A) 15 to 30 $m^3/day/m^2$
(B) 30 to 40 $m^3/day/m^2$
(C) 40 to 50 $m^3/day/m^2$
(D) 50 to 60 $m^3/day/m^2$

121. For plan sedimentation tanks the detention time ranges form

(A) 1 to 2 hours
(B) 2 to 2.5 hours
(C) 3 to 4 hours
(D) 4 to 8 hours

122. The efficiency of a sedimentation tank does not depend upon

(A) detention time
(B) depth of the tank
(C) length of the tank
(D) horizontal velocity of water

123. At the end of distribution system there should be a minimum residual pressure head of

(A) 0 - 5m
(B) 5 - 10m
(C) 10 - 15m
(D) 15 - 20m

124. The type of valve which allows water to flow in one direction but prevents its flow in the reverse direction is

(A) reflux value
(B) air relief value
(C) relay value
(D) scour value

125. Water loses in a metered water supply system may be assumed as

(A) 5 - 10 %
(B) 20 %
(C) 15 %
(D) 25 %

126. The layout of distribution system in which water flows towards the outer periphery is

(A) dead end system
(B) radial system
(C) grid iron system
(D) ring system

127. A pipe which is installed in the house drainage to preserve the water seal of traps is called

(A) Vent pipe
(B) Antisiphonage pipe
(C) Waste pipe
(D) Soil pipe

128. The method which is most widely used for analysing and designing the pipes of all types of complex water distribution networks is

(A) equivalent pipe method
(B) hardy cross method
(C) circle method
(D) All of the above

129. Hardy Cross method of analysis of distribution system
i) involves successive trials
ii) takes economic aspects into account
iii) is time consuming
iv) can be used to analyse layouts of any number loops
The correct answer is

(A) i
(B) i, ii
(C) i, iii, iv
(D) i, ii, iii, iv

130. The water having lower values of pH may cause
1) Tuberculation
2) Incrustation
3) Corrosion
4) Difficulties in chlorination
Of these statements,

(A) 1 and 2 are correct
(B) 2 and 4 are correct
(C) 1 and 3 are correct
(D) 3 and 4 are correct

131. Which of the following forms of chlorine has no disinfectant property?

(A) Hypochlorous acid
(B) Hypochlorite ion
(C) Monochloramine
(D) Trichloramine

132. In lime-soda process of water softening

(A) only carbonate hardness is removed
(B) only non carbonate hardness is removed
(C) lime reduces non carbonate hardness and soda removes carbonate hardness
(D) lime reduces carbonate hardness, and soda removes non-carbonate hardness

133. For a flow of 5.7 MLD (million litres per day) and a detention period of 2 hours, the surface area of a rectangular sedimentation tank to remove all particles having settling velocity of 0.33 mm/s is

(A) 20 $m^2$
(B) 100 $m^2$
(C) 200 $m^2$
(D) 400 $m^2$

134. The term sludge age is associated with

(A) aeration
(B) sedimentation
(C) sludge drying
(D) sludge conditioning

135. The sewage of a town is to be discharged into a river stream, the quantity of sewage produced per day is 5 million liter. And its BOD is 200 mg/l. If the discharge in the river is 150 l/sec and if its BOD is 6mg/l so the BOD of the dilution water is

(A) 80.21 mg/l
(B) 60.0 mg/l
(C) 40.0 mg/l
(D) 20.mg/l

136. The percentage BOD reduction expected in preliminary treatment of sewage

(A) 5 - 10%
(B) 10 - 20%
(C) 15 - 30%
(D) 20 - 50%

137. In the relative stability test conducted at 20°C for sewage, if the period of test completion is 10 days, the percentage of relative stability of sample is

(A) 98.04%
(B) 90.04%
(C) 88.04%
(D) 80.04%

138. Incineration at lower temperature should be avoided in the case of

(A) PVC
(B) biodegradable organic waste
(C) paper
(D) glass

139. The type of EIA which is carried out to predict impact of polices and plans is called

(A) project EIA
(B) strategic EIA
(C) cumulative EIA
(D) rapid EIA

140. The process of desalination of water, which makes use of semi permeable membrane is

(A) Electro dialysis
(B) Solar distillation
(C) Reverse osmosis
(D) osmosis

141. Which of the following is commonly used as carbon source in denitrification of industrial waste water?

(A) Benzene
(B) Phenol
(C) Methanol
(D) None of the above

142. Match List-I with List-II and select the correct answer using the codes given below the lists:

| List – I (Process Terms) | List – II (Meaning) |
|---|---|
| a. dechlorination | 1. only chlorine treatment is applied |
| b. super chlorination | 2. apply chlorine at the end of all treatments |
| c. post chlorination | 3. apply extra chlorine for highly polluted water |
| d. plain chlorination | 4. removal of chlorine from water |

(A) a3, b4, c2, d1
(B) a3, b4, c1, d2
(C) a4, b3, c2, d1
(D) a4, b3, c1, d2

143. Which of the following is the most cost effective chemical for the removal of fluorides and phosphates from waste water?

(A) Lime
(B) Caustic soda
(C) Alum
(D) Bleaching powder

144. Assertion A: The consumption of water increases with the increase in the distribution pressure.
Reason R: Higher distribution pressure in distribution networks causes more loss and waste of water.
Select the answer according to the coding system given below.

(A) Both A and R are true
(B) Both A and R are false
(C) A is true but R is false
(D) A is false but R is true

145. The specific capacity of a well is the

(A) volume of water that can be extracted by the force of gravity from a unit volume of aquifer
(B) discharge per unit drawdown of the well
(C) drawdown per unit discharge of the well
(D) rate of flow through a unit width and entire thickness of aquifer

146. Pyrolysis is also termed as

(A) destructive distillation
(B) oxidation
(C) incineration
(D) None of the above

147. Which of the following refers to aerobic attached growth system of biological waste treatment?

(A) UASB
(B) Rotating biological contactor
(C) Activated sludge process
(D) Aerobic lagoon

148. When the temperature rises in river water, the dissolved oxygen content (DO) of sewage gets

(A) reduced
(B) unaffected
(C) enhanced
(D) enhanced and then reduced

149. An equivalent term of "solids retention time" is

(A) mean cell residence time
(B) hydraulic retention time
(C) solids age
(D) specific growth rate

150. The minimum DO which should always be present on water for aquatic life support is

(A) 1 ppm (mg/l.)
(B) 2 ppm
(C) 4 ppm
(D) 8 ppm

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