

004

DOs:

- DON'Ts:**

- ### IMPORTANT INSTRUCTIONS TO CANDIDATES

- ### Marks Distribution

004-A1



004-A1

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ENVIRONMENTAL ENGINEERING
PART - 1

Each question carries one mark.

(50 × 1 = 50)

1. The approximate percentage of water in sewage is
(A) 90% (B) 99%
(C) 99.9% (D) 98.9%
2. To test COD of sewage, organic matter is oxidized by $K_2Cr_2O_7$ in the presence of
(A) Hydrochloric acid (B) Sulphuric acid
(C) Nitric acid (D) Citric acid
3. The digested sludge from septic tank is generally removed after a minimum period of
(A) 3 years (B) 4 years
(C) 5 years (D) 6 years
4. The colour of fresh & septic sewage respectively
(A) Grey and blue (B) Blue and grey
(C) Grey and dark green (D) Dark green and blue
5. Methaemoglobinemia disease is caused in children by
(A) Conversion of nitrites to nitrates
(B) Conversion of nitrates to nitrites
(C) Reaction between hemoglobin and CO_2
(D) Both (A) & (C)

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6. Uniformity coefficient of filter sand is given by
 (A) D_{50}/D_5 (B) D_{50}/D_{10}
 (C) D_{60}/D_5 (D) D_{60}/D_{10}
7. If annual average daily demand of water is 270 LPCD and population of city is 2 lakhs with peak factor of 2.7, then peak demand will be
 (A) 145.8 MLD (B) 160.5 MLD
 (C) 170 MLD (D) 180 MLD
8. If total hardness of water is greater than its total alkalinity, then carbonate hardness will be equal to
 (A) Total alkalinity (B) Total hardness
 (C) Carbonate hardness (D) Non-carbonate hardness
9. A type of valve which is provided to control the flow of water in the distribution system at street corners and where a pipe line intersect is
 (A) Check valve (B) Sluice valve
 (C) Safety valve (D) Scour valve
10. Standard EDTA solution is used to determine
 (A) Hardness in water (B) Turbidity in water
 (C) Dissolved oxygen in water (D) Residual chlorine in water
11. The Gaussian model is used for prediction of the concentration of pollutants from
 (A) Line source (B) Single point source
 (C) Plane source (D) All of the above

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12. A 50 μm size particle is removed from the gas by
(A) Gravity settling chamber (B) Centrifugal collector
(C) Wet scrubber (D) Fabric filter
13. The major atmospheric gas layer in stratosphere is
(A) Hydrogen (B) Carbon dioxide
(C) Ozone (D) Helium
14. When environmental lapse rate equals to adiabatic lapse rate and both the lines coincide, the environment is called
(A) Meta stable (B) Unstable
(C) Stable (D) None of the above
15. Blue haze in forest air is produced because of
(A) Alkenes (B) Aerosols
(C) PAN (D) Lead
16. Pollutant standard index (PSI) value greater than 300, denotes the air quality as
(A) Good (B) Moderate
(C) Unhealthful (D) Hazardous
17. Which one of the following pollutants or pairs of pollutants is formed in atmosphere due to photochemical reactions ?
(A) CO alone (B) O_3 and PAN
(C) PAN and NH_3 (D) NH_3 and CO

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18. The acoustics of an auditorium is considered to be excellent when its reverberation time is between
- (A) 0.5 and 1.5 S (B) 1.5 and 2 S
(C) 2 and 3 S (D) 3 and 5 S
19. Cavitations in turbines is caused by
- (A) High velocity (B) Low pressure
(C) High pressure (D) High temperature
20. In India which of the following is adopted as standard recording rain gauge ?
- (A) Symons's rain gauge (B) Tipping bucket type
(C) Natural syphon type (D) Weighing bucket type
21. Yield of a given reservoir depends upon
- (A) Catchment area (B) Reservoir evaporation
(C) Reservoir leakage (D) All of the above
22. Discharge per unit of drawdown of a well is called as
- (A) Specific capacity (B) Efficiency
(C) Well loss (D) Yield
23. Isohyets are
- (A) Areas of equal precipitation
(B) Lines of equal precipitation on maps
(C) Lines of equal temperature on map
(D) Lines of equal barometric pressure on maps

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24. Which of the following is a producer in an ecosystem ?
(A) Animals (B) Human beings
(C) Fish (D) Plants and some bacteria
25. The pyramid, which represents the total dry weight and other suitable measures of the total amount of living matter is
(A) Pyramid of numbers (B) Pyramid of biomass
(C) Pyramid of energy (D) None of the above
26. The primary constituent of living matter which move through a gaseous cycle is
(A) Hydrogen (B) Carbon
(C) Nitrogen (D) All of the above
27. The major goals of Environmental Impact Analysis are
(A) Resource conservation (B) Waste minimization
(C) Recycle and reuse (D) All of the above
28. The analytical functions associated with environmental impact assessment include
(A) Defining scope of EIA (B) Prediction
(C) Impact evaluation and analysis (D) All of the above
29. For environmental impact prediction the model used for Water environment is
(A) Stream I & II (B) ISCST
(C) Caline (D) None of the above
30. The scattering of particles or contaminants by the combined effects of shear and transverse diffusion is
(A) Dispersion (B) Advection
(C) Thermal Diffusion (D) None of the above

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31. The sources of groundwater and soil contamination are
(A) Infiltration from ponds & lagoons (B) Nuclear wastes
(C) Industrial chemical spills (D) All of the above
32. The movement of a solvent through a membrane that is impermeable to a solute is
(A) Osmosis (B) Adsorption
(C) Dialysis (D) None of the above
33. The mathematical equation which describes the dissolved oxygen variation in river is known as
(A) Michaelis-Menton Enzyme equation
(B) Vollenweider equation
(C) Monods equation
(D) Streeter-Phelps equation
34. From biological viewpoint a lake has layers of
(A) Compensation level (B) Euphotic zone
(C) Profoundal zone (D) All of the above
35. Sanitary land filling is an engineered burial of
(A) Soil (B) Wastewater
(C) Refuse (D) None of the above
36. In stationary container system the containers are emptied at
(A) Transfer station (B) Destination point
(C) Collection point (D) None of the above

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37. Recovery of solid waste components for possible use as raw materials is called
 (A) Processing (B) Salvaging
 (C) Screening (D) Shredding
38. A waste is said to be hazardous if it possesses
 (A) Corrosivity (B) Ignitability
 (C) Reactivity (D) All of the above
39. The combustible and non-combustible portion of solid waste excluding food waste is
 (A) Trash (B) Garbage
 (C) Rubbish (D) None of the above
40. If the container is hauled from the collection point to the final point of disposal or processing facility is
 (A) Stationary container system (B) Hauled container system
 (C) Curb or alley method (D) None of the above
41. The chemical characterization of solid waste includes
 (A) Proximate and Ultimate analysis (B) Density
 (C) Moisture Content (D) None of the above
42. Landfill gases are composed of
 (A) Methane (B) Nitrogen
 (C) Hydrogen sulfide (D) All of the above
43. Compaction ratio indicating densities of solid waste is given by
 (A) $r = \rho_d / \rho_c$ (B) $r = (\rho_c / \rho_d) \times 100$
 (C) $r = \rho_c / \rho_d$ (D) $r = (\rho_d / \rho_c) \times 100$

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44. The redox potential of a system is indicated by
(A) E_p (B) pE
(C) RT (D) ΔG°
45. The source of organic compounds derived from
(A) Nature (B) Synthesis
(C) Fermentation (D) All of the above
46. If one hydrogen atom of ammonia is replaced by an alkyl group it is
(A) Primary amines (B) Secondary amines
(C) Tertiary amines (D) None of the above
47. During biochemical reactions the organisms that thrive at 0 to 10 °C are
(A) Psychrophilic (B) Mesophilic
(C) Thermophilic (D) None of the above
48. Biochemical Oxygen Demand is an example of
(A) Zero Order Reaction (B) First Order Reaction
(C) Second Order Reaction (D) None of the above
49. The nitrate formers in nitrification process are
(A) Nitrobacter (B) Nitrosomonas
(C) Denitrifiers (D) None of the above
50. The total amount of dissolved salts present in water can be easily estimated by measuring the
(A) Specific conductivity (B) Turbidity
(C) Total solids (D) None of the above

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PART - 2

Each question carries two marks.

(25 × 2 = 50)

51. The total hardness of a water sample is 500 mg/L as CaCO_3 ; if the total alkalinity of the same sample is 270 mg/L as CaCO_3 , the temporary hardness of the water is
- (A) 500 mg/L as CaCO_3 (B) 270 mg/L as CaCO_3
(C) 230 mg/L as CaCO_3 (D) None of the above
52. If 5 m³ of certain oil weighs 4000 kg, then what is its specific weight ?
- (A) 800 (B) 0.8
(C) 20000 (D) None of the above
53. The food-to-microorganism ratio in activated sludge process is defined as
- (A) $F/M = S_0 / \theta X$ (B) $F/M = \theta S_0 / X$
(C) $F/M = S_0 / X$ (D) $F/M = \theta / X S_0$
54. Gases which are generally evolved during anaerobic decomposition of sewage are
- (A) $\text{CO}_2 + \text{NH}_3 + \text{H}_2\text{S}$ (B) $\text{CO}_2 + \text{NH}_3 + \text{H}_2\text{S} + \text{CH}_4$
(C) $\text{CO}_2 + \text{NH}_3 + \text{SO}_2$ (D) $\text{CO}_2 + \text{NH}_3 + \text{SO}_2 + \text{CH}_4$
55. pH = 3 when compared to pH = 5 will be more acidic by
- (A) 2 times (B) 20 times
(C) 100 times (D) none of these

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56. Total volatile suspended solids to be aerobically digested/ (Kg/day VSS) shall be
 (A) 133 (B) 166
 (C) 233 (D) 245
57. A water treatment work treats 6000 m^3 of water per day. If it consumes 20 kg Chlorine per day, then Chlorine dosage would be
 (A) 2.33 mg/L (B) 5 mg/L
 (C) 4 mg/L (D) 3.33 mg/L
58. The population of town in three consecutive years is 5000, 7000 and 8400 respectively. The population of the town in the fourth consecutive year according to geometrical increase method is
 (A) 9500 (B) 9800
 (C) 10100 (D) 10920
59. At 25°C what will be deoxygenation coefficient for a curve, if at 20°C the deoxygenation coefficient is 0.1 ?
 (A) 0.326 (B) 0.258
 (C) 0.1 (D) 0.126
60. The BOD_5 of a waste has been measured as 600 mg/L. If $K_d (20^\circ) = 0.1\text{d}^{-1}$ then BOD after 20 days will be
 (A) 868.72 mg/L (B) 877.5 mg/L
 (C) 910 mg/L (D) 930 mg/L

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61. Which of following pairs is NOT correctly matched ?

Type of filter	Rate of filtration
(A) Slow sand filter	100 to 200 $\text{l/m}^2/\text{h}$
(B) Rapid sand filter	3000 to 6000 $\text{l/m}^2/\text{h}$
(C) Double media filter	25000 to 30000 $\text{l/m}^2/\text{h}$
(D) Pressure filter	6000 to 15000 $\text{l/m}^2/\text{h}$

62. Looping occurs when

- (A) Vertical temperature gradient is super adiabatic and air is turbulent
- (B) Vertical temperature gradient is super adiabatic but less than turbulent
- (C) Temperature gradient is positive
- (D) All of the above.

63. The percentage of nitrogen in the atmosphere is

- (A) 70.91
- (B) 20.91
- (C) 4.03
- (D) 50.00

64. Permissible standards of air quality fixed in India for residential areas for SPM, SO_2 , NO and CO in $\mu\text{g/m}^3$ respectively are

- (A) 500, 120, 5000, 6000
- (B) 200, 80, 80, 2000
- (C) 100, 30, 30, 1000
- (D) 160, 80, 100, 1000

65. Two sources generate noise levels of 90 db and 94 db respectively. The cumulative effect of those two noise levels on human ear is

- (A) 184 db
- (B) 95.5 db
- (C) 94 db
- (D) 92 db

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66. The height of chimney required for effective disposal of 27 kg/hour of SO_2 emission is
 (A) 42 mt (B) 30 mt
 (C) 22 mt (D) 81 mt
67. A vertical triangular area with vertex downward and attitude 'h' has its base lying on the free surface of a liquid. The centre of pressure below the free surface is at a distance of
 (A) $h/4$ (B) $h/3$
 (C) $h/2$ (D) $2h/3$
68. The relationship between Manning's coefficient 'n' and Chezy's coefficient 'C' is given by
 (A) $C = R^{2/3}/n$ (B) $C = R^{1/6}/n$
 (C) $C = R^{1/3}/n$ (D) $C = R^{1/4}/n$
69. If the pump head is 75 m, discharge is $0.46 \text{ m}^3/\text{s}$ and motor speed is 1440 rpm, at rated condition, the specific speed of the pump is about
 (A) 4 (B) 26
 (C) 38 (D) 90
70. The effluent containing chloride concentration at 4000 mg/L in river is discharged to a stream. The upstream concentration (background) of chloride is 40 mg/L. If the effluent flow is $200 \text{ m}^3/\text{day}$ and stream flow is $2000 \text{ m}^3/\text{day}$, what is the resulting chloride concentration in the mixed stream at confluence point?
 (A) 200 mg/L (B) 260 mg/L
 (C) 400 mg/L (D) 540 mg/L

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71. The ionic strength of a solution is defined as
- (A) $\mu = \frac{1}{2} \sum_i C_i Z_i^2$ (B) $\mu = \frac{1}{2} \sum_i C_i^2 Z_i$
- (C) $\log \gamma = 0.5 Z^2 \frac{1 + \sqrt{\mu}}{\sqrt{\mu}}$ (D) $\log \gamma = 0.5 Z^2 \frac{\sqrt{\mu}}{1 + \sqrt{\mu}}$
72. If K is first order reaction rate constant and K_2 is reaction constant, then critical Dissolved Oxygen deficit in rivers is calculated by
- (A) $D_c = K K_2 (L_o e^{-kt})$ (B) $D_c = K_2/K (L_o e^{-kt})$
- (C) $D_c = K/K_2 (L_o e^{-kt})$ (D) $D_c = K/K_2 (L_o e^{-kx})$
73. Following data pertaining to a sewage sample, initial DO = 10 mg/L, final DO = 2 mg/L, dilution 1%, BOD of the given sample is
- (A) 8 mg/L (B) 10 mg/L
- (C) 80 mg/L (D) 800 mg/L
74. Phosphorus occurring as orthophosphate can be measured quantitatively by
- (A) Volumetric method (B) Gravimetric method
- (C) Colorimetric method (D) All the above
75. Waste stabilization ponds can be
- (A) Aerobic (B) Anaerobic
- (C) Facultative (D) Any of the above

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SEAL

A-1

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