Environmental Engineering Question Bank
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1. List the major pollutant categories (there are four) that are produced by each of the four principal sources of wastewater.

2.Explain the difference between point sources and non-point sources of pollution.

3.Define biochemical oxygen demand (BOD).

4.Define acid rain.

5.Explain why acid rain is of concern.

6.Calculate a new k for a temperature other than 20°C, given a value at T °C.

7. Calculate the BOD rate constant k and ultimate BOD (L_o) from experimental data of BOD versus time.

8. Calculate the critical oxygen deficit DO at the DO sag point (minimum).

9. If the BOD_5 of a waste is 327 mg/L, what sample size (in percent) should be selected to yield an oxygen consumption of 4.8 mg/L?

10. If the BOD_5 of two wastes having K values of 0.0800 d_{-1} and 0.120 d_{-1} is 280.0 mg/L, what would be the ultimate BOD for each?

11. List and define three units of measure used to report air pollution data (that is, ppm, $\mu g/m_2$, and μm).

12. Explain the influence of moisture, temperature, and sunlight on the severity of air pollution effects on materials.

13. List three potential chronic health effects of air pollution.

14. Identify one indoor air pollution source for each of the following pollutants: CH_2O, CO, NO_x, Rn, respirable particulates, and SO_x.

15. Explain the term “greenhouse effect”, its hypothesized cause, and why it is being debated, pro and con.

16. Determine the stability (ability to dissipate pollutants) of the atmosphere from vertical temperature readings.

17. What is the density of oxygen at a temperature of 273.0 K and a pressure of 98.0 kPa?

18. Show that 1 mole of any ideal gas will occupy 22.414 L at standard temperature and pressure (STP). (STP is 273.16 K and 101.325 kPa.)

19. What volume would 1 mole of an ideal gas occupy at 20_C and 101.325 kPa?

20. A sample of air contains 8.583 moles/m_3 of oxygen and 15.93 moles/m_3 of nitrogen at STP. Determine the partial pressures of oxygen and nitrogen in 1.0 m_3 of the air.

21. A 1.000 m^3 volume tank contains a gas mixture of 8.32 moles of oxygen, 16.40 moles of nitrogen, and 16.15 moles of carbon dioxide. What is the partial pressure of each component in the gas mixture at 25.0°C?

22. Calculate the volume occupied by 5.2 kg of carbon dioxide at 152.0 kPa and 315.0 K.

23. Determine the mass of oxygen contained in a 5.0 m^3 volume under a pressure of 568.0 Pa and at a temperature of 263.0 K.

24. A gas mixture at 0°C and 108.26 kPa contains 250 mg/L of H_2S gas. What is the partial pressure exerted by this gas?

25. A 28-L volume of gas at 300.0 K contains 11 g of methane, 1.5 g of nitrogen, and 16 g of carbon dioxide. Determine the partial pressure exerted by each gas.

26. Convert 80 $\mu g/m^3$ of SO_2 to ppm at 25°C and 101.325 kPa pressure.

27. Convert 0.55 ppm of NO_2 to $\mu g/m^3$ at _17.7°C and 100.0 kPa pressure.

28. Determine the atmospheric stability category of the following observations.
a. Clear summer afternoon at 1:00 P.M.; wind speed of 1.6 m/s
b. Overcast summer night at 1:30 A.M.; wind speed of 2.1 m/s
c. Clear winter morning at 9:30 A.M.; wind speed of 6.6 m/s
d. Thinly overcast winter night at 8:00 P.M.; wind speed of 2.4 m/s

29. A factory releases a plume into the atmosphere on an overcast summer afternoon. At what distance downwind will the plume begin mixing downward if an inversion layer exists at a base height of 414 m and the wind speed is 1.8 m/s? The effective stack height is 45 m.

30. At what distance downwind will the plume from a stack begin mixing downward if an inversion layer exists at a base height of 265 m and the wind speed is 4.0 m/s on an overcast summer afternoon? The effective stack height is 85 m.

31. A green coffee bean screening and handling operation emits 0.75 g/m^3 of fine particulate matter. A reverse-air baghouse is being proposed for controlling the particulate emissions. The gas handling system has an exhaust flow rate of 3.3 m^3/s. A manufacturer has supplied the following data:
Bag diameter =20 cm
Bag length = 12 m
Air-to-cloth ratio = 0.010
Bag cleaning = 0.5

Estimate the number of bags required and the mass of particulate matter collected each day if the efficiency is 99 percent. Assume 24-hour operation.

32. Determine the collection efficiency of an electrostatic precipitator (ESP) tube that is 0.300 m in diameter and 2.00 m in length for particles that are 1.00 μm in diameter. The flow rate is 0.150 m^3/s, the collection field intensity is 100,000 V/m, the particle charge is 0.300 femtocoulombs (fC), and the gas temperature is 25°C.

33. Under which of the following conditions would you expect the strongest inversion (largest positive lapse rate) to form?

a. Foggy day in the fall after the leaves have fallen
b. Clear winter night with fresh snow on the ground
c. Clear summer morning just before sunrise
Explain why.

34. Photochemical oxidants are not directly attributable to either people or natural sources. Why, then, are automobiles singled out as the major cause of the formation of ozone?

35. Define frequency, based on a sketch of a harmonic wave you have drawn, and state its units of measure (namely, hertz, Hz).

36. State the basic unit of measure used in measuring sound energy (namely, the decibel) and explain why it is used.

37. Explain why a weighting network is used in a sound level meter.

38. Differentiate between a mid/high-frequency noise source and a low-frequency noise source on the basis of A, B, and C scale readings.

39. Explain the purpose of octave band analysis.

40. Differentiate between continuous, intermittent, and impulsive noise.

41. Sketch the curves and label the axes of the two typical types of impulsive noise.

42. Define “phon.”

43. Explain the mechanism by which hearing damage occurs.

44. Explain what hearing threshold level (HTL) is.

45. Define presbycusis and explain why it occurs.

46. Distinguish between temporary threshold shift (TTS), permanent threshold shift (PTS), and acoustic trauma with respect to cause of hearing loss, duration of exposure, and potential for recovery.

47. Explain why impulsive noise is more dangerous than steady state noise

48. Explain the relationship between the allowable duration of noise exposure and the allowable level for hearing protection, that is, damage-risk criteria.

49. List five effects of noise other than hearing damage.

50. List the three basic elements that might require alteration or modification to solve a noise problem.

51. Describe two techniques to protect the receiver when design and/or redress are not practical, that is, when all else fails.

52. Calculate the resultant sound pressure level from a combination of two or more sound pressure levels.

53. Determine the A-, B-, and C-weighted sound levels from octave band readings.

54. Compute the mean sound level from a series of sound level readings.

55. Determine whether or not a noise level will be acceptable given a series of measurements and the criteria listed in Tables 8-3, 8-5, 8-6, 8-7.

56. Calculate the sound level at a receptor site after transmission through the atmosphere.

57. A building located near a road is 6.92 m high. How high is the building in terms of wavelengths of a 50.0-Hz sound? Assume that the speed of sound is 346.12 m/s.

58. Determine the sum of the following sound levels (all in dB): 68, 82, 76, 68, 74, and 81.

59. A law enforcement officer has taken the following readings with her sound level meter. Is the noise source a predominantly low- or middle-frequency emitter? Readings: 80 dBA, 84 dBB, and 90 dBC.

60. The following readings have been made outside the open stage door of the opera house: 109 dBA, 110 dBB, and 111 dBC. Is the singer a bass or a soprano? Explain how you arrived at your answer.

61. Compute the average sound pressure level of the following readings by simple arithmetic averaging and by logarithmic averaging (all readings in dB): 42, 50, 65, 71, and 47. Does arithmetic averaging underestimate or overestimate the sound pressure level?

62. Repeat Previous problem for the following data (all in dB): 76, 59, 35, 69, and 72.

63. Is the following statement true or false? If it is false, correct it in a nontrivial manner.
“A sonic boom occurs when an aircraft breaks the sound barrier.”

64. Is the following statement true or false? If it is false, correct it in a nontrivial manner.
“Excessive continuous noise causes hearing damage by breaking the stapes.”

65. Differentiate between garbage, rubbish, refuse, and trash, based on their composition and source.

66. Compare the advantages and disadvantages of public and private solid waste collection systems.

67. List the three pickup methods (backyard, set-out/set-back, and curbside) and explain the advantages and disadvantages of each.

68. List the components of a time study for a waste collection system.

69. Compare the advantages and disadvantages of the four methods of collection truck routing.

70. Explain the four methods of integrating several crews.

71. Explain what a transfer station is and what purpose it serves.

72. List and discuss the factors pertinent to the selection of a landfill site.

74. Describe the two methods of constructing a MSW landfill.

75. Explain the purpose of daily cover in a MSW landfill and state the minimum desirable depth of daily cover

76. Define leachate and explain why it occurs.

77. Sketch a MSW landfill that includes proper cover and a leachate collection System.

78. Explain the relationship between oxygen, time, temperature, and turbulence in establishing efficient combustion reactions.

79. Explain the effect of source-separation on the heating value of solid waste and on the potential for hazardous air pollution emissions.

80. Determine the volume and mass of solid waste from various establishments.