6. Examination Questions

1. Which test best measures the efficiency of a trickling filter? *Basic*

a. Total solids.
b. pH.
c. BOD.
d. Temperature.
e. Sludge age.

2. Which of the following tests would not be run routinely on a trickling filter plant effluent? *Basic*

a. Settleable solids.
b. Chlorine residual.
c. DO.
d. Sludge index.

3. The application of a stale septic wastewater to a trickling filter *Basic*

a. Causes the filter stone to disintegrate because of the acid character of the wastewater.
b. Will destroy all of the filter flies.
c. May be the source of a severe odor nuisance.
d. Increases the efficiency of the filter.

4. The SS content in the filter effluent of a trickling filter is generally _____ the SS in the influent when the filter is sloughing. *Basic*

a. Greater than
b. The same as
c. Less than

5. A trickling filter or activated sludge process causes nitrification, which is *Advanced*

a. Conversion of nitrogen to nitrate.
b. Conversion of nitrogen to ammonia.
c. Conversion of nitrate to nitrogen.
d. Conversion of ammonia to nitrate and nitrite nitrogen.

6. The waste from which one of the following industrial processes could be oxidized on a trickling filter along with domestic wastewater? *Advanced*

a. Lime-soda water softening.
b. Acid pickling.
c. Chromium plating.
d. Meat packing.

7. Which one of the following industrial wastes would receive little or no treatment if it were applied to a trickling filter at reasonable rates? *Advanced*

a. Milk.
b. Packing.
c. Canning.
d. Metal plating.

8. Which treatment unit would be affected most by the presence of dissolved dairy wastes? *Advanced*

a. Grit removal.
b. Comminutor.
c. Raw sludge pumps.
d. Trickling filters.
e. Secondary digester.

9. The purpose of recirculation in a trickling filter is *Basic*

a. To increase influent BOD concentration.
b. To increase the removal efficiency of settleable solids.
c. To prevent theis leakage of mercury from the bearing seal.
d. To increase the time of contact of the BOD substance with microorganisms.
e. To prevent the growth of bacteria and protozoa.

10. A recirculation ratio of 1:1 means *Basic*

a. 1-mg/l dilution in the BOD test.
b. The total flow received by the filter is twice that of the incoming raw wastewater flow.
c. The total flow received by the filter is 2 mgd.

11. Recirculation is provided to the influent of the trickling filter from the secondary clarifier to provide primarily for *Basic*

a. Increased sludge removal.
b. Uniform filter loading.
c. An alkaline pH.
d. Less flow through the chlorine contact chamber.
e. All of the above.

12. In operating a trickling filter, the operator should *Basic*

a. Use the highest recirculation ratio to keep filter fly larvae from being washed out.
b. Use the lowest recirculation rates that will yield good results in order to conserve power.
c. Rotate the distributor as fast as possible in order to spray settled wastewater over the media better.
d. Maintain ponding conditions in the future.
e. All of these.

13. A trickling filter plant receives a raw wastewater flow of 2 mgd. A recirculation rate of 1:1 was reported. This means that the rates of flow being applied to the filter were *Basic*

a. 4 mgd.
b. 1 mgd.
c. 3 mgd.
d. 2 mgd.
e. 6 mgd.

14. High-rate trickling filters may return recirculated flow to *Advanced*

a. The influent of the primary settling unit from the final settling unit.
b. The influent of the trickling filter from the effluent of the trickling filter.
c. The influent of the trickling filter from the final settling unit.
d. All of the above.

15. Stage filtration normally refers to *Advanced*

a. Two or more filters operated in series.
b. Two or more filters operated in parallel.
c. The mechanism whereby wastewater is treated with a trickling filter.
d. Operation of one-half of a trickling filter plant.

16. In a 2-stage filter plant with two identical trickling filters, the amount of BOD removal in the first-stage filter will be *Advanced*

a. Less than the BOD removal in the second-stage filter.
b. Equal to the BOD removal in the second-stage filter.
c. More than the BOD removal in the second-stage filter.

17. If a strong wastewater that has passed through a trickling filter at higher than conventional loadings is pumped back and passed through it a second time *Advanced*

a. No good is accomplished.
b. There is no need for a final settling tank.
c. The efficiency of the plant is increased considerably in most cases.
d. The primary treatment units may be eliminated.

18. How would increasing recirculation rates affect the DO content of trickling filter effluent? *Advanced*

a. Decrease it.
b. Increase it.
c. It would remain the same.
d. It would become supersaturated.

19. One of the methods to determine if the distribution of wastewater over a trickling filter is even is *Basic*

a. To check the velocity of the wastewater flow in the distributor arm.
b. To place litmus paper at several points along the outer rim of a filter.
c. To place pans of the same size in the media at several points along the radius of a filter.
d. To place pans of the same size in the media at several points along the perimeter of a filter.
e. Measure the spacing of the orifice along the distributor arms.

20. If the effluent of a trickling filter contains no DO, it is likely that *Basic*

a. The filter is working at maximum efficiency.
c. Filter fly larvae are overabundant.
erating correctly.
c. Filter fly larvae are overabundant.
d. None of the above.

21. A problem associated with trickling filters is *Basic*

a. Bulking.
b. Protozoa.
c. Ponding.
d. Liquefaction.
e. Snails.

22. Sloughing from a trickling filter refers to *Basic*

a. A process whereby wastewater is recirculated over the filter.
b. Bypassing of the filter.
c. The breaking of the filter stone as a result of weathering and the sluicing of small stone particles to the final settling tank.
d. The periodic discharge of large quantities of slime growth with the filter effluent.

23. When there is considerable plugging of the orifices of trickling filter arms, one possible solution is to install _____ ahead of the trickling filters. *Basic*

a. A coarse screen.
b. An air diffuser.
c. An air lift pump.
d. A mercury trap.
e. A felt oil seal.

24. It is necessary to keep the distribution equipment on a trickling filter clean and in good repair in order to *Basic*

a. Avoid an overload on the secondary settling tank.
b. Assure good ventilation through the filter.
c. Avoid plugging of the underdrains.
d. Assure uniform distribution of the wastewater.

25. What are sloughings? *Basic*

a. Troughs.
b. Slop.
c. Material washed off trickling filter media.
d. Waste-activated sludge.
e. Grit.

26. Filter flies that grow profusely on some trickling filters are objectionable because *Basic*

a. They consume much of the growth on the filter stone and therefore reduce the efficiency of the filter.
b. They have been shown to transmit disease.
c. They may be present in such large numbers as to be a nuisance to the operator and nearby residents.
d. They cause a foul odor.

27. The flooding of the stone of trickling filters is occasionally recommended to *Basic*

a. Act as storage during peak flows or plant breakdown.
b. Control the filter flies.
c. Hold the wastewater in contact with the stone for a longer period of time to improve the efficiency of removal.

28. Ponding of a trickling filter means *Basic*

a. Flooding the filter.
b. Hosing the growth from the rocks with a high pressure hose.
c. Caking over the rock in areas that will not permit the water to flow through.
d. Running the trickling filter effluent to a wastewater pond.

29. Trickling filters are *Basic*

a. Easily upset by shock loads but not affected by temperature.
b. Easily upset by shock loads and temperature.
c. Not easily upset by shock loads or affected by temperature.
d. Not easily upset by shock loads but affected by temperature.

30. To correct an odor problem in a trickling filter, the operator should *Basic*

a. Increase the BOD loading.
b. Shut off flow to the filter.
c. Try to maintain anaerobic conditions.
d. Check ventilation in the filter.
e. Decrease the recirculation rate.

31. When ponding occurs with a trickling filter, either of two of the following choices might be made (Check two): *Advanced*

a. Replace the media.
b. Break the media into smaller pieces.
c. Let nature take care of it.
d. Apply chlorine to kill some growth.
e. Rest the filter and let it dry.
f. Apply an insecticide solution.

32. If water is found in the oil chamber of a trickling filter bearing, check the *Advanced*

a. Filter underdrain.
b. Distributor orifice.
c. Bearing races.
d. Adjustable ring.
e. Mercury seal.

33. Mercury used in the bearing seal of the distributor (trickling) filter is *Advanced*

a. Grease-like material.
b. Heavier than water.
c. Lighter than water.
d. Harmless.
e. None of the above.

34. During freezing weather, a trickling filter *Advanced*

a. Should always be bypassed.
b. Should be covered to prevent the formation of ice on the rock.
c. Should be operated as usual as long as the formation of the ice does not interfere with the distribution system.
d. Is of no value in treating wastewater, even though the distribution of wastewater continues to be good.

35. Unloading of the trickling filter means *Advanced*

a. That the medium is slowly being disintegrated and washed off into the final tank.
b. That solid matter has sloughed off the filter material.
c. That the filter is operating poorly and should be checked.
d. All of the above.
e. None of the above.

36. Maintenance of a distributor of a trickling filter does not include *Advanced*

a. Cleaning the filter media.
b. Cleaning the orifices in the distributor arms.
c. Changing the mercury if the distributor arm does not rotate smoothly.
d. Adjusting turnbuckles occasionally on the guy rods to keep rotating arms at proper level.
e. Greasing gears that rotate the distributor.

37. Successful trickling filter operation depends on *Advanced*

a. Maintenance of a chlorine residual in the effluent.
b. Maintenance of the highest possible recirculation rates.
c. Maintenance of clean grounds.
d. Maintenance of a good growth of organisms on the filter media.
e. All of these.

38. The prinicipal function of slimes that accumulate on trickling filter media is to *Advanced*

a. Reduce the rate of flow through the filter.
b. Prevent disintegration of filter media.
c. Accumulate and oxidize organic matter in wastewater.
d. Filter out SS.

39. Chlorine may be used to control the filter fly in trickling filters. What chlorine residual is recommended for filter fly control? *Advanced*

a. 200 to 300 ppm.
b. 1 to 2 ppm.
c. 0.1 to 0.3 ppm.
d. 500 to 600 ppm.
e. 0.02 to 0.04 ppm.

40. Psychoda are *Advanced*

a. Organisms that cause sludge bulking.
b. Small flies often found on trickling filters.
c. A type of small red worm frequently found in deposits of sludge.
d. Nitrifying bacteria found in sand filters.

41. In the winter the temperature of the wastewater applied to a trickling filter is lower than it is in the summer. This may cause *Advanced*

a. No change in the efficiency of the filter.
b. An increase in the amount of BOD removed from the applied wastewater.
c. A decrease in the amount of BOD removed from the applied wastewater.
d. A severe ponding condition.

42. A trickling filter reduces the strength of wastewater applied to it by *Basic*

a. The aeration received over the rocks, which causes the wastewater impurities to settle in the final settling tank.
b. The absorption and adsorption of the impurities by the bacterial slimes growing on the rock.
c. The mechanical action of the wastewater carrying solids over the rock.
d. The filtering action of the stones.

43. The purpose of a trickling filter is to *Basic*

a. Filter or strain out bacteria through sand particles.
b. Remove large bits of SS.
c. Remove settleable solids.
d. Oxidize organic material.
e. None of these.

ANSWER KEY

SECTION 6 - Trickling Filters

1. c
2. d
3. c
4. a
5. d
6. d
7. d
8. d
9. d
10. b
11. b
12. b
13. a
14. d
15. a
16. c
17. c
18. b
19. c
20. d
21. c
22. d
23. a
24. d
25. c
26. c
27. b
28. c
29. d
30. d
31. d & e
32. e
33. b
34. c
35. b
36. a, c & e
37. d
38. c
39. b
40. b
41. c
42. b
43. d