Objective Test

Chapter 1. The Treatment Plant Operator

Please check the accuracy of your student contact information and mark the correct answers on the answer sheet provided in your enrollment packet. There may be more than one correct answer to each multiple-choice question. This test for Chapter 1 contains 20 questions.

True-False

1. As an operator, you are responsible to your employer for maintaining an economical and efficient operating facility.
   1. True
   2. False
2. An operator has an obligation to the great numbers of people who rely on downstream water supplies and are to-tally dependent on the operator’s competence and trustworthiness for their welfare.
   1. True
   2. False
3. Today, the natural purification processes in rivers treat all the waste loads and keep rivers clean.
   1. True
   2. False
4. Operators are water quality protectors on the front line of the water pollution battle.
   1. True
   2. False
5. The main benefit of a successful wastewater treatment program is the protection of public health.
   1. True
   2. False
6. Without adequate, reliable records of every phase of operation, the effectiveness of your operation has not been documented (recorded).
   1. True
   2. False
7. Your Records showing a high-quality effluent will mean nothing to citizens visiting your plant unless your plant appears clean and well maintained and the effluent looks good.
   1. True
   2. False
8. Safety is never an operator responsibility.
   1. True
   2. False
9. Chief operators frequently have the responsibility of training new operators and must encourage all operators to work safely.
   1. True
   2. False
10. The wastewater treatment field is changing rapidly and operators, maintenance personnel, foremen, managers, instrumentation experts, and laboratory technicians are sorely needed.
    1. True
    2. False

Best Answer (Select only the closet or best answer.)

1. What is a treatment plant operator?
   1. The contact for media and regulatory agencies
   2. The final and essential link in maintaining and protecting the aquatic environment upon which all life depends
   3. The operator who coordinates the efforts of designers and builders
   4. The person responsible for keeping expenditures within budget
2. Why are wastewater treatment plants built?
   1. To divert polluted water from a community
   2. To occupy space alongside rivers
   3. To provide opportunities for designers to display their skills
   4. To purify soiled water and prevent water pollution
3. How should wastewater treatment plant operators consider their job?
   1. As a colleague of other wastewater plant employees
   2. As a regularly paid wastewater plant employee
   3. As a secure position with the plant
   4. As a water quality protector on the front line of the water pollution control battle
4. What is the primary objective of an operator operating a wastewater treatment plant?
   1. To achieve the highest level of certification possible
   2. To convince the public that the operators deserve top pay
   3. To keep the sewer-user charges as low as possible
   4. To protect the receiving water quality by continuous and efficient plant performance
5. How can a well-guided tour for other operators help an operator?
   1. May allow the other operators to suggest helpful solutions to operational problems
   2. May convince the other operators to suggest better employment opportunities
   3. May develop long-lasting friendships
   4. May reveal good fishing opportunities

Mutiple Choice (Select all correct answers.)

1. What type of employers might a wastewater treatment plant operator work for?
   1. A city, sanitation district, or other public agency
   2. A company that transports collected samples to a laboratory for analysis
   3. A large industry that operates its own treatment plant
   4. A private contractor retained to operate and maintain a municipal or industrial treatment plant
   5. An agency that collects delinquent sewer-user service charges
2. Why do wastewater treatment plant operators need continuous training? Due to
   1. Advanced or improved equipment
   2. Increasing budgets
   3. Increasing instrumentation
   4. More facility tours
   5. New treatment techniques
3. Why should an operator be present or at least available during the construction period of a new plant?
   1. To become familiar with the entire plant, including the equipment and machinery and their operation.
   2. To discuss with the engineer how the treatment plant should best be run
   3. To ensure that the contractor stays within the budget
   4. To observe how the contractor’s employees, perform their tasks
   5. To relate the plant drawings to actual facilities
4. Operators are in the field of public relations and must be able to explain the purpose and operation of their plant to which groups?
   1. City council or directors of the plant
   2. Civic organizations
   3. Officials of regulatory agencies
   4. Representatives of news media
   5. School classes
5. Which factors are contributing to the increasing need for trained wastewater treatment plant operators?
   1. More sophisticated treatment
   2. Operator certification regulations
   3. Population growth
   4. Regulatory Requirements
   5. Retirement of many current operators

Objective Test

Chapter 2. Why Treat Wastes?

Please check the accuracy of your student contact information and mark the correct answers on the answer sheet provided in your enrollment packet. There may be more than one correct answer to each multiple-choice question. This test for Chapter 2 contains 25 questions.

True-False

1. All organic materials have one thing in common—they all contain basic minerals
   1. True
   2. False
2. Most living creatures need oxygen to survive, including fish and other aquatic life.
   1. True
   2. False
3. Initial efforts to control human wastes evolved from the need to prevent the spread of diseases.
   1. True
   2. False
4. The bacteria that grow in the intestinal tract of diseased humans find the environment in the wastewater treatment plant or receiving waters favorable for their growth and reproduction.
   1. True
   2. False
5. One of the primary functions of a treatment plant is the removal of solids from wastewater.
   1. True
   2. False
6. Operators try to kill or inactive pathogenic organisms by disinfection.
   1. True
   2. False
7. The weight of no settleable solids may be calculated by subtracting the weight of dissolved and total solids from the weight of settleable solids.
   1. True
   2. False
8. The organic portion of the total solids can be very harmful to receiving waters.
   1. True
   2. False
9. Operators should use a standard method for the measurement and evaluation of floatable solids.
   1. True
   2. False
10. Nutrient cycles are very complex and involve chemical changes in living organisms.
    1. True
    2. False

Best Answer (Select only the closet or best answer.)

1. What is the definition of pollution?
   1. Any discharge of waste to a body of water
   2. Any interference with the beneficial reuse of water
   3. Any substance that is toxic or hazardous
   4. Anything that is odorous or unsightly
2. What is an organic waste?
   1. Waste material such as sand, salt, iron, or calcium
   2. Waste material that may come from animal or plant sources
   3. Wastes that could come from hospitals, research laboratories, and nuclear power plants
   4. Wastewaters that may come from cooling processes used by industry
3. What is an inorganic waste?
   1. Waste material such as sand, salt, iron, or calcium
   2. Waste material that may come from animal or plant sources
   3. Wastes that could come from hospitals, research laboratories, and nuclear power plants
   4. Wastewaters that may come from cooling processes used by industry
4. What happens to fish in receiving waters when bacteria use the entire supply of oxygen from the stream faster than it can be replenished by natural diffusion from the atmosphere?
   1. They become agitated
   2. They die
   3. They feed
   4. They reproduce
5. The stabilization of a waste means which of the following?
   1. To convert the waste to a form that resists change
   2. To flatten the waste
   3. To remove all food for bacteria
   4. To shrink the waste
6. Many serious outbreaks of communicable diseases have been traced to which problem?
   1. Direct contamination of drinking water or food supplies by the body wastes from a human disease carrier
   2. Lack of personal hygiene in public schools
   3. Leachate from sanitary landfills and municipal garbage dumps
   4. Poor sanitation in fast-food restaurants
7. What is an operator’s best defense against infections and diseases?
   1. Good personal hygiene
   2. Personal protective equipment
   3. Regular physical examinations
   4. Use of detergents
8. What is the objective to treated wastewaters containing nutrients?
   1. Nutrients act as fertilizer in crop irrigation water
   2. Nutrients can encourage excess algae and plant growth in receiving waters
   3. Nutrients create extreme pH levels
   4. Nutrients produce tastes and odors in drinking water
9. Why are floatable solids undesirable in the plant effluent?
   1. Color of floatables presents a colorful appearance
   2. Floatables tend to cause tastes in fish
   3. Odors produced by floatables smell like rotten eggs
   4. The sight of floatables in receiving waters indicates the presence of inadequately treated wastewater
10. Why are ammonia and hydrogen sulfide undesirable in receiving waters?
    1. They are difficult gases to capture and contain
    2. They are indicative of poor maintenance
    3. They are odorous gases
    4. They represent the loss of a valuable resource

Multiple Choice (Select all correct answers.)

1. Substantial amounts of organic industrial waste come from which industries?
   1. Dairy processing
   2. Meat packing
   3. Mining
   4. Tanning
   5. Vegetable and fruit packing
2. Waste discharges may contain what types of toxic substances?
   1. Chlorine residual
   2. Cyanide
   3. Hardness
   4. Heavy metals
   5. Taste- and odor-producing substances
3. Which substances are objectionable in treated wastewater discharges?
   1. Color-producing substances
   2. Highly acid or alkaline (basic) substances
   3. Pathogenic organisms
   4. Taste- and odor-producing substances
   5. Toxic substances
4. Whether any problems are caused by the discharge of treated wastewater in the receiving waters depends on which factors?
   1. Amount of flow in the receiving stream or volume of receiving lake that can be used for dilution
   2. Quality of receiving waters
   3. Size of flow from the treatment plant
   4. Type or degree of treatment
   5. Uses of the receiving waters
5. Why do operators need to know how to control nutrient cycles?
   1. To conserve water
   2. To control odors
   3. To generate energy efficient systems
   4. To protect receiving waters
   5. To treat wastes

End of Objective Test

Objective

Chapter 3. Wastewater Treatment Facilities

Please check the accuracy of your student contact information and mark the correct answers on the answer sheet provided in your enrollment packet. There may be more than one correct answer to each multiple-choice question. This test for Chapter 3 contains 35 questions.

True-False

1. The length of time required for wastes to reach your plant can affect treatment plant efficiency.
   1. True
   2. False
2. Ponds are frequently constructed in rural areas where there is sufficient available land.
   1. True
   2. False
3. The purpose of flow measuring devices is to treat wastes.
   1. True
   2. False
4. All primary clarifiers, no matter what their shape, must have a means for collecting the settled solids and the floating solids.
   1. True
   2. False
5. Both the trickling filter and the activated sludge treatment processes are anaerobic biological treatment processes.
   1. True
   2. False
6. The activated sludge process is a biological process and it serves the same function as a trickling filter or rotating biological contractor.
   1. True
   2. False
7. Incineration or burial of skimmings from the clarifiers will prevent treatment plant operational problems
   1. True
   2. False
8. Algae in ponds produce oxygen for the other organisms to use.
   1. True
   2. False
9. Both industry and agriculture are discovering that treated effluent may be the most economical source of additional water.
   1. True
   2. False
10. Both aerobic and anerobic sludge digestion processes produce stabilized or digested solids that ultimately must be disposed of in the environment.
    1. True
    2. False

Best Answer (Select only the closet or best answer.)

1. What is a sanitary sewer?
   1. A pipe or conduit (sewer) intended to carry wastewater or water borne wastes from homes, businesses, and industries to the treatment works
   2. A separate pipe, conduit, or open channel (sewer) that carries runoff from storms, surface drainage, and street wash, but does not include domestic and industrial wastes
   3. A sewer designed to carry both sanitary wastewaters and stormwater or surface water runoff
   4. The seepage of groundwater into a sewer system including service connections
2. When are pump stations normally installed?
   1. When low areas of land must be severed or where pipe depth under the ground surface becomes excessive
   2. When sewers need a break to allow for maintenance activities
   3. When the landowners want a structure to blend in with the landscape
   4. When wastewater must be treated before it reaches the treatment plant
3. How can fluctuating flows from a large pump station be reduced?
   1. By controlling flows or discharges to the sewers at the source
   2. By controlling the power input to the pump station
   3. By installing valves in the fluent sewers to the plant
   4. By using variable speed pumps or short pumping cycles
4. What is the purpose of flow measuring devices?
   1. To freshen the wastewater and to help remove oils and greases
   2. To measure and record pathogenic organisms entering the plant
   3. To measure and record solids bypassing the solids removal processes
   4. To measure and record the flow rates and volumes of wastewater treated by the plant
5. What is the purpose of pre-aeration?
   1. To freshen the wastewater and to help remove oils and greases
   2. To measure and record flows
   3. To remove settleable and floatable materials
   4. To remove suspended and dissolved solids
6. Why is treated wastewater disinfected before it is discharged to receiving waters?
   1. To clean up the effluent before discharge
   2. To freshen the wastewater
   3. To prevent the spread of disease
   4. To remove settleable and floatable materials
7. Why are debris and trash usually removed from wastewater by a bar screen?
   1. To bar wastewater from causing odors while being treated
   2. To collect debris and trash for recycling
   3. To protect equipment and reduce any interference with in-plant flow
   4. To reduce maintenance on bar screens
8. Why are most sewer pipes laid at a slope steep enough to maintain a wastewater flow of two feet per second (fps) (0.6 m/sec)?
   1. To ensure straight flow through manholes
   2. To prevent grit from settling in the pipes
   3. To prevent the release of odors and toxic gases
   4. To provide enough cover to avoid breaking the pipe
9. Why should grit be removed early in the plant treatment process?
   1. Because grit accumulates on the surface of clarifiers
   2. Because grit is abrasive and will rapidly wear out pumps and other equipment
   3. Because grit provides food for organisms in biological treatment processes
   4. Because grit sticks to grease and forms grease balls
10. The exact amount of BOD removal in a clarifier depends on which factor?
    1. The amount of BOD contained in the settled material
    2. The amount of floatable grease removed from the clarifier
    3. The procedures used to measure the BOD
    4. The rate at which organisms decompose organic matter
11. What happens when the clear surface water of the primary tanks flows over the effluent weir at a high velocity?
    1. Insufficient food (BOD) flows into the aeration tank
    2. Particles settling to the bottom or those already on the bottom may be picked up and carried from the tank
    3. Re-aeration occurs and reduces the BOD
    4. The tank empties too quickly
12. How is oxygen provided for the organisms living in the biological slime that grows on the RBC media?
    1. The atmosphere surrounding the media
    2. The blowers from the system
    3. The diffusers in the bottom of the tank
    4. The return or recirculated flows
13. What are the two major types of bacteria present in a digester?
    1. Acid formers and gas formers
    2. Aerobic and anerobic
    3. Fecal and E. coli
    4. Methane and sulfide
14. Why must the effluent from plants in some areas be dechlorinated or detoxified before discharge to receiving waters?
    1. To allow the application of precise chlorine doses for perchlorinating
    2. To avoid the release of chlorine odors
    3. To protect aquatic life
    4. To reduce chlorine tastes in the water
15. What is disinfection?
    1. A process designed to kill or inactive pathogenic organisms
    2. The killing of all organisms
    3. The preparation of water for drinking
    4. The preparation of water for use in the laboratory

Multiple Choice (Select all correct answers.)

1. If hydrogen sulfide from the collection system reaches your plant, what impact could this have on the plant?
   1. Additional gas could be available for heating
   2. Concrete in the plant could be damaged
   3. Industrial wastes could be masked
   4. Odor problems could occur
   5. The wastes could be more difficult to treat
2. When wastewater enters a treatment plant, it usually flows through a series of pretreatment or preliminary treatment processes including which processes?
   1. Disinfection
   2. Flow measurement
   3. Grit removal
   4. Screening
   5. Shredding
3. Why must operators know the quantity of wastewater flow into a treatment plant?
   1. To adjust aeration rates
   2. To adjust chlorination rates
   3. To adjust pumping rates
   4. To calculate loadings on treatment processes
   5. To calculate treatment efficiency
4. What are the disadvantages of using a weir to measure wastewater flows entering a plant?
   1. A relatively dead water space occurs just upstream of the weir
   2. As solids accumulate upstream of the weir, the flor reading may become incorrect
   3. Odors and unsightliness can result from an upstream dead space
   4. Organic solids may settle out upstream of the weir
   5. There is very little head loss during flow through the weir
5. Which flow measuring devices are used to measure wastewater flows in pipelines?
   1. Magnetic flowmeters
   2. Orifices
   3. Rotameters
   4. Venturi meters
   5. V-notch weirs
6. Why are digestion tanks mixed continuously?
   1. To allow the formation of supernatant
   2. To avoid the formation of thick scum blankets
   3. To bring the food to the organisms
   4. To provide a uniform temperature
   5. To return supernatant to the headworks
7. Scum blankets in a digester above the supernatant consist of which items?
   1. Grease
   2. Hair
   3. Plastics
   4. Rubber goods
   5. Soap
8. Advanced methods of waste treatment are used to reduce which items from wastewater?
   1. Last traces of organic materials
   2. Nutrient content
   3. Roots, rags, cans, and large debris
   4. Sand and gravel
   5. Settleable and floatable materials
9. Why do regulatory agencies require the disinfection of plant effluent prior to discharge?
   1. To kill or inactive pathogenic organisms
   2. To protect the receiving water that is used for a drinking water supply
   3. To protect the receiving water that is used for hydroelectric power generation
   4. To protect the receiving water that is used for navigation
   5. To protect the receiving water that is used for swimming or wading
10. How can solids removed from wastewater by pretreatment processes by disposed of?
    1. By centrifuging and dewatering
    2. By dewatering and then direct burial in an approved sanitary landfill
    3. By digestion and the returning to the supernatant
    4. By incineration with the remaining ash disposed of in a landfill
    5. By mixing and heating

End of Objective Test

Objective Test

Chapter 4. Racks, Screens, Comminutors, and Grit Removal

Please check the accuracy of your student contact information and mark the correct answers on the answer sheet provided in your enrollment packet. There may be more than one correct answer to each multiple-choice question. This test for Chapter 4 contains 35 questions.

True-False

1. There are many potential safety hazards around a waste-water treatment plant
   1. True
   2. False
2. Always wash your hands thoroughly before eating, smoking, or going home.
   1. True
   2. False
3. Stand on a slippery surface while raking material from a bar screen.
   1. True
   2. False
4. Storms or sewer cleaning operations by maintenance crews may cause a sudden surge of wastewater and debris and a resultant greater head loss through the screens.
   1. True
   2. False
5. The totalizer records the total volume of screenings removed by the plant.
   1. True
   2. False
6. When starting up comminutors and barminutors, always observe the unit to verify that it sounds normal and appears to be operating properly.
   1. True
   2. False
7. When estimating the velocity in a grit channel suing a stick or other float, the average velocity in the channel will be slightly higher than your estimate.
   1. True
   2. False
8. A little organic matter in the grit removed from a git channel usually indicates that proper velocities are being maintained in the channel.
   1. True
   2. False
9. Treat an empty grit washer as a confined space and provide adequate ventilation.
   1. True
   2. False
10. Advance preparation for emergencies can save a lot of extra work and make it possible to keep your plant operating efficiently under favorable conditions.
    1. True
    2. False

Best Answer (Select only the closet or best answer)

1. Which problem is created by treatment plant operating a reduced efficiency?
   1. A decrease in chlorine does requirements
   2. A decrease in operator O & M requirements
   3. An increase in the paperwork required to document the change
   4. An increase in the pollution level of the effluent discharged into receiving waters
2. What is the purpose of screens, racks, comminutors, and grit removal devices?
   1. To biologically degrade or stabilize the wastewater
   2. To control flow through the preliminary treatment processes
   3. To disinfect the wastewater
   4. To remove rocks, large debris, and grit
3. Which injuries can occur from pulling too hard when lifting inlet or outlet gates or pulling heavy, waterlogged debris from the racks?
   1. Back injuries, hernias, and muscle strains
   2. Falling objects striking your head and hands
   3. Heart attacks and strokes
   4. Shortness of breath and heat exhaustion
4. What should the operator do after broken equipment has been repaired and placed in service again?
   1. Conduct a maintenance training program for maintenance staff
   2. Look for other broken equipment
   3. Observe the unit for proper operation
   4. Try to increase the size of maintenance staff
5. The frequency of sharpening the cutting edges on the cutter of a barminutor depends on which factor?
   1. The ability of downstream processes to deal with partially cut-up wastes
   2. The effectiveness of the tools available to sharpen the cutting edges
   3. The number of operators available to sharpen the cutting edges
   4. The type and abrasiveness of the wastewater being treated
6. What is putrescible material?
   1. Material that becomes inorganic after decomposition
   2. Material that will decompose of under aerobic conditions and produce nuisance odors
   3. Material that will decompose under anaerobic conditions and produce nuisance odors
   4. Material that will turn purple during decomposition
7. Why should a grit channel be removed from service during the cleaning operation?
   1. To prevent the breeding of mosquitoes
   2. To prevent the grit from being washed into the downstream treatment processes
   3. To prevent the need to wash the removed grit
   4. To prevent the production of odors
8. Why should grit disposed of by burial be quickly covered with soil?
   1. To prevent neighbors from complaining about the appearance of the burial site
   2. To prevent odors and attracting flies and rats
   3. To prevent precipitation from filling the burial site
   4. To prevent sunlight from drying out the grit
9. Under what conditions should the cyclone liner and screw conveyor of a cyclone grit separator be replaced?
   1. When excessive wear prevents proper adjustments and the equipment of no longer functions as intended
   2. When grit fails to flow out the separator
   3. When the conveyor leaks
   4. When the liner becomes too thin
10. What is detritus?
    1. A solution or liquid whose chemical makeup neutralizes acids and bases without a great change in pH
    2. The capacity of water or wastewater to neutralize acids
    3. The debris that floats on the surface of wastewater
    4. The heavy material present in wastewater such as sand, coffee grounds, eggshells, gravel, and cinders

Multiple Choice (Select all correct answers.)

1. The poor safety record of operators in the past may have been caused by which factors?
   1. Operators not being able to read safety manuals
   2. Operators not being aware of unsafe conditions
   3. Operations not immediately correction unsafe conditions when they become obvious
   4. Operators not knowing safe procedures
   5. Operators not wanting to follow safe procedures
2. Pieces of metal, rocks, and similar items may cause which problems in wastewater treatment plants?
   1. Damage or plug pumps
   2. Jam sludge collector mechanisms in settling tanks
   3. Plug pipes
   4. Require excessive amounts of chlorine for effective disinfection
   5. Toxic to organisms to biological treatment processes
3. Sand, eggshells, and similar materials (grit) may cause which problems in wastewater treatment plants?
   1. Cause excessive wear in pumps
   2. Plug bar screens
   3. Plug pipes
   4. Require excess amounts of chlorine for effective disinfection
   5. Use up valuable space in sludge digesters
4. Which factors may cause the flow diagram or location of processes in your wastewater treatment plant to differ from a typical plant?
   1. Characteristics of the wastewater
   2. Construction, operating, and maintenance costs of various processes
   3. Discharge requirements
   4. Quantity of the wastewater
   5. Seasonal variations in the quantity and characteristics of the wastewater
5. Before starting to rake material from a manually cleaned bar screen, the area should be examined for which types of objects or structures that might interfere with the rake and handle and knock you off balance?
   1. Corners of buildings or diversion structures
   2. Electrical wires
   3. Flooring grates
   4. Guardrails
   5. Light posts or overhead lights
6. Why is the hydrogen sulfide gas produced by septic conditions undesirable?
   1. Can produce a toxic atmosphere
   2. Can produce an explosive atmosphere
   3. Causes corrosion of concrete, metal, and paint
   4. Has a rotten egg odor
   5. Requires the use of bypass channels
7. Which problems could prevent the rake mechanism from moving mechanically cleaned screens?
   1. Compatible sources of energy
   2. Equipment broken
   3. Excessive lubrication of moving parts
   4. Low influent flows
   5. Rake mechanism jammed
8. Sudden high flows or heavy amounts of debris entering a wastewater treatment plant could be caused by which factors?
   1. Industrial dumps
   2. Sewer line maintenance
   3. Storm flows
   4. Supernatant discharges
   5. Waste activated sludge
9. How can desired velocities in grit channels be achieved?
   1. By adjusting the weirs
   2. By controlling the ON/OFF cycles of the influent pumps
   3. By maintaining the proper number of grit channels in service
   4. By regulating flows entering the collection system
   5. By removing solids floating on the surface of the influent wet well
10. Abnormal operating conditions can develop in grit channels under which conditions?
    1. During abnormal operator work hours
    2. During peak canning seasons
    3. During period industrial dumps
    4. During periods of heavy snow melt
    5. During rainstorms
11. Maintenance of a grit washing facility includes which tasks?
    1. Examining moving parts for war
    2. Inspecting the entire facility for corrosion damage
    3. Oiling and greasing the equipment in accordance with the plant O & M manual and the manufacturer’s instructions
    4. Painting any parts that could corrode
    5. Repairing or replacing any worn or corroded parts
12. Which items should an operator consider when reviewing the plans and specifications for the racks and screens facilities of a wastewater treatment plant?
    1. Is there a enough standby units?
    2. Is there room for a rake when removing screenings?
    3. Is there some place to drain and storage screenings?
    4. Do the plans and specifications adhere to the Operation and Maintenance (O & M) requirements of the facilities?
    5. Where is the disposal site for screenings?
13. What items should an operator consider when reviewing the plans and specifications for the grit removal facilities of a wastewater treatment plant?
    1. Are there grit dewatering capabilities?
    2. Are there grit storage facilities and are they adequate?
    3. Are there guardrails around grit chambers or grit channels?
    4. Can the grit hoppers be flushed easily?
    5. How easily can the units be cleaned?

Math (Select the closet answer).

1. A wastewater treatment plant has an average daily flow of 0.9 MGD. An average of 2.4 cubic feet of grit are removed each day. How many cubic feet of grit are removed per million gallons of flow? Select the closet answer.
   1. 2.0 cu ft/MG
   2. 2.7 cu ft/MG
   3. 3.0 cu ft/MG
   4. 3.5 cu ft/MG
   5. 4.0 cu ft/MG
2. A stick travels 45 feet in 22 seconds in a grit channel. What is the flow velocity in the grit channel? Select the closet answer.
   1. 1.5 ft/sec
   2. 1.6 ft/sec
   3. 1.8 ft/sec
   4. 1.9 ft/sec
   5. 2.0 ft/sec

End Of Objective Test

Objective Test

Chapter 5. Sedimentation and Flotation

Please check the accuracy of your student contact information and mark the correct answers on the answer sheet provided in your enrollment packet. There may be more than one correct answer to each multiple-choice question. This test for Chapter 5 contains 51 questions.

True-False

1. Settling tanks increase the wastewater velocity far above the velocity in a collection sewer.
   1. True
   2. False
2. Pumping skimmed solids to a digester is considered good practice.
   1. True
   2. False
3. Annually, during periods of low flow, each clarifier should be shut down for inspection, routine maintenance, and any necessary repairs.
   1. True
   2. False
4. There is a great deal an operator can do in terms of clarifier operation to improve or maintain clarifier performance under toxic conditions.
   1. True
   2. False
5. The operator’s main concern must be the quality of the plant effluent, regardless of percent of wastes removed.
   1. True
   2. False
6. The accumulated sludge on the floor of a clarifier should be removed frequently.
   1. True
   2. False
7. As thick a sludge as possible should be pumped from the clarifier sump with the least amount of water.
   1. True
   2. False
8. As water temperature increase, the settling rate of particles decreases.
   1. True
   2. False
9. As wastewater enters a settling tank, it should be evenly dispersed across the entire section of the tank and should flow at the same velocity in all areas toward the discharge end.
   1. True
   2. False
10. Actual detention time for a clarifier is often greater than the detention time calculated using the formula.
    1. True
    2. False
11. Trickling filter sloughing's are generally quite low in BOD.
    1. True
    2. False
12. Secondary clarifier tasks, which follow the activated sludge process, are designed to handle small volumes of sludge.
    1. True
    2. False
13. Laboratory tests should be conducted to provide a check on the accuracy of the monitoring instrumentation.
    1. True
    2. False
14. Enough gas is produced in combined sedimentation digestion units to serve as a reliable source of energy for power or for heating.
    1. True
    2. False
15. One method of operating septic tank effluent leaching systems is to apply effluent to half of the system while the other half rests to give the system a chance to recover its percolation capacity.
    1. True
    2. False

Best Answer

1. What s the man difference between primary and secondary clarifiers?
   1. Effluent from a primary clarifier is normally clearer than secondary effluent
   2. Primary clarifiers are usually much larger than secondary clarifiers.
   3. Secondary sludges are usually denser than primary sludges
   4. The density of the sludge handled
2. What is the purpose of a rectangular sedimentation basin effluent trough (launder)?
   1. Collects the settled wastewater flowing over the weirs
   2. Drags sludge to the deep end of the sump for removal by pumping
   3. Ensures equal flow over all weirs
   4. Receives the floating material from the scum simmer for removal
3. What is the purpose of circular clarifier blades and scraper squeegees?
   1. Allows the collected scum to flow from the skimmer box to a scum tank or pump
   2. Collects the sludge before withdrawal
   3. Removes the sludge from the clarifier
   4. Scrapes sludge from the bottom of the clarifier to the sump
4. During normal operations, which daily operation and maintenance tasks should be performed with regard to clarifier flights?
   1. Examine bolts for looseness, corrosion, and excessive wear on those parts that can be inspected above the waterline
   2. Grease all moving equipment according to manufacturer’s specifications and check oil levels in motors where appropriate
   3. Using water under pressure, wash off accumulations of solid particles, grease, slime, and other material from walkways, handrails, and all other exposed parts of the structure and equipment
   4. Write in your pocket notebook any unusual observations and transfer these notes to the plant record sheet.
5. Why should operators perform an annual inspection on each clarifier?
   1. To be in compliance with regulatory requirements
   2. To help prevent serious problems and failures in the future when harmful consequence can result
   3. To maintain essential clarifier records
   4. To provide operators with an opportunity to observe the submerged equipment
6. In most plants, why do the surface loading and detention time vary widely throughout the day?
   1. Due to the hourly changes in plant inflow resulting from the activities of the people and industries in the community
   2. Due to the inflow and infiltration from stormwater runoff and groundwater fluctuations
   3. Due to the scheduled maintenance activities of the sewer maintenance crews
   4. Due to the tidal action of sea water
7. What is the only conclusive method of measuring the efficiency of clarifiers?
   1. By continually observing the quality of the effluent
   2. By documenting and recording odor complaints
   3. By obtaining regulatory agency approval of efficiency
   4. Y proper analysis of representative samples
8. What is the purpose of performing calculations of clarifiers treatment efficiency?
   1. For laboratory QA/QC purposes
   2. For process control purposes
   3. To fulfill the needs of the plant administration
   4. To satisfy the reporting requirements of regulatory agencies
9. Why should clarifier weirs be kept level?
   1. To help operators measure the clarifier effluent flow
   2. To help operators record the efficiency of the clarifier
   3. To help prevent short-circuiting, which reduces the efficiency of the clarifier
   4. To help prevent the growth of algae on the weirs
10. Why must fats, oils, hair, and other light material be removed by flotation?
    1. To allow for the recovery and recycling of this valuable resource
    2. To prevent the material from settling to the bottom of the tank
    3. To protect the aesthetics (appearance) of receiving waters
    4. To remove the material as quickly as possible to avoid odor complaints
11. If laboratory results indicate a poorly operating clarifier. How can an operator try to identify the problem?
    1. By contacting the regulatory agency
    2. By draining the clarifier and inspecting the interior
    3. By questioning the O & M staff
    4. By using mathematical methods to check the performance of existing facilities against the design values
12. During times when the activated sludge process is upset, why must operators be careful that the return sludge rate does not become too high?
    1. The high flows can cause the return sludge pumps to overheat
    2. The high flows can overflow the tank weirs and walls
    3. The resulting turbulence in the tank can release obnoxious odors
    4. The resulting turbulence in the tank can upset the sludge blankets
13. What does a combined sedimentation-digestion nit consist of?
    1. A small chlorinator with a chlorine contact basin
    2. A small clarifier constructed over a sludge digester
    3. A small grit clarifier with grit-washing facilities
    4. A small package plant that includes aerobic digestion
14. When should digested sludge be withdrawn from the digester of a combined sedimentation-digestion unit?
    1. When solids start appearing in the supernatant
    2. When the pH in the digester becomes too low
    3. When the unit can no longer treat the design influent flow
    4. When there is a demand for the biosolids
15. How is the effluent from a septic tank usually disposed of?
    1. In cooling towers
    2. In evaporation ponds
    3. In storm sewers
    4. In underground perforated pipes called leach lines

Multiple Choice

1. Which types of sludge handling and sludge disposal systems are used at wastewater treatment plants?
   1. Activated sludge systems
   2. Burial systems
   3. Digestion systems
   4. Filter presses
   5. Land disposal systems
2. Which items could cause the clarifier squeegee mechanism to jerk or jump?
   1. A nonuniform sludge blanket on the clarifier floor
   2. An uneven clarifier floors
   3. An uneven water depth within the clarifier
   4. Problems with the drive unit
   5. Squeegees that have too much drag
3. Most clarifiers that do not produce an acceptable effluent usually fail due to which problems?
   1. Equpment failures
   2. Excessive hydraulic loadings (shock loads)
   3. Operator errors
   4. Recordkeeping system
   5. Sloppy laboratory procedures
4. The installation of which items will help operators maintain clarifier performance under abnormal conditions?
   1. Chemical feed systems
   2. Comminutors
   3. Control structures
   4. Instrumentation
   5. Monitoring devices
5. Which items are probable causes of floating sludge (bulking) in primary clarifiers?
   1. Insufficient sludge removal
   2. Sludge blanket is too deep
   3. Sludge collection mechanism, or flights, are off
   4. Sludge decomposing in the tank is lifted by gasification
   5. Sludge pump runs but discharges are thin, or no sludge is pumped
6. Which items are possible clarifier problems an operator could encounter?
   1. Large amounts of floating scum
   2. Loss of solids over the effluent weirs
   3. pH is low and there are odors
   4. Removal efficiencies are low
   5. Sludge blanket is deep, but the pumped sludge is thin
7. Which items should an operator check if floating chunks of sludge are observed on the surface of a clarifier?
   1. Collector mechanism
   2. Pipes and sludge sump
   3. Plant influent
   4. Quality of the supernatant return from the digester
   5. Sludge pump
8. Which items are general maintenance hints that will help keep clarifiers operating properly?
   1. Always lubricate equipment at the intervals recommended by the manufacturer
   2. Clean all equipment and structures regularly
   3. Inspect and correct (if possible) all peculiar noises, leaks, pressure and vacuum gauge irregularities, belts, electric systems, and safety devices
   4. Keep the weirs level
   5. Maintain a record-and-file system for future reference
9. The sedimentation and flotation units commonly used to treat wastewater include which items?
   1. Activated sludge units
   2. Combined sedimentation-digestion units
   3. Imhoff tanks
   4. Primary clarifiers
   5. Secondary clarifiers
10. Short-circuiting in clarifiers can be prevented by which means?
    1. Adequate preventive maintenance
    2. Proper design of inlet channels
    3. Use of baffles
    4. Use of port openings
    5. Use of weir plates
11. Detention time for a clarifier can be calculated using which known factors?
    1. Depth of the sludge blanket
    2. Hydraulic capacity of the influent pump
    3. Quantity of flow per day
    4. Tank dimensions or volume
    5. Weight of the water in the clarifier
12. Why should operators review the plans and specifications for wastewater treatment plant?
    1. To become familiar with a proposed plant
    2. To check the calculations of the construction costs
    3. To learn what will be constructed
    4. To look carefully for potential safety hazards
    5. To offer suggestions on how the plant can be designed for easier and more effective operation and maintenance
13. When reviewing the plans and specifications for a proposed wastewater treatment plant, which safety items should an operator check?
    1. Adequate guards must be placed over chain drives, belts, and other moving parts
    2. Adequate lighting must be provided on the clarifier
    3. Catwalks and bridges must have floor plates or grates firmly secured and equipped with toe boards and nonskid surfaces
    4. Do not allow any pipes or conduits to cross on top of catwalks or bridges
    5. Safety hooks, poles, or floats should be stationed at strategic locations
14. Under normal operating conditions for combined sedimentation-digestion units, which tasks should be performed daily?
    1. Hose down the baffles, weirs, scum rough, and scum pit to remove any grease, scum, or other floating debris
    2. Look and listen for anything unusual
    3. Measure the pH in the digester
    4. Observe the flow through the facility and the operation of the equipment
    5. Remove debris and solids from the bar screen and properly dispose of them by burial
15. Under which circumstances are abnormal operating conditions likely to occur for a combined sedimentation-digestion unit?
    1. Inflows are higher than design flows due to stormwater inflow and inflation
    2. Inflows follow a diurnal pattern
    3. Residents discharging to the collection system are using specified procedures
    4. Solids loadings are high due to seasonal or industrial discharges
    5. Toxic substances or high or low pH liquids are released into the collection system
16. Upon which items should the operator focus during an inspection of a combined sedimentation-digestion unit?
    1. BOD level
    2. Corrosion damage
    3. Cracks and leaks
    4. Unpainted surfaces
    5. Worn parts

Math

1. What is the detention time in a 20,000-gallon sedimentation tank if the flow is 026 MGD? Select the closet answer.
   1. 1.6hr
   2. 1.8hr
   3. 2.1hr
   4. 2.4hr
   5. 2.6
2. What is the detention time in a sedimentation tank 80 feet long, 30 feet wide, and 10 feet deep, if the flow is 2.1 MGD? Select the closet answer.
   1. 1.6hr
   2. 18hr
   3. 2.1hr
   4. 2.4hr
   5. 2.6hr
3. The flow into a clarifier is 1.8 MGD in a tank 80 feet long and 20 feet wide. What is the surface loading rate? Select the closet answer.
   1. 1,125 GPD/sq ft
   2. 1,300 GPD/sq ft
   3. 1,500 GPD/sq ft
   4. 1,625 GPD/sq ft
   5. 1,750 GPD/sq ft
4. The flow is 2.8 MGD in a circular sedimentation tank with an 80-foot weir diameter. What I the weir overflow rate? Select the closet answer.
   1. 9,000 GPD/ft
   2. 9,500 GPD/ft
   3. 10,000 GPD/ft
   4. 10,500 GPD/ft
   5. 11,000 GPD/ft
5. A circular secondary clarifier with a diameter of 90 feet treats a flow of 3.0 MGD (2.5 MGD inflow and 0.5 MGD return sludge flow) with a mixed liquor suspended solids concentration of 3,200 mg/L. What are the solids loading? Select the closet answer.
   1. 10.8 lbs/days/sq ft
   2. 11.3 lbs/days/sq ft
   3. 12.6 lbs/days/sq ft
   4. 13.8 lbs/days/sq ft
   5. 15.2 lbs/days/sq ft

End of Objective Test

Objective Test

Chapter 6. Trickling Filters

Please check the accuracy of your student contact information and mark the correct answers on the answer sheet provided in your enrollment packet. There may be more than one correct answer to each multiple-choice question. This test for Chapter 6 contains 43 questions.

True-False

1. The maintenance of a good growth of organisms on the filter media is crucial to successful trickling operation.
   1. True
   2. False
2. Trickling filters separate the solids from the wastewater by a straining action.
   1. True
   2. False
3. Higher trickling filter loadings and greater efficiency are possible warmer climates if aerobic conditions can be reasonably maintained in the filter.
   1. True
   2. False
4. The hydraulic loading applied to a trickling filter is the total volume of liquid, including recirculation, expressed as GPD/sq ft.
   1. True
   2. False
5. High-rate trickling filter loadings may be lower for synthetic media.
   1. True
   2. False
6. When you have checked out all equipment mechanically, starting up the trickling filter portion of the plant is very simple.
   1. True
   2. False
7. Slime growth on trickling filter media may be accelerated by recirculating wastewater through the trickling filter prior to treating the main wastewater flow stream.
   1. True
   2. False
8. Operation of clarifiers is interconnected with trickling filter operation.
   1. True
   2. False
9. When increasing the recirculation rate on a trickling filter, be sure the hydraulic loading remains within the engineering design limits.
   1. True
   2. False
10. For each incoming 100 pounds of BOD entering a trickling filter treatment plant, there should be at least five pounds of ammonia nitrogen and one pound of orthophosphate
    1. True
    2. False
11. Since operation of trickling filters is an aerobic process, serious odors are likely to exist
    1. True
    2. False
12. Good grounds maintenance and cleanup practices will help to minimize fly problems.
    1. True
    2. False
13. Trickling filters respond quickly to operational changes.
    1. True
    2. False
14. Trees should be planted close to open filters to provide shade.
    1. True
    2. False

Best Answer

1. What is the purpose of trickling filter distributor bearings?
   1. Allow air to flow through the media
   2. Allow the distributor arms to rotate
   3. Convey wastewater to outlet orifices located along the arms
   4. Provide a large surface area upon which the biological slime growth develops
2. What is the purpose of trickling filter media?
   1. Allow air to flow through the media
   2. Allow the distributor arms to rotate
   3. Convey wastewater to outlet orifices located along the arms
   4. Provide a large surface area upon which the biological slime growth develops
3. Where trickling filters use recirculation, an additional organic (BOD) loading will be placed on the filter. Why is this added loading omitted in most calculations?
   1. Because it does not accurately reflect the additional organic loading
   2. Because it fluctuates over a wide range in recirculated flows
   3. Because it is difficult to measure in recirculated flows
   4. Because it was included in the fluent load
4. How can some of the unexpected, frustrating problems encountered during the start-up of a new plant be avoided?
   1. By awarding the project to a low-bid contractor
   2. Be careful inspection ahead of time
   3. By cutting costs during the planning and design phases
   4. By excluding operator participation during the review of plans and specifications and the construction phase
5. The ability of an operator to correct deficiencies in trickling filter performance will depend on which factors?
   1. The operator’s ability to network with other operators and regulatory inspectors
   2. The operator’s alertness and ingenuity, as well as the design of the collection system and treatment plant
   3. The operator’s knowledge of plant construction techniques and options
   4. The operator’s participation in a continuing education program
6. Rapid changes in the influent load to a trickling filter plant can best be estimated by using which rest?
   1. BOD test
   2. COD test
   3. Chlorine residual test
   4. Coliform bacteria test
7. What is the main indicator of how effectively a trickling filter plant is working?
   1. Chlorine residual
   2. Clarity
   3. Plant effluent
   4. Plant influent
8. In the operation of trickling filters, which item could cause serious odors?
   1. Excessively high hydraulic loadings
   2. Flow of air through the media
   3. Odor-producing compounds present in the wastewater in high concentrations
   4. Prolonged aerobic conditions
9. What should be checked when the trickling filter treated effluent quality is poor?
   1. Diameter of the distributor base
   2. Organic load on the filter
   3. Size distribution of the media
   4. Spacing of the ventilation ports
10. Why should the turnbuckles be adjusted occasionally on the guy rods of a trickling filter?
    1. To keep the orifices on the rotation distributor from plugging
    2. To keep the rotating distributor arms at the proper level to provide even flow over all of the media
    3. To keep the rotating distributor rotating in a circular motion
    4. To prevent pounding on the surface of the floor
11. When reviewing plan for a new trickling filter plant with respect to overhead clearance, what should operators check?
    1. Distance from floor to ceiling in pump rooms will provide adequate ventilation
    2. Electrical power and telephone lines will to interfere with any equipment
    3. Headroom for stationary equipment will be cost effective
    4. Height of doors will not cause head bumps and bruises

Multiple Choice

1. What is the purpose of secondary treatment? To remove
   1. Dissolved solids
   2. Grit
   3. Scum or floatable solids
   4. Settleable solids
   5. Very small suspended solids (colloids)
2. Clogged void spaces in trickling filters can create which operational problems?
   1. Decrease in chlorine requirements
   2. Decrease in recirculation
   3. Greater microorganism activity in the zoogloeal film
   4. Ponding
   5. Reduction in overall filter efficiency
3. What are the benefits of recirculation and the resulting sloughing of excess or aged growths from trickling filter media?
   1. Decrease the opportunity for snail and filter fly breeding
   2. Improve ventilation through the filter
   3. Increase the production of methane gas
   4. Prevent ponding
   5. Provide a more aggressive surface of new growths to treat the wastewater
4. Which tasks should be performed by operators during the pre-start activities of a new trickling filter plant?
   1. Be sure the correct oil and amount of oil are used in all oil reservoirs
   2. Check the distributor arms for even adjustment and level
   3. Check the trickling filter carefully to be certain the essential parts will work properly when wastewater is applied
   4. Record the amount and type of oil each reservoir holds
   5. Remove the packing grease from the filter bearings and replace with the proper grease
5. Why should trickling filter recirculation be done during low-inflow periods of the day and night?
   1. To avoid clarifier problems from hydraulic overloading
   2. To encourage the development of snail populations on the media
   3. To keep the slime growths wet
   4. To minimize filter fly development
   5. To wash off excessive slime growths
6. What trickling filter problems can result from recirculation rates that are too low?
   1. Decrease in water conservation efforts
   2. Increase in chlorine usage
   3. Loss of solids over effluent weirs in the clarifiers
   4. Ponding
   5. Reduced BO removal efficiency
7. A trickling filter plant effluent that is high in suspended solids could be caused by which factors?
   1. Anoxic conditions in the primary clarifier
   2. Gasification (denitrification) caused by septic sludge in the secondary clarifier
   3. Heavy sloughing from the filters
   4. High hydraulic loading or short-circuiting through the secondary or final clarifier
   5. Shock loading caused by toxic wastes or hydraulic organic overloads
8. An alert operator will note changes in process units by observing which physical factors in a trickling filter plant?
   1. Amount of scum on a clarifier
   2. Appearance of the effluent
   3. Flow rate or height over weirs
   4. Launder levels
   5. Spray pattern
9. Minor pounding in a trickling filter can be eliminated by which methods?
   1. Does the filter with chlorine at about 5 mg/L for severa hours
   2. Hand turn or stir the filter surface with a rake, fork, or bar
   3. Remove any accumulation of leaves or other debris
   4. Shut off the flow to the filter for several hours
   5. Spray the filter surface with a high-pressure water stream
10. Which items are guidelines for maintaining trickling filters to prevent odor problems?
    1. Check the ventilation in the trickling filter
    2. Do everything possible to maintain aerobic conditions in the sewer collection system and in the primary treatment units
    3. Increase the recirculation rate to provide more oxygen to the filter bed and increase sloughing
    4. Keep the wastewater splash from the distributor away from exposed structures, grass, and other surfaces
    5. Provide a forced-air ventilation system and odor control of the exhaust air stream for covered filters
11. When are plant inflows considered abnormal? When there are
    1. Extreme levels of biochemical oxygen demand (BOD)
    2. Extreme levels of suspended solids
    3. Flows consistent with normal dry weather flows
    4. High flow rates
    5. Inflows of a septic influent
12. Which item are typical influent toxic conditions?
    1. Excess amounts of ammonia
    2. Excess amounts of heavy metals
    3. Excess amounts of hydrocarbons
    4. Excessively high or low levels of coliforms
    5. Excessively high or low pH
13. Which items are probably causing of trickling filter odors?
    1. Anaerobic waste being applied to the filters
    2. Excessive biological growths
    3. Excessive hydraulic loads
    4. Poor housekeeping
    5. Poor ventilation of the filter
14. Why should operators review plans and specifications for a new plant?
    1. To become a contractor and construct new plants
    2. To become familiar with the proposed plant
    3. To learn how to design new plants
    4. To learn what will be constructed
    5. To offer suggestions on how the plant can be designed for easier and more effective operation and maintenance
15. When reviewing plans for a new plant, operators should carefully study which areas?
    1. Budget
    2. Equipment
    3. Safety aspects
    4. Site
    5. Trickling filter structure

Math

1. A flow rate of 300 GPM is approximately the same as how many MGD? Select the closet answer.
   1. 0.43 MGD
   2. 0.50 MGD
   3. 0.58 MGD
   4. 0.65 MGD
   5. 0.72 MGD
2. What is the hydraulic surface loading on a trickling filter 80 feet in diameter with a flow rate of 060 MGD? Select the closet answer.
   1. 120 GPD/sq ft
   2. 130 GPD/sq ft
   3. 140 GPD/sq ft
   4. 150 GPD/sq ft
   5. 160 GPD/sq ft
3. What is the BOD load applied to a trickling filter in pounds of BOD per day for a filter with a diameter of 70 feet, a depth of 5 feet, a flow rate of 05 MGD, and a filter influent BOD of 120 mg/L? Select the closet answer.
   1. 375 lbs BOD/day
   2. 420 lbs BOD/day
   3. 460 lbs BOD/day
   4. 500 lbs BOD/day
   5. 520 lbs BOD/day

End of Objective Test

Objective Test

Chapter 7. Rotating Biological Contactors

True-False

1. Rotating biological contactors (RBCs) are a primary biological treatment process for domestic and biodegradable industrial wastes
   1. True
   2. False
2. Organisms on the first-stage media of rotating biological contractor (RBC) are exposed to high levels of BOD and reduce the BOD at a high rate.
   1. True
   2. False
3. Usually, rotating biological contactor (RBC) units are shut down during low-flow conditions because power consumption is minimal and as the flows decrease, the percent of BOD removal increases.
   1. True
   2. False
4. Rotating biological contactors are less sensitive to industrial wastes than trickling filters.
   1. True
   2. False
5. If the wastewater flow is perpendicular to the rotating media shaft a of a rotating biological contactor, the media should be moving through the wastewater in the direction of flow.
   1. True
   2. False
6. If the optimum range of influent pH to a rotating biological contactor (RBC) plant is exceeded at any time (due to industrial waste discharges, for example), an increase in treatment efficiency is likely.
   1. True
   2. False
7. One advantage of rotating biological contactor (RBC) units is the fact that high flows usually wash the slime growths off the media.
   1. True
   2. False
8. A loss in rotating biological contactor process efficiency can result if the slimes are washed off the media.
   1. True
   2. False
9. Always shut off the power to a rotating biological contactor unit, tag the switch, and local the main breaker in the OFF position before working on the unit.
   1. True
   2. False
10. Good personal hygiene must always be practiced by operators.
    1. True
    2. False

Best Answer

1. What is a biodegradable waste?
   1. Inorganic matter that can be broken down by bacteria to more stable forms that will not create a nuisance or give off foul odors
   2. Organic matter that can be broken down by bacteria to more stable forms that will not create a nuisance or give off foul odors
   3. Wastes that are primarily treated first
   4. Wastes that create foul odors
2. How is oxygen provided for the organisms in the rotating biological contactor treatment process?
   1. By algae producing oxygen by photosynthesis during the day
   2. By forced-air aeration
   3. By rotating the slime into the settled wastewater and then into the atmosphere
   4. By splashing mechanical action
3. How are sloughed slimes in the effluent from rotating biological contactors removed from the effluent?
   1. By chlorine in the chlorine contact basin
   2. By digestion by the slime bacteria
   3. By filtration by filtering media
   4. By settling in the secondary clarifier
4. What is the purpose of the rotating media of a rotating biological contractor (RBC)?
   1. To allow for the removal of solids that may settle out in the tank
   2. To control odors
   3. To prevent short circuiting of wastewater
   4. To provide support for organisms
5. What is soluble BOD?
   1. A measure of food for microorganisms that is dissolved in the water being treated
   2. A measure of the microorganisms presents to treat the wastewater
   3. The dissolved suspended solids
   4. The slimy organic matter in wastewater
6. As flows to a rotating biological contactor unit increase, why will effluent values of the various water quality indicators increase?
   1. Because a greater flow is applied to each square foot of media while the time the wastewater is in contact with the slime growths is reduced
   2. Because the bacteria in the slimes become more active
   3. Because the nutrient deficiencies are eliminated
   4. Because there will be more slimes on the media
7. Why are rotating biological contactor influent and effluent data often plotted as seven-day moving averages?
   1. To allow each operator on each shift to participate
   2. To ensure that plug flows are traced through the process
   3. To facilitate calculations by using easy numbers to stress comprehension of the procedures
   4. To smooth out daily fluctuations and reveal trends
8. When dealing with nitrification in the rotating biological contactor process, which items are very critical?
   1. DO and BOD
   2. Influent an effluent flow
   3. PH and alkalinity
   4. Suspended and settleable solids
9. What are inhibitory substances?
   1. Addition of an acid or alkali (base) to a liquid to cause the pH of the liquid to move toward a neutral pH of 7.0
   2. Liquid removed from settled sludge
   3. Materials that kill or restrict the ability of organisms to treat wastes
   4. Stabilized digested sludge
10. What could be the cause of rotating biological contactor sloughing or loss of biomass?
    1. Industrial discharges containing sulfur compounds
    2. Influent wastewater containing toxic or inhibitory substances
    3. Solids or BOD overloading
    4. Solids or BOD underloading
11. Why should slime growth not be washed off the media of a rotating biological contactor?
    1. Because the washed off slimes will cause serious odor problems
    2. Because you will be washing away the organisms that treat the wastewater
    3. Because you will cause a solids overload on the secondary, clarifier
    4. Because you will cause excessive effluent chlorine demand
12. What should be done if grease balls appear on the water surface in the rotating biological contactor bays?
    1. Locate and control the sources of grease
    2. Reduce flows to the primary clarifier and increase the skimmer speed
    3. Remove them with a dip net or screen device
    4. Use a spray to push them below the surface and into flow

Multiple Choice

1. Why are rotating biological contactors covered?
   1. To avoid exposure of the media to sunlight, which may cause the media to become brittle
   2. To prevent intense rains from washing off some of the slime growths
   3. To protect biological slime growths from freezing
   4. To provide protection for operators from sun, rain, snow, or wind while maintaining the equipment
   5. To stop exposure of the media to direct sunlight to prevent the growth of algae.
2. If grit and large organic matter are not removed by pretreatment before the wastewater being treated reaches the rotating biological contactor unit, the material can settle beneath the drums and form sludge deposits that can cause which problems?
   1. Be reduced quickly by anaerobic digestion
   2. By produce septic conditions
   3. Reduce the effective tank volume
   4. Scrape the slimes from the media
   5. Stall the unit
3. Who should instruct the operator on the proper operation of a rotating biological contactor plant and the maintenance of the equipment?
   1. Appropriate elected official
   2. Communications representative
   3. Design engineer
   4. Manufacturer's representative
   5. Regulatory engineer
4. Before starting any equipment or allowing any wastewater to enter the rotating biological contactor treatment process, which areas should be inspected for clearances?
   1. Between the chain casing and the media
   2. Between the media and the baffles or the cover support beams
   3. Between the media and the tank wall
   4. Between the roller chain, the sprockets, and the chain casing
   5. Between the rotor and the stator
5. Rotating biological contactor treatment plants are not difficult to operate and produce a good effluent provided the operator properly and regularly performs which basic duties?
   1. Inspecting the equipment
   2. Maintaining the equipment
   3. Observing the media
   4. Taking corrective action when necessary
   5. Testing the influent and effluent
6. Which items should be checked when inspecting rotating biological contactor equipment?
   1. Feel the motors to determine if they are running hot
   2. Feel the outer housing of the shaft bearing to see if it is running hot
   3. Inspect the bets for proper tension
   4. Inspect the chain drive for alignment and tightness
   5. Listen for unusual noises in the motor bearings
7. Which items are appropriate safety gear when handling chemicals?
   1. Goggles or face shield
   2. Hard hat
   3. Impervious gloves
   4. Protective clothing
   5. Steel-toed boots
8. What are the probable causes of decreased rotating biological contactor treatment efficiency?
   1. High wastewater temperatures
   2. Hydraulic overload
   3. Low wastewater temperatures
   4. Organic overload
   5. PH being too high or too low
9. Which items are probable causes of a noisy chain drive on rotating biological contactor?
   1. Chain not fitting the sprockets
   2. Faulty lubrication
   3. Loose chain
   4. Misalignment or improper assembly
   5. Moving parts rubbing stationary parts
10. Which items are potential safety hazards when operating a rotating biological contactor unit?
    1. Excessive noises
    2. Infections and diseases
    3. Slippery surfaces
    4. Slow-moving equipment
    5. Wiring and connections
11. Hydraulic and organic loadings on rotating biological contactors depend on which factors?
    1. Certification level of operators
    2. Effluent total and soluble BOD requirements
    3. Influent soluble BOD
    4. Plant effluent coliform requirements
    5. Wastewater temperature

Math

1. A rotating biological contactor treats a flow of 1.4 MGD with an influent soluble BOD of 100 mg/L. The surface area of the media is 500,000 square feet. Wat is the organic loading? Select the closet answer.
   1. 2.3 lbs BOD/day/1,000 sq ft
   2. 2.7 lbs BOD/day/1,000 sq ft
   3. 3.0 lbs BOD/day/1,000 sq ft
   4. 3.3 lbs BOD/day/1,000 sq ft
   5. 3.6 lbs BOD/day/1,000 sq ft
2. A rotating biological contactor treats a flow of 1.4 MGD. The surface area of the media is 500,000 square feet. What is the hydraulic loading? Select the closet answer.
   1. 1.2 GPD/sq ft
   2. 1.6 GPD/sq ft
   3. 2.0 GPD/sq ft
   4. 2.4 GPD/sq ft
   5. 2.8 GPD/sq ft

End of Objective Test

True-False

1. The ratio of food to organisms is a primary control in activated sludge process.
   1. True
   2. False
2. The treatment plant operator has significant control over the make-up or amount of influent coming into the treatment plant.
   1. True
   2. False
3. Extended aeration produces as much waste sludge as other activated sludge processes.
   1. True
   2. False
4. Mechanical aerators in the aeration tank tend to be higher in installation and maintenance costs than diffused air systems.
   1. True
   2. False
5. When starting a new activated sludge package plant, operators should try to build up the solids or mixed liquor suspended solids (MLSS) as quickly as possible during starting up.
   1. True
   2. False
6. Some sludge must be wasted routinely from a package activated sludge plant to achieve optimum plant performance.
   1. True
   2. False
7. Operators should practice safety, avoid hazardous conditions, and use safe procedures.
   1. True
   2. False
8. Oxidation ditches always have a primary settling tank and grit removal system.
   1. True
   2. False
9. Lost time, injury, and even death are the results of not being concerned with applying the rules of safety to all activities involved in operating and maintaining a plant.
   1. True
   2. False
10. Influent flows and waste characteristics are subject to limited control by the operator.
    1. True
    2. False
11. The shallower the oxidation ditch rotors sit in the water, the greater the transfer of oxygen from the air to the water (greater DO).
    1. True
    2. False
12. Odor at an oxidation ditch plant may be a sign of poor housekeeping.
    1. True
    2. False
13. To prevent injury to personnel, shut down the oxidation ditch rotor assembly whenever any maintenance function is performed.
    1. True
    2. False
14. Oxidation ditch plans and specifications must provide standby or auxiliary power to operate critical equipment.
    1. True
    2. False
15. What is stabilized waste?
    1. A biological wastewater treatment process that uses microorganisms to speed up decomposition of wastes
    2. A waste that has been treated or decomposed to the extent that, if discharged or released, its rare and state of decomposition would be such that the waste would not cause a nuisance or odors in the receiving water.
    3. Sludge particles produced in raw or settled wastewater by the growth of organisms in aeration tanks in the presence of dissolved oxygen
    4. The addition of oxygen, removal of hydrogen, or the removal of electrons from an element or compound.
16. What is the purpose of the activated sludge process?
    1. The oxidation and removal of soluble or finely divided suspended materials that were not removed by previous treatment
    2. The settling of suspended active sludge solids
    3. To create an active treatment process
    4. To prevent the formation of odors in receiving waters
17. What is agglomeration?
    1. Bacteria that can use either dissolved oxygen or oxygen obtained from food materials such as sulfate or nitration's
    2. Clumps of bacteria and particles or coagulants and impurities that have come together and formed a cluster
    3. Organisms that grow in a threat form
    4. The growing or coming together of small scattered particles into larger flocs or particles, which settle rapidly.
18. Why should an operator determine activated sludge solids concentrations in the aerator and the secondary clarifier?
    1. For control of clarifier solids loading
    2. For control of odors
    3. For DO control in the aerator
    4. For process control purposes
19. How can operators build up the solids or mixed liquor suspended solids (MLSS) as quickly as possible during the startup of an activated sludge plant?
    1. By diverting excess food (waste) for the aerator
    2. By maximizing air to the aerator
    3. By minimizing air to the aerator
    4. By not wasting sludge until the desired level of MLSS is achieved
20. Whenever an aeration tank must be drained, why should the operator try to determine the groundwater level?
    1. Because a high groundwater level can float a tank and cause considerable damage to structures and pipes
    2. Because the disposal of aerator contents could contaminate the groundwater
    3. Because the groundwater could fill the tank faster than the drainage pump
    4. Because the groundwater level may be too low to prevent uneven settling of the tank
21. During the start-up of an oxidation ditch plant, what is essential for the plant to succeed in reducing the quantities of polluting materials in the raw wastewater?
    1. Containment of the entire influent flow
    2. Development of a proper microbial floc
    3. Development of the anoxic selectors
    4. Maintenance of a super DO saturation
22. During oxidation ditch plant start-up, what does a dark gray color of the developing mixed liquor suspended solids (MLSS) indicate?
    1. A lack of bacterial buildup
    2. A lack of nutrients
    3. A lack of enough detention time
    4. A lack of suitable food (wastes)
23. In the oxidation ditch process, how is control of rotor oxygenation achieved?
    1. By adjusting the ditch outlet level control weir
    2. By adjusting the pitch of rotor blades or brushes
    3. By adjusting the speed of rotor rotation
    4. By adjusting the surface reaeration rates
24. Which factor determines the flow velocity in an oxidation ditch?
    1. Sufficient to encourage water/solids separation
    2. Sufficient to maintain optimum DO
    3. Sufficient to mix wastes with microorganisms
    4. Sufficient to prevent the deposition of floc
25. Why is it usually necessary to vary the amount of mixed liquor suspended solids (MLSS) in the ditch as seasons change?
    1. Because the microorganisms are less active in the summer at high temperatures
    2. Because the microorganisms are more active in the summer at high temperatures
    3. Because the microorganisms experience seasonal reproductive phases
    4. Because the microorganisms perspire (sweat) less in winter at low temperatures
26. Oxidation ditch drive and gear assemblies should be elevated out of the water and have which other provision?
    1. Grit removal system to prevent san, silt, and cinders from damaging the equipment
    2. Safe and easy access for maintenance
    3. Splash guards to prevent the operators from getting wet
    4. Viewing deck to observe the proper operation of the equipment

Multiple Choice

1. Insufficient oxygen in the aeration tank of an activated sludge process will have which effect(s)?
   1. Favor the production of foul-smelling intermediate products of decomposition and incomplete reactions
   2. Lead to complete waste stabilization
   3. Make facultative organisms work less efficiently
   4. Require increasing waste activated sludge (WAS) pumping rate
2. For the activated sludge process to work properly, the operator must control which factors?
   1. Dissolved oxygen in the aeration tanks
   2. Effluent chlorine residual
   3. Influent coliform level
   4. Number of organisms
   5. Treatment time
3. Effluent quality requirements may be stated by regulatory agencies in terms of which factors?
   1. Allowable quantities of wastes that may be discharged
   2. Allowable times of day for the discharges of wastes
   3. News media notification of the condition of wastes
   4. Percentage removal of wastes
   5. When the regulatory staff will monitor the waste discharges
4. How can an operator determine if not enough air is being supplied to the aerator?
   1. Aeration compartment has a rotten egg odor
   2. Effluent chlorine demand is high
   3. Foam is present on the surface of the aerator
   4. Plant effluent lacks coliforms
   5. Water in the settling compartment is murky or cloudy
5. If odors from waste activated sludge drying beds are a problem, which items are possible solutions?
   1. Arrange for disposal of the excess activated sludge at a nearby treatment plant
   2. Dispose of the waste activated sludge using an incinerator
   3. Have the excess or waste activated sludge removed y a septic tank pumper and disposed of in an approved sanitary landfill
   4. Treat the waste activated sludge in an anaerobic digester
   5. Waste the excess activated sludge into an aerated holding tank
6. When troubleshooting the activated sludge process, which problems should the operatr look for?
   1. Coliforms in the aeration tank
   2. Foaming/frothing
   3. Nutrients
   4. Odors
   5. Solids in the plant effluent
7. Which items should an operator consider in the day-to-day operation of a package activated sludge plant?
   1. Adjusting the oxygen level accordingly, if an increase or decrease in organisms occurs, to maintain proper solids settling and production of a clear final effluent
   2. Avoiding injuries by avoiding hazards and following safe procedures
   3. Ensuring that the return sludge flow rate is such that it allows for a high concentration of solids, which will reduce the amount of water returned to the aerator
   4. Making a final and detailed check of the equipment for proper operation before leaving the plant for the day
   5. Referring to a troubleshooting guide or checklist when a problem develops in the activated sludge process.
8. What are the purposes of the oxidation ditch rotor?
   1. To allow scum to accumulate on the water surface of the ditch
   2. To cause surface aeration, which transfers oxygen from the air to the water for respiration by the microorganisms
   3. To keep the contents of the ditch mixed and moving
   4. To mix the chlorine disinfection solution in the ditch
   5. To prevent nitrification in the ditch
9. What are the primary objectives of oxidation ditch start-up?
   1. To develop a proper microbial floc (activated sludge) in the oxidation ditch
   2. To maintain super DO saturation in the oxidation ditch
   3. To make certain that all mechanical equipment is operating properly
   4. To monitor budget items always
   5. To waste as much activated sludge as possible
10. During the period of start-up of an oxidation ditch plant, wastewater testing procedures should be initiated for which influent items?
    1. BOD
    2. COD
    3. Settleable solids
    4. TKN
    5. TSS
11. Over oxygenation of an oxidation ditch is a problem for which reasons?
    1. Excessive DO levels can cause a pinpoint floc to form that does not settle
    2. Floc can be lost over the weir in the settling tank
    3. Foam may develop in the effluent
    4. Obnoxious odors could be released
    5. Wastes power
12. The clarity of the supernatant, usually visible a few feet upstream from the oxidation ditch rotor, will depend on which factors?
    1. Concentration of MLSS
    2. Ditch DO
    3. Ditch velocity
    4. Removal of BOD from the ditch
    5. Settling characteristics of the activated sludge solids
13. Daily oxidation plant cleanup usually involves which tasks?
    1. Polishing the guardrails
    2. Removing and burying debris that may have accumulated on the bar screen
    3. Removing grease and scum from the surface of the clarifier
    4. Washing or brushing down the clarifier weirs and walls
    5. Washing or brushing down the ditch
14. Which items should operators check when reviewing plans and specifications for oxidation ditch plants?
    1. All drive and gear assemblies should be elevated out of the water
    2. Standby or auxiliary power must be provided to operate critical equipment
    3. The ditch should be constructed with some type of lining
    4. Walkways with railings must be provided across the aeration channel to provide access to the rotor for maintenance
    5. Water level in the aeration channel should be controlled by an adjustable weir

Math

Data for questions 41, 42, 43, and 44:

An oxidation ditch has a volume of 25,000 cubic feet or 0.187 million gallons. The flow is 0.18 MGD, the influent BOD is 160 mg/L, the influent suspended solids 180 mg/L, the mixed liquor suspended solids (MLSS) is 4,400 mg/L and the MLSS is 70 percent volatile matter.

1. What is the ditch detention time in hours? Select the closet answer.
   1. 20.4 hours
   2. 21.4 hours
   3. 22.4 hours
   4. 23.6 hours
   5. 24.9 hours
2. What is the BOD loading in pounds BOD per day per 1,000 cubic feet of ditch volume? Select the closet answer.
   1. 9 lbs BOD/day/1,000 cu ft
   2. 10 lbs BOD/day/1,000 cu ft
   3. 11 lbs BOD/day/1,000 cu ft
   4. 12 lbs BOD/day/1,000 cu ft
   5. 13 lbs BOD/day/1,000 cu ft
3. What is the food/microorganism ratio in pounds BOD per day per pound MLVSS? Select the closet answer.
   1. 0.04 lb BOD/day/lb MLVSS
   2. 0.05 lb BOD/day/lb MLVSS
   3. 0.06 lb BOD/day/lb MLVSS
   4. 0.07 lb BOD/day/lb MLVSS
   5. 0.08 lb BOD/day/lb MLVSS
4. What is the sludge age in days? Select the closet answer.
   1. 19 days
   2. 21 days
   3. 23 days
   4. 25 days
   5. 27 days

End of Objective Test

Objective Test

Chapter 9. Wastewater Stabilization Ponds

True-False

1. When discharged into ponds, wastes are treated or stabilized by several natural processes acting at the same time.
   1. True
   2. False
2. The greatest organic load destroyed by pond treatment per unit of area (High treatment efficiency) may be accompanied by objectionable odors.
   1. True
   2. False
3. During the day, algae use carbon dioxide, which raises the pH, while at night they produce carbon dioxide and the pH is lowered.
   1. True
   2. False
4. All of the organic matter that finds its way to the bottom of a stabilization pond is subject to methane fermentation, provided that proper conditions exist or become established.
   1. True
   2. False
5. Although the bottom of a pond is anerobic, travel of gas from the anaerobic layer through the aerobic surface layers generally prevents odor release.
   1. True
   2. False
6. A high pH in a pond is indicative of high algal activity since removal of a carbon dioxide from the water in algal metabolism tends to keep the pH high.
   1. True
   2. False
7. Scum is broken up most easily if it is attended to after it dries.
   1. True
   2. False
8. Suspended vegetation, such as duckweed, usually will flourish if the pond is exposed to a clean sweep of the wind.
   1. True
   2. False
9. Grazing animals are an effective means of controlling vegetation on pond levee slopes.
   1. True
   2. False
10. Usually, the pH and dissolved oxygen in a pond will be lowest just at sunset.
    1. True
    2. False
11. If the pond dissolved oxygen (DO) level is supersaturated, the sample must be aerated to remove the excess oxygen before the BOD test is performed.
    1. True
    2. False
12. Winds can have both favorable and unfavorable impacts on ponds.
    1. True
    2. False
13. Pond outlet structures should consist of a baffled and submerged pipe inlet to prevent scum and another floating surface from leaving the pond.
    1. True
    2. False
14. Provisions must be made for easy pond access and sufficient space for maintenance and repair of fixed surface aerators.
    1. True
    2. False
15. Blue-green algae can be controlled by the active agent produced during the decomposition of barley straw.
    1. True
    2. False

Best Answer

1. How is some of the wastewater on a pond surface disposed of?
   1. By algae and evapotranspiration
   2. By evaporation
   3. It is broken down by bacteria in suspension
   4. It is decomposed by bacteria
2. What is the purpose of a pond outlet baffle?
   1. Conveys the treated wastewater to the receiving waters
   2. Measures and records flow into the pond
   3. Prevents scum and other surface debris from flowing onto the next pond or receiving waters
   4. Provides contact time for chlorine to disinfect the pond effluent
3. What is a polishing pond?
   1. A pond located after a primary wastewater treatment plant to provide additional clarification, BOD removal, and disinfection
   2. A pond used in series after a trickling filter plant
   3. A pond used to mask odors
   4. A pond used to provide evaporative surfaces
4. What is a facultative pond?
   1. A pond characterized by having dissolved oxygen distributed throughout its contents practically all of the time
   2. A pond in which the upper portion (supernatant) is aerobic, while the bottom layer is anaerobic
   3. A pond that is continuously mixed by wind action
   4. A pond usually without any dissolved oxygen through its entire depth
5. What do algae dot at night, when light is no longer available for photosynthesis?
   1. Algae become dormant and release alkalinity
   2. Algae remove nutrients and store them for the production of oxygen
   3. Algae store up energy and prepare to become activate during sunlight
   4. Algae use up the oxygen by respiration and produce carbon dioxide
6. How is a considerable amount of the organic load on ponds removed?
   1. By algal photosynthesis
   2. By methane fermentation
   3. By percolation to groundwater
   4. By surface water evaporation
7. What best describes the activity of algae in a pond? Algae in a pond
   1. Break down acids and other products to methane gas, carbon dioxide, hydrogen sulfide, alkalinity, and water
   2. Convert organic matter to volatile acids, carbon dioxide, water, and nitrogen
   3. Use the carbon dioxide in the water to produce free oxygen, using sunlight for energy in the process of photosynthesis
   4. Waste organic matter and nutrients in the influent to the pond
8. Why are pond detention times sometimes specified by regulatory agencies
   1. To avoid high levels of coliforms in the effluent
   2. To avoid the presence of algae in the effluent
   3. To ensure adequate treatment and removal of pathogenic bacteria
   4. To ensure prompt reporting of noncompliance
9. A definite green color is evidence of what in a pond.
   1. That a flourishing algal population has been established
   2. That aquatic weeds have established roots in the pond
   3. That duckweed is thriving in the pond
   4. That the sunlight is penetrating to the bottom of the pond
10. Why is a high pH essential in a pond?
    1. To allow algae to freely produce significant amounts of volatile acids
    2. To encourage a balanced anaerobic fermentation (bacterial decomposition) of bottom sludge
    3. To indicate that acid-forming bacteria are predominant
    4. To produce high levels of alkalinity to minimize any buffering action
11. What is the objection to duckweed on the surface of a conventional wastewater treatment pond?
    1. Duckweed attracts ducks and other nuisance waterfowl
    2. Duckweed promotes the production of pond odors
    3. Duckweed stops sunlight penetration and hinders surface aeration
    4. Duckweed treats the wastewater and leaves no food for algae
12. Why do many pond installations have grit chambers at the headworks?
    1. To capture and recycle the grit
    2. To grind up the grit before it enters the pond
    3. To prevent toxic grit from killing pond algae
    4. To protect raw wastewater lift pumps and to prevent plugging of the influent lines
13. Why do ponds usually not become overloaded during storms and periods of high runoff?
    1. Because of the decrease in BOD discharged into sewers during storms
    2. Because of the increase in bacterial decomposition during storms
    3. Because the high flows wash BOD out of the pond
    4. Because there is not a significant increase in the BOD loading on the ponds
14. What are probably the most important pond analyses that can be accomplished easily by operators?
    1. Routine dissolved and suspended solids analyses
    2. Routine fecal and total coliform analyses
    3. Routine green and blue-green algal analyses
    4. Routine pH and dissolved oxygen analyses
15. What does a sparkling, deep green color in a pond generally indicate?
    1. A declining pH and a lowered dissolved oxygen content
    2. A high pH and a satisfactory dissolved oxygen content
    3. A pond is being overloaded or into working properly
    4. A steady pH and deteriorating weather conditions
16. Why is a headworks with a bar screen desirable at a pond plant?
    1. To remove debris that could reduce the pond volume
    2. To remove odor-causing organic matter
    3. To remove pathogenic organisms
    4. To remove rags, bones, and other large objects that might lodge in pipes or control structures
17. Why should valves that have stems extending into the steam flow be avoided
    1. TO prevent corrosion of the steam
    2. To prevent operators from having to grease and lubricate the stem
    3. To prevent stringy material and rags from collecting on the stem
    4. To prevent visual observation of the unsightly stem

Multiple Choice

1. What are probably causes when sludge accumulation occurs in the bottom of a pond and decomposition does not set in?
   1. Excessive nutrients
   2. Lack of the right bacteria
   3. Low pH
   4. Low temperature
   5. Presence of substances that slow or stop the process
2. In order for a population of methane bacteria to cause methane fermentation, which conditions do the bacteria require?
   1. A pH level of from 6.5 to 7.5 within the sludge
   2. Alkalinity of several hundred mg/L to buffer (enutralize) the organic acids
   3. An abundant population of methane bacteria must be present
   4. Excessive amounts of nutrients
   5. Suitable temperatures
3. The treatment efficiencies that can be expected from ponds vary according to many variables including which biological factors
   1. Activity of the organims
   2. Nutrient deficiencies
   3. Toxic concentrations
   4. Type and quantity of algae
   5. Type of bacteria
4. Most odors from pond treatment plants are caused by which sources?
   1. Algae in the effluent
   2. Excessive maintenance
   3. Low flows
   4. Overloading
   5. Poor housekeeping practices
5. Which items are control measures for pond dike vegetation?
   1. A few ducks may be used to eat the weeds
   2. Drown the weeds by raising the water level
   3. Mow regularly during the growing season
   4. Seed or reseed slopes with desirable grasses that will form a thick and somewhat impenetrable mat
   5. Use herbicides as a last resort
6. Why should pond effluent not be overchlorinated when high levels of algae are present?
   1. Because over chlorinating will cause the algae to “explode,” making the effluent more difficult to disinfect
   2. Because of the formation of toxic disinfection byproducts (D&Ps)
   3. Because of the potential to create algae that are resistant or immune to chlorine
   4. Because of the problems caused by odors from the release of chlorine gas
   5. Because the dead algae will increase the BOD in the effluent
7. Excessive BOD levels can occur in ponds when influent loads exceed design capacity due to which factors?
   1. Algae failing to decompose influent organic matter
   2. Industrial dumps
   3. Industrial growth
   4. Population increases
   5. Recreational overuse
8. All the flow should be stopped to a pond when emptying the pond to perform which tasks?
   1. Collect samples
   2. Control mosquitoes
   3. Remove bottom deposits
   4. Repair inlet or outlet structures
   5. Repair levees
9. What could be the probable causes of a poor quality pond effluent?
   1. Blockage of light by excessive plant growth near the dikes
   2. Excessive turbidity from scum mats
   3. Loss of pond volume caused by sludge accumulation
   4. Organic overload
   5. Toxic material in the influent
10. A grab sample is used to measure which water quality indicators?
    1. BOD
    2. Chlorine residual
    3. Dissolved oxygen
    4. PH
    5. Temperature
11. Which tests are important indicators of the condition of pond?
    1. BOD
    2. Coliform
    3. DO
    4. PH
    5. Temperature
12. Winds on ponds can be desirable in terms of which factors?
    1. Winds blow odors and insects away from the pond toward neighbors
    2. Winds blow surface scum to one side of the pond where it can be removed
    3. Winds blow weeds to one side of the pond where they can be removed
    4. Winds create waves that can erode of the pond levee
    5. Winds mix the contents of a pond, such as DO, algae and incoming wastes
13. The waste loading on a pond is generally spoken of in relation to its area, and may be stated in which terms?
    1. Coliform effluent discharge requirements
    2. Inches (or feet) of depth added per day
    3. Persons (or population served) per acre
    4. Pounds of BOD per day per acre
    5. Pounds of industrial waste applied per day
14. What are the undesirable effects of algae on the receiving waters?
    1. Development of nuisance conditions
    2. Increased biochemical oxygen demand
    3. Increased suspended solids
    4. Increased turbidity
    5. Loss of aesthetic values

Math

1. Two ponds serve a summer resort and are operated in series. They cover an area of 125 feet (average width and length of both ponds combined). The average depth is four feet and the average inflow is 26,000 GPD. What is the detention time? Select the closet answer.
   1. 25 days
   2. 29 days
   3. 31 days
   4. 34 days
   5. 38 days
2. Two ponds serve a summer resort and are operated in series. They cover an area of 125 feet by 200 feet (average width and length of both ponds combined). The average depth is four feet and the average inflow is 30,000 GPD. When the influent BOD is 120 mg/L, what is the organic loading? Select the closet answer.
   1. 53 lbs BOD/day/ac
   2. 57 lbs BOD/day/ac
   3. 58 lbs BOD/day/ac
   4. 64 lbs BOD/day/ac
   5. 70 lbs BOD/day/ac
3. Assuming a plant has a flow of 100 gallons per person per day, what would be the population served if the inflow to the plant is 0.10 MGD? Select the closet answer.
   1. 1,000
   2. 1,200
   3. 1,300
   4. 1,600
   5. 1,800
4. What is the velocity in a grit channel if a stick travels 40 feet in 35 seconds? Select the closet answer.
   1. 1.00 ft/sec
   2. 1.14 ft/sec
   3. 1.33 ft/sec
   4. 1.43 ft/sec
   5. 1.50 ft/sec

End of Objective Test

Objective Test

Chapter 1. Disinfection Processes

True-False

1. Wastewater should be sterilized because it is necessary and practical.
   1. True
   2. False
2. The reaction of chlorine gas in wastewater tends to decrease the pH, while the reaction of hypochlorite in wastewater increases the pH.
   1. True
   2. False
3. Free available chlorine has the highest disinfecting action of any form of chlorine.
   1. True
   2. False
4. The rise in a pH caused by hypo chlorination will decrease the disinfection effectiveness of the hypochlorite, thereby requiring a higher dosage.
   1. True
   2. False
5. Mixing of the chlorine solution with wastewater as well as the speed of mixing are extremely important ahead of a chlorine contact tank or a residual sampling point.
   1. True
   2. False
6. When something abnormal is observed in a chlorination system, corrective action must be taken.
   1. True
   2. False
7. There must be funding to purchase safety equipment and to enforce safety regulations required by OSHA and industrial safety programs.
   1. True
   2. False
8. Chlorine ton tanks may be stacked for storage.
   1. True
   2. False
9. In case of a liquid chlorine leak, the container should be rotated so leaking chlorine escapes as a liquid rather than as a gas.
   1. True
   2. False
10. Before any new chlorine system is put into service, it should be cleaned, dried, and tested for leaks.
    1. True
    2. False
11. Hypo chlorination systems consist of a water meter and a diaphragm metering pump.
    1. True
    2. False
12. Sodium chlorite is usually supplied to plants as a salt and is very combustible around organic compounds.
    1. True
    2. False
13. Chlorination is the physical or chemical removal of all traces of residua chlorine remaining after the disinfection process.
    1. True
    2. False
14. Always wash your hands thoroughly after handling sulfur dioxide.
    1. True
    2. False
15. The sulfonate vacuum is regulated by an orifice opening and the water flowing through the throat of the aspirator.
    1. True
    2. False
16. Chlorinators sed as sulfonates can deliver the full rated capacity of sulfur dioxide.
    1. True
    2. False
17. As flow increases or transmission reduces, the ultraviolet (UV) dose will be reduced.
    1. True
    2. False

Best Answer

1. What is the purpose of disinfection?
   1. To destroy all microorganisms in the wastewater being treated
   2. To destroy pathogenic microorganisms and thus prevent the spread of waterborne diseases
   3. To distinguish between pathogenic and nonpathogenic organisms
   4. To produce disinfection by-products (DBPs) to enhance disinfection effectiveness
2. What is chlorine demand?
   1. Chemical compounds containing available chlorine
   2. Chlorine in a liquid or gaseous form
   3. Concentration of chlorine present in water after the chlorine demand has been satisfied
   4. Difference between the amount of chlorine added to wastewater and the amount of residual chlorine remaining after a given contact time
3. Where is the most effective place for chlorine application for disinfection?
   1. After the chlorine contact chamber to maximize disinfection effectiveness
   2. After treatment and on a well-clarified effluent
   3. At the plant headworks to ensure adequate contact time
   4. Nearest to the chlorinators to ensure immediate application and contact
4. What happens if moisture in the air enters a chlorination system?
   1. The moisture and air will form a blockage in the system and prevent the flow of chlorine
   2. The moisture and air will readily mix with the chlorine and form a flammable mixture
   3. The moisture readily mixes with chlorine and forms hydrochloric acid, which will corrode the pipes, valves, joints and fittings
   4. The moisture will condense and reduce the chlorine carrying capacity of the system
5. What is breakpoint chlorination?
   1. A point at which chlorine leaves solution as a gas because the chlorine feed rate is too high
   2. The addition of chlorine to wastewater until the chlorine demand has been satisfied
   3. The amount of chlorine that is needed for a prticular purpose
   4. The total chlorine, present as chloramine or other deratives, that is present in a water and is still available for disinfection and for oxidation of organic matter
6. What is combined available chlorine?
   1. A point at which chlorine leaves solution as a gas because the chlorine feed rate is too high
   2. The addition of chlorine to wastewater until the chlorine demand has been satisfied
   3. The amount of chlorine that is needed for a particular purpose
   4. The total chlorine, present as chloramine or other derivatives, that is present in a water and is still available for disinfection and for oxidation of organic matter
7. What could happen if chlorine comes in contact with the sweat on your body?
   1. The chlorine could boil and run off your body
   2. The chlorine could evaporate
   3. The chlorine could form hydrochloric aci
   4. The chlorine could stick to your clothes
8. Why should water never be put on a chlorine leak?
   1. A mixture of water and chlorine will cause both water and chlorine to be wasted
   2. A mixture of water and chlorine will create a sticky residue that is difficult to clean up
   3. A mixture of water and chlorine will increase the rate if corrosion of the container and make the lea larger
   4. A mixture of water and chlorine will produce toxic chlorine gas
9. How can an operator repair pinhole leaks in the walls of a chlorine cylinder?
   1. By replacing the gasket or adapter connection
   2. By using a clamping pressure saddle with a turnbuckle available in repair kits
   3. By using a strong ammonia solution
   4. By using an emergency repair kit for this purpose
10. What should an operator do if a chlorine container is delivered to the plant showing evidence of leaking, stripped threads, or abuse of any kind?
    1. Attempt to make the necessary repairs
    2. Immediately put the defective container on line and use the chlorine as quickly las possible
    3. Refuse delivery
    4. Request the supplier to fix the container defects at the plant so the chlorine can be used
11. What is the purpose of a chlorinator injector water supply?
    1. To mix or inject chlorine gas into the water supply
    2. To provide a source of water for the chlorine solution
    3. To regulate the chlorinator vacuum, which in turn adjusts the chlorinator feed rate
    4. To relive excess vacuum by allowing air to enter the system and reduce the vacuum
12. What are hypo chlorinators?
    1. Chlorine pumps or devices used at small treatment plants
    2. Chlorine pumps or devices used to convert hypochlorite's to chlorine gas
    3. Chlorine pumps or devices used to feed chlorine solutions made from hypochlorite's
    4. Devices used to generate hypochlorite's on site
13. When chlorination is practiced for disinfection, why must the chlorine facilities provide continuity of chlorination?
    1. For the control of grease and floatables in the effluent
    2. For the prevention of effluent foaming
    3. For the protection of downstream fisheries
    4. For the protection of downstream water users
14. Why are treatment plant effluents dechlorinated?
    1. To add excess chlorine to the effluent to ensure adequate disinfection
    2. To ensure nutrients have been removed from effluents
    3. To protect receiving waters from toxic substances
    4. To reclaim excess chlorine for future use
15. Why should soapy water never be used to look for a sulfur dioxide leak?
    1. The soapsuds may get into your eyes and irritate them
    2. The soapsuds will cover up the leak and make the exact location difficult to detect
    3. The soapy water can be drawn by a vacuum into the line and then into the sulfur dioxide container
    4. The soap water combines with sulfur dioxide to form sulfuric acid, which is very corrosive and will make any leak worse
16. Why must the residual sulfur dioxide in plant effluent be measured?
    1. To be sure management will not need to monitor the effluent
    2. To be sure the operator is not spending too much time switching the sulfur dioxide containers
    3. To be sure the sulfonator is not overdosing and wasting sulfur dioxide
    4. To be sure toxic amounts of sulfur dioxide are not reaching the receiving waters
17. What happens when ultraviolet (UV) radiation is absorbed by the cells of microorganisms
    1. The UV radiation causes a “sunburn” on the surface of the organisms and thus prevents the absorption of food, causing starvation
    2. The UV radiation changes the genetic material in such a way that the organisms are no longer coliform in nature
    3. The UV radiation damages the genetic material in such a way that the organisms are no longer able to grow of reproduce
    4. The UV radiation Illuminates the organisms in such a way that they can be readily seen and destroyed by predator organisms
18. The ultraviolet (UV) light intensity that reaches the pathogens in the water being disinfected is affected by which factors?
    1. The condition o the Uv lamps and the quality of the waste
    2. The experience of the design engineer and the manufacturer
    3. The sensitivity of the monitoring instruments and the alertness of the operators
    4. The time of day and the weather conditions
19. Why must the flow velocity past the ultraviolet (UV) lights be controlled?
    1. So that the biofilms that develop on the lamps and walls will not be washed free as clumps of biofilm
    2. So that the solids in the wastewater will be prevented from settling out
    3. So that the velocity will avoid short-circuiting
    4. So that the wastewater is exposed to UV radiation long enough for the desired level of disinfection to occur

Multiple Choice

1. Which types of illnesses may be transmitted by wastewater to operators during on-the-job activities?
   1. Acquired immune deficiency syndrome (AIDS)
   2. Cryptosporidiosis
   3. Giardiasis
   4. Human immunodeficiency virus (HIV)
   5. Infectious hepatitis
2. Since vhlorine is very reactive, it is often used up before disinfection takes place by side reactions with which types of substances?
   1. Ferrous iron
   2. Hydrogen sulfide
   3. Organic material
   4. Phenols
   5. Thisosulfate
3. What are the possible benefits of up-screw chlorination?
   1. BOD reduction to decrease the load on wastewater treatment processes
   2. Odor control
   3. Permanent measure to solve problems
   4. Septicity control
   5. To prevent the deterioration of structures
4. Why might prechlorination be applied at a wastewater treatment plan?
   1. For corrosion control
   2. For grease removal
   3. For odor control
   4. To aid sedimentation
   5. To reduce plant BOD load
5. Which factors make hypochlorite use cost effective in smaller plants?
   1. Application equipment costs are lower
   2. Safety costs are lower
   3. Storage costs are lower
   4. Training costs for hypochlorite usage are lower
   5. Useful chlorine concentration in hypochlorite compounds is lower
6. Before starting any chlorination system, operators should perform which tasks?
   1. Complete the plant’s monthly data sheet
   2. Determine what equipment, pipelines, pumps, tanks, and valves are to be placed into service or are in service
   3. Read the manufacturer's literature to become familiar with the equipment
   4. Read the plant’s operation and maintenance (O & M) manual
   5. Review the plans or drawings of the facility.
7. Which tasks should be performed daily on chlorinators, including injectors?
   1. Check the chlorinator vacuum
   2. Check the injector water supply pressure
   3. Inspect the system for chlorine leaks
   4. Measure the chlorine residual at the application point
   5. Read the chlorinator feed rate on the rotameter tube
8. Which items are abnormal chlorinator conditions?
   1. Chlorine gas pressure is too low
   2. Chlorine leak in the chlorinator
   3. Chlorine residual is low
   4. Chlorine usage is high
   5. Injector vacuum is too low
9. When troubleshooting a chlorination system, what could be a probable cause of a breakout (breakaway) of chlorine?
   1. Excess mixing
   2. Inadequate diffuser submergence
   3. Inadequate mixing
   4. Insufficient injector water flow
   5. Overfeeding chlorine
10. Periodic hands-on training on the use and maintenance of safety equipment should include what equipment?
    1. Accident report forms
    2. Atmospheric monitoring devices
    3. Leak-detection equipment
    4. Leak-repair equipment
    5. Respiratory protective equipment
11. Which items should be examined when reviewing plans and specifications for chlorine facilities?
    1. Ample working space around the equipment and storage space for spare parts should be provided
    2. Chlorinators should be located as near the point of application as possible
    3. The building should be adequately heated
    4. There should be a separate room for chlorinators and chlorine container storage (above ground) to prevent chlorine gas leaks from damaging equipment and harming personnel
    5. There should be an ample supply of water to operate the chlorinator at the required capacity
12. Chlorine valves consist of which types of valves?
    1. Auxiliary tank valves for use at the container
    2. Check valves to prevent the incorrect direction of flow of gas or liquid chlorine
    3. Header valves for use on or in conjunction with manifolds
    4. Line valves for insertion in liquid and gas lines for shutoff purposes
    5. Pressure-reducing valves to reduce the pressure in gas lines where necessary
13. Which items are problems of hydrogen sulfide?
    1. Breathing hydrogen sulfide can impair your ability to smell and too much will paralyze your respiratory center
    2. Cause corrosion of metals and concrete
    3. Cause grease to plug pipes
    4. Explosion hazard when mixed with air in certain concentrations
    5. Odor nuisance
14. Which items could cause a sulfur dioxide leak?
    1. Broken lines
    2. Broken sight glass
    3. Leak-detection equipment
    4. Leaking joints
    5. Leak-repair equipment
15. If sulfur dioxide or sodium sulfite gets on the skin, which items are recommended first-aid responses?
    1. If a burn has occurred, transport the injured person to a doctor for treatment and care
    2. Induce vomiting
    3. Remove any clothing that has been contaminated
    4. Start CPR (cardiopulmonary resuscitation) immediately
    5. Wash off immediately with large amounts of water
16. Which precautions must be exercised when handling and storing sodium sulfite tablets used for dichlorination?
    1. Flood with water in case of fire
    2. Flush away small spills of dust or power with water
    3. Keep tablets dry in a tightly closed container when not in use
    4. Shovel up spilled material for disposal in accordance with directions on the Material Safety Data Sheet (MSDS)
    5. Store tablets in a cool, dry place, away from acids or oxidizers
17. Which items are possible symptoms of trouble in the operation of a gas sulfonator system?
    1. Freezing of the rotameter
    2. Leaking joints
    3. Low injector vacuum reading
    4. Sulfonator not feeding
    5. Sulfonator not reaching maximum output
18. Maintenance of sulfur dioxide systems involves maintenance in which areas?
    1. Chlorine contact basin
    2. Evaporator
    3. Piping
    4. Sulfonator
    5. Supply area
19. Maintenance in the supply area of a sulfur dioxide system includes which tasks?
    1. A record should be kept of all maintenance and repairs
    2. All joints should be tested periodically
    3. All lifting devices such as hand trucks and hoists should be properly maintained
    4. The area should be kept clean and free of unused objects
    5. The ventilation system should be periodically inspected for proper operation
20. The ultraviolet (UV) channel water level control device must be regulated by the operator to achieve which objectives?
    1. Keep the UV lamps submerged at all times
    2. Maintain the channel’s water level at a defined level
    3. Minimize variation of the channel’s water level
    4. Prevent excessive water evaporation losses due to expose of heat from the lamps
    5. Prevent excessive water layer thickness above the top lamp row
21. Which items are preliminary steps for shutdown or start-up of the ultraviolet (UV) disinfection process units and equipment?
    1. Check switches
    2. Clean units
    3. Plan ahead
    4. Prepare equipment
    5. Set controls

Math

1. What should be the approximate chlorine feed rate for a flow of 0.5 MGD and a chlorine dosage of 12 mg/L? Select the closet answer.
   1. 50 lbs/24 hr
   2. 60 bs/24 hr
   3. 70 bs/24 hr
   4. 80 bs/24 hr
   5. 90 bs/24 hr

Data for questions 59 and 60:

A rectangular sedimentation tank 10 feet deep, 25 feet wide, and 100 feet long handles a flow of 1.9 MGD.

1. What is the theoretical detention time? Select the closet answer.
   1. 2.05 hr
   2. 2.25 hr
   3. 2.35
   4. 2.60 hr
   5. 2.80
2. What is the approximate surface loading rate? Select the closet answer.
   1. 640 GPD/sq ft
   2. 760 GPD/sq ft
   3. 800 GPD/sq ft
   4. 880 GPD/sq ft
   5. 920 GPD/sq ft

End of Objective Test