Effective Date: 3-1-17

C2EP Certification Commission for Environmental Professionals

Water Treatment Operator
Certification Examination Content Outline
Classes 1-4

	Class 1	Class 2	Class 3	Class 4
1. Treatment Process				
A. Calculate and/or record:				
1. plant residuals.				
2. backwash water.				
3. daily flow rates.				
4. chemical levels and previous days usage.				
5. filter performance data.				
6. online analyzers data.				
B. Calculate chemical dosages.				
C. Interact with HMI and SCADA.				
D. Determine correct disinfectant dosage and contact time to maintain desired level of residual in system.				
E. Control treatment plant processes, chemical dosages, and equipment used to treat water.				
F. Determine and adjust plant flows to meet system demands.				
G. Troubleshoot malfunctions and problems in plant process and equipment.				
H. Identify trends and abnormal operation in plant processes by interpreting data from gauges, meters, charts, and graphs.				
I. Interpret facility and process control water meters.				
J. Maintain records of operation of treatment facilities:				
1. daily testing logs.				
2. daily equipment logs.				
3. daily intake and production.				
4. daily maintenance management reports and notes.				
5. microbiological sampling and testing.				
K. Make appropriate changes in plant processes to optimize performance and efficiency.				
L. Mix batches of chemical solutions.				
M. Add chemicals to hoppers and feed equipment.				
N. Monitor filter performance and backwash filters.				
O. Monitor the transmission and distribution system.				
P. Monitor, evaluate, and adjust:				
1. pretreatment.				
2. coagulation and flocculation (e.g., flocculation tanks, rapid mix units).				
3. clarification and sedimentation (e.g., inclined-plate, tube, up-flow solids-contact).				

The blue shading indicates that a given task statement is not applicable for the class or classes shown.

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4. filtration (e.g., biofiltration, diatomaceous earth filters, direct and conventional filtration, membranes, microscreens, slow sand, Greensand, pressure, upflow, rapid sand, cartridge).				
5. residuals disposal (e.g., lagoons, sludge drying beds, land application, on-site disposal, solids composting).	■	■		
6. backwash aids.	■	■		
7. source water treatment (e.g., copper sulfate, aeration, mixing).	■	■		
8. iron/manganese treatment.	■			
9. lime-soda ash softening.	■	■		
10. granular activated carbon.	■	■		
11. powdered activated carbon.	■	■		
12. pressure testing membranes.	■	■	■	
13. ion exchange.				
14. chemical feed pumps.				
15. online instrumentation.				
Q. Operate and control electric motors, pumps, and valves to regulate flow of water at the treatment facility.				
R. Perform calculations related to process monitoring.				
S. Ensure the proper handling, storage and use of chemicals:				
1. acids.				
2. bases.	■			
3. oxidants.				
4. coagulants.	■	■		
5. coagulant aids.	■	■	■	
6. weighting agents.	■	■	■	
7. polymers.	■	■		
8. chemical disinfectants.				
9. fluoride.	■	■		
10. corrosion control chemicals.	■			
2. *Laboratory Analysis*	■	■	■	■
A. Calibrate and repair laboratory instrumentation to ensure proper operation.				
B. Collect water samples.				
C. Perform sample preservation and documentation for laboratory samples.				
D. Perform lab tests, record results, and interpret data.				
E. Use equipment to evaluate water quality.				

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F. Perform analyses:				
1. color.	■			
2. taste and odor.	■	■		
3. turbidity.				
4. free Cl2 residual.				
5. total Cl2 residual.				
6. coagulant charge.	■	■	■	
7. fluoride.	■	■		
8. pH.				
9. hardness.	■			
10. aluminum.	■			
11. alkalinity.	■			
12. iron	■			
13. manganese.	■	■		
14. temperature.	■			
15. DBP.	■	■	■	
16. bacteria.	■	■		
17. jar test.	■	■		
18. zeta potential.	■	■		
19. transmittance and absorbance.	■	■	■	
3. Equipment Operation and Maintenance	■	■	■	
A. Adjust pumps to meet demand.				
B. Measure and analyze filter media to determine compliance with design specifications.	■	■		
C. Perform facility startup and shutdown per SOP.				
D. Calibrate inline instrumentation (e.g., pH, turbidimeters, Cl analyzer).				
E. Complete equipment maintenance and repair records, including work orders.				
F. Update asset management log (e.g., CMS).	■	■		
G. Ensure the operation and maintenance of equipment at the water treatment facility:				
1. chlorine disinfection system.				
2. filter systems (e.g., biofiltration, diatomaceous earth filters, direct and conventional filtration, membranes, microscreens, slow sand, Greensand, pressure, upflow, rapid sand, cartridge).	■			
3. clarifier.	■	■		
4. treated water storage tanks.	■			
5. clearwell.	■			

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6. Programmable Logic Control (PLC) System.	■			
7. SCADA.				
8. polymer feed system.	■	■		
9. raw and treated water pumping systems.				
10. raw water screening.	■	■		
11. ozone.	■	■	■	
12. ultraviolet.	■	■	■	
13. on-site chlorine generation.	■	■	■	
14. water intake equipment.				
15. pumps.				
16. chemical feed equipment.				
17. chemical mixing equipment (e.g., rapid mix, flocculators, static mixers).				
18. water quality analyzers.				
19. valves.				
20. injectors.				
H. Evaluate filter operation by performing filter surveillance tests.	■	■		
I. Inspect, exercise, and maintain valves.				
J. Maintain facility and process control water meters.				
K. Install and maintain facility piping (e.g., air, water, chemical).				
L. Lubricate pumps, motors, chains, conveyors, and other machinery and equipment.				
M. Operate and maintain pumps, drivers, and auxiliary equipment.				
N. Operate and maintain onsite backup power generator.				
O. Perform calibration of chemical feeders.				
P. Perform efficiency tests on pumps and related equipment (e.g., pump curves).	■	■		
Q. Perform preventive and corrective maintenance to the auxiliary water treatment plant equipment:				
1. electric motors.				
2. engines.	■	■		
3. gas and electric powered pumps.				
4. air compressors.	■			
5. emergency systems.				
6. power generation systems.	■			
7. pressure and flow regulators.				
8. online analyzers.	■			
9. filters (e.g., air, oil).	■			
10. chemical feed systems.				
11. blowers.	■	■	■	

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R. Perform routine maintenance of grounds machinery, structures, equipment, and piping systems (e.g., cleaning, painting).				
S. Perform inspections on clear well covers, hatches, access covers, vents, and overflows.				
T. Backwash filters.	■			
4. Source Water Characteristics	■	■	■	
A. Calculate stored water release based on forecasted demand.	■	■	■	
B. Evaluate the following source water characteristics:	■			
1. biological (bacterial, protozoa, viruses).	■			
2. chemical.	■			
3. potential sources of source water contamination.	■			
4. physical.	■			
C. Measure static water level and pumping levels of wells.	■			
D. Measure and monitor raw water source.	■			
E. Perform inspections of surface water sources and report any issues that may affect water quality (e.g., non-native plant species, mussels, algae, erosion).	■	■		
F. Perform inspections of ground water well sites and report any issues that may affect water quality (e.g., contamination, flooding, well head protection).	■	■	■	
G. Perform raw water reservoir inspection, maintenance, and cleaning.	■	■		
H. Plan source water protection and watershed management, (e.g., watershed related to road construction and maintenance, silviculture and forest harvesting; watershed inspections public relations).	■	■	■	
I. Determine if wells are under the direct influence of surface water (GWI).	■			
J. Monitor lake stratification.	■	■		
K. Forecast future source water availability based on climatic data (e.g., climate change, hydrologic cycle, precipitation forecast).	■	■	■	
L. Educate community on source water protection and conservation.				
5. Security, Safety, Compliance, and Administrative Procedures				
A. Accept chemical shipments.				
B. Advise on need to order chemicals, repair parts, and tools.				
C. Advise system staff and/or contractors of potential problems and alarms.				
D. Prepare budget for chemicals, laboratory reagents, and equipment.	■	■		

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E.	Inspect plant safety equipment (e.g., fire extinguishers, AED, smoke and gas detectors).				
F.	Comply with safety requirements of the facility and actively promote safe work practices.				
G.	Conduct tours of facilities.				
H.	Develop and maintain standard operating procedures.				
I.	Determine materials, labor, and cost needed for operation, maintenance, and repairs.				
J.	Procure materials, labor, and cost needed for operation, maintenance, and repairs.				
K.	Investigate consumer complaints regarding water quality and take remedial action.				
L.	Take delivery of chemicals by unloading by hand or with equipment such as fork lifts and cranes (e.g., chlorine cylinders, bulk liquids, and dry bagged chemicals).				
M.	Inspect chemical containers and security tags before taking delivery (e.g., review SDS's).				
N.	Comply with lockout tagout procedures.				
O.	Determine if water quality violations have occurred.				
P.	Ensure compliance with regulatory agency standards.				
Q.	Manage safety and environmental issues in compliance with appropriate regulatory agencies (e.g., Hazardous Waste Disposal and Air Quality Standards).				
R.	Monitor and control residual effluents to comply with regulatory permit limits.				
S.	Monitor the use of energy and chemicals.				
T.	Complete monthly reports.				
U.	Track and maintain inventory (e.g., equipment, chemical, and general supplies).				
V.	Evaluate operating records and trends.				
W.	Maintain facility operation records.				
X.	Monitor and record daily weather readings.				
Y.	Conduct confined space entries according to appropriate regulatory guidelines.				
Z.	Notify the public when reportable maximum contaminant levels are exceeded.				
AA.	Perform facility and perimeter security checks.				
BB.	Use, handle, and dispose of chemicals according to safety standards.				

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CC. Perform safety procedures (e.g., calibration of atmospheric testing devices, chemical hazards and chemical spill response, pathogens, personal protective equipment).				
DD. Perform supervisory duties:				
1. determining and assigning work schedules and tasks.				
2. enforcing policies and safety procedures.				
3. conducting performance evaluations.				
4. resolving grievances.				
5. making appropriate hiring decisions.				
6. initiating, investigating, and implementing disciplinary actions.				
7. coordinating schedule to ensure that plant resources are being utilized to achieve project specific objectives.				
EE. Plan water treatment operations:				
1. production.				
2. treatment and storage.				
3. budgeting.				
4. project management.				
5. contract management.				
6. capital improvement planning.				
7. asset management.				
FF. Review and update facility emergency response plans.				
GG. Respond to emergencies (e.g., facility upset, major spill response, natural disasters, system contamination).				