

Georgia State Board of Examiners for Certification of Water and Wastewater Treatment Plant
Operators and Laboratory Analysts
Water Treatment Plant Operator Need-to-Know
Class I, II, and III

Note: Many of the topics covered on the Class III, Class II, and Class I exams are the same. The questions asked on the Class II exam may be more detailed than those on the Class III, and those on the Class I exam may be more detailed than those on the Class II exam. Class II examinees also need to be familiar with the information on the Water Laboratory Analyst Need-to-Know.

Safe Drinking Water Act

Know and understand the following Subparts of 40 CFR 141:

Class III

- Subpart A – General Definitions
 - Action level
 - CT formula
 - Coagulation
 - Community water system
 - Conventional filtration treatment
 - Corrosion inhibitor
 - Disinfectant
 - Disinfection
 - Filtration
 - First draw sample
 - Flocculation
 - Ground water under the direct influence of surface water
 - Maximum contaminant level
 - Maximum contaminant level goal
 - Non-community water system
 - Non-transient non-community water system
 - Public water system
 - Sedimentation
 - Slow sand filtration
 - Surface water
 - Transient non-community water system
- Subpart B – Maximum Contaminant Levels
 - Chlorine
 - Fluoride
 - Nitrate
 - Turbidity
- Subpart C – Monitoring and analytical requirements
 - Asbestos sampling
 - Coliform sampling and repeat sampling
 - Turbidity monitoring, sampling and analysis

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- Subpart H – Filtration and disinfection
 - Filtration and disinfection requirements
 - Turbidity requirements
- Subpart I – Lead and Copper
 - Action level for copper
 - Action level for lead
- Subpart L – Disinfection residuals, disinfection byproducts, and disinfection byproduct precursors
 - Haloacetic acids
 - Residual disinfectant levels
 - Total trihalomethanes
- Subpart Q – Public notification of drinking water violations
 - Tier 1
 - Tier 2
 - Tier 3

Class II

- All Class III topics
- Subpart A – General Definitions
 - Diatomaceous earth filtration
 - Enhanced coagulation
 - Haloacetic acids
 - Total trihalomethanes
- Subpart B – Maximum Contaminant Levels
 - Haloacetic acids
 - Total trihalomethanes
- Subpart C – Monitoring and analytical requirements
 - Total trihalomethane sampling requirements
 - Turbidity monitoring requirements
- Subpart H – Filtration and disinfection
 - Required disinfectant residual levels
 - Disinfectant level reporting requirements
 - Turbidity level limitations
 - Turbidity level reporting requirements

Class I

- All Class III and II topics
- All of 40 CFR 141

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Water Treatment Processes

For the following water treatment processes, know how to:

- Adjust chemical feed rates
- Calculated dosage rates
- Troubleshoot process units
- Maintain processes in normal operating conditions
- Evaluate process units

Chemical Treatment/Addition

Class III

- Fluoridation
- Chlorine disinfection
- Ultraviolet disinfection basics
- pH adjustment
- Corrosion control

Class II and I

- Class III topics
- Chlorine dioxide disinfection
- Ozone disinfection
- Ultraviolet disinfection

Coagulation and Flocculation

Class III, II, and I

- Chemical coagulants
- Flocculation tanks
- Rapid mix units

Clarification and Sedimentation

Class III, II, and I

- Sedimentation basins
- Up-flow solids contact clarification
- Inclined plate sedimentation
- Tube sedimentation
- Dissolved air flotation

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Filtration

Class III

- Gravity/rapid sand filtration
- Membrane filtration
- Cartridge filters
- Slow sand filters
- Direct filtration
- Pressure or greensand filtration
- Mixed media filtration

Class II and I

- Class III topics
- Backwash recycle requirements
- Diatomaceous earth filters
- Filter aids

Source Water Treatment

Class III-None

Class II and I

- Algae control
- Chemical treatment (copper sulfate)
- Intake structure

Additional Treatment Processes

Class III

- Aeration
- Packed tower aeration
- Ion exchange softening
- Iron and manganese sequestration/removal
- Lime-soda ash softening
- Granular activated carbon

Class II and I

- Class III topics
- Copper sulfate treatment
- Powdered activated carbon
- Coagulation aids
- Filter aids
- Backwash aids

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Residuals Disposal

Class III

- Discharge to lagoons
- Discharge to lagoons then surface water
- On-site disposal
- Mechanical dewatering
- Solids composting

Class II and I

- Class III topics
- Land application

Collect Samples and Interpret Analysis

For the following parameters, know:

- If analytical results are normal or abnormal
- Regulatory sample collection and preservation procedures
- Normal characteristics of water

Class III

- Alkalinity
- Chlorine, Free residual
- Fluoride
- Hardness
- Heavy metals
- Iron/manganese
- Jar test
- Lead/copper
- Microbiological
- Nitrate
- Phosphate
- pH
- Radiological parameters
- Settleable solids
- Synthetic organic chemicals
- Temperature
- Total coliform bacteria
- Turbidity
- Volatile organic chemicals

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Class II

- Class III topics
- Aluminum
- Carbon dioxide
- Cryptosporidium
- Disinfection byproducts
- Dissolved oxygen
- Giardia lamblia

Class I

- Class III and II topics
- Conductivity

Perform Plant Process Control Laboratory Analysis

For the following parameters, know:

- How to calibrate and use appropriate laboratory instrumentation
- How to correctly perform the analysis
- The appropriate laboratory ware to use
- Quality assurance procedures
- How to perform related laboratory calculations
- Where to find regulatory-approved procedures
- What can interfere with proper analysis
- How to properly document analysis and results

Class III, II, and I

- Alkalinity
- Chlorine, free residual
- Fluoride
- Hardness
- Iron/manganese
- Jar test
- pH
- Settleable solids
- Temperature
- Total coliform bacteria
- Turbidity

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Evaluate Source Water Characteristics

Be able to evaluate the following characteristics of source water, knowing what is normal and what is abnormal:

Class III, II, and I

- Bacteriological
- Biological
- Chemical
- Physical

Equipment Operation, Maintenance, and Troubleshooting

For the following pieces of equipment, know:

- Proper operation
- Start-up and shut-down procedures
- How to recognize abnormal operation
- What to do if it is not operating properly
- Basic principles behind how it works
- Proper maintenance procedures
- How to read related charts, meters, and gauges

Class III, II, and I

- Blowers, compressors, and pneumatics
- Chemical feeders
- Chlorinators
- Cross-connection control devices
- Computers
- Electronic testing equipment
- Flow monitoring equipment
- Generators
- Hydraulic equipment
- Instrumentation
- Intake structure
- Pumps and motors
 - Types of pumps
 - Pump and motor components
 - Factors that influence type of pump to use
 - Types and correct locations of pressure gauges
 - Maintenance records
 - Improper operation
 - Cavitation

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- Head
 - Dynamic
 - Pressure
 - Static
- Valves

Safety and Security

Class III, II, and I should be able to perform security and safety procedures related to

- Confined space entry
- Manhole safety
- Location of underground utilities
- Chlorine safety
- Electrical hazards and safety
- Lock-out/tag-out
- First aid
- Use of Self Contained Breathing Apparatus (SCBA)
- Fire extinguishers
- Proper storage of chemicals, including lubricants and fuels
- Material Safety Data Sheets
- Chemical spill response
- Facility upset
- Pathogens
- Personal protective equipment

Class III should be able to perform administrative procedures, such as

- Administer compliance, emergency preparedness, and safety programs
- Develop operation and maintenance plan
- Plan and organize work activities
- Record and evaluate data
- Respond to complaints
- Write regulatory authority reports

Class II and I should be able to perform administrative procedures, such as

- Class III topics
- Develop budget

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Mathematics

Class III

- Area
- Backwash rate
- Volume
- Velocity and flow
- Chlorine dosage rates
- Flow conversions
- Head to psi conversion and psi to head conversion
- Surface loading rate
- Detention time
- Percent removal

Class II and I

- Temperature conversions
- Filtration rate

Definitions

Class III

- Acid
- Alkaline
- Anion
- Base
- Blue baby syndrome
- Cation
- Chlorine demand
- Chlorine dose
- Chlorine residual
- Coliform bacteria
- Cross-connection
- Diffusion
- Electrical terms
 - Amp
 - Hertz
 - Ohm
 - Volt
 - Watt
- Filtrate
- Grab sample
- Indicator organism
- Microfiltration
- Nanofiltration

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- Normality
- Pathogen
- Percolation
- Permeability
- Porosity
- Reverse osmosis
- Solute
- Solvent
- Specific Gravity
- *Standard Methods for the Examination of Water and Wastewater*, published by AWWA, APHA, and WEF
- Titrant
- Titration
- Ultrafiltration
- Velocity
- Vulnerability assessment

Class II and I

- Eutrophication
- Langlier index
- Stratification
- Tracer studies