



Illinois Drinking Water Exam Preparation Class C Course Syllabus

Purpose

This course is designed to prepare you for your second level drinking water operator exams.

Topics

Basic Water Math

Unit Conversions
Working with Formulas
Understanding Percentages
Calculating Area
Calculating Volume
Weight Volume Relationships
Force-Pressure-Head
Velocity and Flow Rate
Pumps
The Metric System
Problem Solving

Math and Distribution System Review

Flow Conversion Problems
System Design and Layout
Flow Rate Problems
Volume Problems
Distribution Piping
Water Storage
Fire Hydrants and Valves
Water Meters
Pumps and Motors
Cross-Connection Control
Disinfection
Distribution Disinfection Problems
Chemical Feed Problems
Corrosion Control
Water Quality
Distribution Laboratory Problems
Water Main Installation and Backfilling
Safety
Regulations
Instrumentation and Information and Technology
Hydraulics
Chemical Dose Problems
Source Water Review
Disinfection Review
Disinfection Problems
Fluoridation Review

CEUs (Contact Hours)

Upon completion of this course, you will receive a certificate for 2.9 CEUs (29 contact hours).

Completion Requirements

In order to receive [IACET CEU](#) credit for this course, you must complete the following:

- Complete each individual lesson module by watching the video lecture, completing the lesson handout, and passing the lesson quiz. A score of 70% or higher is required to pass each quiz.

Once you have completed all of these elements, your course completion certificate will be automatically placed into your learning account for printing/downloading. It will remain in your learning account even after your course access has expired.

Learning Objectives

Unit Conversions

Upon completion of this lesson the student will be able to:

- Define what a unit is
- Define what an equivalent is
- Demonstrate how units and equivalents are used to solve math problems

Working with Formulas

Upon completion of this lesson the student will be able to:

- Define what a formula is
- Demonstrate how a formula is used
- Demonstrate how formulas are rearranged
- Demonstrate how to solve math problems using formulas

Understanding Percentages

Upon completion of this lesson the student will be able to:

- Demonstrate how to convert between fractions and percentages
- Demonstrate how to convert between decimals and percentages

Calculating Area

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve for the area of a square
- Demonstrate how to solve for the area of a rectangle
- Demonstrate how to solve for the area of a circle
- Demonstrate how to solve for the area of a triangle

Calculating Volume

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve for the volume of a cube
- Demonstrate how to solve for the volume of a cylinder
- Demonstrate how to solve for the volume of a cone
- Demonstrate how to solve for the volume of a sphere

Weight/Volume Relationships

Upon completion of this lesson the student will be able to:

- Recall how many pounds one gallon of water weighs
- Recall how many gallons are in one cubic foot
- Recall how many pounds one cubic foot of water weighs
- Recall how many liters are in one gallon
- Recall how many pounds are in one kilogram
- Discuss and demonstrate how these weight and volume relationships are used to solve math problems

Force-Pressure-Head

Upon completion of this lesson the student will be able to:

- Define force
- Define pressure
- Define water head

- Recall how many psi (pounds per square inch) is one foot of water head
- Discuss and demonstrate how to solve math problems involving force-pressure-head calculations
- Demonstrate how to calculate feet of water head
- Demonstrate how to calculate pressure due to head
- Demonstrate how to calculate force on a tank due to head

Velocity and Flow Rate

Upon completion of this lesson the student will be able to:

- Define velocity
- Demonstrate how velocity is calculated
- Define flow rate
- Demonstrate how flow rate is calculated

Pumps

Upon completion of this lesson the student will be able to:

- Define horsepower
- Define water horsepower
- Define break horsepower
- Define motor horsepower
- Discuss and demonstrate how to solve pump math problems involving horsepower

The Metric System

Upon completion of this lesson the student will be able to:

- Define what metric system units
- Demonstrate how to convert between weight and volume measurements in the metric system
- Demonstrate how to convert between metric units and standard units

Problem Solving

Upon completion of this lesson the student will be able to:

- Define the five steps to problem solving
- Determine if all five steps are needed to solve a specific problem
- Explain how the five steps work
- Apply the five step problem solving method to water math problems

Flow Conversion Problems

Upon completion of this lesson the student will be able to:

- Demonstrate how to convert between MGD and gpm
- Demonstrate how to convert between MGD and CFS

System Design and Layout

Upon completion of this lesson the student will be able to:

- Define system design and layout vocabulary
- Identify what makes a water system “public”
- Identify the different types of public water systems
- Describe distribution system design considerations
- Describe different system layout designs.

Flow Rate Problems

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve math problems relating flow rate through a pipe
- Demonstrate how to solve math problems relating flow into a storage tank

Volume Problems

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve trench volume problems
- Demonstrate how to solve tank volume problems

Distribution Piping

Upon completion of this lesson the student will be able to:

- Define piping vocabulary
- Identify the four main pipe selection considerations
- Describe the construction material and construction characteristics of common pipe
- Describe different pipe joints and their applications

Water Storage

Upon completion of this lesson the student will be able to:

- Define water storage vocabulary
- Identify the purpose of water storage
- Describe the differences between various types of storage facilities
- Describe how storage facilities are constructed

Fire Hydrants and Valves

Upon completion of this lesson the student will be able to:

- Define hydrants and valves vocabulary
- Identify the four main types of hydrants
- Describe gate valve construction and use
- Describe globe valve construction and uses
- Describe ball valve construction and use
- Describe butterfly valve construction and uses
- Describe relief valve construction and uses
- Describe pressure regulating valve construction and uses
- Describe air and vacuum relief valve construction and uses
- Describe altitude valve construction and uses

Water Meters

Upon completion of this lesson the student will be able to:

- Define water meters vocabulary
- Describe the construction and operation of the different types of water meters
- Describe the normal application of the various water meters.

Pumps and Motors

Upon completion of this lesson the student will be able to:

- Define pumps and motors vocabulary
- Describe the construction and operation of velocity type pumps
- Describe the functions of the main components of a centrifugal pump

- Describe the theory of operation and common uses of positive displacement pumps
- Describe the differences between the various types of single and three-phase motors

Cross-Connection Control

Upon completion of this lesson the student will be able to:

- Define cross-connection control vocabulary
- Describe the purpose of cross-connection control
- Describe potential cross-connections
- Describe backflow control devices

Disinfection

Upon completion of this lesson the student will be able to:

- Define distribution disinfection vocabulary
- Describe the different characteristics of disinfecting agents
- Identify the different disinfection methods for water mains
- Identify different disinfection methods for water storage facilities

Distribution Disinfection Problems

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve math problems relating to mixing chlorine solutions
- Demonstrate how to solve math problems relating to chlorine dosing
- Demonstrate how to solve math problems relating to chlorine demand

Chemical Feed Problems

Upon completion of this lesson the student will be able to:

- Calculate Chemical Feed rates
- Solve Chemical Feed Problems

Corrosion Control

Upon completion of this lesson the student will be able to:

- Define corrosion control vocabulary
- Recall the factors affecting corrosion
- Describe the tools used to control corrosion
- Identify the LCR (Lead and Copper Rule) requirements

Water Quality

Upon completion of this lesson the student will be able to:

- Define water quality vocabulary
- Identify types of samples collected
- Identify sample custody requirements
- Describe which water quality parameters are monitored
- Describe what different water quality parameters indicate
- Describe the different public notification requirements

Distribution Laboratory Problems

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve math problems relating to running averages
- Demonstrate how to solve math problems relating to meter accuracy

Water Main Installation and Backfilling

Upon completion of this lesson the student will be able to:

- Define water main installation vocabulary
- Define backfilling vocabulary

Safety

Upon completion of this lesson the student will be able to:

- Define safety vocabulary
- Describe trenching safety requirements
- Describe confined space safety requirements
- Describe how to set up a traffic diversion

Regulations

Upon completion of this lesson the student will be able to:

- Define regulation vocabulary
- Describe and identify each of the following rules/regulations
 - Safe Drinking Water Act (SDWA)
 - Surface Water Treatment Rule (SWTR)
 - Total Coliform Rule (TCR)
 - Lead and Copper Rule (LCR)
 - Stage 1 Disinfection by Product Rule (DBP)
 - Interim Enhanced Surface Water Treatment Rule (IESWTR)
 - Long Term 2 Surface Water Treatment Rule (LT2SWTR)
 - Stage 2 Disinfection by Products Rule (DBP)

Instrumentation and Information and Technology

Upon completion of this lesson the student will be able to:

- Define Instrumentation and Information and Technology vocabulary
- Identify Primary and Secondary Instrumentation and Telemetry
- Define and classify Equipment Control Systems
- Define SCADA
- Define System Mapping and identify different types of system maps and symbols

Hydraulics

Upon completion of this lesson the student will be able to:

- Define Hydraulics vocabulary
- Perform calculations using force, pressure, and head

Chemical Dose Problems

Upon completion of this lesson the student will be able to:

- Describe what units are used in Polymer and Alum Dosing
- Describe what units are used in chemical feed pump calibrations and settings
- Explain the jar testing process

- Demonstrate how to calculate jar testing problems
- Explain chemical feed system calibrations
- Demonstrate how to calculate chemical feed calibration problems
- Demonstrate how to calculate feed pump settings in percent stroke
- Demonstrate how to calculate chlorinator settings

Source Water Review

Upon completion of this lesson the student will be able to:

- Define source water vocabulary
- Discuss proper water source evaluation
- Recall the different types of source water contaminants
- Explain the hydrologic cycle
- Distinguish the different types of public water systems
- Describe the main objectives of water treatment
- Formulate solutions to water quality problems

Disinfection Review

Upon completion of this lesson the student will be able to:

- Define disinfection vocabulary
- Recall the factors influencing disinfection
- Describe the agents of disinfection
- Identify the properties of chlorine gas
- Describe the relationship between pH and chlorine species
- Describe breakpoint chlorination
- Discuss the pros and cons of alternative disinfectants
- Relate chlorine safety principles

Disinfection Problems

Upon completion of this lesson the student will be able to:

- Define what units and formulas are used in disinfection problems
- Demonstrate how to solve chlorine dose problems
- Demonstrate how to solve chlorine demand problems
- Demonstrate how to solve chlorine usage problems
- Demonstrate how to solve hypo chlorinator flow rate problems
- Demonstrate how to solve hypochlorite solution strength problems
- Demonstrate how to solve hypochlorite dilution problems
- Demonstrate how to solve average pounds per day problems
- Demonstrate how to calculate chlorine supply in days

Fluoridation

Upon completion of this lesson the student will be able to:

- Define fluoridation vocabulary
- Recall fluoride chemicals
- Recall the regulations related to fluoridation
- Describe good fluoride process operation practices

- Describe the tests associated with fluoridation
- Recall key safety info associated with fluoridation

Support

Students can contact our student support staff with any course-related, content-related, or technology-related inquiries.

Our office hours are Monday-Thursday, 9-5 CT, and Friday 9-12 CT.

Contact Info

Phone Number: (661) 874-1655

General Course Inquiries: Info@americanwatercollege.org