IDEM Wastewater Operator Examination
Study Guide
Municipal Class 1-SP Exam

April 2021

As you prepare for the Municipal Class 1-SP exam, you will need to focus your study on Books 1, 2, 10, and 11 as listed on the IDEM Wastewater Operator Certification Exam Book List web page. These reference materials have been used in developing the examination questions which you will need to be able to answer.

Books 1 and 2 are manuals prepared by and available through California State University, Sacramento College of Engineering and Computer Science, Office of Water Programs (Referred to hereafter as the Sacramento manuals), which can be purchased at: https://www.owp.csus.edu/courses/wastewater.php

Book 10 is IDEM's Wastewater Operator Certification Manual, found at: https://www.in.gov/idem/cleanwater/files/wastewater_cert_booklist_10_manual.pdf

Book 11 is Stabilization Ponds, U.S. EPA Operation Manual (1977), found at: https://www.in.gov/idem/cleanwater/files/wastewater_cert_booklist_11_stabilization_ponds.pdf

This document is designed to guide you to the subject matter that you will need to be familiar with in order to pass the test. While this covers a wide range of material, you should keep in mind that the exam consists of only 50 questions, they are all multiple choice (meaning the correct answer is right there in front of you, so all you have to do is identify it), you do not need to study every chapter of these books, and since you have been working at a wastewater treatment plant for some time, much of this will already be familiar to you. **You can do this!** The breakdown of the distribution of the questions is described below.

The chapters from the Sacramento manuals that apply to your test are:

Operation of Wastewater Treatment Plants - Volume I (Book 1)
Chapter 1 Introduction to Wastewater Treatment, parts 1.1 through 1.9
Chapter 8 Lagoon Systems, parts 8.3 through 8.5

Operation of Wastewater Treatment Plants - Volume II (Book 2**)**
Chapter 15 Maintenance
Chapter 16 Laboratory Procedures and Chemistry

Other subject matter that will be found on the test includes:

Mathematics

Mathematics problems given on the examination will have a corresponding formula listed on the Formula Sheet furnished with the exam on your test day. It is recommended that you look over the formula sheets and work the problems in the Appendices in Volumes 1 and 2 of the Sacramento manuals. Solving these problems involves plugging the numbers given in the problem into the correct formula and calculating the answer.

There are a few basic rules that apply to solving formulas:

1. Work from left to right
2. Do all of the multiplication and division above the line (in the numerator) and below the line (in the denominator); then do the addition and subtraction above and below the line.
3. Perform the division (divide the numerator by the denominator).
4. Parentheses ( ) are used in formulas to identify separate parts of a problem. Work the arithmetic within the parentheses before working outside the parentheses. Use the same order stated in rules 1, 2, and 3 above when working inside of parentheses.

Web site for the Formula Sheet:
https://www.in.gov/idem/cleanwater/files/wastewater_cert_study_guide_formula_sheet.pdf

Subject Matter Topics

The following is subject matter that an operator should be familiar with. You should be able to answer questions on the points presented below. Of course, not all of this will appear on any given test, but some of it will appear on all tests. You will need to able to answer questions related to the topics presented below when sitting for the Class I-SP examination.

Basics

What is the average per capita domestic sewage flow?
As sewage ages, bacterial activity first converts insoluble organic matter to what?
What kind of algae is desirable in a pond because it is mobile and stays near the surface?
Typical products of aerobic bacteria in a waste stabilization pond are?
Typical products of anaerobic bacteria in a waste stabilization pond are?
What is the common form of crustaceans found in a pond?
Can warm water hold more oxygen than cold water?
What is “oxygen demand”?
What are the sources of oxygen in a waste stabilization pond?
What are the two major forms of algae found in a waste stabilization pond?
What is “photosynthesis”?
When do algae stop producing oxygen?
At what part of a waste stabilization lagoon will the microbial population be the greatest?
What happens if a pond is overloaded?

Name two types of anaerobic bacteria that stabilize the settled organic matter(sludge) in a waste stabilization lagoon.
How do algae help aerobic bacteria?
Describe the secondary treatment of wastewater in a pond.
Describe aerobic ponds.
Describe anaerobic ponds.
What is the difference between lagoons and ponds?
Discuss “parallel” and “series” operation.
Describe the modes of discharge used for a pond.
Explain “controlled discharge”.
For controlled discharges, certain periods of the year are normally selected. Explain the reason.
Describe “spring turnover” problems.
Explain “short circuiting” in a pond.
Describe facultative ponds.
What natural factors affect the treatment process of a pond?
How will biological activities be affected with a drop in temperature?
What is the effect of a sudden drop in temperature for a pond?
Describe the function of sunlight in the operation of a pond.
Describe physical factors affecting treatment of wastewater by a pond.
Explain why series operation of ponds is desirable in warmer months.
Describe chemical factors affecting operation of a pond.
Describe oxygen demand of wastewater.
Describe the pH changes in a pond throughout the day.
Discuss nutrient requirements for proper pond operation.

Operational Control of Ponds

What are the three major points of measurement for proper operation of ponds?
Describe control parameters of pond operation.
What is one of the most important factors affecting pond operation?
Discuss sample collection of wastewater in a pond operation.
Discuss the types of samples.
The collection of samples for a pond is recommended at a certain time of the day. Discuss this.
Discuss the preservation of samples.
Discuss sample collection from a pond.
Discuss the solubility of oxygen in fresh water.
Discuss the need of an influent flow measurement for operation of a pond.
Discuss the effect of algal growth on the effluent pH of a pond.

Discuss BOD.
Discuss the relationship between SS and BOD. Why is SS difficult to removefrom pond effluent?
What are nitrification and denitrification?
Discuss three steps of nitrification.
Discuss the importance of pond effluent color.
Discuss the importance of weather in pond operation.
Discuss the significance of water depth in pond operation.
Discuss ice cover reporting in a pond operation.

Operation and Maintenance of Ponds

Discuss operation and maintenance goals for stabilization ponds.
Describe operation and maintenance goals for anaerobic ponds.
Discuss waste stabilization pond items that require daily monitoring of operation.
Discuss the regulation of flow to improve pond operation.
Discuss the use of baffles and screens for a pond.
Discuss a controlled discharge program.

Troubleshooting

Discuss the control of water weeds in a pond.
Discuss the control of burrowing animals in a pond.
Describe weed and vegetation control for a pond.
Discuss scum control in a pond.
Describe odor control for pond operation.
Discuss insect control for a pond.
Discuss how to correct lightly loaded ponds.
Discuss a low D.O. condition in a pond.
Discuss decreasing pH in a pond.
Discuss the correction of short-circuiting in a pond.
Describe the correction of high effluent BOD from a pond.

Safety

Discuss public health aspects of pond operation.
Discuss safety precautions in the operation of pumping stations and stabilization ponds.
Describe safety precautions against infection while working around a pond and in a laboratory.
Discuss safety concerns regarding sewer gas.

Flow Meters

Describe the use of "V" notch weirs for pond flow measurements.
Describe Parshall flumes.

Laboratory Analysis

Discuss pH.
Describe procedures of pH measurement.
Describe procedures of suspended solids measurement.
Discuss measurement procedures for dissolved oxygen.
What is BOD?
Describe BOD testing procedures.
Discuss bench sheets.

Mathematics

Given pertinent data, calculate the surface area of a pond in acres.
Given pertinent data, calculate the volume of a pond.
Given pertinent data, calculate the BOD loading to a pond in lbs/day.
Given pertinent data, calculate the removal efficiency of BOD.
Given pertinent data, calculate the organic loading per acre to a pond expressed in lbs/day acre.
Given pertinent data, calculate the population loading to a pond expressed in persons/acre.
Given pertinent data, calculate the population equivalent of a BOD loading.
Given pertinent data, calculate the theoretical detention time.

We at IDEM wish you success and hope to be seeing you out there working to protect Indiana's waters and the infrastructure investments in wastewater facilities. Now, go pass that test!