



A Non-Profit Educational Corporation

OCT ACADEMY
A U.S. Government Education Educator
Class Description submittal to OESAC

Title: **Wastewater Math Grades 3-4**

☐ **New Class**, or ☐ **Class Renewal**

CEU Award requested: 1.4 **CEUs**

OVERVIEW:

This class can be given in person or livestreamed via zoom with a live instructor. This is a two (2) – day Grade 3 - 4 advanced wastewater mathematics class with exercise problems throughout the workbook in individual applied plant process control chapters. The class concentrates on representative Grade 3 - 4 process unit problem solving challenges utilizing a written Step-By-Step math solution method, conventional math formulas and a broad knowledge of conversions. These multi-step process control and logic mathematics problems reflect daily plant operation situations, data needed to complete state monthly reporting forms and typical advanced math problems encountered on Grade 3 - 4 **ABC** state wastewater operator examinations.

CLASS DESCRIPTION:

This two (2) – day mathematics class identifies **key problem-solving skills** needed by all operators. State and Association examinations heavily stress the need to know and use Process Control **formulas** and **conversions** throughout the course of each examination. OCT teaches standard Algebraic math and not dimensional analysis.



Activated Sludge

The mathematics compiled within the accompanying workbook (**WW-48**) for advanced level wastewater operators has all been arranged by process unit in logical order. Word problems are presented together with multiple choice (a, b, c, d) answers. Solutions are provided in the Step-By-Step format together with a summary of working formulas, unit process problems with written solutions, and chapter quizzes with solutions. A summary of the chapter topics appears below. During the two (2) day period, and after foundation chapter information is presented the morning of the first day, operators are then challenged to solve up to 30 – 40 math problem working on their own whenever possible. White board presentations are presented when needed for support. Support materials such as **Key Words to Formulas Cards**, **WW Pie Wheel cards**, and a summary of conversions on a **wallet card** are passed out to everyone.

OUTLINE:

Summary of Advanced Wastewater Mathematics Table of Contents (TOC)

Chapters

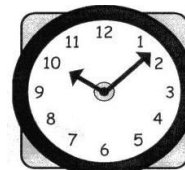
1. The Step-by-Step math solution method
2. Use of a Scientific Calculator. TI – 30 Xa.
3. Summary of Wastewater Formulas by Process Unit.
4. Conversions
5. Volumes, Mass, BOD and TSS
6. Ponds and Lagoons – Dry / wet weather water balance problems.
7. Activated Sludge and DAF Process Math
8. Anaerobic Digesters – Seeding and gas production with BTUs produced.
9. Applied Hydraulics and Pumps and amortizing cost of repair
10. Tertiary Filtration with Polymers
11. Solids Handling Problems; Belt Press, polymer usage per ton
12. Chlorine Disinfection – Gas, HTH and Sodium Hypochlorite
13. Laboratory - BOD₅, COD, CBOD, BOD and TSS.



TIME PRESENTATION OUTLINE:

Day One

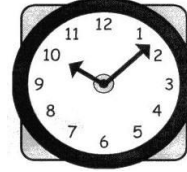
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|------------|--|
| 8:00 a.m. | The Step-By-Step Method. |
| 8:30 a.m. | Using Your Scientific Calculator |
| 9:00 a.m. | Break - 10 minutes |
| 9:10 a.m. | Summary of Key Wastewater Plant Formulas |
| 10:10 a.m. | Conversions |
| 11:30 a.m. | General Volumes and Mass Calculations |
| 12:00 Noon | Lunch |
| 12:45 p.m. | Volumes – General and Mass Calculations |
| 1:30 p.m. | Grit chambers - Velocity |
| 2:50 p.m. | Break – 10 minutes |
| 3:00 p.m. | Pumps and Pumping |
| 4:00 p.m. | Break – 10 minutes |
| 4:10 p.m. | Sedimentation Tanks and clarifiers |
| 5:00 p.m. | Close |



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Day Two:

8:00 a.m. Pumps and Pumping
9:30 a.m. Break - 10 minutes
9:40 a.m. Ponds and Lagoons
11:15 a.m. Break – 10 minutes
11:25 a.m. Trickling Filters
12:00 Noon Lunch
12:45 p.m. Activated Sludge
1:45 p.m. Break – 10 minutes
1:55 p.m. Anaerobic Digesters
3:00 p.m. Effluent Disinfection
3:50 p.m. Break – 10 minutes
4:00 p.m. Laboratory Analysis – BOD / TSS
5:00 p.m. Close



Example of Key Formulas:

1.	Lbs/Day (BOD / TSS)	=	(Vol, MGD) x (Conc., mg/l) x (8.34 lbs/gal)
2.	Dosage, mg/L	=	$\frac{(\text{Feed, lbs/day})}{(\text{Flow, MGD} \times 8.34 \text{ lbs/gal})}$
3.	Rectangular Tank Volume, cu. ft.	=	(Length, ft) x (Width, ft) x (Height, ft)
	i) Vol, Gals	=	Multiply the above by the factor 7.48 gals/cu.ft.
4.	Right Cylinder Volume, cu. ft.	=	$(0.785) \times (D^2, \text{ft}) \times (\text{Height or Depth, ft})$
	i) Vol, Gals	=	Multiply the above by the factor 7.48 gals/cu.ft.

Conversions:

A **conversion** is a number that is used to multiply or divide into another number in order to change the units of the number. In most instances conversion numbers cannot be derived. They must be known.

ABC Conversion Factors: As published.

1 acre = 43,560 square feet
1 acre foot = 326,000 gallons
1 cubic foot = 7.48 gallons
1 cubic foot = 62.4 pounds
1 cubic foot per second = 0.646 MGD
1 foot = 0.305 meters
1 foot of water = 0.433 psi
1 gallon = 3.79 liters
1 gallon = 8.34 pounds
1 grain per gallon = 17.1 mg/L
1 horsepower = 0.746 kW or 746 watts or 33,000 ft. lbs./min.
1 mile = 5,280 feet
1 million gallons per day = 694 gallons per minute
1 million gallons per day = 1.55 cubic feet per second (cfs)
1 pound = 0.454 kilograms
1 pound per square inch = 2.31 feet of water
1 ton = 2,000 pounds
1% = 10,000 mg/L
 π or pi = 3.14159

END