California Water Treatment Study Sheet

Conversions · the operator formula set · process terms · chemical jobs

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UNIT CONVERSIONS

From	To
1 cubic foot	7.48 gallons
1 gallon of water	8.34 pounds
1 cfs	448.8 gpm
1 MGD	1,000,000 gpd = 694 gpm = 1.55 cfs
1 day	1,440 minutes

From	To
1 acre-foot	325,851 gallons
1 foot of head	0.433 psi
1 psi	2.31 feet of head
1 mg/L	1 part per million (ppm) in water
1 million gallons	1 MG (the flow unit in the pounds formula)

FORMULAS

Calculation	Formula
Flow (Q)	`Q = Area × Velocity` (sq ft × ft/sec = cfs; × 448.8 = gpm)
Velocity	`Velocity = Flow ÷ Area`
Tank volume, rectangular	`gal = Length × Width × Depth × 7.48` (feet)
Tank volume, circular	`gal = 0.785 × Diameter² × Depth × 7.48`
Detention time	`Time = Volume ÷ Flow` (gal ÷ gpm = minutes)
Chemical feed, dry (pounds formula)	`lb/day = Flow (MGD) × Dose (mg/L) × 8.34` — e.g., 1.0 × 2.0 × 8.34 = 16.7 lb/day
Feed with purity	`lb/day = (MGD × mg/L × 8.34) ÷ purity (decimal)`
Dose from feed rate	`Dose (mg/L) = lb/day ÷ (MGD × 8.34)`
Liquid chemical feed	`gal/day = (MGD × Dose × 8.34) ÷ (strength decimal × lb/gal)`
Chlorine balance	`Dose = Demand + Residual`
Filtration / loading rate	`gpm/sq ft = Flow (gpm) ÷ surface area (sq ft)`
Surface overflow rate	`gpd/sq ft = Flow (gpd) ÷ clarifier surface area (sq ft)`
Percent removal	`% = (in − out) ÷ in × 100`
Dilution	`C1V1 = C2V2`

TERMS & PROCESS FACTS

Term	Reference
Treatment train order	screening → coagulation → flocculation → sedimentation → filtration → disinfection → storage → distribution
Chlorine demand	the chlorine consumed reacting with substances in the water before a residual forms
Free / total residual	free = hypochlorous acid + hypochlorite; total = free + combined (chloramines)
CT	disinfection credit factor: residual Concentration × contact Time
Alkalinity	the water's acid-neutralizing (buffering) capacity
Hardness	driven mainly by calcium and magnesium
Coagulation / flocculation	rapid mixing that destabilizes particles / gentle mixing that grows floc

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Backwashing	the cleaning method for rapid sand filters; slow sand filters are cleaned by scraping the surface layer
Corrosion promoters	dissolved oxygen, low alkalinity, dissimilar-metal (galvanic) contact, high velocity
Operator ladder	California treatment certification runs Grade T1 (entry) through Grade T5 (most advanced)

CHEMICALS — PRIMARY JOB

Chemical	Job
Alum (aluminum sulfate)	coagulant
Chlorine	disinfectant / oxidant
Fluoride compounds	fluoridation

Chemical	Job
Lime	softening and pH adjustment
Activated carbon	taste, odor, and organics removal
Caustic soda	pH / alkalinity adjustment

WHAT THIS SHEET DOESN'T COVER

- Grade-by-grade blueprint coverage — each grade (T1 through T5) weights treatment processes differently.
- Blueprint-weighted scenario application: plant-upset, water-quality, and safety scenarios, not just formulas.
- Timed, full-length exam simulation at your grade's length.
- An explanation for every answer — why the right answers are right and the wrong ones are wrong.
- A fresh set of questions on every attempt, so practice never repeats itself.

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Formulas and facts are the ABC/CWEA canon as taught in the PassProfessor California Water Treatment question banks (Grades T1–T5). Confirm grade requirements with the State Water Resources Control Board.

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