NONE

Exam Math Review
Treatment Systems
Grades III & IV
Practice Problems

The Division of Water Quality makes no claim as the accuracy of any answers provided herein.

Certification Exam Review
Treatment Grade III & IV

Math Problems - Areas

1. What is the total clarifier surface area of the treatment plant. The treatment plant has two 40 foot diameter primary clarifiers and three 45 foot diameter secondary clarifiers?

2. If a treatment plant receives 1.0 MGD, and the plant has two 48 foot diameter primary clarifiers. If one clarifier is taken out of service, what is the surface loading rate of the clarifiers in gal./ft.^{2} ?

Math Problems - Volumes

3. How gallons of wastewater is there in a 45 foot diameter primary clarifier that operates at 10 foot sidewall depth? Assume the clarifier has a 4 foot deep conical bottom.

4. A treatment plant receives 4.0 cfs, The plant has three 50 foot diameter single stage trickling filters, and the filters are 6 foot deep. If the plant has a recirculation ratio of 0.5, what is the hydraulic loading rate in gal./1,000 ft.^{3}?

Math Problems - Time

5. Activated sludge has a rectangular aeration tank that is 25 foot by 18 foot and operates at a 10 foot depth. If the plant has a flow of 0.75 MGD, what is the hydraulic detention time?

6. A sludge pump has a bore of 8 inches and a stroke of 4.5 inches. The pump operates at 30 cycles/minutes. How long will it take to pump 750 gallons of sludge?

Math Problems - Efficiency

7. If the efficiency of the primary clarifier is 55% and the TSS influent to the clarifier is 280 mg/L. What is the TSS effluent from the clarifier?

8. The motor has an efficiency of 78% and a pump has an efficiency of 81%. What is the "wire to water" efficiency?

Math Problems - Chlorine Equation

9. What is the chlorine feed rate per day for a flow of 1.5 MGD with a dose rate of 15 mg/L.

10. How many pounds of BOD are received at a treatment plant, if the flow is 900,000 gpd and the BOD influent concentration is 195 mg/L?

11. An anaerobic digester's supernate has a concentration of 30,000 mg/L and the digester produces 400 pounds of dry sludge per day. How many gallons of liquid sludge are produced a day?

Math Problems - Solid Retention Time

12. An aeration tank has the dimensions of 45 feet by 20 feet by 12 feet. The MLSS concentration in the tank is 3,500 mg/L. Sludge is wasted at a rate of 200 lbs./day and the effluent concentration is 5 mg/L. If the flow through the plant is 0.8 MGD, what is the SRT of the plant?

13. A plant has two 55 foot diameter aeration tanks, each are 12 feet deep. The MLSS concentration in one tank is 3,500 mg/L, and the other concentration is 4,000 mg/L. Sludge is wasted at a rate of 450 lbs./day and the effluent concentration is 2 mg/L. If the flow through the plant is 1.35 MGD, what is the SRT of the plant?

14. A treatment plant has three aeration basins, each 35 feet by 20 feet by 9 feet deep. The MLVSS concentration in all the basins is 2,800 mg/L. Sludge is wasted at a rate of 300 lbs/day. The flow through the plant is 1.2 MGD, and the effluent TSS concentration is 5 mg/L. Given the volatility is 70%, what is the solid retention time?

Math Problems - Mean Cell Residence Time

15. A plant has an aeration tank with the dimensions of 40 feet by 20 feet by 10 feet. The MLSS concentration in the tank is 3,500 mg/L. The plant also has two 40 foot diameter clarifiers that are 12 foot deep. The MLSS concentration is the clarifiers is 400 mg/L. The plant treats 0.5 MGD and the influent TSS concentration is 225 mg/L. What is the MCRT of the plant?

16. An activated sludge plant has 7,800 pounds of solids in the system. If the influent TSS is 200 mg/L and the plant has a flow of 0.3 cfs. What is the mean cell resident time of the plant?

Math Problems - F/M Ratios

17. An oxidation ditch has a volume of 0.75 million gallons. The MLSS concentration in the ditch is 3,800 mg/L. The influent BOD is 230 mg/L and the plant has a flow of 0.5 MGD. The volatility of the influent is 65%. What is the F/M ratio?

18. Given the desired F/M ratio is 0.2. The aeration tank is 50 foot by 15 foot and the tank is 12 foot deep. The MLVSS concentration in the tank is 5,800 mg/L. The plant treats 0.25 MGD with an influent BOD concentration of 225 mg/L. Should sludge be wasted? if so how many pounds?