

CEE 483, Win 2009. HW#1.

1. What volume of a PFR is required to remove 90% of a substance that decays according to first-order kinetics with a rate constant of 0.05 d^{-1} ? The flow rate is $395 \text{ m}^3/\text{d}$ ($\sim 105,000 \text{ gal/d}$).
2. What is the effluent concentration of a substance that enters the first reactor in a series of three CMRs at a concentration of 560 mg/L ? Each reactor has a volume of 80 m^3 , and the flow rate is $150 \text{ m}^3/\text{h}$. The substance decays according to second-order kinetics with a rate constant of 0.062 L/mg-h .
3. A system with three treatment units has an influent, Q , of $3,800 \text{ m}^3/\text{d}$. The volumes of the First and second basins are 950 and 500 m^3 , respectively. Flow from the second basin is recycled at a rate of $0.50 Q$ to the first basin. Also, 20% of the flow coming into the second basin is sent to the third basin. Seventy percent of the flow from the third basin is returned to the first basin. What are the detention times in the first and second basins, based on the total flow entering them? What volume is required in the third basin to provide a detention time of 15 d based on the total flow entering it?
4. Using information from EPA web sites and any other sources that you choose, write a short (~ 2 page) summary of the regulatory situation with regard to the drinking water contaminant indicated below. Include some discussion of the typical sources of contamination, health effects, current regulatory status, and possible treatment options.

HW Group 1: Atrazine

HW Group 2: Perchlorate

HW Group 3: Arsenic

HW Group 4: Cryptosporidium