

Problem Set 4

CEEG 340–Introduction to Environmental Engineering

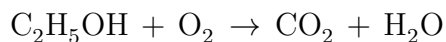
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Due Date

Friday, September 27

Problems

1. (45 points) A tanker truck carrying ethanol has a crash and spills 500 lbs of ethanol into a river adjacent to the road. The good news is that if enough oxygen is available, all of the ethanol will be biodegraded by native aerobic microbes in the river. The unbalanced chemical reaction is:



If all of the ethanol in the river is biodegraded (and converted to CO_2 and H_2O), calculate

- (a) kg of oxygen consumed
 - (b) kg of CO_2 produced
 - (c) cubic meters of CO_2 produced at 1 atm and 30 °C?
2. (20 pts) An industrial plant discharges 100 kg/day of liquids into a disposal pond. Measurements show that 1 kg/day seeps out of the bottom of the pond into the ground and 2 kg/day evaporates into the air. What is the rate of mass accumulation in the pond?
 3. (15 pts) Each day 3780 m³ of wastewater is treated at a municipal wastewater treatment plant. The influent contains 220 mg/L of suspended solids. The “clarified” water (after removal of solids) has a suspended solids concentration of 5 mg/L. Determine the mass of sludge produced daily from the clarifier. (Sludge = suspended solids removed by clarification from the influent).
 4. (20 pts) **FE Formatted Question (Multiple Choice)**
A 350 m³ retention pond that holds rainwater from a shopping mall is empty at the beginning of a rainstorm. The flow rate out of the retention pond must be restricted to 320 L/min to prevent downstream flooding from a 6-hour storm. What is the maximum flow rate (in L/min) into the pond from a 6-hour storm that will not flood it.
 - (a) 5,860 $\frac{\text{L}}{\text{min}}$
 - (b) 321 $\frac{\text{L}}{\text{min}}$
 - (c) 1,290 $\frac{\text{L}}{\text{min}}$
 - (d) 7,750 $\frac{\text{L}}{\text{min}}$

Show your work even though you wouldn't have to for the FE.