1.85 WATER AND WASTEWATER TREATMENT ENGINEERING
HOMEWORK 6

Question 1 (2 points)

You need to design an air stripper for ground water contaminated by benzene. Your ground-water extraction system will generate 0.1 m^3/s at a concentration of 100 µg/L. You need to reduce the concentration to the MCL under the Safe Drinking Water Act, which is 5 µg/L. Your manufacturer's representative tells you that their 3.5-inch plastic tripacks have a value of K_La = 0.011 sec^{-1}. Determine the diameter and height of the tower assuming a water flow rate of 0.014 m/s and stripping factor of 3.5.

Question 2 (2 points)

The results of a chlorine demand test on a raw water at 20°C are given in the following table:

Sample	Chlorine Dosage (mg/L)	Residual chlorine after 10 minutes of contact (mg/L)
1	0.2	0.19
2	0.4	0.37
3	0.6	0.51
4	0.8	0.50
5	1.0	0.20
6	1.2	0.40
7	1.4	0.60
8	1.6	0.80

a. Sketch the chlorine demand curve.
b. What is the breakpoint chlorine dosage?
c. What is the chlorine demand at a chlorine dosage of 1.2 mg/L?

Question 3 (4 points)

The average daily wastewater flow for a city is 17.6 L/s, the peak hourly rate is 28.4 L/s, and the minimum hourly rate is 7.1 L/s. Design a rectangular-cross-section grit chamber with a proportional weir outlet to control flow. Assume the grit particle to be removed has a settling velocity of 2.3 cm/s and that the chamber flow-through velocity is to be maintained at approximately 0.3 m/s. You can assume the grit chamber will be 30 cm wide and that the weir coefficient, C_W, for the proportional weir is 0.98. The proportional weir equation does not have a solution at h = 0, which is the bottom of the weir. You can set the bottom width as that determined for h = 1 cm. In other words, your weir will have vertical sides between h = 0 and h = 1 cm.

Question 4 (2 points)

Fats, oils, and grease ("FOG") is represented by the generic chemical formula $C_8H_{16}O$. Determine the COD and cell yield of FOG. Determine cell yield both per gram of FOG and gram of COD.