CEE 370	Fall 2019

Homework #2

1. ***How many grams of anhydrous Sodium Sulfate (Na_2SO_4) must be added to a liter of water so that the ionic strength equals 0.01M?***

2. ***The pesticide, parathion, undergoes photolytic degradation (destruction by absorption of energy from the sun's rays) in natural waters. This is a first order process with a rate constant of $8x10^{-7}s^{-1}$.***

    a. What is the half-life for parathion based on this degradation process?

    b. How long will it take for 90% of the parathion to degrade?

    c. How long will it take for 99% of the parathion to degrade?

3. ***Hypochlorous acid (HOCl) reacts with phenol (C_6H_5OH) to produce a wide range of products including highly offensive chlorophenols. The rate of this reaction is second order, overall (first order in each reactant). The rate constant is $2x10^3$ $M^{-1}s^{-1}$. In this problem you have 1.2 ppb of phenol in water, and to this you add 0.1 mM hypochlorous acid.***

    a. How long will it take to destroy 50% of the phenol?

    b. How long will it take to destroy 99.99% of the phenol?

4. ***Calculate the ThOD of the following wastewaters***

    a. 45 mg/L of methanol

    b. 10 mg/L of glucose

    c. 45 mg/L of methanol with 10 mg/L glucose

    d. 10^{-4} M acetic acid

    e. 5 mg/L of trichloroethane

5. ***Nitrogen occurs at a variety of oxidation states in water environments. Balance the following oxidation-reduction reaction which is important in wastewater treatment:***

$$NH_3 + O_2 \rightarrow NO_3^- + H_2O$$

Show all steps.

Assigned: 25 Sept 19
Due: 2 Oct 19

Answer Page
Fill in the boxes with the correct answer.

You will only get credit for a problem if you (1) fill in the box with the correct answer, (2) your answer is legible, and (3) you include attach page(s) with calculations backing up your answer, when requested for the problem.

Problem #

1		g/L

2	a		hours
	b		hours
	c		hours

3	a		seconds
	b		seconds

4	a		mg-O_2/L
	b		mg-O_2/L
	c		mg-O_2/L
	d		mg-O_2/L
	e		mg-O_2/L

5 $1NH_3$ + [ ] O_2 = [ ] NO_3^- + [ ] H^+ + [ ] H_2O