

**CE/ESM 479/579 Fate and Transport
EXTRA CREDIT PROBLEM SET – 2016
DUE: Thursday 6/9/2016 at CEE Office by 5 pm.**

1. A 5 kg eagle feeds on small fish from a pesticide-contaminated farm pond. The fish contain 2.0 ppm of pesticide and the eagle eats 200 g of fish each day. The eagle eliminates about 20% of its body burden of pesticide each week. What is the steady-state concentration of pesticide in the eagle.
2. Using the data tables from various readings, estimate the body concentration in mg/kg of a fathead minnow in equilibrium with water that is saturated with *n*-octane.
3. A stream contains 10^{-3} M vinyl acetate and the pH is 8.5. The main decay mechanism is hydrolysis with the following rate coefficients:

$$k_a = 1.4 \times 10^{-4} \text{ M}^{-1} \text{ s}^{-1}$$

$$k_n' = 1.1 \times 10^{-7} \text{ s}^{-1}$$

$$k_b = 10 \text{ M}^{-1} \text{ s}^{-1}$$

What is the expected half life, in hours, of vinyl acetate in this system?

4. A stream has a discharge of 3.0 L/s, is 0.2 m deep. At a certain point in the stream toluene seeps in from groundwater at a rate of 9 mg/s and dissolves into the stream. The propane piston velocity is 19 cm/h. What is the predicted toluene concentration in the stream at a point that is 35 minutes downstream of the toluene seep? (Assume air-water exchange is water-side control and is the only loss of toluene.)
5. Methylmercury very strongly partitions into fish tissues with a BCF of 10^6 L/kg. What *fraction* of the methylmercury in a lake would be in fish tissue if the lake has a volume of 10^6 m³ and contains 1000 kg of fish? (Note that you do not need to know the concentration of mercury to answer this question.)