Fate & Transport — PRACTICE PROBLEMS (For Midterm)

NOTE: These problems may NOT resemble the exact problems you will get on an exam. These are for practice in GENERALLY learning the material, not for 'just practicing for a test'. But, if you can understand these, you should do well on the exam.

① Text Ch. 1, Problem 4. (p. 58)

② Text Ch 1, Problem 13

③ Text Ch 1, Problem 21

④ A lake sediment is 5% org. carbon by weight. A sample (solid) has naphthalene conc. = 1.0 mg/kg. What is the equilibrium conc. of naphthalene in pore water.
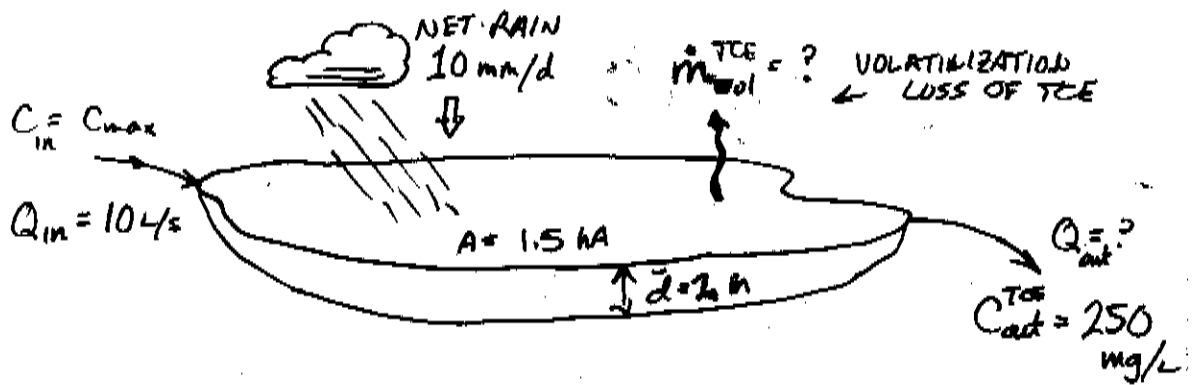
[Hint: Use regression in Table 3-5; choose one for polynuclear aromatics. [I used 3rd equ because it's same as class example]

⟹ WATCH YOUR UNITS.

⑤ A TCE spill leaves a substantial pool of pure TCE in the bottom of a small stream. (I.e., DNAPL on bottom) What is the MAXIMUM possible conc. of TCE downstream of this spilled pool?

⑥ Assume stream above contains MAXIMUM [TCE] as it discharges into a lake at a flow of Q = 10 L/s.

The lake has an area of 1.5 hectares, and average depth of 2 m. The only other input of water is net rainfall at an average of 10 mm/day (millimeters/day).

(Net here means evaporation already taken into account, so no need to worry about evaporative water loss from lake.)

NET RAIN 10 mm/d

$\dot{m}_{vol}^{TCE} = ?$ VOLATILIZATION LOSS OF TCE

$C_{in} = C_{max}$

$Q_{in} = 10 \ell/s$

$A = 1.5 \, hA$

$d = 2 \, m$

$Q_{out} = ?$

$C_{out}^{TCE} = 250 \, mg/L$

If the lake drains thru a stream at far end, as shown, and lake is well mixed. If C_{out}^{TCE} in outlet is 250 mg/L, what is the loss of TCE (in g/s) due to volatilization.

[Neglect any other losses other than volatilization.]

⟹ NOTE: This is NOT an air/water exchange problem. you can solve it just from a mass balance on TCE.