Example 6.4-2. Cephalosporin Adsorption. We are studying the adsorption of this antibiotic on a weakly anionic resin. From batch experiments, we find that

$$q(\text{g/liter resin}) = 32(y(\text{g/liter solution}))^{1/3}$$

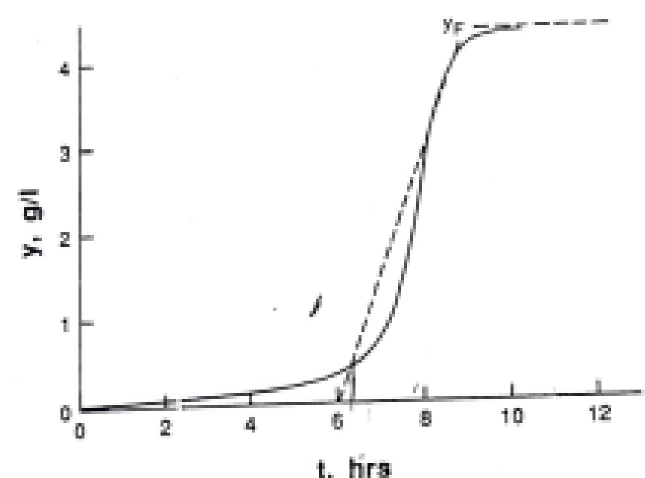
We now want to measure adsorption in a fixed bed.

The bed which we choose is 1.0 m long and 3.0 cm in diameter, with a bed density of 0.67 cm³ resin/cm³ bed. Our feed solution contains 4.3 g/liter of the antibiotic. When we use a superficial bed velocity of 2 m/hr, we obtain the breakthrough curve shown in Figure 6.4-4. Answer the following:

(a) Calculate how much of the feed is lost if we stop the adsorption when $y = 0.4$ g/liter.

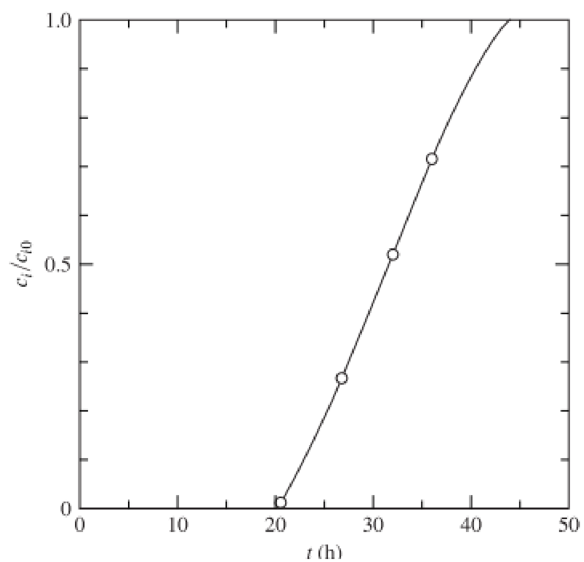
(b) Estimate what fraction of the bed's capacity is used at this breakthrough. Assume the bed is exhausted when $y = 4.0$ g/liter.

(c) Estimate the rate constant in the bed.



Problem

The breakthrough data given in Table were obtained for the adsorption of a pharmaceutical product in a laboratory column (5 cm diameter × 15 cm high) at a feed flow rate of 400 ml/h and feed concentration of 0.75 U/liter, where U is units of biological activity of the pharmaceutical product. It is desired to scale up the process to operate in a column 30 cm high. What break-point time can be expected in the 30 cm high column?



t (h)	c_i (U/liter)
20.5	0.01
26.7	0.17
32.0	0.39
36.0	0.53

Ref 2, (Harrison) Ex 7.6