

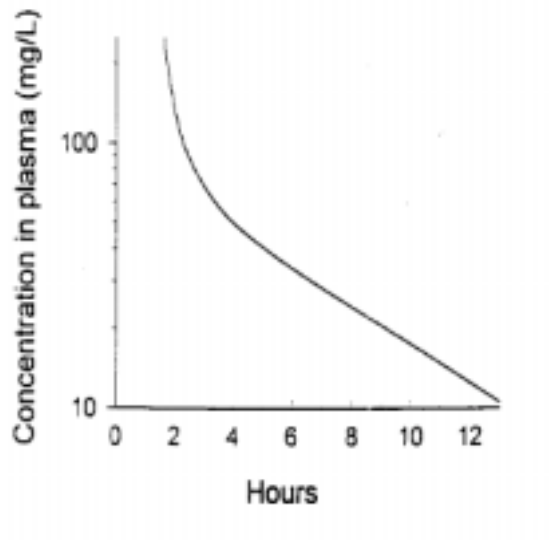
PCOL425  
PHARMACOKINETICS PRACTICE PROBLEMS

1) If equal volumes of intestinal juice (pH = 5.4) and plasma (pH = 7.4) were separated by an epithelial membrane, what would be the ratio of concentrations (plasma/intestinal juice) achieved

by an organic acid (pKa = 6.4)? An organic base (pKa = 6.4)?

2) A 400 mg dose of a drug was given to a 60 kg woman. Extrapolation of the linear portion of the drug disposition curve intersects the Y-axis at 30 mg/L. What is the fractional volume of distribution?

3) The figure shows disposition of a drug after an intravenous dose of 1500 mg. Calculate the following: Volume of distribution ( $V_d$ ); elimination constant ( $K_e$ ); half-life ( $T_{1/2}$ ); clearance (Cl).



4) If a drug has an elimination rate constant ( $K_e$ ) of  $0.3 \text{ days}^{-1}$ , how much time is required for elimination of 95% of the drug?

5) A drug has a half-life of 3.5 hours, and a fractional  $V_d$  of 0.6 L/kg. If the drug is administered by IV infusion to a 65 kg man at a constant rate of 2 mg/min, what will be the steady-state plasma concentration? How long will it take to reach 95% of that concentration?

6) A drug was present in the plasma of a patient at a concentration of 400  $\mu\text{g/ml}$ . 7 hours later, the concentration was 50  $\mu\text{g/ml}$ . Assuming that the drug is eliminated by zero order kinetics, how

long did it take to reduce the original concentration by 50%? Assuming that the drug is eliminated by first order kinetics, how long did it take to reduce the original concentration by 50%?

7) Drugs A and B are alike in that they are not metabolized, not bound to plasma proteins, and not secreted or reabsorbed by the renal tubule. Their volumes of distribution in a 50 kg woman are 10L and 30L, respectively. If the elimination half-life for A is 60 minutes, what is the elimination half-life for B? (Hint: What can you assume about the clearance of A and B?)

8) A drug is administered as an IV bolus dose of 200 mg to an 80 kg patient. The fractional volume of distribution is 0.1 L/kg.

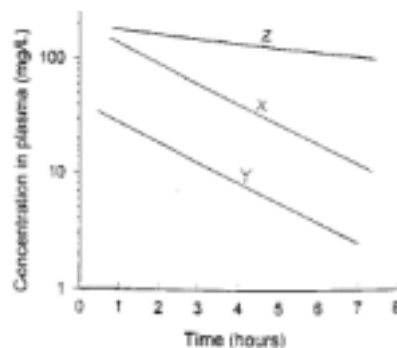
What is the theoretical concentration of drug in plasma at time = 0? After 4 hours, the concentration of the drug is 15 mg/L. What is the total amount of drug in the patient's body at 4 hours?

9) 100 mg of drug is given orally every 6 hours to a 70 kg patient. The bioavailable fraction after oral dosing is 50%. The drug is eliminated by first-order kinetics, with a half-life of 6 hours.

The fractional volume of distribution is 0.7 L/kg. How long will it take to achieve a plasma concentration that is 95% of the steady-state concentration?

10) See question 10, above. If you wished to achieve that steady-state plasma concentration immediately by IV bolus injection, what loading dose would you give? If you wished to maintain that steady-state concentration indefinitely by oral administration, what dosage regimen would you prescribe?

(11 and 12) The figure below depicts drug elimination curves, plotted on a log scale, for 3 drugs (X, Y, and Z) after identical amounts were independently administered to the same patient in bolus doses.



11 Which of the following statements is correct?

- A)  $(V_d \text{ for X}) = (V_d \text{ for Z}) < (V_d \text{ for Y})$
- B)  $(T_{1/2} \text{ for X}) = (T_{1/2} \text{ for Y}) > (T_{1/2} \text{ for Z})$
- C) Clearance for X  $(Cl_x) = Cl_y$
- D)  $Cl_z > Cl_x$
- E) Elimination constant  $(K_e)$  for X  $< K_e$  for Y

12) If X, Y, and Z were independently infused in equal amounts at a constant rate, which of the following statements would be correct?

- A) At steady state,  $[X] > [Z]$
- B) At steady state,  $[X] = [Y]$
- C) It would take longer for Z to reach a steady state than X or Y
- D) X would reach a steady state faster than Y