

LEARNING QUESTIONS

Q1. Plasma samples from a patient were collected after an oral bolus dose of 10 mg of a new benzodiazepine solution as follows:

Time (hr)	Concentration (ng/mL)
0.25	2.85
0.50	5.43
0.75	7.75
1.00	9.84
2.00	16.20
4.00	22.15
6.00	23.01
10.00	19.09
14.00	13.90
20.00	7.97

From the data above:

- Determine the elimination constant of the drug.
- Determine k_a by feathering.
- Determine the equation that describes the plasma drug concentration of the new benzodiazepine.

Q2. Assuming that the drug in Question 1 is 80% absorbed, find (a) the absorption constant, k_a ; (b) the elimination half-life, $t_{1/2}$; (c) the t_{max} , or time of peak drug concentration; and (d) the volume of distribution of the patient.

Q3. What are the main pharmacokinetic parameters that influence (a) time for peak drug concentration and (b) peak drug concentration?

Solution:

- t_{max} is influenced by k_a and k .
- C_p is influenced by F , D_0 , VD , k_a , and k .

Q4. Name a method of drug administration that will provide a zero-order input.

Solution:

A drug product that might provide a zero-order input is an oral controlled-release tablet or a transdermal drug delivery system (patch).

An IV drug infusion will also provide a zero-order drug input.

Q 5. Two drugs, A and B, have the following pharmacokinetic parameters after a single oral dose of 500 mg:

Drug	k_a (hr^{-1})	k (hr^{-1})	VD (mL)
A	1.0	0.2	10,000
B	0.2	1.0	20,000

Both drugs follow a one-compartment pharmacokinetic model and are 100% bioavailable.

a. Calculate the t_{max} for each drug.

b. Calculate the C_{max} for each drug.

Q5. The bioavailability of phenylpropanolamine hydrochloride was studied in 24 adult male subjects. The following data represent the mean blood phenylpropanolamine hydrochloride concentrations (ng/mL) after the oral administration of a single 25-mg dose of phenylpropanolamine hydrochloride solution.

Time (hr)	Conc (ng/mL)
0	0
0.25	51.33
0.5	74.05
0.75	82.91
1	85.11
1.5	81.76
2	75.51
3	62.98
4	52.32
6	36.08
8	24.88
12	11.83
18	3.88
24	1.27

a. From the data, obtain the rate constant for absorption, k_a , and the rate constant for elimination, k , by the method of residuals.