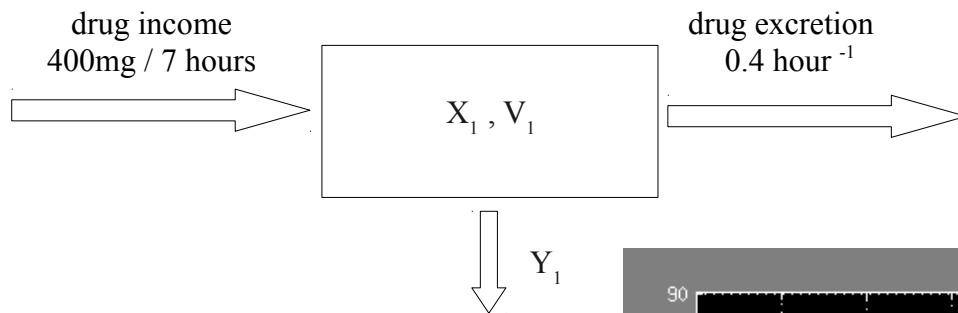


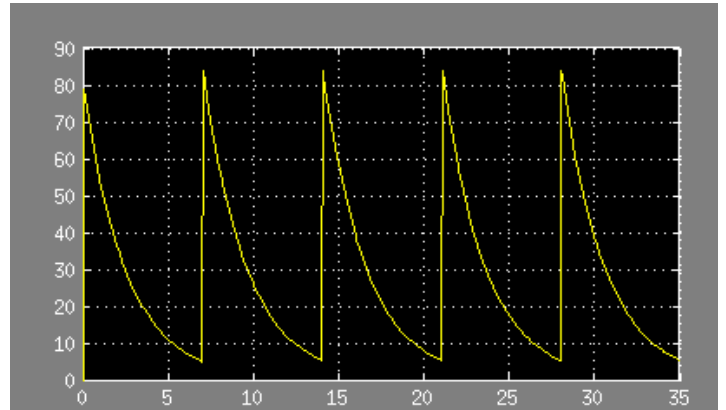
Pharmacokinetics model

Case 1:



$$X_n = X_0 \cdot (1 - e^{-knT}) / (1 - e^{-kT})$$

$$Y_1 = X_1 / V_1$$



| Symbol | Importance | Value | Units | |
|----------------|------------------------|---------------|-----------------------|--------|
| X | ammount of drug | init value: 0 | mg | Variab |
| Y | concentration of drug | init value: 0 | mg/liters | |
| V | volume of the system | 5 | liters | Param |
| K _i | income of the drug | 400 | mg/time ⁻¹ | |
| K _e | rate of drug excretion | 0.4 | time ⁻¹ | |

Case 2:

$$X1' = (-k_{12} - k_{13}) \cdot X1 + k_{21} \cdot X2 + k_{31} \cdot X3$$

$$X2' = k_{12} \cdot X1 - k_{21} \cdot X2$$

$$X3' = k_{13} \cdot X1 - k_{31} \cdot X3$$

$$A = \begin{pmatrix} -0.9 & 0.2 & 0.7 \\ 0.6 & -1 & 0 \\ 0.3 & 0 & -0.7 \end{pmatrix} \quad B = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$$

$$X1' = -0.9 \cdot X1 + 0.2 \cdot X2 + 0.7 \cdot X3$$

$$X2' = 0.6 \cdot X1 - 0.2 \cdot X2$$

$$X3' = 0.3 \cdot X1 - 0.7 \cdot X3$$

$$C = \begin{pmatrix} 1/V & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \quad D = \begin{pmatrix} 0 \end{pmatrix}$$

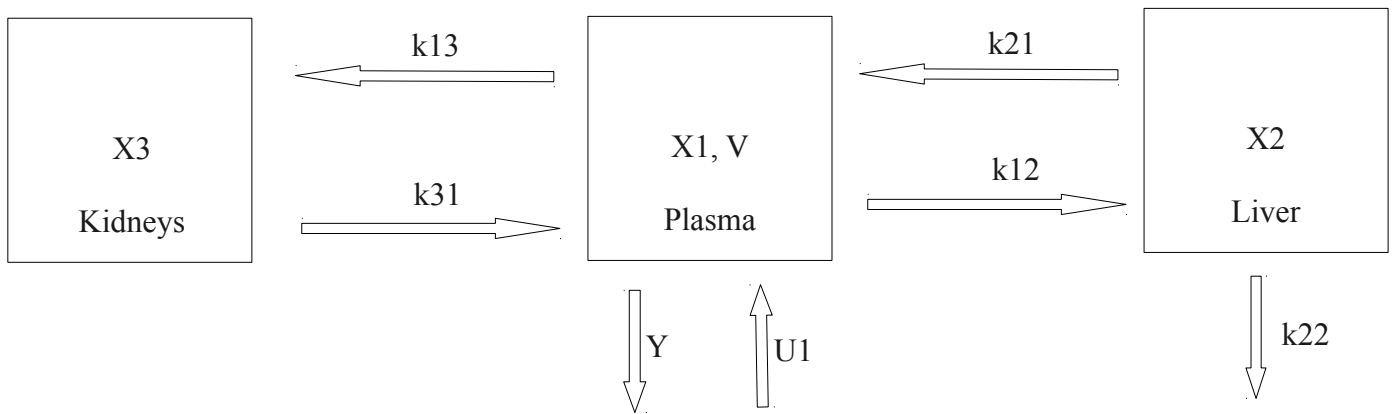


Table of variables

| | | | |
|----|---------------------------------|---------------|-----------|
| X1 | ammount of drug in plasma | init value: 0 | mg |
| Y | concentration of drug in plasma | init value: 0 | mg/liters |
| X2 | ammount of drug in kidneys | init value: 0 | mg |
| X3 | ammount of drug in intestine | init value: 0 | mg |

Table of parameters of the system

| Symbol | Importance | Value | Units |
|--------|--|-----------|-----------------------|
| V | volume of blood in the system | 5 | liters |
| k12 | drug transfer from plasma to kidneys | 0.6 | time ⁻¹ |
| k21 | drug transfer from kidneys to plasma | 0.2 | time ⁻¹ |
| k13 | drug transfer from plasma to kidneys | 0.3 | time ⁻¹ |
| k31 | drug transfer from intestine to plasma | 0.7 | time ⁻¹ |
| k22 | excretion rate from the kidneys | 0.8 | time ⁻¹ |
| U1 | drug income | different | mg/time ⁻¹ |

Figure 2: output of all 3 types of simulation.

