**The laboratory work 13**

A two-compartment model with a suction is given. 1 is a place of drug administration, 2 - chamber and chamber 3, connected to chamber 2. Between the chambers 2 and 3 the drug can circulate.



The chamber is a space-limited volume of liquid (tissue), unchanged over time. A certain volume of medicinal product is given, which is absorbed into the chamber in proportion to its mass in accordance with the equation:

$$\frac{dm}{dt}=-k\_{1}m$$

where m is the mass of the drug at the site of administration, 1, k1 is the rate of entry of the drug into the chamber (rate constant of absorption). It is assumed that the mass of the drug in 1 at the initial moment time is equal to m0, and there is no preparation in the chamber at the initial moment of time. Then the masses in chambers 2 and 3 are described by equations (2) and (3), respectively:

$\frac{dm\_{1}}{dt}=k\_{1}m-\left(k\_{el}+k\_{12}\right)m\_{1}+k\_{21}m\_{2}$;

$\frac{dm\_{2}}{dt}=k\_{12}m\_{1}-k\_{21}m\_{2}$;

where m2 is the mass of the drug in chamber 3, k12 is the rate constant of the intake of the drug from chamber 2 to chamber 3, k21 is the elimination constant of the drug from chamber 3 to chamber 2.

At the initial time in the chambers 2 and 3, the drug is absent. Once the mass of the drug at the site of administration becomes less than the threshold value ε, the time interval **Time** is recorded after which at the injection site all remnants of the previous dose of the preparation are destroyed and a new dose m = m0 is introduced.

Build a model of the system

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Variant | m0 | k1 | k12 | k21 | ε | Time |
| 1 | 45 mg | $$0.7 s^{-1}$$ | $$0.9 s^{-1}$$ | $$0.6 s^{-1}$$ | 0.01 mg | 20 s |
| 2 | 64 mg | $$0.5 s^{-1}$$ | $$0.7 s^{-1}$$ | $$0.9 s^{-1}$$ | 0.09 mg | 15 s |
| 3 | 25 mg | $$0.3 s^{-1}$$ | $$0.5 s^{-1}$$ | $$0.8 s^{-1}$$ | 0.001 mg | 10 s |
| 4 | 36 mg | $$0.6 s^{-1}$$ | $$0.8 s^{-1}$$ | $$0.7 s^{-1}$$ | 0.002 mg | 30 s |
| 5 | 30 mg | $$0.9 s^{-1}$$ | $$1.1 s^{-1}$$ | $$0.2 s^{-1}$$ | 0.004 mg | 45 s |
| 6 | 39 mg | $$0.3 s^{-1}$$ | $$0.5 s^{-1}$$ | $$0.4 s^{-1}$$ | 0.001 mg | 10 s |
| 7 | 43 mg | $$0.4 s^{-1}$$ | $$0.6 s^{-1}$$ | $$0.8 s^{-1}$$ | 0.095 mg | 50 s |
| 8 | 58 mg | $$0.7 s^{-1}$$ | $$0.9 s^{-1}$$ | $$0.3 s^{-1}$$ | 0.065 mg | 25 s |