Goldman-Hodgkin-Katz equation calculator. Each calculator cell shown below corresponds to a term in the formula presented above. Enter appropriate values in all cells except the one you wish to calculate. Therefore, at least ten cells must have values, and no more than one cell may be blank.

Please note that the unit of temperature used in the Goldman-Hodgkin-Katz equation is the Kelvin.

Interpretation. As mentioned above and as can be seen from the GHK equation shown above, the value of the membrane potential is determined by the concentration gradients and the relative permeability values of ions for which there are open channels in the plasma membrane. The physiological concentration gradients are homeostatically maintained within a very narrow range. The magnitude of the permeability (i.e., how many open channels in the plasma membrane) for any given ion can, in fact, be regulated physiologically, and determines the relative contribution of that ion to V_m. It is important to remember that the movement of any ion down its own electrochemical gradient will tend to move the membrane potential toward the equilibrium potential for that ion. The larger the permeability of a given ion, the larger the contribution of that ion will be in setting the membrane potential.

Conclusion. Thanks to the determination of different channels and transporter structures, the mechanisms that determine ion selectivity and transport in them is much better understood at present. However, the elegance, simplicity, and usefulness of the GHK equation are something difficult to beat.

APPLICATION OF THE QUEUING THEORY IN THE PHARMACY

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Introduction. Queuing theory is part of process control theory. It describes any system where queues and / or denials of service are possible. Such systems are called queuing systems; in the following we will denote them as QS. The use of this theory allows us to formalize the process and find a cost-effective solution to the problem of the ratio of the costs of eliminating queues and the danger of losing profits due to the loss of customers. The queuing theory has found wide application in various fields of activity: sales management, communication networks, aircraft landing systems and passenger traffic regulation in other types of transport, etc.

Aim. The aim of the work is to study the features of using the queuing theory to solve the problems of the pharmaceutical business, including to analyze the quality of functioning of a pharmaceutical company and to develop recommendations for improving their work.

Materials and methods. Queuing theory includes the development and analysis of mathematical models that describe the service process as a flow that forms a queue at the entrance to the QS. The main elements of a QS are: incoming flow of requests, service channels, queue of requests waiting for service, coming out served requests, coming out unserved requests.

The incoming flow of requests is a requirement requiring service. For the pharmaceutical business, these are customers in a pharmacy, customers of drugs, equipment, etc. Typically, the flow of requests obeys the Poisson law, in which the time intervals between requests are distributed according to the exponential law with density λ.

Channels are used to service requests. Under the service can be understood as the implementation of the necessary customer actions. In our case, the service is the appeal of the pharmacy visitor to the pharmacist and the issuance of necessary medications. It is usually considered that the time of request servicing is random and obeys the exponential distribution law with the parameter μ.

Requests to the system are received under the stochastic law and service channels may not always cope with their «processing». This leads to the formation of a queue of requests waiting for service. Waiting time is subject to exponential law with the parameter ν.

Depending on the type of QS chosen, two outgoing flows can be realized – served and unserved requests.

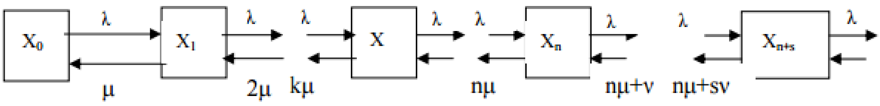
The queuing theory considers the following types of QS.

Types of QS

Item number	Classification feature	Type of QS
1	The behavior of the request in the case when all channels are busy	With denials
		Limited waiting time
		Unlimited waiting time
2	Queue discipline	With priority
		No priority
3	Service mode	With concentration of forces
		Without concentration of forces
4	Source of requests	Closed loop
		Open
5	The number of service channels	Single channel
		Multichannel
6	The composition of service channels	Homogeneous
		Heterogeneous
7	The number of service phases	Single phase
		Multiphase
8	Ability to restore channels	With channel recovery
		No channel recovery

Results and discussion. In the report, the authors consider the application of queuing theory in the field of pharmacy. Objects of pharmacy are characterized by types of QS with a limited or unlimited waiting time.

QS with a limited waiting time are used in systems of state reimbursement, for example, in the program «Valid drugs», when possible delay in the delivery of drugs. In this case, the prescription for a medicinal product is on delayed maintenance for a fixed time, after which it may lose its status. At the input of a system consisting of n service channels, a flow of requests arrives with a density λ. For the service of each request is assigned one channel from the number of free. The service time of the request is random and obeys the exponential distribution law with the parameter μ. The request, which made all the channels busy at the moment of arrival, becomes a queue and waits for service during a random time, distributed according to the exponential law with the parameter ν. If, during the waiting time, the service has not started, the request leaves the system unattended. If the service has begun, it will be completed regardless of the time the application is in the queue. The graph of such a system is



The probability that there are k requests in the system and, accordingly, k channels are busy, is calculated using the Erlang formula:

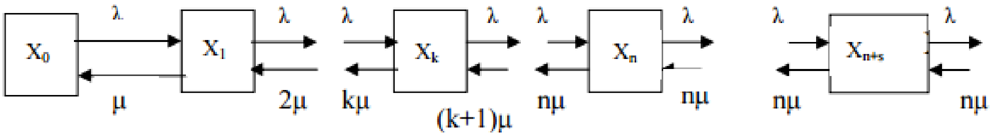
$$P_k = \frac{\dfrac{a^n}{k!}}{\sum\limits_{m=0}^{n}\dfrac{a^m}{m!}+\dfrac{a^n}{n!}\sum\limits_{s=1}^{\infty}\dfrac{a^s}{\prod\limits_{m=1}^{s}(n+m\beta)}}, \quad k=0\div n \tag{1}$$

The parameter α is called the reduced density of the incoming flow of requests and represents the average number of requests received by the system during the average service time of one request. The parameter β is called the reduced density of removal of request from the queue unserved. It is equal to the average number of requests leaving the queue unserved for the average service time of one requests (it is assumed that there is an average of one requests in the queue).

The probability that there are n + s requests in the system, n channels are busy and, moreover, s requests are in the queue, is also calculated using the Erlang formula

$$P_{n+s}=\frac{\dfrac{a^{n+s}}{n!\prod\limits_{m=1}^{s}(n+m\beta)}}{\sum\limits_{m=0}^{n}\dfrac{a^m}{m!}+\dfrac{a^n}{n!}\sum\limits_{s=1}^{\infty}\dfrac{a^s}{\prod\limits_{m=1}^{s}(n+m\beta)}},\quad k=0\div n,\ s\geq 1 \qquad (2)$$

Systems with unlimited waiting times are used in the case of guaranteed satisfaction of applications, for example, when a pharmacy requests from medical institutions or reserving drugs through the Internet. Such applications are usually completed over time. In such systems, all applications are serviced, and there is no flow of applications leaving the queue unserved. The graph of such a system is



Erlang formulas (1), (2) in this case are converted to the form

$$P_k=\frac{\dfrac{a^k}{k!}}{\sum\limits_{m=0}^{n}\dfrac{a^m}{m!}+\dfrac{a^{n+1}}{n!(n-a)}},\quad k=0\div n \qquad P_{n+s}=\frac{\dfrac{a^n}{n!}\left(\dfrac{a}{n}\right)^s}{\sum\limits_{m=0}^{n}\dfrac{a^m}{m!}+\dfrac{a^{n+1}}{n!(n-a)}},\quad k=0\div n,\ s\geq 1$$

Conclusions. The queuing theory can be successfully used in the pharmaceutical business to optimize the number of employees, the number of cash registers, assess the performance of individual departments, etc.

MODELING AND RESOLUTION OF CONFLICT SITUATION BASED ON HE RULE OF THE TALMUD IN THE FIELD OF PHARMACEUTICAL MARKET

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Introduction. At the moment, our market economy characterized by phenomena such as the decline of industry, economic crisis, lack of investment, that leads to bankruptcy of economic subjects.

The relevance and practical importance. Reallocation of funds received after the bankruptcy, crisis prevention.

Aim. Search asset allocation methods at bankruptcy. The research of distribution of property in bankruptcy, the inheritance section.

Materials and methods. Game theory is, perhaps, the most effective tool that can help find the best ways to cooperate in resolving conflicts arising in the levels – family, business, public relations.

The rule of the Talmud. Depending on the amount of the stated requirements in relation to the distributed amount of money used one or another rule. If the sum is equal to half the sum of the stated requirements, each receives ½ of its application. If the sum is less than ½ the amount of the stated requirements, then we use formula of the rules of equal payments restrictions. If the amount is more ½ the amount of the stated requirements, then we use the formula of equal rules limited damages.This rule can be determined by the following algorithm:

Divide equally among all agents until each non get an amount equal to half the minimum application. After this agent fraction with the lowest requirement for some time stops.

The main part of shared equally among the remaining, yet each of them will not get the amount equal to ½ for the next minimal application.