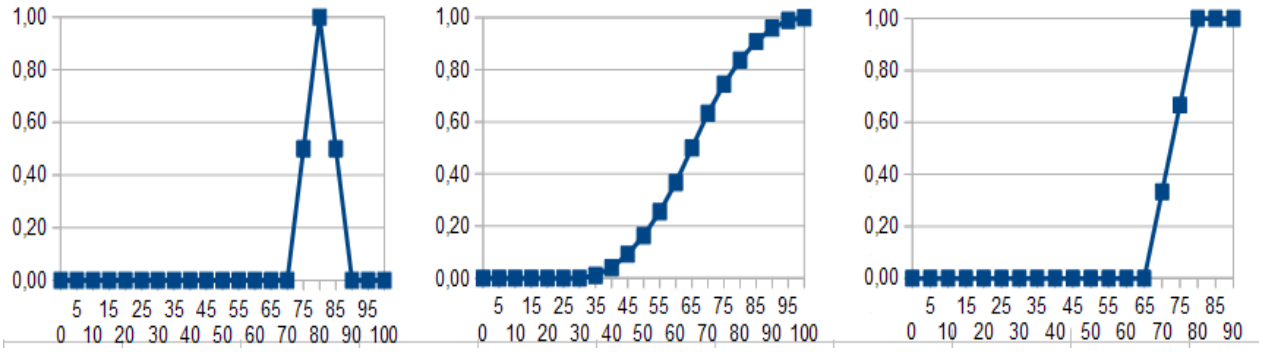


a) b) c)

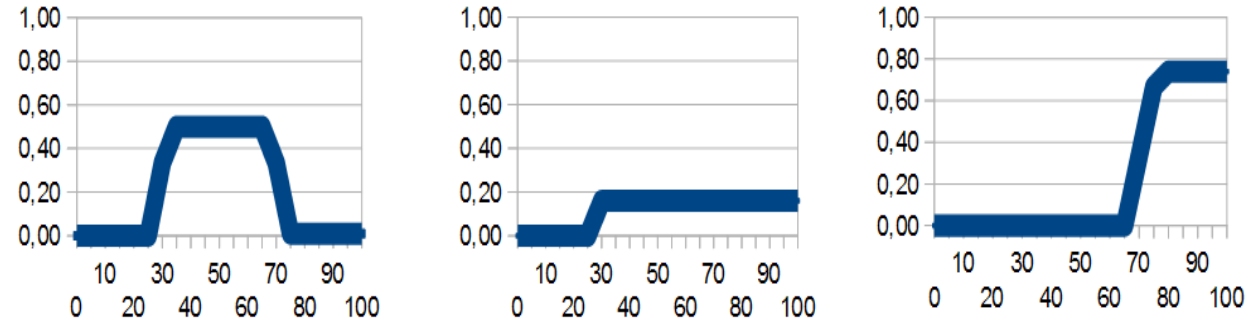
Fig.1.

a) ATTESTATION-Good; b) MOTIVATION–Strong; c) PROGNOSIS-Positive.

Results and discussion. Studies of dependence of the prognosis on motivation for a fixed value of average rating carried out. At average rating 80 and values of motivation 35, 50 and 75 points are got values of prognosis accordingly: 50.53, 65.0 and 86.45 points. The formula for finding the exact value of prognosis by the method of the center of weight has the form:

$$c = \frac{\int_0^{100} u \times \mu_A(u)du}{\int_0^{100} \mu_A(u)du},$$

where *u* varies from 0 to 100, and μ_A is the value of the functions of belonging on the interval [0,1].



a) b) c)

Fig.2. Prognosis values for average rating=80: a) motiv.=35, prog.=50.53;
b) motiv.=50, prog.=65.0; c) motiv.=75, prog.=86.45

Conclusions. The got quantitative results allow estimate the role of motivation in the process of achieving the goal. In this connection there is of interest research of motivation of students by conducting interviews of touching domestic traditions, personal desire to attain success, of prestige and highly sought of profession.

MODELING OF THE ACTION OF LASER RADIATION ON BIOLOGICAL TISSUES. APPLICATION IN MEDICINE AND COSMETOLOGY

Maslivets I. I.
Scientific supervisor: assist. Sheykina N. V.
National University of Pharmacy, Kharkiv, Ukraine
iramaslivets@ukr.net

Introduction. The unique properties of the laser beam have opened wide possibilities of its application in various fields: surgery, cosmetology, therapy, urology, ophthalmology, stomatology and diagnostics. A laser is a device for generating or amplifying monochromatic light, creating a narrow beam of light that can propagate over long distances without scattering and create an exceptionally high power density of radiation when focusing. The physical basis of the laser is the quantum mechanical phenomenon

of forced (induced) radiation. The intensive introduction of lasers into experimental and practical medicine is very important, and in some cases it is necessary in our time.

The purpose of this work is to determine the vital importance of the further introduction of laser radiation in surgery, cosmetology and other areas of medicine.

Materials and methods. Laser surgery is usually performed to eliminate malignant tumors in the early stages. In some cases, laser radiation is used to recanalize the lumen of the hollow organs in incurable patients, the treatment of some slowly progressing tumors, in particular, bladder cancer and some brain tumors, elimination of (often, successful) metastases. The application of neurosurgical laser technology can increase the radicality and reduce the traumatic operation of tumors located in the "critical" areas of the brain affecting vital and functionally significant departments, provided a gentle relationship to adjacent brain structures, preservation of anatomical and functional integrity of arterial vessels and venous collectors in the area of surgical intervention. For solving many tasks of ophthalmology, it is promising to apply laser coagulators in the near infrared wavelength range, which is due to the maximum transmittance and minimal scattering by optical media of the eye. In modern medicine there are three types of laser devices, with which cosmetic correction is performed. The laser is allocated to combat unwanted age-related skin changes or to combat wrinkles; the second type of laser struggling with unwanted hair or laser hair removal and the third type of laser that removes old capillaries. These lasers perfectly cope with their task, eliminating cosmetic problems. One of the latest innovations in laser correction was skin correction from age-related changes. Age changes are meant the vascular mesh on the face. The sound of a drill is associated with pain for many patients, and therefore continuous development of silent dental equipment is ongoing.

The Erbium Laser is an excellent alternative and meets all modern requirements. The light beam of a certain light wave is capable of silently and painlessly removing microparticles of dental tissues so that the patient does not feel any discomfort at the same time.

Results and discussion. Physical model. Laser radiation affects the biological tissue by such physical factors as: temperature, weak electric current, pressure, etc. A distinctive feature of its influence is localization. Waves of the light radiation range are absorbed and reflected by the surface of the biofilm, high-frequency rays penetrate deeper, but in any case, the impact zone only affects on a part of the biological tissue.

In conditions of the fast-moving processes of laser influence, the characteristics that determine the thermal conductivity properties of the biomaterial can be formulated as follows. 1) The number of biological layers, for example: the biological tissue of the esophagus (stomach) is a six-layer structure, formed by the epidermis, upper dermis, blood plexus, lower dermal, fatty and muscular tissues; 2) when describing the transfer of heat in the biomaterial, the layers forming it can be represented as the parallelepipeds are one after the other; 3) heat-generating capacity (perfusion) of layers is evenly distributed in volume; 4) fatty fiber performs a heat-insulating function and does not supply heat; 5) each of the layers of bio-waste is taken as a "gray" radiation, absorbing and scattering translucent medium surrounded by "gray" diffusely-reflective regions; 6) the boundaries between the layers of the biomaterial are considered translucent; 7) the contact between the layers of the biomaterial is considered absolute, that is, without taking into account the contact thermal resistance; 8) the power of laser radiation is considered a constant value in the process of heating the biomaterial; 9) the zone of local laser radiation is characterized by a certain diameter; 10) the epidermis is a layer of biomaterial, which interacts directly with laser radiation, and is characterized by a certain absorbing and reflective properties; 11) outside of the spot of laser radiation, its conditions of interaction with the environment are considered in accordance with the Newton-Richman law (convection heat transfer conditions); 12) adiabatic conditions or conditions of convective heat transfer are considered on other surfaces of bio-waste. Accepted assumptions allowed constructing a physical model of biological tissue (stomach or esophagus).

Mathematical model. A mathematical model for heating a specimen of biological tissues under the action of laser radiation, taking into account absorption, radiation and scattering by a translucent medium surrounded by translucent diffuse reflection boundaries, can be represented as a non-stationary nonlinear heat equation with internal heat sources:

$$p_i \frac{\partial h_i}{\partial \tau} = \Delta[(T)\Delta T]\lambda_i + q_{\nu bi}(T) + E_i(T)$$

where p is density, kg/m³; $h = \int_{T'}^{T} p(T)dT$ is volume enthalpy J/(m³·K); $\Delta = \left(\frac{\partial}{\partial x}, \frac{\partial}{\partial y}, \frac{\partial}{\partial z}\right)$ is the Hamiltonian operator; $\hat{\imath}$ is thermal conductivity, W/(mK); T is temperature, K; $i = \underset{l,M}{\rightarrow}$ is index of the biological tissue element; $q_{vb}(T) = c_{pb}\rho_b w_b(T_b - T)$ is the density of the internal source of heat associated with perfusion, W/m; E (T) is the volume density of the radiation heat flux of the "gray" radiation, absorbing and dispersing medium (W/m³), which is determined by the intensity of the radiation from the solution of the transport equation $dI\frac{dI(s,\Omega)}{ds} + +\beta I(s,\Omega) = KI_b(T) + \frac{\sigma_s}{4\pi}\int_{4\pi} I(s,\Omega')d\Omega'$; s is the length of the path measured along the direction of radiation propagation Ω, m; I is intensity of radiation along s in the cortical corner Ω, W/(m².sr); $I_b = \frac{n^2\sigma T^4}{\pi}$ is intensity of radiation of an absolutely black body, W/(m2.sr); σ is the constant of Stefan-Boltzmann, W/(m².K⁴); n is index of refraction of the medium; $\beta = K+\sigma_s$ is the relaxation factor of the medium, m^{-1}; K is absorption coefficient of medium, m^{-1}; σ_s is the scattering factor of the medium, m^{-1}. For numerical solution of problems, the method of discrete ordinates (MDO) is used, namely the method of finite volumes (MSO), which is widely used for the problems of convective heat transfer.

Conclusions. In the course of this work, a theoretical analysis was made of the vital importance of laser radiation application in surgery, cosmetology, and dentistry. Analyzing the theoretical material, we can say that the application of laser technology is very commonly used in modern medicine. Especially lasers gain popularity in surgery. Laser technology is used widely in oncology. Depending on the wavelength of radiation, its dose and methods of exposure, tumor growth may be accelerated or inhibited. Laser technology is used successfully to treat many benign neoplasms.

The application of neurosurgical laser technology can increase the radicality and reduce the traumatic operation of tumors located in the "critical" areas of the brain affecting vital and functionally significant departments.

Since laser biotechnology deals with living objects, in addition to the physical and chemical manifestations of light radiation, it is necessary to take into account the influence of light on the functioning of living matter, which is determined by the degree of homeostasis of a living object. Laser radiation affects the biological tissue by the following physical factors: temperature, weak electric current, pressure, and so on. A distinctive feature of its influence is localization. The physical and mathematical model can reliably describe the nonstationary distribution of temperature in the sample during laser radiation exposure.

MATHEMATICAL ANALYSIS OF THE DYNAMICS OF POPULATIONS GROWTH IN EUROPEAN STATES

Mitusov O. E.
Scientific supervisor: prof. Kokodii M. G.
National University of Pharmacy, Kharkiv, Ukraine,
kokodiy.n.g@gmail.com

Introduction. Trend in the number the population of countries is a very important factor of its existence. Therefore, there are groups that are made the analysis of the existing situation and outlook for the future in all countries and international organizations.

Aim. Determine population trends in Europe and the Commonwealth of Independent States over the years and now.

Materials and methods. Mathematical models are developed for this purpose. The different differential equations are using for this purpose. For example the statistical data on population of Earth for the time from the beginning of our era until the year 2030 is showing in fig.1. This process is described by the differential equation