

	<h2 style="color: blue;">"EFFECTS OF ELECTROMAGNETIC FIELD ON BIOLOGICAL OBJECTS" PRACTICAL COURSE ONLINE ON MODULAR SYSTEM.</h2>
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ABSTRACT	<p>This article consists of three main parts and a conclusion. This article is published in Samarkand State Medical Institute "The effect of electromagnetic fields on biological objects" devoted to methods of teaching the subject. The first part provides methodological guidelines for the module system, and the second part provides practical course information. In the third part, the module system assesses students' scores on lectures and control tests, mutual questions and answers, independent work and activity in the classroom.</p>
Keywords:	Electromagnetic field, training in a modular system, practical lesson, independent work.

One of the main directions of training in the field of medicine is to acquaint them with modern technical means used in modern diagnosis and treatment, an in-depth study of these techniques, a thorough study of their impact on physical factors in correct diagnosis and treatment.

One of the most common physical methods of treatment is galvanization and the introduction of drugs into the body through the skin and mucous membranes, ie electrophoresis.

All matter is made up of atoms and molecules, each of which forms a system of charges.

Therefore, the position of objects is directly related to the current flowing through them and the effect of the electromagnetic field. Since the primary mechanism of action of currents and electromagnetic fields on the body is a physical mechanism, we consider its use in medicine for therapeutic purposes.

About $\approx 70\%$ of the human body is made up of fluids. They contain ions involved in various exchange processes. Training at the Samarkand State Medical Institute (SamDTI) has been conducted in a modular system since 2013.

More than six and a half terabytes of data were collected on the basis of the modular system of the Institute's platform. According to the State Educational Standards and the decision of the "Pedagogical Council" of the Institute on August 14, 2020, 18 hours of lectures, 54 hours of practical classes and 36 hours of independent work are allocated for the subject "Medical and Biological Physics" [1.2.3].

Given the current prevalence of the Coronavirus pandemic around the world, and the recurrence of various infectious diseases in some countries, the SamDTI platform will sometimes explain the advantages of modular

training during a workshop on "The impact of electromagnetic fields on biological objects."

"The effect of electromagnetic fields on biological objects" 80 minutes are allotted for the practical lesson on the topic. The main purpose of writing this article is to cover in detail the practical lesson online on the platform SamDTI, modular system, programs "ZOOM" and "Telgram", to show the priorities and evaluation criteria.

I. Time distribution of the practical lesson on "The effect of electromagnetic fields on biological objects."

1. Organizational part of the lesson (5 min)
2. Evaluate questions and answers with students online. (10 min)
3. Information on the operation of tools and equipment required for laboratory training. (5 min).
4. Information about biological organs and tissues in the electromagnetic field (10 min).
5. Brief information about galvanization and electrophoresis. (5 min).
6. Theoretical information on treatment with devices "Diathermy and local darsonvalization" (10 min).
7. "Exposure to electromagnetic waves" - Theoretical information about sleep therapy. (10 min).
8. Students solve theoretical tests in a modular system (20 min)
9. Concluding part of the lesson (5min).

II. Students should know about the topic: [3.4.5.6]

1. Information about alternating and constant current.
2. Ohm and Joule-Lenz law.
3. Descriptions of the equipment needed for treatment.
4. What is the effect of the electromagnetic field on biological objects?
5. What is "galvanization"?
6. Electrophoresis of drugs.
7. Types and sizes of electrodes.
8. Methods of placement of electrodes.
9. Faraday's laws.
10. Diathermy and local darsonvalization.

11. Local darsonvalization.
12. Induction heating.

III. Additional questions to reinforce the practical lesson: [3.7.8]

1. What is "galvanization"?
2. What is drug electrophoresis?
3. Types and sizes of electrodes?
4. Explain the methods of placement of electrodes?
5. Advantages of electrophoresis of drugs?
6. Explain diathermy?
7. What is darsonvalization?
8. What is local darsonvalization?
9. What is inductothermy?
10. Explain the effects of exposure to electromagnetic waves?

IV. The text of the practical training on "The effect of electromagnetic fields on biological objects" was presented in the modular system of the platform SamDTI (We also abbreviate the text). [3]

All matter is made up of molecules, each of which forms a system of charges. Therefore, the position of objects in the electric field is directly related to the current flowing through them and the effect of the electromagnetic field.

Since the primary mechanism of action of currents and electromagnetic fields on the body is a physical mechanism, we will consider its use in medicine for therapeutic purposes. Most of the human body is made up of biological fluids.

They contain ions involved in various exchange processes. Under the influence of an electric field, ions move at different speeds and accumulate near cell membranes, creating an opposite electric field called the polar field.

Thus, the primary effect of direct current depends on the movement of ions, their separation in different elements of the tissue and changes in their concentration. The effect of direct current on the body depends on the strength of the current, so the electrical resistance of tissues and primarily the skin is very important. The specific resistance of the skin is $\approx 105 \text{ Ohm} \cdot \text{m}$, moisture significantly reduces the resistance of the skin, which can

cause a much larger current to pass through the body, even at low voltages. A continuous DC voltage of 60-80 V is used as a treatment method of physiotherapy (galvanization).

The current source is usually two semiconductor rectifiers - galvanizing apparatus. To do this, use electrodes made of lead or staninol with a thickness of 0.3-0.5 mm. Hydrophilic gaskets moistened with warm water are placed between the electrodes and the skin, as the product of electrolysis of the salt solution in the tissue can burn the body. The DC current is dosed according to the milliammeter reading, assuming that the maximum allowable current density is 0.1 mA / cm².

Treatment is also used in practice when the drug is administered from a constant current through the skin or mucous membranes. This method is called drug electrophoresis. For this purpose, the same work is done as during galvanizing, but the active electrode gasket is wetted with a solution of the appropriate substance.

The drug is injected from the same pole as it has a polar charge: A physiotherapeutic treatment called diathermy and local darsonvalization are used to conduct high-frequency current through the tissue. Diathermy uses a current with a low attenuation oscillation, a frequency close to 1 MHz, a voltage of 100-150 V, and a current of several amperes. Skin, (105 Ohm · m) fat, (33.3 Ohm · m) bones (107 Ohm · m) muscles, (2 Ohm · m) have the greatest specific resistance, so they heat up a lot. Blood or lymph-rich organs — the lungs, the liver, the lymph nodes — are the warmest organs. The useless release of too much heat in the skin layer and subcutaneous tissue is a shortcoming of diathermy. Diathermy is currently emerging from therapeutic practice and is being replaced by another high-frequency exposure method.

This is due to the high risk of diathermy: a malfunction of the apparatus, biological: accidental sparking at the place where the electrodes are placed due to the installation of the object directly on both poles and a large current can lead to tragic consequences.

Darsanvalizatsiya-a method of exposure to client tissue with a small current (0.02 mA), high voltage (20kv) and high frequency (110 kHz) fast-extinguishing pulsed current for therapeutic purposes.

Local darsonvalization The frequency is 100 ÷ 400 kHz, the voltage is tens of kilovolts, and the current is small - 10 ÷ 15 mA.

High-frequency current is a factor influencing the electric discharge generated between the patient's skin and the electrode.

Inductothermy- is a method of treatment in which a specific part of the body is exposed to a high-frequency (40.68 MHz) magnetic field.

Tissue-rich tissues, such as muscle, heat up more than adipose tissue.

heats up more than the cast. Typically, during inductothermy, the local effect of an alternating magnetic field is applied using spiral or flat-wound cables.

Treatment with floating currents can also be performed during general darsonvalization. In this case, the patient is placed inside a cage-solenoid, where a high-frequency pulsed current is sent through the solenoid windings.

Exposure to electromagnetic waves-It is a physiotherapeutic method based on the use of electromagnetic waves in the ultra-high frequency (UHF) range, divided into two depending on the wavelength: microwave therapy (frequency 2375 Gts wavelength 12.6 cm) and decimetre wave therapy (frequency 460 wavelength 65.2 cm). At present, the theory of the thermal effects of OYUCH fields on biological objects is the most developed. An electromagnetic wave polarizes the molecules of matter and periodically reorients them like an electric dipole. In addition, the electromagnetic wave affects the ions of the biological system and the conduction generates an alternating current. Just as shear currents are generated in a substance in an electromagnetic field, conductive currents are also generated. All this leads to heating of the substance. If we say that the biological tissue is electromagnetic, then the amount of heat

released is given by the formula $Q_1 = \frac{E_0^2}{\rho}$ where the E-electric field strength is the specific resistance of the r-electron. If the biological tissue is dielectric, then the amount of heat released $Q_2 = \omega E^2 \varepsilon \varepsilon_0 \tan \delta$ is found by the formula. Here the cyclic frequency of the ω -oscillation is the e-relative dielectric constant d-dielectric loss angle.

Hence, the amount of heat released by the tissue under the action of UYuCh is equal to $Q = Q_1 + Q_2$. Electromagnetic waves can disrupt hydrogen bonds by affecting biological processes and affecting the orientation of DNA and RNA macromolecules. The depth of penetration of electromagnetic waves into biological tissues depends on the ability of these tissues to absorb wave energy, which in turn is determined by the structure of the tissue as well as the frequency of the electromagnetic wave. Accordingly, the centimeter electromagnetic wave used in physiotherapy penetrates about 2 cm into muscle, skin and biological fluids, and about 10 cm into fat and bone.

V. The following additional texts on the topic "Effects of electromagnetic fields on biological objects" are presented in the module system. [3]

Structure and principle of operation of galvanized electrophoresis apparatus. Principles of operation of the device ChYuCh-30.

VI. Assessment of students in the modular system on the topic "The effect of electromagnetic fields on biological objects."

1. Scores from the learner tests.
2. Scores from situational tests.
3. Control tests.
4. Written online answers to control questions.
5. Activities in the platform system are evaluated taking into account.

VII. Advantages of teaching practical lessons in the modular system of the platform SamDTI "zoom" and telegram: [1,2].

1. Students participate in video conferences on the platform module system and the program "ZOOM", organized by professors and teachers.
2. The student can enter the module system of SamDTI platform at any time, independently master the text of the report and practice there, and in case of any misunderstandings, he can easily ask during the video conference.
3. Students have the opportunity to get acquainted with the videos on the topic and additional information on the topic in the modular system of the platform SamDTI.
4. Students have the opportunity to strengthen their knowledge by solving tests on the topic, situational tests.
5. The ability of the teacher to control the activity of students on the given topic.
6. The ability of the speaker to control the activity of the student in the modular system of the platform SamDTI.
7. Students can find out the questions on the topic in the telegram program and ask the professor for answers.

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