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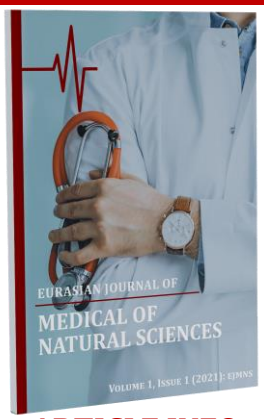

INVESTIGATION OF THE STRUCTURE OF X-RAY TUBES IN HIGHER EDUCATION INSTITUTION BY INTERACTIVE METHODS

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ABSTRACT

Issues related to the use of interactive teaching methods for X-ray tubes in higher education will be analyzed. Lectures, practical and seminar classes provide general information about the interactive learning activities of students. In particular, the exploratory student-teacher approach to student learning. based on the fundamental principles of the conceptual approach such as . With the effective organization of the process of training future teachers in higher education, as a result of the use of modern pedagogical technologies in education, the training of qualified personnel is achieved.

INTRODUCTION

One of the main trends in the modern education system is informatization, mainly due to the introduction of various media methods that stimulate the creation and optimization of the educational process. The information space of higher education is designed to improve the interaction and quality of the educational process of all its structures, especially those that are designed to ensure the efficiency and conditions for the activities of institutions as a whole. However, it is important not only to introduce multimedia teaching aids, assimilate the material, increase the motivation of students, activate their independence, but also the precise formation of the multifaceted competencies of the future specialist.

there is a need to determine the optimal forms of teaching methods and actions based on an individually differentiated approach to students. One of the innovative teaching methods is interactive learning.

A person -centered , developing educational paradigm allows you to actively introduce interactive methods and forms of its organization, forms effective mental activity of students and cognitive curiosity.

methods of teaching X-ray tubes in high school allows students to master the subject more deeply.

RESULTS AND DISCUSSION

According to A.A. Verbitsky, the more diverse the role and position of the student in the activity, the more the future specialist develops, that is, the personality, the teaching is formed, and the creative approach to learning develops meaningful

activity, flexibility, tries to think deeper. . The study of interactive methods in the learning process is primarily associated with the quality of training of highly qualified specialists [1].

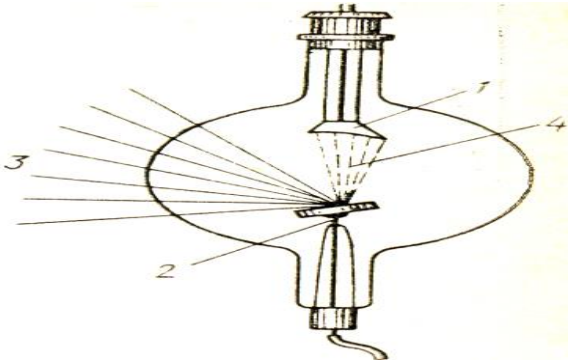
Attracting interactive teaching methods forms active learning and knowledge, skills and competencies of students. According to G. M. Gazizova, these methods are especially effective in teaching the structure of X-ray tubes: they ensure the activity of students (participation in the learning process - activation); based on experience; relies on needs and personal motivation, shows respect for students; creates friendly relations [2].

The most common methods for teaching the design of an X-ray tube;

1. Problem report. By resolving existing contradictions in problem situations, students can independently come to conclusions that the teacher should declare as new tasks. Problem reports Ensuring the creative mastering of the principles and laws of construction of X-ray tubes by future specialists; it is necessary to strengthen the educational activities of students, their independent auditory and extracurricular activities, to practice the acquisition and application of knowledge.

Didactic materials on the topic

X-rays are electromagnetic waves with a length of approximately 80 to 10-5 nm. The longest wavelength X-rays are associated with short wavelength ultraviolet light, while the shortest wavelength X-rays γare associated with long wavelength radiation. There are two types of X-ray depending on the method of excitation: inhibitory and characteristic [4].



1-расм

The most common source of X-ray radiation is an X-ray tube, which is a two-electrode vacuum device (Fig. 1). The heated cathode emits 1 electron 4. The surface of the anode 2, often referred to as the anticathode , is inclined in an oblique direction to guide the X-ray beam 3 at an angle to the tube axis. The anode is made of a material that conducts heat well so that the electrons can transfer the heat generated when they hit the anode surface. The anode surface is made of a high-order material, insoluble in the periodic table , such as tungsten. In some cases, the anode is deliberately cooled with water or oil [5].

2 . Lecture-visualization. This type of presentation was the result of a new application of the principle of presentation to students. The lecturer prepares lecture materials using visual slides and multimedia.

It is important that the X-ray source in the tubes used for diagnostic purposes be a point source. This requires the electrons to be focused in one place on the anticathode, so two opposite points

The reason for this is that the students cannot imagine if it is not explained by the arrangement of the x-ray tube and the demonstration of the equipment. For example, the structure of an X-ray tube (Fig. 1). The anode electrode should be rotated around the axis using a special tool (Fig. 2).

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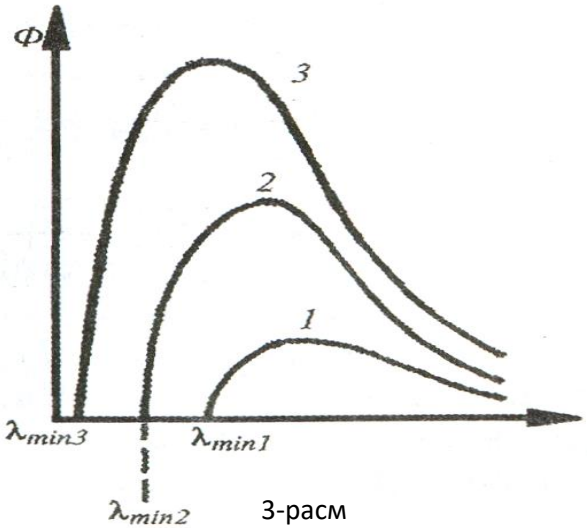
must be considered when designing the anode: infrared light is visible due to thermal radiation, or it interferes with the reception of pure x-rays in ultraviolet light. This technical problem can be solved in three ways: 1. The surface of the anode electrode must be quantized with heavy metals (basic phosphorus) in the periodic table. 2. The anode electrode should be

Its mechanism can be explained as follows. A magnetic field arises around a moving charge, the induction of which depends on the speed of the electron. When the electron is decelerated, the magnetic induction decreases and an electromagnetic wave is generated

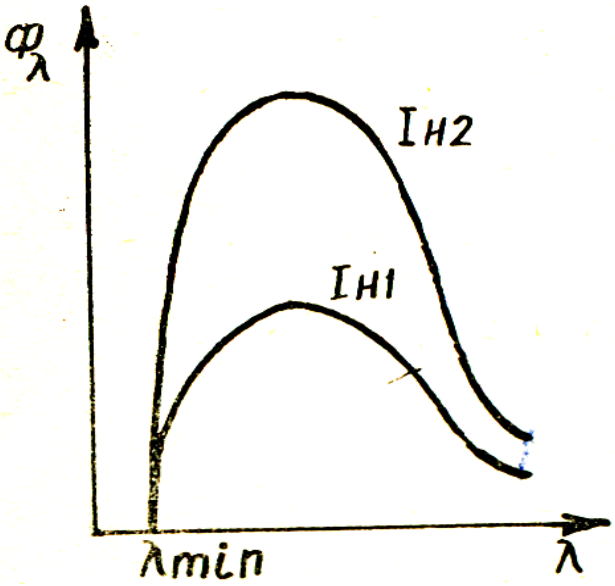


3-расм

according to Maxwell's theory.

When the electrons are decelerated, only part of the energy is used to generate X-rays, while the rest is used to heat the anode. Since the ratio between these parts is random, when a large number of electrons decelerate, a continuous spectrum of x-rays is formed. Because of this, bremsstrahlung is also called discontinuous emission. On fig. Figure 3 shows the dependences (spectra) of the X-

periodically cooled with a special liquid or oil.3. The anode electrode should be rotated around the axis using a special tool (Fig. 2). As a result of the deceleration of an electron (or other charged particle) in the electrostatic field of the nucleus of an atom of the anticathode substance and atomic electrons , the gene of inhibitory rent is scattered.



4pac

ray wavelength l at various X-ray tube voltages U 1 < U 2 < U 3 .

The radiation with the shortest wavelength in each spectrum occurs when the energy received by the electron in the accelerating field is completely converted into photon energy.

eU = hn max = hc / l min (1)

from this expression

l min = hc / eU (2)

This formula can be reduced to a form convenient for practical purposes :

l min \u003d 12.3 / U (3)

where l min x-ray, 10-10 m; U - voltage, kV.

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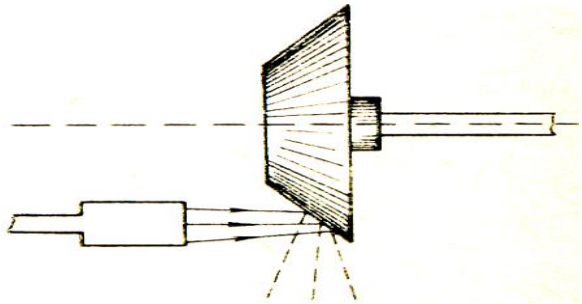
note that experimentally found one of the most accurate ways to determine the Planck constant .

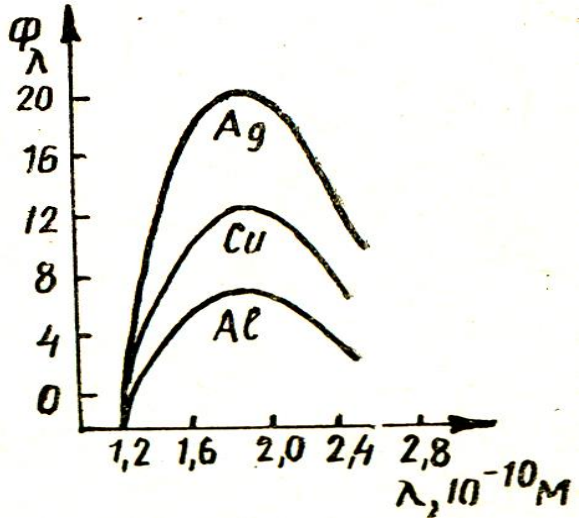
In general, shortwave X-rays have a



2-расм

higher transmittance than long-wavelength X-rays, called hard radiation, while long-wavelength X-rays are called soft radiation.

from figure 3 and formula 3, the spectral composition of the radiation changes, and the rigidity increases with



5-расм

increasing voltage in the x-ray tube.

If the ignition temperature of the cathode rises, the electron emission and current in the tube increase. This increases the number of photons emitting x-rays per second. Its spectral composition does not change. On fig. Figure 4 shows the X-ray bremsstrahlung spectra for the same voltage and different (I 1 r 1 > 2 r) values of the cathode ignition current.

The X-ray flux was determined by the following formula.

F = kIU2Z (4)

Where U and I are the voltage and current in the x-ray tube; Z is the atomic number of the anode material; k = 10-9 V-1 - coefficient of proportionality. The spectra obtained for the case when U and Ich are the same at different anticathodes are shown in Fig. 5.

4. The process of lecture interview is the most common and relatively simple form of active involvement of students in the learning process. In this lecture, the teacher's communication with the audience is taken for granted. The advantage of a lecture-dialogue is that it allows students to focus on the most important aspects of the topic, questions on the topic, determine the content and speed of presentation of educational material, taking into account some features. Audience participation in lectures and discussions can be provided in a variety of ways, questions and answers, informational and problematic, knowing the level of students' readiness to understand the material. For example, during a lecture on the topic "The structure of an X-ray tube", the teacher can ask students the following questions:

-What is an x-ray?

-Explain the x-ray tube ?

How is x-ray radiation produced?

- Are X-ray tubes used for diagnostic purposes?

Questions are asked to the whole group of students, and active students can answer from their seats. The teacher asks questions to the student himself or several students. To save time, it is recommended to formulate questions as much as possible and give clear answers.

The round table method is based on the principle of group discussion of the studied problems of the X-ray tube device. The main purpose of such classes is to give students the opportunity to work out theoretical knowledge in an environment that encourages forms of professional activity. Such a report allows you to form the professional competence of a future specialist.

Professional use of knowledge means fluency in the language of science, fluency, rates, specific actions with concepts.

X-ray tube increases the cognitive activity of students, motivates them to a deeper understanding of the studied physical phenomenon, obtaining additional information on the topic, turning reading into a creative activity. the process stimulates research [3-6].

Develops the abilities of students of higher educational institutions as a basis for further professional activities. A graduate or a specialist who has delivered lectures in accordance with the educational standard must have the appropriate competencies and professional skills [7]:

a willingness to analyze and publicly demonstrate physical evidence based on evidence-based radiography;

- the opportunity to participate in research;

- willingness to participate in the introduction of new methods and techniques aimed at health;

The active practical activity of students is a necessary condition that determines the effectiveness of the formation of these skills in students in the study of various disciplines.

is a challenge for educational institutions. To solve this and for independent work of students, a material and technical base, a sufficient number of technical means are needed. In addition, the visual fund of educational institutions of educational institutions should be allowed to organize practical educational activities in the institution [8].

The conditions set by the state for solving medical problems in higher education are the state educational standard; new conceptual approaches to its organization are needed. As a basis for organizing the practical educational activities of students, including the study of the structure of an X-ray tube, a conceptual approach is proposed that allows using the potential of research methods in fundamental sciences.

approbation) of the proposed concept was carried out at the Department of Nuclear Physics of the Faculty of Physics of the National University of Uzbekistan named after M. Ulugbek, students of this department are being tested. Students use guidelines and materials prepared by teachers of the department [9] .

The promise and potential of the proposed conceptual approach is reflected in the fact that the student-teacher research approach helps students to be successful in future research work. [5].

In conclusion , the considered interactive teaching methods allow, first of all, to implement the concept of practice-oriented learning, to form professions defined in the curriculum. The introduction of interactive forms and teaching methods into the educational process will increase the motivation for learning, a student-oriented learning model will be implemented. Interactive learning develops knowledge associated with the exchange of ideas, activates public affairs, and is a necessary organizer in the formation of the

professional interests of future specialists. The use of interactive teaching methods allows students to integrate coherent and independent learning activities into a range of extended research projects in preparation for the X-ray tube structure, which provides for interactive format requirements.

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