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THE IMPORTANCE OF TEACHING QUANTUM PHYSICS IN GENERAL SECONDARY SCHOOLS

Abdurazzokh Nizamiddinovich Ernazarov
CSPU Associate Professor of Physics

Azizbek Farkhodovich Khudayberganov
CSPU Physics and Chemistry Faculty Tutor

Tajibayeva J.T.
CSPU Student

Abstract:

This article discusses the importance of teaching quantum physics in general secondary schools and the challenges in teaching the department.

Keywords: Quantum physics, mathematical apparatus, theoretical concept, De Broglie hypothesis.

ВАЖНОСТЬ ПРЕПОДАВАНИЯ КВАНТОВОЙ ФИЗИКИ В ОБЩЕЙ СРЕДНЕЙ ШКОЛЕ

Аннотация:
В данной статье рассматривается важность преподавания квантовой физики в общеобразовательных школах и проблемы преподавания на кафедре.

Ключевые слова: Квантовая физика, математический аппарат, теоретическая концепция, гипотеза Де Бройля.

INTRODUCTION

In the current environment, where the priorities and values of our society are changing, new demands are placed on the education system. These requirements are the main goal of the school - to form a socially flexible creative person. In such conditions, the tasks of the teacher are not limited to giving the student only a certain amount of knowledge and skills, but it is necessary to form a new way of thinking in the young generation that encourages them to behave in accordance with the new conditions. Accordingly, it determines the search for a modern approach and educational technologies in order to qualitatively update the requirements for the training of students with developed practical competence in general secondary education schools. This is the integration of the educational cluster into physics, which is a modern direction of teaching in the development of students' knowledge, skills and abilities in physics,

the development of teaching models, the development of students' ideas about quantum physics. innovative education requires the improvement of the methodical system for the use of technologies on a scientific basis.

RESEARCH MATERIALS AND METHODOLOGY

The quantum physics section includes elements of radiation, quantum properties of atoms, and nuclear physics. In explaining all this, it is based on quantum imagination. The scope of the section is large and complex, and the main idea in the educational material is united around the idea of quantization of phenomena and quantities in the microworld.

This section, due to its complexity, creates difficulties for students and teachers who teach it. Its reasons are as follows:

uniqueness of mathematical apparatus;

minimal visibility;

theoretical concepts and conclusions do not fit within the framework of simple or classical ideas;

corpuscular-wave dualism of microparticles and others can be included.

The material in the section is of great importance from the point of view of the theory of cognition. Here, the initial ideas about the microworld, the world of atoms and molecules, formed in physics and chemistry classes from secondary general education, are summarized here. Looking at these phenomena from a new quantum perspective makes an important contribution to shaping the physical picture of the universe. Many of the previously superficial issues, including X-ray radiation and atomic radiation, are now explained in detail on the basis of quantum theory.

Based on the history of the development of quantum concepts, atomic and nuclear physics, the method of knowledge is the emergence of new scientific evidence and the collection of experimental data, putting forward hypotheses, drawing conclusions from them and testing the results in experiments, creating a coherent theory, the heuristic power of the theory and it it is shown that it is possible to discover new, previously unknown phenomena, to create a new technique based on the created physical theory.

On the example of the corpuscular-wave dualism of light and matter particles, one of the general laws of dialectics - the law of the struggle and unity of opposites - is revealed. As an example of the interaction of photons with substances, the relationship between the quantitative and qualitative characteristics of the object is shown.

RESEARCH RESULTS

Introducing the history of the development of quantum physics and the activities of scientists who made a great contribution to the development of this science is of great educational value. M. Planck, A. Einstein, A.G. Stoletov, P.N. The main ideas of Lebedov, E. Rutherford, N. Bor, I.V. Kurchatov, and others are considered. Analyzing their ideas, the process of penetration

into matter, the gradual formation of quantum theory and its modern achievements, will increase students' thinking ability and increase their interest in physics.

Finally, the study of quantum physics has an important polytechnic value. Here, students will get acquainted with the practical application of the photoelectric effect, photocells, photoresistors, photorelays, photochemical effects of light. Spectral analysis methods, laser techniques and technology are described in the section related to the study of atomic physics. In the study of nuclear physics, the use of radioactive isotopes in the national economy, the foundations of nuclear energy, the achievements and directions of development of nuclear energy are considered.

The level and content of the presentation of quantum physics in general secondary schools cannot fully reflect all the concepts and laws related to this branch of physics. Nevertheless, the physics course of general secondary schools provides a sufficient basis for understanding the main phenomena and laws of quantum physics and their practical application.

Elements of Quantum Physics was introduced to students in high school physics courses in the late 20th century, and this section is now widely taught in high school physics courses. Total hours are 4 hours, of which 3 hours are mixed class and 1 hour is practical training.

A total of 18 hours are studied in the department of quantum physics in specialized schools. The theoretical training is 10 hours, and the practical training is 8 hours.

In the system of compulsory secondary education, the physics course is mainly studied qualitatively. Based on this, the quantum physics section of the physics course in secondary schools is studied in an expanded and in-depth manner. Concepts of quantum physics entered the physics course of secondary general education schools in the middle of the last century, and by that time the concepts of quantum physics were mathematically based. In secondary schools, the concepts of quantum physics are explained in the teaching of the chapters "Optics" and "Fundamentals of Atomic Physics" in the 9th grade [1]. Teaching students about the microcosm poses a number of challenges.

As a result of the analysis of the content of quantum physics in the 11th grade physics course, we came to the conclusion that the main attention should be focused on the formation of the following quantum-mechanical ideas and concepts in students and their comprehensive experimental justification [2]:

Structure and properties of atoms and molecules.

The structure and properties of the atomic nucleus.

The idea of corpuscular-wave dualism of light and its experimental confirmation.

De Broglie's hypothesis and wave, its experimental confirmation.

Elementary particles and their properties.

At present, there are some shortcomings in the provision of educational material of the department. They consist of:

1. Lack of textbooks and educational methodical manuals corresponding to the content of quantum physics.

2. There is no scientifically based methodology for studying the fundamental issues of the department.
3. Coherence of the department with other departments of the physics course, insufficient connection between chemistry and other disciplines.

Naturally, the correction of the above shortcomings will increase the level of students' knowledge, that is, a deeper mastery of the main ideas and concepts of quantum physics will be achieved even in secondary general education schools.

The content and importance of quantum physics is that this section is aimed at making the student interested in studying the processes that take place in the microcosm and forming the skills to study the fundamental foundations of science. In addition, the purpose of studying the "quantum physics" department in secondary schools is to memorize, strengthen, expand and deepen the knowledge of this department in the 11th grade. Again, it is worth saying that teaching quantum physics is explaining the basis of modern physics.

The fact that microcosm phenomena cannot be explained by classical physics requires the study of modern physics. Almost all important branches of modern physics are based on the formulas of quantum physics. When dealing with microscopic systems that require the application of quantum mechanics methods, they are often explained in the language of classical mechanics formulas.

DISCUSSION

The training of the quantum physics department is of great importance in the formation and development of students' scientific worldview, and in the implementation of polytechnic education. In this case, it is necessary to explain the connection of cause and effect that exists in quantum phenomena, to explain and emphasize the origin of physical concepts, the possibility of knowing nature, and the fact that there is no limit to the process of knowledge.

The peculiarity of the "Quantum physics" section in general secondary schools is that its content is not only enriched with qualitative concepts, but also deepened by its quantitative expression, expanded in terms of volume, and attention to its practical aspects is emphasized. are given opportunities to take into account the areas of specialization. In addition, it is necessary to use innovative interactive teaching methods, taking into account the individual characteristics of students, to use more sophisticated modern educational tools. Classical mechanics studies the laws of motion of microscopic bodies whose speeds are much smaller than the speed of light in space.

Laboratory work and problem solving should be widely used in the study of the "Quantum Physics" section. The program " Физика в картинках" occupies one of the main places in performing quantum physics laboratory exercises. In addition, demonstration, practical (problem solving), independent learning, self-control, comparison, modeling, conversation, discussion, it is appropriate to use lecture, "brainstorming", "cluster" and other interactive teaching methods.

CONCLUSION

Along with the development of society, the methodological foundations and methods of accurate and effective teaching of physics in all directions are also developing and being updated. Through these methods, students can develop theoretical and practical knowledge of quantum physics and help them in independent thinking, creativity and visual problem solving.

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