



# **MODERN SCIENTIFIC CHALLENGES AND TRENDS**

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# **MODERN SCIENTIFIC CHALLENGES AND TRENDS**

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## **ORGANIZATION OF INDEPENDENT WORK ON MASTERING THE SUBJECT OF PARTICLE PHYSICS IN PEDAGOGICAL INSTITUTIONS**

**Annotation:** *This article presents the role of independent work in the study of elementary particle physics in pedagogical higher educational institutions and some recommendations for the organization of independent work.*

**Key words:** *independent work, task, pedagogy, methodology, education, upbringing, literature, information, project, solution, test, elementary particle, process.*

**Аннотация:** *Данная статья посвящена роли самостоятельной работы при изучении физики элементарных частиц в педагогических вузах, а также организацию и проведение самостоятельной работы.*

**Ключевые слова:** *самостоятельная работа, задание, педагогика, методика, образование, воспитание, литература, информация, проект, решение, тест, элементарная частица, процесс.*

In today's information age, it is necessary to protect young people, who are the future of society, from various information attacks, as well as to teach them how to defend themselves. To do this, it is important to direct young people to work independently, to think healthy and deeply. This work is mainly done by teachers in the educational process. The training of specialists in all areas of education is mainly the responsibility of pedagogical higher education institutions. This means that if a student of a pedagogical higher education institution is considered to be a continuator of the educational process in the future, then teaching the student to work independently and to organize independent work is an important pedagogical task.

The educational process in higher education institutions is radically different from this process in secondary school. In high schools, unlike the secondary school stage, there is no practice of doing homework on a daily basis on a regular basis and reviewing the material covered. No matter how high the level of lectures in the classroom, the quality of students' knowledge depends on their independent work. Independent work is determined by the teacher and appropriate instructions are given and monitored<sup>7</sup>.

The results of the observations showed that independent work in pedagogical higher education institutions is carried out mainly by preparing an abstract on a given topic. In this case, the student can copy the information from a ready-made book or Internet material. This situation does not take much time of the teacher and the student and is easily done. This, in turn, prevents us from forgetting the essence of independent work and training the future specialist to the extent that he can meet the requirements of production.

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<sup>7</sup> M. Djoraev. Fizika o'qitish metodikasi (umumiy masalalar). Toshkent 2015. 163-bet

The purpose of independent work of students should be to teach them to work with abstracts, textbooks, additional literature, to expand and deepen their knowledge, to acquire independent knowledge, to form skills and abilities<sup>8</sup>.

Tasks of independent work of the student are:

- processing and consolidation of knowledge on the topics covered during the training;

- deepening and expanding knowledge;
- develop the ability to understand and think;
- to have the skills to independently acquire new knowledge;
- identify convenient ways and means of finding the necessary information;
- effective use of information sources and means;
- work with electronic textbooks and databases;
- determine the rational solution of the given task;
- systematic and creative approach to assignments;
- substantiate an developed solution, project, or idea.

Each independent work of students on the subject is provided in the following form<sup>9</sup>:

- information (abstract) or abstract on a given topic;
- calculation - graphic work (each practical solution of the equation with a complete explanation);
- each result obtained is summarized in tabular (or graphical) form at the end of the independent study.

It should be noted that the department of Elementary particle physics is one of the most complex sections of the science of physics. However, mastering the ideas of elementary particle physics requires not only basic knowledge, but also learning to think physically and high physical imagination. In order to obtain quality results, it is also important to be able to perform calculations that are evaluated in the order of magnitudes.

The undergraduate student must be prepared for pedagogical activities that require deep fundamental and professional preparation, including preparation for research work.

Elementary particle physics is studied in pedagogical higher education institutions as part of the general physics subject "Physics of Atoms, Nuclear and Elementary Particles." Specialty direction According to the curriculum, 80 hours are allocated for independent study of this subject, of which 16 hours correspond to elementary particle physics. Hence, there is a need to develop recommendations for the proper organization and meaningful conduct of independent work for this allotted time.

Below we give some recommendations for the organization of independent work in elementary particle physics.

1. Work with textbooks: the student finds additional literature in addition to the literature listed in the program, reads, analyzes and draws conclusions on the given topic. It prepares an abstract or abstract based on what it has read, and of

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<sup>8</sup> M. Djoraev. Fizika o'qitish metodikasi (umumiy masalalar). Toshkent 2015. 163-bet

<sup>9</sup> X.X. Xudoynazarov, X.M. Buranov. Talabalar mustaqil ishlarini tashkil etish, ularni bajarish va nazorat qilish bo'yicha uslubiy qo'llanma. Samarqand 2012 y. 9 bet.

course cites the literature used at the end of the work. To control this, the teacher also asks the student about the content of the topic and the literature used, using additional questions.

2. Questions are given for independent work. In doing so, the student demonstrates theoretical knowledge by solving problems independently. To do this, it will be possible to give the following view issues.

Task 1: Review the processes outlined below and identify the types of interactions.

- a)  $K^- + p \rightarrow \Lambda + \pi^0$ .
- b)  $\pi^+ + p \rightarrow \Sigma^+ + K^+$ .
- c)  $\Sigma^0 \rightarrow \Lambda + \gamma$
- d)  $\Xi^0 \rightarrow \Lambda + \pi^0$
- e)  $\pi^0 \rightarrow \gamma + \gamma$
- f)  $\Omega^- \rightarrow \Xi^- + \pi^0$

Task 2: State the reasons that confirm the following processes.

- a)  $\Sigma^- \rightarrow \Lambda^0 + \pi^-$
- b)  $\pi^- + p \rightarrow K^+ + K^-$
- c)  $K^- + n \rightarrow \Omega^- + K^+ + K^0$
- d)  $n + p \rightarrow \Lambda^0 + \Sigma^+$
- e)  $\pi^- \rightarrow \mu^- + e^- + e^+$
- f)  $\mu^- \rightarrow e^- + \nu_e + \bar{\nu}_\mu$

In the process of this task, the student compares and differentiates between fundamental types of interactions, distinguishes between conservation laws that are enforced and prohibited in interactions, learns about carriers and the formation and disintegration of particles in interactions. In supervising the assignment, the teacher should pay special attention to the above.

3. Working with tables or graphs: as an assignment we can cite the following. Systematization of the preservation and non-preservation of quantities and quantum numbers in interactions.

(with "yes" if not saved, with "no" if not saved)

Conserving quantities	Interactions		
	Strong	Electromagnet	Weak
Energy			
Impulse			
Momentum impulse			
Electr charge			
Lepton charge			
Barion charge			
Isotop spin			
Projection of isotop spin			
Strangeness			
Charmness			
Parity			

4. Development of tests for learning: The criterion of the level of difficulty of test tasks fully reflects the characteristics of the object under study, which can be divided into the following four levels according to the mental operations performed by students to determine these characteristics<sup>10</sup>.

- Reproductive degree
- Productive degree
- In part - degree of research
- Creative degree

Preliminary tasks at the reproductive and productive levels are the minimum level of the State Educational Standard approved by the curriculum, and partially at the research and creative level are the maximum level required by the State Educational Standard.

Content plays a key role in the development of test items, so it is advisable to create test items that determine the level of knowledge in the course content and determine the level of achievement of appropriate learning objectives.

Through the recommendations we have given, students can work independently of elementary particle physics:

- expands the perception of the world of particles;
- master particle physics well and clearly;
- learns to work individually;
- learns to think independently;
- develops skills in working with textbooks;
- learn to construct equations representing processes;
- learn to work with tables or graphs;
- learn to create non-standard tasks (tests) for self-control.

Hence, independent work is of great importance in the study of elementary particle physics, as in the study of any science. From the above it can be seen that pedagogy requires the development of scientific-methodical, methodological recommendations and developments for the organization and conduct of independent work, improving the content of independent work on elementary particle physics in higher education, providing effective teaching.

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<sup>10</sup> J.O.Tolipova. Pedagogik kvalimetriya. O'quv qo'llanma. – Toshkent 2017. 24-b.

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