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## THE IMPORTANCE OF INTERDISCIPLINARY INTEGRATION OF SUBJECTS RELATED TO SOLID STATE PHYSICS WITH THE NATURAL SCIENCES IN THEIR HIGH SCHOOLS

<https://doi.org/10.5281/zenodo.10054509>

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### **Annotatsiya**

*Ushbu maqolada umumta'lim maktablarida qattiq jismlar fizikasiga oid mavzularni o'qitishda fanlararo integratsiyaning ahamiyati, ta'lim jarayonida uning namoyon bo'lish shart-sharoitlari muhokama etiladi.*

### **Kalit so'zlar**

*fizika, qattiq jism, qattiq jismlar fizikasi, ta'lim, metod, IT, texnologiya.*

### **Аннотация**

*в данной статье рассматривается значение междисциплинарной интеграции в преподавании тем по физике твердого тела в общеобразовательных школах, условия ее проявления в образовательном процессе.*

### **Ключевые слова**

*физика, твердое тело, физика твердого тела, образование, метод, ИТ (IT), технология.*

### **Abstract**

*this article examines the importance of interdisciplinary integration in the teaching of topics in solid state physics in secondary schools, the conditions of its manifestation in the educational process.*

### **Keywords**

*physics, solid state, solid state physics, education, method, IT, technology.*

## INTRODUCTION

If we look at history, we will see that the science of Physics was the fundamental basis for the creation of almost all discoveries and technologies in the world. Indeed, without deep mastery of the laws of physics, it is impossible to achieve results in such areas as mechanical engineering, electrical engineering, IT, water and energy-saving technologies that are in demand today by The Times.

Currently, great attention is paid to improving the quality and efficiency of the educational and educational process. We can see this in the many decrees and resolutions adopted by our president in the following years in relation to the radical reform and improvement of the Education System [1].

#### RESEARCH METHODOLOGY AND EMPIRICAL ANALYSIS

The rapid development of Natural Sciences, the emergence of Integrated Sciences between them, the general education system presupposes an integrative improvement in the content of the physical educational science, which is taught at different stages. In the teaching of physics, as a result of the interdependence of Sciences, that is, the principle of interdisciplinary communication, the addition of one category of knowledge to the second group of knowledge occurs. When it was discovered that the solid and their types and the solid properties (e.g. crystal and amorphous) were related to physical rather than chemical changes in matter, a twist was made in the perceptions of matter and its changes. Discoveries in physics have proven the existence of matter in two main manifestations - in the form of matter and in the form of a field. Matter in the form of matter aggregate state of matter gas, liquid and solid bodies are made up of particles, which can include protons, neutrons, electrons and positrons, atoms and molecules made up of them. Macroscopic bodies composed of molecules can be in different aggregate States than the data given by modern science: gas, liquid, solid and plasma. The field appearance of matter differs from the appearance of matter by having a mass in motion and moving with a velocity close to the speed of light. A strong field (nuclear field), an electromagnetic field, a weak field, a gravitational field - these are the field views of matter. So, both chemistry and physics study changes in matter. However, as we noted above, the physical and chemical types of a substance are distinguished. Quality in this substance is measured by the scale of changes. Nuclear or subatomic physics studies the changes of elements in the decay of atoms.

While the quantum model of the atom of solid objects explained the content of the periodic law (the help of physics to chemistry), during the development of chemistry, such sections as the atomic - molecular doctrine and the periodic law serve as an ideological and experimental basis for the modern doctrine of the complex structure of the atomic data (the help of chemistry to physics). In general, knowledge of the microstructure of the material world became possible thanks to the effective cooperation of physics and chemistry. At the same time, the scale of chemistry in physics (physical chemistry and Chemical Physics) also increased

dramatically. Nuclear chemistry, elementary particle chemistry are such new directions.

Physicists are also engaged in the study of atomic nuclei and atoms at the same time as chemists. In this, the achievements of both disciplines complement each other. The study of their physicochemical properties, depending on the composition and structure of the molecule of substances, is spreading wide ears.

The interaction and integration of Sciences is a general objective process and serves to create a complete picture of changes in a lively and inanimate nature. The academic disciplines of Natural Sciences introduced in the school-Natural Science, Biology, natural geography, physics, solid state physics, chemistry, astronomy, etc. - form a system of natural-scientific education consisting of scientific facts, concepts, laws, theory and methods. In the program of educational disciplines (natural sciences, biology, chemistry, physics, astronomy, geography, etc.), formed at the expense of the integration of Sciences and part of the Universal educational system, interdisciplinary communication is carried out directly, in other educational disciplines within the sphere of Natural Sciences. Interdisciplinary communication is the reflection in the academic disciplines of the part of objective dialectical connections that exist in nature studied using Sciences.

The criteria for interdisciplinary communication are diverse, the main of which is the time (chronological) criterion. For the subject being taught, there may be current and promising contacts that will be carried out earlier. The criterion for information is determined by facts, concepts and theories. In interdisciplinary communication, such as the relationship between disciplines, academic disciplines enrich and complement each other. The General Laws of physics that apply in chemistry with topics related to solid - state physics-the law of conservation of mass of matter and the existence of periodic law, terminology, the same method of measurement and commonly used concepts-closely connect these two academic disciplines.

The main goal of the interdisciplinary connection between physics and other academic disciplines is to create a holistic modern scientific picture of the universe in the minds of students. However, the successful implementation of such an event is hampered by two main obstacles.

1) the level of knowledge of students from all educational subjects should not be equally high;

2) a science teacher's narrow range of thinking, ignorance (or low awareness) of other sources of Science from his field.

In secondary schools, two aspects of inter-subject communication are important:

- 1) such contacts arise as one of the factors that increase the effectiveness of teaching students;
- 2) enhance the teaching of physics in secondary schools, serve to improve the well-mastered and interest of students and improve their professional training.

The power of modern physics is manifested in the prosperity of the foundation stones of such border sciences as solid state physics, molecular biology, space-chemistry, biological-chemistry in the general educational system. In their ranks, however, physics-chemistry remains a clear example of the all-round and deep convergence of physics and chemistry.

#### CONCLUSION AND DISCUSSION

Thus, mentioning the similarity of these properties with chemical properties in solving problems on the properties of solid bodies in practical training from topics related to the physics of solid bodies, it is doubtful that their comparative analysis serves to effectively assimilate concepts related to the physics of solid bodies by readers.

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