

## Types of Problems and Methods of their Solution in Physics

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### Abstract:

This article discusses examples of problems to be solved in the physics department of the physics course and methods of their solution. Here are some ways to solve each problem in several ways.

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### Introduction

Physics tasks are varied in content and didactic goals. They can be classified according to various criteria. According to the way of expressing the condition, physical problems are divided into four main types: textual, experimental, graphic and drawing problems, each of them, in turn, is divided into quantitative (calculated) and qualitative (problem-questions).

At the same time, the main tasks can be divided according to the degree of difficulty into easy and difficult, training and creative tasks and other types.

In the educational process in physics, word problems are most often used - problems in which the condition is expressed verbally, and the condition contains all the necessary data, except for physical constants.

### Materials and Methods

According to the methods of solving them, they are divided into problem-questions and calculated ones.

#### 1 Tasks-questions.

When solving problem-questions, it is required to explain a particular physical phenomenon or retell how it will proceed under certain conditions. As a rule, there are no numerical data in the content of such problems. For example:

1. Thick lead plates are placed on the diver's chest and back, and lead soles are attached to the shoes. Why do they do this? (Grade 7).
2. Why does a hair of an electric bulb glow white while the wires remain cold, although the same current flows through them? (8th grade).
3. Why does a loaded vehicle on a cobblestone pavement move more smoothly than an unloaded vehicle? (Grade 9).

The absence of calculations when solving problem-questions allows students to focus on the physical essence. The need to substantiate the answers to the questions posed teaches schoolchildren to reason, helps

to understand more deeply the essence of physical laws. The solution of problem-questions, as a rule, is oral, except for those cases when the problem contains graphic material. I always listen to the guys' answers, and the answers imply both not very rational decisions and outright mistakes. I listen to them, of course, I can't stand value judgments, but in the process of general discussions I create an attitude towards the readiness to answer, not being afraid to make mistakes, not being ashamed of my, albeit not entirely successful, solution of the problem [1-5].

## 2. Drawing tasks.

Tasks-questions are closely related to tasks-drawings. They require orally to give an answer to a question or to depict a new drawing that is an answer to the question of the problem. The solution of such problems contributes to the education of students' attention, observation and the development of graphic literacy.

One of the most important components of psychological comfort in physical activity is a constant feeling of joy from overcoming difficulties: the student as a person simply "bored" from the routine, perceiving it only as a necessary step to more interesting, to difficulties, overcoming which will bring genuine joy and increase self-esteem student and his assessment from others.

## 3. Quantitative objectives.

In order to show interest among students, I give quantitative problems for solving problems.

Quantitative problems are problems in which the answer to a perennial question cannot be obtained without computation. To instill in students the skill of a conscious approach to solving quantitative problems, a certain system of work and a well-thought-out teaching methodology are needed. The correct selection of tasks is of no small importance.

The most accessible at first are tasks in which it is proposed to give an explanation of natural phenomena or facts. Famous learners from personal experience. In them, students will see a connection with life. Solving quantitative problems involves three stages: reading the condition, analyzing the problem, and solving. When analyzing the content of tasks, they use, first of all, general patterns known to students on this topic [6-12].

After that, they find out how exactly the phenomenon that is described in the task should be explained. The answer to the problem is received as the completion of the analysis. In qualitative problems, the analysis of a condition is closely merged with the receipt of the necessary substantiated answer. When solving such problems, a qualitative analysis is also necessary, but it is also complemented by a quantitative analysis with the calculation of certain numerical characteristics of the process. Quantitative tasks are divided by difficulty: simple and complex.

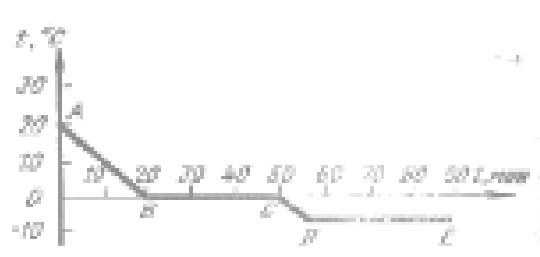
Simple tasks are understood as tasks requiring simple analysis and simple calculations. Usually in one or two steps. The solution of such problems is necessary to concretize the just studied regularity. The easiest ones can be solved orally. To solve quantitative problems, different methods can be applied: algebraic, geometric, graphic. The algebraic way to solve problems is to use formulas and equations. In the geometric method, geometry theorems are used, and in the graphic method, graphics.

## 4. Graphic tasks.

Graphical problem solving is often found in grades 9.10 when studying the section "Relativity of motion"; "Thermal phenomena", "Electrical phenomena" in the 8th grade.

According to the role of graphs in solving problems, there are those, the answer to which can be obtained on the basis of the analysis of the existing graph and in which it is required to graphically express the functional dependence between the values.

Solving graphical problems helps to clarify the functional relationship between values, instilling skills in working with graphs. This is their cognitive meaning.



## 5. Text tasks.

Word problems include abstract problems, which are about phenomena and processes observed in everyday life, tasks with historical content, and entertaining tasks.

Tasks of interdisciplinary content reflecting the connection of physics with other sciences are distinguished into a special type. The tasks of the MPS include those in which knowledge in two or more subjects is used when solving [13-17]. They can be qualitative, calculated, experimental. The tasks of the MPS in physics lessons can be used for a different purpose: to deepen knowledge and their development, to generalize and systematize the knowledge and skills of students. For example:

How long will it take for a TU-154 plane to fly the route distance Moscow-Sverdlovsk, Moscow-Khabarovsk, Moscow-Sukhumi, if this multi-seat liner has a speed of 800 km / h? Distance between cities on a geographic map. (MPS physics and geography). During the day, the thickness of the ice in the pond increases evenly by 5 mm. Plot a graph expressing the dependence of ice thickness on time  $d = f(t)$ . When constructing a graph, the initial ice thickness should be taken equal to 1 cm. (MPS physics and mathematics).

What physical laws are manifested when the fish descend to depth and the volume of their bubble decreases. And when it rises, does it increase? (MPS physics and biology). How to explain that during the combustion of fuel a certain amount of heat is released (coal, oil, fuel oil, kerosene, firewood, etc.)? (MPS physics and chemistry).

Physical problems in the condition of which there is not enough data to solve are called problems with incomplete data. The missing data for such tasks are found in reference books, tables and other sources. Students will encounter such problems in life, so solving such problems is very valuable. Students are faced with such tasks already from the 7th grade. Densities of various substances (liquids, gases, solids) are tabular data used to find the mass and volume of a body. Free fall acceleration, gravitational constant, fundamental velocity, and other constants that students encounter in almost every problem solving.

And so, for students to develop the ability to solve physical problems, is the "Methodology for solving problems", which is compiled in such a way that it can be used for independent work. All material is divided into several stages [18-20]. The analysis of the tasks of all chapters is carried out according to a single scheme, and each chapter can be worked out independently of the others.

## Conclusion

In order to instill interest in students in solving problems, they must be skillfully selected. The content of the tasks should be clear and interesting, concise and clearly formulated.

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