

## Methods of solving problems from the department of electromagnetism in comprehensive schools

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**Abstract:** The article is devoted to the study of the methods of solving problems from the department of electromagnetism in secondary schools and to increase the activity of these methods in studying physics and solving problems of schoolchildren.

**Key words:** Department of electromagnetism, research methods, problem solving methods, steps in problem solving. Methodology solution zadach po kafedre elektromagnetizma v obshcheobrazovatelnyx shkolax.



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### Enter

In the current educational system, the purpose of imparting knowledge in natural sciences is to form students' theoretical knowledge as well as practical skills. In the process of solving problems in the electromagnetism department of physics, it is important to develop students' reasoning, experiment analysis, and comparison of results competencies. Below, I would like to dwell on the methods aimed at deepening the knowledge and developing the skills of students of general education schools in this field.

### Literature analysis

Yu.A. Makarov's book "Methodology of Teaching Physics" is devoted to effective teaching methods of physics. It is a valuable guide for teachers [1].

The method of working with problems from the department of electromagnetism in general schools is cited [1].

It is important for students to learn the methods of solving problems from the department of electromagnetism in general schools, and the following literature presents problems to strengthen the knowledge of students [3].

Methods are of great importance in students' learning of physics and solving problems [2].

What is the significance of the method of working experimental and practical problems in the

department of electromagnetism in secondary schools?

We know that topics and issues in the Electromagnetism department are closely related to practice in various fields. Examples of such processes include studying the properties of electric and magnetic fields, analyzing the condition of materials under the influence of electric currents, and understanding the propagation of electromagnetic waves. In addition, we will have the opportunity to learn the basic concepts of electrical engineering, communication and technology through experiments.

The importance of the development of comparative competences is great, the competence of comparison is the ability to compare and analyze various data, results and processes, this competence plays an important role in the development of the student's scientific thinking. In the process of solving experimental and practical problems in the department of electromagnetism, students compare the results obtained by different methods, compare theoretical calculations and practical indicators. This process helps to develop students' analytical thinking skills.

The methods used in experimental problems also increase the thinking ability of students, that is, if we take direct measurements: for example, measuring the electric current using an ammeter, determining the potential difference using a voltmeter, etc.

One of the research methods is the graphical analysis of the results, which helps to improve students' ability to solve problems, imagine and think. For example, presenting the dependence of current on voltage in a graphical form leads to a better formation of problem-solving skills among students.

Mathematical modeling method allows to compare calculation results with theoretical formulas. By solving practical problems and analyzing the results, students learn about real-life technology issues. For example: studying the principle of operation of a transformer, explaining the operation of current generators based on the phenomenon of electromagnetic induction, analyzing the operation of radio engineering equipment using the principles of electromagnetic wave propagation, etc.

The use of modern technologies in education is also important. The use of multimedia tools to strengthen knowledge in the section of electromagnetism is effective.

The method of solving problems from the department of electromagnetism in schools helps to form the ability of students to apply the theoretical knowledge they have received in the course of the lesson. Let's consider the following methodical sequences for effective study of electromagnetism section.

1. Strengthening theoretical knowledge. For this, it is necessary to learn the basic concepts and laws of electromagnetism, such as Coulomb's law, laws and concepts related to electric and magnetic fields, and to be able to apply the learned laws. Reflecting on the relationship between electric and magnetic fields and giving examples from real life will further strengthen the knowledge gained. In addition, it is important to know how to apply formulas and laws to practical situations.
2. Dividing problems into types will also increase the interest of students in working with problems. Issues can be divided into several types. For example, it can be divided into theoretical problems, practical problems, graphic problems, laboratory problems. Theoretical problems are problems aimed at explaining physical laws and giving their theoretical solutions. In practical matters, calculations are performed by deriving a working formula. By solving these types of problems, students are sure to be able to apply every formula they learn. There are also several advantages to working with analytical problems. That is, students analyze several physical phenomena by connecting them. Such issues allow to strengthen the acquired theoretical knowledge in practice. Physics classes also include theoretical and practical exercises. During this activity, students will find solutions to laboratory problems, that is, they will conduct experiments with the help of instruments and analyze the results.
3. The student should pay attention to each step in the process of solving problems. These steps are:

## 1. Read and understand the condition:

- Read the text of the problem carefully.
- Separation of known and to be found values.
- Understanding the physical meaning of the problem.

## 2. Drawing according to the condition of the problem:

- Draw a circuit or diagram to describe the shape of an electric or magnetic field.
- Removal of redundant information to clarify the purpose.

## 3. Choosing a formula:

- Determine which physical law or formula applies.
- Linking and applying multiple formulas when required.

## 4. Billing:

- Perform all mathematical and logical operations according to the task.
- Check the result to avoid mistakes.

## 5. Analysis of the result:

- Explanation of the physical meaning of the obtained answer.
- Connect with real life situations.

The following are examples of processing issues for the following stages:

Matter. Two  $q_1=8 \cdot 10^{-9}$  Кл and  $q_2=-6 \cdot 10^{-9}$  Кл find the electric field strength at the point lying between the point charges. Range of charges  $r=10$  см;  $\epsilon=1$ .

Solving.

$$q_1=8 \cdot 10^{-9} \text{ Кл}$$

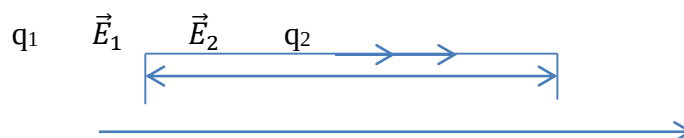
$$q_2=-6 \cdot 10^{-9} \text{ Кл}$$

$$r=10 \text{ см}$$

$$\epsilon=1$$

$$\vec{E}=?$$

Problem drawing



According to the superposition principle  $\vec{E} = \vec{E}_1 + \vec{E}_2$  or x is projected  $E=E_1+E_2$ . Urgent charging of the electric field

$$E = \frac{q}{4\pi\epsilon_0 r^2},$$

where  $r$  is the distance from the charge to the point.

$$E_1 = \frac{q_1}{4\pi\epsilon_0 (\frac{r}{2})^2}; \text{ ба } E_2 = \frac{q_2}{4\pi\epsilon_0 (\frac{r}{2})^2}$$

$$E_1 = \frac{q_1}{\pi\epsilon_0 r^2}; \text{ ба } E_2 = \frac{|q_2|}{4\pi\epsilon_0 r^2} \text{ га кӱра } E = \frac{q_1+|q_2|}{\pi\epsilon_0 r^2}$$

$$E = \frac{8 \cdot 10^{-9} \text{ Кл} + |-6 \cdot 10^{-9} \text{ Кл}|}{3,14 \cdot 8,85 \cdot 10^{-12} \frac{\text{Кл}^2}{\text{Н} \cdot \text{м}^2} \cdot 0,1^2 \text{ м}^2} = \frac{14 \cdot 10^{-9} \text{ Кл}}{0,27789 \cdot 10^{-12} \frac{\text{Кл}^2}{\text{Н}}} = 50,379 \cdot 10^3 \frac{\text{Н}}{\text{Кл}} = 50,4 \text{ к} \frac{\text{Н}}{\text{Кл}}$$

Frog:  $50,4 \kappa \frac{H}{\kappa\lambda}$

4. Interactive methods require group work. For this, it will be necessary to divide the students into groups in order to perform the tasks that are reasonably divided. At the same time, it is necessary to carry out experiments on electromagnetism.

5. In order to overcome the difficulties in resolving issues, it is first necessary to choose the right laws. Therefore, re-examining the theoretical material will cause students to lose their self-confidence and fears. It is necessary to conduct tests to strengthen the basic formulas. Analyzing errors and misunderstandings in mathematical calculations with the help of a teacher helps in finding answers to all questions.

6. In evaluating the students' acquired knowledge, the teacher uses tests and supervision. According to the answers given by teachers and students, incentive activities will be suitable for the purpose. The most important stages of the malaria epidemic should be encouraged.

### Conclusion

In studying the problems of the electromagnetism department, the students develop the skills of logical thinking, analysis and explanation of events based on the laws of physics. At the same time, in order to develop the comparative competence of students in the process of developing experimental and practical problem-solving methods in the electromagnetism department of physics, it is necessary to connect theoretical knowledge with practice and use advanced methodologies aimed at developing skills. This not only develops students' thinking ability, but also prepares them for their future professional activities.

### References

- Makarov Yu.A. "Methodology of teaching physics". M.: Prosveshchenie. 1983. 320p.
2. Dosmurodov M.B. "Physics" (Guide for those entering higher education schools). T.: Uzbekistan 2016. 520p.
3. Volkenstein V.S. "A collection of problems from the general physics course". T.: Uzbekistan 2008. 398b.

### Электрон манбалар

1. -[AllPhysics.ru](https://www.allphysics.ru) – Electromagnetism issues, theoretical information and tutorials.
2. -[Fizika.uz](https://fizika.uz) – electronic manuals and tests on physics adapted for Uzbekistan schools.