FORMATION OF SKILLS OF SELF-STUDY OF STUDENTS IN THE PROCESS OF SOLVING PROBLEMS ON PHYSICS

Z. A. Jumayeva
Tashkent architecture and civil engineering university

https://doi.org/10.5281/zenodo.8054462

Abstract. *One of the important tasks of the present day is to bring up a free, independent thinker, a perfect person with a broad scientific outlook. Physics, which is the leader of natural sciences, has a great opportunity to solve such an important task. That is, the scientific outlook of every student who has a deep understanding of physics both theoretically and practically will undoubtedly expand.*

Physics teachers have the responsibility of guiding students to independent learning by making them interested in science.

In this article, we will focus on the method of independent learning of students in the process of solving a problem related to Coulon's law.

Keywords: *independent learning, students, tasks, Coulon's law.*

Problem solving. Side α +q,+q,+q,–q,–q,–q charges are placed at the vertices of the regular hexagon. Find the force acting on the charge +q at the center of the hexagon. *(А.П. Римкевич «Физикадан масалалар тўплами» Т. «Ўқитувчи»1990й № 690 масала)*

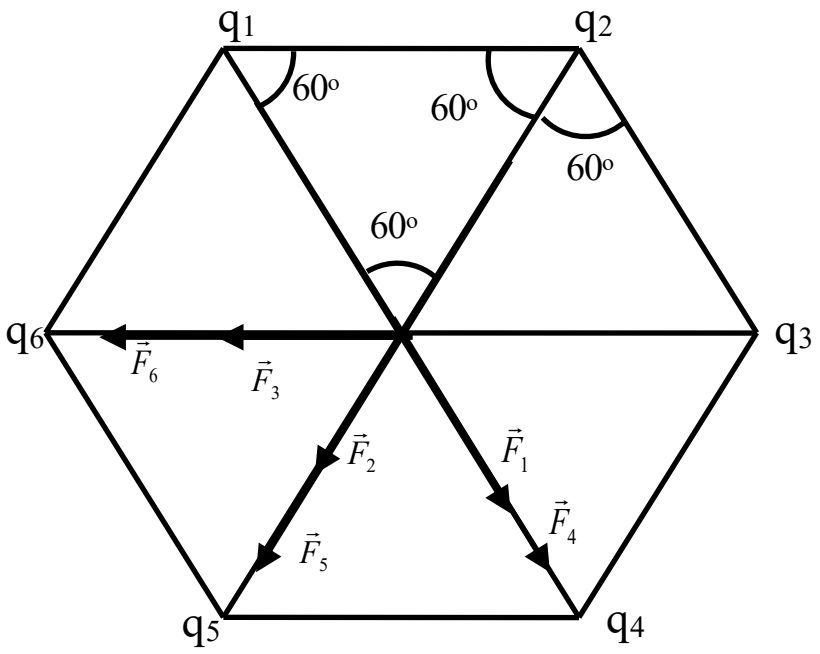
This issue is somewhat more complicated, and the interaction of several charges is considered. A diagram related to the problem is drawn, and in the diagram, the forces of influence of each charge on the +q charge located in the center are considered (Fig. 1). By adding the forces found, an equal acting force is found. (2-3 pictures). Equivalent force can be found by two methods.

1. Projection method:
2. Vector method:

The teacher chooses which of these methods will be easily understood by the group. In both of these methods α you will need to know the angle. Since a regular hexagon consists of the sum of 6 equilateral triangles α =60^0 it follows that Depending on the direction of the charges, the direction of the forces is shown in the diagram. The magnitudes of forces are found based on Couloun's law:

Solving:

Given: $+q_1=+q_2=+q_3=+q$; $-q_4=-q_5=-q_6=-q$; +q	Indexes 1, 2, 3, 4, 5, 6 are introduced to indicate the force of influence of each charge on the charge in the center.
Must find $F_н$=?	



1- Figure

$\vec{F}_1$ with $\vec{F}_4$;

$\vec{F}_2$ with $\vec{F}_5$;

$\vec{F}_3$ with $\vec{F}_6$

Since they are equal to each other and directed in the same direction, they are respectively $2\vec{F}_1$, $2\vec{F}_2$, $2\vec{F}_3$ we simplify the drawing by. (2-Figure)

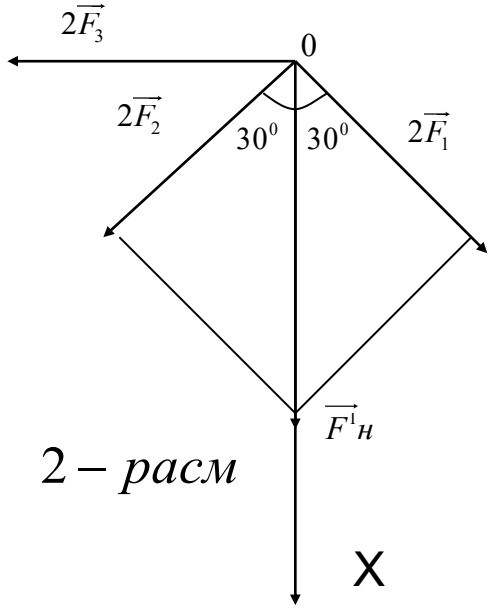


Figure 2

$\vec{F}'_H = 2\vec{F}_1 + 2\vec{F}_2$ (1) OX projecting onto the axis,

$F'_H = 2F_1 \text{Cos } 30^0 + 2F_2 \text{ Cos } 30^0$ (2)

F_1 and F_2 since the forces are equal in magnitude

$F'_H = 4F_1 \text{Cos } 30^0$

$\text{Cos } 30^0 = \frac{\sqrt{3}}{2}$; $F'_H = 2\sqrt{3}F_1$ (3)

From 3-Figure $\vec{F}_H = 2\vec{F}_3 + \vec{F}'_H$ (4)

According to the Pythagorean theorem

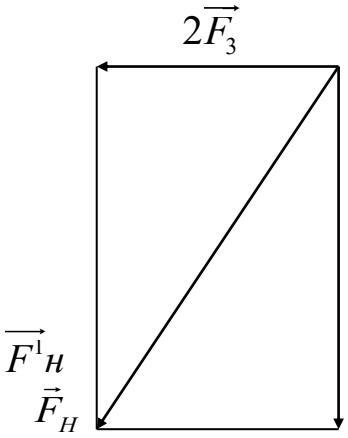


Figure 3

$F_H^2 = 4F_3^2 + F_H'^2$; $F'_H = 2\sqrt{3} \cdot F_1$

$F_H = \sqrt{4F_3^2 + 4 \cdot 3 \cdot F_1^2}$ (5)

F_1 since the force is quantitatively equal to the force F_3

$F_H = \sqrt{16F_1^2} = 4F_1$; $F_H = 4F_1$ (6).

According to Coulon's law

$F_1 = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q^2}{a^2}$ (7) $F_H = 4 \cdot \frac{1}{4\pi\varepsilon_0} \cdot \frac{q^2}{a^2}$

$F_H = \frac{q^2}{\pi\varepsilon_0 a^2}$ (8) .

We used the projection method to find the resultant force. The result (8) is also obtained in the vector method. After making sure that the students have mastered the method of solving the problem, the following problems are recommended for them to work independently.

1. To the vertices of a regular hexagon +q, -q, +q, -q, +q, -q. If the charges are placed in series, in the center +q find the force acting on the charge.

2. To the vertices of a regular hexagon +q, +q, +q, +q, +q, +q If the charges are placed, find the force acting on the charge +q at the center.

3. In Figure 1, find the total force exerted on charge q_1 by other charges (q2; q3; q4; q5; q6; q).

Students try to work independently because the problems with such content are close to the content of the studied problem. If necessary, they use the electronic version of the problem on the computer. As a result, students develop skills and abilities to solve problems independently.

REFERENCES

1. А.П. Римкевич «Физикадан масалалар тўплами» Т. «Ўқитувчи»1990й
2. В.М.Спиранский. Физикадан масалалар қандай ечилади. –Т.: Ўқитувчи. 1971.
3. С.Е.Каманецкий, В.П.Орехов «Физикадан масалалар ечиш методикаси», Т. Ўқитувчи, 1976 й.