METHODS FOR SOLVING PROBLEMS ON THE TOPIC "ALTERNATING CURRENT AND ITS PRODUCTION" IN SECONDARY EDUCATION

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Abstract. *This article is devoted to the study of the electrodynamic section of electrostatic also to the use of the improvement of modern methods in solving problems related to this topic, as well as its improvement.*

Keywords: *electric current, alternating current, phenomena, experiment, an experience, laboratory work, problem solving.*

The 21st century is distinguished not only by a sharp increase in the scope of scientific and technical innovations, but also by the fact that the quality of technologies has risen to a completely new level. Today, it is important to improve the quality of physics teaching in educational institutions, to introduce modern teaching methods into the educational process, to select talented students, to prepare competitive specialists for the labor market, to develop scientific research and innovations, and to direct them to practical results. attention is being paid. [1] It is possible to achieve high efficiency through appropriate use of new pedagogical technologies in the teaching hours allocated for teaching physics in the curriculum of educational institutions. One of these technologies is methods. The methods are different, including theory, practice and laboratory work. Just as a bird cannot be imagined without its wings, the science of physics cannot be imagined without theory, practice, and laboratory work. A pedagogue who meets the demands of the times must have a unique methodology in all three directions. This ensures that the teacher works regularly on himself. They should be mature specialists of their profession and should pass the lessons with the help of active interactive games, various new methods and technologies. This will help the student to understand the subject again and increase his competence in life.

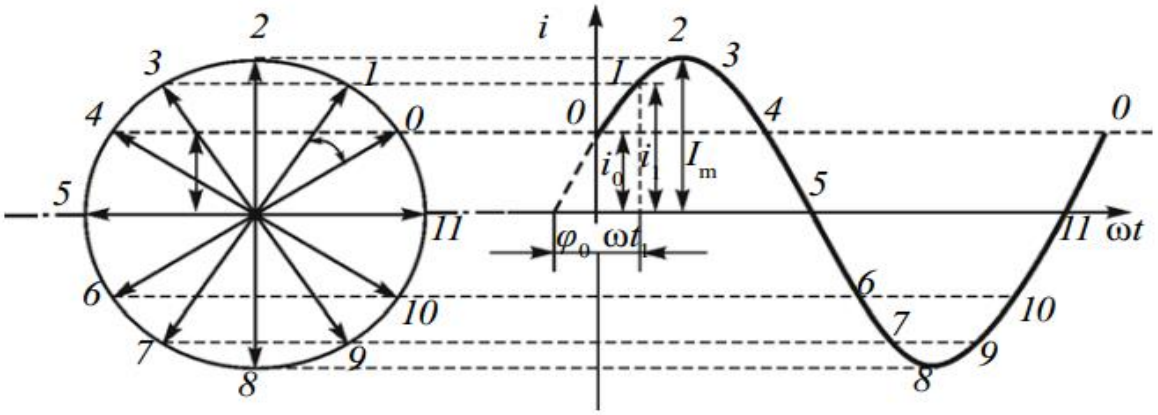
As a proof of my word, I would like to explain my methodology for solving problems related to "Alternating current and its production". For this, I would like to share my conclusions after studying a lot of articles and dissertations. Physics is a clear and natural science with a large scale, based on the laws of nature, which teaches all the phenomena that surround us and occur. Therefore, we will study it in several sections. Including departments of mechanics, molecular physics, electrostatics, magnetism and optics. We will stop at the electrical department. In general education schools, this section is mainly held in the 8th-10th-11th grade, and basic information is given in the 6th grade. Electrostatics - studies the electrification of bodies, electrical equipment and its structure, as well as the laws of their interaction.

This method is useful for strengthening the topic, solving problems, and answering questions. So, what is alternating current?

Let's say a change in current in a circuit

$$i = I_m \cos(\omega_0 t + \varphi_0)$$

be given by the equation. Let's take a vector whose length is Im and rotate it counterclockwise. In this case, the time it takes for one revolution should be equal to the period of change of the ikat. Then the projection of the vector *im* on the vertical axis is equal to the instantaneous value of the quantity *i* will be.



Now let's talk about the problem solving method. Having improved the method used by the Russian physicist, high-class pedagogue Tokarova in solving problems, I applied it to this "Alternating current" topic. [3] This made it possible for good students' knowledge of the subject to improve their skills. The problems are divided into groups with three different levels of difficulty:

1st difficulty problem:

Sample problem solving

1. When a resistor was connected to an alternating current circuit with an amplitude value of 30 V, a current of 2 A passed through it. Find the average power dissipated in the resistor.

Given:	Formula:	Solution:
$U_m = 30V$	$P = \frac{I_m U_m}{2}$	$P = \frac{30V*2A}{2} = 30W$
$I_m = 2A$		
Solved:		Answer: 30W
P=?		

2 nd difficulty problem:

Sample problem solving

A capacitor with a capacity of 50 mF is connected to an alternating current circuit with a frequency of 50 Hz. What is the capacitance of the circuit?

Given:	Formula:	Solution:
$\boldsymbol{C = 50\mu F = 50 * 10^{-6}F}$	$\boldsymbol{X_C = \frac{1}{\omega C} = \frac{1}{2\pi \nu C}}$	$\boldsymbol{X_C = \frac{1}{2*3,14*50*50*10^{-6}}\Omega = 63,69\Omega}$
$\nu = \boldsymbol{50\ Hz}$		
Solved:		Answer: 63,69 Ω
X_C =?		

Sample problem solving

A coil with an inductance of 5 H is connected to an alternating current circuit with a frequency of 10 kHz. What is the inductance of the circuit?

Given:	Formula:	Solution:
V=1- kHz = 10000Hz L=5H	$X_L = \omega L = 2\pi \nu L$	$X_L = 2 * 3{,}14 * 10000 * 5 = 314000\Omega = 314k\Omega$
Solved:		Answer: $314k\Omega$
X_L =?		

3 rd difficulty problem:

Sample problem solving

The active resistance is 200 Ω, the capacitor with a capacitance of $5 * 10^{-6}$ F F and an inductance of 400 mH is connected to an alternating current source with a maximum voltage of 120V and a frequency of 100Hz. the altar is connected. Find the maximum current in the circuit.

Sample problem solving

Given:	Formula:	Solution:
V=1- kHz = 10000Hz L=5H	$X_L = \omega L = 2\pi \nu L$	$X_L = 2 * 3{,}14 * 10000 * 5 = 314000\Omega = 314k\Omega$
Solved:		Answer: $314k\Omega$
X_L =?		

From the above problems and their solutions, it can be concluded that they can be divided into three parts based on the formulas of the topic and its solving methods: 1st easy, 2nd medium and 3rd complex types of problems. The teacher should explain these three-part problems step by step, from easy to complex.

It increases children's understanding of the subject. In addition to problems, it can be reinforced by asking questions to the class or by handing out quick questions and tests. For example:

Questions:

1. Why does the phase shift between current fluctuations and voltage fluctuations occur in an alternating current circuit?

2. Derive the formula for calculating the amplitude value of the alternating current for the case where there is a reactive resistance and a coil.

3. Write the formula for finding the phase difference between alternating current strength and voltage for the case of active resistance and capacitor in the circuit.

Tests:

1. Electric charge in the capacitor in the oscillating circuit $q = 10^{-3}cos100\pi t$ (C) is changing according to the law. Find the frequency of electromagnetic oscillations generated in the circuit.

A) 100 Hz B) 100π Hz C) 50 Hz D) 50π Hz

2. Electric charge in the capacitor in the oscillating circuit $q = 10^{-3}cos100\pi t$ (C) is changing according to the law. Find the amplitude of the current generated in the circuit.

A) 10^{-3} A B) 1 A C) 10 A D) 10π A

3. If the capacitor capacity is reduced by 9 times in an ideal oscillation circuit, how does the oscillation frequency of the circuit change?

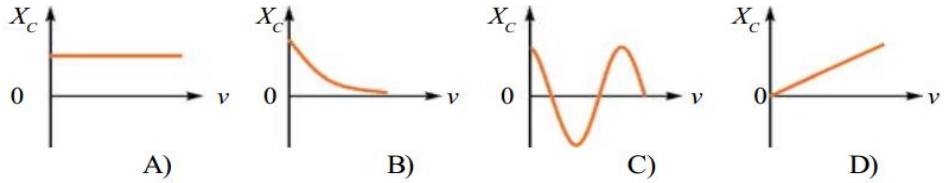
A) It is reduced by 3 times B) increases by 3 times C) It is reduced by 9 times D) increases by 9 times

4. Electromagnetic oscillations are formed in the ideal oscillation circuit, where the maximum value of the electric field energy in the capacitor is 2 mJ, and the maximum value of the magnetic field energy in the coil is also equal to 2 mJ. What is the total energy in the oscillation circuit?

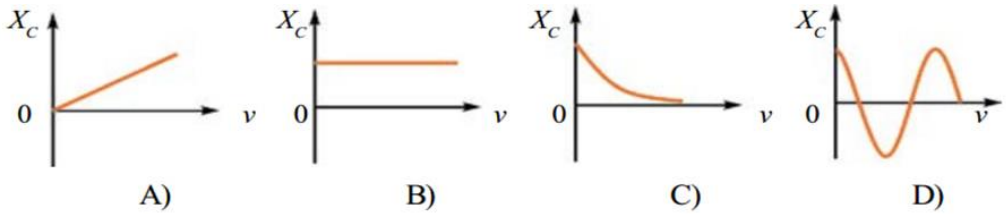
A) It varies from 0 to 2 mJ; B) It varies from 0 to 4 mJ

C) does not change and is equal to 2 mJ; D) does not change and is equal to 4 mJ;

1. Which of the following graphs shows the frequency dependence of capacitance resistance in an alternating electric circuit?



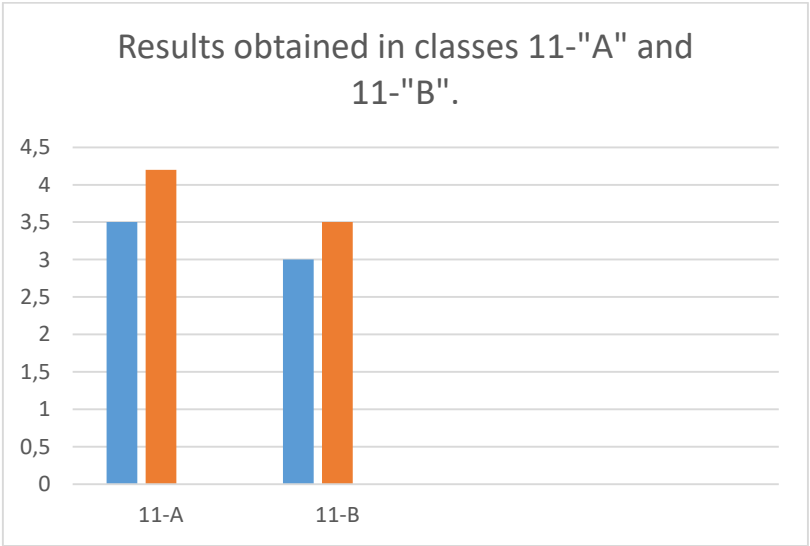
2. Which of the following graphs shows the frequency dependence of inductive resistance in alternating electric circuits?



It is possible to enrich students' understanding of the subject by giving similar problems and tests. The diagram below shows the results of the 11th grade electrical section of physics using the "work with small group" method:

This is the result of a lesson without a color method,

This is the result of a lesson through the color method.



From this diagram, it can be concluded from the experiment conducted twice that each method should be used in the course of the lesson in accordance with the subject.

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