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PHOTO EFFECT LAWS ENSHTAIN EQUATION EDUCATIONAL INTERNAL PHOTO EFFECT LAW METHODS OF TEACHING

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Annotation
This article describes the use of interactive methods of pedagogical and information technology in teaching the department of quantum physics. In particular, the article uses audio-video materials, imitation models to explain the content of the topic to the reader. Interactive “Physics Dictation”, “Why”, “Brainstorming” and “BBB” methods were used to help students to better understand physical processes and laws, and most importantly, to apply physical processes in practice. Methods of using different categories of self-assessment tests to check or reinforce are analyzed. It is also noted that the performance of theoretical and practical tests is highly effective.

Keywords. Laws of photoeffect, red border, Einstein's equation of intensity, output, "Physics dictation", "Why", "Brainstorming", "BBB", method

The main part

I KNOW	I WANT TO KNOW	I KNEW
Laws of photo effect first	Rules and formulas	When a metal is irradiated with light of constant wavelength, the maximum number of electrons emitted by light per unit time (ie, the saturation photocurrent) is directly proportional to the flux of light.
Laws of photo effect second		the frequency of incident light increases, the speed of photoelectrons increases, but this does not depend on the intensity of light.
		Photoelectric effect For a given metal, regardless of the intensity of light, the exact minimum, called the "red limit" of the photoeffect chastotada boshlanadi.
Einstein's equation		$h\nu = \frac{m\upsilon^2}{2} + A$

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The use of the "why" method in the study of the laws of photoeffects

1. Why does the velocity of electrons increase with increasing frequency?
2. Why is the number of electrons emitted from a substance directly proportional to the current?
3. Why the second and third laws of light cannot be explained on the basis of the electromagnetic theory of light: Indeed, according to this theory, any frequency light of sufficient intensity must strike electrons from the metal, in other words There should be no "red border". This conclusion contradicts the third law of the photoeffect. Then the greater the intensity of the light, the greater the kinetic energy of the electrons, that is, the speed of the photoelectrons had to increase with the intensity of the light; this conclusion contradicts the second law of the photoeffect.

The laws of external photoeffect can be easily explained on the basis of quantum theory of light. According to this theory, the magnitude of the light flux is determined by the number of light quanta falling on the metal surface per unit time. Assuming that each light quantum interacts with only one electron, the maximum number of photoelectrons is proportional to the flux of light (the first law of the photoeffect).

The energy of the quantum of light absorbed by the electron is used to carry out the work of the electron leaving the metal; The rest of this energy is the kinetic energy of the photoelectron. Accordingly, we can write the law of conservation of energy as follows:

where: A is the work function of the electron.

This formula, proposed by Einstein in 1905 and later confirmed experimentally, is called the Einstein equation.

occurs. [4-5-6-7]

"Physical dictation" according to the laws of photoeffect and Einstein's equation

The first and second laws of the photo effect, the "red line", the classification of Einstein's equation?

When a metal is illuminated with a constant wavelength of light, the maximum number of electrons emitted by the light is directly proportional to the flux of light. This is because the number of electrons emitted from a substance is directly proportional to the current.

As the frequency of incident light increases, the speed of photoelectrons increases, but this does not depend on the intensity of light. Because of the law of conservation of energy, the photon energy is directly proportional to the kenetic energy of the electron.

The photoelectric effect begins at a certain minimum frequency, called the "red limit" of the photoelectric effect, for a given metal, regardless of the intensity of light.) proves that it does not depend on light intensity.
formula is the law of conservation of energy
The energy of a photon falling on a substance is equal to the work function of the substance and the kenetic energy of the electrons emitted from the substance.
The explanation in the formula is equal to one phaton energy and one electron energy. [8-9-10]

"Mental Attack"
1. State the first law of the photo effect.
2. State the second law of photoeffect
3. Write the formula of Einstein's equation
4. Explain the laws in the formula of Einstein's equation
5. Explain the physical meaning of the output

Test task on the Topic
Topic How does the maximum velocity of photoelectrons emitted from a substance change under the influence of light as the flux increases?
It does not change
Increases
Decreases
Increases by 2 times
How does the number of photons emit from a metal change if the frequency of the light waves incident on it increases by a factor of 4?
It does not change
Increases by 2 times
Decreases
Decreased by 2 times
What is the photoelectric effect at the frequency of light incident on the metal surface with output A?
$\nu > A / h$
$\nu < A / h$
$\nu = A / h$
$\nu \leq A / h$
Show the formula for determining the red border of the photo effect!
$\lambda = hc / A$

λ = cA / h
λ = hA / c
λ = A / hc

5. Separation of electrons from matter under the influence of light.... called
Photo effect
Diffraction
Interference
Dispersion

6. When an electron released in an atom or molecule under the influence of light remains as free electrons in matter, it is called....
Internal photo effect
External photo effect
Light absorption
The phenomenon of emesis

Analysis and Results

1. It is much better for the student to understand the topic if he reads, sees and hears the text in order to visualize the physical processes in order for the student to understand the topic.
2. The rules, laws and formulas that the reader should pay attention to and know while reading the text, as well as their physical meanings are given in audio form.
4. It is a good idea to use the BBB method to see if students know the rules of the topic or formulas.
5. The use of "Physical Dictation" gives good results so that students can imagine their theoretical and practical knowledge.
6. It was agreed that it is important for students to know, feel, and understand the laws of physics, and to use the “why” method to apply the most important theoretical knowledge in practice.
7. Different types of tests are important to reinforce the topic. Compatibility tests The role of conformity tests in the development of students' thinking, reasoning, analysis in general, the acquisition of theoretical knowledge and its application in practice is invaluable. At the same time, it is important to know the general formula and be able to derive a working formula from it, as well as compatibility tests to further strengthen theoretical knowledge.
8. Applying compatibility tests to memorize the basic rules in the text of the topic leads to good results. This is because it is also important for the student to memorize rules

or physical laws, or to check how well he or she has learned the laws and rules he or she has memorized.

9. Spot tests give good results so that the student knows the physical rules of the subject.

Conclusion

In the study of the laws of photoelectric effect and Einstein's equation, it is important to use interactive methods such as "Physics dictation", "Why", "Brainstorming" and "BBB". it was concluded that all types of test assignments are important for students to self-assess and reinforce the knowledge they have acquired.

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