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PHYSICAL FUNDAMENTALS OF NON-CONNECTIVE ENERGY SOURCES IN TEACHING PHYSICS IN GENERAL SECONDARY EDUCATION

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ANNOTATION

This article summarizes information on solar photovoltaic and solar engineering elements in a school physics course, taking into account their age, ability, and class stages so that students can adequately master the information in the physics course program in physics teaching in general secondary schools. Taking into account the information presented in the article, it is a practical approach for students to acquire knowledge, skills and abilities on the physical basis of modern solar photoelectronics. The basics of applying the principle of consistency of a broader interpretation of data on solar photovoltaic cells and elements of solar technology in the teaching of physics are described.

Keywords: Semiconductor, photoeffect, optics, construction, non-conventional energy, consistency principle, photoenergy, solar engineering, element, energy resources, quantity, geothermal energy, photoelectronics, bioenergy, phosphorus, electron, cavity, silicon, p-n-transition, diffusion, potential.

INTRODUCTION

Physical Education in General Secondary Schools Continuing Physics Education In the school phase, relatively simple, understandable topics and topic-related information on solar photovoltaics should be formed. When students master the information in the school physics course program, their age, ability, and class stages should be taken into account. The school physics course provides a brief overview of the elements of solar photovoltaics and solar engineering. Therefore, in the teaching of elements of solar technology in the general secondary education system, students should master the basics of natural sciences and the rapidly evolving physics, to arouse their interest in this science, to explain physical phenomena and laws of nature and to introduce new discoveries and research in physics is important today.

It is known that modern physics is inextricably linked with many natural sciences, plays an important role in their synergistic development, and on this basis, there are opportunities for the emergence of new areas. These include modern energy, biophysics, thermal physics, heliophysics, semiconductor physics, microelectronics, and more. Therefore, it is possible to combine the materials taught in the teaching of physics in secondary schools with several subjects in a synergistic way. However, this information is not sufficient for students to develop knowledge, skills and competencies in the physical foundations of modern solar photoelectronics.

It is known that the human way of life and science and technology, all existing spheres of production can not be imagined without energy, energy sources.

Currently, the amount of raw materials (coal, oil, gas) that make up energy sources is declining sharply. This, in turn, necessitates the development and widespread introduction of new non-conventional and renewable energy types. From this point of view, the gradual formation of knowledge about the possibilities in this area, ie the use of renewable energy resources, plays an important role in the process of physics education. These data mainly highlight the possible formation of the physical-technological basis of non-traditional energy sources in the process of teaching physics. Examples of non-conventional and renewable energy sources are solar photovoltaic, wind energy, geothermal energy and bioenergy.

The most efficient and environmentally friendly of these types of energy is solar photovoltaic, which has much higher efficiencies and capabilities. It is expedient to formulate information on solar photovoltaics on the topics of physics "Photoeffect phenomena (internal photoeffect) and their application", "Heliotechnics and the use of solar energy." [1] The main raw materials in solar photovoltaics are semiconductor elements. Semiconductor elements have very high electrical and optical properties and photosensitivity. Also, these substances are very sensitive elements to external influences. It is expedient to provide students with basic concepts and information on solar photovoltaics in physics lessons. Table 1 below presents topics on the physical and technological basis of the conversion of solar energy into electricity.

№	Name of topics	Basic information on the subject	Time
1	Theoretical bases of conversion of solar energy into electricity	Physical mechanisms of electricity generation under the influence of light light based on the phenomenon of internal photoeffect	2 hours
2	The principle of operation of solar cells	Processes of formation of electronic pairs based on p-n transition phenomenon in semiconductor materials	2 hours
3	Semiconductor multilayer solar cells	Physico-technological processes of formation of multilayer heterosexual solar cells	2 hours
4	Solar panels and their new designs	Information on solar technology and modern new designs	2 hours
5	Solar cell-based photovoltaic power plants and their future prospects	The components of photovoltaic devices, their functions, the possibility of generating electricity directly from solar photovoltaic devices and providing electricity to the population	2 hours
6	Physical bases of solar equipment	Conversion of mechanical energy into electrical, thermal, mechanical, compressed air energy using actuators (generators, compressors, electrolysis, etc.)	1 hour

As can be seen from the table above, there is sufficient general scientific and theoretical information on solar photovoltaics from non-traditional energy sources. Based on the possibilities of the proposed topics, we consider it expedient to introduce semiconductors and their properties in the electromagnetism section of the physics course of secondary schools after they have been fully covered. Because semiconductor materials are the raw material of solar photovoltaics, their working mechanisms are closely related to the fundamental laws of electromagnetism. In particular, the formation of p-n junctions, the motion of electron pairs under the influence of the field, and the physical processes in the surface layer of the elements are governed by certain laws.

In secondary schools, elementary concepts and information should be as simple, convenient and understandable as possible. As an example, the p-n transition process takes into account the fact that the mechanisms of formation in different elements depend on the type of element, as well as the possibility of sensitivity to external influences. Semiconductor elements are mainly used in solar photovoltaic silicon element. In this case, the elements (V) Boron or Phosphorus (F) are diffused in silicon to form a p-n transition. These elements also diffuse into the silicon element at different temperatures. Such data and sizes should be shown in schematic tables. The use of animation and visual aids in the formation of knowledge and skills of students is much more effective. In this regard, it is advisable to use animated visual aids in developing students' knowledge and skills about solar photovoltaics. As an example, the animated visual process of motion of electrons and cavities in the p-n junction (potential barrier) in the photoelectric effect is the basis for the formation of a clear image in the reader. It is also relatively easy to understand the nature of the laws of physics. Taking into account the age of students and their worldview, in the process of teaching physics there is a need to develop the physical and technological basis of solar photovoltaics. [2]

In teaching students the physical basics of modern energy technology, energy resources should be based on materials about renewable and new energy sources and their use in various sectors of the economy, energy production. It is expedient to study the problem of energy technology in education, because the use of solar energy is also used in the integral connection of physics, chemistry, mathematics, engineering and technology. Wind devices and airflow, as well as any moving object, have the energy to move. This kinetic energy is converted into mechanical energy using a wind wheel or other working body.

Depending on the function of wind devices, mechanical energy can be converted into electrical, thermal, mechanical, and therefore compressed air energy using actuators (generators, compressors, electrolysis, etc.). Different types of wind engines can be used to convert the kinetic energy of air flow into mechanical energy. Wind devices such as the Whister and the Acro-Cruft are used to convert the kinetic energy of airflow into electricity.

The main mechanism that converts wind energy into electricity is the wind turbine. It has a greater number of details than other turbines. The wind turns the blades attached to the bushing and they rotate together. Thus, the blades and the bushing together form the rotor. There are also contacts that turn and stop the turbine blades. The generator rotates and generates electricity. The generator, controller and other devices are placed in the box behind the blades. The anemometer detects the wind speed and transmits this information to the

controller. When the wind speed reaches 15-23km/h, the wind unit starts to rotate, and when the speed increases to 100km/h, they stop automatically to protect the mechanism from damage. The speed of some newer models of wind turbines is driven by the wind. The speed of some of the newer models will change along with this, making them more efficient. Large-capacity megawatt turbines are large in size, and their new models are capable of generating 2 to 5 MW of electricity. They are usually placed on islands close to the coast so that strong sea winds can turn them around. Such wind turbines are currently used in the UK, Germany, Denmark and other countries. [3]

These references suggest topics that reflect the basic concepts of solar photovoltaics and the elements of solar technology, while focusing on this issue. In addition to these suggested topics, independent work using essays, journals and other media, essays can also be used to develop knowledge and skills. The development of modern science and technology is bringing unprecedented discoveries and innovations in the field of physics. The discoveries made in scientific research in solar photovoltaics are also leading to the development of this field. In order to convey this information to the students, the teacher will have to find opportunities to organize the lesson process in an interesting and effective way, as well as to pass the lesson at an "excellent" level. At the same time, the use of new innovative pedagogical technologies, non-traditional types of lessons gives positive results. As a requirement of the period, not only in physics classes, but also in optional courses and clubs, the topics include the basic concepts of solar photovoltaics, the formation of lessons, the physico-technological basis of renewable energy sources and information on the structure, principles and use of photovoltaic devices. should be considered, because the way of life of all mankind now and in the future cannot be imagined without energy sources, without energy.

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