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Research Article

OF SOLVING DIFFERENT TYPES OF NON-STANDARD PROBLEMS IN THE " DYNAMICS" DEPARTMENT OF PHYSICS IN GENERAL SECONDARY EDUCATION SCHOOLS

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ABSTRACT

In this article, the method of solving different types of non-standard problems related to the "Dynamics" section of physics.

KEYWORDS

Non-standard, modern, paradigm, feature, logic, thinking, activity, creative, event, process, knowledge, skill, competence, competence, influence.

INTRODUCTION

It is aimed at creating conditions for the implementation of the paradigm in modern general secondary education schools, which in many ways contributes to the formation of academic subjects, readiness for self-development in accordance with their individual characteristics and personal experiences. At the same time, taking into account that the current system of school education, including general secondary school textbooks, does not pay attention to non-standard issues, we will try to make a proposal to improve students' knowledge levels by strengthening this method.

For this, the formation and development of the subject of educational activity takes place in the process of its implementation: the need for this activity creates a desire to learn, and the essence of educational creative activity forms the ability to learn. The desire and ability to learn characterizes the topic of educational activity.

In the process of solving non-standard problems related to the "Mechanics" section of physics,

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students' logical thinking expands and their creative abilities develop. They have a wider understanding of the fundamental nature of physical phenomena, and a deeper understanding of the practical application of the laws of physics. They get acquainted with the function, structure, principles of operation of many physical measuring instruments, acquire the skills, qualifications and competences to work with them.

Also, the problems educate hard work, courage, will and character in students. By analyzing the literature on many problem-solving methods and based on experience, there are common aspects of solving non-standard problems related to all sections of the physics course, and specific aspects of solving non-standard problems related to each major topic. Below we briefly discuss the general aspects of the methodology for solving non-standard problems from mechanics:

1. In the content of each non-standard problem of mechanics lies a particular view of physical phenomena and processes, laws and regularities. So, in order to solve non-standard complex problems related to the "Mechanics" department of physics, it is necessary to study the related theory in depth. It is impossible to solve a non-standard problem without knowing theoretical conclusions and formulas expressing actions.

2. Solving a non-standard problem in mechanics begins with reading it carefully several times and understanding its content. When reading the condition of a non-standard problem, you should not focus on the quantity you are looking for, you should not try to find it quickly. On the contrary, it is necessary to understand the content of the physical phenomenon reflected in the non-standard problem, to remember the physical laws and formulas underlying this phenomenon.

If it is necessary to find a physical quantity and to calculate a chain or to make an image, it is necessary to clarify what quantities and conditions are given in a non-standard problem. The details of the issue are recorded in the order given in its condition. If in the conditions of the problem, the quantities are given in different units, they must be converted to SI.

3 If a drawing or chain is given in a non-standard problem, they should be carefully studied and copied correctly. If a non-standard problem does not have a drawing or a chain, then according to the condition of the problem, it is necessary to draw a drawing or make a chain that fully reflects the content of the problem by bringing the physical process before our eyes [14].

Issue 1. What is the acceleration of free fall at a height equal to half its radius above the surface of the Earth ?

Given:

R=6370 km=63.7 ·10 ^{5} m

$h = \frac{R}{2}$

G = 6.67 ·10 $^{-11}$ Nm ^{2} /kg ^{2}

g_o = 9.81 m/s ^{2}

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g_h = ?

Solution. Earth's surface and from him h to the height raised place for free drop off acceleration we write :

$$g_0 = G\frac{M}{R^2} \text{ and } g_h = G\frac{M}{(R+h)^2}.$$

Putting the value of the height in the second expression, we get:

$$g_h = \frac{4}{9}\cdot G\cdot\frac{M}{R^2} = \frac{4}{9}\cdot g_o. = \frac{4}{9}\cdot 9{,}81\frac{м}{c^2} = 4{,}36 \text{ м/с}^2.$$

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Answer : $g_h = 4.36$ m/s ^{2}.

Issue 2 . _ What is the value of the acceleration of free fall at depth from the surface of the earth ? Assume 100 кмthe acceleration of free fall at the Earth's surface is g = 9.81 m/s ^{2} and the radius of the Earth 6370 кмis equal to .

Given:

h =100 km =10 ^{5} m

R=6370 km=63.7 ·10 ^{5} m

G = 6.67 ·10 $^{-11}$ Nm ^{2} /kg ^{2}

g = 9.81 m/s ^{2}

g_h = ?

Solving. This issue solve for free work _ _ acceleration of the body density and to the radius dependence from the expression we use : $g = \frac{4}{3} \cdot G \cdot c \cdot p \cdot R$ (1)

(1) - to the expression according to h depth for free drop off acceleration we write :

$$g_h = \frac{4}{3} \cdot G \cdot c \cdot p \cdot (R - h) \text{ (2)}$$

Expressions (1) and (2). to each other being ***h*** in depth place for free drop off acceleration to determine expression harvest we do :

$$G_h = \frac{R - h}{R} \cdot G \text{ (3).}$$

(3) - calculations based on the expression we do :

$$g_h = \frac{63{,}7 \cdot 10^5 м}{63{,}7 \cdot 10^5 м} \cdot 9{,}81 \frac{м}{c^2} = 9{,}66 \frac{м}{c^2}.$$

The answer is : $g_h = 9.66$ m/s ^{2}.

Issue 3. A body is sliding down a plane with a slope of 60° with an acceleration of 5.6 m/s ^{2} · Find the coefficient of friction.

Given :

α= 60 °

a= 5.6 m/s ^{2}

μ=?

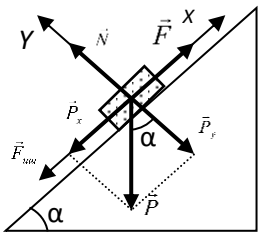

Figure 3.

Solving . To the body three forces $\vec{P}$ gravity , $\vec{N}$ of support the power of reac ts iya and $\vec{F}$ effect of friction force does _ (Figure 3). According to the condition of the problem, the acceleration is directed down the inclined plane. We write the equation of motion of the body as follows $m\vec{a} = \vec{P} + \vec{N} + \vec{F}$:

of the forces acting on the body on *the X* and *Y* axes. $P_x = P\sin a$, $P_y = P\cos a$ and we write the equation of motion in the form of a system of scalar equations:

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$$\begin{cases} ma = P_x - F \\ 0 = N - P_y \end{cases} \Rightarrow \begin{cases} ma = mg\sin\alpha - \mu N \\ N = mg\cos\alpha \end{cases}$$

Solving these equations together, we get *ma = mg sinb – mmg cosb* . From this

$$\mu = \frac{g\sin\alpha - a}{g\cos\alpha} = \frac{10\frac{м}{c^2}\cdot 0{,}86 - 5{,}6\frac{м}{c^2}}{10\frac{м}{10c^2}\cdot 0{,}5} = 0{,}6.$$

Answer: μ=0.6.

To achieve the goal, the following tasks must be performed:

1. Analysis of educational creative activity, which describes the purpose, structure, content, conditions of formation and development of physics education.
2. Summarizing information on the development of ideas about the role of tasks in school physics education; to determine the level of development in didactics and methods of applying non-standard physical problems in the formation of the subject of student-educational creative activity in the lower grades of the school.
3. Evaluation of the quality of non-standard problems from mechanics, formation of criteria and determination of their methodological possibilities, that they are used as a means of education of the specific characteristics of the personality of a general secondary school student describing the subject of study.
4. Preparation of a set of non-standard problems from mechanics for secondary schools of general education and development of instructions for teachers describing the methods of working with exercises in the prescribed order.
5. To check whether the quality and efficiency of non-standard problem solving methods offered by mechanics have increased.

It is worth saying that it is difficult for students to have a broad idea of physical phenomena and processes when solving non-standard problems from simple mechanics. In solving a non-standard problem from mechanics, it helps not only to understand the physical content of the problem, but also to develop the ability to think logically.

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