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USING THE PHET SIMULATIONS PROGRAM WHEN PERFORMING PRACTICAL AND LABORATORY CLASSES IN 7TH GRADE PHYSICS IN GENERAL EDUCATION SCHOOLS

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ANNOTATION

This article is about the possibilities of using PHET program simulations in place of practical and laboratory classes conducted in 7th grade physics.

Keywords: PHET program, Virtual laboratory work, innovative technology, determination of the density of bodies of various shapes laboratory work.

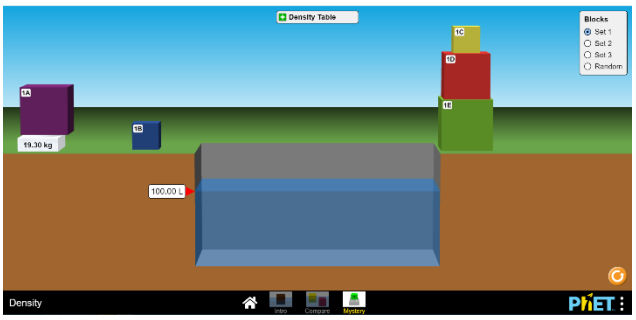
INTRODUCTION

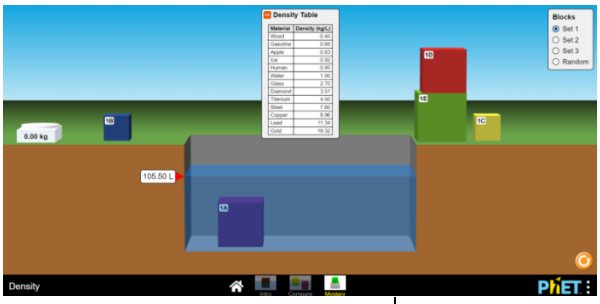
The new changes that are currently taking place in our Republic necessitate a radical renewal of the educational sphere. Indeed, the issue of raising a well-educated person with a broad worldview imposes great responsibility on the implementation of new principles of research from educators. Including in the decision of the president of our country "on measures to improve the quality of Education in the field of Physics and the development of scientific research» of PD-5032 (March 19, 2021) "to improve the quality of teaching physics in educational institutions today, introduce modern teaching methods to the educational process, select gifted students, prepare competitive specialists, a number of problems found in the solution, with great emphasis on the development of scientific research and innovation, as well as the direction of practical results, showed the need to carry out activities based on the quality of education in the field of physics and the improvement of the effectiveness of scientific research».[1]

In modern conditions, the need arises to use various methods of teaching students and schoolchildren. Visualization is one of the main methods of training that allows you to deeper understand a physical phenomenon or law. Visualization is most useful when studying dynamic objects and phenomena that are difficult to understand depending on the static picture. Not all experiments can be carried out in real laboratory conditions. Therefore, in addition to the traditional forms of teaching used in lecture, practical and laboratory work, it is necessary to introduce classes using interactive modeling methods.

For example, when performing practical and laboratory training in 7th grade physics, we will consider a demonstration of laboratory work "Determination of the density of bodies of different shapes" using the PHET simulations program. [2,3,4]

1 A- body





Given:

$$\rho_s = 1000\frac{kg}{m^3}$$

$$m_{1A} = 19.30kg$$

$$V_1 = 100l$$

$$g = 10\frac{m}{s^2}$$

$$V_2 = 105.5l$$

$$\rho_j = ?\ F_A = ?$$

Solution:

Using the given magnitudes we determine the density of the body. We determine the volume of the body using the formula.

$$V_j = V_2 - V_1$$

We calculate the density of a body through its mass and volume.

$$\rho_d = \frac{m_{1A}}{V_{1A}}$$

When a body is immersed in a liquid, we determine the Archimedean force acting on it.

$$F_A = \rho_s \cdot g \cdot V_{1A}$$

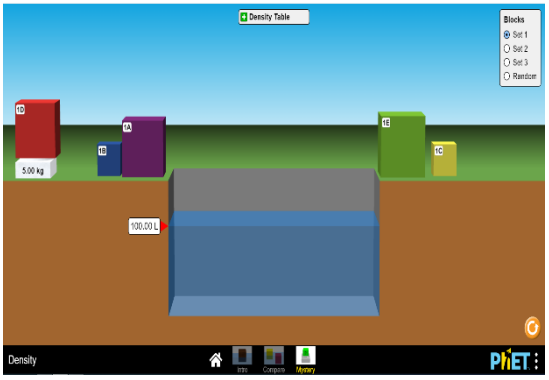
Let's calculate using the following formulas.

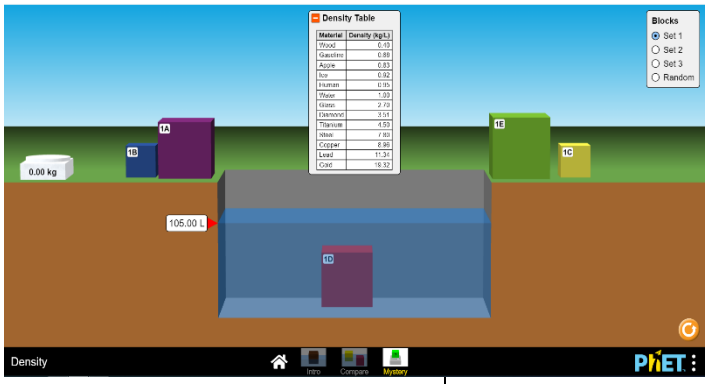
$$V_{1A} = (105.5 - 100)\cdot 10^{-3}m^3 = 5.5\cdot 10^{-3}m^3$$

$$\rho_{1A} = \frac{19.30kg}{5.5\cdot 10^{-3}m^3} = 3500\frac{kg}{m^3}$$

$$F_A = 1000\frac{kg}{m^3}\cdot 10\frac{m}{s^2}\cdot 5.5\cdot 10^{-3}m^3 = 55N$$

1 D-body





Given:

$$\rho_s = 1000\frac{kg}{m^3}$$

$$m_{1D} = 5kg$$

$$V_1 = 100l$$

$$g = 10\frac{m}{s^2}$$

$$V_2 = 105l$$

$$\rho_j = ?\ F_A = ?$$

Solution:

Using the given magnitudes we determine the density of of the body using the the body. We determine the volume formula.

$$V_j = V_2 - V_1$$

We calculate the density of a body through its mass and volume.

$$\rho_{1D} = \frac{m_{1D}}{V_{1D}}$$

When a body is immersed in a liquid, we determine the Archimedean force acting on it.

$$F_A = \rho_s \cdot g \cdot V_{1D}$$

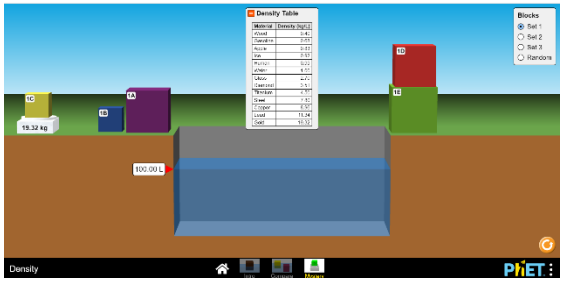
Let's calculate using the following formulas.

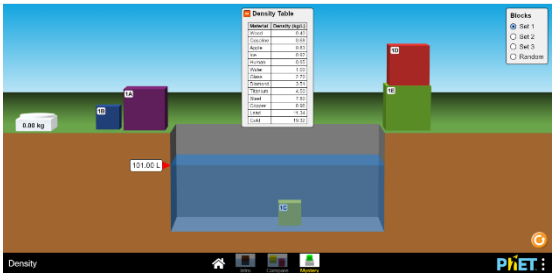
$$V_{1D} = (105 - 100)\cdot 10^{-3} m^3 = 5\cdot 10^{-3} m^3$$

$$\rho_{1D} = \frac{5kg}{5\cdot 10^{-3} m^3} = 1000\frac{kg}{m^3}$$

$$F_A = 1000\frac{kg}{m^3}\cdot 10\frac{m}{s^2}\cdot 5\cdot 10^{-3} m^3 = 50N$$

1 C-body





Given:

$\rho_s = 1000\frac{kg}{m^3}$

$m_{1C} = 19.32kg$

$V_1 = 100l$

$g = 10\frac{m}{s^2}$

$V_2 = 101l$

$\rho_j = ?\ F_A = ?$

Solution:

Using the given magnitudes we determine the density of the body. We determine the volume of the body using the formula.

$$V_j = V_2 - V_1$$

We calculate the density of a body through its mass and volume.

$$\rho_{1C} = \frac{m_{1C}}{V_{1C}}$$

When a body is immersed in a liquid, we determine the Archimedean force acting on it.

$$F_A = \rho_s \cdot g \cdot V_d$$

Let's calculate using the following formulas.

$$V_{1C} = (101 - 100)\cdot 10^{-3}m^3 = 1\cdot 10^{-3}m^3$$

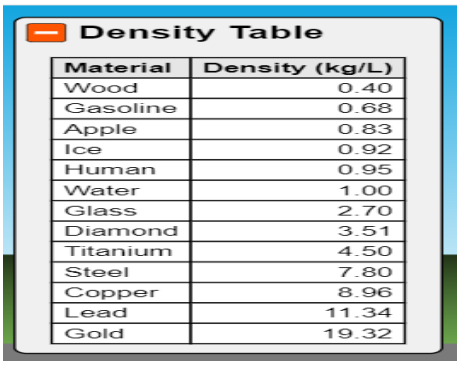
$$\rho_{1C} = \frac{19.32kg}{1\cdot 10^{-3}m^3} = 19320\frac{kg}{m^3}$$

$$F_A = 1000\frac{kg}{m^3}\cdot 10\frac{m}{s^2}\cdot 1\cdot 10^{-3}m^3 = 10N$$

Result:

Jism massasi $m(kg)$	Suyuqlik zichligi $\rho_s\left(\frac{kg}{m^3}\right)$	Suyuqlik hajmi $V_1(m^3)$	Erkin túshich tezlanishi $g\left(\frac{m}{s^2}\right)$	Jism solingan nan keyingi hajm $V_2(m^3)$	Jismning hajmi $V_j(m^3)$)	Jismning zichligi $\rho_j\left(\frac{kg}{m^3}\right)$	Material turi	Arximed kuchi $F_A(N)$
m_{1A}	1000	$100\cdot 10^{-3}$	10	$105.5\cdot 10^{-3}$	$5.5\cdot 10^{-3}$	3500	Olmos	55
m_{1D}				$105\cdot 10^{-3}$	$5\cdot 10^{-3}$	1000	Suv	50
m_{1C}				$101\cdot 10^{-3}$	$1\cdot 10^{-3}$	19320	Oltin	10

Using the results obtained, we determine what material the body is made of.



Density Table

Material	Density (kg/L)
Wood	0.40
Gasoline	0.68
Apple	0.83
Ice	0.92
Human	0.95
Water	1.00
Glass	2.70
Diamond	3.51
Titanium	4.50
Steel	7.80
Copper	8.96
Lead	11.34
Gold	19.32

1) $\rho_{1A} = 3500\frac{kg}{m^3}$ Since the density of the body is approximately equal to the density of the Diamond.

2) $\rho_{1D} = 1000 \frac{kg}{m^3}$ This body density corresponds to the density of water.

3) $\rho_{1C} = 19320 \frac{kg}{m^3}$ This density corresponds to the gold density in the table.

In conclusion, through the PHET model, it is achieved to educate highly educated personnel in this area so that they can awaken their heat to science, not giving teachers and students their basic knowledge of physics. So, taking laboratory classes in teaching physics using innovative technologies, the virtual laboratory gives the most effective results. The student gains practical knowledge through vision and understanding. This will definitely help to increase the effectiveness of the lesson using unconventional methods.

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