WALIA journal 32(1): 19-28, 2016
Available online at www.Waliaj.com
ISSN 1026-3861

Determining factor fluid viscosity through information technology

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Abstract: Information technology is a versatile learning tool, its use allows you to create in students not only knowledge and skills but also to develop the personality of students to meet her educational interests. With the help of information technology, applied physics in the discipline, the level of knowledge of students achieves good results. The proposed technique compared to the traditional, allows students to develop algorithmic and logical thinking, imagination, desire to assert them, to get the final result. The uses of information technology in education provide a strong tendency to increase the level of mastery of the material, motivation to learn, the attractiveness of the object itself.

Key words: *Physics; Drafting techniques; Problem solving; Research; Information technology; Decision problems*

1. Introduction

Informatization of modern society entails the following social impacts: Increase in the number of people employed in the field of information (producers, processors, distributors of information); - Intellectualization of many types of work and increasing demands for comprehensive training, training on the basis of new information technologies (most people should be able to work with automated information systems);- The emergence of entirely new professions and the withering away of the existing (especially with regard to robotization of many trades and the introduction of artificial intelligence).

Hence it is evident that the informatization of education is becoming a key condition for the development of society. New information technology training - is primarily an approach to the formation of training and methodological support of the real learning process when initially assumed substantial enrichment of methodological tools of the teacher. That is the nature of the procedure and methodological tools enrichment teacher becomes the content of the professional activity of methodical associations of teachers - of subject. There is formed a methodical approach to service. This professional activity of teacher's methodologists, heads of association's method, a new training will methodically targeted "grown" training system - new technology training. The practical result is the first textbook for teaching in the future after a special scientific-methodological research - college and high school textbooks of the new generation of real functions of a real educational process. It is understood by the technology: In - the first technology - is an art, skill, ability, a set of processing methods, changes in the state. Second technology - is a cultural concept related to thinking and human activity. In modern pedagogy for knowledge does not understand any information, but only one that gets the system quality, introducing it into meaningful relationships with other knowledge. Since everything in the real world systematically, interdependent and interrelated, the knowledge, describing the variety of forms of this world must be systemic. The mastery of a certain system of knowledge and should be a means and an end in relation to the development of the child. Information technology - an approach to the design of the educational process and its implementation is important because it affects the productive achievements of students, developing and raising training purposes. This integration ties are the basis for the formation of a scientific outlook, help students see the world in motion and development, promote the establishment of logical connections between the concepts and develop logical thinking of students. Educators are increasingly aware of the contradiction between: -Information technologies, traditional educational systems, the methodological

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possibilities of modern educational technologies, and insufficient professional level of teachers.

New type of pedagogical activity of the teacher, spontaneously formed in the actual practice of the university and focused on the design of the educational process, and continue to operate the traditional model of vocational training of teachers; - The need special training for teachers in planning activity and insufficient development of substantive and procedural structure of such a professional methodical preparation of the teacher of physics; an integer, the declared state educational policy, and the real-life methodical system of teaching physics;

New trends in the development of education (standardization, technologization, information, integration) and traditions in the teaching of physics; The need technologizing professional activity of the teacher of physics in accordance with the requirements of state educational standards and existing methodical system of teaching physics; huge volume of disparate methodological knowledge of physics and the need to integrate them for optimal organization of professional training of the future teacher; practice is the need to optimize the learning process in physics and insufficient development of technological tools teacher.

It seems that these contradictions, primarily caused by the insufficient development of the foundations of methodical system of training of students in pedagogical high school, in particular, its designing component allows teachers to design the educational process in physics, according to the stated objectives, and to implement it in practice. Information technology training implements and provides a radical turn to the person of the student by the teacher, the restructuring of the psychology of their interaction, highlighting the respect for the students as a subject of study and significantly enriching the content and form of communication of the teacher and the student, i.e., going humanization "humanization" methodical system.

Information technology training - is primarily an approach to the formation of training and methodological support of the real learning process when initially assumed substantial enrichment of methodological tools of the teacher. That is the nature of the procedure and methodological tools enrichment teacher becomes the content of the professional activity of methodical association of teachers of subject. There is formed a methodical approach to service. In today's society it is fully aware of the role of the quality of education in addressing the moral issues in the development of mankind. The flow of information is constantly growing and today it is impossible to get an education at the university for a lifetime; the principle of the existence and development of a modern education system in its continuity; the task of high schools to teach a person a lifetime to learn. This requires the development and implementation of new approaches to the organization of the pedagogical process.

If the learning process is organized on the basis of the technological approach, then: The learning process becomes open for students; the learning process is a learner-oriented, student of the subject makes building a conscious and self-own learning paths; the learning process considerably intensified; Provides an objective and unambiguous assessment of the level of Learning; Self-organized cognitive activity of students; implemented physiological, hygienic and psycho-educational standards in the learning process and create a comfortable environment for students and teachers; reduced congestion students; solved the problem of the variability of education; improving the quality of education in educational institutions. educational technology - there is an area of research theory and practice (in the education system), which has contact with all the parties organizing the educational system in order to achieve specific and potentially replicable pedagogical results.

Understanding the modern quality of education confronts the teacher the following tasks: Individualization of the educational process that is, for each student creating the most favorable conditions for development; implementation of all elements of the educational process new information approach; implementation of all elements of the educational process of the competent approach. The technology training is crucial learning tool. However, not all agents having high production capacity can be used in technology. Consequently, not all the means of education can create the technology and act as a formative factor. Consider the most popular to date learning tools - information technology and try to see how their technology formed the basis of learning.

We say at once that learning technology and information technology is not the same thing. Firstly, to technology training are and non-information technology (eg, technology education textbooks), and secondly, information technology, contain a lot of that will never be examined in the learning process (for example, the mechanism of coding, processing and transmission of information on network).

The use of information technology in education due to serious objective reasons, they are normally capable of several times to increase the effectiveness of learning. According to researchers from the University of Contemporary Humanitarian Computer training allows the student to absorb per unit of time 13 times more educational concepts than when listening to lectures in groups. Increasing the speed of assimilation of the material - one of the strengths of information technology, but not only; the basic structural unit of the information-technology network is the computer. When considering the learning process, that is, at any given point in time (in the classroom or during the execution of independent tasks), the computer serves only as a means of learning; whatever software on it or standing, whatever curriculum the student worked, he uses a computer like any other learning tool (eg,

film and video projectors, tables, charts, maps and other visual aids).

However, the situation changes completely, if we consider the dynamics of the learning process (for some period of time). In this case, the computer takes over the function of the teacher and more. Programs built into the computer, committed themselves assess learning activities and provide instructions for further work. The training program is designed for a certain amount of time during which the student can learn a new teaching material without the help of a teacher. The program presents the material beautifully, clearly, with the necessary explanations, detailed, manage the learning process and, in addition, can still take into account the individual interests of students, revealing some aspects of the topic more deeply. Note that this is due to the expansion properties of the medium of instruction and the implementation of some of their teaching functions; we can talk about the learning process with the use of the computer as a kind of learning technology.

Technology brings qualitative changes in the educational activity, but this does not mean that learning with technology is always better, efficient and quality. Technology may be outdated or designed to achieve results only to a single parameter. The effectiveness of the technology - is the question of specificity and accuracy of statement of purpose in the development of educational software and the adequacy of the methods submission and control; technologies capable of managing the educational process, but the content of the material that is embedded in training programs developed by subject specialists. This educational material is transmitted through the computer learner not the teacher who recounts and interprets in his own textbook content, and directly from the author of the textbook.

Each student has a computer program is not only a certain educational content, but also is characterized by a specific form of its presentation. The most commonly used demonstration of text pages followed by monitoring, screening movies with the author's comments, including a business game as a party to the parallel development of the rules (new educational concepts) and others. Different forms of presentation require different, appropriate methods of their development. Thus, technology is incorporated not only the content of educational material, but also the author of some of his methods of training program development. Given the fact that technology training is a new type of learning tools that can independently conduct the educational process, there are two qualitatively different types of teaching aids. Learning Tools of the first type (teaching) the teacher used to improve the efficiency of the educational process in the organization of the assimilation of new knowledge students. Examples include textbooks, manuals, books, visual aids, laboratory equipment, teaching aids, and others. The second type of training tools (technology) involves learning technologies, which allow conducting the learning process without the participation of the teacher. The learning process is focused specially trained teachers, managers who perform mainly control function.

Thus, the word "technology" we mean two things. Firstly, a new type of learning tools, raising the educational process to a new, fundamentally different level, characterized by wider didactic learning opportunities and meets the individual needs of the student. Secondly, under the technology implementation process, we understand a new way of learning. This concept would be more accurately described as not even the technology, and the process of learning (or technological training). Another is the case with education. Technical means are transferred to the student knowledge of the norms of human behavior, you can find - these are the same computers. However, practicing skills student behavior in society and its monitoring exercise by these means is not possible; a serious problem in the way of development of technology education - the uncertainty of the goals of education. Man - multifactor structure, which has a significant amount of both psychological and personality characteristics, therefore neither describe in detail nor build pedagogical processes aimed at developing students' skills of behavior in society, nor, especially, to combine them into one, education today is not state. No she and diagnostics that would determine the level of education, so that we can continue to rely only on existing methods and subjective methods of control. The combination of "technology education" cannot be applied to the "totality and consistency of educational methods and processes," which in the literature are called "technology." However, we are keeping the hope that in the future (probably in the distant than near) the technical means to be able to control and correct the student's behavior, believe in the emergence of technology education. The conclusion about the impossibility of use in modern conditions the concept of "educational technology" (or "technology education") allows you to talk about the inability to use the term "educational technology." Education is a set of two processes of training and education. Since the term "technology" to the process of education today is not applicable, then the combination of "educational technology" (or "technology education") cannot be used. The same conclusion should be made about the widely used combination of "educational technology." To understand the meaning of the word "teaching" means two processes are not, as in "education" (education and training), and three - training and development. The process of developing a more complex, less studied than education. Information technology training professional work of teachers, trainers, heads of associations, method, methodically targeted the new "grown" training system - new technology training. In practice, the first result will be a textbook for teaching in the future after a special scientific-methodological research - college textbooks and universities of the new generation of real functions of a real learning process (Akhmetov,

2002). What is meant by technology?-technology is an art, skill, ability, a set of processing methods, changes in the state; technology a cultural concept related to thinking and human activity; technology an intelligent processing of technically relevant skills and abilities; technology an organized, purposeful, deliberate pedagogical influence and impact on the educational process; under didactic technology transformation understand abstract theoretical formulations and synthesis of didactics and teaching methods in practice before the implementation of which is required to put a certain didactic purpose, where the problem is solved, this didactic.

Pedagogical technology is the domain of the study of theory and practice (in the education system), which has contact with all the parties organizing the educational system in order to achieve specific and potentially replicable educational outcomes (Bashmakov, 2003). In practice, information technology training refers to all technologies that use special technical information tools (computer audio, film, and video). When computers became widely used in education, it appeared the term "new information technology training." The rapid development of information technology has been constantly makes to revise the form of the physics lessons and their structure. Information technology in teaching physics allow us to solve a number of fundamentally new didactic problems: management quality physical education; Studying of the phenomena and processes in the micro- and macrocosm, inside the complex technical, physical, technological installations through the use of simulation; representation in a convenient and time-scale study of various physical phenomena and processes that actually take place with very high or very low speed (Sailor et al., 2001). Introduction of new technologies does not mean that they are replacing the traditional method of the object. Technology is not used instead of the previous methods of training, and along with them, as they are an integral part of the methodology of the subject. The novelty of the work lies in the consideration of possible attempts to form a complete set of information technology on each lesson. For effective learning material student activities should be directed in the right direction, constantly monitor and change their type of activity, or a lesson on the computer will be for them the same as the study material in the textbook. Make no mistake that saw a lesson in physics on the computer, students immediately begin it with joy to learn and remember. Nothing of the sort happens. That's right, that now the youth is very high interest in computers. Therefore, it is necessary to skillfully use this interest in learning. Proper maintenance of the physics lesson in the computer room increases the effectiveness of training. In the organization of the educational process is important not only to use technology already spent learning, but also to use and develop new, revealing the specifics of their functioning in a particular subject area. Pedagogical science and practice proved that work with personal information technology in the classroom for physics and after school effectively ensures the implementation of an individual approach to learning. It promotes realization of intersubject communications of physics with other Science subjects and other subject's cycles

The special features of the differential operation Information technology in teaching physics include the following:

- Along with general pedagogical, general information and technological objectives to solve specific methodological purpose subject teaching, such as the manifestation of functions managed interactively physical modeling and design decisions of the calculated and experimental problems, identifying their basis and graphic fixation of physical laws, creating student projects deal with complex objectives.

- Together with the development of general learning skills formed the system of knowledge and generalized substantive skills in physics are solved using a computer in various applications (to carry out simulation experiment to decide the model calculated and experimental tasks to encode information in a symbolic and graphical form, clearly express the physical laws and etc.).

- In addition to purely substantive skills formed a fundamentally new type of skills generic computer physical abilities that allow active use of the computer and its instrumental application capabilities to solve a variety of problems for student design different problems and orienting basis of action.

- The main problem of using information technology in teaching physics can be divided into several groups (Nurkasymova, 2008).

- Object technology is a learning process. In the traditional approach, the learning process is described verbally in the form of thematic planning. Any improvement in the educational process and its development course actually requires a new description. Using the technology of designing the educational process teacher training on this topic leads to a process map with a clear view tselepologaniya, diagnostics, correction, metering and logical structure, which is itself a model of educational process on this topic? Information and computer technology can be applied in the educational process in three ways: I-like "penetration" technique (the use of computer-based training on specific topics, sections for individual teaching tasks); II-as the main, determines the most significant use of technology in teaching; III-mono technology (when training, management of educational process, including all kinds of diagnostics, monitoring, based on the use of a computer) (Nurkasymova, 2013).

Information computer technologies allow to fully reveal the pedagogical, didactic function of teaching methods, to implement incorporated in their potential; they become the basis of modern education, which guarantees the necessary level of quality variation, differentiation and

individualization of training and education. The use of information technology for preparing an electronic abstract of the lesson requires new approaches to aesthetics and the lessons that process. Making the lesson presentation showing movies and computer virtual reality should not significantly lag behind the level design of web-pages of the Internet and television. In such circumstances, increase the professional requirements for teachers of physics, chemistry, mathematics and other disciplines in terms of knowledge of modern software and (or) organization of joint work over the course of the lesson of subject and computer designers (Lisichko and Sozorov, 2007). If you use the computer as a communicative tool in teaching physics, the professional position of teachers varies considerably. In this work the teacher turns into a leader, facilitator and assistant students in the course of their joint creative work. The software, tutorials, computer media, computer communication act as related tools for building the educational process; the computer turns into an ordinary working tool, what today it is the book, notebook and pencil.

2. Theoretical information

Molecular physics, the branch of physics that studies the structure and properties of matter on the basis of molecular-kinetic concepts, based on the fact that all bodies are composed of molecules present in the continuous chaotic motion. Parameters of system status can be changed. Any change in a thermodynamic system, associated with a change of at least one of its thermodynamic parameters, called the thermodynamic process. Macroscopic system is in thermodynamic equilibrium if its state over time does not change (assuming that the ambient conditions of the system are not changed). Static method - a method of research of systems of a large number of particles, operating static laws and an average value of physical quantities characterizing the totality of the particles (for example, the average speed of the thermal motion of molecules and their energy). Thermodynamic method - a method of research of systems of a large number of particles, which operates on the basis of the laws of energy conversion quantities characterizing the system as a whole (eg, pressure, volume, temperature), without considering its microstructure and microscopic processes occurring in the system. This thermodynamic method is different from the static. Thermodynamics deals with the thermodynamic system - a set of macroscopic bodies that interact and exchange energy between themselves and with other bodies (the environment), the basis of thermodynamic method - to determine the state of a thermodynamic system. System status is given thermodynamic parameter (state) - a set of physical quantities characterizing the properties of a thermodynamic system. Typically, the selected state parameters temperature, pressure, and specific volume. Temperature - one of the basic concepts, which play an important role not only in thermodynamics, but also in physics in general; temperature-physical quantity characterizing the state of thermodynamic equilibrium macroscopic systems. In accordance with decision XI of the General Conference on Weights and Measures (1960) it is now possible to use only two temperature scales - thermodynamic and International practice, graduated respectively in kelvins (K) and in degrees Celsius (° C). Parameters of system status can be changed. Any change in a thermodynamic system, associated with a change of at least one of its thermodynamic parameters, called the thermodynamic process. Macroscopic system is in thermodynamic equilibrium if its state over time does not change (assuming that the ambient conditions of the system are not changed). The function of the velocity distribution is the quantity that is numerically equal to the relative number of molecules in the unit interval of speeds:

$$f(\vartheta) = \frac{dN(\vartheta)}{Nd\,\vartheta}$$

Maxwell's law of the distribution of the molecules of an ideal gas velocity:

$$f(\vartheta) = 4\pi\left(\frac{m_0}{2\pi KT}\right)^{3/2} e^{-\frac{m_0\vartheta^2}{2KT}} \cdot \vartheta^2$$

$f(\vartheta)$ - It depends on the type of gas, m_0 – the mass of the molecules and the parameter condition on the temperature T. Then, from the definition of the function can determine the number of molecules with speeds in the range from ϑ to $\vartheta + d\vartheta$:

$$dN = f(\vartheta)Nd\,\vartheta = 4\pi N\left(\frac{m}{2\pi kT}\right)^{3/2} e^{-\frac{m\vartheta^2}{2KT}} \cdot \vartheta^2 d\vartheta$$

The arithmetic average speed is determined by:

$$<\vartheta>= \int_0^{\infty}\left(\frac{m}{2\pi kT}\right)^{3/2} e^{--\frac{m\vartheta^2}{2KT}} \cdot \vartheta^3 d\vartheta$$

Integrating obtains:

$$<\vartheta>= 4\pi\left(\frac{m}{2\pi kT}\right)^{3/2}\frac{1}{2}\left(\frac{2kT}{m}\right)^2 = \sqrt{\frac{8RT}{\pi m}}$$

The average velocity of the molecules:

$$<\vartheta>= \sqrt{\frac{8RT}{\pi m}}$$

$$<\vartheta^2>= 4\pi\left(\frac{m}{2\pi kT}\right)^{3/2}\int_0^{\infty} e^{-\frac{m\vartheta^2}{2KT}}\vartheta^4 d\vartheta = 4\pi\left(\frac{m}{2\pi kT}\right)^{3/2}\frac{3}{8}\pi^{1/2}\left(\frac{2kT}{m}\right)^{5/2} = \frac{3KT}{m}$$

The mean square velocity of the molecules:

$$<\vartheta_{кв}>= \sqrt{\frac{3kT}{m}}$$

The most probable velocity is determined from the extremum's condition:

$$\frac{\partial f(\vartheta)}{\partial\vartheta} = A\left(-\frac{2m\vartheta}{2kT}\vartheta^2 e^{-\frac{m\vartheta^2}{2kT}} + 2\vartheta\cdot e^{-\frac{m\vartheta^2}{2kT}}\right) = 0$$

$$\vartheta_{в}^2 = \frac{2kT}{m}, \qquad \vartheta_{в}^2 = \sqrt{\frac{2kT}{m}}$$

Number of molecules at velocities in the range of up ϑ_1 to a ϑ_2 :

$$N = \int_{\vartheta_1}^{\vartheta_2} 4\pi N f(\vartheta) d\vartheta$$

The expression determines the most probable speed $\vartheta_в$:

$$\vartheta_в = \sqrt{\frac{2kT}{m_0}} = \sqrt{\frac{2RT}{M}}$$

The average velocity of the molecules:

$$< \vartheta >= \sqrt{\frac{8kT}{\pi m_0}} = \sqrt{\frac{8RT}{\pi M}}$$

From the velocity distribution can go to the momentum distribution of the kinetic energy, relative to the speed:

$$m\vartheta = P,\ md\vartheta = dP \text{ and } \vartheta^2 = \frac{P^2}{m^2}$$

$$f(P) = 4\pi\left(\frac{m}{2\pi kT}\right)^{3/2} \cdot e^{-\frac{P^2}{2mkT}} \frac{P^2}{m^2}\frac{dP}{m} = 4\pi\left(\frac{1}{2\pi mkT}\right)^{3/2} e^{-\frac{P^2}{2mkT}} \cdot P^2$$

$$\frac{m\vartheta^2}{2} = \varepsilon \quad \frac{2m\vartheta d\vartheta}{2} = d\varepsilon \quad , \quad \vartheta = \sqrt{\frac{2\varepsilon}{m}}$$

$$f(\varepsilon) = 4\pi\left(\frac{m}{2\pi kT}\right)^{3/2} \cdot e^{-\frac{\varepsilon}{kT}} \frac{2\varepsilon}{m}$$

From the distribution of the energy we obtain the expression for the most probable energy, i.e., energy, which has the greatest number of molecules.

$$\frac{df(\varepsilon)}{d\varepsilon} = A\left(-\frac{1}{kT}e^{-\frac{\varepsilon}{kT}} \cdot \frac{2\varepsilon}{m} + \frac{2}{m}e^{-\frac{\varepsilon}{kT}}\right) = 0$$

$$\varepsilon_в = \frac{m\vartheta_в^2}{2} = \frac{m2kT}{2m} = kT \quad , \quad \varepsilon_в = kT$$

Given that $\rho = \frac{m}{V}$, a $PV = \frac{m}{M}RT$, m - mass of gas, M - The molar mass of the gas:

$$dP = -\frac{Mg}{RT}Pdh \quad \text{or} \quad -\frac{dp}{p} = -\frac{Mg}{RT}dh$$

With the change in altitude h_1 and from h_2 pressure changes inside P_1 and out P_2 i.e.

$$\int_{P_1}^{P_2} \frac{dP}{P} = -\frac{Mg}{RT}\int_{h_1}^{h_2} dh$$

Solving the integral, we obtain:

$$P_2 = P_1 e^{-Mg(h_2 - h_1)/RT}$$

This formula is called the barometric formula. Normally, the height is determined with respect to the sea level, the equation can be written as: $P = P_0 e^{-Mgh/RT}$

Where P - pressure adjustment h .

Using the basic equation MKT can obtain the relationship between the gas concentrations at different heights:

$$n = n_0 e^{-\frac{Mgh}{RT}}$$

Where n - the concentration of molecules at a height h , n_0 - on high $h = 0$.

So how $M = m_0 N_A$, where N_A - Avogadro's number, m_0 - the mass of a single molecule,

and $R = kN_A$, and then

$$n = n_0 e^{-\frac{m_0 gh}{kT}}$$

If we consider that $П = mgh$ the potential energy in the gravitational field, we get: $n = n_0 e^{-\frac{П}{KT}}$

This is the mathematical expression of the Boltzmann distribution. Maxwell Boltzmann distribution, and combined into a single law of Maxwell-Boltzmann:

$$dn = 4\sqrt{\pi}\, n_0 \left(\frac{m}{2\pi kT}\right)^{3/2} \vartheta^2 e^{-\frac{E}{kT}} d\vartheta$$

All real liquids and gases is inherent in the internal friction or viscosity, manifested in the fact that both have arisen under the influence of any cause of motion in the fluid being phased out. The molecules of any gas found in the Earth's gravitational field. If it was not, then the molecules are settled, the universe and atmosphere of the Earth would not exist. The combined effect of thermal motion and gravitational field leads to a state of the atmosphere in which the concentration of the gas pressure and it decreases with increasing height above the ground. We obtain the distribution of the thermodynamic equilibrium with the atmosphere around the same temperature in a uniform gravitational field. Molecules constantly collide with each other, but collisions between moving uniformly in a straight line. The distance of the mean free time is called the mean free path of the molecules. To determine these quantities should stop, at which the molecular model. For example, they are balls of approximately 10^{-} m, depending on the nature of the substance; to start that all the molecules are, and the only one moving; she also per unit time to face all the molecules whose centers are spaced from its center at a distance of less than or equal to the diameter of the molecules. If the concentration of the molecules, the number of collisions, taking into account the movement of other molecules necessary to maintain high relative velocity of the molecules, and get a more accurate expression for the average number of collisions: $< z >= \sqrt{2}\pi d^2 n < \vartheta >$

Then the mean free path is:

$$< \lambda >= \frac{< \vartheta >}{< z >} = \frac{1}{\sqrt{2}\pi d^2 n}$$

Until now, we considered the equilibrium state of a system of molecules in the absence of flows of matter and energy. If gas exists in the spatial heterogeneity of density, temperature, or rate of displacement of the individual layers of ordered gas, spontaneously mixes these in homogeneities. Streams that are typical of non-equilibrium states is the general name - the phenomenon of migration. These include - diffusion - mass transport; viscosity-momentum transfer and thermal conductivity - the

transfer of energy. Suppose that on opposite sides of the area dS is gas with parameters

: n_1, T_1, ϑ_1, $G_1$and n_2, T_2, ϑ_2, G_2 . From left to right flow properties of the system can be written: $\frac{1}{2}, \frac{1}{3}\vartheta_1 dtdSnG_1$

From right to left: $\frac{1}{2}\frac{1}{3}\vartheta_2 dtdSn_2 G_2$. The resulting flow that is Diffusion of gas - with the diffusion mass transfer:

$$dG = \frac{1}{2}\cdot\frac{1}{3}(\vartheta_1 n_1 G_1 - \vartheta_2 n_2 G_2)dSdt$$

Concretize the problem, consider the diffusion. Then:

$$T = const\ ,\quad P = const\ ,\quad n_1' + n_1 = n_2' + n_2 = const\quad G_1 = G_2 = m\quad <\vartheta_1>=<\vartheta_2>=<\vartheta>$$

$$dM = \frac{1}{6}m<\vartheta>(n_1 - n_2)\,dS\,dt\ ,\qquad n - n_1 = \lambda\frac{dn}{dx}\quad n_2 - n = \lambda\frac{dn}{dx}\quad n_2 - n_1 = 2\lambda\frac{dn}{dx}$$

$$dM = -\frac{1}{3}m<\vartheta><\lambda>\frac{dn}{dx}dSdt\quad <D>=\frac{1}{3}<\vartheta><\lambda>\qquad m\frac{dn}{dx} = \frac{dp}{dx}$$

$$<\vartheta_1>=<\vartheta_2>=<\vartheta>$$

In the transport equation:

$$dM = \frac{1}{6}m<\vartheta>(n_1 - n_2)dSdt\ ,$$

$n_1 - n_2$ - Change of concentration:

$$n - n_1 = \lambda\frac{dn}{dx},\quad n_2 - n = \lambda\frac{dn}{dx},\quad n_2 - n_1 = 2\lambda\frac{dn}{dx}$$

Then:

$$dM = -\frac{1}{3}m<\vartheta><\lambda>\frac{dn}{dx}dSdt\ ,\quad \frac{mdn}{dx} = \frac{d\rho}{dx}$$

$$<D>=\frac{1}{3}<\vartheta><\lambda>$$

$$dM = -D\frac{d\rho}{dx}dSdt$$

The phenomenon of diffusion Fick's law:

$$j_m = -D\frac{d\rho}{dx}$$

Where j_m - mass flow density, $\frac{d\rho}{dx}$ - density gradient, D - diffusion coefficient, the sign (-) indicates that mass transfer occurs in the direction of decreasing density, $<\vartheta>$ - the average velocity of the molecules, $<\lambda>$ - the mean free path; the thermal conductivity of the gas - with heat conduction transfer of energy from one layer to another.

$$j_E = -\chi\frac{dT}{dx}$$

$$\chi = \frac{1}{3}<\vartheta><\lambda>\rho C_v\ ,$$

$$dQ = -\chi\frac{dt}{dx}dSdt$$

Where j_E - heat flux, χ - thermal conductivity, $\frac{dT}{dx}$ - temperature gradient, C_V - the specific heat of the gas at constant volume; diffusion of gas - with the diffusion mass transfer. The phenomenon of diffusion chemically homogeneous gas obeys Fick:

$$j_m = -D\frac{d\rho}{dx}$$

Where j_m - mass flow density, $\frac{d\rho}{dx}$ - density gradient, D - diffusion coefficient, the sign (-) indicates that mass transfer occurs in the direction of decreasing density. According to the kinetic gas theory:

$$D = \frac{1}{3}<\vartheta><\lambda>$$

where $<\vartheta>$ - the average velocity of the molecules, $<\lambda>$ - the mean free path.

The internal friction of the gas (viscosity) - portable pulse value

$$T = const\ ,\quad P = const\ ,\quad n_2 = n\ .\quad <\vartheta_1>=<\vartheta_2>=\vartheta$$

$$K_1' = m<\vartheta> + mu_1\quad K_2'' = m<\vartheta> + mu_2\quad G_2 = mu_2\quad dK = \frac{1}{6}n\vartheta m(u_1 - u_2 dSdt)$$

$$\rightarrow u_4\quad K_3' = m<\vartheta> + mu_3\quad u - u_1 = \frac{du}{dx}\lambda\quad u_2 - u_1 = \frac{du}{dx}2\lambda$$

$$\rightarrow u_3$$

$$\rightarrow u_2\quad K_1' < K_2' < K_3'\quad G_1 = mu_1\quad u_2 - u = \frac{du}{dx}\lambda\quad dK = -\frac{1}{3}n\vartheta m\,2\lambda\frac{du}{dx}dSd\tau$$

Consider viscosity. The strength of the internal friction in the gas by Newton's law: $dF = -\eta\frac{dU}{dx}dS$

where U - the rate of flow of the gas layer, $\frac{dU}{dx}$ - velocity gradient, dS - area between the layers. Consider the thermal conductivity. Then:

$$T \neq const\ ,\quad p = const\ ,\quad G_1 = \frac{i}{2}KT_1,\quad G_2 = \frac{i}{2}KT_2\quad \eta = \frac{1}{3}\rho<\vartheta><\lambda>$$

$$T_2 - T_1 = -2\lambda\frac{dT}{dx},\quad dQ = \frac{1}{6}\frac{i}{2}k(n_1<\vartheta_1>T_1 - n_2<\vartheta_2>T_2)dSdt\ ,\quad n<\vartheta>\approx\frac{1}{T}\sqrt{r}\approx\frac{1}{\sqrt{r}}$$

$$n_1<\vartheta_1> - n_2<\vartheta_2>\approx\frac{1}{\sqrt{r_1}} - \frac{1}{\sqrt{r_2}}\quad n_1<\vartheta_1>\approx n_2<\vartheta_2>;\quad dQ = -\frac{1}{3}\frac{i}{2}kn\lambda\vartheta\frac{dT}{dx}dSd\tau$$

$$H = \frac{1}{3}<\vartheta><\lambda>\rho c\vartheta$$

The transfer of energy in the form of heat obeys Fourier: $j_P = -\eta \frac{d\vartheta}{dx}$

where j_P - momentum flux density.

$$\eta = \frac{1}{3}\rho < \vartheta >< \lambda >$$

The coefficient of internal friction is independent of the gas pressure of the gas. The reason for the viscosity is the imposition of an orderly movement of gas or liquid layers with different speeds $\vec{\vartheta}$ and thermal chaotic motion of molecules with speeds of $< \vartheta >$, depending on the temperature.

The random motion of molecules brings them out of bed in the moving B with velocity $\vec{\vartheta}_2$ in the layer A, moving with speed $\vec{\vartheta}_1$. In the transition of molecules from one layer to another is transferred momenta

$m\vec{\vartheta}$ ordered motion of molecules. If $\vec{\vartheta}_1 > \vec{\vartheta}_2$ the molecules previously were in bed in B, being in the layer A, in collisions with molecules it accelerate its orderly movement and orderly moving molecule layer A slowing and on the contrary, during the transition of molecules from a fast-moving layer A layer in B which they carry large momenta's $m\vartheta$ and intermolecular collisions in a layer B in the accelerating movement of the molecules of this standing.

The momentum flux K_I tolerated molecules downward momentum is the product of a single molecule to the number of molecules crossing the site I m²per unit time. This number of molecules is equal to:

$$N_1 = \frac{1}{6}n < \vartheta > \quad (1)$$

Indeed, the thermal velocities of the molecules are uniformly distributed in three mutually perpendicular directions. Of all the molecules of n 1/3 volume unit moves along the X axis and half of them moving in the positive and in the negative half-axis direction X, n - molecular concentration, $< \vartheta >$ - the average speed of the thermal motion of the molecules of the liquid. Then,

$$K_1 = N_1 m\vartheta_1 = \frac{1}{6}n < \vartheta > m\vartheta_1 \quad (2)$$

where ϑ_1 - directional velocity of the molecules in the layer A.

Accordingly, for molecules crossing area S from the bottom up, we have:

$$K_2 = N_2 m\vartheta_2 = \frac{1}{6}n < \vartheta > m\vartheta_2 \quad (3)$$

where ϑ_2 - directional velocity of the molecules in the layer B.

The resulting pulse stream via I m² area in the I c is:

$$K = K_1 - K_2 = \frac{1}{6}n < \vartheta > m(\vartheta_1 - \vartheta_2) \quad (4)$$

Here ϑ_1 - ϑ_2 the difference in velocity of the fluid flow at points spaced at a distance of two mean free paths of the molecules before the collision. This speed difference may be represented as:

$$\vartheta_1 - \vartheta_2 = -\frac{d\vartheta}{dx}2\lambda \quad (5)$$

There $\frac{d\vartheta}{dx}$ - adjusting the speed of layers per unit length Xb

Direction normal to the surface of the bed (velocity gradient) amd By substituting (5) into (4) we obtain:

$$K = \frac{1}{3}nm < \vartheta > m < \lambda > \frac{d\vartheta}{dx} \quad (6)$$

This expression gives the power of internal friction acting on the unit area of the surface of the layer (Newton's law). Composition:

$$\eta = \frac{1}{3}nm < \vartheta >< \lambda > \quad (7)$$

It is characteristic of the type of liquid and is called the coefficient of viscosity.

Lambda <λ> mean free path of the molecules of the liquid in the physical sense is very different from the mean free path of the gas molecules. The transfer of momentum from one layer to another is carried out in the liquid molecules, occasionally commits intermittent translational movement, changing the position of the equilibrium, around which the molecules vibrate. The product *mn* gives a mass per unit volume of fluid, i.e., liquid density:

$$\rho = nm \quad (8)$$

Finally, for the viscosity of the liquid we have

$$\eta = \frac{1}{3} < \vartheta >< \lambda > \rho \quad (9)$$

The physical meaning of the coefficient of viscosity is as follows: From Newton's law coefficient is expressed as follows:

$$\eta = \frac{F}{S\frac{d\vartheta}{dx}} \quad (10)$$

This shows that the viscosity coefficient is numerically equal to the force of internal friction on I m² of surface layers of touch with the velocity gradient with a module equal to I m/s at 1 m (Nurkasymova, 2009). In every body moving in a viscous liquid, the force of resistance depends on the type of fluid, body shape and nature of the flow. A rigorous solution of the problem of laminar flow around the ball boundless liquid was obtained by the English scientist Stokes (1845). 3 Methods of study of the topicIt is called a laminar flow of gas or liquid in which the layers of gas or liquid flowing though at different speeds, but parallel to each other, in contrast to the turbulent flow when the liquid and gas vortices appear. Sala resistance to movement of the ball in this case is determined by the formula (Fig. 1):

$$F = 6\pi\eta r\vartheta \quad (11)$$

where *r* - radius of the ball, ϑ - its rate of motion of the fluid.

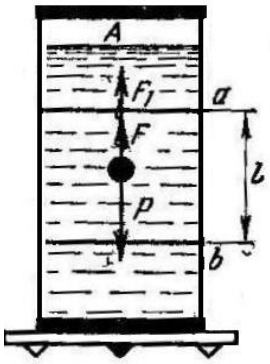

Fig 1: A moving body in a fluid

The vessel diameter D, much greater than the diameter d of the ball is filled with glycerin. Balls made of Wood's alloy are lowered into the glycerin in the center of the vessel and fall to the bottom thereof. Wire marks are for convenience of reference distance. The travel time is determined by a stopwatch. The diameter of the ball is determined by measuring the microscope in the calculation formula (18) includes a steady speed of the ball, because the top label should be placed far below the level of the liquid in such a way that the velocity of the ball at the time of the passage of the uterus can be established.

On the ball moving in the fluid are three forces: gravity, pushing the power and strength of internal friction (see Fig. 1). Gravity is:

$$m\vec{g} = \rho V\vec{g} \qquad (12)$$

where ρ - the density of the ball, V- the volume of the ball.

The buoyant force of the law of Archimedes is numerically equal to the weight displaced liquid:

$$m_{ж}\vec{g} = \rho_{ж} V\vec{g} \qquad (13)$$

The strength of the internal friction of Stokes' formula is:

$$\vec{F} = 6\pi\eta\, r\vec{\vartheta} \qquad (14)$$

In steady uniform movement of the ball of his equation of motion of Newton II of the Act is written:

$$m\vec{g} + m_{ж}\vec{g} + \vec{F} = 0 \qquad (15)$$

In view of (12 - 14), we obtain:

$$\rho Vg - \rho_{ж} Vg - 6\pi\eta\, r\vartheta = 0 \qquad (16)$$

The amount of ball we express through its range:

$$V = \frac{3}{4}\pi \cdot r^3 \qquad (17)$$

With this in mind, we express the equation (16), the coefficient of viscosity, we obtain:

$$\eta = \frac{2}{9}\frac{r^2 g(\rho - \rho_{ж})}{\vartheta} \qquad (18)$$

Speed of uniform motion of the ball is determined by the distance traveled and time of travel: $\vartheta = \frac{h}{t}$

The final form of the working of the formula:

$$\eta = \frac{2}{9}\frac{r^2 g(\rho - \rho_{ж})t}{h} \qquad (19)$$

3. Conclusions

As a result of theoretical information precede the experiment, allowing for students to solve specific problems on this topic. In the experiment, the student learns to use information technologies and methods of processing the results of measurements and acquire skills of reporting on the work. The formula viscosity based on Stokes' law. According to this formula is necessary to determine the viscosity of glycerol and compared with reference data. In general, the use of information technology in education provides a strong tendency to increase the level of knowledge retention, motivation to learn, the attractiveness of the object itself. The proposed method compared to the conventional, allows students to develop algorithms and logical thinking, imagination, the desire to assert them, to get the final result.

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