ISSN 2518-1467 (Online),
ISSN 1991-3494 (Print)

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫНЫҢ

Х А Б А Р Ш Ы С Ы

ВЕСТНИК

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН

THE BULLETIN

OF THE NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN

1944 ЖЫЛДАН ШЫҒА БАСТАҒАН
ИЗДАЕТСЯ С 1944 ГОДА
PUBLISHED SINCE 1944

4

АЛМАТЫ
АЛМАТЫ
ALMATY

2017

JULY
ИЮЛЬ
ШІЛДЕ

«Қазақстан Республикасы Ұлттық ғылым академиясының Хабаршысы».
ISSN 2518-1467 (Online),
ISSN 1991-3494 (Print)
Меншіктенуші: «Қазақстан Республикасының Ұлттық ғылым академиясы»РҚБ (Алматы қ.)
Қазақстан республикасының Мәдениет пен ақпарат министрлігінің Ақпарат және мұрағат комитетінде 01.06.2006 ж. берілген **№5551-Ж** мерзімдік басылым тіркеуіне қойылу туралы куәлік

Мерзімділігі: жылына 6 рет.
Тиражы: 2000 дана.

Редакцияның мекенжайы: 050010, Алматы қ., Шевченко көш., 28, 219 бөл., 220, тел.: 272-13-19, 272-13-18,
www: nauka-nanrk.kz, bulletin-science.kz

Типографияның мекенжайы: «Аруна» ЖК, Алматы қ., Муратбаева көш., 75.

«Вестник Национальной академии наук Республики Казахстан».
ISSN 2518-1467 (Online),
ISSN 1991-3494 (Print)
Собственник: РОО «Национальная академия наук Республики Казахстан» (г. Алматы)
Свидетельство о постановке на учет периодического печатного издания в Комитете информации и архивов Министерства культуры и информации Республики Казахстан **№5551-Ж**, выданное 01.06.2006 г.

Периодичность: 6 раз в год
Тираж: 2000 экземпляров

Адрес редакции: 050010, г. Алматы, ул. Шевченко, 28, ком. 219, 220, тел. 272-13-19, 272-13-18.
www: nauka-nanrk.kz, bulletin-science.kz

Адрес типографии: ИП «Аруна», г. Алматы, ул. Муратбаева, 75

Bulletin of the National Academy of Sciences of the Republic of Kazakhstan.
ISSN 2518-1467 (Online),
ISSN 1991-3494 (Print)
Owner: RPA "National Academy of Sciences of the Republic of Kazakhstan" (Almaty)
The certificate of registration of a periodic printed publication in the Committee of Information and Archives of the Ministry of Culture and Information of the Republic of Kazakhstan N 5551-Ж, issued 01.06.2006

Periodicity: 6 times a year
Circulation: 2000 copies

Editorial address: 28, Shevchenko str., of. 219, 220, Almaty, 050010, tel. 272-13-19, 272-13-18,
http://nauka-nanrk.kz /, http://bulletin-science.kz

Address of printing house: ST "Aruna", 75, Muratbayev str, Almaty

BULLETIN OF NATIONAL ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN
ISSN 1991-3494
Volume 4, Number 368 (2017), 5 – 10

UDC 532.133, 371.62, 372.8.002

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DESIGNING THE AMBIGUOUS TASKS AND TASKS WITH MISSING DATA FOR PERFORMANCE OF COMPUTER LABORATORY WORKS

Abstract. Here are suggested the examples of ambiguous tasks and tasks with missing data for performance of computer laboratory works on the models "Composition of Vectors" and "Relative movement", "Movement with Acceleration of Gravity", "Movement with Continuous Acceleration", "Elastic and Inelastic Collision" and "Elastic Impacts of Spheres models". The choice of two interconnected parameters is necessary in ambiguous tasks which defines the set condition. Such tasks can have several decisions. While solving them the student has to choose one of parameters proceeding from computer model capacity, first to solve them on paper, then realize these conditions in a computer experiment, check result and reflect results in answers. Lacking parameter is determined in tasks with missing data in the first instance, and this parameter is chosen on the assumption of a computer model capacity, and further acts in the same way as in the previous case. Such tasks are improves the logical thinking, and the ability to find an optimal way of the solution of a task. Brief characteristics, an opt for change of initial parameters and questions discussed for the solution of tasks are given to each computer model.

The suggested tasks had a trial at Nazarbayev Intellectual School for the physical and mathematical direction in Shymkent, at regional school "Daryn" for exceptional children and at school gymnasium named after M. Auezov in Arys. Most of pupils performed all tasks with big interest.

Keywords: speed, acceleration, flight range and altitude, targeted distance, force of friction.

The President of the Republic of Kazakhstan N. Nazarbayev has told in his Message "Strategy "Kazakhstan-2050" is a new policy of the established state" to the people of Kazakhstan having emphasized the priorities in education: - We should make modernization of techniques of teaching and develop actively the online-education-systems and create the regional school centers. We have to intensively introduce innovative methods, decisions and tools to the national education system, including distance learning and training in online mode, which is available for those who want [1].

For accomplishment of the set tasks the "Theory and Technique of Teaching Physics" department of SKSU named after M. Auezov of the MES of the Republic of Kazakhstan has introduced the disciplines "Information technologies in education", "Information technologies in teaching physics", "The technique of using the electronic textbooks in teaching physics" in training process since 2013, which provide the development and use modern information technologies in teaching physics.

There have been created the new computer models, training programs, databases and a technique of their usage in teaching physics at schools, colleges, lyceums and HIGHER EDUCATION ESTABLISH-MENTS.

One difficult problem at introducing these results in educational institutions is insufficient practical skills of school teachers in using computer models of the physical phenomena at carrying out laboratory works at organizations. Activization, motivation and eventually learning efficiency in many respects depends on the organization of computer laboratory works. According to many domestic and foreign experts A powerful tool of teaching physics is production of the Fizikon company. Each teacher of physics optionally can independently design computer laboratory work, using interactive models from the multimedia course "Open Physics" of the Fizikon company [2-4]. And therefore it is recommended to use the same algorithm for creation of laboratory works which was applied in this multimedia course. At first it is recommended to sort the theory of a question, then to answer control questions, then to do the tasks while working out on these tasks it is necessary to make a computer experiment and to check the received result. Certainly, For the accomplishment of computer laboratory works short data from the theory, fact-finding tasks to the corresponding computer model, which provide the description of work of interactive model have to precede ambiguous tasks and tasks with missing data for performance of computer laboratory works. We presented such tasks in works [5-17]. In ambiguous tasks the choice of two interconnected parameters is required, which define the specified condition. Of course such tasks can have several decisions. While working out these tasks student has to choose one of parameters relying on the possibility of computer model, first work out on paper, then realize these conditions in a computer experiment and check result. Lacking parameter will be determined firstly at tasks with missing data, and this parameter will be chosen proceeding from a possibility of computer model, further students act as in the previous case. Such tasks develop logical thinking, ability to find an most suitable way of solving tasks and their realization on computer model.

Ambiguous tasks and tasks with missing data for performance of computer laboratory works on some sections of physics with use of the "Open Physics" resource are given below 1.1. resource [2].

Tasks with missing data and ambiguous tasks.

1. The discussed questions:

• Composition of equally directed vectors A and V. Answer:.....

• Vector A is directed on an axis Ox, vector B is directed on Oy axis. The task here is to find the module of their composition and its direction respectively an axis Ox. Answer:.....

• River speed compared with the coast is 1 m/s, and boat speed compared with the coast is 3 m/s. The task is to find the resultant speed of the boatman when he goes down stream and against the current stream of the river, and also his speed if he directs the boat at right angle to the coast. Answers:.....

• Write expression of dependence of speed on time of the rectilinear body movement which has initial υ0 speed and a acceleration. Answer:.....

• Write expression of dependence of a way on time of the rectilinear body movement which has initial υ0 speed and a acceleration. Answer:.....

• Write dependence of final speed of the rectilinear body movement on acceleration and a way. Answer:.....

• The body of weight of 1 kg is located to a horizontal on the inclined plane with a tilt angle α=30o. With what force does the body press on a support. Answer:.....

• On the inclined plane with a tilt angle α=30o the body of mass of m=1kg is located to a horizontal. The body is affected by force of F=1 N directed up along the plane. The task is to define the Module of the Sum of Force F and force of Gravity. Answer:.....

• The body is thrown at an angle α=30o to the horizon with an initial speed υ0=5 in m/s. Define υ0x and υ0y. By what maximum height do the body, time of rise and time of falling, and also flight time rise. Answer:.....

• Write the expression of dependence component speeds Vx and Vy depending on time movement in the field of Earth gravity. Answer:.....

• Write the equation of a trajectory of the movement of the body thrown from the Earth's surface with an initial speed υ0 at an angle α to the horizon. Answer:.....

• Write expressions of flying range and the maximum height of the body thrown from the Earth's surface with an initial speed υ0 at an angle α to the horizon. Answer:.....

• What component of speed is responsible for height of raising of the body thrown at an angle to the horizon? Answer:.....

• What component of speed is responsible for flying range of the body thrown at an angle to the horizon? Answer:.....

• Write the equation of a trajectory of body movement in in the field of Earth gravitation if it is thrown at an angle α to the horizon with an initial speed υ0 from a hill h height.

Answer:.....

• Write expression of law of preservation of impulse and energy. Answer:.....

1. Computer models: Composition of vectors. Relative movement. Models can be used for demonstration of laws of composition, subtraction of vectors and the choice of vectors module size and their direction.

1.1. Width of the river is 100 m, watercourse speed is u=3 m/c. With what speed and under what angle to the river bank does the boatman have to sail to be transported on other coast on the shortest way? The task is to realize this experiment on computer model.

Answers:..... Computer results .....

1.2. Width of the river is 100 m, the speed of a watercourse is u of =3 m / c. With what speed and under what angle to the river bank does the boatman have to sail to be transported on other coast in 25c? The task is to determine resulting speed of V and demolition Δx as well. To realize this experiment on computer model.

Answers:..... Computer results.....

1.3. Width of the river is 100 m, the speed of a watercourse is u =4 m / c. With what speed and under what angle to the river bank does the boatman have to sail to be transported on other coast in 20 c? The task is to determine resulting speed of V and demolition Δx as well. To realize this experiment on computer model.

Answers:..... Computer results.....

1.4. Width of the river is 100 m, the speed of a watercourse of u of =5 m / c. With what speed and under what corner to the river bank the boatman to be transported on other coast 20 with has to float? To determine also rezultirushchy speed of V and demolition Δx as well. To realize this experiment on computer model.

Answers:..... Computer results.....

1.5. Width of the river is 100 m, the speed of a watercourse of u of =5 m / c. With what speed and under what angle to the river bank does the boatman have to sail to be transported on other coast in 23c? The task is to determine resulting speed of V and demolition Δx as well. To realize this experiment on computer model.

Answers:..... Computer results.....

2. Computer model: The movement with gravity acceleration. It is used for demonstration of body movement thrown from a certain height from the Earth's surface at an angle to the horizon. On the screen it is given schedules of dependence of speed and body coordinate on time.Choice of initial parameters of the movement is provided and on the screen you can observe the movement in the stroboscopic mode.

2.1. From what height and for what time does the body freely fall if its final speed makes 34.3 m/s? To determine final speed as well. To realize this experiment on computer model.

Answers:..... Computer results.....

2.2. From what height and with what final speed does the body freely fall if it flies with 3,5c ? To determine also final speed. To realize this experiment on computer model.

Answers:..... Computer results.....

2.3. From what height and with what initial speed is the body vertically up thrown if it flew 5,5s? To determine also final speed. To realize this experiment on computer model.

Answers:..... Computer results.....

2.4. From what height and with what initial speed is the body vertically up thrown if it flew 6,9s? To determine final speed as well. To realize this experiment on computer model.

Answers:..... Computer results.....

2.5. For what time does the body thrown from height vertically up with an initial speed of 25 m/s fall to the Ground? To realize this experiment on computer model. To determine final speed as well.

Answers:..... Computer results.....

3**. Computer model: The movement with constant acceleration.** It is used at demonstration of the uniform accelerated rectilinear movement of a body. The choice of initial parameters of the movement is provided. There are provided the Schedules of dependence of speed, acceleration, a way and movement from time.

3.1. With what initial speed and with what acceleration does the body have to move if through 1,0s its final speed reached 10 m/s? What distance it will pass during the movement? To realize this experiment on computer model.

Answers:..... Computer results.....

3.1. With what initial speed and with what acceleration does the body have to move if through 35,0 s its final speed becomes 4.50 m/s? What distance it will pass during the movement? To realize this experiment on computer model.

Answers:..... Computer results.....

3.2. With what initial speed and with what acceleration does the body have to move if through 36,0 s its way was 38,80 m? What his final speed? To realize this experiment on computer model.

Answers:..... Computer results.....

3.3. With what initial speed and with what acceleration does the body have to move if through 145 s its way is 145 m? What his final speed? To realize this experiment on computer model.

Answers:..... Computer results.....

3.4. With what initial speed and with what acceleration did the body move if its way for 68,0 s was 115,6 m? What his final speed? To realize this experiment on computer model.

Answers:..... Computer results.....

3.5. With what initial speed and with what acceleration did the body move if its speed by the time 68,80s was 3,40 m/s? What is its way during the movement? To realize this experiment on computer model.

Answers:..... Computer results.....

4. Computer model: Movement on the inclined plane. It is used for a research of the movement of a body in the presence of friction force and external force.

4.1. The body with a mass of m=2kg is located on the inclined plane. External force is absent. At what tilt angle and coefficient of friction it will slide on a plane surface with acceleration and =2,06 m/c2. The task is to determine sliding friction force as well. To realize this experiment on computer model.

Answers:..... Computer results.....

4.2. The body with a mass of m=3kg is located on the inclined plane. External force is absent. At what tilt angle and coefficient of friction it will slide on a plane surface with acceleration and =2,06 m/c2. The task is to determine sliding friction force as well. To realize this experiment on computer model.

Answers:..... Computer results.....

4.3. The body with a mass of m=2kg is located on the inclined plane. The external force of F=10,0 H works parallelly to the inclined plane down. At what tilt angle and coefficient of friction it will slide on a plane surface with acceleration and =7,06 m/c2. The task is to determine also total force. To realize this experiment on computer model.

Answers:..... Computer results.....

4.4. The body with a mass of m=3kg is located on the inclined plane. The external force of F=10,0 H works parallelly to the inclined plane down. At what tilt angle and coefficient of friction it will slide on a plane surface with acceleration and =5,39 m / c2. The task is to determine total force as well. To realize this experiment on computer model.

Answers:..... Computer results.....

4.5. The body with a mass of m=3kg is located on the inclined plane. The external force of F=3,1 H works parallel to the inclined plane up. At what tilt angle and coefficient of friction it will slide on a plane surface with acceleration and =1,02 m / c2. To determine also total force. To realize this experiment on computer model.

Answers:..... Computer results.....

5. Computer models: Elastic and inelastic collision and impact of elastic spheres. There are used research of elastic and inelastic collision of bodies on the basis of law of conservation of impulse and

energy, and includingly for a case of noncentral impact is used. The choice of initial parameters is provided.

5.1. What mass be the mass of spheres that they at head-on elastic collision have exchanged speeds. To realize these experiments on computer model.

Answers:..... Computer results.....

5.2. Which have to be the mass of spheres that they at not head-on elastic collision have scattered at right angle. To realize these experiments on computer model.

Answers:..... Computer results.....

5.3. Which have to be the mass of two carts that they after head-on inelastic collision have stopped? To realize this experiment on computer model.

Answers:..... Computer results.....

5.4. Which have to be the mass of two carts that after elastic collision the speed of one of them was twice more than another? To realize this experiment on computer model.

Answers:..... Computer results.....

5.5. At what ratio of the masses (m1/m2) of spheres the speed of spheres after elastic head-on collision will be V1=6,53 m/s and V2=16,3 m/s if the first ball at a speed of V=9,8 m/s. To realize this experiment on computer model.

Answers:..... Computer results.....

The proposed tasks were tested in Nazarbayev to intellectual school of physical and mathematical direction Shymkent, the regional school "Daryn" for gifted children and in the school gymnasium them M. Auezov of Arys. Most students with great interest fulfilled all tasks.

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Н. С. Сайдуллаева, К. А. Қабылбеков, Д. Т. Пазылова, Х. А. Аширбаев, А. О. Каликулова

М. О. Әуезов атындағы Оңтүстік Қазақстан Мемлекеттік университеті, Шымкент, Қазақстан

КОМПЬЮТЕРЛІК ЗЕРТХАНАЛЫҚ ЖҰМЫСТАРДЫ ОРЫНДАУ ҮШІН БІРМӘНДІ ЕМЕС ЕСЕПТЕР МЕН БЕРІЛГЕНДЕРІ ТҮГЕЛ ЕМЕС ЕСЕПТЕРДІ ҚҰРАСТЫРУ

Аннотация. Мақалада «Векторларды қосу», «Салыстырмалы қозғалыс», «Еркін түсу үдеуімен қозғалыс», «Тұрақты үдеумен қозғалыс», «Серпімді және серпімсіз соққы», «Шарлардың серпімді соқтығысуы» моделдерінде компьютерлік зертханалық жұмыстарды орындауға арналған бірмәнді емес есептер мен берілгендері түгел емес есептерге мысалдар қарастырылған.

Бірмәнді емес есептерде берілген шартты анықтайтын екі өзара байланысқан параметрді таңдау керек. Мұндай есептердің бірнеше шешімі болады. Оларды шешу кезінде оқушы компьютерлік модель мүмкіндігін ескеріп, параметрлердің ішінен біреуін таңдап, қағазда шығарып, содан соң осы шарттарды компьютерлік тәжірибеде жүзеге асыру керек. Нәтижені тексеріп болғаннан кейін оларды жауап түрінде көрстету керек. Берілгендері түгел емес есептерде алдымен жетпей тұрған параметр анықталады. Бұл параметр компьютерлік модель мүмкіндігін ескеріліп таңдалады. Әрі қарай алдыңғы жағдайдағыдай әрекет етеді. Осындай есептер қисынмен ойлауды, есепті шығарудың оңтайлы әдісін анықтау дағдысын дамытады. Әр компьютерлік моделге оның қысқаша сипаттамасы, бастапқы параметрлерді өзгертуді таңдау, есептерді шешу үшін сұрақтар берілген.

Ұсынылған тапсырмалар физика-математика бағытындағы Назарбаев зияткерлік мектебі, дарынды балдарға арналған «Дарын» облыстық мектебі, Арыс қаласының М.Әуезов атындағы мектеп-гимназияда сынақтан өткізілді. Оқушылардың басым көпшілігі тапсырмаларды аса қызығушылықпен орындады.

Түйін сөздер: жылдамдық, үдеу, ұшудың алыстығы мен биіктігі, дәлдеу қашықтығы, үйкеліс күші.

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КОНСТРУИРОВАНИЕ НЕОДНОЗНАЧНЫХ ЗАДАЧ И ЗАДАЧ С НЕДОСТАЮЩИМИ ДАННЫМИ ДЛЯ ВЫПОЛНЕНИЯ КОМПЬЮТЕРНЫХ ЛАБОРАТОРНЫХ РАБОТ

Аннотация. Предлагаются примеры неоднозначных задач и задач с недостающими данными для выполнения компьютерных лабораторных работ на моделях «Сложение векторов» и «Относительное движение», «Движение с ускорением свободного падения», «Движение с постоянным ускорением», «Упругое и неупругое столкновение» и «Упругое соударения шаров». В неоднозначных задачах требуется выбор двух взаимосвязанных параметров, определяющих заданное условие. У таких задач могут быть несколько решений. При их решении обучающийся должен выбрать один из параметров исходя из возможности компьютерной модели, прорешать на бумаге, затем реализовать эти условия в компьютерном эксперименте, проверить результат и отразить результаты в ответах. В задачах с недостающими данными сначала определяется недостающий параметр, выбирается этот параметр исходя из возможности компьютерной модели, далее поступают также как в предыдущем случае. Такие задачи развивает логическое мышление, умение находить оптимальный способ решения задачи. К каждой компьютерной модели дается краткая ее характеристика, выбор изменения начальных параметров и вопросы, обсуждаемые для решения задач.

Предложенные задания апробированы в Назарбаев интеллектуальной школе физико-математического направления г. Шымкент, областной школе «Дарын» для одаренных детей и в школе-гимназии им. М. Ауэзова г. Арысь. Большинство учащихся с большой заинтересованностью выполняли все задания.

Ключевые слова: скорость, ускорение, дальность и высота полета, прицельное расстояние, сила трения.

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www:nauka-nanrk.kz

ISSN 2518-1467 (Online), ISSN 1991-3494 (Print)

http://www.bulletin-science.kz/index.php/ru/

Редакторы *М. С. Ахметова, Д. С. Аленов, Т. М. Апендиев*
Верстка на компьютере *Д. Н. Калкабековой*

Подписано в печать 21.07.2017.
Формат 60x881/8. Бумага офсетная. Печать – ризограф.
11,75 п.л. Тираж 2000. Заказ 4.

Национальная академия наук РК
050010, Алматы, ул. Шевченко, 28, т. 272-13-18, 272-13-19