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Кафедра английского языка естественных факультетов

Методические указания

по развитию навыков чтения и разговорной речи
на английском языке по теме «Моя специальность»
для студентов 1-2 курсов
естественных факультетов РГУ
(часть I)

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Методическая записка

Настоящие методические указания предназначены для аудиторной и самостоятельной работы студентов 1-2 курсов.

Основная цель указаний – расширение знаний студентов естественных факультетов по теме «Моя специальность» и совершенствование навыков изучающего и ознакомительного чтения и устной речи на английском языке. Методические указания также способствуют расширению тематического и терминологического словарного запаса по данной теме.

Данные методические указания состоят из основных четырех разделов по следующим темам:

- Математика и прикладная математика;
- Механика;
- Физика;
- Наука и технология.

В каждый раздел входит текст, предназначенный для изучающего чтения, ряд заданий и тренировочных упражнений для работы в аудитории. Под рубрикой «Supplementary Reading» предлагаются дополнительные тексты по теме раздела для самостоятельного чтения. Под рубрикой «Discussion Points» приводятся творческие задания, которые побуждают студентов прокомментировать прочитанные тексты, высказать свое отношение и обменяться мнением по полученной информации.

Методические указания также содержат ссылку на сайт формата Webquest, посвященный величайшим ученым и их открытиям в различных областях человеческого знания. Данный сайт можно использовать как информационно-аналитический сборник, включающий аутентичные материалы широкого спектра, что обеспечивает каждому студенту возможность личностного выбора тематики и индивидуального графика подготовки к *занятию\ям* по избранной теме.

При наличии хорошей компьютерной базы данный сайт можно использовать как ролевой проект для изучения вклада ученных в развитие науки и оценки их научных достижений, что способствует развитию аналитических, поисковых и исследовательских навыков студентов, а также навыков речевой деятельности на английском языке.

MATHEMATICS AND APPLIED MATHEMATICS

1. Before you start

1.1 Answer the questions:

1. Why did you choose to study at the Mathematics faculty?
2. Which field of mathematics do you have special interest in? Why?
3. What field of mathematics would you like to specialize in when you become a third year student? *Why would you like to study it in depth?*

2. Pronunciation

2.1 Read and practise the pronunciation of the following words:

astronomy	□ʋ`st□□nʋmi□
geodesy	□d□i:`□disi□
to thrive	□□r□iv□, □`fl`ri□□
to flourish	
civilization	□sivil□i`zei□ʋn□
quantitative	□`kwʋntitʋtiv□
symmetry	□`simʋtri□
trigonometry	□,tri□ʋ`n□mit□i□
arithmetic	□ʋ`□i□mʋtik□
infinity	□in`finiti□
discrete mathematics	□di`sk□i:t□
pseudodifferential operators	□,sju:dʋu dife`□en□iʋl□
approximate methods	□ʋ`pr□ksimʋt `me□ʋdz□
applied	

3. Reading

3.1 Read the text to know more about mathematics and applied mathematics

Mathematics and Applied Mathematics

Mathematics can be called “the queen of knowledge”. Due to the close relationship between abstract theorems, principles and their physical counterparts in the material world, mathematics can be applied to different branches of science. It is vital in the study of mechanics, engineering, optics, astronomy, geodesy, electricity and other fields of knowledge.

Mathematics thrived and flourished with the growth of civilization as man’s quantitative needs increased. One might say that mathematics was born when the man began to count. The Greeks elevated mathematics to the field of abstract thinking. In its higher form, mathematics becomes a form of logic in which basic assumptions are laid down and results are then deduced within the framework of the system. The system itself is composed of a few elementary, undefined terms such as numbers, points and lines which are called primitives and rules that govern their operations.

Mathematics is a language of symbols that is understood in all civilized countries of the world. It can also be described as the study of patterns, where a pattern is any kind of regularity in the form of an idea. This study of patterns has been very important for science because pattern, regularity and symmetry occur quite often in nature. Light, sound, electric currents, waves of the sea, magnetism and even the flight of a bird or the shape of a snowflake and the mechanics of the atom can be classified by mathematics.

The main branches of mathematics are: geometry, trigonometry and calculus. Pure mathematics includes arithmetic – the science of numbers and computation; algebra – the language of symbols, operations and relations; geometry – the study of shapes, sizes and spaces; statistics – the study of interpreting data and graphs; calculus – the study of limits and infinity.

Today mathematics includes many newly developed branches for example, one of the leading departments at the Faculty of Mechanics and Mathematics – the Department of Algebra and Discrete Mathematics – is concerned not only with algebra. The game theory, the theory of analytical function, pseudodifferential operators, systematic programming and many other problems are studied there. One of the important areas of study in the department – the operators of a convolution type – is widely applied in the theory of random processes and mechanics.

Another field of research involves the study of approximate methods of solving equations with convolution operators. These methods are also applied in the theory of equations of mathematical physics and in the study of mapping and modelling.

Mathematical logic is also one of the main fields of algebra studied in this department, since mathematical logic is increasingly used in modern computers.

The invention of computers is one of the greatest achievements of mankind. They have greatly increased man's ability to plan, analyse, compute and control. First electronic computers were installed at Rostov State University in the 1960s when the Department of Computational Mechanics startedits work. The Computer Centre was founded at the same time, it helped to train the first computer programmers in the North Caucasus and Southern Russia. The Faculty of Mechanics and Applied Mathematics is a thriving centre of scientific study in our country. It has eleven departments, four of them belong to the Division of Applied Mathematics. They are the Operation Research Department, the Algebra Department, the Department of Computing Mathematics, and the Department of Software.

In their third year students of the faculty choose the field of mathematics, applied mathematics or mechanics and one of eleven departments to major in.

3.2 What new facts about mathematics and the Faculty of Mechanics and Applied

Mathematics have you learnt from the text?

4. Comprehension check

4.1Answer the following questions:

1. Why is mathematics called “the queen of knowledge”?
2. Which fields of science and life is it widely used in?
3. What is the role of ancient civilizations in the development of matematics?
4. What main branches does mathematics include?
5. What does pure mathematics study?
6. What are the most promising trends of research at your faculty?
7. How many departments are there at the Mathematics Faculty? What are they?

4.2Agree or disagree with the following statements:

1. Practical needs made people start and develop mathematics.
2. Mathematics is a universal language of science.
3. The Mathematics Faculty in Rostov University has all the necessary facilities to train qualified specialists.
4. The invention of modern computers gave rise to the development of matematical logic.

5. Vocabulary

5.1 Give English equivalents of the following word combinations:

применяться в различных областях науки; абстрактное мышление; основные предположения; изучение шаблонов (моделей), основные разделы математики; недавно появившиеся разделы; одна из ведущих кафедр; область научного исследования; включать; изобретение компьютеров; одно из величайших достижений человечества; моделирование; отделение.

5.2 Match the fields of mathematics with their definitions:

1. algebra	a branch of mathematics that deals with integers, rational numbers, real numbers, or complex numbers under addition, subtraction, multiplication, and division
2. geometry	a branch of mathematics that concerns itself with the application of mathematical knowledge to other domains.
3. trigonometry	a branch of mathematics that deals with limits and the differentiation and integration of functions of one or more variables
4. arithmetics	a branch of mathematics which may be

	roughly characterized as a generalization and extension of arithmetic, in which symbols are employed to denote operations, and letters to represent number and quantity
5. statistics	mathematics motivated entirely for reasons other than application.
6. pure mathemetics	a branch of mathematics dealing with angles, triangles and functions such as sine, cosine and tangent.
7. applied mathematics	a branch of mathematics concerned with the properties of and relationships between points, lines, planes, and figures and with generalizations of these concepts.
8. calculus	a branch of mathematics concerned with the collection, organization, and interpretation of numerical data, especially the analysis of population characteristics by inference from sampling.

6. Supplementary reading

6.1 Read the text to learn about Jules Henri Poincare.

Jules Henri Poincare

Before looking briefly at the many contributions that Poincare made to mathematics and to other sciences, we should say a little about his way of thinking and working. He is considered as one of the great geniuses of all time and there are two very significant sources which study his thought processes. One is a lecture which Poincare gave to l'Institut General Psychologique in Paris in 1908 entitled *"Mathematical invention"* in which he looked at his own thought processes which led to his major mathematical discoveries. The other is the book by Toulouse who was the director of the Psychology Laboratory of l'Ecole des Hautes Etudes in Paris.

Toulouse explains that Poincare kept very precise working hours. He undertook mathematical research for four hours a day, between 10 am and noon, then again from 5 pm to 7 pm. He would read articles in journals later in the evening. An interesting aspect of Poincare's work is that he tended to develop his results from first principles. For many mathematicians there is a building process with more and more being built on top of the previous work. This was not the way that Poincare worked and not only his research, but also his lectures and books, were all developed carefully from basics.

He worked in algebraic geometry making fundamental contributions in papers written in 1910-1911. He examined algebraic curves on an algebraic surface F(x, y, z) = 0 and developed methods which enabled him to give easy proofs of deep results due to Emile Picard and Severi. He gave the first correct proof of a result stated by Castelnuovo, Enriques and Severi, these authors having suggested a false method of proof. His first major contribution to number theory was made in 1901 with work: *"...on the Diophantine problem of finding the points with rational coordinates on a curve f(x,y) = 0, where the coefficient of f is rational numbers."*.

In applied mathematics he studied optics, electricity, telegraphy, capillarity, elasticity, thermodynamics, potential theory, quantum theory, theory of relativity and cosmology. In the field of celestial mechanics he studied the three-body-problem, and the theories of light and of electromagnetic waves. He is acknowledged as a co-discoverer, with Albert Einstein and Hendrick Lorentz, of the special theory of relativity. We should note that, despite his great influence on the mathematics of his time, Poincare never founded his own school since he did not have any students. Although his contemporaries used his results, they seldom adopted his techniques.

Poincare achieved the highest honours for his contributions of true genius. He was elected to the Academie des Sciences in 1887 and in 1906 was elected President of the Academy. Due to his research Poincare was the only member elected to every one of the five sections of the Academy, namely the geometry, mechanics, physics, geography and navigation sections. In 1908 he was elected to the Academie Francaise and was elected director in the year of his death. He was also made chevalier of the Legion d:Honneur and was honoured by a large number of learned societies around the world. He won numerous prizes, medals and awards.

(Adapted from the Internet sites)

6.2 Read the text to learn about the outstanding Russian mathematician A. Kolmogorov.

Andrei Nikolaevich Kolmogorov

Andrei Nikolaevich Kolmogorov was one of the greatest scientists in Russian history. His work in probability theory, turbulence, and dynamic systems was fundamental and is now considered classic. The range of his contributions was enormous – from poetics to stratigraphy, from genetics to celestial mechanics, from topology to mathematical logic and algorithmic complexity theory.

Kolmogorov was born on April 25, 1903 in the central Russian city of Tambov. At 17 he finished the secondary school there and enrolled in the University of Moscow in 1920. Early on he showed a keen interest in Russian history. His first work was a research paper on the registration of real estate in the medieval Novgorod republic. But when he found out that history professors required at least five different proofs of every assertion, he switched to mathematics, where one proof suffices! At that time Kolmogorov was interested in the ancient Russian arts as well and he retained this interest for the rest of his long life.

At the age of 19 Kolmogorov constructed an integrable function with a Fourier series divergent almost everywhere. This unexpected result created a tremendous sensation and made Kolmogorov an internationally recognized mathematician overnight.

At that time mathematics graduate students at Moscow University had to pass 14 examinations in various mathematical subjects, but it was possible to substitute an original article on a relevant topic in place of the exam. Kolmogorov never took any of the examinations, choosing instead to write the kind of papers he would make his life's work. Even at the outset of his career, his articles contained new results in function theory, set theory, topology, mathematical logic, probability theory and other topics.

In May 1934, a little before James Alexpander came up with the same idea, Kolmogorov introduced the cohomology ring, one of the most important topological invariants of a space. The idea came up to him from physics. He generalized such notions as the distributions of charges and currents in space, on surfaces, and on lines, considering the similar "functions of sets" for a more abstract mathematical situation.

Though educated in abstract, set-theoretical mathematics, Kolmogorov was always interested in the natural sciences and other applications, in which he would put aside the shackles of mathematical rigor to obtain a concrete result. But after guessing a result, he invariably tried to formulate it rigorously as a mathematical theorem or conjecture whose proof might be deduced from the fundamental postulates of the theory.

Kolmogorov's work in 1941 on turbulent motions changed the face of the theory of turbulence. Here he introduced the ideas of self-similarity and scaling, leading to the famous Kolmogorov law of 2/3. These ideas, and the modern developments they spawned, are now crucial elements of statistical physics and field theory.

What did Kolmogorov consider his most difficult achievement? His work, from 1955 to 1957, on the 13-th Hilbert problem involved the representation of continuous functions of many variables as the superposition of continuous single-variable functions and on the summation operation.

Kolmogorov's last work before retiring from active research was dedicated to applying the ideas on information theory to the theory of algorithmic complexity and to the foundations of probability theory. He proved, for instance, that any "computer" containing N element of fixed diameter related to no more than k other elements by "wires" of fixed thickness may be packed in a cube with an edge of approximately N. He had guessed this result by starting from the observation that the grey substance of the brain (the neurons) forms its surface, while the white substance (the junctions) is inside.

In addition to his many mathematical theories, Kolmogorov expounded a theory of a more human sort: that it is impossible to do good mathematical research after the age of 60. And so, after half a century of original and often path finding work, he became a high school teacher. This was his main occupation for the last 20 years of his life. He was also appointed chairman of the Commission for Mathematical Education in the Academy of Sciences of the USSR and in that position instituted new programmes to more fully develop the research interests of schoolchildren.

In 1970, together with I.K.Kikiyin, Kolmogorov started a new magazine for Soviet youth – *Kvant*. He wrote articles for it and remained active in managing it right up until his death in 1987.

A.N. Kolmogorov stood out among the great mathematicians of the 20th century in that he revolutionized both mathematics and physics, much as Newton had done two centuries earlier. His mind roamed freely in many fields and tirelessly sought connections. A brilliant guesser and a hard worker, Kolmogorov was a mentor to students and younger colleagues. And even in his retirement Kolmogorov nurtured yet another generation.

(Abridged and adapted from V. Arnold, Physics Today)

6.3 Read the text to learn more facts from the history of mathematics.

History of Mathematics

Mathematics starts with counting. It is not reasonable, however, to suggest that early counting was mathematics.

In Babylonia mathematics developed from 2000 BC.

Number problems such as that of the Pythagorean triples (a, b, c) with a^$b^2=c^2$ were studied from at least 1700 BC. Systems of linear equations were studied in the context of solving number problems. Quadratic equations were also studied and these examples led to a type of numerical algebra.

Geometric problems relating to similar figures, area and volume were also studied and values obtained for .

The Babylonian basis of mathematics was inherited by the Greeks and independent development by the Greeks began from around 450 BC.

The major Greek progress in mathematics dated back to 300 BC - 200 AD. After that time mathematics flourished in Islamic countries in Iran, Syria and India, in particular.

From about the 11th century Adelard of Bath, then later Fibonacci, brought the Islamic mathematics and its knowledge of Greek mathematics back into Europe.

Major progress in mathematics in Europe was made again at the beginning of the 16th century by Pacioli, then Cardan, Tartaglia and Ferrari with the algebraic solution of cubic and quartic equations. Copernicus and Galileo revolutionised the applications of mathematics to the study of the universe.

The 17th century saw Napier, Briggs and others greatly extended the power of mathematics as a calculatory science with the discovery of logarithms.

Progress towards the calculus continued with Fermat, who, together with Pascal, began the mathematical study of probability.

Newton developed the calculus into a tool to push forward the study of nature. His work contained a wealth of new discoveries showing the interaction between mathematics, physics and astronomy. Newton's theory of gravitation and his theory of light took us into the 18th century.

The most important mathematician of the 18th century was Euler who, in addition to work in a wide range of mathematical areas, invented two new branches, namely the calculus of variations and differential geometry.

Toward the end of the 18th century, Lagrange *began to develop/started* a rigorous theory of functions and of mechanics.

The 19th century saw rapid progress in mathematics. Fourier's work on heat was of fundamental importance. In geometry Pibcker produced fundamental work on analytic geometry and Steiner - in synthetic geometry.

Non-Euclidean geometry developed by Lobachevsky and Bolyai led to characterisation of geometry by Riemann. Gauss, thought by some to be the greatest mathematician of all time, studied quadratic reciprocity and integer congruence. His work in differential geometry revolutionized the topic. He also contributed in a major way to astronomy and magnetism.

Cauchy, building on the work of Lagrange on functions, began rigorous analysis and began the study of the theory of functions of a complex variable. This work would continue through Weierstrass and Riemann.

Analysis was driven by the requirements of mathematical physics and astronomy. Lie's work on differential equations led to the study of topological groups and differential topology. Maxwell was to revolutionize the application of analysis to mathematical physics. Statistical mechanics was developed by Maxwell, Boltzmann and Gibbs. It led to ergodic theory.

(Adapted from the Internet sites)

6.4 Read the text to learn more about the World Wide Web.

The World Wide Web

The World Wide Web began life as a project designed to distribute scientific information across computer network in a system known as hypertext. The idea was to allow collaborative researchers to present their research complete with text, graphics, illustrations, and ultimately sound, video, and any other means required.

The Web is among the most rapidly adopted technological entities of a century that has seen many, and understanding it might be crucial for understanding the next century.

For any technology, it’s impossible to predict the future. No sooner are the predictions made than the technology develops unexpected adherents and unforeseen uses. This was the case with gunpowder, with television, with computers, and now with multimedia, online services, and the Internet itself. But trends count for something, and the Web has revealed nothing if not a series of trends toward future use. Here are some, presented as ideas to be explored.

Full-Scale Publishing

A wide range of publishers has already appeared on the Web. Some have presented samples of publications; others have presented full texts. In the future, there's every reason to expect full publishing efforts on the Web, everything ranging from children's book through advertising-laden magazines.

Voting

With fill-in forms establishing themselves as perhaps the most important single advance in Internet-based technology, and with the White-House and other governments turning to the Next for information dissemination of a variety of kinds, it seems only a matter of time until the Web can be used for voting – maybe not in a presidential election. At least for a while, but certainly for other purposes. If the idea is to get more people voting on public issues, why not use all public media?

Live Interactive Entertainments

We have television. But television is presentation only, not interaction, and here the Web can make a difference. Why not comedy routines in which Web users participate in skits and jokes? Why not dramatic pieces in which Web users influence the outcome? How about real-time role-playing games?

News

The problem with CNN or any other continual news supply is that the news we get is the news they decide we'll get. Here the Web's possibilities are enormous. How about fully customizable news packages, so that if we want to focus on Rwanda, or the Middle East, or a flood or earthquake area, or for that matter the qualifying games among Africa teams for the 1998 World Cup, we can get the text, audio, and video of whatever subject we want. Companies such asTurner Broadcasting, Discovery Channel, Microsoft, and ESPN have already made great inroads into creating information "on demand".

Distance Education

Obvious, maybe, but no less important for being so. For decades, universities and colleges have been looking for ways of offering courses to students who don't have access to the campus (usually because of physical distance). The Web is beginning to see activity in this regard, and this activity will increase dramatically over the next few years. Watch for full university-level courses to be offered over the Web to all registered students (and perhaps others as well), complete with real-time seminares and exams, and professors' visiting hours.

Distance Presentations

Organizations with high-speed Internet connections might well consider offering multimedia presentations over the Web. These need not be real-time presentations – which eliminates some of the problems presented by desktop conferencing – and they offer the benefit of eliminating travel and accommodation costs, as well as downtime costs, for presentation attendees. Presentations can take full advantage of the Web's multimedia and networking capabilities, and the HTML pages can be quickly redesigned and updated as a result of the presentation. Another benefit is that the presentation can offer links to other information sources, all of which will be updated by the site being linked. The presentation will thus be always up-to-date.

There are other applications: scheduling, interpersonal communication, meetings and conferences. But the Web is far from the only technology whose future points toward these possibilities, and it remains to be seen if it will overtake, fall behind, or simply incorporate all the rest. What's certain is that the Web is extremely flexible, and that its capabilities haven't begun to be explored.

(Abridged and adapted from)

6.5 For further information on the biographies of famous scientists and their achievements use Famous Scientists WebQuest http://www.kn.sbc.com/wired/fil/pages/webwebquestel.html

7. Discussion Points

7.1 Work in groups of 3 - 4. Find information about one of the departments at your faculty and prepare a poster presentation of it. Include the following topics:

- history of the department;
- prominent scientists and teachers who work in the department, famous graduates;
- the scientific research carried out by the department fellows.

7.2 Comment on the statements:

1. Scientific progress in the world is impossible without mathematics.
2. The most outstanding achievements in mathematics have already been made.
3. Graduates of the Mathematics Faculty are highly qualified specialists and they are in demand on the employment market.

MECHANICS

1. Before you start

1.1 Answer the following questions:

1. Why did you choose to study at the Department of Mechanics ?
2. What does mechanics study?
3. What major achievements in this science do you know?
4. What famous scientists made great contribution to the development of mechanics?

2. Pronunciation

2.1 Read and practise the pronunciation of the following words:

dawn	□d□:n□
scientific	□□saiυn`tifik□
to calculate	□`k□lkjuleit□
hydroaeromechanics	□□h□id□υu□□υ□υmi`k□niks□
viscous	□`viskυs□
liquid	□`likwid□
lubricant	□`lu:bikυnt□
equipment	□i`kwipmυnt□
hydrofoil	□`h□idrυuf□il□
further	□`fυ:□υ□
civilization	□□sivil□iz`□i□υn□
achievement	□υ`t□i:vment□
to forecast	□`f□:k□:st□
dynamics	□d□in`□miks□
asymptotic	□□□sim(p)`toutik□
research	□□i`sυ:t□□
turbine	□`tυ:bin□
technical	□`teknikυl□
compact	□`k□mp□kt□
machine	□mυ`□i:n□
kinetics	
quantum	
kinematics	

3. Reading

3.1 Read the text to know more about the science of mechanics

The Subject of Mechanics.

Mechanics was born at the dawn of civilization. As a science, mechanics deals with the motion of masses and the effect of forces in causing or modifying these motions.

Classical mechanics can be divided into statics and dynamics. Statics studies bodies at rest, or in motion at a constant speed and in a constant direction. Dynamics is the study of bodies that undergo a change of speed or direction, or both, because of forces acting upon them. There are three branches in mechanics:
1) statics which deals with forces acting on and in a body at rest;
2) kinematics describes the possible motions of a body or a system of bodies;
3) kinetics attempts to explain or predict the motion that will occur in a given situation.

During the 100 years following Newton's death, the progress in mechanics was its progressive mathematization. In 1788, Louis Lagrange published his

"*Me chanique* analitique", which treated mechanics as a branch of mathematics, arising from a few axioms and developed entirely by analytical mathematical techniques. *Mechanics has continued to be a branch of mathematics*, but it also returned to its roots in physics in the 19th century. *Andr e-Marie Amp ere* used experiment to discover aspects of electrical science that could be treated by mechanical mathematics. The kinetic theory of gases provided new physical measurements and concepts that could be mathematized and handled by mechanics. But here individual bodies or elements could no longer be treated as it was impossible to follow an individual gas molecule. Instead, large groups were the subject of mechanical operations, and statistical mechanics was born.

All this work was done within the Newton's framework, which proved too narrow by the beginning of the 20th century. In the 1920s a special mechanics called quantum mechanics was devised to deal with subatomic particles. This mechanics is completely mathematical: it consists of the mathematical computation of the probability of making a physical measurement.

In the ordinary world Newtonian mechanics still holds and serves to direct everything from the design of new automobiles and aircraft to the navigation of intercontinental ballistic missiles and satellites. Mechanics helps further progress in many scientific and engineering fields. Its achievements are used to create new machines and aircrafts, calculate the orbits of spaceships, study ocean currents and forecast the weather.

Of eleven departments in the faculty of Mathematics at Rostov State University, two belong to the Division of Mechanics: the Department of Elasticity and the Department of Hydromechanics. These two departments give lectures on the theory of plates and shells, the theory of plasticity, the stability of elastic systems, dynamics of viscous fluid, the stability of motion, gas dynamics and the plane problem of hydromechanics. The scientists in the department use the asymptotic method for solving the problems of strip wedge layers. They also investigate the contact problems of bodies of non-classical shape. All these problems are very important, especially in machine building. *Among other problems are those concerning the waves on the surface of viscous fluids*. Hydroaeromechanics studies the laws of the mechanical movement of a substance in its three states: liquid, gas and solid. The range of problems examined by hydroaeromechanics is very wide and interesting. Calculations in the aircraft industry, weather-forecasting, examining sea currents, and monitoring the stars are all impossible without using the main laws of hydroaeromechanics.

The demands which the specialist in the field of hydroaeromechanics must satisfy have greatly increased. For example, when calculating the movement of a spaceship in the period of its re-emergence in the atmosphere, one must take into account complicated physical and chemical transformations which take place in the hot gas around the ship. In other words, he must be able to solve complex mathematical problems and then use modern calculating machines.

The Department of Theoretical Hydroaeromechanics gives training in four scientific areas. The first of them is connected with the problems of hydroaeromechanics and the theory of elasticity.

The department also investigates the problem of liquid and gas lubricants. *Investigations in this area are centred upon research into the use of ball bearings*, which find use in the constructions of gas turbines and *high-precision (high-accuracy) equipment.*

The third scientific trend is the study of the waves on the surface of liquid. It is of particular importance in determining the influence of waves on various technical constructions.

Another area of research deals with complex problems of mechanics of compact environments. This is of great importance for constructing hydrofoils.

(Adapted from)

3.2 What new facts about the science of mechanics have you learnt from the text?

4. Comprehension check

4.1 Answer questions:

1. What problems does mechanics study?
2. What branches in classical mechanics can you name?
3. What does statics study?
4. What is dynamics?
5. What problems does the Department of Elasticity deal with?
6. What kind of problems are important in machine building?
8. What kind of problems does the Department of Hydromechanics investigate?
9. What scientific ares does the Department of Theoretical Hydromechanics give training in?

4.2 Agree or disagree with the following statements:

1. Mechanics does not belong to natural sciences.
2. Mechanics studies effects on various kinds of bodies, the human body included.
3. Mechanics refers either to physics or to mathematics.
4. Mechanics helps further progress in science and engineering.

5. Vocabulary

5.1 Give English equivalents of the following word combinations:

механическая математика; смазочный материал; физические замеры; квантовая механика; кинетическая теория газов; просчитывать движение космических кораблей по орбите; движение масс; на заре цивилизации; межконтинентальная баллистическая ракета; жидкость; прогнозирование погоды; твердые тела; статистическая механика; теория упругости; однородная среда; динамика сгущенных газов; приливы и отливы в океане; создавать новые машины и самолеты; оборудование с высокой точностью.

проводить научное исследование; решать задачу; читать лекции по ...;

5.2 Match the parts of the sentences:

1. mechanics	*a) attemts to explain or predict the motion that will occur in a given situation*
2 statics	*b) studies the laws of the mechanical movement of a substance in its three states: liquid, gas, and solid*
3. dynamics	*c) deals with the motion of masses and the effect of forces in causing or modifyng these motions*
4. kinematics	*d) deals with forces acting on and in a body at rest*
5. kinetics	*e) studies the bodies that undergo a change of speed or direction because of forces acting upon them*
	h) deals with subatomic particles
6. quantum mechanics	*f) describes the possible motions of a body or a system of bodies*
7. hydroaeromechanics	*g) studies bodies at rest, or in motion at a constant speed and in a constant direction*

5.3 Complete the sentences:
1. Mechanics is a science that deals with …
2. Quantum mechanics was devised to …
3. Statics deals with …
4. Hydroaeromechanics studies …
5. The achievements in mechanics are used to …
6. The kinetic theory of gases provided …
7. Kinematics describes …
8. Dynamics is the study of …
9. Kinetics attempts to …

5.4 Fill in the words and word combinations:
1. Mechanics was born in … .
2. The Department of Hydroaeromechanics … the problem of liquid and gas … .
3. Mechanics can be divided into 3 branches: … .
4. *Andr e-Marie Amp ere discovered aspects of electrical science that could be* treated by … .
5. Mechanics is used to design …, calculate …, study …, … and forecast … .

6. There are two departments that belong to the division of mechanics: … and … .

6. Supplementary reading

6.1 Read the text to learn about the outstanding British scientist Sir Isaak Newton.

Isaak Newton

Isaak Newton was born in a farmer's house on December 25, 1642 in a little village not far from the old university town of Cambridge.

His family wanted him to become a farmer, but with no success, as his mind was always busy with observing various phenomena of nature. He studied at Cambridge at mathematical course. Some years later after having taken his degree he was appointed professor to the chair of physics and mathematics at Cambridge. He delivered lectures in optics. The study of light was Newton's favorite study. He came to the conclusion that white light consisted of rays of different coloures and that each particular kind of coloured ray was differently bent when it fell on a glass surface at the angle. His results formed the bases of modern spectrography. The theory of gravity was developed by him when he was only 24. Having seen the fall of an apple he came to the conclusion that the apple and the earth were pulling each other, and he began to think of the same pull of gravity extending far beyond the earth. The problem of the paths of the planets was "What laws could account for the ceaseless motion of the planets round the Sun?" Newton deduced and calculated the force of gravity acting between the Sun and the planets, thus establishing the law of gravitation. By discovering this law, he demonstrated the uniformity of things and found a connecting link between the mechanics of the earth and the mechanics of the heavens.

His great work "Principia", published in 1687, gave an insight into the structure and mechanics of the universe. He also discovered the laws of motion which we still consider to be the basis of all calculations concerning the motion.

Although a genius of science, Newton owed much to his predecessors. The year of his birth was the year of the death of Galileo. Galileo had founded the science of mechanics, and his application of the astronomical telescope (then recently invented) had been of the greatest help in the study of the heavens. Copernicus, Brahe and Kepler had overthrown the old conception of the earth as the centre of the universe.

Newton himself modestly said: "If I have seen farther than most men, it is by standing on the shoulders of giants".

While studing light, Newton invented the reflecting telescope. It was only an inch in diametre, and six inches long, but it magnified forty times and gave a good view of the Jupiter's moons. He made a larger one. You can see it in the library of the Royal Society in London, and there you can read: "The first reflecting telescope, invented by Sir Isaak Newton, and made with his own hands".

(Adapted from)

6.2 Read the text to learn about French-Iitalian scientist Joseph Conte Lagrange.

Joseph Lagrange(1736-1813)

Joseph Lagrange, one of the greatest mathematicians of the 18th century, was noted for his famous work "Mechanique analyticue" (1788), the definitive text on the post-Newtonian mechanics of the 18th century, written in a purely formal rigorous manner and lacking any diagrams.

As a pure mathematician, Joseph Lagrange published two important memoirs on the theory of equations in 1770 and 1771, advancing a uniform principle for the solution of all equations up to the quintic ones. In the course of this work the result known as Lagrange's theorem (on groups) was first formulated.

Other mathematical work of Lagrange was on the foundations of the calculus, the theory of differential equations, and number theory. Joseph Lagrange also made a great contribution into astronomy, publishing a special solution of the three-body problem. In addition Lagrange played a leading role in the introduction of the metric system into revolutionary France of the late 18th century.

In one of his works in 1770 Lagrange considered the problem of solving the general polynomial equation by comparing the known solution of quadratic, cubic and quartic equations. As the result he noted that in each of these three cases a certain reduction transformed the equation to one of the lower degree; but unhappily, when Lagrange tried this "reduction" on a quintic equation, the degree of resulting equation was increased rather than decreased. Although Joseph Lagrange didn't succed in his main objective, his attack on the problem made use of permutations of the roots of the equations. He also discovered the key to the theory of permutation group, including the property mentioned earlier and now called the Lagrange theorem.

One must also remember that the works of Abel and Galois were built on Lagrange's work.

(Adapted from)

6.3 Read the text to learn about outstanding German scientist Gotfried Wilhelm Leibnitz.

Gotfried Wihelm Leibnitz

Distinguished for almost universal scholarship especially in philosophy and mathematics famous German scientist Gotfried Wilhelm Leibnitz was born on July 1, 1646 at Leipzig, where his father was a professor of Moral Philosophy. Leibnitz attended the school in Leipzig, but learned much more from independent study. He spent some time also in *Jena* working at mathematics. He graduated from Altdorf University not far from Nurnberg.

Some years later he invented a calculating machine and devised what was in many respects a noble method of calculations. This gave rise to a controversy with Newton as to which of them first invented this valuable mathematical method.

Gotfried Wilhelm Leibnitz was noted for his discovery of the differential calculus which he first made in his famous book "A New Method of Determining

Maxima and Minima" (1684). In his subsequent works Leibnitz also developed the integral calculus (the now-familiar symbols are in fact his innovations).

Much of his time was spent on his attempts to advance beyond the traditional logic of Aristotle to the mathematical logic later formulated by a famous English mathematician and logician George Boole only in 1847.

In 1676 Leibnitz quitted the service of Mainz and was appointed a custodian of the library of Hannover. In 1687 he visited various cities in Germany, Austria and Italy. Leibnitz was also a pioneer in the science of comparative philology. Leibnitz died at the age of 70 on November 14, 1716 in Hannover.

(Adapted from)

6.4 Read the text to learn about Sir William Rowan Hamilton.

William Rowan Hamilton

Wiliam Rowan Hamilton was the greatest mathematician of the English-speaking people after Isaak Newton. Hamilton was born in Dublin in 1805 and died in 1864. His great fame has had curious and regular changes. This scientist was celebrated but not understood during his lifetime. After his death his reputation declined and people began considering him the scientist of the second rank. In the 20th century he became the subject of an extraodinary revival of interest and appreciation.

In 1826, at the age of only 21, Hamilton submitted to the Royal Irish Academy a paper entitled "A Theory of Systems of Rays" which in effect made a new science of mathematical optics. In 1832 he announced to the Royal Irish Academy a remarkable discovery in optics which followed up his theory of systems of rays. In 1835 Hamilton received the honor of knighthood for his works, and two years after, in 1837, Hamilton was elected President of the Royal Irish Academy.

In 1837, six years after Gauss invented his treatment of complex numbers, Hamilton arrived at his own independent discovery of the same ideas which he applied to rotations and vectors in the plane, as other had done. In the second paper on this subject Hamilton generalized from ordered pairs to n-tuples with emphasis on quadruples (or "quaternions"), which extended the algebra of the vectors in the plane to vectors in space. Thus, the concept of a complex number a+bi was extended to the form a+bi+ci+dk (a,b,c,d real) where i?=j?=k?= -1=ijk . Thus, in 1843 Hamilton made his greatest discovery - the calculus of quaternions. He named the set of four numbers a quaternion, and found that he could multiply quaternions as if they were single numbers. But he also discovered that the algebra of quaternions differed from ordinary algebra in one crusial respect: it was noncommutative. The surrender of the commutative law was a tremendous break with tradition. It marked the beginning of a new era.

From 1843 until his death Hamilton's chief interest for 22 years was to develop the new calculus. Hamilton's discovery was quickly followed by other new algeras, such as the theory of matrices which is likewise noncommutative. Thus Sir

William Hamilton started a new glorious school of mathematics, though it was not to come into full flower for another half century.

(Adapted from)

6.5 Read the text to learn about Sophia Kovalevskaya. Может лучше убрать – сильно русифицированный текст

Sophia Kovalevskaya

The outstanding Russian mathematician Sophia Kovalevskaya was born in Moscow on the 15th of February 1850, in a family of an artillery general Korvin-Krukovsky. When she was only eight an experienced teacher was invited to Polibino to instruct her in arithmetic, grammar, literature, geography and history. Though the girl liked literature so much that it seemed that literature would become her walk of life, she showed an unusual gift in mathematics. At the age of twelve she puzzled her teacher by suggesting a new solution for the determination of the ratio of diameter of the circle to its circumference.

In 1867 Sophia Korvin-Krukovsky and her elder sister were taken to St.Petersburg. There the young lady was allowed to go on with her studies privately. To attend lectures at the University Sophia had to obtain a special permission, and even then by no means would she be allowed to take examinations, to say nothing of taking a degree.

The only way-out for her was to go abroad, as some other Russian women did. But in this case there was a condition that the woman should be married. This made her marry Vladimir Kovalevsky, with whom she soon left for Vienna. There the Kovalevskys were given permission to attend lectures on physics at the Vienna University, but this did not satisfy Sophia. She made up her mind to go to Heidelberg University to study under such scholars as Helmholz and Bunzen, as her intention was to take examinations for a Doctor's Degree in mathematics and mecanics.

In 1871 Kovalevskaya went to Berlin. Where she read privately with professor Weierstrass, as the public lectures were not open to women. In 1874 the University of Gottingen franted her a degree of Doctor of Philosophy in absentias excusing her from the oral examinations in consideration of the three dissertations sent in, one of which, on the theory of partial differential equations, was one of her most remarkable works.

When the Kovalevskys returned to Russia they planned to live and work in St.Petersburg. But despite the efforts of Mendeleyev, Butlerov and Chebyshev, Sophia Kovalevskaya, a great scientist could not find a position there and was obliged to turn to journalism. In 1878 Sophia gave birth to a daughter and as her husband was promised a lectureship at the Moscow University, she decided to take her Magister's Degree there.

In 1883 Kovalevskaya was given an opportunity to report on the results of her research at a session held in Odessa, but no post followed. When she was *offered lectureship at Stockholm University she willingly accepted the offer and went there with her little daughter.*

In 1888 she achieved the greatest of her successes winning the highest prize offered by the Paris Academy. The problem set was: "to perfect in one important point the theory of a movement of a solid body about an immovable point". The solution obtained by her made a valuable addition to the results submitted by Euler and Lagrange.

In 1889 she was awarded another prize by the Swedish Academy of Science. Sonn, in spite of her being the only woman-lecturer in Sweden, she was elected professor of mecanics and held the post until her death.

Unfortunately Sophia Kovalevskaya did not live to reap the full reward of her labour, for she died on February 10 1891, at the age of 41, just as she had attained the high of her fame and had won recognition even in her own country by election to membership of the St.Petersburg Academy of Science.

(Adapted from)

6.6 For further information on the biographies of famous scientists and their achievements use Famous Scientists WebQuest http://www.kn.sbc.com/wired/fil/pages/webwebquestel.html

7. Discussion Points

7.1 Work in groups of 3 - 4. Find information about one of the departments at your faculty and prepare a poster presentation of it. Include the following topics:

- history of the department;
- prominent scientists and teachers who work in the department, famous graduates;
- the scientific research carried out by the department fellows.

7.2 Comment on the statements:

1. *Mechanics is a physical(natural) science.*
2. There would be no mechanics without works of Isaak Newton and other famous scientists.
4. The demands to the researchers in the area of mechanics are constantly increasing.
5. Mechanics helps further progress in many scientific and engineering areas.

PHYSICS

1. Before you start

1.1 Answer the following questions:

1. What faculty do you study at?

2. Why have you chosen this faculty to study at?
3. Why do you interest in studying such science as physics?
4. What is the field of your (future) specialization?
5. Why would you like to study this branch of science?

2. Pronunciation

2.1 Read and practise the pronunciation of the following words:

heat [hi:t]
current [`k`rʊnt]
motion [`mʊu□(ʊ)n]
sound [`saund]
lightning [`laitni□]
electricity [□ilek`trisiti]
magnetism [`m□gni□tiz(ʊ)m]
phemonenon (-a) [fi`n□minʊn]
mechanics [mi`k□niks]
astrophysics □□□strʊu`fiziks□
acoustics [ʊ`ku:stiks□
optics [`□ptiks]
thermodynamics
[`□□:mʊudai`n□miks]
rotation □rʊu`tei□(ʊ)n□

oscillation □□□si`lei□(ʊ)n□
particle □`p□:tik(ʊ)l□
molecule □`m□li□kju:l□
electron □i`lekt□□n□
friction □`frik□(ʊ)n□
divide [di`vaid]
devising [di`vaisi□]
coefficient □□kʊui`fi□(ʊ)n□
vibration □v□i`br□i□(ʊ)n□
behaviour [bi`heivjʊ]
various [`veʊriʊs]
mysteries [`mistʊriz]
mutually exclusive [`mju:t□uʊli
ik`sklu:siv]

3. Reading

3.1 Read the text to know more about physics.

Physics

The word “physics” has its origin in the Greek word “pheusis” meaning nature.

Physics is a broad science concerning nature. Nature consists of countless objects. Any object (a pencil, sand, stone, a drop of water, etc.) is called a physical body or a body. All bodies consist of matter. Steel, copper, water, air and a stone are some examples of matter.

Upon close observation of different physical bodies, we notice, without any particular difficulty, that various changes are taking place within them.

All changes which occur in a physical body are known as phenomena. The melting of ice, the boiling of water, the falling of a stone, the heating of a wire by an electric current, wind, lightning – all these are different phenomena.

Physics studies not only various natural phenomena (mechanical motion, heat, sound, electricity, magnetism, light, etc.), but, more importantly determines exact relations between physical phenomena. Physics is divided into a number of different fields – mechanics, acoustics, optics, thermodynamics, astrophysics, radiophysics, nuclear physics, the physics of solids and others. These different fields are not mutually exclusive. In all cases, physics deals primarily with phenomena that can be accurately described in terms of matter and energy.

Physics can be divided into two great branches: experimental physics and theoretical physics. Experimental physics is the science of making observations and devising experiments. On the basis of experimental facts, theoretical physics formulates laws and predicts the behaviour of natural phenomena. Every physical law is based on experiments.

Physics helps explain the mysteries of the natural world; the development of other sciences depends in many respects on the knowledge of physical phenomena.

In the Physics faculty, students specialize in optical spectroscopy, X-ray spectroscopy, astrophysics, chemical physics, microwave electronics and quantum radiophysics, the physics of the ionosphere and wave propagation, the physics of thin films and many others.

3.2 What new facts about physics have you learnt from the text?

4. Comprehension check

4.1 Answer questions:

1.What is the origin of the word “physics”?
2.What is the physical body?
3.What physical phenomena do you know?
4.What are the fields that physics can be divided into?
5.What are the main branches into which physics can be divided?

5.Vocabulary

5.1 Match different parts of the sentences:

1. Physics helps explain…	a) formulates laws and predicts the behaviour of natural phenomena
2. Experimental physics is the science of…	b) that can be accurately described in terms of matter and energy
3. In all cases physics deals primarily with phenomena…	c) various changes are taking place within them
4. We notice without any particular difficulty, that…	d) making observations and devising experiments
5. On the basis of experimental facts, theoretical physics…	e) the mysteries of the natural world

5.2 Fill in the gaps with the words and word combinations from the text

Physics is a … science … … . Any object is called a … …or a …. All bodies consist of …. …, …, …, … and a … are some examples of matter. All changes which … in a physical body are known as …. …, …, …, …, …, …, - all these are different phenomena. Physics can be divided into two great branches: … and …. Experimental physics is the science of … … and … …. Every physical … is based on …. In the Physics faculty, students specialize in ….

5.3 Complete these sentences**:**

1) All changes which occur in a physical body…
2) … - all these are different phenomena.
3) Physics studies not only various natural phenomena but more importantly…
4) These different fields are not…
5) The development of other sciences depends in many respects…

6. Supplementary reading

6.1 Read the text to know more about the main notions in physics

Quantity of Matter

Materials quite obviously take up space; we say they have volume. In britain we buy petrol by the gallon, on the continent we buy it by the litre. The gallon, the litre, are all units of volume – measures of a quantity of material bought or sold. But it is also quite common to buy and sell things by weighing them in ounces, pounds, kilograms or tons.

The simplest form of weighing machine consists of a balanced level with equal arms. When two identical lumps of material are hung from the ends of the arms, they exactly balance each other. If one of the lumps, say the coin is replaced by something quite different but which still balances it, then we say that the two things have the same quantity of matter. To quantity of matter measured in this way we give the name mass.

In this balancing method we are really balancing two forces, the weights of the objects. It is important to distinguish between the mass which we measure this way and the weight which helps us to do so. The heaviness of objects is due to the attraction which our planet, the Earth, has for them. This heaviness is different at other places. Thus it has been calculated that objects on the Moon have only one-sixth of their earth-weight; a 10-stone boy would weigh only 23 pounds on the Moon, would find it possible to jump 30 ft. And throw a cricket ball a quarter of a mile. The space traveller of the future will find that 50 pounds of luggage become less heavy the further he goes from the Earth. But the quantity of it – its mass – will not change; it will still balance 50 pounds on a level balance.

The standards of mass on the metric system and on the British system are the kilogram and the pound respectively The abbreviations for these are kg. And lb. The abbreviations for the forces which the Earth has on them are Kg (for the kilogram-weight) and Lb (for pound-weight).

Answer questions:
What is the unit of volume?
What is the simplest form of weighing machine?
When do the two things have the same quantity of matter?
Why do the objects have the weight?
Could be the weight of objects different?
What are the standards of mass?

Time

A time scale must be based on some happening which takes place regularly. The regular rotation of the Earth, which governs the rising and setting of the Sun or the passage of a star across the true north-south line (meridian), gives us our time-unit, the day, which is subdivided into hours, minutes and seconds. The time between successive transits of a star across the meridian is known as a sidereal day (sider, sideris, a star), and standard clocks are checked against this time.

Although sidereal time is of great importance to the astronomer, it is the mean solar day (the average time between successive transits of the Sun across the meridian) which is the unit on which the hours, minutes and seconds of daily life are based.

The division of the day into its parts is brought about by means of clocks. The Egyptians made use og the rate at which water or sand flowed through a hole in a vessel, while some people used the regular burning of a candle or oil-lamp. Most modern clocks are based on some type of oscillating system. A pendulum swings to and fro in a time which is almost independent of the extent of the swings.

Answer questions:
What is the thing on which a time scale must be based?
What governs the rising and the setting of the Sun?
What are the time units?
Why is sidereal time of great importance to the astronomer?
What kind of clocks do you know?

The Pressure of the Atmosphere

By pressure we mean the force or weight acting on unit area. From many years of observations and experiments scientists have formulated a theory about the structure of gases; the theory is known as the Kinetic Theory of Gases. The theory draws a picture of a gas as being made up of a large number of very small particles, which are called molecules. The actual volume of the molecules is very small compared with the volume of the gas. They are moving at high speeds in all directions in straight lines, and collide both with each other and with the walls of the containing vessel. Since the molecules are perfectly elastic no energy is lost in these collisions. The continual bombardment of the walls of the containing vessel creates the pressure which the gas exerts on these walls. The pressure will depend upon the number of impacts on unit area per second. If the volume of the vessel increases, the number of impacts on unit area per second decreases, and so the pressure decreases. Conversely the pressure will increase as the number of impacts increases if the volume of the vessel decreases.

Answer questions:
What is pressure?
What is the Kinetic Theory of Gases?
What will the pressure depend upon?
When will the pressure increase?

Friction

Whenever a body slides along another body, a resisting force is called into play which is known as the force of friction.

This is a very important force and serves many useful purposes, for a person could not walk without it, or a car could not propel itself along the road without the friction between the tires and the road. On the other hand, friction is very wasteful because it reduces the efficiency of machines, since work must be done to overcome it, and this energy is wasted as heat. The purpose of this experiment is to study the laws of sliding friction and to determine the coefficient of friction between two surfaces.

Friction is the resisting force encountered when one tries to slide one surface over another; this force acts along the tangent to the surface in contact. The force necessary to overcome friction depends on the nature of the materials in contact, their roughness or smoothness, and on the normal force, but not on the area of contact, within wide limits. It is found experimentally that the force of friction is directly proportional to the normal force. The constant of proportionality is called the coefficient of friction.

The coefficient of friction is equal to the force of friction divided by the total normal force pressing the surfaces together. Thus $K=F/N$ or $F=KN$ where F is the force of friction to be overcome. N is the total normal force, or the perpendicular component of the force holding the two surfaces together, and K is the coefficient of friction.

To determine the above relation the substances must be in the form of a plane placed horizontally, with a pulley fastened at one end. The other substance is made in the form of a block to which a cord passing over the pulley and carrying weights is attached; these may be varied until the block moves uniformly when given a very slight push. The normal force between the two surfaces can be changed by placing weights on top of the block, and the relation between the coefficient of friction, the force of friction, and the normal force can thus be tested.

The limiting angle of repose is the angle at which a body will just begin to slide down an inclined plane. The coefficient of friction is equal to the tangent of the angle of repose. It is found that the frictional force acting when actual sliding is taking place, is slightly lower than the maximum frictional force that can act just before the body begins to slide. Thus the kinetic coefficient of friction is somewhat lower than the static coefficient of friction.

Answer questions:

Is friction important?
What kind of force is it?
Why is friction wasteful?
How is the nature of materials important цhen we speak about friction?
What is the coefficient of friction?
What is the limiting angle?
When could the maximum frictional force take place?

Boyle's Law

One of the imprtant properties of a gas is that it always tends to expand until it completely fills the vessel in which it is placed and thus the pressure it exerts depends on the volume it occupies. To describe fully the condition of a gas it is necessary to give not only the volume but also the temperature and pressure, because they are all interrelated. It is the purpose of this experiment to study Boyle's law, that is, to show that the product of the pressure and volume of a given mass of gas remains constant if the temperature is kept constant.

What are the most important properties of gas?
How can we describe the condition of a gas?

Sound

Every source of sound is in a state of vibration.

Sometimes the vibration is of short duration as in the crack of a whip or the bang of a gun , in many instances the vibration is clearly visible, as in the case of a taut wire. The vibratory origin of many common sounds is not so obvious, often because the vebrating system is gaseous and therefore invisible – the moaning of wind, the note of whistle, the thunderous noise which succeeds a lightning flash, but experiments have been devised which prove the vibratory nature of all such sounds.

Mere vibration, however, is not in itself sufficient to produce the sensation of sound; there must be some material medium to transmit the effects of the vibration to the ear of the listener – sound cannot travel through a vacuum. This can be proved by hanging an electric bell in a glass jar from which air can be withdrawn by an exhaust pump.

Answer questions:

What is the source of sound?
What is vibration?

What is it origin?
What things are important to produce sound?

6.2 Read the text to know more about Archimedes.

Archimedes

The great Scientist of ancient times Archimedes was born at Syracuse in Sicily in the year 287 before our era. He was educated in Alexandria. After he had completed his course there, he returned to his native town where he spent the rest of his life and earned the high respect of its citizens.

Archimedes discovered many laws of mathematics. He used to say: “Give me but one firm spot on which to stand, and I will move the Earth.”

Archimedes was not only a mathematician. Many stories are told of his assistance to his city. Once he destroyed the enemy ships by focussing the Sun’s rays upon them by means of lenses. On another occasion, when the builders were unable to launch a ship, Archimedes did it using some mechanism.

The King of Syracuse had high respect for Archimedes. It happened that a goldsmith made a gold crown for the king but the king suspected the gold to have been alloyed with some baser metal. The king asked Archimedes to test the gold of the crown.

One day when Archimedes was having his bath, the method to test the crown came into his mind. And the astonished people saw Archimedes run through the streets of Syracuse shouting “Eurika! Eurika! (I have found it! I have found it!)”

“ This day, if we knew which it was, must be celebrated as the birthday of mathematical physics”, an English scientist says.

6.3 Read the text to know more about Isaak Newton.

Isaak Newton

Newton,one of the greatest scientists of all time- was born on the 25th of December 1642 at the village of Woolsthorpe in Linkolnshire, not far from the old university town of Cambridge- His father was a farmer and had died before Newton was born. When Newton was a schoolboy, he liked to make things with his own hands and once he made a primitive wooden clock.

When he was fifteen, Newton’s family wanted him to become a farmer. He did his best but was a poor farmer and his uncle sent him back to school. At the age of 18 he was sent to Cambridge where he studied mathematics and took his degree in 1665. Some years later he was appointed professor to the chair of physics and mathematics at Cambridge.

In 1665 the great plague broke out in England and the University was closed. Newton went home for a period of eighteen months. During that time, between the ages of 22 and 24 Newton made his great discoveries – the discovery of the differential calculus of the nature of white light, and the laws that govern the forces of gravitation.

Newton was interested in the problem of light and he showed that white light was made up of various colours of the rainbow.

He developed the theory of gravity when he was only 24. It is interesting how the idea which led to the discovery of the law og gravitation first came to him. Once, as he sat in his garden, he saw the fall of an apple from a tree- The fall of an apple was not unusual event but it made Newton think why apples always fell perpendicularly to the ground. So the sight of the falling apple led to a great scientific discovery and Newton began to apply this property of gravitation to the motion of the Earth and the heavently bodies round the Sun. He calculated the force of gravity acting between the Sun and the planets.

Newton thought that gravity was the cause of the motion of the Moon but his calculations showed that it was not. Only 6 years later, in 1672 when the true size of the Earth was established, Newton started new calculations which proved that gravity was the cause of the motion of the Moon.

In 1687 Newton's great work Principia was published. Newton demonstrated the uniformity of things; he showed that the laws of the motion of the planets were the results of universal gravitation.

Newton died when he was 84, in 1727. His funeral ceremonies were those of a national hero. He was buried in Westminster Abbey.

6.4 Read the text to know more about Faraday.

Faraday(1791-1867)

Michael Faraday, the great English physicist, was born in 1791 in a family of a blacksmith. At the age of thirteen he began to work at a bookbinder's shop. He read many books he had to bind and once he came across an article on electricity. Since that time he took a great interest in electricity and even tried to make some experiments.

A well-known physicist Humphry Davy whose lectures Faraday used to attend, helped him to become an assistant at the laboratory of the Royal Institute in London. Michael worked hard and with enthusiasm. He studied physics and chemistry and even lectured. He helped Davy to construct a safety lamp for miners.

Then he was working on the problem of turning gases into liquids. One of the most important Faraday's discoveries of that time was the discovery of benzol which finds a wide application all over the world now. He succeeded in improving optical glass but above all he was interested in the problems of electricity and magnetism. In 1831 he made one of the most important discoveries – the electromagnetic induction.

This discovery laid the foundation for the development of electrical engineering. Faraday was the first who measured the electric current and made a number of very important discoveries in the sphere of conductivity of different materials. Everybody who studies physics knows Faraday's Law. Faraday died in

1867 almost a hundred years ago but we consider him one of those great scientists who laid foundations for the future age of electricity.

6.5 Read the text to know more about Maxwell.

James Maxwell

James Clerk Maxwell was a remarkable physicist and mathematician of the 19^{th} century. He was born in Edinburgh on November 13, 1831.

When Maxwell was a little boy, he was fond of making things with his own hands.

At school Maxwell became interested in mathematics and when he was 14, he won a mathematical medal. After school Maxwell studied at the University of Edinburgh. While studying he read many books, made chemical, magnetic and other experiments and attended meetings of the Royal Society. Two of his papers were read before the Society and published in the Transactions. In 1850 Maxwell went to the University of Cambridge. He studied hard and joined in social and intellectual activities at the University. In 1854 he got the degree and for two years he stayed at Trinity College where he studied, lectured and did some experiments on optics.

In 1856 he became a professor of natural philosophy at Marischal College, Aberdeen, and in 1860 professor of physics and astronomy at King's College in London. He remained there for five years. Those five years were the most productive for Maxwell. He continued his work on gases and the theory of electricity.

One of Maxwell's greatest works was On the Physical Lines of Force which was published in London.

Maxwell asserts the identity of the two phenomena – electric disturbances and light.

After 20 years of thought and experiments he published his famous Treatise on Electricity and Magnetism.

In 1871 he was appointed professor of experimental physics in Cambridge.

In 1876 his classic Matter and Motion appeared.

Maxwell died on November 5, 1879.

His contribution to the kinetic theory of gases, the theory of heat, dynamics, and the mathematical theory of electricity are the best monuments to his great genius.

6.6 Read the text to know more about Rutherford.

Ernest Rutherford

Ernest Rutherford, a great English physicist, was born in 1871 in New Zealand. His grandparents were among the first English settlers on the Island. In his early childhood Rutherford used to work at his father's farm.

When he was five, he was sent to primary school. Later at the University he revealed great abilities in physics. He took a deep interest in physical experiments.

His work on The Magnetisations of Iron by Highfrequency Discharges was a great success. In 1895 Rutherford came to Cambridge. Here at the famous University he began his work at the laboratory led by professor Thomson. After discovering X-rays many scientists started to work with the new rays.

Rutherford was among them.

Together with professor Thomson he found that the X-rays have positive and negative ions in the gas. In 1898 Rutherford came to Canada to work at a research chair of physics at the Montreal University. He studied the structure of the atom and the processes of radioactivity. In 1899 he discovered that radioactive radiation consists of two parties, which he called Alpha and Beta rays.

Rutherford's discoveries made a great impression upon the scientists all over the world and he was invited to many Universities both in the US and Europe to lecture on these interesting problems. Later he worked at the University of Manchester where he continued to study the structure of the atom.

His work The Scattering of Alpha and Beta Particles of Matter and the Structure of the Atom was the result of his numerous experiments.

During the World War I he worked on the problem of submarine detection.

In 1918 he resumed his work and in 1919 he first split the atom (atom fission). Rutherford died in 1937. His research work is of great importance and is continued by many scientists all over the world. Our country has many achievements in this field of science.

6.7 For further information on the biographies of famous scientists and their achievements use Famous Scientists WebQuest http://www.kn.sbc.com/wired/fil/pages/webwebquestel.html

7. Discussion Points

7.1 Work in groups of 3 - 4. Find information about one of the departments at your faculty and prepare a poster presentation of it. Include the following topics:

- history of the department;
- prominent scientists and teachers who work in the department, famous graduates;
- the scientific research carried out by the department fellows.

7.2 Comment on the statements:

1. Physics is a broad science concerning nature.
2. Physics studies not only various natural phenomena.
3. Physics helps explain the mysteries of the natural world.
4. Materials quite obviously take up space.
5. A time scale must be based on some happenings which take place regularly.
6. By pressure we mean the force or weight acting on unit area.
7. Whenever a body slides along another body, a resisting force is called into play which is known as the force of friction.

8. Every source of sound is in a state of vibration.

SCIENCE AND TECHNOLOGY

1. Before you start

1. Why did you choose the faculty to study at of High Technologies?
2. Can you explain what High Technologies are?
3. What kind of technologies is considered advanced nowadays?
4. What are the most perspective technologies nowadays?

2. Pronunciation

2.1 Read and practise the pronunciation of the following words.

technology □tek`nolod□□□
technique □tekn`i:k□
to pursue □`pʊ:sju□
conceptual □kʊn`septjuʊl□
craftsman □`kra:ftsm□n□
medieval □□med□`i:vʊl□
flourishing □`fl¯r□□□□□

to distinguish □d□s`t□n□w□□□
modeling □m□`deli□□
Process □`prouses□
Engineering □□nd□□`ni:iʊr□□□
civilization □s□v□la□`ze□□n□
amateur □`□mʊtʊ:□
haphazard □h□`ph□zʊd□

3. Reading

3.1 Read the text to know more about science and technology

Science and Technology

A lot of technological inventions and advances (from steam engines to organ transplantation, from radio to semiconductors and so on) made peoples lives easier, safer and more comfortable. But technology goes alongside with science. Moreover the history of technology is longer than and distinct from the history of science. Science is the systematic attempt to understand and interpret the world; technology is the systematic study of techniques for making and doing things. While technology is concerned with the fabrication and use of artifacts, science is devoted to the more conceptual understanding of the environment, and it depends upon the comparatively sophisticated skills of literacy and numeracy. Such skills became available only with the emergence of the great world civilizations, so it is possible to say that science began with those civilizations, some 3 000 years BC, whereas technology is as old as manlike life. Science and technology developed as different and separate activities, the science was practised by a class of aristocratic philosophers, while the technology remained a matter of essentially practical concern to craftsmen of many types. There were points of intersection, such as the use of mathematical concepts in building and irrigation work.

The situation began to change during the medieval period of development in the West (AD 500-1500), when both technical innovation and scientific understanding interacted with the stimuli of commercial expansion and a flourishing urban culture. The robust growth of technology in these centuries attracted the interest of educated men. Early in the 17^{th} century, the natural philosopher Francis Bacon had recognized three great technological innovations – the magnetic compass, the printing press, and gunpowder – as the distinguishing achievements of modern man, and he had advocated experimental science as a means of enlarging man’s dominion over nature. By emphasizing a practical role for science in this way, Bacon implied a harmonization of science and technology, and he made his intention explicit by urging scientists to study the methods of craftsmen and craftsmen to learn more science. Still over the next 200 years, carpenters and mechanics – practical men - built iron bridges, steam engines, and textile machinery without much reference to scientific principles, while scientists – still amateurs – pursued their investigation in a haphazard manner. Only in the 19^{th} century the Royal Society in London formed in 1660 represented a determined effort to direct scientific research towards useful ends, first by improving navigation and cartography, and ultimately by stimulating industrial innovation and the search for mineral resources. Similar bodies of scholars developed in other European countries, and by the 19^{th} century scientists were moving toward a professionalism in which many of the goals were clearly the same as those of the technologists. Thus Justus von Liebig of Germany, one of the fathers of organic chemistry and the first proponent of mineral fertilizer, provided the scientific impulse that led to the development of synthetic dyes, high explosives, artificial fibres, and plastics; and Michael Faraday, the brilliant British experimental scientist in the field of electromagnetism, prepared the ground that was exploited by Thomas A. Edison and many others.

The role of Edison is particularly significant in the deepening relationship between science and technology, because the prodigious trial-and-error process by which he selected the carbon filament for his electric light bulb in 1879 resulted in the creation at Menlo Park, N.J., of what may be regarded as the world’s first genuine industrial research laboratory. From the achievement the application of scientific principles to technology grew rapidly. It led easily to the engineering rationalism applied by Frederick W. Taylor to the organization of workers in mass production, and to the time-and-motion studies of Frank and Lillian Gilbreth at the beginning of the 20^{th} century. It provided a model that was applied rigorously by Henry Ford in his automobile assembly plant and that was followed by every modern mass-production process. It pointed the way to the development of systems engineering, operations research, stimulation studies, mathematical modeling, and technological assessment in industrial processes. This was not just a one-way influence of science on technology, because technology created new tools and machines with which the scientists were able to achieve an ever-increasing insight into the natural world. Taken together, these developments brought technology to its modern highly efficient level of performance.

In the present day sense a technology is study and utilization of manufacturing and industrial methods, systematic application of knowledge to practical tasks in industry. Whereas a science is considered as an absolute authority, technology becomes the cutting edge of history, the new frontier. In the early 1970s the phrase "high technology" began to appear as a synonym for computer technology. Today "high technology" has become a symbol of progress, like the space program in the 1960s, biotechnology innovations in the 1980s or the development of new medical techniques in the 1990s.

(encyclopedia Britannica, 2001, Deluxe edition)

3.2 What new facts about the development of science and technology have you learnt from the text?

4. Comprehension check

4.1 Answer the following questions:

1. What is the difference between science and technology?
2. When did they start?
3. Who practised and developed science at an early stage of civilization?
4. Who was engaged in practical work at that time?
5. Why did technology attract the interest of educated men in the medieval period?
6. What were the most significant technological achievements in the 17th century?
7. Who emphasized the practical role of science?
8. When and where was the first scientific society formed?
9. Name the scholars and experimental scientists who were the first to apply scientific principles to technological innovations?
10. When did the term "high technology" began to appear?

4.2 Agree or disagree with the following statements.

1. In ancient times science and technology developed together as two sides of one activity.
2. None of technological innovations were recognized in the 17th century.
3. In the 19th century the scientists made the first attempts to apply scientific research to industrial innovation.
4. Thomas A.Edison was the only experimental scientist in the 19th century.
5. Influence of science on technology was a one-way process.
6. The term "High Technologies" has always meant computer technologies.

5. Vocabulary

5.1Give English equivalents of the following words and combinations:

расширять влияние; рост технологий; систематическое изучение; методы; приемы; попытка объяснить; точки пересечения/соприкосновения; технические новшества; ремесленники; защищать; привлекать чей-либо интерес; признавать; метод проб и ошибок; приводить к; применения; одностороннее влияние; поднимать на высокий уровень.

5.2. Fill in the sentences with the words or word combinations from the text.
1. Technology is the systematic study of … and their … .
2. Science depended on the comparatively sophisticated skills of … and … .
3. Over the centuries the technology remained … to … of many types.
4. F.Bacon … three … : the magnatic compass, the printing press and gunpowder.
5. Advances in systems engineering, math modeling, technological assessment in industrial processes brought technology to its modern … .

5.3 Complete the following sentences.
1. Technology studies techniques … .
2. Science attempts to … .
3. Technology is concerned with …
4. Science was practised by … .
5. Technology was developed by … .
6. According to F.Bacon experimental science was … .
7. Modern term “high technology” implies … .

6. Supplementary reading

6.1 Read the text to learn about information science

Information Science

Information science is a discipline that deals with the processes of storing and transferring information. It attempts to bring together concepts and methods from various disciplines such as library science, computer science and engineering, linguistics, psychology, and other technologies in order to develop techniques and devices to aid in the handling - that is, in the collection, organization, storage, retrieval, interpretation, and use of information.

The transfer of information through time requires the existence of some storage medium, which is designated a document - hence the term documentation. Historically, “documentation” emerged as a distinct discipline in the early 20th century, paralleling the rise of empirical research, which was to provide its main source of subjects. The discipline grew in response to the growth of the periodical and the journal as the prevalent media for scientific reports. Whereas books required control through cataloging and classification, periodicals required indexes and abstracts that would bring together for the research primary information originally published in divergent sources.

The roots of the discipline of information science lay in three post-World War II developments: the Shannon-Weaver information theory model, Norbert

Wiener's conception of the science of cybernetics, and rapid advances in the design and production of electronic computers. These innovations pointed to a new field of study in which many disciplines could be merged under the unifying idea of "information". After the Georgia Institute of Technology established the first formal information science program in 1963, the discipline quickly developed at a number of other universities either as an independent field of study or as a specialty within such departments as library science, computer science, or engineering.

In its early stages during the 1960s, information science was primarily concerned with applying the then-new computer technology to the processing and managing of documents. Modeling studies were undertaken of the effectiveness of information storage and retrieval; modes of human-machine interaction; the effect of form on the content and comprehension of information; the processes of information generation, transmission, and transformation; and the establishment of general principles that explain and predict information phenomena.

The applied computer technologies – and more recently, the theoretical areas of study – of information science have since permeated many other disciplines and have even been appropriated by new fields, each preferring a more descriptive designation of its subject domain. The institutionalization of information science as a discrete discipline thus has not occurred, and the number of its scientist-practitioners is low. Computer science and engineering tend to absorb the theory – and technology-oriented subjects of the field, and management science tends to absorb the information systems subjects. Hundreds of professional associations do exist that are concerned with information-related disciplines, providing a forum where people can exchange ideas about information processing.

(encyclopedia Britannica, 2001, Deluxe Edition)

6.2 Read the text about information systems

Analysis and design of information systems

The building of information systems falls within the domain of engineering. As is true with other engineering disciplines, the nature and tools of information systems engineering are evolving owing to both technological developments and better perceptions of societal needs for information services. Early information systems were designed to be operated by information professionals, and they frequently did not attain their stated social purpose. Modern information systems are increasingly used by people who have little or no previous hands – on experience with information technology should accomplish in their professional and personal environments. A correct understanding of the requirements, preferences, and "informational styles" of these end users is crucial to the design and success of today's information systems.

The methodology involved in building an information system consists of a set of iterative activities that are cumulatively referred to as the system's life cycle. The principal objective of the systems analysis phase is the specification of what the system is required to do. In the system design phase such specifications are converted to a hierarchy of increasingly detailed charts that define the data required and decompose the processes to be carried out on data to a level at which they can be expressed as instructions of a computer program. The systems development phase consists of writing and testing computer software and of developing data input and output forms and conventions. Systems implementation is the installation of a physical system and the activities it entails, such as the training of operators and users. Systems maintenance refers to the further evolution of the functions and structure of a system that result from changing requirements and technologies, experience with the system's use, and fine-tuning of its performance.

Many information systems are implemented with generic, "off-the-shelf" software rather than with custom-built programs; versatile database management software and its nonprocedural programming languages fit the needs of small and large systems alike. The development of large systems that cannot use off-the-shelf software is an expensive, time-consuming, and complex undertaking. Prototyping, an interactive session in which users confirm a system's proposed functions and features early in the design stage, is a practice intended to raise the probability of success of such an undertaking. Some of the tools of computer-aided software engineering available to the systems analyst and designer verify the logic of systems design, automatically generate a program code from low-level specifications, and automatically produce software and system specifications. The eventual goal of information systems engineering is to develop software "factories" that use natural language and artificial intelligence techniques as part of an integrated set of tools to support the analysis and design of large information systems.

(encyclopedia Britannica, 2001, Deluxe Edition)

6.3 Read the text to learn about technology of production of pyroelectric and piezoelectric organic thin films

Production Technology of Pyroelectric and Piezoelectric Organic Thin Films

Purpose

Pyroelectric and piezoelectric thin film materials were obtained by vacuum deposition of an initial organic substance on a substrate. This technology permits take advantage of the techniques and equipment used in microelectronics technologies. The vacuum deposition technique enables an easy multicomponent structures integrated with signal recording and processing devices. Low cost of the initial material, little labour cost, relatively high output of the finished products. First there is an opportunity to obtain an active pyro- or piezoelectric element formed directly on a semiconductor device without risk to damage it.

Description

The thin film materials are superior to the best monocrystalline and ceramic ones in the basic technical characteristics. Pyroelectric thin materials are conventionally used to manufacture IR-detectors. The “Vostoc” scientific and production enterprise produces such detectors in lots as well as radiation detectors for pulse laser-ray, UV, visible, IR and RF-ranges.

Piezoelectric thin film materials can be used to manufacture: high-frequency piezoelectric transducers operating in the range of 1 G c/s and above, pulse pressure transducers with 1-second response time, supersensitive wideband membrane pressure, sensors of different purposes, acoustopical, adapting and fiber optical devices, etc.

The materials presented have no analogues in the world practice and are protected by the patents of the Russian Federation. A wide use of the developed materials provides for creating the scientific and home-purpose devices of a new generation for recording radioactive, electromagnetic and acoustic radiation.

Other Conversion Technologies

Energy requirements for space vehicles led to an intensive investigation, from 1955 on, of all possible energy sources. Direct energy-conversion devices are of interest for providing electric power in spacecraft because of their reliability and their lack of moving parts. As have solar cells, fuel cells, and thermoelectric generators, thermionic power converters have received considerable attention for space applications. Thermionic generators are designed to convert thermal energy directly into electricity. The required heat energy may be supplied by chemical, solar or nuclear sources, the latter being the preferred choice for current experimental units.

Another direct energy converter with considerable potential is the magnetohydrodynamic (MHD) power generator. This system produces electricity directly from a high-temperature, high-pressure electrically conductive fluid – usually an ionized gas – moving through a strong magnetic field. The hot fluid may be derived from the combustion of coal or other fossil fuel. The first successful MHD generator was built and tested during the 1950s. Since that time developmental efforts have progressed steadily, culminating in a Russian project to build an MHD power plant in the city of Ryazan, located about 180 kilometres (112 miles) southeast of Moscow.

(Adapted from Internet sites)

6.4 Read the text on advanced and retarded technologies

Technology in Reverse

Let me introduce you to retarded technology. It’s the opposite of advanced technology. Advanced technology enables us to do useful new things or to do old things more efficiently. By contrast, retarded technology creates new and expensive ways of doing things that were once done simply and inexpensively. Worse, it encourages us to do things that don’t need doing at all. It has made waste respectable , elaborate, alluring and even fun.

Just the other week, Newsweek reported a boom in electronic books. The idea is to put books onto discs that you can plug into your customized book-displaying computer. Here's a swell idea of retarded technology. On the one hand, you can buy $900 or $9,000 book-reading computer that you can feed with $20 discs of your favourite books. It's cumbersome. If you take it to the beach, it gets clogged with sand. You can't use it as a pillow. If it slips off the kitchen counter, it smashes.

On the other hand, you can buy an old-fashioned book. It's cheaper, more mobile, less fragile and more durable. You can lend it, even to casual friends. If you don't like it, you can stop reading without hating yourself for ever buying it. Losing it is not a traumatising event.

The pro-technology comeback is that computers will someday compress entire libraries onto chips or discs and, thereby, open vast vistas of information to almost anyone. The trouble with this is arithmetic and common sense. A school library with 2,000 books can theoretically serve 2,000 readers simultaneously. A school library with one computer terminal that can call up 200,000 books can serve only one reader at a time. The computer creates a bottleneck. Sure, the library can buy more computers, but they're costlier and bukier than books. Finally, there's common sense: do most people really need access to, say, the entire collection of the New York Public Library?

Here's another example of technology racing backward: the video press release. In my business, we're bombarded with press releases for products, politicians and policies. And now there are promotional videos. Instead of a 10-cent press release that took two days to prepare and 29-cents to mail, I get a $4.50 tape that cost $2 to mail and two months to prepare. I can read standard press release in 10 or 15 seconds before tossing 99 per cent of them. But the videos get tossed immediately. To view them would require finding a VCR and wasting five to 10 minutes watching. Sorry, no sale. The video costs more and does less.

I am not about to argue that all technology is bad. Heavens, no. Ours is an era of conspicuous technological upheaval. But the purported gains of new technology - rising incomes, greater productivity - seem to elude us. Somehow, the paradox must be explained. One theory holds that we're still in the primitive stages of, say, the computer revolution whose full benefits will soon burst upon us. Maybe. (A corollary is that techno-dopes like me are holding back progress.)

But to this theory, I would add the notion of rearded technology. The gains from new technologies are plentiful and real. But the benefits are being crudely offset by a lot of technology-inspired waste. Technology is often misused because the reasons people embrace it can be fairly frivolous. To wit:

Social Status. Suppose your brother in Honolulu gets a car phone. He might even need it for work. Can you then be without one? Obviously not. Need isn't an issue. (Since 1985, the number of cellular subscribers has leaped from 340,000 to about 8 million.)

Adult Play. New machines are often grown-up toys, successors to Legos and dolls. A woman I know well (my wife) recently exulted after creating invitation cards on her personal computer. (I dared not ask how long this took.) “I know I could have gone out and bought Hallmark cards,” she says. “But I’m so proud of myself. I’m thrilled.” In the office, computer mail has transformed idle chitchat into an all-day affair.

The Mount Everest Effect. Every new technology inspires the temptation to see what it will do – no matter how inane or time-consuming the task. This is the technological equivalent of “We’re climbing that mountain because it’s there.” Hence, the video press release.Entire areas of academic life (political science, economics and even history) are now increasingly given over to number crunching. Computers allow numbers to be easily crunched; so they are. Genuine thought is discouraged. The same thought-deadening process afflicts American managers.

The survival of stupid technology is ordained by ego and money. New technologies often require a hefty investment. Once investments are made, they cant’n easily be unmade. To do so would be embarrassing. Old and inexpensive ways of doing things are eliminated to help pay for new and expensive methods. Retarded technology becomes institutionalized and permanent.

This is routinely denied, because people won’t admit they’re frivolous or wasteful. One survey of cellular-phone owners found that 87 per cent said their phones raised their productivity by an average of 36 per cent. More than half (54 per cent) said the phone had improved their marriages. Imagine if these gains were generalized to the entire population: our economy’s output would instantly leap from $6 trillion to $8 trillion; divorce rates would plunge, and “family values” would triumph. What we need are cellular subsidies so everyone can have one.

The beat goes on. Apple Computer recently announced Newton, the first of a generation of handheld “personal digital assistants”. Newton will, Apple says recognize your handwriting when you scribble something on its small display scree. This seems impressive. You scrawl “Joe Smith”, and Newton calls up “Joe Smith” from its memory and tells you Joe’s phone number and anything else you’ve put in Joe’s tiny file. Just like a Rolodex.

Hey, maybe a Rolodex is better. It’s cheaper. How about a standard notebook or address book? They already accept handwriting. Even fancy address books cost only $15 or $20. Apple says Newton (which will also act as a pager and send messages over phone lines) will be priced “well under $1,000.” It should be a smashing success.

(R.J. Samuelson, “Science and Technology Today”, St.Martin’s Press, NY)

6.5 Look through the list of words and phrases below. Tick (**V**) the word combinations you are confident about and cross (**X**) the ones you need to revise.

- to store/transfer/interprete/retrieve information
- human-machine interaction

- technology-oriented subjects
- information-related disciplines
- to absorb a theory
- a system analysis phase
- a system design phase
- a system development phase
- artificial intelligence techniques
- high-frequency piezoelectric transducers
- pyroelectric thin materials
- home-purpose devices
- energy conversion devices
- direct energy converter
- conductive fluid
- advanced/retarded/waste technology
- technology-inspired waste
- technological upheaval

6.6 For further information on the biographies of famous scientists and their achievements use Famous Scientists WebQuest http://www.kn.sbc.com/wired/fil/pages/webwebquestel.html

7. Discussion Points

7.1. Divide into three groups and choose a topic to discuss:
- the positive impact of new technologies on people's lives;
- the negative impact of new technologies on people's lives;
- retarded technologies: pros and cons.

7.2 Work in groups of 3 - 4. Find information about one of the departments at your faculty and prepare a poster presentation of it. Include the following topics:
- history of the department;
- prominent scientists and teachers who work in the department, famous graduates;
- the scientific research carried out by the department fellows.

7.3. Comment on the statements:
1. Present development of technology has great impact on modern society.
2. Technology plays an important role in people's lives, transforming them whether for good or for ill.
3. Science and technology are two sides of one coin.
4. Since the 20th century the relations between science and technology have been a two-way process.
5. Advanced technologies enable people to do useful new things or to do old things efficiently.

6. Term “high technology” is a symbol of progress.