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КАФЕДРА ИНОСТРАННЫХ ЯЗЫКОВ

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ДЕЛОВОЙ АНГЛИЙСКИЙ ЯЗЫК ДЛЯ АУДИТОРНЫХ ЗАНЯТИЙ И САМОСТОЯТЕЛЬНОЙ РАБОТЫ СТУДЕНТОВ НАПРАВЛЕНИЯ ПОДГОТОВКИ 20.04.02 ПРИРОДООБУСТРОЙСТВО И ВОДОПОЛЬЗОВАНИЕ (УРОВЕНЬ МАГИСТРАТУРЫ)

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Пособие предназначено для обучающихся по направлению подготовки 20.04.02, изучающих дисциплину «Деловой английский язык». Основной целью учебного пособия является приобретение коммуникативной компетенции, необходимой для квалифицированной информационной и творческой деятельности в различных сферах и ситуациях делового партнерства, совместной производственной и научной работы.

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ВВЕДЕНИЕ

Основной целью обучения в магистратуре является приобретение обучающимися коммуникативной компетенции, необходимой для квалифицированной информационной и творческой деятельности в различных сферах и ситуациях делового партнерства, совместной производственной и научной работы. Обязательным условием достижения поставленной цели является решение следующих задач:

- достижение зрелого владения всеми видами чтения и перевода литературы разных функциональных стилей;
- овладение всеми видами монологического высказывания (информирование, пояснение, уточнение, инструктирование и иллюстрирование высказывания, а также умение сделать доклад на иностранном языке);
- осуществление и понимание высказываний профессионального и научного характера в ситуациях приема зарубежных специалистов, обмена профессионально-значимой информацией в процессе повседневных бесед, деловых переговоров, при заключении сделок и контактов, обсуждении условий делового партнерства.

Предлагаемое учебное пособие построено с учетом преемственности обучения и состоит из самостоятельных блоков (Units). Цель каждого блока - развитие умения чтения и адекватного перевода текстов по направлению подготовки и написания тезисов, докладов, рефератов и аннотаций. Работа с данным пособием способствует формированию у обучающихся следующих компетенций: ОК-3, ОК-6, ОПК-3.

Учебные тексты служат для первичного введения языковых явлений и иллюстрацией их употребления в иноязычной речи. При подборе текстов учитывалась их актуальность, информативность, частотность представленной в них лексики и уровень языковой подготовки студентов.

Перед каждым текстом даётся подробный список лексики, предназначенный для активного изучения и закрепления в ходе выполнения послетекстовых упражнений. Упражнения направлены на активизацию лексического материала и развитие навыков устной речи.

Грамматический материал охватывает основные явления грамматики английского языка и направлен на закрепление знаний, полученных на бакалаврском уровне подготовки.

PART 1
Unit 1
EDUCATION IN MODERN SOCIETY. HIGHER EDUCATION

1. Read and translate the text:

Text 1. HIGHER EDUCATION IN RUSSIA

learning materials – учебные материалы
to bring up to date – довести до современных требований
information explosion – информационный взрыв
training and instruction – подготовка и обучение
over years – за многие годы
curricula are enriched and broadened – программы (курсы обучения) обогащаются и расширяются

Higher education plays an important part in the life of any country as it provides the country with highly-qualified specialists for future development and progress. It trains people to become teachers, engineers, doctors and other professional workers.

In all the industrial countries standards of living are steadily changing; this means that the kind of education, which was good enough thirty years ago, is not necessarily good for them today. The serious need to find ways and means of ensuring continuous and thorough adoption of the universities to contemporary needs in our rapidly changing world is widely recognized. And this means that styles of teaching, quality of learning materials and organization of the university itself have to be continuously brought up to date and improved.

Besides, knowledge and information which comes through the mass media must also be taken into consideration. This information explosion has affected every field of study, especially, of course, in the natural and applied sciences and in all other sciences as well. The increase of information requires new methods and new approaches to students' training and instruction.

At present a new system of education is introduced in this country – a distance education system. This computer system of learning helps working professionals to continue their education while remaining at their jobs. This system enables people to get knowledge and a good foundation in the sciences basic to his or her field of study. Distance learning has developed over years from satellite video courses to modern videoconferencing through personal computers.

The academic year usually lasts 9 months and is divided into two terms (semesters). The first- and second-year students obtain thorough instructions in the fundamen-

tal sciences of mathematics, physics, chemistry and drawing as well as computer engineering and a number of others. The curricula are enriched and broadened by instructions in such subjects as foreign languages, history and economics.

At the third year students get more advanced knowledge and begin to concentrate on their special interests, so to say, their «major» subject and take many courses in this subject. Specialized study and courses will help students to become specialists and prepare them for their future work.

After four years students will get a bachelor's degree. Then the students may go on with their studies and in a year or two of further study and research get a master's degree. After graduating from the university they may go on with their study and research and may get a still higher degree.

About 75 percent of students receive state grants and 15 percent are sponsored by enterprises. Universities have their own students' hostels and some of them have large and excellent sport centers.

Education is a process through which culture is preserved, knowledge and skills are developed, values are formed, and information is exchanged. Education is the way to success.

2. Practise the pronunciation of the following words:

Highly-qualified, steadily, ensuring, thorough, adoption, contemporary, instructions, science, curricula, preserve.

3. Answer the questions:

1. When does the academic year begin in this country? 2. How many exams did you pass to enter the University? 3. Do you pay for your education? 4. Do students get grants? 5. What subjects do students study in the first year? 6. Which subject is the most interesting for you? 7. Is there a sport center in your University? 8. What degree do students get after four years of study? 9. What degree can a student get after two years of further study and research? 10. What new education system is introduced in this country? 11. What specialities do people get after graduating from a university? 12. Why is higher education important in the life of every country?

4. Use Active and Passive Voice.

1. Students asked the lecturer many questions. The lecturer was asked many questions. 2. The monitor told the first-year students to come to the laboratory. The first-year students were told to come to the laboratory. 3. Usually a lab assistant shows the equipment to the students. Usually the equipment is shown to the students by a lab assistant. Usually students are shown the equipment by a lab assistant. 4. Students watched the process with great attention. The process was watched with great attention. 5. Tomor-

row our teacher will give us a new task. A new task will be given tomorrow. We shall be given a new task tomorrow. 6. Practice accompanies theory. Theory is accompanied by practice. 7. He asked me to bring a dictionary. He was asked to bring a dictionary. 8. The teacher told the students to sign their drawings. The students were told to sign their drawings. 9. The dean will send the students to a big plant in summer. The students will be sent to a big plant in summer. 10. He taught us to use the lab equipment. We were taught to use the lab equipment.

5.

A. Transform into Passive Voice.

1.You open the door. 2. We asked questions. 3. He will finish his project next week. 4. He can do this exercise. 5. They invited me to their conference. 6. 1 saw a new film. 7. My sister writes letters regularly. 8. Universities develop new methods of students' training. 9. After graduating from the University the students may get a still higher degree. 10. The study of foreign languages, history and economics must improve the curricula of technological universities.

B. Translate.

1. Mathematics, strength of materials, mechanics, elements of machines as well as engineering physics are studied at technological institutes. 2. The development of science is closely connected with the development of higher education. 3. Students are provided with hostels, well-equipped laboratories and libraries. 4. Any country must be provided with good specialists in all branches of science and technology for its further development. 5. Large sums of money are spent by the state to train highly-qualified engineers. 6. Much attention must be paid to improve the standards of higher education. 7. Students of technological institutes are trained to analyse various facts and theories. 8. The scientific and technological progress of a country is determined by the qualification of specialists. 9. Some institutes of technology are reorganized into universities. 10. The country must be provided with specialists capable of working with the technology of tomorrow effectively.

6. Find Participle I and Participle II, translate.

1. The students studying at the institutes passed entrance exams in summer. 2. The subjects studied in the first two years are very important for future engineers. 3. The lecture delivered by our dean was on new methods of technology. 4. The man delivering this lecture is our professor on mathematics. 5. An article discussing the new system of school education appeared in all newspapers. 6. The results of the experiments discussed yesterday will be published. 7. The attention paid to the study of fundamental subjects is great. 8. Students interested in computer engineering enter technological in-

stitutes. 9. The number of specialists connected with new branches of science and engineering is increased every year.

7. Read and translate the text.

Text 2. HIGHER EDUCATION IN THE UK AND THE USA

to consist of - состоять из
self-governing - самоуправляющийся
tuition - обучение
to proceed - продолжать делать (что-либо)
a gown - мантия
a major subject - профилирующий предмет
a graduate scool - старшие курсы
a five point scale - пятибалльная шкала

Part 1. Cambridge is one of the two main universities of England which is located at the Cam River. It was founded at the beginning of the 12th century. The University consists of 24 different colleges including 4 colleges for women. Each college is self-governing.

The head of the University is the chancellor who is elected for life. The teachers are commonly called «dons» and «tutors». Part of the teaching is by means of lectures organized by the University. Besides lectures teaching is carried out by tutorial system for which Cambridge University is famous all over the world. This is a system of individual tuition organized by the colleges.

Each student has a tutor who practically guides him through the whole course of studies. The tutor plans the student's work and once a week the student goes to his tutor to discuss his work with him. The training course lasts 4 years. The academic year is divided into 3 terms. The students study natural and technical sciences, law, history, languages, geography and many other subjects.

After three years of study a student may proceed to a Bachelor's degree, and later to the degrees of Master and Doctor. Students are required to wear gowns at lectures, in the University library, in the street in the evening, for dinners in the colleges and for official visits. All the students must pay for their education, examinations, books, laboratories, university hostel, the use of libraries, etc. Very few students get grants. Not many children from the working class families are able to get higher education, as the cost is high. The cost of education depends on the college and speciality.

A number of great men, well-known scientists and writers studied at Cambridge. Among them are: Erasmus, the great Dutch scholar, Bacon, the philosopher, Milton and Byron, the poets, Cromwell, the soldier, Newton and Darwin, the scientists.

Part 2. There is no national system of higher education in the United States. Higher education is given in colleges and universities. There are over 2100 various higher educational institutions, including colleges, technological institutes and universities. The average college course of study is 4 years. The academic year is usually 9 months or 2 terms (semesters) of four and a half months each. Classes usually begin in September and end in June. The first-year students are called freshmen. Students choose a major subject and take many courses in this subject. After four years, they get a traditional Bachelor's degree. Then the students may go on to graduate school and with a year or two of further study get a Master's degree.

After another year or two of study and research, they may get a still higher degree as Doctor of Philosophy (Ph. D.). The student's progress is evaluated by means of tests, term works and final examinations in each course. The student's work is given a mark, usually on a five point scale. Letters indicate the level of achievement.

«A» is the highest mark. «F» denotes a failure.

Most American colleges and universities charge for tuition. The methods of instruction in the universities are lectures, discussions, laboratory and course works and seminars. Most cities have colleges or universities that hold classes at night as well as in daytime. In this way people may work for a degree or just take a course in the subject that interests them.

8. Practise the pronunciation of the following words:

Tutor, tutorial system, guide, through, languages, chancellor, major, require, sciences, law, scholar, further, evaluated, Bachelor's degree, Master's degree, failure, method.

9. Read and translate the text.

Text 3. OXFORD UNIVERSITY

Oxford is renowned the world over. It ranks in importance with Athens, Rome and Paris because of the stream scholars who, for hundreds of years, and particularly in the 20th century, have come to sit at the feet of learned men, and have returned to their own countries, their minds enriched with the distilled learning to be found here, and imbued with an abiding love for the place. They have absorbed the almost indefinable "spirit of Oxford", and many of them return again and again, so strong is the pull of the place.

This book is designed to help the visitor whose stay is short. So many visitors want to know where the University is. In their home country, the universities are easily identifiable because they are compact, purpose-built places, and probably isolated from the domestic and commercial buildings which form the heart of the city from which they take their name.

Oxford is different. It has a golden heart - an area of less than half a square mile in

which is to be found the most varied assortment of historic buildings in the world. But they do not stand in isolation; they are intermingled, in the must delightful way, with houses, shops and offices.

Over the last decade millions of pounds have been spent in restoring and cleaning the stonework of college and university buildings, which had become blackened and decayed, and in many cases was in danger of disintegrating. Great care was taken in the restoration, and the result is that the university buildings present the honey-coloured facades which the great architects such as Wren and Hawksmoor created.

Interiors too, have been cleaned and restored - notably those of the Sheldonian Theatre and the Bodleian Library. Oxford is a place of great beauty, but it is not just a shrine to the past. It is a living entity and its historic buildings are the homes of masters and students whose learning, thinking and ideas have a profound influence on culture, education, science and politics, not only in England, but throughout the world.

The University did not come into being all at once. Oxford had existed as a city for at least 300 years before scholars began to resort to it. The end of the 12th century saw the real beginnings of the University. It is known that early in that century distinguished scholars were lecturing in Oxford, but it had no recognition as a place of learning. In about 1184 the University had become an accomplished fact as result of the migration to Oxford of students who brought their own traditions with them.

It is generally assumed that between 1164 and 1169, when Henry II forbade English clerks to go to the University of Paris, which at that time was the foremost in Europe, the scholars had to find somewhere else to continue their studies. Their choice fell on Oxford. The first group of scholars at Oxford may have been joined by others from Paris, and from other parts of Britain.

There is no ''university'' as such. Each college is practically autonomous, with its own set of rules for its good government. There is a central administration, providing services such as libraries and laboratories.

10. Practise the pronunciation of the following words:

Rank, scholars, particularly, imbued, indefinable, short, purpose, varied, delightful, autonomous, distinguished, profound, disintegrating, foremost, migration.

11. Answer the questions:

1) Why is Oxford ranking amongst the world's top universities?
2) How does Oxford differ from other educational institutions?
3) Why do the Oxford's buildings need to be restored?
4) What architects have worked on the University's facades?
5) Why didn't Oxford deserve any recognition until the 12th century?
6) When was the heyday of Oxford?

7) Why does the author claim that there's no university such as Oxford?
8) Why did English clerks give up going to the University of Paris, which was considered to be the foremost in Europe?

12. Make up definitions:

Distinguished	Ahead of all others, especially in position or rank.
A scholar	Something that exists as a particular and discrete unit.
To intermingle	Standing above others in character or attainment or reputation.
An entity	An exposition of a given subject delivered before an audience or a class, as for the purpose of instruction.
Foremost	To mix or become mixed together.
A lecture	One who attends school or studies with a teacher.

Unit 2
THE QUALITY OF ENVIRONMENT. ENVIRONMENT PROTECTION

1. Read and translate the text.

Text 1.ENVIRONMENT PROTECTION MUST BE GLOBAL

That the problem of pollution and ecology has become the most important one for mankind is evident to all. The more civilization is developing, the greater the ecological problems are becoming. Air and water pollution by industry is now reaching tremendous proportions. In our era it is changing from a national to an international problem, especially in territories where rivers cross several countries. The seas and oceans are also becoming seriously polluted. A similar situation is developing in the atmosphere. It is known that many cities throughout the world suffer from air pollution.

However, our scientific knowledge and technological advancement make it possible to eliminate it if people use good will and make considerable investments for that purpose. The development of natural resources on a global scale is alreadypossible from a scientific and technical standpoint. Large-scale experimental work in this area is successfully being carried out.

At present scientists in industrially developed countries are working on the theory of interaction of all the atmospheric and oceanic global processes that determine the climate and weather of the world. Increasing growth of population, industrialization and the use of resources are slowly but surely changing the global climate and water balance. This can be described as a great experiment, one that may bring about changes in the environment more serious than ever before.

The essential feature in the environment protection is that many problems can be solved only on the level of world community. Therefore, the planning of protection against pollution by human society as a whole is imperative today and in the near future. It is necessary to develop an international program to study data on land, forest, atmospheric and oceanic resources, both renewable and non-renewable. It is the joint efforts of many scientists and special public organizations that can deal with the problem and take necessary measures to protect the environment.

It is still a big job and much remains to be done. However, scientists are confident that planned actions of all countries can eliminate pollution and achieve suc-cesses in purifying air, water and soil and in safeguarding natural resources. At the same time one must realize that social and political circumstances may stand in the way of further progress in this field.

2. Answer the questions:

1. What is this text about? 2. What is ecology? 3. How does water (air) become polluted? 4. Why is the problem of water pollution becoming a global problem?

3. Read and translate the following international words:

Global, resources, problem, ecology, proportion, era, territory, ocean, oceanic, situation, atmosphere, process, climate, balance, experiment, social.

4. Read and translate the following words:

Environment, pollution, achieve, success, successful, successfully, purify, air, natural, however, job, remain, mankind, reach, special, especially, serious, throughout, world, knowledge, advance, eliminate, purpose, scale, weather, essential, therefore, data, joint, measure, realize, circumstance.

5. Answer the questions according to the example:

What is one of the most important problems for mankind now? (<u>the problem of pollution and ecology</u>).

<u>The problem of pollution and ecology</u> is one of the most important problems for mankind now.

1. What problem is becoming a global problem? (the problem of air and water pollution). 2. What makes it possible to eliminate air and water pollution? (scientific knowledge and technological advance, good will and large investments). 3. What are scientists in industrially developed countries currently working on? (the theory of interaction of the atmospheric and oceanic global processes). 4. What factors are slowly changing the global climate and water balance? (the growth of population, industrialization and use of resources). 5. What actions are necessary to take to deal successfully

with the problem of protecting the environment throughout the world? (planning, developing international programs to study ecological data, joint efforts of scientists and special public organizations).

6. Read and translate the following text without a dictionary:

It is difficult for mankind to predict changes in the environment accurately. It is known that natural changes in weather and climate may have more catastrophic global effects than human activity. But scientists are developing a new concept that can help make such prediction more accurately. It is based on our understanding that the Earth is an integral system. Its parts – oceans, atmosphere, land or life – cannot be understood in isolation to predict changes in the most accurate way. Modern scientific and technological progress made it possible to use new technologies for that purpose. That satellites can control physical, chemical, biological and geological changes on a global scale is well-known now. One must also know that the study of environmental problems with the help of satellites is becoming international. Russia, the US, France, Japan, Canada, India, China and Italy are planning to send their satellites in both polar and geostationary orbits.

7. Read and translate the text 2.

Text 2. LAST CHANCE FOR MOTHER EARTH?

(*From Scientific American)*

man’s intrusion upon nature - вторжение человека в природу
to intrude upon - вторгаться
to violate the laws of nature - нарушать законы природы
to destroy the balance - нарушать равновесие
to combat pollution - бороться с загрязнением атмосферы
to be faced with the problem of - стать перед проблемой
environment - окружающая среда
industrial waste - промышленные отходы
to govern the process - управлять процессом
to harm - наносить ущерб
to be aware of the consequences - осознавать последствия
radioactive fallout - радиоактивные осадки
to affect nature - влиять на природу
to threaten - угрожать
to contaminate the atmosphere - загрязнять атмосферу

The U.S. environment is seriously threatened by the garbage of the economy. The Apollo 10 astronauts could see Los Angeles as a smudge from 25000 miles in outer space. What most Americans now breathe is closer to filth than to air. Americans know pollution well. It is car-clogged streets and junk-filled landscape – their country's visible decay.

California's air pollution is already so bad that on many days Los Angelesschool children are warned not to breathe too deeply because of heavy smog conditions.

The United States is far from alone in its pollution and waste. The smog is dense in Tokyo. Some of Norway's legendary fjords are awash with stinking industrial wastes.

Sections of the Rhine River which flows through the industrial Ruhr Valley to the North Sea are so toxic that even hardy eels have difficulty surviving. In Sweden, not long ago, black snow fell on the province of Smoland.

The earth has its own waste-disposal system, but it has limits. The winds that ventilate the earth are only six miles high; toxic garbage can kill the tiny organisms that normally clean rivers. Meanwhile, modern technology is pressuring nature with tens of thousands of synthetic substances, many of which almost totally resist decay. This includes aluminum cans that do not rust, inorganic plastics that may last for decades, floating oil that can change the thermal reflectivity of oceans and radioactive wastes whose toxicity lingers for centuries.

Where do most of the pollutants end up? Probably in the oceans, which cover70 per cent of the globe and have vast powers of self-purification. Yet even the oceans can absorb only so much filth; many scientists are worried about the effects on plankton – passively floating plants and animals, which produce about one fifth of the earth's oxygen. Emerging now is the importance of the science of survival – ecology. Trying to awaken a sense of urgency about the situation, ecologists sometimes do not hesitate to predict the end of the world. Yet they hold out hope too.

Ecology is the study of how living organism and the nonliving environment function together as a whole, or ecosystem, in the biosphere – that extraordinarily thin global envelope which sustains the only known life in the universe. Hundreds of millions years ago, plant life enriched the earth's atmosphere to a life supporting mixture of 20 per cent oxygen, plus nitrogen, argon, carbon dioxide and water vapour. The mixture has been maintained ever since by plants, animals and bacteria, which use and retain the gases at equal rates. The result is a closed system, a bal-anced cycle, in which nothing is wasted and everything counts.

The process is governed by distinct laws of life and balance. One is adaptation; each species finds a precise niche in the ecosystem. Another law is the necessity of diversity: the more different species in an area, the less chance that any single type will destroy the balance. Man has violated these laws – and endangered nature as well as himself.

A primitive community could harm only its own immediate environment. When it ran out of food, it had to move on or perish. But a modern community can destroy its land and still import food, thus possibly destroying ever more distant land without knowing or caring. Technological man forgets that his pressure upon nature may provoke revenge.

What most appalls ecologists is that technological man remains so ignorant of his impact. Neither the politicians nor the physicists who developed the first atomic bomb were fully aware of the consequences of radioactive fallout. The men who de-signed the automobile did not foresee that its very success would turn cities into parking lots and destroy greenery in favour of highways, all over the world.

Man's inadvertence has even upset the interior conditions of the earth. Wherever huge dams are built the earth starts shuddering. The enormous weight of the wa-ter in the reservoirs behind the dams puts a new stress on the subsurface strata. In consequence the earth quivers.

If technology got man into this environment crisis ant pollution mess, surely technology can get him out of it again.

There is no lack of hopeful ideas for balancing the environment and the most encouraging today is the swell of public opinion. We are at least starting to combat gross pollution. Even so, real solutions will be extremely difficult and expensive. Ideally, entire environment should be subjected to computer analysis. Whole cities and industries could measure their inputs and outputs via air, land and water. But this is a far-off dream. Far more knowledge is needed.

Even the simplest ecosystem is so complex that the largest computer cannot fully unravel it.

Technological man is bewitched by dangerous illusion that he can build bigger and bigger industrial society with scant regard for the iron laws of nature. Pessimists argue that only a catastrophe can change that attitude – too late. By contrast, the hopeful ecologist put their faith in man`s ability.

8. Read and translate the following words and word-combinations

Garbage, smudge, breathe, decay, synthetic substances, radioactive wastes, linger, self-purification, filth, carbon dioxide, vapour, govern, species, violate, immediate environment, subjected to computer analysis, bewitched.

9. Agree or disagree with the statements given below. Use the following phrases:

1. What most Americans now breathe is very clean air and they have no idea about pollution.
2. Some other countries are faced with the same problem of pollution and waste as the U.S.
3. Modern technology does not affect nature in any way.

4. We needn't worry about the resources of our environment for they are inexhaustible.
5. The oceans can absorb as much filth as necessary.
6. It is plants that help maintain the mixture of oxygen, nitrogen, carbon dioxide and water vapour.
7. Ecology is a linguistic science.
8. Man has violated laws of nature and is going to pay for it.
9. When the primitive community ran out of food it perished.
10. The men who designed automobiles knew only too well that some day the automobiles would turn cities into parking lots and destroy all the greenery in them.
11. More attention ought to be paid to ecology.
12. We are actually ruining our own habitat.
13. It will be very difficult to balance the environment now.
14. Technical progress has greatly affected nature.
15. The big cities of today are not faced with any important problems such as traffic and so on.
16. A catastrophe is inevitable and there's no solution to the problem.

10. Sum up discussion. Use the following phrases:

Summing it up… On the whole…

Summarizing the discussion I`d like to say that…

Model: The garbage of economy is a serious threat to our environment.

Summing it up I`d like to say that the garbage of economy is a serious threat to our environment.

1. Pollution has grown into an urgent problem.
2. Nature is being seriously damaged by civilization.
3. Immediate measures must be taken to change the grave situation.
4. Politicians and scientists must realize full well dangers we are faced with.
5. The consequences of this violation of nature are hard to foretell.
6. Measures must be taken to save the plankton of oceans.
7. The problem of man and biosphere is very acute.
8. Radioactive fallout must be strictly controlled.
9. Computers must be of much help in solving the problem.
10. Technology will help man to get out of this critical situation.

11. Comment upon the following problems.

1. Modern technology and its impact upon nature.
2. The resources man has been using for centuries are not inexhaustible and there is an urgent need for an efficient research into our environment.
3. How do you picture the development of science in ten years' time

12. Dispute the problems given below. The group can be divided into two opposing parties, each advocating their viewpoint.

Use the following phrases:

It must be admitted that…

My point is that…

It seems reasonable to assume…

1. There can hardly be any solution to the problem raised in the text. A catastrophe is inevitable.
2. Big cities are now becoming self-defeating for their growth entails numerous insoluble problems. They ought not to be developed, renewed or replanned.
3. Nature is being destroyed by growing civilization. We can hardly stop or prevent it.

13. Read and translate the text 3.

Text 3. THE QUALITY OF ENVIRONMENT

emissions – выбросы в атмосферу
pollutants– загрязняющие примеси
automobile exhausts – автомобильные выхлопные газы
to expose to air pollution – подвергаться воздействию воздушного загрязнения
portable water – питьевая вода
water pipe network – городской водопровод
ferrous metallurgy – черная металлургия
mechanical engineering industry – машиностроение
non-ferrous metallurgy – цветная металлургия
eroded soil–эродированная почва
degrading land– приходящая в упадок почва
coniferous forest – хвойный лес

Poisonous atmospheric emissions by Russia's industry were close to 32 m tons in 1991. Russia's European part accounts for nearly 65% of the country's industrial air pollution. Automobile exhausts in Russian cities contaminated the air with anoth-er 21 m tons of pollutants in 1990. Some 50 m people in Russia were breathing air with harmful content amounting to 10 MAC; over 60 m were exposed to air pollution of between 5 and 10 MAC. (Maximum admissible concentration).

In 1991 the water run-off of some southern rivers was decreasing at a progres-sive rate, as a result of human economic activity. A lot of Russia's small rivers, most badly affected by human activity throughout the last 10 or 15 years, were deteriorat-ing rapidly. The quality of portable water in Russia is far from satisfactory. About a quarter of

municipal water pipe networks and one- third of industrial ones carry water which was not properly purified. The most common water surface pollutants include petroleum products, phenols, organic matter, copper and zinc compounds, etc. Surface water is heavily polluted by ferrous and non-ferrous metallurgy, the coal, oil, 25gas, chemical and petrochemical industries, farms, municipal drainage, etc. chemicals arc washed in large quantities into rivers and lakes from adjacent areas. Livestock farms, pastries and sown land are responsible for high content of biological and organic matters in water.

The ozone content in the atmosphere has been decreasing lately in high and medium latitudes of the Northern Hemisphere. The ozone layer depletion is especially fast (10% in ten years) in the lower stratosphere, that is, at altitudes between 15 and 20 kilometers.

Many small and detached fields were overgrown with woods and shrubs. Soils on large areas were eroded, flooded or turned into marsh. Arid lands are degrading everywhere in Russia, giving way to deserts. Soils contaminated with heavy metallic isotopes, oil products and other toxic substances lay in rings dozen of kilometers wide around big cities and centers of metallurgical, chemical petrochemical and me-chanical engineering production.

The national timber wealth in standing trees totals 81.6 bn cubic meters. Over the past 20 years, timber cutting and forest fires reduced the country's reserve of ripe wood in coniferous forests by 8 bn cu m, including by 3 bn cu m over the past 5 years.

14. Read and translate the following international words:

Atmospheric, industry, automobile, progressive, economic, human, activity, satisfactory, industrial, portable, products, phenols, zinc , metallurgy, chemical, ozone, biological, organic, stratosphere, eroded, isotope, toxic, petrochemical, production, reserve, substance.

15. Practise the pronunciation of the following words:

Exhausts, content, admissible, throughout, deteriorating, purify, water surface, quantify, adjacent, decrease, latitude, altitude, flooded, dessert, wealth, timber, reduce, ripe, coniferous, include.

16. Sum up a discussion. Use the following phrases:

Summing it up… On the whole…

Summarizing the discussion. I'll like to say that…

Model: *The garbage of the economy is a serious threat to our environment. Summing it up I'd like to say that the garbage of economy is a serious threat to our environment.*

1. The atmosphere, rivers, lakes and underground stores hold less than 1% of all fresh water and this tiny amount has to provide the fresh water needed to support the Earth population.
2. Fresh water is a precious resource and the increasing pollution of our rivers and lakes is a cause for alarm.
3. Industry often uses water for cooling processes sometimes discharging large quantities of warm water back into river.
4. Raising the temperature of the water lowers the level of dissolved oxygen and upsets the balance of life in the water.
5. Contaminants in the soil can adversely impact the health of animals and hu-mans.
6. Everywhere in the world where people change a natural ecosystem into agriculture, the land degrades.
7. Soil can degrade without actually eroding. It can lose its nutrients and soil biota.
8. Probably one of the most dangerous disasters that can be averted to a great extent is a forest fire.
9. When out of control, forest can cause extensive damage not only the forest cover, but also to human life and the environment.

17. Agree or disagree with the following statements given below.
1. Nature means simply what is around us.
2. We never know the world of water till the well is dry.
3. There are no passengers on Spaceship Earth. We are all crew.
4. We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong we may begin to use it with love and respect.
5. There is enough oxygen in the water and in the atmosphere.
6. Rivers are not polluted, because factories don't produce a lot of waste and don't pour it into rivers.
7. Economic advance is not the same thing as human progress.
8. Take care of the earth and she will take care of you.
9. The ozone layer in the atmosphere protects us from dangerous radiation.
10. Understanding of laws of nature does not mean that we are immune to their operations.
11. The universe is not required to be in perfect harmony with human ambition.
12. Man is a complex being: he makes deserts bloom and lakes die.
13. In its broadest ecological context, economic development is the development of more intensive ways of exploiting the natural environment. Give the examples.
14. The system of nature of which man is a part tends to be self-balancing, self-adjusting, self-cleaning. Not so with technology.

18. Comment upon the following problems.

1. In efficiency of timber use Russia lags far behind other countries.
2. Over 80% of timber in Russia is logged in clear cutting.
3. Fortunately there are many ways to reduce erosion.

19. Fill in the blanks with the following words and word-combinations and translate the text 3.

Careful, to say nothing of, in addition, oil, urbanization, to result in, according to, growth of industry, contamination, crude oil, harmful, laundry, poisonous waterways, due to, catastrophe, substances, discharging, depredations, tons.

There are many causes of water pollution which may be classified into four main categories

1. pollution from chemicals, 2. pollution from solids, 3. pollution from radio-active wastes, 4. pollution from living matter.

Text 3. WATER POLLUTION

immense urbanization – колоссальный рост городов.
contamination of water from fertilizers – загрязнение воды удобрениями.
tons of detergents – моющие средства.
crude oil – неочищенная сырая нефть.
refuse – отходы.
to make worse – ухудшать.
to bring about degradation – приводить к деградации.
heavy expenditures - значительные расходы.
mass campaign – массовая компания.
sad statistics – неутешительные данные статистики

The first two causes are perhaps more dangerous than the others due to the tremendous ____and the immense____ in large cities. Pollution from chemicals and solids includes _____of water from fertilizes and pesticides, acids, alkalis, mercury and cadmium (i.e. from heavy metals) which are widely used in industry_____ detergents from washing _____are also dumped into the water. The above-mentioned _____ are extremely _____ for the living matter and once found in water in large quantities they kill everything and turn our rivers into _____. A remarkable illustration of such pollution is the Thames in England and the Rhine in Europe - up until recently there was no fish in these two rivers.

The banks of these rivers and many others represent a sad picture of cans, plastic containers, paper and refuse. Furthermore man not only pollutes water in the rivers and

lakes, but he also pollutes seas and oceans as well. Let us take for example oil from _____tankers and supertankers. As we know each supertanker is capable of carrying hundreds upon thousands of _____. Sea water is used to clean the tankers after _____ and to make things still worse almost every year _____sad statistics there occurs at least one shipwreck in the sea _____bad weather conditions, faulty navigation aids, grounding, etc. This _____ tremendous contamination of sea and the sea shore too. One of the vivid examples of such a disaster was the wreckage of the supertanker TORREY CANYON in the English Channel. Not only the sea but the beautiful beaches in England and in France were covered with oil.

This ____ brought about huge losses of sea birds and animals _____ the heavy expenditures by the French and British governments in a mass clean-up campaign.

We should remember that we are all passengers aboard the ship "Earth". We must be more _____ and must do everything to protect our beautiful planet from the_____ of man, i.e. ourselves.

20. Read and translate the following international words:

Urbanization, classify, chemicals, radioactive, pesticides, mercury, cadmium, ocean, heavy metals, contamination, illustration, result, substances, tons, supertanker, passengers, protect, campaign.

21. Practise the pronunciation of the following words:

Cause, dangerous, tremendous, immense, fertilizer, detergent, above-mentioned, dump, quantity, turn into, discharging, remarkable, poisonous, occur, due to, shipwreck, refuse, wreckage, faulty, furthermore, laundry, according to, loss, worse, beautiful.

22. Read the text and give English equivalents to the following Russian words and word-combinations:

Бурный промышленный рост, в соответствии с, разделить на, бытовые отходы, широко применяться, в больших количествах, превратить в, до недавнего времени, загрязнить моря и океаны, происходить, приводить к, вызывать, колоссальный рост городов, тонны моющих средств, сырая нефть, отходы, загрязнение воды, значительные расходы правительств, ухудшать, гибель морских птиц и животных, неутешительные данные статистики, массовая компания.

23. Agree or disagree with the statements given below. Use the following phrases:

That's right
I don't think so
Exactly

You're wrong there
I fully agree with you
Just the reverse

1. The causes of water pollution may be classified into two main categories pollution from solids and pollution from living matter.
2. Pollution from chemicals is unknown to large cities inhabitants.
3. Chemicals and solids contaminate water.
4. Fertilizers and pesticides are seldom used in industry.
5. The above-mentioned substances including acids, mercury and cadmium kill everything.
6. The Thames in England and the Rhine in Europe bound in fish.
7. Sea water is never used to clean the tankers after discharging.
8. The shipwrecks occur due to bad weather conditions, faulty navigation aids.
9. Sea catastrophes do not cause tremendous contamination of sea and the sea shore
10. The supertanker Torrey Canyon catastrophe brought about losses of sea birds and animals.
11. Water pollution doesn't affect people's health.
12. We do everything to protect our planet.

24. Sum up a discussion. Use the following phrases:

Summing it up…
On the whole …
Summarizing the discussion…
I'd like to say that…

1. Powerful purifying systems are urgently needed in Russia.
2. Water contamination has grown into a serious problem.
3. Oil transporters should meet the ecological safety requirements.
4. Water pollution is inevitable in big cities.
5. Contamination from chemicals could hardly be avoided today.
6. The problem of biosphere is very acute.
7. Ecological education of individuals and preventive measures can do more than penalties of the violators.
8. Cars make the human life dependable, thus aggravating the hard ecological situation in small and big cities.
9. Water transport is harmful for sea nature.

25. Comment upon the following problems:

1. Nature is threatened by technological progress.

2. Human mankind acidified lakes and streams and they can't support fish, wildlife, plants or insects.
3. Acid rain is killing forests.
4. Water contamination could lead to shortage of safe drinking water.
5. Civilization has upset nature's sensitive equilibrium polluting rivers and oceans with industrial wastes.
6. Computers project that between now and the year 2030 sea levels would rise by several metres, flooding coastal area and ruining vast tracts of farmland.

26. Dispute the problems given below. The group can be divided into two opposing parties, each advocating their viewpoint. Use the following phrases:

It must be admitted that …
My point is that…
It seems reasonable to assume…

1. We are obliged to remove factories and plants from cities, redesign and modify purifying systems for cleaning and trapping harmful substances.
2. We must review our wasteful, careless ways of life, we must consume less, recycle more, conserve wildlife and nature.
3. We should act according to the dictum «think locally, think globally, act locally».
4. We are obliged to protect and increase the greenery.
5. 159 countries – members of the UNO hold conferences and set up environmental research centres.
6. The 5th of June is proclaimed the World Environmental Day by the UNO and is celebrated every year.

Unit 3
MASS MEDIA AND THEIR ROLE IN CONTEMPORARY SOCIETY

1. Read and translate the following international words:

Politics, communication, process, individual, group, term, technical, type, publication, classify, electronically, function, specific, totalitarian, democratic, electorate, idea, contrast, rehabilitation, paralyze, focus, idealize.

2. Practise the pronunciation of the following words:

Lament, among, citizen, government, heterogeneous, disperse, audience, circulation, relative, population, through, target, entertainment, interpreting, influence, agenda, socialize, moreover, official, accountable, dual, capability, view, although, prominent, particularly, doggedly, resignation, award-winning, severely, wounded.

3. Read the text and give English equivalents to the following Russian words and word combinations:

Обычная жалоба, не ладят, для того, чтобы жить мирно, передача информации, от одного человека, разнородная аудитория, живущая в разных местах, основные примеры, тиражи, обычно, средства вещания, для целевого общения, СМИ, зарабатывать деньги, главным образом, развлекательные мероприятия, влияние на общественное мнение, формировать план работы, знакомить граждан с политической жизнью, способствовать, ответственный за свои действия, заметный, кинофильмы, наиболее сильные политические идеи, с упорством разоблачали, перенес болезненную реабилитацию, превратился.

4. Read and translate the text:

Text 1. PEOPLE, GOVERNMENT AND COMMUNICATIONS

lament - жалоба
to get along – ладить, жить мирно
heterogeneous – разнородный, различный
disperse – рассеиваться
technical device – техническое устройство, прибор
circulation —тираж
relative to – относительно, касательно
broadcast media – средства вещания
targeted - целенаправленный
entertainment – развлекательное мероприятие
agenda – повестка дня, план действий
promoting – способствующий
to be responsible to – ответственный за что-либо
moreover –более того
electorate - избиратели
accountable for – ответственный, подотчетный
voter – голосующий, избиратель
capability - способность
reflect – отражать
shape - формировать
prominent - заметный
motion pictures – кинофильм
convey – нести, содержать (информацию)
doggedly – упрямо, упорно

expose - разоблачать
resignation – уход в отставку
paramilitary - военизированный
seamy – зд. грязный

«We never *talk* anymore» is a common lament among people who are living together but not getting along very well. In politics, too, citizens and their government need to communicate in order to get along well. **Communication** is the process of transmitting information from one individual or group to another. Mass **communication** is the process by which individuals or groups transmit information to large, heterogeneous, and widely dispersed audiences. The term **mass media** refers to the technical devices employed in mass communication. The mass media are commonly divided into two types:

1. Print media communicate information through the publication of written words and pictures. Prime examples of print media are daily newspapers and popular magazines. Because books seldom have very large circulations relative to the population, they are not typically classified as a mass medium.

2. Broadcast media communicate information electronically through sounds or sights. Prime examples of broadcast media are radio and television. Although the telephone also transmits sounds, it is usually used for more targeted communications and so is not typically included within the mass media.

The mass media are in business to make money, which they do mainly by selling advertising through their major function, entertainment. We are more interested in the five specific functions the mass media serve the political system: *reporting* the news, *interpreting* the news, *influencing* citizens' opinions, *setting* the *agenda* for government action, and *socializing* citizens about politics.

Our special focus is on the role of the mass media in promoting communication from a government to its citizens *and* from citizens to their government. In totalitarian governments, information flows more freely in one direction (from government to people) than in the other. In democratic governments, information must flow freely in both directions; a democratic government can be responsible to public opinion only if its citizens can make their opinions known. Moreover, the electorate can hold government officials accountable for their actions only if voters know what their government has done, is doing, and plans to do. Because the mass media provide the major channels for this two-way flow of information, they have dual capability of reflecting and shaping our political views.

Although this text concentrates on political uses of the four most prominent mass media - newspapers, magazines, radio, and television - you should understand that political content can also be transmitted through other mass media, such as recording and

motion pictures. Rock actors like Peter Gabriel and U2 often express political ideas in their music.

And motion pictures often convey particularly intense political messages. In the 1976 film All the President's Men, Dustin Hoffman and Robert Redford played Carl Bernstein and Bob Woodward, the two Washington Post reporters who doggedly exposed the Watergate scandal in a series of articles that led to President Richard Nixon's resignation in 1974. This motion picture dramatized a seamy side of political life that contrasted sharply with an idealized view of the presidency. In his series of "Rambo" films Sylvester Stallone played a paramilitary superhero that solved difficult international problems through combat. In contrast, the award-winning Born on the Fourth of July starred Tom Cruise in the real-life story of Ron Kovic, who enlisted in the marines and was severely wounded in Vietnam. Paralyzed from the waist down, he underwent painful rehabilitation and turned into an antiwar-activist. This film presents a very different view of fighting.

5. Answer the questions:

1. What is the difference between 'communication' and 'mass communication?'
2. What types are the mass media divided into?
3. What are the mass media main functions?
4. What conveys particularly intense political messages?

6. Choose the right variant:

2.1. Communication is

a) speaking on the telephone
b) the transmitting information from one to another object
c) individuals transmit information to large audience
d) a device for transmitting information

2.2. The mass media are commonly divided into ..... types.

a) three
b) five
c)four
d) two

2.3. Which doesn't refer to the print media?

a) books
b) magazines
c)newspapers
d) posters

2.4. Telephone isn't typically included within the mass media because

a) the quality of the sound is bad

b) radio and television are more interesting for audiences
c) it doesn't transmit information through sounds or sights
d) it is commonly used for more specific communications

2.5. The mass media make money by

a) selling valuable information
b) interpreting the news
c) selling advertising through entertainment
d) reporting the news

2.6. Mass media reflect and shape our political views because

a) they are responsible to public opinion
b) they provide the major channels for two-way flow
c) they report topical news
d) they concentrate on political issues

7. Read and translate the text:

Text 2. THE MASS MEDIA

The mass media transmit information to large, heterogeneous, and widely dispersed audiences through print and broadcasts. The main function of the mass media is entertainment, but the media also perform the political functions of reporting news, interpreting news, influencing citizens' opinions, setting the political agenda, and socializing citizens about politics.

The mass media in many countries are privately owned and in business to make money, which they do mainly by selling space or air time to advertisers. Both print and electronic media determine which events are newsworthy, a determination made on the basis of audience appeal. The rise of mass-circulation newspapers in the 1830s produced a politically independent press in the United States and Europe. In their aggressive competition for readers, those newspapers often engaged in sensational reporting, a charge sometimes leveled at today's media.

The broadcast media operate under technical, ownership, and content regulations set by the government, which tend to promote the equal treatment of political contests on radio and television more than in newspapers and news magazines.

The major media maintain staffs of professional journalists in major cities across the world. All professional journalists recognize rules for citing sources that guide their reporting. What actually gets reported in the media depends on the media's gatekeepers, the publishers and editors.

Although more people today get more news from television than newspapers, newspapers usually do a more thorough job of informing the public about politics. De-

spite heavy exposure to news in the print and electronic media, the ability of most people to retain much political information is shockingly low-and less than it was in the mid-1960s. It appears that the problem is not with the media's inability to supply quality news coverage, but the lack of demand for it by the public.The role of the news media may be more important for affecting interactions among attentive policy elites than in influencing public opinion.

The media's elite including reporters from the major television networks tend to be more liberal than the public.

From the standpoint of majoritarian democracy, one of the most important effects of the media is to facilitate communications from the people to the government through the reporting of public opinion polls. The media zealously defend the freedom of the press, even to the point of encouraging disorder through criticism of the government and the granting of extensive publicity to violent protests, terrorist acts, and other threats to order.

8. Develop the following ideas:

1. The message of an article or a TV programme is more important than the form.
2. The media zealously defend the freedom of the press.
3. The media's elite tend to be more liberal than the public.
4. To facilitate communications from the people to the government is one of the most important effects of the media in democratic countries.

9. Additional questions:

1.What electronic media are of importance nowadays?
2. What helps newspaper publishers to win the competition for readers?

10. Read and translate the text:

Text 3. THE INTERNET

The Internet is a magnificent global network with millions and millions of computers and people connected to one another where each day people worldwide exchange an immeasurable amount of information, electronic mail, news, resources and, more important, ideas.

It has grown at a surprising rate. Almost everyone has heard about it and an increasing number of people use it regularly. The current estimate is that over 70 million people are connected, in some way, to the Internet — whether they know it or not.

With a few touches at a keyboard a person can get access to materials in almost everywhere. One can have access to full-text newspapers, magazines, journals, refer-

ence works, and even books. The Web is one of the best resources for up-to-date information. It is a hypertext-based system by which you can navigate through the Internet. Hypertext is the text that contains links to other documents. A special program known as «browser» can help you find news, pictures, virtual museums, electronic magazines, etc. and print Web pages. You can also click on keywords or buttons that take you to other pages or other Web sites. This is possible because browsers understand hypertext markup language or code, a set of comands to indicate how a Web page is formatted and displayed.

Internet Video conferencing programs enable users to talk to and see each other, exchange textual and graphical information, and collaborate.

Internet TV sets allow you to surf the Web and have e-mail while you are watching TV, or vice versa. Imagine - watching a film on TV and simultaneously accessing a Web site where you get information on the actors of the film. The next generation of Internet-enabled televisions will incorporate a smart-card for home shopping, banking and other interactive services. Internet-enabled TV means a TV set used as an Internet device.

The Internet is a good example of a wide area network (WAN). For longdistance or worldwide communications, computers are usually connected into a wide area network to form a single integrated network. Networks can be linked together by telephone lines or fibre-optic cables. Modern telecommunication systems use fibreoptic cables because they offer considerable advantages. The cables require little physical space, they are safe as they don't carry electricity, and they avoid electromagnetic interference.

Networks on different continents can also be connected via satellites. Computers are connected by means of a modem to ordinary telephone lines or fibre-optic cables, which are linked to a dish aerial. Communication satellites receive and send signals on a transcontinental scale.

11. Answer the questions:

1. What is the Internet? 2. How many people are connected to the Internet today? 3. What is Hypertext? 4. What are computers usually connected into? 5. What advantagers do fibre-optic cables offer?

12. Read and translate the text:

Text 4. A “FREE PRESS” MUST MEAN JUST THAT

(by Adriana Lopez)

waffle – *ам. жарг*. болтать, пустословить
toll - потери
misdeed- преступление, злодеяние

trafficking - торговля
volatile – непостоянный, нестабильный
flawed – порочный, с изъяном
ambiguity – неясность, двусмысленность
loophole - лазейка
guerrilla – партизанский
withdraw – отзывать
take for granted –считать (что-либо) доказанным/ не требующим доказательства, само собой разумеющимся.

We take freedom of speech for granted in the United States, but in the rest of the hemisphere it is the exception, not the rule. The Organization of American States met to discuss this issue and, for a while, it looked as if the United States was waffling.

A draft of the Inter-American Declaration on Freedom of Expression stated that the OAS is «convinced that the unlawful restrictions on the exercise of freedom of expression not only violate individual human rights but threaten democratic society itself». But it also said that «freedom of expression may be subject to certain restrictions established under domestic law and international obligations».

That loophole could have licensed Latin American countries to ban – and punish – members of the press.

Journalists in Latin America already face enough threats. In the last decade the death toll has reached nearly 200. Thousands of journalists are being severely punished for exposing the misdeeds of their countries' powerful people. Attacks come as a direct result of their work. Reporters are subjected to harassment, kidnapping, torture, imprisonment and murder.

Gustavo Gorriti, a Peruvian journalist and recipient of the 1998 International Press Freedom Award of the Committee to Protect Journalists, has been continually harassed by the Peruvian and Panamanian governments. Gorriti has said that any journalist in Latin America who engages in serious, substantive reporting «will almost certainly face certain forms of harassment. You are literally taking your life in your hands».

Latin America's rocky road from dictatorship to democracy – with drug trafficking, government corruption, left-wing guerrilla groups and paramilitary organizations all putting up obstacles – has made journalism one of the most dangerous careers in this volatile region. Peruvian novelist and one time presidential candidate Mario Vargas Llosa once noted that «a fully free press won't be secure until democratic values and a rule of law are more firmly embedded».

Fortunately, Victor Marrero, U.S. ambassador to OAS, withdrew the flawed draft late last month, citing «ambiguities which should be clarified». He requested that the draft return to a working group for further revision before being voted on. This belated

move at least puts the United States on the right track. The U.S. government should not back any kind of press restriction, and Latin America should not have to deal with double standards when it comes to freedom.

13. Questions for discussion:

1. Is freedom of speech taken for granted in your country?
2. Are journalists in your country subjected to any forms of harassment? If yes, why?
3. Freedom of expression may be subject to certain restrictions. Do you agree with this statement?

Unit 4
SCIENCE AND SOCIETY IN THE USA

1. Read and translate the text. Comment on the statement: «Science is a powerful engine by which the genius of the few is magnified by the talents of the many for the benefits of all».

entitlement – зд. установленная норма (панацея)
maintain – сохранять
generate – порождать
outright – полный
frustratingly – потрясающе, слишком уж
volatility – смена, перемена
commitment – обязательство (зд. вклад)
vistas – перспективы
embark – начинать (дело), *зд*. основываться
superstring – суперсерия или суперряд
give an account – объяснять, описывать
resolution – *зд*. расширение
underpinning – *зд*. свидетельство, пример
forestall – предвосхищать
poise – *зд*. склоняться (балансировать)
pinnacle – *зд*. кульминация

Science on the scale that it exists and is needed today can, however, be maintained only with large amounts of public support. Large-scale public support will be provided only if science and technology are meeting the critical needs of society. Intellectual progress, as measured by advances in specific public disciplines, is not in itself sufficient to

generate such support. Perhaps it should be, but it is not. Public support for science may be wise policy, but is not an entitlement.

The central problem is that the costs of meeting the needs of society are too high, and the time scale for meeting them is too long. Both the ideals and the pragmatics of American society are based on improvement in the quality of life. We expect better health care, better education, and economic security. We expect progress towards the reduction, if not outright elimination of poverty, disease, and the environmental degradation.

Progress towards these goals has recently been frustratingly slow and increasingly expensive. The heavy costs of providing and improving health care and education are examples.

The situation has produced a volatility in public opinion and mood that reflects a lack of confidence in the ability of government and other sectors of society, including science and technology, to adequately address fundamental social needs.

If this mood hardens into a lack of vision, of optimism, of belief in the future, a tremendous problem for science will result. Science, in its commitment to innovation and expanding frontiers of knowledge, is a thing of the future.

The vistas of science are inspiring. Condensed matter physics is embarked on materials by design, nanotechnology and high temperature superconductivity, each containing the seeds of new industries as well as new scientific understanding. Molecular biology is in full bloom with a vast potential for further intellectual progress, betterment of human (and plant and animal) health, and commercialization. Neuroscience seems poised for dramatic progress.

Research into the fundamental laws of physics is aiming at a pinnacle. There is a candidate theory - the superstring theory – which is proposed as a unification of all the known fundamental forces in nature and which is supposed to give an account, complete in principle, of all physical phenomena, down to the shortest distances currently imaginable. At the largest scales of distance, observational astronomy is uncovering meta-structures which enlarge the architecture of the universe a deepening of the problem of cosmology preliminary to its resolution.

Underpinning much of this progress, and progress in countless other areas as well has been the emergence of scientific computing as an enabling technology.

All this is first-rate science. All this is not enough – either to forestall change or to ensure adequate support for science in the present climate. Why it is not enough – and what else is required – are the subjects of a special inquiry.

2. Discussion.

1. Are there statements in the text that you disagree with? What are they?
2. Are you aware of the latest achievements in your field of science? What are they?

3. Do you think the achievements of science are not sufficient to ensure adequate support for science?
4. If you were in power what would you do to support science in Russia?

PART 2. ESPECIAL FIELD OF SCIENCE AND RESEARCH

Unit 5
WATER

1. Read and translate the text, give the title.

Text 1.

Of the 326 million cubic miles of water on Earth, only about 3% of it is fresh water; and 3/4 of that is frozen. Only 1/2 of 1% of all water is underground; about 1/50th of 1% of all water is found in lakes and streams. The average human is about 70% water. You can only survive 5 or fewer days without water. Water is generally classified into two groups: Surface Water and Ground Water. Surface water is water found in a river, lake or other surface impoundment. This water is usually not very high in mineral content, and many times is called "soft water" even though it usually is not. Surface water is exposed to many different contaminants, such as animal wastes, pesticides, insecticides, industrial wastes, algae and many other organic materials. Even surface water found in a pristine mountain stream possibly contains Giardia or Coliform Bacteria from the feces of wild animals, and should be boiled or disinfected by some means prior to drinking. Ground Water is that which is trapped beneath the ground.

Rain that soaks into the ground, rivers that disappear beneath the earth, melting snow are but a few of the sources that recharge the supply of underground water. Because of the many sources of recharge, ground water may contain any or all of the contaminants found in surface water as well as the dissolved minerals it picks up during its long stay underground. Waters that contain dissolved minerals, such as calcium and magnesium above certain levels are considered "hard water". Because water is considered a "solvent", over time it can break down the ionic bonds that hold most substances together, it tends to dissolve and 'gather up' small amounts of whatever it comes in contact with. For instance, in areas of the world where rock such as limestone, gypsum, fluorspar, magnetite, pyrite and magnesite are common, well water is usually very high in calcium content, and therefore considered "hard".

Water pollution is the contamination of natural water bodies by chemical, physical, radioactive, or pathogenic microbial substances. Adverse alteration of

water quality presently produces large scale illness and deaths, accounting for approximately 50 million deaths per year worldwide, most of these deaths occurring in Africa and Asia. In China, for example, about 75 percent of the population (or 1.1 billion people) are without access to unpolluted drinking water, according to China's own standards.

Widespread consequences of water pollution upon ecosystems include species mortality, biodiversity reduction and loss of ecosystem services. Some consider that water pollution may occur from natural causes such as sedimentation from severe rainfall events; however, natural causes, including volcanic eruptions and algae blooms from natural causes constitute a minute amount of the instances of world water pollution. The most problematic of water pollutants are microbes that induce disease, since their sources may be construed as natural, but a preponderance of these instances result from human intervention in the environment or human overpopulation phenomena.

2. Translate into English.

1. В природе воды бывает двух типов – поверхностная и грунтовая. 2. Поверхностные воды содержат минеральные вещества, и загрязнены экскрементами животных, пестицидами, простоками, водорослями и другими органическими загрязнениями. 3. Перед употреблением в пищу, поверхностные воды необходимо прокипятить и продезинфицировать. 4. Грунтовые воды могут быть загрязнены теми же загрязнениями, которые содержатся в поверхностных водах, а также различными минералами примесями из грунта. 5. Вода называется жесткой при высоком содержании кальция и магния.

3. Make sentences.

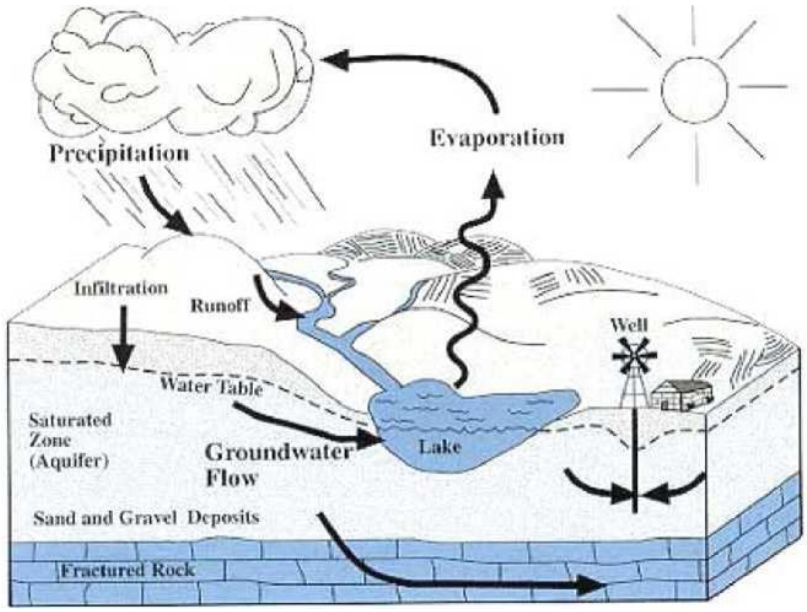
WATER QUALITY

The complexity of water quality as a subject is reflected in many types of measurements of water and wastewater quality. These measurements include:

Water quality target	Definition
1. Conductivity	a. amount of oxygen that would be consumed if all the organics in one liter of water were oxidized by bacteria.
2. Dissolved Oxygen (DO)	b. determined by the measurement of optical density (absorptivity) on a spectrophotometer of various wavelengths of the passing light.
3. pH	c. a major light-absorbing substance, responsible for much of the color in water bodies.
4. Color of water	d. a measure of the ability of water to pass an electrical current.

5. Turbidity	e. particles that are larger than 2 microns found in the water column.
6. Total suspended solids (TSS)	f. the concentration of oxygen dissolved in water, expressed in mg/l.
7. Chemical oxygen demand (COD)	g. a measure of the molar concentration of hydrogen ions in the water
8. Biochemical oxygen demand (BOD)	h. the most common microbiological contaminants of natural waters, live in the digestive tracks of warmblooded animals, including humans, and are excreted in the feces.
9. Fecal coliform bacteria	i. measure of water clarity how much the material suspended in water decreases the passage of light through the water
10. Dissolved organics	j. the amount of oxygen which is needed for the oxidation of all organic substances in water in mg/l or g/m3.

4. Describe the scheme in English:



5. Read and find the appropriate words in English. Remember the tense and endings of the verbs.

WATER PURIFICATION METHODS

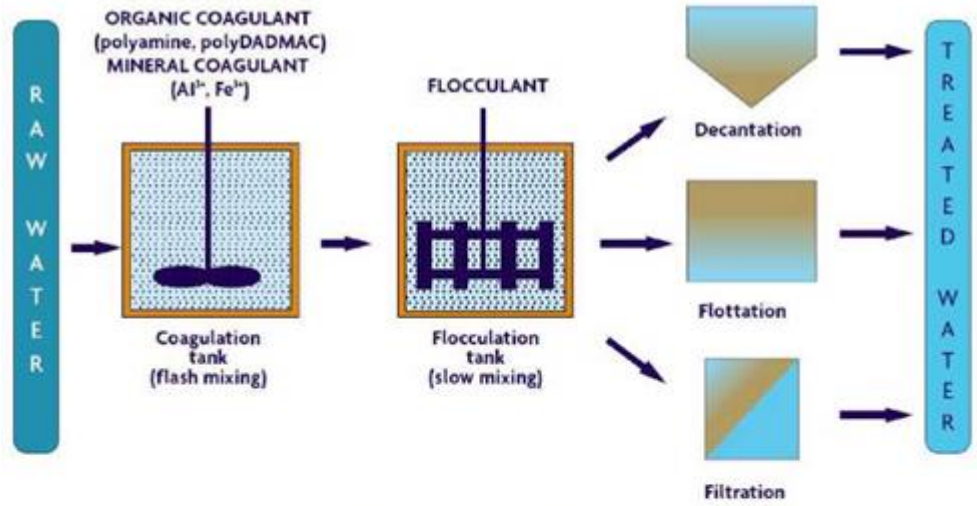
Coagulation and flocculation	
Natural and ***сточные воды*** containing small particulates. They are ***во взвешенном состоянии*** in water forming a ***коллоиды***. These particles carry the same ***заряд***, and ***препятствовать отталкиванию*** them from combining into larger	attract or trap, suspended, repulsion prevents, to settle,

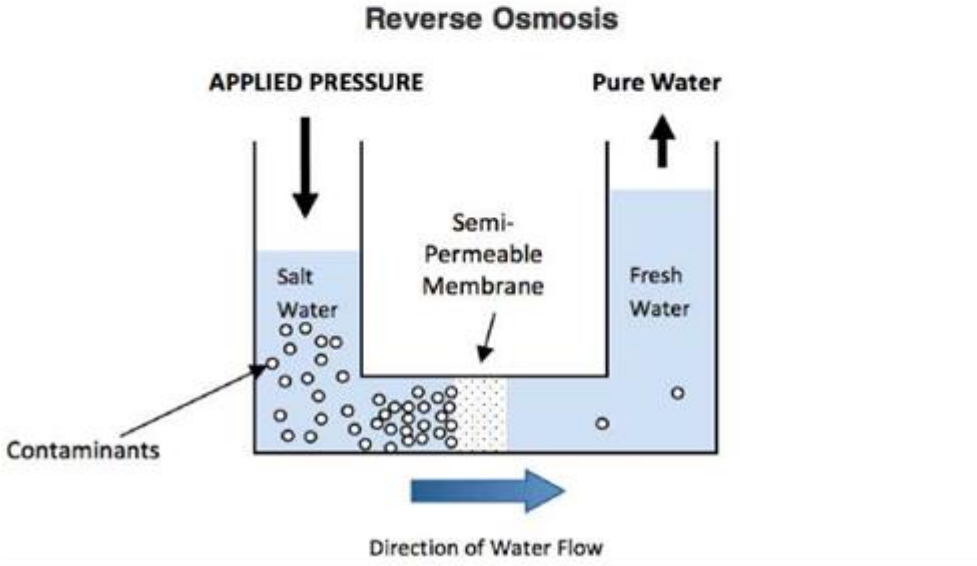
particulates ***осаждаться***. Thus, some chemical and physical techniques are applied to help them settle. The ***феномен*** is known as ***коагуляция***. A well known method is the ***добавление электролита***. Charged particulates combine with ***ионы нейтрализация*** the charges. The ***нейтральные частицы*** combine to form larger particles, and finally settle down. Another method is to use ***материал с большой малекулярной массой*** to ***притягивать*** or ***улавливать*** the particulates and settle down together. Such a process is called ***хлопьеобразование***. Starch and ***многозарядные ионы*** are often used. Historically, dirty water is cleaned by treating with ***алюминий*** and ***известь.*** These electrolytes cause the pH of the water to ***изменяться в связи*** to the following reactions: The slightly basic water causes Al(OH)3, Fe(OH)3 and Fe(OH)2 to ***выпадать в осадок***, bringing the small particulates with them and the water becomes clear. ***Суспензии оксида железа*** particulates and ***гуминовое органическое вещество*** in water gives water the yellow ***грязные оттенок***. Both iron oxide particulates and organic matter can be removed from coagulation and flocculation. The ***описание*** given here is ***простейшее***, and many more techniques have been applied in the treatment of water. Coagulation is a major application of lime in the treatment of wastewater. Other ***соли*** such as iron ***сульфаты*** Fe2(SO4)3 and FeSO4, chromium sulfate Cr2(SO4)3, and some ***специальные полимеры*** are also useful. Other ions such as ***натрий, соли хлора, кальций, магний,*** and ***калий*** also affect the coagulation process.	phenomenon, coagulation, addition of electrolyte, ions neutralizing, neutral particulates, high-molecular-weight material, wastewater, magnesium, flocculation, starch and multiply charged ions, oversimplified, alum, colloid charges, precipitate, suspension of iron oxide, humic organic matter, muddy appearance, description, salts, sulfates special polymers sodium, chloride, calcium, lime, potassium
Clarification and sedimentation	
The term ***осветление***, or ***осаждение***, is normally used to describe the ***осаждение хлопьев*** produced by the coagulation and flocculation process. It works best with ***относительно плотные частицы (ил*** and minerals), while ***флотация*** works better for lighter particles (***водоросли***, color). A ***отстойник*** should be big enough so that it takes a long time to get through. ***Впуск*** and ***выпуск*** are designed so the water moves slowly in the tank. ***Длина*** and ***ширина*** channels are ***установлено*** to let the water to snake its way through the tank. The settled particles, ***шлам***, must occasionally be removed from	inlets, filtered, narrow, sludge, sedimentation, settling of the flocs, silt,algae, settling tank, outlets, long, installed, relatively dense particles, wastewater treat-

the tanks. The water is next ready to be ***фильтровать***. Sedimentation is used in pretreatment and ***очистка сточных вод***.	ment, clarification, flotation.
Filtration	
Filtration is the process of ***удаление твердых частиц*** from a ***жидкость*** by ***пропускание*** it through a ***пористая среда***. ***Крупный, средний***, and ***мелкий*** porous media have been used ***в зависимости от требований***. The ***фильтрующий материал*** are **искусственные мембраны**, ***сетки, песчаные фильтры***, and high technological filter systems. The choice of filters depends on the required filtering ***скорость*** and the ***требования очистки воды***. The flow required for filtration ***может быть достигнут*** using ***сила тяжести or давление***. In pressure filtration, one side of the filter medium is at higher pressure than that of the other so that the filter plane has a pressure drop. The process of removing the ***заиленной*** portion of the filter bed by ***обратный поток*** through the bed and washing out the solid is called back washing. During this process, the solid must be removed out of the system, but otherwise the filters must be ***заменять*** or taken out of service to be cleaned.	replaced, passing, porous medium, coarse, medium, requirement gravity, fine, depending on the requirement, removing solids, fluid, reversing the flow, can be achieved, filter media, artificial membranes, nets, sand filter, speed, cleanness pressure, clogged.
Reverse osmosis	
Обратный осмос is a ***процесс разделения*** which employs pressure to force water through a ***полупроницаемая мембрана*** (a membrane which will only ***допустимая вода*** to pass) that retains the salts on one side and allows the pure water to pass to the other side. The water with the ***солесодержание*** is ***отделаться*** while the purified water is ***собирается*** in a tank. The pore size of the reverse osmosis membrane is 0.0001 ***микрон*** or 0.000 0001 mm, which makes reverse osmosis the finest form of water filtration known to man.	discarded, semi-permeable membrane, separation process, allow water, salt concentration, micron, reverse osmosis.
Ozone treatment	
The ***формирование кислорода*** into ozone ***происходить*** with the use of ***электричество***. This process is ***происходить*** by an ***электрически разряженное поле*** as in the ***генераторы озона CD-типа***. In general, an ***озонирования*** includes ***пропускать через***, clean air through a ***высокое напряжение*** electric discharge, ***коронарный разряд***, which creates and ozone concentration of ***приблизительно*** 1% or 10,000 mg/L	raw water, occurs, electricity, electric discharge field, ozonation system, high voltage, corona discharge, approximately,

The ***неочищенная вода*** is then passed through a ***диффузор*** which creates a ***вакуум*** and pulls the ozone gas into the water or the air is then ***образуются пузыри*** through the water being treated. Since the ozone will react with metals to create insoluble metal oxides, post filtration is required.	passing dry, CD-type ozone generators, venturi throat, vacuum, carried out, bubbled up, formation of oxygen.
UV (Ultra Violet) treatment	
Typical ***дезинфекция ультрафиолетом*** systems involve the ***поток воды*** through a ***емкость*** containing a ***ультрафиолетовая лампа***. As the water passes through this vessel, microorganisms are ***подвергаться*** to intense ultraviolet light energy which ***приводить к изменению*** to ***генетических молекул*** needed for ***воспроизводственная функция***. This damage prevents the microorganism from ***размножение or воспроизводство*** in a human or animal host. Because the microorganism cannot multiply, no infection can occur. Disinfection of water is achieved when UV light causes ***подавление активности микробов***. Ultraviolet (UV) light is electromagnetic radiation traveling in ***длина волны*** in all directions from its ***источник излучения*** (bulb). It is found in the spectral range of light between ***рентгеновские лучи*** and ***видимый свет***; UV light occurs with a wavelength ranging from 200 to 390 nanometers. The most effective wavelength ***частота***, from the point-of-view of microbiological disinfection, is 254 nm as this is where the optimum energy intensity is found.	frequency, flow of water, microbial inactivation, UV lamp, x-rays, exposed, causes damage, genetic molecules, reproductive functions, multiplying, UV disinfection, replicating wavelengths, emitting source, visible light, vessel.
Water chlorination	
Дезинфекция, a chemical process whose objectiveis to control ***болезнетворные микроорганизмы*** by killing or ***дезактивировать*** them, is ***несомненно*** the most important step in drinking water treatment. By far, the most common method of disinfection is ***хлорирование***. Chlorine is added to filtered water to destroy ***вредные микроорганизмы***. An additional amount, known as a ***остаточный хлор*** is ***применяется*** to protect treated water from recontamination as it travels throughout the ***система подачи воды***.	distribution system, disease-causing, inactivating, chlorine residual, disinfection, unquestionably, harmful microorganisms, microorganisms, applied.

5. Describe the scheme in English:





6. Test on your understanding water treatment process:

1. _____ are purification methods which works by using chemicals that effectively "glue" small suspended particles together so that they settle out of the water or stick to sand or other granules in a granular media filter. (2 answers)

a. filtration
b. coagulation
c. disinfection
d. flocculation
e. screening
f. sedimentation

2. The coagulation chemicals are added in a tank (often called _____ or _____), which typically has rotating paddles. (2 answers)

a. flocculation tank\basin
b. rapid mix tank\chamber
c. sedimentation basin\tank

d. filter
e. sludge blanket\thickening tank
f. flash mixer
3. One of the more common coagulants used is_____.
a. Ozon
b. Iron (II) sulfate
c. Activated carbon
d. Aluminum sulphate
e. Fluoride
4. The principle involved is to allow as many particles to contact other particles as possible generating large and robust floc particles. Where does this process happen?
a. sedimentation basin\tank
b. flocculation tank\basin
c. rapid mix chamber\tank
d. clearwell
5. This could be called a clarifier or settling basin\tank.
a. filter
b. flocculation basin\tank
c. sedimentation tank\basin
d. flash mixer
6. It is a large tank with slow flow, allowing floc to settle to the bottom.
a. flocculation basin\tank
b. sedimentation basin\tank
c. mix chamber\tank
d. filter
7. As particles settle to the bottom of the basin a layer of sludge is formed on the floor of the tank. Where does this process happen?
a. sedimentation basin\tank
b. filter
c. clear well
d. flocculation basin\tank
8. Why do use filtration?
a. to remove debris
b. to remove SS
c. to remove taste and odour
d. to soften water hardness

7. Read the text:

Text 2. STAGES IN WATER TREATMENT

There are three principal stages in water purification:

Primary treatment - collecting and screening including pumping from rivers and initial storage;

Secondary treatment - removal of fine solids and the majority of contaminants using filters, coagulation, flocculation and membranes;

Tertiary treatment - polishing, pH adjustment, carbon treatment to remove taste and smells, disinfection, and temporary storage to allow the disinfecting agent to work.

Primary Treatment. Pumping and containment - The majority of water must be pumped from its source or directed into pipes or holding tanks. To avoid adding contaminants to the water, this physical infrastructure must be made from appropriate materials and constructed so that accidental contamination does not occur.

Screening - The first step in purifying surface water is to remove large debris such as sticks, leaves, trash and other large particles which may interfere with subsequent purification steps. Most deep Groundwater does not need screening before other purification steps.

Storage -Water from rivers may also be stored in bankside reservoirs for periods between a few days and many months to allow natural biological purification to take place. This is especially important if treatment is by slow sand filters. Storage reservoirs also provide a buffer against short periods of drought or to allow water supply to be maintained during transitory pollution incidents in the source river.

Pre-conditioning - many waters rich in hardness salts are treated with bsodaash to precipitate calcium carbonate out utilising the common ion effect

Pre-chlorination - in many plants the incoming water was chlorinated to minimise the gowth of fouling organisms on the pipe-work and tanks. Because of the potential adverse quality effects (see Chlorine below), this has largely been discontinued.

Secondary treatment. There is a wide range of techniques that can be used to remove the fine solids, micro-organisms and some dissolved inorganic and organic materials. The choice of method will depend on the quality of the water being treated, the cost of the treatment process and the quality standards expected of the processed water.

• pH adjustment,
• Coagulation and flocculation,
• Sedimentation,
• Filtration,
• Ultrafiltration membranes.

Tertiary treatment. Disinfection is normally the last step in purifying drinking water. Water is disinfected to destroy any pathogens which passed through the filters. Possible pathogens include viruses, bacteria, including Escherichia coli, Campylobacter and Shigella, and protozoans, including G. lamblia and other Cryptosporidia. In most developed countries, public water supplies are required to maintain a residual disinfecting agent throughout the distribution system, in which water may remain for days before reaching the consumer. Following the introduction of any chemical disinfecting agent, the water is usually held in temporary storage - often called a contact tank or clear well to allow the disinfecting action to complete.
1. Chlorine
2. Chlorine dioxide
3. Ozone
4. UV radiation

8. Answer the following question according to the text.
1. What are the principal stages in water purification?
2. What process takes place at the Primary Treatment?
3. What process takes place at the Secondary Treatment?
4. What process takes place at the Tertiary Treatment?

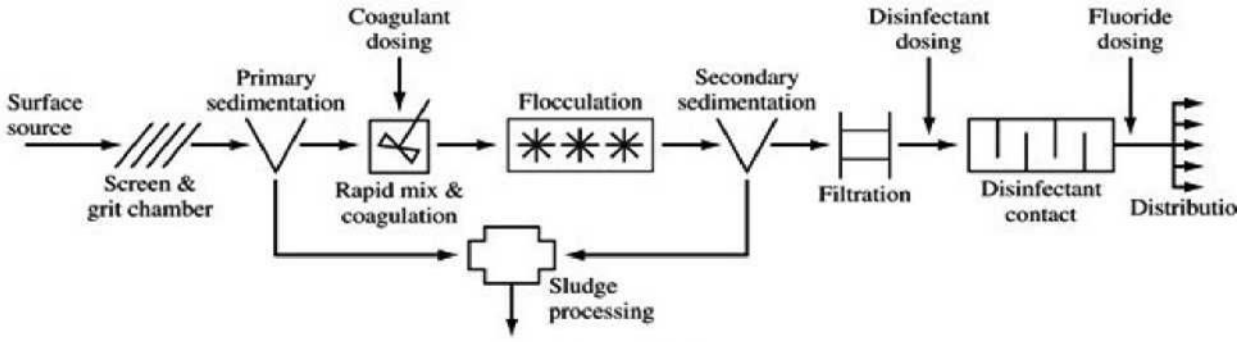
9. Read and find the appropriate words in English.

bar-screen; reservoir; solids; Treatment Works; preliminary chlorine dose; added; adequate disinfection; disinfection process; coagulant; Flash Mixer; 'Clarification Stage'particles; 'dosed water'; retained for; «binding process»; Low Lift Pumping Station; divided, rapid gravity filters; Intakes; mesh rotating screens; chlorine residual; a membrane filtration system; sink; gravitates; covered contact tank; chemicals; High Lift Pumps.

Water leaves the river through *водозабор*. It then passes through a mechanically raked *стержневая решетка* before entering the *насосная станция первого подъема*, where it is strained through fine *механическое барабанное сито* before being pumped to the *резервуар*. Water from the Low Lift Pumping

Station enters the first compartment of the reservoir where 90% of the *твердые вещества* settle to the reservoir floor. Many of the bacteria and viruses die off before the water *спускаться самотеком* to the *водоочистная станция* where a *предварительное хлорирование* dose is *добавляться* to ensure the start of the *процесс обеззараживания*. A *коагулянт* is added at the *смеситель* to bind any small *частицы*. The *вода с дозой коагулянта* is now *задерживаться* a short period to enable the *процесс образования хлопьев* to start before the water passes to the *стадия осветления*. The 'clarified water' is then *разделяться* equally between *скорый безнапорный фильтр*. The filtered water is then passed through a *система мембранных фильтров*. Following filtration the 'filtered water' is further dosed with chlorine to ensure *достаточная дезинфекция*. It remains in contact with a high dose of chlorine for a minimum of six hours in a *контактный резервуар*. The final water is dosed with *реагент* to reduce the *остаточный хлор* to its set point before being pumped by *насосная станция второго подъема*

10. Describe the scheme in English.



Unit 6
WASTEWATER

1. Read the text, give the title.

Text 1.

Sewage is the liquid waste from toilets, baths, showers, kitchens, etc. that is disposed of via sewers. In many areas sewage also includes some liquid waste from industry and commerce.

The waste from toilets is termed foul waste, the waste from items such as basins, baths, and kitchens is termed sullage water, and the industrial and commercial waste is termed trade waste. Much sewage also includes some surface water from roofs or hard-

standing areas. Municipal wastewater therefore includes residential, commercial, and industrial liquid waste discharges, and may include stormwater runoff.

The underground conduit for the collection of sewage is called sewer. A network of sewers and appurtenances for the collection and conveyance of sewage generated from each of the properties to sewage pumping station for pumping to sewage treatment and disposal is called Sewage System.

There are two types of sewerage system:

1. Separate sewerage system
2. Combined sewerage system.

Separate sewerage system. In separate system of sewerage there are two collection systems or pipe network:

1. for collecting domestic sewage as sanitary sewerage system,
2. for collecting storm water as storm water drainage system.

The sanitary sewerage systems for domestic sewage are designed for peak sewage flow expected at ultimate stage at the end design period. The storm water drainage systems are designed to carry the maximum storm runoff expected during the critical duration of rainfall.

The advantages of separate sewerage system are:

1. The capacity of the water treatment plant will be smaller since only domestic sewage alone is to be treated.
2. Operational problems are less.

The disadvantage of separate sewerage system is:

1. Storm water may always find its way into the domestic sewerage system either through wrong house sewer connections or through manholes and overload the sewage treatment plant.

Combined sewerage system. In Combined system of sewerage both sewage discharge and the storm runoff are collected and conveyed through a common collection system. The ratio of the maximum storm runoff to sewage flow works out to be 20 to 30. Hence during non-monsoon period only 1/20th or 1/30th of the design flow, only the sewage flow is passing through the combined system with very small velocity, resulting in clogging of the systems. Combined sewers are, therefore not recommended for Indian conditions since the rainfall occurs for a period of 3 months or less and there are poor water supplies. In India, only separate sewerage systems are adopted.

The advantages of combined sewerage system are:

1. Only one system is provided and therefore there will not be any confusion in giving connection,
2. Less expensive to install the system.

The disadvantage of combined sewerage system is:

1. During non-rainy days the flow will be very meager causing, salivation requiring frequent cleaning.

As rainfall runs over the surface of roofs and the ground, it may pick up various contaminants including soil particles (sediment), heavy metals, organic compounds, animal waste, and oil and grease. Some jurisdictions require stormwater to receive some level of treatment before being discharged to the environment. Examples of treatment processes used for stormwater include sedimentation basins, wetlands, and vortex separators (to remove coarse solids).

The site where the process is conducted is called a sewage treatment plant. The flow scheme of a sewage treatment plant is generally the same for all countries:

Mechanical treatment:

— Influx (Influent)

— Removal of large objects

— Removal of sand and grit

— Pre-precipitation

Biological treatment:

— Oxidation bed (oxidizing bed) or Aerated systems

— Post precipitation

— Effluent

Chemical treatment (this step is usually combined with settling and other processes to remove solids, such as filtration. The combination is referred to physical-chemical treatment).

2. Find the English equivalents to the underlined Russian ones in the text:

a. ***Сточная вода*** is the liquid waste from toilets, baths, showers, kitchens, etc. that is disposed of via ***сточные трубы (коллекторы, канализационные трубы)***.

b. ***Городские сточные воды*** therefore includes ***жилые дома, офисы***, and ***промышленные предприятия*** liquid waste discharges, and may include ***поверхностный сток.***

c. A ***сеть канализационных труб*** conveyance of sewage to sewage ***насосной станции*** for pumping to ***очистные сооружения канализации*** is called ***канализационная система***.

d. In раздельной системе of sewerage are two ***системы отведения стоков*** for collecting domestic sewage as ***система бытовой канализации*** and for collecting storm water as система ***ливневой канализации***.

e. ***Соотношение*** of the maximum ***ливневого стока*** to ***сточным водам*** works out to be 20 to 30.

f. As rainfall runs over the ***поверхность крыш*** and ***земля***, it may pick up various contaminants including ***твердые частицы (минералы), тяжелые металлы, органические соединения, экскременты животных, масла*** and ***жиры***.

g. ***Технологическая схема*** of a ***очистных сооружений канализации*** is generally the same for all countries.

3. Answer the questions:

1. What is the difference is between the following terms: foul waste, sullage water and trade waste?
2. What is the difference is between the following terms: Separate sewerage system and Combined sewerage system?
3. What steps does mechanical (biological and chemical) treatment include?

4. Describe the scheme in English.

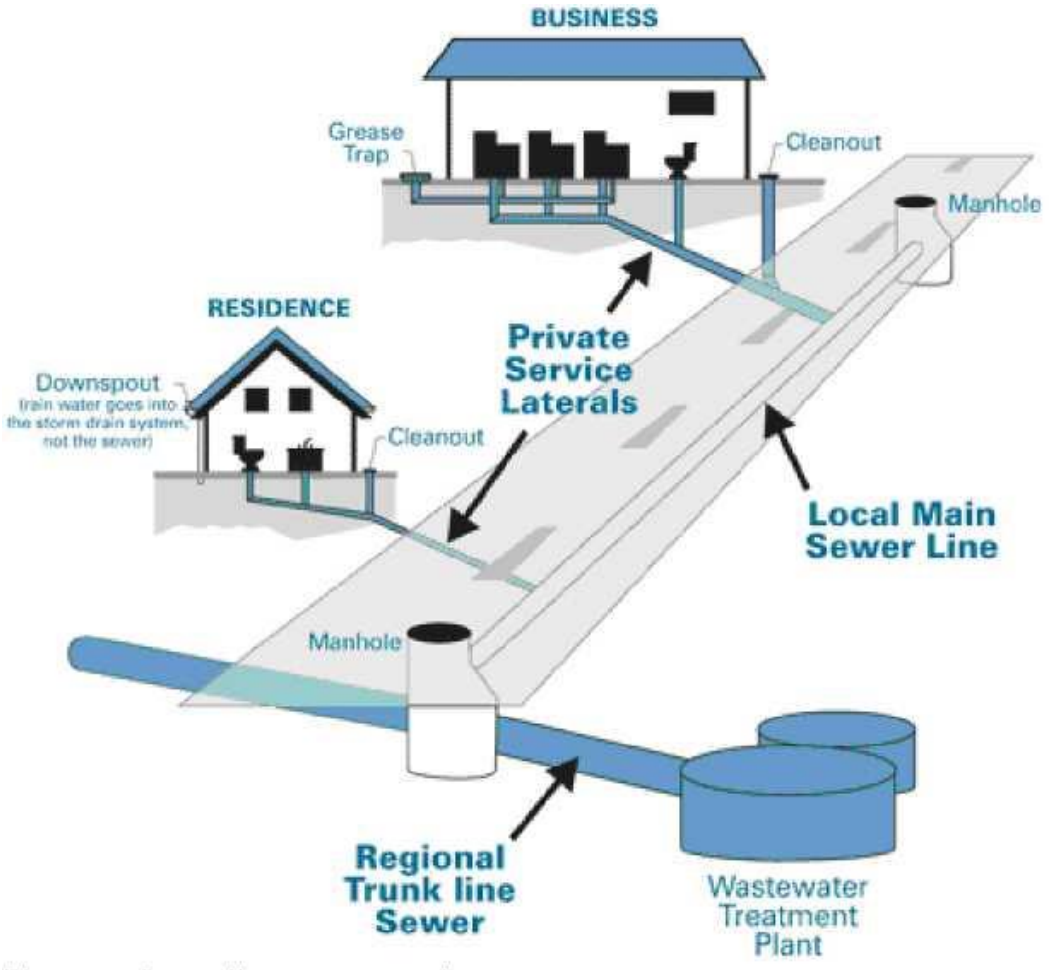


Diagram of a sanitary sewer system

5. Read the text.

Text 2. WASTEWATER TREATMENT

Sewage (or domestic wastewater) treatment incorporates physical, chemical and biological processes which treat and remove physical, chemical and biological contaminants from water following human use. The objective of the treatment is to produce both a clean waste stream suitable for discharge or reuse back into the environment, and a solid waste or sludge also suitable for proper disposal or reuse.

Sewage is generated by residences, institutions, and commercial and industrial establishments. It can be treated onsite at the point of which it is generated (e.g., septic tanks or onsite package plants), or collected and conveyed via a network of pipes and pump stations to a municipal treatment plant (see Sewerage and pipes and infrastructure). Efforts to collect treat and discharge domestic wastewater are typically subject to local, state and federal regulations and standards (regulation and controls). Industrial sources of wastewater often require specialized treatment processes.

Typically, sewage treatment is achieved by the initial physical separation of solids from the raw wastewater stream followed by the progressive conversion of dissolved biological matter into a solid biological mass using indigenous, waterborne bacteria. Once the biological mass is separated or removed, the treated water may undergo additional disinfection via chemical or physical processes. This 'final effluent' can then be discharged or re-introduced back into a natural surface water body (stream, river or bay) or other environment (wetlands, golf courses, greenways, etc.). The segregated biological solids undergo additional treatment and neutralization prior to proper disposal or re-use.

TREATMENT STAGES

Primary treatment. Primary treatment is to reduce oils, grease, fats, sand, grit, and coarse (settleable) solids. This step is done entirely with machinery, hence the name mechanical treatment.

Influx (influent) and removal of large objects	
In the mechanical treatment, the influx (приток) of sewage water is strained ***удалять*** all large objects that are ***содержаться*** in the sewer system, such as ***тряпки, палки, гигиенические средства*** (sanitary napkins), cans, fruit, etc. This is most commonly done using a manual or automated mechanically ***решетки***. This type of waste is removed because it can damage the ***чувствительное оборудование*** in the sewage treatment plant.	raked screen, to remove, sticks, deposited, sensitive equipment, influent, sanitary towels, rags.

Sand and grit removal and Screening	
This stage typically includes a ***песковой канал*** where the скорость of the incoming wastewater is ***тщательно контролируется*** to allow sand grit and stones ***оседать*** but still maintain the majority of the ***органические материалы*** within the flow. This equipments called a ***песколовка***. Sand grit and stones need to be removed early in the process to ***во избежание повреждений*** to ***насосы*** and other equipment in the remaining treatment stages. Sometimes there is a sand washer followed by a conveyor that transports the sand to a container for ***утилизация***. The contents from the sand catcher may ***подаваться*** into the ***мусоросжигательная печь*** in a sludge processing plant but in many cases the sand and grit is sent to a ***иловая площадка***.	carefully controlled, to settle, detritor or sand catcher, velocity, avoid damage, pumps, disposal, fed, land-fill, organic material, sand or grit channel
Sedimentation	
Almost all plants have a ***стадия осветления (отстаивания)*** where the sewage is allowed to pass through large ***круглые*** or ***прямоугольные резервуары***. The tanks are large enough that ***фекальные твердые вещества*** can settle and ***плавучие вещества*** such as grease and plastics can rise to the surface and be ***снять с поверхности***. The main purpose of the primary stage is to produce a generally ***однородная жидкость*** capable of being treated biologically and a sludge that can be separately treated or processed. Primary settlement tanks are usually equipped with mechanically ***движущийся скребковый механизм*** that continually drive the collected sludge towards a hopper in the base of the tank from where it can ***перекачивать*** to further ***стадия обработки осадка***.	homogeneous liquid, circular or rectangular tanks, floating material, skimmed off, be pumped, sludge treatment stages, faecal solids, sedimentation stage, driven scrapers,

Secondary treatment. Secondary treatment is designed to substantially degrade the biological content of the sewage such as are derived from human waste, food waste, soaps and detergent. The majority of municipal and industrial plants treat the settled sewage liquor using aerobic biological processes. For this to be effective, the biota requires both oxygen and a substrate on which to live. There are number of ways in which this is done. In all these methods, the bacteria and protozoa consume biodegradable soluble organic contaminants (e.g. sugars, fats, organic short-chain carbon molecules, etc.) and bind much of the less soluble fractions into floc particles. Secondary treatment systems are classified as fixed film or suspended growth. In fixed film systems - such as rock filters - the biomass grows on media and the sewage passes over its surface. In suspended growth systems - such as activated sludge - the biomass is well mixed with

the sewage. Typically, fixed film systems require smaller footprints than for an equivalent suspended growth system; however, suspended growth systems are more able to cope with shocks in biological loading and provide higher removal rates for BOD and suspended solids than fixed film systems.

Roughing filters	
Фильтр предварительной (грубой) очистки are ***предназначен*** to treat ***очень высокая*** or ***переменная нагрузка по органическим веществам***, typically industrial, to allow them to then be treated by conventional secondary treatment processes. They are typically tall, circular filters filled with open ***синтетическая фильтрующая загрузка*** to which sewage is applied at a ***достаточно высокая скорость***. The design of the filters allows ***высокая гидравлическая нагрузка*** and a ***интенсивный поток воздуха***. On larger installations, air is ***подается*** through the media using ***воздуходувку***. The ***получившаяся жидкость*** is usually within the normal range for ***традиционных*** treatment processes.	intended, particularly strong, resultant liquor, synthetic filter media, relatively high rate, high flowthrough of air forced, blowers, variable organic loads, roughing filters, high hydraulic loading, conventional.
Activated sludge	
Активный ил plants use a variety of mechanisms and processes to use dissolved oxygen to generate a ***биологические хлопья*** that substantially removes organic material. It also traps particulate material and can, under ideal conditions, ***преобразовать азот*** to ***нитриты*** and ***нитраты*** and ultimately to ***азот газообразный***.	nitrite, biological floc, convert ammonia, nitrate, nitrogen gas, activated sludge.
Filter Beds (Oxidising beds)	
In older plants and plants receiving more variable loads, ***капельный биологический фильтр*** are used where the ***осветленная сточная жидкость*** is spread onto the surface of a deep bed made up of ***кокс (карбонизированный уголь)***, ***известковый щебень*** or ***специально приготовленные пластиковые загрузки***. Such media must have high surface areas to support the ***биопленка*** that form. The liquor is distributed through ***перфорированный вращающийся ороситель*** биофльтра radiating from a ***центральный привод.*** The distributed liquor trickles through this bed and is collected in ***дренажного устройства для удаления***	settled sewage liquor, protozoa, fungi, limestone chips, specially fabricated plastic media, biofilm, perforated rotating arms, central pivot, drains at the base, coke (carbonised coal),

профильтровавшейся воды. These drains also provide a source of air which percolates up through the bed, keeping it aerobic.	trickling filter beds.
Moving Bed Biological Reactor	
Биореактор с плавающей загрузкой involve the addition of ***инертная среда*** into existing activated sludge basins to provide active sites for ***присоединение биомассы***. This conversion results in a strictly attached ***систему роста***. Advantages of attached growth systems include 1) maintain a high ***плотность популяций биомассы*** 2) increase the efficiency of the system without the need for increasing the ***перемешивание жидкости*** suspended solids (MLSS) concentration and 3) eliminate the cost of operating the ***трубопровод рециркуляционного активного ила***.	return activated sludge line, biomass attachment, inert media, density of biomass population, growth system, mixed liquor, Moving Bed Biological Reactor
Aeration Tanks	
The ***аэротенк*** provide a location where biological treatment of the waste water takes place. In these tanks, microorganisms and waste water in various stages of ***разложение*** are mixed, aerated, and maintained in suspension. The contents of the aeration tanks, which require a delicate balance of food and oxygen, are commonly referred to as the mixed liquor suspended solids (MLSS) or activated sludge. The activated sludge ***преобразовывать органические вещества*** into oxidized products and a ***осаждение хлопьев*** which is settled out in the ***вторичные отстойники***. Raw sewage can be introduced in various locations and be aerated and mixed for varying lengths of time and intensity.	decomposition, settleable floc, converts organic substances, aeration tanks, secondary clarifiers.
Membrane Biological Reactors	
Мембранный биореактор (MBR) includes a ***полунепроницаемая мембрана барьер*** either submerged or in ***сочетание*** with an activated sludge process. This technology guarantees removal of all suspended and some ***растворенные загрязнения***. The ***ограничение системы*** MBR is directly proportional to nutrient reduction efficiency of the activated sludge process. The cost of building and operating a MBR is usually higher than conventional wastewater treatment.	limitation of MBR systems, dissolved pollutants, semi-permeable membrane barrier system, conjunction, Membrane Biological Reactors

The final step in the secondary treatment stage is to settle out the biological floc or filter material and produce sewage water containing very low levels of organic material and suspended matter.

Tertiary treatment. Tertiary treatment provides a final stage to raise the effluent quality to the standard required before it is discharged to the receiving environment (sea, river, lake, ground, etc.) More than one tertiary treatment process may be used at any treatment plant. If disinfection is practiced, it is always the final process. It is also called Effluent polishing.

Lagooning	
Биопруд provides settlement and further biological improvement through storage in large ***сделанный руками человека пруд*** or ***природный пруд***. These lagoons are highly aerobic and colonization by ***природные микрофиты***, especially reeds, is often encouraged. Small filter ***кормление беспозвоночных*** such as *дафния* and ***виды коловраток*** greatly assist in treatment by removing fine particulates.	Daphnia, species of Rotifera, Lagooning, man-made ponds, feeding invertebrates, native macrophytesm, lagoons.
Constructed wetlands	
Поля орошения (фильтрации) include engineered ***заросли тростника*** and a range of ***похожих методов***, all of which provide a high degree of aerobic biological improvement and can often be used instead of secondary treatment for small communities, also see *фиторемидиация*.	Constructed wetlands, similar methodologies, phytoremediation, reedbeds.
Disinfection	
The purpose of disinfection in the treatment of wastewater is to substantially reduce the number of living organisms in the water to be ***возвращаться обратно в окружающую среду***. The effectiveness of disinfection depends on the quality of the water being treated (e.g., turbidity, pH, etc.), the type of disinfection being used, the disinfectant dosage (concentration and time), and other environmental variables. ***Мутная вода*** will be treated less successfully since solid matter can shield organisms, especially from Ultraviolet light or if contact times are low. Generally, short contact times, low doses and high flows all militate against effective disinfection. Common methods of disinfection include ozone, chlorine, or UV light.	discharged back into the environment, turbid water, persistence.

6. Match the words:

1. activated sludge	a. exposing to circulating air; adds oxygen to the wastewater and allows other gases trapped in the wastewater to escape (the first step in secondary treatment via activated sludge process)
2. aeration	b.sludge particles produced by the growth of microorganisms in aerated tanks as a part of the activated sludge process to treat wastewater
3. BOD	c.wastewater that comes primarily from individuals, and does not generally include industrial or agricultural wastewater
4. biosolids	d.a parameter used to measure the amount of oxygen that will be consumed by microorganisms during the biological reaction of oxygen with organic material
5. decomposition	e.sludge that is intended for beneficial use. They must meet certain government specified
6. domestic wastewater	f.treated wastewater, flowing from a lagoon, tank, treatment process, or treatment plant
7. effluent	g.wastewater flowing into a treatment plant
8. grit chamber	h.a chamber or tank used in primary treatment where wastewater slows down and heavy, large solids (grit) settle out and are removed
9. influent	i.the process used in both primary and secondary wastewater treatment, that takes place when gravity pulls particles to the bottom of a tank (also called settling)
10.lagoons (oxidation ponds or stabilization ponds	j.a tank in which solids settle out of water by gravity during wastewater or drinking water treatment processes
11.primary treatment	k.a wastewater treatment method that uses ponds to treat wastewater
12. secondary treatment	l.the first stage of wastewater treatment that removes settleable or floating solids only
13.sedimentation	m.a type of wastewater treatment used to convert dissolved and suspended pollutants into a form that can be removed, producing a relatively highly treated effluent
14.settling tank (sedimentation	n.any level of treatment beyond secondary treatment, which could include filtration, nutrient removal and removal of toxic chemicals or metals

tank or clarifier)	
15.sludge	o.the process of breaking down into constituent parts or elements
16.tertiary treatment	p.the cloudy or muddy appearance of a naturally clear liquid caused by the suspension of particulate matter
17.total suspended solids TSS	q.any solid, semisolid, or liquid waste that settles to the bottom of sedimentation tanks or septic tanks
18.trickling filter process	r.a laboratory measurement of the quantity of suspended solids present in wastewater
19.turbidity	s.a biological treatment process that uses coarse media contained in a tank that serves as a surface on which microbiological growth occurs

7. Describe in details each of 5 processes using the following words.

Preliminary treatment
transported via
the sewer system
to be sent through a bar screen
to include
to be used to
to remove large solid objects
wastewater flow
to enter the grit tank
to settle to the bottom
debris is disposed at a sanitary landfill

Primary treatment
second step
physical separation of solids and
greases from the wastewater
to flow into settling tank
to allow solid particles to settle to the
bottom of the tank
oil and grease float to the top

Secondary treatment
a biological treatment process
to remove dissolved organic matter

from wastewater
the settling tank
to flow by gravity
aeration tank
to be mixed with solids, that contain microorganisms
to use oxygen to consume the remaining organic matter
air bubbles provide the mixing and oxygen
to be sent to the final clarifier
the solids settle out to the bottom
to be sent to the solids handling process

Final treatment

to be disinfected by chlorine and ultraviolet disinfection
to kill harmful microorganisms to release into receiving water

Solids processing

the primary solids from the primary settling tank
the secondary solids from the clarifier
to be sent to the digester
microorganisms use the organic materia as a food source
to convert to by-products such as methane gas and water
a 90% reduction in pathogens
production of a wet soil-like material called “biosolids” that contain 95-97% water
filter presses or centrifuges
to be used to squeeze water from the biosolids
is sent to landfill, incinerator
to be used as a fertilizer or soil amendment

8. Read the text.

SLUDGE TREATMENT

The coarse primary solids and secondary biosolids accumulated in a wastewater treatment process must be treated and disposed of in a safe and effective manner. This material is often inadvertently contaminated with toxic organic and inorganic compounds (e.g. heavy metals). The purpose of digestion is to reduce the amount of organic matter and the number of disease-causing microorganisms present in the solids. The most common treatment options include anaerobic digestion, aerobic digestion, and composting.

Anaerobic digestion	
Анаэробное сбраживание is a bacterial process that is carried out in the ***отсутствие кислорода***. The process can either be ***термофильное сбраживание*** in which sludge is ***подвергается брожению*** in tanks heated to about 38°C or ***мезофильное сбраживание*** where sludge is maintained in large tanks for weeks to allow ***естественная минерализация*** of the sludge. Thermophilic digestion generates biogas with a high proportion of ***метан*** that may be used to both heat the tank and run engines or microturbines for other on-site processes. In large treatment plants sufficient energy can be generated in this way to produce more electricity than the machines require. The ***образование метана*** is a key advantage of the ***анаэробный процесс***. Its key disadvantage is the long time required for the process (up to 30 days) and the high ***капитальные вложения***.	capital cost, natural mineralisation, absence of oxygen, fermented, mesophilic digestion, thermophilic digestion, methane, methane generation, anaerobic process, anaerobic digestion.
Aerobic digestion	
Аэробное сбраживание is a bacterial process occurring in the presence of oxygen. Under ***аэробные условия***, bacteria ***стремительно потреблять*** organic matter and convert it into ***углекислый газ***. Once there is a lack of organic matter, bacteria die and are used as food by other bactieria. This stage of the process is known as ***эндогенное дыхание***. ***Растворение твердых веществ*** occurs in this phase. Because the aerobic digestion occurs much faster than anaerobic digestion, the capital costs of aerobic digestion are lower. However, the operating costs are characteristically much greater for aerobic digestion because of energy costs for aeration needed to add oxygen to the process.	solids reduction, aerobic conditions, carbon dioxide, endogenous respiration, aerobic digestion, rapidly consume.
Sludge thickening	
Уплотнение осадка is the process used to increase the solids content of sludge by the ***разделение*** and removal of a portion of the ***жидкая фаза***. ***Гравитационное уплотнение*** makes use of the force of gravity as the main agent in the settling and thickening process. The thickening of sludge plays an important role in reducing capital costs relating to the provision of sludge handling equipment and the operational costs of the handling and treatment of the sludge. Three accepted methods used for pre-digestion sludge thickening:	separation, dissolved air flotation thickening, centrifugation, liquid phase, gravity thickening, thickening.

Gravity thickening, ***флотационное илоуплотнение*** and ***центрифугирование.***	
Composting	
Компостирование is also an aerobic process that involves mixing the wastewater solids with sources of carbon such as ***опилки, солома*** or ***древесные щепки***. In the presence of oxygen, bacteria digest both the wastewater solids and the added carbon source and, in doing so, produce a large amount of heat.	wood chips straw, composting, sawdust.

Both anaerobic and aerobic digestion processes can result in the destruction of disease-causing microorganisms and parasites to a sufficient level to allow the resulting digested solids to be safely applied to land used as a soil amendment material (with similar benefits to peat) or used for agriculture as a fertilizer provided that levels of toxic constituents are sufficiently low.

Thermal depolymerization	
Термическая деполимеризация uses hydrous ***пиролиз*** to convert reduced complex organics to oil. The ***предварительно измельченный, при удалении песка*** sludge is heated to 250C and compressed to 40 MPa. The hydrogen in the water inserts itself between chemical bonds in natural polymers such as fats, proteins and cellulose. The oxygen of the water combines with carbon, hydrogen and metals. The result is oil, light combustible gases such as methane, propane and butane, water with ***растворенные соли***, carbon dioxide, and a small ***остаточный инертный нерастворимый материал*** that resembles powdered rock and char. All organisms and many organic toxins are destroyed. Inorganic salts such as nitrates and phosphates remain in the water after treatment at sufficiently high levels that further treatment is required.	soluble salts, pyrolysis, premacerated, grit-reduced, residue of inert insoluble material, thermal depolymerization

The choice of a wastewater solid treatment method depends on the amount of solids generated and other site-specific conditions. However, in general, composting is most often applied to smaller-scale applications followed by aerobic digestion and then lastly anaerobic digestion for the larger-scale municipal applications.

Sludge disposal	
When a liquid sludge is produced, further treatment may be re-	emissions,

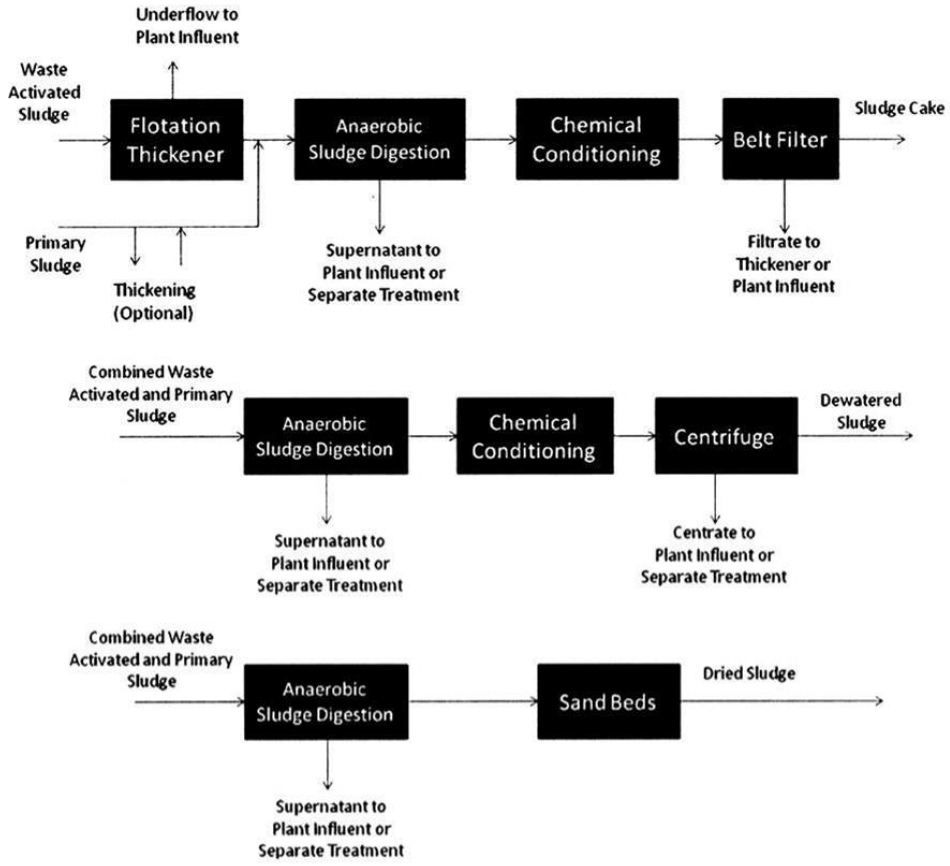
quired to make it suitable for final ***утилизация***. Typically, sludges are thickened (dewatered) to reduce the volumes transported off-site for disposal. Processes for reducing water content include lagooning in drying beds to produce a cake that can be applied to land or incinerated; pressing, where sludge is mechanically filtered, often through ***тканевый фильтр*** to produce a firm cake; and centrifugation where the sludge is thickened by centrifugally separating the solid and liquid. Sludges can be disposed of by liquid injection to land or by disposal in a landfill. There are concerns about ***сжигание осадка*** because of air pollutants in the ***выбросы в атмосферу***, along with the high cost of supplemental fuel, making this a less attractive and less commonly constructed means of sludge treatment and disposal. There is no process which completely ***исключать*** the requirements for disposal of biosolids.	cloth screens, sludge incineration, eliminates, disposal

9. Translate into English.

1.Осадок из первичных отстойников и избыточный активный ил из вторичных отстойников, часто загрязненные токсичными органическими и неорганическими соединениями, должны быть обработаны и утилизировать безопасным и эффективным способом.
2. Наиболее распространенными вариантами обработки осадка являются анаэробное и аэробное сбраживание и компостирование.
3. Для анаэробного сбраживания обычно используют два температурных режима: термофильный при температуре 38°C и мезофильный.
4. При аэробном сбраживании бактерии потребляют органические вещества и превращают их в углекислый газ.
5. Уплотнение осадка это процесс, используемый для повышения содержания сухого вещества ила, отделяя жидкую фазу.
6. При компостировании происходит смешивание осадка сточных вод с источниками углерода, такими как опилки, солома или древесная стружка.
7. При термической деполимеризации используется пиролиз для разложения сложных органических соединений.

9. Describe the scheme in English.

ALTERNATIVE TREATMENT OF SEWAGE SLUDGE



PART 3. SUPPLEMENTARY TEXTS

THE ENVIRONMENT

Within a biological context, the term “environment” is used to mean the sum total of external factors to which a living system is exposed, including both the biotic (living) and the abiotic (non-living) influences. In thinking about an ecological environment we have to consider the physical features, the chemical characteristics and any biological interactions.

Thus, in taking stock of an environment from the physical standpoint, we have to consider the topography, the basic medium of which it is made (for example salt water, freshwater, soil type) and also the latitude, altitude and aspect relative to the sun. From the chemical standpoint we have to consider the available elements and the systems which ensure their continued availability. These systems are the biogeochemical cycles of raw materials, particularly water, carbon, nitrogen, sulphur and phosphorus. Thirdly, we have to consider the biological interactions, that is the effects that organisms have on each other and how animals and plants influence the survival of their own and other species. Lastly, the flow of energy into, through and out of the area has to be taken into account and this involves physical, chemical and biological aspects.

Consideration of these features does not, however, answer all ecological questions. Environments are not static but change over time. Organisms, by their activities, bring about changes in both the biotic and abiotic aspects of the environment. In this context, man is probably the most important organism, as his activities cause both rapid and radical changes. Another major problem is that of delimiting an environment. W here does a particular environment start and stop? Even in apparently straight forward situations, the demarcation of boundaries is complex. A pond seems to be a well-defined environment and the field surrounding it to be another, but between the two there is a region where the conditions are not the same as in the field or in the pond. Does this area constitute a different environment or in fact several environments grading into one another? This question is very difficult to answer and in most cases an environment cannot be accurately delimited.

The total number of environments on this planet constitutes the ecosphere. Within the ecosphere there are thousands of ecosystems. Ecosystems occupy habitats and consist of communities of organisms which in turn are made up of populations of individual species which occupy particular niches. Each of these term s constitutes an important ecological concept.

THE ECOSPHERE

The ecosphere has been defined by Boughey as that portion of the earth which includes the biosphere and all the ecological factors which operate on the living organisms it contains.

THE BIOSPHERE

The biosphere is the total living material on the Earth, which is limited in total quantity but is capable of infinite internal variety. Also, it is in a state of dynamic equilibrium with the abiotic factors and this totality of the living matter and the physical world in which it exists forms the ecosphere. The ecosphere is not a constant either at any one time or over a period of time. The study of change in the ecosphere over time is the realm of evolution while consideration of variations at a given time leads naturally to the examination of the constituent parts of the ecosphere that is of the ecosystems.

ECOSYSTEMS

The term “ecosystem” was first used by Sir Arthur Tansley, Professor of Botany at Oxford University, in 1935 and is formed from the words “ecology” and “system ”. “Ecology”, as other similar words such as “economy”, comes from the Greek root “oikos” meaning a household and is defined in a dictionary as “that branch of biology which deals with organism s’ relationships to one another and to their surroundings”. The word “system” means an orderly working totality or a complex whole. Thus, an ecosystem is a complex, self-perpetuating assembly of organisms taken together with their inorganic environment. As Tansley pointed out, the organisms react with each other and with the various elements of the physical environment. All the constituents, both biotic and abiotic, influence each other and if any one organism is removed or the quantity or quality of any physical element is changed then the whole ecosystem is altered.

An ecosystem is defined as an area where inputs and outputs can be measured across its boundaries but beyond this the delineation becomes vague. A beech tree with its associated animal and plant life on the bark, in the canopy and in the rhizosphere around the roots could be considered to be an ecosystem, but as the canopies and rhizospheres of trees tend to overlap it would be difficult to define boundaries. A whole beech wood could also be considered as one ecosystem, but again there may be difficulties in defining boundaries where it merges into other areas of vegetation. Usually, therefore, the term ecosystem is used for a clearly defined area with a distinctive flora and fauna, even if this overlaps with other ecosystems at its edges. Thus, for example, a beech wood, a saltmarsh, a pond, a river and a hedgerow may all be defined as separate ecosystems.

Man is an important part of the biosphere, a fact which he tends to forget. Man's influence now is enormous and unfortunately it is often detrimental, largely as a result of his greatly increased population and materialistic way of life. As a result of man's activities, both organic and inorganic materials are removed from ecosystems and natural recycling is prevented.

As well as removing substances from ecosystems, man also adds to them. He adds large quantities of nutrients in the form of fertilizers and rich organic wastes such as sewage or effluent from factories processing organic materials. He may also add substances which would not occur naturally and which are in many ways detrimental. This is particularly so in the case of heavy metals from industrial processes and certain organic compounds which are used as pesticides or which are wastes from "civilized" human activities. Many of these compounds, such as polythene, are biostable. That is to say they are not easily broken down by bacteria. Apple cores and orange peel on the other hand, which rot away easily, are termed biodegradable.

Ecosystems are dynamic, not static, entities and as such are subject to change. Some of these changes are of a seasonal or cyclic nature whilst others are evolutionary and non-recurring. They may be due to man's activities but many, including both the devastating effects of fire, flood or earthquake and the gentler seasonal changes, are not caused by human influence.

HABITATS

Habitats are the geographical areas which are occupied by ecosystems. A habitat is a physical entity and it comprises the sum total of the abiotic factors to which a species or a group of species is exposed. The totality of a pond, the abiotic plus the biotic factors, forms an ecosystem. The abiotic part, i.e. the substratum and the water it contains, form the habitat for that ecosystem.

Some animals and plants are very specific as to their habitat, for example, calcicolous plants such as the grass dog's tail (Cynasurus cristatus) will only grow on soils containing calcium salts whilst Rhodadendron species will not grow on such soils. Some fresh water animals such as mayfly nymphs will only live in water with high oxygen content whilst others such as Chironomus larvae survive well in water almost devoid of oxygen. On the other hand, some species are very tolerant and will live in a wide variety of habitats. For example, perennial ryegrass or couch will grow in most temperature soils and earthworms will survive in almost any soil where they can form burrows. Although most species have evolved to live in specific habitats, some animals are extremely adoptable and can very quickly learn to live successfully in new habitats. Examples of these are rats which have adapted to live in sewers, langurs occupying ruined Indian temples or human fleas living in clothes.

The term “habitat” is usually used to mean a relatively large and well-defined area such as a garden seashore or meadow. However, such an area is not constant in its physical features and so may be subdivided into parts which differ in their properties; these smaller areas with different characteristics form the general broad features of the whole habitat are known as micro habitats. Thus in a pond, for example, the water surface, the mud on the bottom, the spaces in a mat of blanketweed and those between the overlapping leaf bases of yellow flag are all different micro habitats within the pond habitat.

COMMUNITIES

A community is the total number of plant and animal populations living in a habitat. Certain sets of species tend to occur together, usually with one or a few species being dominant. Thus we can sometimes name communities after the dominant species present, for example, a Salicornia marsh community or a beechwood community.

Within a community, restraints are imposed on one member population by another and also by the habitat itself, so that no one population, not even that of the dominant species, displaces all the others. Communities pass through a life cycle, coming into existence when pioneer species occupy a barren area such as a mud flat or a sand dune. These species modify the environment so that other species can invade and survive, thus one species is succeeded by another until final colonization by the dominant species occurs, which replaces itself rather than by being replaced by other species. This is the climax community. Generally speaking, the older and more mature the community, the more diverse will be the population of both plants and animals.

NICHES

A community consists of a number of populations within a given habitat. Each species population occupies a certain very specific part of the habitat and within this it performs certain functions. The habitat plus the function forms the niche of the species. The concept of a niche thus includes factors such as tolerance ranges from abiotic variables, the food relations of the species and also its predators. Every population has an ecological niche but no two species can occupy the same niche within a given community on a permanent basis. If two species have identical niches they will be in direct competition and one will eliminate the other; for different species to survive in one community there must be some differences in their niches. This has been shown many times with many different organisms. The classic experiment was performed by G.F.Gause in 1934 with species of Paramecium. When P.caudatum and P.aurelia were cultured together, the former was eliminated. This was because the two species occupied the same niche but P.aurelia bred faster and so became dominant. When

P.caudatum and P.bursaria were cultured together, both survived, because although they used the same food resource they had different space requirements and thus were not occupying the same niche. Although the idea was not original and Gause did not wish to take credit for it, the concept that two species with an identical ecological niche cannot occupy the same environ¬ment became known as "Gause's principle".

There are many instances of related species evolving to occupy different niches and thus all surviving in a limited habitat. An example of this is the honeycreepers (family Drepaniidae) in Hawaii. A small population was introduced into the islands by chance and as there was no competition they exploited a variety of food sources, underwent adaptive radiation and now have evolved to occupy different niches. Modern types of honeycreeper include honey eaters, seed eaters, bark-creepers and woodpecker-like birds.

WHERE WHOOPING CRANES CHEAT EXTINCTION

Some of the most majestic birds on the planet congregate each winter just off the narrow road to a cavernous barbecue restaurant, on an area of salt marches stretching into the chocolate-coloured waters of the Gulf of Mexico. Standing 1.5 meters in the shallow water, occasionally opening their wings to a span wider than that of a pickup truck, these are whooping cranes, part of a population that still numbers fewer than 500 after slowly making its way back from the brink of extinction. They arrive here, at Aransas Bay in Texas, in tight-knit family units after flying 3,900 km from their summer home in the Northwest Territories of Canada.

Catering to people who go on crane-watching tours is relatively new for Port Aransas and Rockport, the small Texas towns near the Aransas National Wildlife Refuge, not far from Corpus Christi. Altogether, including wildlife lovers not specifically seeking the whooping cranes, about 75,000 visitors from around the globe travel to the Aransas National Wildlife Refuge each year, contributing some 5 million dollars to the local economy.

The more typical trip into the marches a few decades ago would have carried hunters seeking other more common waterfowl, for other, more traditional purposes. But Texans have learned that there can be more money in whooping cranes and other unusual birds – and in the people who will travel thousands of kilometers to see them.

Whooping cranes – the tallest North American birds – are the family type. They mate for life and can live 25 years or more in the wild. The migration of cranes has been studied in awe for centuries, taking place on every continent except South America and Antarctica. The 15 species of the crane family, heralded in myth as symbols of longevity and good fortune, include far-flung members like the relatively small demoiselle crane that breeds in southeastern Siberia and winters in East Africa and Iraq, and the re-

nowned red crowned crane of Japan, whose crimson radiance was, until recently, painted on the plane tails of Japan Airlines. (Cranes also inspired the logo of another airline, Lufthansa.)

Still, the cranes' rarefied status among birds has not guaranteed their survival. Of the 15 surviving species, 11 are imperiled with the possibility of extinction, as the naturalist Peter Matthiessen described in wrenching detail in his 2001 book on cranes, "The Birds of Heaven". Yet none of the cranes, whether found in isolated Bhutan or the Mongolian steppe, are as rare as Grus Americana, the whooping crane of North America, and the largest flock of them, born and raised in the wild, spend their winters in the gulf marshes of Texas.

More than half a century ago, the ecologist Also Leopold tried to articulate the crane's mystique. "Our ability to perceive quality in nature begins, as in art, with the pretty," he wrote in the late 1940's, when the extinction of the whooping crane seemed imminent. "It expands through successive stages of the beautiful values as yet uncaptured by language. The quality of cranes lies, I think, in this higher gamut, as yet beyond the reach of words."

BIRDS

Climate change is likely to have both direct and indirect effects on birds. Higher temperatures can directly alter their life cycles. The loss of wetlands, beaches, and other habitat could have an equally important indirect effect, by making some regions less hospitable to birds than those regions are today.

As temperatures warm, birds will tend to inhabit more northerly areas (in the Northern Hemisphere). Data collected by the National Audubon Society's Christmas Bird Count show that during years with warmer temperatures, the majority of bird species do not have to fly as far south for the winter. Warmer temperatures also allow birds to spend their summers on the Bobolink (a North American songbird). During summer, this bird is currently found throughout New England, the states that border the Great Lakes, and north of a line stretching from Missouri to Idaho. With the projected climate changes under a doubling of carbon dioxide, the Bobolink would not be found south of the Great Lakes.

Warmer temperatures can also affect how birds respond to the change in seasons. Several types of birds that fly north to Michigan during spring now arrive two or three weeks earlier than in 1960. Scientists at the British Trust for Ornithology have found that 20 of 65 species of birds are laying their eggs an average of 9 days earlier today than in 1971. The earlier nesting appears to result in part because plants are flowering and growing leaves sooner, which in turn caus¬es earlier availability of the insects that these birds eat.

Scientists do not know whether birds will benefit from these changes. Earlier nesting means that birds will be a week or so older when the time comes to migrate south, which may improve their odds of survive their first winters. The changing climate, however, may impair the extent to which a bird's life cycle is synchronized with its food supply. While birds can adjust to warmer temperatures by flying to more northern areas in any given year, the vegetation upon which they (or the insects they eat) rely may take decades or longer to adjust.

In some cases, the habitat upon which birds rely may not only fail to migrate north, it may be threatened in its current location. The loss of estuarine beaches caused by rising sea level would decrease available habitat for the least tern, an endangered species; the loss of these beaches also would decrease feeding areas for shore birds that rely on horseshoe crabs and other organisms found in inter-tidal areas. By decreasing estuarine fish and shellfish populations, the loss of coastal wetlands would decrease available food supplies; and the loss of wetlands would also decrease available habitat.

Similarly, the decline in prairie potholes would decrease duck populations. The prairie potholes in the northern Great Plains are responsible for breeding 50-80 per cent of the nation's duck population. A drier climate would decrease the amount of open water ponds in this region, with a commensurate reduction in duck populations.

HISTORY OF DRINKING WATER TREATMENT

In ancient Greek and Sanskrit (India) writings dating back to 2000 BC, water treatment methods were recommended. People back than knew that heating water might purify it, and they were also educated in sand and gravel filtration, boiling, and straining. The major motive for water purification better tasted drinking water, because people could not yet distinguish between foul and clean water. Turbidity was the main driving force between the earliest water treatments. Not much was known about micro organisms, or chemical contaminants.

After 1500 BC, the Egyptians first discovered the principle of coagulation. They applied the chemical alum for suspended particle settlement. Pictures of this purification technique were found on the wall of the tomb of Amenophis II and Ramses II.

After 500 BC, Hippocrates discovered the healing powers of water. He invented the practice of sieving water, and obtained the first bag filter, which was called the 'Hippocratic sleeve'. The main purpose of the bag was to trap sediments that caused bad tastes or odours. In 300-200 BC, Rome built its first aqueducts. Archimedes invented his water screw.

AQUEDUCTS

The Assyrians built the first structure that could carry water from one place to another in the 7th century BC. It was 10 meters high and 300 meters long, and carried the water 80 kilometres across a valley to Nineveh. Later, the Romans started building many of these structures. They named them aqueducts. In Latin, aqua means 'water', and ducere means 'to lead'. Roman aqueducts were very sophisticated pieces of engineering that were powered entirely by gravity, and carried water over extremely large distances. They were applied specifically to supply water to the big cities and industrial areas of the Roman Empire. In the city of Rome alone more than 400 km of aqueduct were present, and it took over 500 years to complete all eleven of them. Most of the aqueducts were underground structures, to protect them in times of was and to prevent pollution. Together, they supplied Rome with over one million cubic meters of water on a daily basis.

Today, aqueducts can still be found on some locations in France, Germany, Spain and Turkey. The United States have even taken up building aqueducts to supply the big cities with water again. Many of the techniques the Romans used in their aqueducts can be seen in modern-day sewers and water transport systems.

ARCHIMEDES' SCREW

Archimedes was a Greek engineer that lived between 287 and 212 BC, and was responsible for many different inventions. One of his findings was a device to transport water from lower water bodies to higher land. He called this invention the water screw. It is a large screw inside a hollow pipe that pumps up water to higher land. Originally, it was applied to irrigate cropland and to lift water from mines and ship bilges. Today, this invention is still applied to transport water from lower to higher land or water bodies. In The Netherlands for example, such structures can be found in the city of Zoetermeer (see picture), in the west close to The Hague. The water screw formed the basis for many modern-day industrial pumps.

During the Middle Ages (500-1500 AD), water supply was no longer as sophisticated as before. These centuries where also known as the Dark Ages, because of a lack of scientific innovations and experiments. After the fall of the Roman Empire enemy forces destroyed many aqueducts, and others were no longer applied. The future for water treatment was uncertain.

Than, in 1627 the water treatment history continued as Sir Francis Bacon started experimenting with seawater desalination. He attempted to remove salt particles by means of an unsophisticated form of sand filtration. It did not exactly work, but it did paved the way for further experimentation by other scientists.

Experimentation of two Dutch spectacle makers experimented with object magni-

fication led to the discovery of the microscope by Antonie van Leeuwenhoek in the 1670s. He grinded and polished lenses and thereby achieved greater magnification. The invention enables scientists to watch tiny particles in water. In 1676, Van Leeuwenhoek first observed water micro organisms.

In the 1700s the first water filters for domestic application were applied. These were made of wool, sponge and charcoal. In 1804 the first actual municipal water treatment plant designed by Robert Thom, was built in Scotland. The water treatment was based on slow sand filtration, and horse and cart distributed the water. Some three years later, the first water pipes were installed. The suggestion was made that every person should have access to safe drinking water, but it would take somewhat longer before this was actually brought to practice in most countries.

In 1854 it was discovered that a cholera epidemic spread through water. The outbreak seemed less severe in areas where sand filters were installed. British scientist John Snow found that the direct cause of the outbreak was water pump contamination by sewage water. He applied chlorine to purify the water, and this paved the way for water disinfection. Since the water in the pump had tasted and smelled normal, the conclusion was finally drawn that good taste and smell alone do not guarantee safe drinking water. This discovery led to governments starting to install municipal water filters (sand filters and chlorination), and hence the first government regulation of public water.

In the 1890s America started building large sand filters to protect public health. These turned out to be a success. Instead of slow sand filtration, rapid sand filtration was now applied. Filter capacity was improved by cleaning it with powerful jet steam. Subsequently, Dr. Fuller found that rapid sand filtration worked much better when it was preceded by coagulation and sedimentation techniques. Meanwhile, such waterborne illnesses as cholera and typhoid became less and less common as water chlorination won terrain throughout the world.

But the victory obtained by the invention of chlorination did not last long. After some time the negative effects of this element were discovered. Chlorine vaporizes much faster than water, and it was linked to the aggravation and cause of respiratory disease. Water experts started looking for alternative water disinfectants. In 1902 calcium hypo chlorite and ferric chloride were mixed in a drinking water supply in Belgium, resulting in both coagulation and disinfection. In 1906 ozone was first applied as a disinfectant in France. Additionally, people started installing home water filters and shower filters to prevent negative effects of chlorine in water.

In 1903 water softening was invented as a technique for water desalination. Cations were removed from water by exchanging them by sodium or other cations, in ion exchangers.

Eventually, starting 1914 drinking water standards were implemented for drinking water supplies in public traffic, based on coliform growth. It would take until the 1940s

before drinking water standards applied to municipal drinking water. In 1972, the Clean Water Act was passed in the United States. In 1974 the Safe Drinking Water Act (SDWA) was formulated. The general principle in the developed world now was that every person had the right to safe drinking water.

Starting in 1970, public health concerns shifted from waterborne illnesses caused by disease-causing micro organisms, to anthropogenic water pollution such as pesticide residues and industrial sludge and organic chemicals. Regulation now focused on industrial waste and industrial water contamination, and water treatment plants were adapted. Techniques such as aeration, flocculation, and active carbon adsorption were applied. In the 1980s, membrane development for reverse osmosis was added to the list. Risk assessments were enabled after 1990.

Water treatment experimentation today mainly focuses on disinfection byproducts. An example is trihalomethane (THM) formation from chlorine disinfection. These organics were linked to cancer. Lead also became a concern after it was discovered to corrode from water pipes. The high pH level of disinfected water enabled corrosion. Today, other materials have replaced many lead water pipes.

HISTORY OF DRINKING WATER DISINFECTION

The link between water quality and health has been known since the early ages. Clear water was considered clean water. Swamp areas were associated with fever.
Disinfection has been applied for centuries. Two basic rules dating back to 2000 B.C. state that water must be exposed to sunlight and filtered with charcoal and that impure water must be purified by boiling the water and than dipping a piece of copper in the water seven times, before filtering the water. Descriptions of ancient civilisations were found about boiling water and water storage in silver jugs. To realize water purification copper, silver and electrolysis were applied.

Disinfection has been applied for several decades. However, the mechanism has been known for only one hundred years. In 1680 Anthony van Leeuwenhoek developed the microscope. His discovery of microorganisms was considered a curiosity. It took scientists another two hundred years before they started using the microscope to distinguish microorganisms and other pathogens. The first multiple filter was developed in 1685 by the Italian physician Lu Antonio Porzo. The filter consisted of a settling unit and a sandfiltration unit. In 1746 the French scientist Joseph Amy received the first patent for a filter design, which was applied in households by 1750. The filters consisted of wool, sponges and charcoal.

For the past centuries humans have suffered from diseases such as cholera and the plague. The origin of these diseases was misinterpreted. It was said that the diseases were a devine punishment or were caused by impure air or the alignment of the planets.

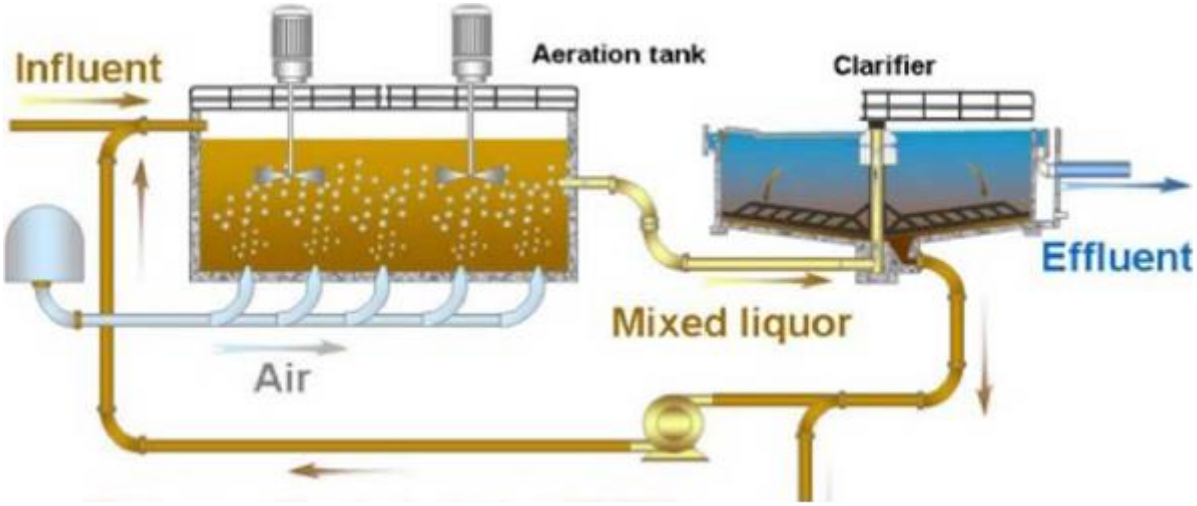
In the nineteenth century the effect of disinfectants, such as chlorine, was discovered. Since 1900 disinfectants are largely applied by drinking water companies to prevent the distribution of diseases and to improve water quality.

WATER TREATMENT MEMBRANE TYPE AND MATERIALS

The water treatments membrane can be defined essentially as a barrier, which separates two phases and restricts transport of various chemicals in a selective manner. A membrane can be homogeneous or heterogeneous, symmetric or asymmetric in structure, solid or liquid can carry a positive or negative charge or be neutral or bipolar. Transport through a water treatments membrane can be affected by convection or by diffusion of individual molecules, induced by an electric field or concentration, pressure or temperature gradient. In the Water treatment Membrane filtration are categorized according to their pore sizes as micro-filtration, ultra filtration, nano filtration and reverse osmosis. Micro filtration uses the largest pore size, reverse osmosis the smallest. Reverse Osmosis water treatment membranes have pore diameters ranging from 5 to 15 A degree (0.5 nm to 1.5 nm). The extremely small size of Reverse Osmosis water treatments membrane pores allows only the smallest organic molecules and unchanged solutes to pass through the semi-permeable membrane along with the water. The water treatments membrane thickness for reverse osmosis may vary from as small as 100 micron to several millimeters. The first commercially available membranes, developed in the mid 1960s, were made of cellulose acetate (CA) manufactured in flat sheets. Modern Cellulose Acetate membranes are modifications of the cellulose acetate structure, including blends and different surface treatments, and are called cellulose or symmetric water treatments membrane.

Non-cellulose water treatments membranes, called thin-film composite membranes, have been developed since the 1970s. These include poly amide membranes with relatively thick asymmetric poly amide support structures and composite membranes with thin-film poly amide or other membrane materials on a porous support structure. Almost all water treatment Reverse Osmosis membranes are made of polymers, cellulose acetate and poly amide types rated at 96%-99+% salt rejection.

ACTIVATED SLUDGE



Return activated sludge (RAS)

Waste activated sludge (WAS)

Activated sludge refers to a mass of microorganisms cultivated in the treatment process to break down organic matter into carbon dioxide, water, and other inorganic compounds. The activated sludge process has three basic components: 1) a reactor in which the microorganisms are kept in suspension, aerated, and in contact with the waste they are treating; 2) liquid-solid separation; and 3) a sludge recycling system for returning activated sludge back to the beginning of the process. There are many variants of activated sludge processes, including variations in the aeration method and the way the sludge is returned to the process.

The process was discovered by the aeration of holding tanks for distributing raw sewage onto land. It was noticed that the nature of the sewage improved during aeration, which was applied mainly to prevent odours from forming. This improvement was even more marked when some of the sludge that was suspended and settled to the bottom during decanting, was re-suspended during aeration of the following batch of sewage. This led to the Fill and Draw method of treatment by which the sludge was allowed to settle to the bottom before decanting the effluent, filling the tank again with raw sewage, re-suspending the sludge by aeration and repeating the decanting process. It was noticed that under these conditions the sludge became more active and this process was referred to as activating the sludge. The basic layout of an activated sludge plant is illustrated in the sketchbelow. The aeration basin is followed by a clarifier, where the active sludge is separated from the liquid and returned (pumped) to the aeration basin, together with the raw influent. The aeration basin or reactor, the clarifier and return sludge pumping form integral parts of an activated sludge system.

The wastewater, containing numerous organic compounds, serves as a food source

for micro-organisms in the mixture of activated sludge. Air is supplied for the respiration or breathing of these organisms and also for keeping the organisms in suspension and in contact with the food source. The organisms use the food to obtain energy, thereby growing to form new micro-organisms, carbon dioxide and water. The mass of organisms is constantly passed to the clarifier to be separated by settling and recycled by pumping back to the aeration basin (return activated sludge - RAS). The surplus sludge (waste activated sludge - WAS) formed by the additional growth of organisms must be removed from the system to keep the total mass of organisms constant**.**

NUTRIENT REMOVAL

Wastewater may also contain high levels of nutrients (nitrogen and phosphorus) that in certain forms may be toxic to fish and invertebrates at very low concentrations (e.g. ammonia) or that can create nuisance conditions in the receiving environment (e.g. weed or algal growth). Weeds and algae may seem to be an aesthetic issue, but algae can produce toxins, and their death and consumption by bacteria (decay) can deplete oxygen in the water and suffocate fish and other aquatic life. Where receiving rivers discharge to lakes or shallow seas, the added nutrients can cause severe eutrophication losing many sensitive clean water fish. The removal of nitrogen and/or phosphorus from wastewater can be achieved either biologically or by chemical precipitation.

Nitrogen removal is effected through the biological reduction of nitrogen from the ammonia to nitrate (nitrification involving nitrifying bacteria such as Nitrobacter and Nitrosomous), and then from nitrate to nitrogen gas (denitrification), which is released to the atmosphere. These conversions require carefully controlled conditions to encourage the appropriate biological communities to form. Sand filters, lagooning and reed beds can all be used to reduce nitrogen. Sometimes the conversion of toxic ammonia to nitrate alone is referred to as tertiary treatment.

Phosphorus removal can be effected biologically in a process called enhanced biological phosphorus removal. In this process specific bacteria, called Polyphosphate accumulating Organisms, are selectively enriched and accumulate large quantities of phosphorus within their cells. When the biomass enriched in these bacteria is separated from the treated water, the bacterial biosolids have a high fertilizer value. Phosphorus removal can also be achieved, usually by chemical precipitation with salts of iron (e.g. ferric chloride) or aluminum (e.g. alum). The resulting chemical sludge, however, is difficult to dispose of, and the use of chemicals in the treatment process is expensive. Although this makes operation difficult and often messy, chemical phosphorous removal requires significantly smaller equipment footprint than biological removal and is easier to operate.

WATER DISTRIBUTION PIPES

A water pipe is any pipe or tube designed to transport drinking water to consumers. If the water is treated before distribution or at the point of use (POU) depends on the context. In well planned and designed water distribution networks, water is generally treated before distribution and sometimes also chlorinated, in order to prevent recontamination on the way to the end user. The varieties of water pipes include large diameter main pipes, which supply entire towns, smaller branch lines that supply a street or group of buildings, or small diameter pipes located within individual buildings. Water pipes can range in size from giant mains of up to 3.65 m in diameter to small 12.7 mm pipes used to feed individual outlets within a building. Materials commonly used to construct water pipes include polyvinyl chloride (PVC), cast iron, copper, steel and in older systems concrete or fired clay. Joining individual water pipe lengths to make up extended runs is possible with flange, nipple, compression or soldered joints (SCOTT 2011).

TYPES OF PIPES

Pipes come in several types and sizes. They can be divided into three main categories: metallic pipes, cement pipes and plastic pipes. Metallic pipes include steel pipes, galvanised iron pipes and cast iron pipes. Cement pipes include concrete cement pipes and asbestos cement pipes. Plastic pipes include plasticised polyvinyl chloride (PVC) pipes.

Steel Pipes. Steel pipes are comparatively expensive, but they are the strongest and most durable of all water supply pipes. They can withstand high water pressure, come in convenient (longer) lengths than most other pipes and thus incur lower installation/transportation costs. They can also be easily welded.

Galvanised Steel or Iron Pipes.Galvanised steel or iron is the traditional piping material in the plumbing industry for the conveyance of water and wastewater. Although still used throughout the world, its popularity is declining. The use of galvanised steel or iron as a conveyer for drinking water is problematic where water flow is slow or static for periods of time because it causes rust from internal corrosion. Galvanised steel or iron piping may also give an unpalatable taste and smell to the water conveyed under corrosive conditions.

Cast Iron Pipes.Cast iron pipes are quite stable and well suited for high water pressure. However, cast iron pipes are heavy, which makes them unsuitable for inaccessible places due to transportation problems. In addition, due to their weight they generally come in short lengths increasing costs for layout and jointing.

Concrete Cement and Asbestos Cement Pipes.Concrete cement pipes are expensive but non-corrosive by nature. Their advantage is that they are extremely strong and durable. However, being bulky and heavy, they are harder and more costly to handle, install and transport.

Plasticised Polyvinyl Chloride (PVC) Pipes. PVC pipes are non-corrosive, extremely light and thus easy to handle and transport. Still, they are strong and come in long lengths that lower installation/transportation costs (LEE n.y.). However, they are prone to physical damage if exposed overground and become brittle when exposed to ultraviolet light. In addition to the problems associated with the expansion and contraction of PVC, the material will soften and deform if exposed to temperatures over 65 °C.

EXERCISES

1. Answer the questions:

1. What is your field of science/research?
2. What is your particular area of research? What are you specializing in?
3. What are the latest achievements in this field of science?
4. What fundamental discoveries have been made in your field of science/ research?
5. Can you name some outstanding researchers in your field of science? What contribution have they made?
6. Do achievements in your branch of science/ research influence everyday life? In what way?
7. What further developments can you predict in your field of science/ research?

Active vocabulary

- to do/to carry out/ to carry on/ to conduct research
- to contribute/ to make a contribution to
- to influence/ to affect
- to study/ to investigate/ to explore
- to put forward an idea
- to suggest an idea/ a theory/a hypothesis
- to advance/ to develop/ to modify a theory
- to predict/ to forecast/ to foresee
- to accumulate knowledge
- field of science/ research
- latest/recent achievements/developments/advances
- an outstanding/prominent/world-known scientists/researcher

2. Complete the following sentences. Speak about your field of science/ research.

1. I do/ carry out research in the field of…
2. It is the branch of science that studies…
3. Major developments include advances in …
4. Remarkable advances have been made …

5. My current field of science/research is …
6. It is difficult/ not difficult to foresee/predict … .

Active vocabulary
- to deal with/ to consider the problem
- to be the subject of special/particular interest
- to be interested in
- to be of great/little/no interest/importance/significance/value/use
- to take up the problem
- to work on the problem
- a lot of/little/no literature is available on the problem

3. Answer the questions:
1. What is your research problem?
2. What is the subject of your research?
3. What is of special interest in the problem of your research?
4. Why has the interest in this problem increased considerably in recent years?
5. What concept is your research based on?
6. Is there much literature available on your research problem?
7. What are the main aspects of the problem that have been considered?

Active vocabulary
- purpose/aim/objective/goal/target
- a method/a technique/ a procedure
- detection/identification/observation
- measurement/calculation/computation/approximation
- consideration/generalization/deduction/assumption
- modeling/simulation
- advantages/merits
- disadvantages/shortcomings/limitations
- accurate/precise
- accuracy/precision
- reliable/valid/conventional/effective/useful/valuable
- data/results/method
- to make an experiment/analysis
- to reveal/to find/to confirm/to prove evidence
- to study/to examine
- to collect data
- to create

- to improve
- to work out/to develop/to design
- to verify/to check
- to approve/ to disapprove an assumption
- to use/to employ/to apply
- to allow/to permit/to provide
- to come into use
- results/findings/data/observations/evidence
- comprehensive/extensive
- detailed
- remarkable/encouraging/convincing
- preliminary
- sufficient/insufficient
- to collect/to get/to receive/to obtain data
- to treat the problem
- to succeed in/to make progress in/to be a success
- to fail in
- to be similar to/ to be the same as
- to coincide/ to be consistent with
- to agree with/to fit the assumption
- to support/in support of
- to conclude/to come to/to bring to a conclusion/to make conclusions

4. Answer the questions:

1. What is the subject of your current research?
2. What is the purpose of your research?
3. What method do you employ? Why?
4. What are the advantages of the method used over other methods or techniques?
5. What does the method consist in?
6. Do you find the method reliable/precise? Why?
7. How much time will it take you to complete your research successfully?
8. Have you already obtained any research results?
9. Has your research been successful?
10. Do your results coincide with those obtained by other researchers?
11. Are your results of theoretical or practical interest?
12. Do the data/results/observations/findings allow you to come to any definite conclusion(s)?
13. What conclusions have you come to?
14. How long will it take you to finish your research?
15. Are you going to publish the results obtained?

5. Complete the sentences with the words from the Active vocabulary section. Speak about the purpose of your current research, the method used and the results obtained.

1.Currently I …
2. I make the experiments/analyses in order to …
3. The purpose of my experiments/analyses is to …
4. In our current research we … the method of ….
5. The method/technique allows/permits … to ….
6. The method/ technique makes it possible to …
7. The method proves to be …
8. At present a lot of work is being done to …
9. The results we have … so far cannot be used to ….
10. The evidence appears to …
11. As a result of numerous experiments performed we've obtained sufficient data to …
12. We have come to the conclusion that … .

ТЕРМИНОЛОГИЧЕСКИЙ СЛОВАРЬ

A
absorptivity - абсорбционная способность,
addition - добавление, привнесение,
alum - алюминий,
algae - водоросли,
artificial membrane - мембрана из искусственного волокна,
ammonia - азот,
activated sludge - активный ил,
aeration tank - аэротенк,
anaerobic digestion - анаэробное сбраживание
B
biochemical oxygen demand (BOD) - биохимическая потребность в кислороде,
bar-screen - решетка,
biofilm - биопленка (тонкий слой микроорганизмов),
biosolids - твердые вещества биологического происхождения.
C
conductivity - электропроводность,
chemical oxygen demand (COD) - химическая потребность в кислороде,
coagulation - коагуляция,
chloride - хлорид,
clarification - осветление,
chemicals - реагенты,
conditioning - кондиционирование,
combined sewerage system - комбинированная канализационная система,
cleanout - ревизия (канализационной сети),
constructed wetlands - поле фильтрации,
carbon dioxide - углекислый газ,
composting - компостирование.
D
dissolved oxygen (DO) - растворенный кислород,
disinfection - обеззараживание,
decomposition - распад, разложение,
domestic wastewater - хозяйственно-бытовые сточные воды,
disposal - удаление, устранение.
E
evaporation - испарение,
effluent - выпуск сточных вод,

endogenous respiration - эндогенное дыхание.
F
feces - фекалии,
flocculation - хлопьеобразование,
floc - хлопья,
flotation - флотация,
flocculation tank\basin - камера хлопьеобразование,
fluoridation - фторирование,
filter media - фильтрующая загрузка,
fermented - вызывать брожение, ферментировать,
flotation thickening - флотационный илоуплотнитель.
H
hydrogen - водород,
hardness - твердый прочный,
high lift pumps - насосная станция второго подъема.
I
infiltration - просачивание,
influent - поступление (приток).
G
ground water - грунтовая вода,
grit chamber - песколовка,
gravity thickening - гравитационный илоуплотнитель.
L
lime - известь,
low lift pumping station - насосная станция первого подъема,
liquid - жидкость,
lagooning - биологический пруд.
M
measurement - измерение,
mesh rotating screens - механическое барабанное сито,
moving bed biological reactor - биореактор с подвижной загрузкой,
mesophilic digestion - мезофильное сбраживание,
methane - метан.
N
nitrite - нитрит,
nitrate - нитрат.
O
oxygen - кислород,
ozonation system - система озонирования.

P
pollution - загрязнение,
particle - частица,
precipitation - выпадение в осадок,
purification methods - методы очистки,
primary treatment - первичная очистка,
pumping - перекачивание насосами,
pipe - труба,
pre-conditioning - предварительное кондиционирование,
pre-chlorination - предварительное хлорирование.
Q
quality - качество.
R
runoff - поверхностный сток,
reverse osmosis - обратный осмос,
raw water - неочищенная вода,
rapid mix chamber\tank - смеситель,
rapid gravity filter - скорый безнапорный фильтр,
return activated sludge - рециркуляционный активный ил.
S
surface water - поверхностные воды,
spectrophotometer substance - субстанция, suspended
settle - отстаивать,
salt - соль,
sludge - осадок,
sedimentation - осаждение,
settling tank - отстойник,
semi-permeable membrane - полунепроницаемая мембрана,
separation - разделение,
sedimentation basin\tank - отстойник,
secondary treatment - вторичная очистка воды,
storage - хранилище,
solids - твердые вещества,
sewage - канализация,
separate sewerage system - раздельная система канализации.
T
turbidity - мутность,
total suspended solids (tss) - общее число взвешенных веществ,
tertiary treatment - доочистка воды,

thermophilic digestion - термофильное сбраживание,
thermal depolymerization - термическая деполимеризация.
W
well - колодец,
wastewater - сточный воды,
wastewater treatment - очистка сточных вод.

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