МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РОССИЙСКОЙ ФЕДЕРАЦИИ
Государственное образовательное учреждение высшего профессионального образования
«НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ»
«**ТОМСКИЙ ПОЛИТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ**»
ЮРГИНСКИЙ ТЕХНОЛОГИЧЕСКИЙ ИНСТИТУТ

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АНГЛИЙСКИЙ ДЛЯ СПЕЦИАЛИСТОВ ПО ЗАЩИТЕ ОКРУЖАЮЩЕЙ СРЕДЫ И БЕЗОПАСНОСТИ ЖИЗНЕДЕЯТЕЛЬНОСТИ

Рекомендовано в качестве учебного пособия
Научно-методическим советом
Юргинского технологического института (филиала)
Томского политехнического университета

Издательство
Томского политехнического университета
2011

УДК 811 (Англ.)(075)
ББК 81.2я73
Г 82

Ульянова О.В.
Г 82 Английский для специалистов по защите окружающей среды и безопасности жизнедеятельности: учебное пособие / О.В. Ульянова; Юргинский технологический институт. – Томск: Изд-во Томского политехнического университета, 2011. – 127с.

Пособие содержит аутентичные тексты на английском языке, посвященные широкому кругу вопросов, связанных с защитой человека и окружающей среды от техногенных воздействий; упражнения направленные на развитие навыков чтения и устной речи по профессиональной тематике, а также приложения.

Предназначено для студентов вузов, обучающихся по направлению 280700 «Техносферная безопасность».

УДК 811 (Англ.)(075)
ББК 81.2я73

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ВВЕДЕНИЕ

Данное учебное пособие предназначено для подготовки по английскому языку студентов высших учебных заведений, обучающихся по специальности **280700** «Техносферная безопасность». Пособие нацелено на обучение студентов 2 курса, уже изучивших базовый курс иностранного языка в вузе и владеющих основами грамматики и лексики общелитературного английского языка. В пособие включены аутентичные тексты на английском языке по широкому кругу вопросов, связанных с защитой человека и окружающей среды от опасных техногенных воздействий. Тексты снабжены упражнениями и заданиями, направленными на развитие навыков чтения, реферирования и аннотирования литературы по специальности, а также устной речи на профессиональные темы и некоторых видов письма.

Работа с материалом, представленным в пособии, поможет студентам не только овладеть английской терминологией из области защиты окружающей среды и безопасности жизнедеятельности, но и познакомиться с некоторыми аспектами видения этой проблемы в англоязычных странах.

Пособие рассчитано на 50-60 часов аудиторной и самостоятельной работы студентов.

PART 1

WHAT IS YOUR FUTURE OCCUPATION?

1. Study the words in the box and make as many word combinations (V+N) as you can.

Verbs	Nouns
study	relationships
examine	environment
solve	population size
collect	over consumption
conduct	air pollution
contribute	research
protect	(soil, plant, etc.) samples
evaluate	wildlife
conserve	regulations
develop	volunteer organization
train	endangered species
advise on	community
improve	hazards
insure	potential dangers
perform	safety
determine	water systems
design	surrounding community
prevent	harmful conditions

2. Study the word building models and complete the table.

V+tion		V+ment/ance		Other ways	
collect	***collection***	develop	***development***	study	***study***
protect		improve		analyze	***analysis***
evaluate		insure	***insurance****	advise	***advice***
contribute		perform		train	***training***
examine	***examination***				
determine					
conserve					
solve	***solution***	**insurance – страхование*			

3. Read and say which of the tasks listed are included in your professional scope.

- To study the relationships of living things to their environment;
- to examine the effects of different factors (rainfall, temperature, forest fires) and many human activities have on ecosystem;
- to protect the health and safety of people in the workplace and the community;
- to collect water, soil, plant or animal samples, and count and identify organisms;
- to advise on treatment and containment (*сдерживание*);
- to conduct hazardous-waste management studies;
- to protect native wildlife;
- to advise government on environmental issues;
- to model problems and evaluate possible solutions;
- to conserve resources in many ways;
- to develop regulations to prevent hazards;
- to contribute to volunteer organizations protecting environment;
- to examine the workplace for hazards and potential dangers;
- control potentially dangerous situations in the workplace and the community;
- to make recommendations on improving safety;
- to ensure that workers are following health and safety rules;
- design municipal industrial wastewater treatment systems;
- develop broad safety programs;
- point out safety hazards;
- suggest ways to fix unsafe structures.

4. Translate the phrases into Russian.

Ozone depletion;
ozone depletion problem.

Public health;
public health issues.

Forest fires;
forest fires prevention.

Waste disposal;
waste disposal project.

Noise level;
noise level reduction.

Water pollution;
water pollution research;
water pollution research results.

Automobile exhausts;
automobile exhausts reduction;
automobile exhausts reduction problem.

Waste water;
waste water management;
waste water management studies.

Industrial waste water treatment systems;
industrial waste water treatment system construction project.

5. Read the descriptions of four occupations: ecologist, safety engineer, industrial hygienist, environmental engineer and say which corresponds to your future profession.

ECOLOGIST

Job description	Typical tasks	Workplace
Ecologists study the relationships of living things to their environment and with each other, and examine the effects of a wide range of factors such as population size, rainfall, temperature, forest fires and major construction projects. They try to solve the impact that many human activities,	Conduct field research (to collect water, soil, plant or animal samples, and count and identify organisms) and analyze field data. Work to protect native wildlife, plants and ecosystems. Use computer simulations to model problems and evaluate possible solutions.	Generally, they work for governments, universities and colleges, research institutions, conservation organizations, environmental consulting firms, and large private corporations such as manufacturers of agricultural products, forestry companies, paper manufacturers, and oil and gas

such as over consumption and air pollution have on the environment and ecosystem in the long term.	Prepare written reports and recommendations for government and environmental agencies.	companies. Some ecologists are self-employed and run their own consulting and research firms.

INDUSTRIAL HYGIENIST

Job description	Typical tasks	Workplace
Industrial hygienists are scientists and engineers committed to protecting the health and safety of people in the workplace and the community. The goal of the industrial hygienist is to keep workers, their families, and the community healthy and safe. They play a vital part in ensuring that federal, state, and local laws and regulations are followed in the work environment.	Investigate and examine the workplace for hazards and potential dangers. Collect air or water samples and monitor noise levels to determine if any harmful conditions Make recommendations on improving the safety of workers and the surrounding community. Train and educating the community about job-related risks. Ensure that workers are properly following health and safety procedures.	Industrial hygienist can work as: ~compliance officer in a regulatory agency; ~professional working for the protection of the workforce in a company; ~consultant working for companies; ~researcher performing laboratory or field occupational hygiene work.

ENVIRONMENTAL ENGINEER

Job description	Typical tasks	Workplace
Environmental engineering is the application of science and engineering principles to improve the environment (air, water, and/or land resources), to	Conduct hazardous waste management studies to evaluate the significance of such hazards. Advise on treatment	Environmental engineer can be: ~a researcher; ~a designer; ~a planner; ~an operator of pollution

provide healthy water, air, and land for human habitation and for other organisms, and to recover polluted sites. Environmental engineering involves waste water management and air pollution control, recycling, waste disposal, radiation protection, industrial hygiene, environmental sustainability, and public health issues as well as a knowledge of environmental engineering law.	and containment (*сдерживание*), and develop regulations to prevent hazards. Design municipal water supply and industrial wastewater treatment systems. Address local and worldwide enviromental issues such as the effects of acid rain, global warming, ozone depletion, water pollution and air pollution from automobile exhausts and industrial sources.	control facilities; ~a professor; ~a government regulatory agency official; ~a manager of programs. The employer can be: ~private consulting engineering firms; ~universities; ~private research firms; ~testing laboratories; ~government agencies of all types (federal, state and local); ~all types of major corporations and private businesses.

SAFETY ENGINEER

Job description	**Typical tasks**	**Workplace**
Safety engineering is the process of designing safer products and structures. Safety engineering also can involve improving the safety of work sites, manufacturing facilities and products as safety standards change. The principles of safety engineering are to identify potential safety risks and mitigate them. Mitigation includes reducing the odds of accidents or reducing the severity of an accident once it occurs. This process is accomplished by changing the product design to prevent	Develop broad safety programs. Study the buildings, equipment, procedures, and records of accidents in their plant and point out safety hazards. Suggest ways to fix unsafe structures or recommend changes in the layout of the plant. Work with designers to make sure that their company's products are safe. Eliminate unsafe practices and conditions in industrial plants, mines, and stores as well as on construction	According to the "Occupational Outlook Handbook," about 7,000 mining safety engineers and 23,000 safety engineers are employed in the United States. Safety engineers work in architectural firms and engineering design companies. The engineers also are employed at construction work sites, mines, and manufacturing facilities.

dangerous failures from occurring. Safety measures also are added to protect people if a hazard does occur.	sites and throughout transportation systems.

6. Complete the sentences using information from the text which describes your future profession.

My future job involves ____
I'll have to ____.
I can work in ____.

7. You will read about the job of industrial hygienists. Before you read find English equivalents for these terms in the text and write them down into your dictionary.

Сохранение здоровья, предотвращать профессиональные болезни, опасность для здоровья, условия труда, чрезмерный шум, опасные материалы, пыль, испарения, химикаты, определять вредные условия, измерять уровень радиоактивности, проводить обучающие семинары, анализировать образцы, тест надежности, хранение и употребление, токсичные отходы, безопасность продукции.

INDUSTRIAL HYGIENIST

Industrial hygienists are occupational health and safety specialists concerned with the **maintenance of good health** among industrial workers. They work to **prevent occupational diseases** among employees and minimize environmental **health hazards** in the workplace. They are trained to predict, recognize, evaluate, and lessen negative **working conditions** that may cause illness or damage the health of workers. Such conditions may include **excessive noise** or the presence of **dust, vapors, chemicals,** and other potentially **hazardous materials** common to some industrial sites. Industrial hygienists frequently collect air or water samples and monitor noise levels to determine if any **harmful conditions** exist. They may also conduct radiological studies **to measure radioactivity levels** at job sites. Industrial hygienists also examine stress-related health problems.

Industrial hygienists are employed by large industrial manufacturers, insurance companies, public health agencies, and consulting firms. An industrial hygienist **conducts a training session** in which he informs workers about the dangers of particular chemicals. Some spend most of their time in laboratories, where they **analyze air samples**, determine the effects of certain chemicals, or run **tests on the reliability** of health equipment, such as pacemakers and respirators. These professionals are sometimes called industrial hygiene chemists.

Other hygienists work on-site, where they consult with plant management, labor organizations, government officials, and in some cases environmental groups to establish health and safety programs that satisfy the different needs of all these groups. Industrial hygienists who specialize in pollution problems may help devise systems for the safe **storage** or **disposal** of **toxic wastes** from an industrial plant. Those with backgrounds in engineering may conduct detailed plant surveys to locate and correct work hazards. These professionals are called industrial hygiene engineers.

Industrial hygienists keep companies and labor groups informed of federal, state, and local health requirements. They prepare hazard communication sheets and interactive computer software to ensure that workers understand the dangers of the chemicals and equipment they use. Industrial hygienists are sometimes called on to testify at governmental hearings on product safety, working conditions, and environmental pollution. They also may be asked to represent their employers in workers' compensation hearings.

8. Add to the list of tasks of industrial hygienists.

GRAMMAR REVIEW

9. Translate the underlined sentences in the text. Mind infinitive constructions:

They work ***to prevent occupational diseases…***
They are trained ***to predict, recognize, evaluate…***

Find similar infinitive constructions in the text. Read the sentences and translate them into Russian.

To learn more about Infinitives Revise Appendix 1 §1.2 (FORMS OF INFINITIVE AND ITS FUNCTIONS) and do Activities 29–32.

10. Define functions of infinitives in the sentences and translate into Russian.

1. **To prevent occupational diseases** is extremely important for the development of modern industry.

2. **To study this phenomenon** requires much knowledge.
3. Our task is **to reduce hazardous wastes** by 15 % this year.
4. Eecologists **must protect** native wildlife.
5. They hope **to be sent to the conference.**
6. The manager was asked **to tell about green policy in his company.**
7. They work to **prevent occupational diseases** among employees.
8. **To measure radioactivity levels** at job sites they conduct radiological studies.
9. This problem is too complex **to be solved by students.**
10. This method is accurate enough **to give reliable results.**
11. The process **to be analysed in this article** is known as evaporation.
12. Our plant produces automatic machine tools **to be exported to Asian countries.**
13. The laboratory assistant will be the last **to leave the classroom.**
14. The problem **to find a safer way of production** is to be solved soon.

11. Translate into Russian.

1. To prevent occupational diseases means…
   To prevent occupational diseases one should…
2. To improve old processes one should…
   To improve old processes is vital for…
3. To reduce wastes it is necessary…
   To reduce wastes requires…
4. To analyze water samples an expert should…
   The water samples to be analyzed should be…
5. To be utilized in industry the metals are to be…
   The metals to be utilized in industry are to be…
6. Our task is to solve the problem of…
   The company management is to solve the problem of…
7. The new director is to improve…
   The problem is to improve…

12. Translate into Russian.

1. Ecologists try and promote sustainability ideas, getting more people to understand that we must help the future environment and ecosystem.
2. Ecologists also work with scientific and mathematical models to analyze and interpret correlations between actions and effects on the environment.

3. They have applied thoughtful principles to attempt to improve the quality of their environment.
4. The main task of environmental engineers is to protect public health by protecting, preserving, and enhancing the environment.
5. Also, they develop new forms of energy and ways to increase the efficiency of generating and using energy.
6. They try to get people to convert to environmental friendly energy and products.
7. The most common living things are very small and difficult to quantify.
8. One way to estimate primary production is by finding the leaf area of the ecosystem.
9. To be effective, personal protective equipment must be individually selected and properly fitted.
10. Gases are formless fluids that expand to occupy the space or enclosure in which they are confined.
11. Shielding also is a way to protect against radiation.
12. To determine concentration, the color of the sample is either compared visually with manufacturer supplied standards or inserted into a photometer.
13. It's now up to governments to decide whether to support this technology.
14. We can use the steam and hot water to heat buildings or generate electricity.
15. The goal was to anticipate changes in soil behavior.

13. Read more about the job of ecologists. Before you read find English equivalents for these terms in the text and write them down into your dictionary.

Устойчивое развитие; удовлетворять потребности; потреблять и производить; краткосрочный; долгосрочный; продвигать идеи устойчивого развития; куча мусора; собранные данные; полевые работы; сохранение природы; естественные места обитания; загрязняющие вещества; естественная растительность; принимать меры предосторожности; подвергаться.

ECOLOGIST

Ecologists examine the relationship between the environment and actions that affect it, including rainfall, pollution, temperature shifts, and industrialization. The basic principle that they follow is that all life on Earth is connected and it is supposed to fit together harmoniously, although we have seen over time that it does not.

Sustainable development, which is loosely the idea of **meeting the needs** of the present without compromising the ability for future generations to meet their own needs, is a very important field of study. Ecologists study how humans **consume and produce** for their own personal, **short-term** benefit, without considering the **long-term** effects of their actions. Ecologists try and **promote sustainability ideas**, getting more people to understand that we must sometimes act in ways that will help the future environment and ecosystem.

The vision of an ecologist as a bearded, outdoorsy, mountain-man standing on **a pile of litter** is based on about 1 out of 100 of all ecologists. "We're not all Grizzly Adams!" wrote one ecological scientist, and she is right; the most accurate picture of an ecologist would be in a lab coat analyzing volumes of **collected data**. Some **fieldwork** is required-at the most, three to six months per year, but more often two to four weeks per year. Ecologists also work with scientific and mathematical models to analyze and interpret correlations between actions and effects on the environment.

Ecologists usually specialize in one or more of the following biological areas: botany, marine biology, microbiology, soil science, toxicology, zoology or related disciplines concerned with **conservation of the environment**. Often working as part of multi-disciplinary teams, ecologists conduct research studies into problems such as the effects of dam construction, mining, logging and recreational use on **natural habitats**, the management of fish, wildlife and forestry resources, and the effects of **pollutants** discharged into the air by factories or vehicles on **natural vegetation** and wildlife.

Some ecologists work for not-for-profit environmental groups; others work for large corporations or the government. Ecologists need to be safety conscious and **take all necessary precautions** as they may **be exposed** to hazardous chemicals or travel in dangerous areas.

14. Add to the list of tasks of industrial hygienists.

15. Complete the sentences with the words.

Simulation, reliability, conservation, sustainable, safety, conditions, samples, relationships, excessive, hazards.

The purpose of ecologists' job is to study the 1)________________ of people and their environment. They are concerned with

2)__________________ of environment. One of the ecological key ideas is the idea of 3)___________________ development. The methods used in their work include collecting air, water, plants 4)____________________; analyzing the collected data; making 5)_____________ models in order to evaluate possible solutions.

The purpose of industrial hygienists' work is to minimize 6)_________________ at a workplace and to improve working 7)_____________________. Harmful factors at an enterprise include dust, vapors, chemicals, 8)_______________________ noise, radioactivity. One of the tasks on industrial hygienists is to test health equipment on 9)_____________________. They make recommendations on improving 10)_________________ of workers.

16. Read the list of requirement for the job of ecologist. Agree or disagree with each item in the list. Prove your ideas.

Example:
Ecologist really needs ***keen analytic mind*** *because he has to do research, analyze data and make conclusions.*

- Keen analytic mind;
- strong essay-writing and report-writing skills;
- excellent communication skills;
- ability to work either independently and as part of a team;
- physical stamina;
- love of the outdoors and wildlife;
- ability to learn new concepts;
- ability to be objective.

17. Divide the tasks which industrial hygienists and ecologists have to do into groups.

Experimental work	Analytical tasks	Consulting work

18. Read more about the job of environmental engineers.

ENVIRONMENTAL ENGINEER

Briefly speaking, the main task of environmental engineers is to protect **public health** by protecting (from further degradation), preserving (the present condition of), and enhancing the environment. Also, they develop new forms of energy and ways **to increase the efficiency** of generating and using energy. They try to get people to convert to **environmental friendly** energy and products.

Environmental engineering is a diverse field, which emphasizes several areas: process engineering, environmental chemistry, water and **sewage** treatment (sanitary engineering), **waste reduction**, and **pollution prevention**. Environmental engineering is a synthesis of various disciplines, incorporating elements from the following:

Agricultural engineering;
Biology;
Chemical engineering;
Chemistry;
Civil engineering;
Ecology;
Geography;
Geology;
Hydrogeology;
Public health;
Solid waste;
Hazardous waste;
Water treatment;
Wastewater treatment;
Statistics.

Environmental engineering training offers you opportunities to work in any aspect of environmental protection. The major areas include air pollution control, industrial hygiene, radiation protection, hazardous waste management, toxic materials control, **water supply**, wastewater management, storm water management, solid waste disposal, public health, and land management. And, within each of these major categories are many sub-specialties.

Environmental engineering provides limitless opportunities as to type of work, for whom you work, and where you work. A career in environmental engineering provides a comfortable salary, job security, and considerable **personal satisfaction**. Since before the turn of this century, there have always been many more jobs than environmental engineers to fill them. So, you will never be out of work. However, the work of an environmental engineer changes with changing government policies and the public's priorities – for a time you might work with wastewater, then for another time with solid waste and still other specialties before retirement. Accordingly, **a commitment to life-long learning** is essential – a college degree is just the beginning of one's education.

Your work can take you around the world. It can be done inside and out; typically, most jobs will find you inside about 75 percent of the time and 25 percent outdoors. However, there are many instances of 100 percent either way. Since most pollution problems are located where there are concentrations of people, the largest number of job opportunities (your employer's location) will coincide with where the greatest number of people live. However, modern information technologies are operating to alter the above described historic pattern.

19. Find English equivalents of these terms in the text and write them down into your dictionary.

Здоровье общества, увеличить эффективность, водоснабжение, сточные воды, очистка воды, экологически чистый, сокращение отходов, предотвращение загрязнения, опасные отходы, личное удовлетворение, готовность к обучению на протяжении всей жизни.

20. Add to the list of tasks of environmental engineers.

19. Tell what you think about the job of environmental engineers. Use the prompts below.

The job of environmental engineers is important because they help to ____.
It is difficult because it requires __________________________________.
It’s interesting / not interesting because they deal with ____.

21. Read more about the job of safety engineers. Before you read find English equivalents for these terms in the text and write them down into your dictionary.

Проводить проверку оборудования, соответствовать нормам безопасности, аварийные выключатели, система аварийной сигнализации, выявлять потенциальные риски, порядок действий в аварийной обстановке, система оповещения об опасности.

SAFETY ENGINEER

Safety engineers serve vital roles in a wide range of workplace settings, including manufacturing and the service sector. Safety engineers' jobs revolve around implementing and maintaining safety policies, procedures and equipment. Workers' lives can depend on safety engineers' thoroughness and effectiveness. Because of this, safety engineer positions include strict applicant requirements.

Safety Audits

Safety engineers regularly **perform audits of the facilities,** systematically checking various mechanical components and work processes to ensure they are **compliant with safety standards**. Engineers will check things like **emergency switches** for factory equipment, **hardhats** and **hazard warning systems** on construction sites, and roller coaster machinery in theme parks. Safety audits often include checking required safety documentation, such as maintenance logs for equipment, to ensure that employees are following procedures.

Monitoring

Technology facilitates the gathering of large amounts of data. Part of a safety engineer's job is to review a range of statistical reports on vital safety issues. On any given day, a safety engineer may review reports showing the percentage increase or decrease in reported accidents for the month, or the number of times machinery has been shut down for maintenance, for example. Engineers monitor these reports **to spot potential safety hazards** and address issues early.

Safety Programs

It is the job of safety engineers to develop the formal **safety compliance programs** of their companies or job sites. Engineers put policies in place to implement a comprehensive safety program, so that all employees know their duties and **emergency procedures**. Engineers continually assess current safety standards, making changes as operations change.

Training

In addition to companywide safety policies, safety engineers may be required to create and lead training programs for new hires and existing employees. Employees must be trained in a range of safety procedures, such as automatic external defibrillator (AED) operation, emergency evacuation procedures and **hazard reporting systems**. Safety engineers may conduct advanced training courses for employees with especially dangerous job roles. Construction workers who work on high beams, for example, require special training on the use of safety harnesses and safety-related communication on the job.

22. Add to the list of tasks of environmental engineers.

GRAMMAR REVIEW

Revise TENSES IN ACTIVE (Appendix 1 §1.1) and do Activities 23–25.

23. Match the sentences with adverbial modifiers of time.
now already usually yesterday next week

1. We have investigated the workplace for hazards.
2. They are collecting soil samples.
3. Ecologists prepare reports and recommendations for government.
4. Workers will be trained about job related risks.
5. We used computer to model the problem and evaluate solutions.

24. Write down into your notebook:

1) special subjects you ***are studying*** this term;
2) special subjects you ***studied*** last term;
3) special subjects you ***are going to study*** next term;
4) tasks which you ***performed*** during your industrial training;
5) tasks you ***have been trained*** for at the institute;
6) types of organizations you ***have worked for*** before;
7) types of organizations you ***will*** probably ***work*** for in the future.

25. Use your notes in the previous Activity to tell about your professional training and your future job. Mind the tenses.

26. Read about educational requirements and salary for the four jobs in the USA and answer the questions:

1) for industrial hygienist;
2) for ecologist;
3) for environmental engineer;
4) for safety engineer.

- What background sciences do you have to study?
- What is the lowest degree you have to get?
- What is the most desirable degree?
- Which profession requires wider qualification?
- Which job is better paid?

INDUSTRIAL HYGIENIST

Educational requirements

High school students interested in careers in industrial hygiene should take biology, chemistry, mathematics, and physics. You generally need at least a bachelor's degree in science or engineering to become an industrial hygienist. Many employers prefer to hire applicants who have graduate-level training. It usually takes a minimum of four years to earn a bachelor's degree and one or two additional years of study to earn a master's degree. A good background in physical or biological sciences is a sound base for entry into this career. Engineers, chemists, physicians, nurses, toxicologists, and statisticians may move from these fields into positions in industrial hygiene.

Average Earnings

Salaries for industrial hygienists vary depending on their experience and education as well as the location and kind of job. In 2006 the average annual income of industrial hygienists with at least four years of experience was $69,103.

ECOLOGIST

Educational requirements

Ecologists must have at least one undergraduate degree with a solid grounding in biology, organic and inorganic chemistry, physics, mathematics, calculus, statistics and computer science. Depending on their area of specialization, ecologists may also have an academic background in such diverse subjects as climatology, economics, geology, mathematical modeling, meteorology, oceanography, sociology or soil science. Most research jobs in ecology require a graduate degree: usually a master's degree, but sometimes a PhD if you want to teach at the university level.

Average Earnings:

Entry Level Salary:
$29,920
Average Salary:
$47,600
Maximum Salary:
$78,200

ENVIRONMENTAL ENGINEER

Educational requirements

Entry requires a B.S. degree in engineering – probably civil, chemical, mechanical or environmental. And, while you are still comfortable with the school life, you should take another year or so to get a Masters degree in environmental engineering (more and more employers are giving preference to those who have a Masters degree). Ph.D will provide additional advantages in your subsequent career.

You must do your best in the math, science and engineering courses that comprise any engineering degree. Equally important, you need to focus on the humanities as it is necessary that you understand how people and societies function. You also need to work on developing your writing and speaking skills. Environmental engineers must be able to communicate effectively with people of all types if they are to succeed in solving problems.

Average Earnings

Starting salaries range from $36-$42,000 with some as much as $48,000; with a Masters degree, $40-$45,000; and with a Ph.D.,$42-$50,000. A licensed engineer (it takes a minimum of four years of post B.S. degree experience to qualify) with five years experience can expect to earn $50-$60,000.

SAFETY ENGINEER

Educational requirements

You generally need a bachelor's degree in science or engineering to become a safety engineer. It usually takes a minimum of four years to get this formal training. Some employers prefer to hire graduates with special degrees in safety management or occupational safety and health. Others look for people who have a master's degree or some work experience in a related field. Undergraduate courses should include behavioral, medical, and social sciences. Many companies provide additional training for their employees.

In some cases engineers need to be licensed by the state in which they work. They generally need a degree from an approved engineering college, about four years of work experience as an engineer, and a passing grade on a state examination before being licensed as professional engineers.

Average Earnings

Salaries vary depending on the safety engineer's experience and education as well as the location and the kind of job. In 2009 the median annual income of safety engineers was of $83,000. Benefits include paid holidays and vacations, health insurance, and pension plans.

INFORMATION SEARCH

27. Learn and write about educational requirements and salary for these jobs in Russia.

PRESENTATION

28. Prepare a presentation or make a report about the profession of industrial hygienist / ecologist / environmental engineer / safety engineer. Follow the plan.

Professional scope
Typical tasks
Job characteristics
Personal qualities required for the job
Educational requirements
Career possibilities

Consult Appendix 2 (HOW TO MAKE A GOOD PRESENTATION)

PART 2

ECOLOGY AS A SCIENCE

1. Choose the best definition for ecology. Think and say what sciences other definitions refer to.

Ecology is the study of

a) matter and natural forces;
b) of living things;
c) relations of animals, plants and people to each other and to their surroundings;
d) the way in which wealth* is produced and used;
e) government;
f) substances which make up the Universe, how these substances combine and behave;
g) the countries of the world and the Earth's surface.

****wealth** is what a country or a person has (money, goods, etc.)*

2. Think and say if ecology has anything in common with other sciences. Guess the sciences mentioned and fill in the gaps.

Ecology studies relations of living organisms to each other and to their surroundings on different levels, from proteins and nucleic acids like ch_______________, to individuals like b____________________ , and finally at the level of populations, communities, and ecosystems, like g_______________. It also has social aspect as far as it focuses on interaction of people and their environment*. Thus ecology is linked with e__________________ and p_________.

****environment** is everything around us: the air, the water and the land, as well as the plants, animals and microorganisms.*

3. Think and say in which spheres of human activity scientifically based ecological knowledge are needed.

4. You will read the text ECOLOGY AS A SCIENCE. Before you read do the tasks below.

A. Study the definition of one of the key terms of ecology and guess the meanings of related terms.

Biota *is the whole population of living organisms of a certain area.*

- biotic
- abiotic

B. Look through the text and write out special terms of ecology. Check their meanings in a dictionary.

Example: living organism

5. Read the text and answer the question:

1. When did the science of ecology appear?
2. What is general principle of ecology?
3. What is the difference between science of ecology and science of environment?

ECOLOGY AS A SCIENCE

Ecology as an independent science was formed to the time of the 1900 year approximately. The term "ecology" is derived from Greek oicos–home and logus–science. It was suggested by German biologist Ernst Heckel in 1869 year. Consequently , this science is very young and is on its stage of the rapid increase.

There are many definitions of ecology, but the majority of modern researchers suppose, that the ecology is a science, which studies conditions of living organisms' being and the interrelation between organisms and environment, where they inhabit.

Theory in ecology consists of principles used to construct models. Unlike evolutionary theory, ecology has no generally accepted global principles. Contemporary ecology consists of patchwork of sub-disciplines including population ecology, community ecology, ecosystem ecology, metapopulation ecology, metacommunity ecology, evolutionary ecology, functional ecology, behavioral ecology. What is common to all this fields is the view that: 1) different biota interact in ways that can be described with sufficient precision and generality to permit their scientific study; 2) ecological interactions set the stage for evolution primarily because they provide an external components of an entity fitness.

It's necessary to pay attention to the interrelation of the ecology and nature security. Scientists of the West differ science of ecology and sciences of the environment. The ecology studies three types of factors, which have an influence on organisms:

- abiotic,
- biotic,
- antropogeneous.

The nature security sees into the third factor only the human effect on the environment doesn't concur with total ecology approach. The nature conservation is in and out of the ecology bounds (it's more narrow, but wider) because not any effect is analyzed, but only the one which has an impact on peoples' lives.

6. Make a good translation of the text into Russian.

7. You will read the text BIOSPHERE. Before you read do the tasks below.

A. Transcribe the following words. Guess their meaning or consult a dictionary.

hydrosphere.................... hydrothermal ....
multicellular. .... nitrogen ....
calcium........................... potassium ....
photosynthesis................ molecule...........................
amino acids .... dioxide..............................

B. Match the verbs to the nouns to make meaningful phrases. Compare with the text while reading.

1) alternate between (варьироваться)	a) several compartments
2) release (выделять)	b) other spheres
3) convert into (преобразовывать в)	c) chemical energy
4) divide into (делиться на)	d) the hydrosphere, lithosphere, atmosphere and biosphere
5) reach into (проникать в)	e) mineral and organic state
6) maintain (поддерживать)	f) the balance of elements
7) exchange between (обмениваться между)	g) free oxygen

C. Find English equivalents of these terms in the text.

Постоянный обитатель, потребление солнечной энергии, население, опылитель, млекопитающее, интенсивная/слабая биологическая деятельность, сообщество видов (животных и растений), выделять свободный кислород, океанические течения, клеточное дыхание, внешний слой, постоянная переработка, поддерживать баланс элементов.

8. Read the text and answer the questions.

1. Why is the biosphere described sometimes as «the fourth envelope»?
2. What elements does the biosphere contain?
3. How is light converted into glucose and other sugar molecules?
4. What determines the specific composition of the Earth's atmosphere?
5. How important are the oceans for water cycling?

BIOSPHERE

For modern ecologists, ecology can be studied at several levels: **population** level (individuals of the same species), biocoenosis level (or **community of species**), ecosystem level, and biosphere level.

The **outer layer** of the planet Earth can be divided into several **compartments**: the hydrosphere (or sphere of water), the lithosphere (or sphere of soils and rocks), and the atmosphere (or sphere of the air). The biosphere (or sphere of life), sometimes described as «the fourth envelope», is all living matter on the planet or that portion of the planet occupied by life. It reaches well into the other three spheres, although there are no **permanent inhabitants** of the atmosphere. Relative to the volume of the Earth, the biosphere is only the very thin surface layer which extends from 11,000 meters below sea level to 15,000 meters above.

The biosphere contains great quantities of elements such as carbon, nitrogen and oxygen. Other elements, such as phosphorus, calcium, and potassium, are also essential to life, yet are present in smaller amounts. At the ecosystem and biosphere levels, there is a **continual recycling** of all these elements, which alternate between the mineral and organic states.

The functioning of the ecosystem is based on the **input of solar energy**. Plants and photosynthetic microorganisms convert light into chemical energy by the process of photosynthesis, which creates glucose (a simple sugar) and releases free oxygen. Glucose thus becomes the secondary energy source which drives the ecosystem. Some of this glucose is used directly by other organisms for energy. Other sugar molecules can be converted to other molecules such as amino acids. Plants use some of this sugar, concentrated in nectar to attract **pollinators** to help them in reproduction.

Cellular respiration is the process by which organisms (like **mammals**) break the glucose back down into its **constituents**, water and carbon dioxide, thus regaining the stored energy of the sun.

The proportion of photosynthetic activity of plants and other photosynthesizers to the respiration of other organisms determines the specific composition of the Earth's atmosphere, particularly its oxygen level. Global air currents mix the atmosphere and **maintain nearly the same balance of elements** in areas of **intense biological activity** and areas of **slight biological activity**.

Water is also exchanged between the hydrosphere, lithosphere, atmosphere and biosphere in regular cycles. The oceans are large tanks, which store water, ensure thermal and climatic stability, as well as the transport of chemical elements thanks to large **oceanic currents**.

9. Mark these statements as true or false (T/F). Prove the true sentences and correct the false ones.

1. The biosphere is sphere of soils and rocks.
2. At the ecosystem and biosphere levels, there is a continual recycling of carbon, nitrogen, oxygen and other elements, such as phosphorus, calcium, and potassium.
3. The process of photosynthesis releases carbon.
4. Glucose and other sugar molecules are concentrated in nectar and attract pollinators to aid plants in reproduction.
5. Water and carbon dioxide are the two constituents which cause the process of cellular respiration.
6. Water cycles between the hydrosphere, lithosphere, atmosphere and biosphere.

10. Find Russian equivalents of the following expressions.

Outer layer; living matter; permanent inhabitants; to extend; amino acids; solar energy; to alternate; cellular respiration; to regain; global air currents; to maintain; mammal; intense biological activity; carbon dioxide; to release; secondary energy source; phosphorus; input; to reach well into.

11. Find odd one out. Explain your choice.

- Population, community, species, ecosystem;
- semisphere, hydrosphere, lithosphere, atmosphere, biosphere;
- phosphorus, calcium, potassium, carbon, nitrogen, mercury, oxygen;
- cellular respiration, photosynthesis, recycling of elements, organic state.

12. Find passages in the text in which the process of converting solar energy into other kinds of energy by living organisms is explained. Translate them into Russian.

GRAMMAR REVIEW

13 Translate the underlined sentences in the text. Mind participle constructions. To learn more about participles consult Appendix 1 §1.3 (PARTICIPLES AND THEIR FUNCTIONS). Do exercises 14-16.

14. Translate into Russian.

The student attending all lectures; using new methods; having entered the Institute; the achieved results; the plan containing many details; constructing new machines; having calculated the distance; all developed countries; the workers building a new house; achieving good results; having developed the speed of 120 km; the apple divided into three parts; the scientist using a new method; dividing the orange into three parts; having introduced new methods of work; the growing population of the country; refusing to give an explanation; receiving important information; having obtained the necessary information; having found the new way; help offered by the teacher.

15. Chose the translation of words given in the brackets.

1. The engineer (проводит) the investigation.
2. The investigation (проводимое) by the engineer is important.
3. The engineer (проводящий) the investigation works in our laboratory.

carrying out; is carrying out; carried out; is carried out

4. (Определяя) the properties of the substance the scientist made lots of experiments.
5. The properties of the substance (определены) accurately enough.
6. When (были определены) all the properties of the substance were analysed.

are determined; determined; determining; arc determining

7. The test (выполнен) by a group of students.
8. The test (выполненный) is very complex.
9. The group of students (выполняющая) the test is in the laboratory.

is performing; performing; performed; is performed

16. Translate the sentences into Russian.

1. The explanation given was not complete.
2. The results received were of great importance for further work.
3. When studying elements Mendeleyev found that they could be divided into nine groups
4. When burnt, coal produces heat.
5. Being built in a new way modern houses have better facilities.
6. Theory in ecology consists of principles used to construct models.
7. The biosphere, sometimes described as «the fourth envelope», is all living matter on the planet or that portion of the planet occupied by life.
8. Plants use some of this sugar concentrated in nectar to attract pollinators to help them in reproduction.
9. Cellular respiration is the process by which organisms break the glucose back down into water and carbon dioxide, thus regaining the stored energy of the sun.
10. Organisms live in groups of the same species occupying a given region.
11. The whole earth can be seen as a single ecosystem, while a lake can be divided into several ecosystems, depending on the scale used.
12. Moving toward the poles, diversity decreases. For example, there are many more species of insects living near the equator than there are in Canada.
13. The deep seafloor is generally uniform, providing animals with few places to live.
14. Energy flows through ecosystems, beginning with primary producers and moving to herbivores, then carnivores.
15. The glucose made by plants determines how much energy is available in ecosystems and therefore limits how many animals can live there.
16. Measured in units of mass/area/time, NPP in terrestrial ecosystems is usually expressed in grams of carbon per square meter per year.

17. Complete the text below with the following words and word combinations.

Oxygen, biosphere, energy , free oxygen, environment, carbon, hydrosphere, solar energy, plants, lithosphere, photosynthesis, nitrogen, atmosphere.

The first step to an understanding the interrelationship of living organisms and their nonliving 1) ____________________ is to begin with the sun. From it comes most of the 2) ____________________ on earth. But, it is largely unavailable to animals directly. It must be transmitted to them by green vegetation through a process known as 3) ____________________. In this process the 4) ____________________ is transferred through a substance in the vegetation called *chlorophyll* (from Greek, *chloros,* green, and *phyllos,* leaf) in the presence of water to become 5) ____________________ and food sugar. Now, animals can receive their energy by eating 6) ____________________ or other animals (who have eaten plants at some stage). As plants and animals decay, with the help of bacteria and fungi, they release chemicals in the earth, helping to feed plants.

This circulation makes the earth's basic substances – 7) ________________, 8) ____________________, 9) ____________________ – and others move between the earth's main stratums: air the – 10) ____________________, water – 11) ____________________, soil and rocks – 12) ___________ and living organisms – 13____________________.

18. You will read the text about ECOSYSTEM CONCEPT. Before you read find English equivalents for these terms in the text.

Взаимоотношения, взаимодействие, снабжение питательными веществами, грибы (споры), четкие границы, стоячий, проточный, делить ресурсы, среда (обитания), пищевые цепи, пищевые сети, водосборный бассейн, территория без растительного покрова.

THE ECOSYSTEM CONCEPT

The first principle of ecology is that each living organism has an ongoing **relationship** with every other element that makes up its environment. An ecosystem can be defined as any situation where there is **interaction** between organisms and their environment. The term is generally understood to refer to all biotic and abiotic components, and their interactions with each other, in some defined area, with no conceptual restrictions on how large or small that area can be.

There are two main components of all ecosystems: abiotic and biotic. Abiotic, or nonliving, components of an ecosystem are its physical and chemical components, for example, rainfall, temperature, sunlight, and **nutrient supplies**.

Biotic components of an ecosystem are its living things – **fungi**, plants, animals, and microorganisms. Organisms live in populations, groups of the same species occupying a given region. Populations never live alone in an ecosystem. They always **share resources** with others, forming a community (a group of organisms living in the given area). Within the ecosystem, species are connected by **food chains** or **food webs**.

The concept of an ecosystem can be applied to units of variable size, such as a pond, a field, or a piece of deadwood. A unit of smaller size is called microecosystem. For example, an ecosystem can be a stone and all the life on it. A mesoecosystem could be a forest, and a macroecosystem a whole ecoregion with its **drainage basin**. As most of these **borders** are not **rigid**, ecosystems tend to blend into each other. As a result, the whole earth can be seen as a single ecosystem, while a lake can be divided into several ecosystems, depending on the **scale** used.

Ecosystems are often classified by reference to the biotopes concerned. The following ecosystems may be defined:

- continental ecosystems, such as forest ecosystems, meadow ecosystems such as steppes or savannas), or agro-ecosystems;
- ecosystems of inland waters, such as **lentic** ecosystems such as lakes or ponds;
- **lotic** ecosystems such as rivers;
- oceanic ecosystems.

Another classification can be done by reference to its communities, such as in the case of a human ecosystem.

The main questions when studying an ecosystem are:

- whether the colonization of a **barren area** could be carried out;
- investigation of the ecosystem's dynamics and changes;
- the methods of which an ecosystem interacts at local, regional and global scale;
- investigating the value of an ecosystem and the ways and means the interaction of ecological systems provide benefit to humans.

19. Match the parts of definitions.

1. Ecosystem is
2. Biotic components are
3. Abiotic components are
4. Lentic ecosystems are
5. Lotic ecosystems are
6. Drainage basin is
7. Barren area is

a) based on running water reservoirs.
b) physical and chemical components of an ecosystem.
c) the area from which water flows down into a water reservoir organisms.
d) based on dead-water reservoirs
e) interaction of living organisms and their environment in some defined area.
f) are without any plants growing on it.
g) living in an ecosystem.

20. Fill in the words.

Biosphere, exchange, abiotic, relationships, communities, habitat, environment, biotic.

Ecosystem means organisms living in a particular 1) _______________, such as forest or coral reef, and physical parts of the environment that affect them.

The ecosystem concept was developed by scientists to simplify the study of the 2) _______________ of the organisms and their physical environment. At the top of the hierarchy is the planets entire living environment, known as 3) _______________. The living or 4) _______________ parts of n ecosystem live in 5) _______________. The physical surrounding or 6) _______________ components such as minerals found in the soil are known as the environment or 7) _______________. All ecosystems show a constant 8) _______________ of matter and energy between biotic and abiotic communities.

21. You will read the text "BIODIVERSITY". Before you read do the tasks below.

A. Suggest your answer to this question.

How many species live on Earth?

B. Look through the text and check if your answer is correct.

C. Read the explanations and guess the verbs.

to survive – to continue life
to sustain – to provide, to support
to adapt – to adjust, to change in new conditions
to recur – to happen regularly
to quantify – to calculate
to estimate – to determine quantity approximately

D. Find English equivalents for these phrases in the text.

Особи различных видов, условия окружающей среды, уникальное сочетание условий, обилие видов, доступные ресурсы, сходные группы видов, разнообразие форм жизни,

22. Read the text. In your own words, define the terms:

- ***community;***
- ***biodiversity.***

BIODIVERSITY

A *community* is a group of **individuals of different species**, each with its own *niche* or way of using **available resources** to sustain itself. The species that live in a community are those that can survive in the **environmental conditions**. Only a limited number of species are adapted to each **unique set of circumstances** that a community can offer. For this reason, patterns of **similar groups of species** recur in communities with similar characteristics.

The **richness of species** in a community is referred to as *biodiversity*, the **variety of life-forms**. No one knows for sure how many species of organisms inhabit Earth. The most common living things are very small and difficult to quantify. Scientists estimate that there are 5 to 30 million different kinds of organisms alive – less than 2 million have been identified and named.

EXPERIMENTAL WORK

23. Do the experimental tasks stated below. Report the results to the group.

1. Copy the data table in your science notebook twice, calling them Data Table 1 and Data Table 2.

Data table

Species	**The number of species**

2. Examine *Figure 1* (below), which shows a community that supports six species of animals. Count the number of each species and record that number on Data Table 1.

3. Examine *Figure 2*, which shows a community that also supports six species of animals. Count the number of each species and record that number on Data Table

4. Calculate the biodiversity of each community. To do so, use the following formula:

$$\text{biodiversity index} = \frac{\text{number of species in the area}}{\text{total number of individuals in the area}}$$

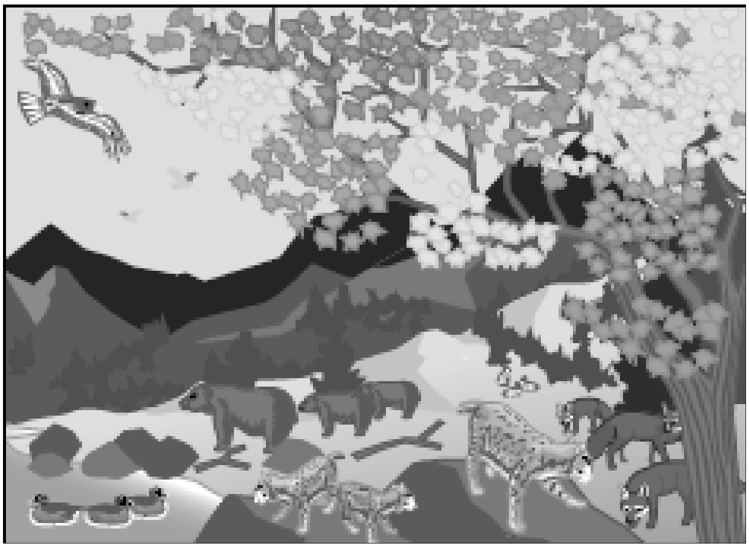


Figure 1 Community A

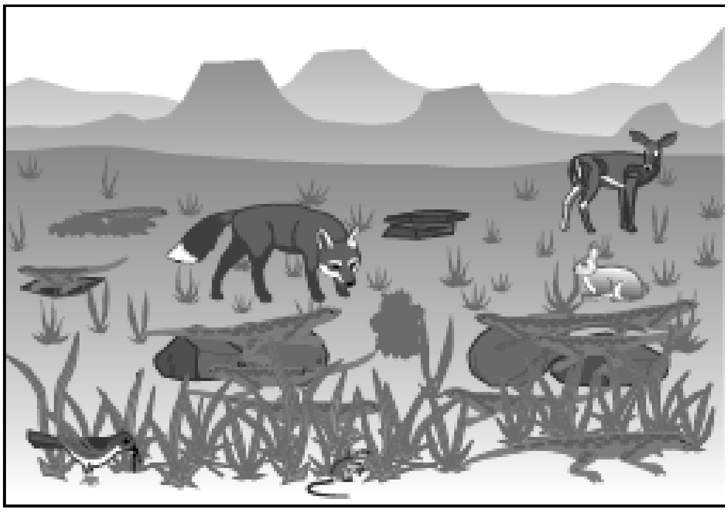


Figure 2 Community B

24. Answer the questions.

1. Which community (Figure 1 or Figure 2) contains the most biodiversity?
2. Calculate the biodiversity index for a plot that has 40 earthworms, but no other species.
3. Calculate the biodiversity index for a plot that has three earthworms, 3 crickets, four centipedes, five grasshoppers, five millipedes, four sow bugs, two moles, two ferns, three filamentous fungi, and nine ants.
4. How do you think farming affects biodiversity?

25. Your partner and you will read different texts so that you could exchange the information. Before you read do the tasks below.

A. Match the word (1-9) to their opposites (a-i) and memorize them.

1) few	a) different
2) increase	b) dry
3) high	c) numerous
4) the same	d) deep
5) warm	e) top
6) humid	f) far
7) near	g) low
8) shallow	h) decrease
9) bottom	i) cool

B. Choose a role: *Student A* or *Student B*. Play memory game.

***Student A*: say a word from list (1-9).**
***Student B*: say its opposite by memory. Swap the roles.**

26. Read the texts and exchange the information.

***Student A:* Read Text A.**

Text A

In a natural community, very few species are numerous. As a result, most successful communities show a relatively high biodiversity index. Communities in grasslands, forests, shrubs, or deserts show a variety of species. If a community is highly impacted by humans, such as a section of grassy lawn on a school campus, it displays relatively low biodiversity. In the case of a lawn, one plant species dominates. The diversity of organisms that live in and on the soil may also be low because of fertilizers, pesticides, and foot traffic.

Biodiversity in communities is determined by three factors: space, time, and feeding. If the community space has numerous layers diversity increases. For example, a forest has several layers beginning on the floor and moving to the top of the canopy.

Changes in use of time also increases diversity. Two species of plants can live in the same area if one blooms and grows in the spring, while the other does so in the fall.

Different feeding strategies also increase diversity. Some birds feed on seeds, some on insects, and other on nectar. Because they do not compete for food, all three types of birds can live in the same area.

Answer your partner's questions.

After that ask these questions to your partner.

- Where is the area of greatest biodiversity? Why?
- What areas have greater biodiversity index in oceans? Why?

Student B: **Read Text B.**

Text B

From a global perspective, species diversity falls into gradients. The area of greatest diversity is around the tropics. Moving toward the poles, diversity decreases. For example, there are many more species of insects living near the equator than there are in Canada. This diversity gradient can be explained by the fact that the tropics are warm, humid regions with plenty of sunlight. Such areas support more types of plants than cool, dry ones.

In oceans, diversity decreases with distance from the continents. Near the continents, there is plenty of food and there are many types of habitats. Runoff from land carries minerals and nutrients into the waters. Shallow, coastal areas provide beds of seagrasses and kelp that provide places to hide, nesting areas, and a lot of food. Far out to sea where water is deep, light cannot penetrate to the bottom to support plant life. The deep seafloor is generally uniform, providing animals with few places to live.

Ask your partner these questions.

- Is biodiversity index in natural communities high or low? Why?
- Is biodiversity index in communities affected by humans high or low? Why?
- What factors affect biodiversity in communities?

After that answer your partner's questions.

27. Read the text FOOD WEBS and guess the meanings of the words in bold.

FOOD WEBS

The living portion of an ecosystem is best described in terms of feeding levels known as **trophic levels**. Green plants make up the first trophic level and are known as **primary producers**. Plants are able to convert energy from the sun into food in a process known as photosynthesis. In the second trophic level, the **primary consumers,** known as **herbivores**, are animals and insects that obtain their energy solely by eating the green plants. The third trophic level is composed of the **secondary consumers**, flesh-eating or **carnivorous** animals that feed on herbivores. At the fourth level are the **tertiary consumers**, carnivores that feed on other carnivores. Finally, the fifth trophic level consists of the **decomposers**, organisms such as fungi and bacteria that break down dead or dying matter into nutrients that can be used again.

Some or all of these trophic levels combine to form what is known as a food web, the ecosystem's mechanism for circulating and recycling energy and materials.

24. Fill in the table below for an aquatic (marine) ecosystem with the following participants:

Fungi and bacteria, salmon, water plants (algae) , brown bear, insects and small fish.

Aquatic (Marine) Ecosystem

primary producers	
primary consumers	
secondary consumers	
tertiary consumers	
decomposers	

28. Complete the sentences using the words from the previous Activity and explain how food webs work.

1. Primary producers such as ______________________________ use sunlight to produce ____________________.
2. Primary consumers such as _________________________ eat____________.
3. They are eaten by _________________ such as __________________.
4. A brown bear is __________________ because it _________________.
5. ____.

29. Arrange the organisms in *Figure 3* into five different food chains. (You should not have any organisms left over.)
Rearrange the five food chains into one large food web.

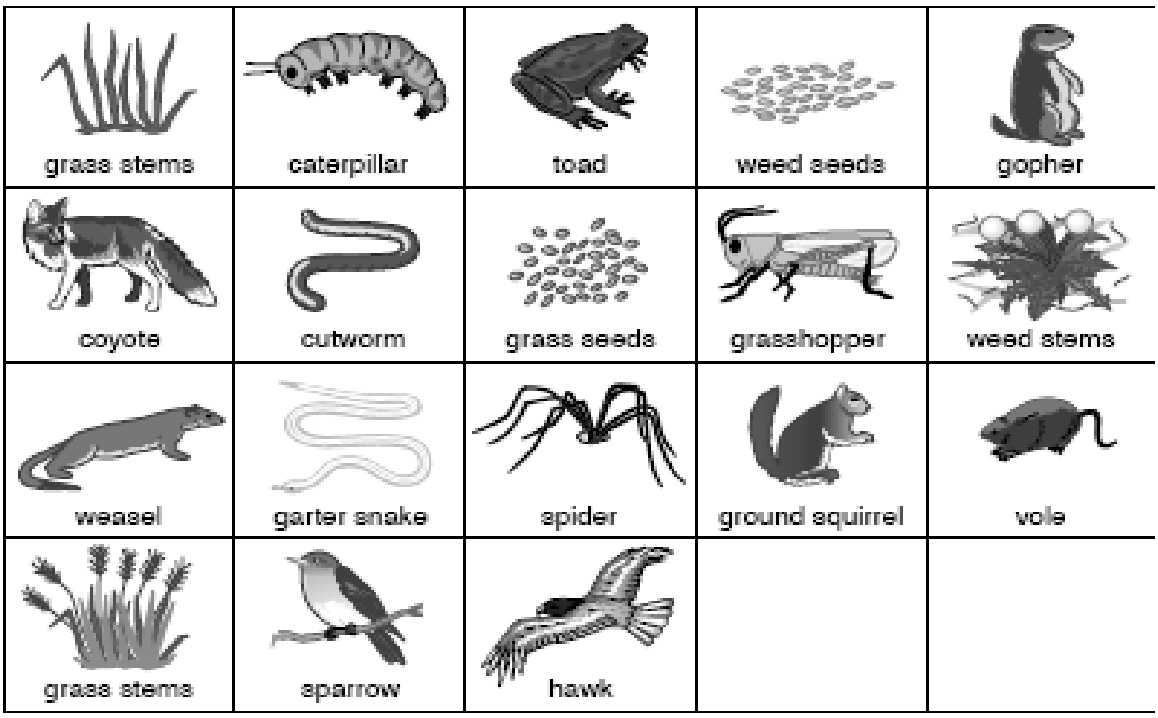


Figure 3 Food Web Participants

30. Read the text "HOW ECOSYSTEMS WORK" and find answers to these questions in the text.

1. Where can chlorophyll be found?
2. Why do plants need glucose?

3. Which process produces more energy: gross primary production or net primary production? Why?
4. What are the units to measure net primary production?
5. What factors affect the productivity in an ecosystem?
6. What portion of the available solar energy do photosynthetic organisms use?
7. Why agricultural ecosystems are very productive?
8. What species dominates on Earth now? What is the term to denote this phenomenon?

HOW ECOSYSTEMS WORK

In nearly all ecosystems, plants are the primary producers, the autotrophs that form the base of food chains. The leaves of plants contain chlorophyll, a pigment that can capture the Sun's energy. Within chlorophyll, glucose is manufactured from carbon dioxide and water vapor in the process of photosynthesis. The equation for photosynthesis is:

$$6\ CO_2 + 6\ H_2O \rightarrow C_6H_{12}O_6 + 6\ O_2$$

Plants obtain the carbon dioxide and water vapor for photosynthesis through small openings in the leaves called stomata. The minerals and additional water they need are taken up through their roots. Glucose is used either to perform work or to make the complex molecules that are found in all living things, carbohydrates, proteins, lipids, and nucleic acids.

The rate at which the producers create useful energy is known as primary production. Gross primary production (GPP) refers to the amount of carbon dioxide that is "fixed," or converted from carbon dioxide gas to glucose by photosynthesis. Some of this glucose is used to carry out cellular respiration, the process in which glucose is changed to energy to carry out life processes. The equation for cellular respiration is:

$$6\ O_2 + C_6H_{12}O_6 \rightarrow 6\ CO_2 + 6\ H_2O$$

Net primary production (NPP) is the amount of primary production after the cost of cellular respiration in plants is deducted. Measuring NPP tells you how much organic material has been synthesized from inorganic compounds and made available to the ecosystem. Measured in units of mass/area/time, NPP in terrestrial ecosystems is usually expressed in grams of carbon per square meter per year.

Ecologists are interested in NPP because it helps them understand the balance of carbon dioxide in ecosystems. One way to estimate primary production is by finding the leaf area of the ecosystem.

Energy flows through ecosystems, beginning with primary producers and moving to herbivores, then carnivores. In terrestrial ecosystems, the leaves of plants are the primary photosynthetic organs. In aquatic environments, algae fill this role. Some algae are unicellular, while others are large, multicellular organisms.

Scientists have calculated that green organisms are not very efficient energy converters. Only about 2 percent of the Sun's energy that strikes a plant or alga is changed to glucose. The glucose made by plants determines how much energy is available in ecosystems and therefore limits how many animals can live there.

NPP is not the same in all ecosystems. Factors that affect productivity include the availability of carbon dioxide, sunlight, and nutrients. Three types of ecosystems stand out as very high producers: estuaries, saltwater marshes, and tropical rain forests. The patterns of productivity vary by climate. The most productive systems are in relatively warm regions that have plenty of moisture and high levels of nitrogen, an essential nutrient. Less-productive ecosystems, like the tundra and desert, lack heat energy and water.

Agricultural ecosystems are also very productive because their water needs can be met with irrigation and their nutrients requirements with fertilizers. Since the arrival of humans on Earth, natural ecosystems have undergone changes. Humans change forests to pastures and farms to meet their needs. Humans now control about 40 percent of the terrestrial NPP, a phenomenon known as human appropriation of net primary productivity, or HANPP. Never in Earth's history has one species so dominated the use of space and organisms. The price of this domination is linked to pollution, loss of other species, and global warming.

31. In your own words, explain the following terms:

- autotrophs;
- food chain;
- photosynthesis;
- stomata;
- primary production;
- cellular respiration;
- herbivores;
- carnivores;
- terrestrial ecosystem;
- aquatic environment;
- fertilizer;
- chlorophyll.

PRESENTATION

32. Prepare a presentation and make a report "BASIC CONCEPTS OF ECOLOGY".

PART 3

ENVIRONMENTAL RESOURCE MANAGEMENT

1. Tell what you know about the job of ecologist and of environmental engineer. What's the difference?

2. You will read the text "DEVELOPMENT OF ENVIRONMENTAL ENGINEERING". Before you read find English equivalents for these terms in the text and write them down into your dictionary.

Улучшать качество окружающей среды, водоснабжение, канализационная система, канализационные трубы, очистка воды, ухудшение качества окружающей среды, длительное воздействие, широкое применение, сельскохозяйственные вредители, на грани вымирания, наносить вред окружающей среде.

3. Read the text and answer the questions.

1. When did people realise that their health was related to the quality of their environment?
2. When did the field of environmental engineering separate from environmental science?
3. What benefit was achieved by constructing drinking water treatment and sewage treatment systems?
4. What is DDT? What is its effect on the environment?
5. What role did Rachel Carson play in the development of environmental engineering?
6. What environmental engineering facilities are mentioned in the text? What are the earliest ones?

DEVELOPMENT OF ENVIRONMENTAL ENGINEERING

Ever since people first realized that their health and well-being were related to the quality of their environment, they have applied thoughtful principles **to improve the quality of their environment**. The ancient Indus civilization utilized early **sewers** in some cities. The Romans constructed aqueducts to prevent drought and to create a clean, healthful **water supply** for the metropolis of Rome. In the 15th century, Bavaria created laws restricting the development and degradation of alpine country that constituted the region's water supply. In the mid-19th century in London Joseph Bazalgette designed the first major **sewerage system.** The introduction of drinking **water treatment** and sewage treatment in industrialized countries reduced waterborne diseases.

The field emerged as a separate environmental discipline during the middle third of the 20th century in response to widespread public concern about water and pollution and increasingly extensive **environmental quality degradation**. However, its roots extend back to early efforts in public health engineering.

In many cases, as societies grew, actions that were intended to achieve **benefits** for those societies had **longer-term impacts** which reduced other environmental qualities. One example is the **widespread application** of DDT (dichlorodiphenyltrichloroethane) to control **agricultural pests** in the years following World War II. While the agricultural benefits were outstanding and crop yields increased dramatically, thus reducing world hunger substantially, and malaria was controlled better than it ever had been, numerous species were brought to **the verge of extinction** due to the impact of the DDT on their reproductive cycles. The story of DDT as vividly told in Rachel Carson's «Silent Spring» is considered to be the birth of the modern environmental movement and the development of the modern field of environmental engineering.

Conservation movements and laws restricting public actions that would **harm the environment** have been developed by various societies for millennia. Notable examples are the laws decreeing the construction of sewers in London and Paris in the 19th century and the creation of the U.S. national park system in the early 20th century.

GRAMMAR REVIEW

Revise TENSES IN PASSIVE VOICE (Appendix 1, §1.1). and do Activities 4,5.

4. In each pair of sentences (A/B) mark the correct one.

A. People’s health affects the quality of their environment.
B. People’s health is affected by the quality of their environment.

A. The earliest sewers were utilized in ancient India.

B. The earliest sewers utilized in ancient India.

A. Waterborne diseases were reduced after the introduction of water treatment.
B. The introduction of water treatment reduced waterborne diseases.

5. Say the same using a different voice. (Change Active Voice => Passive Voice / Passive Voice => Active Voice)

1. The Romans constructed aqueducts to prevent drought.
2. Restricting laws are developed in many countries.
3. Malaria was controlled as a result of application of DDT.
4. Many species were brought to the verge of extinction due to the impact of the DDT.
5. Conservation movement and restricting laws improve environment.
6. People apply thoughtful principles to improve the quality of their environment.
7. Joseph Bazalgette designed the first major sewerage system in the 19^{th} century.

6. Guess the words.

1. A colorless odorless substance used as an insecticide.
2. A drain or pipe used to carry away surface water or wastes.
3. Any organism that damages crops, livestock or man, or reduces the fertility (плодородие) of land.
4. Improving quality of water so that it were safe for drinking.
5. Providing treated and purified water for a community.

7. Read the text ENVIRONMENTAL MANAGEMENT and give definitions to these terms and abbreviations:

- ***environmental management***
- ***ISO***
- ***ESM***
- ***unusables***

ENVIRONMENTAL MANAGEMENT

Environmental management is not, as the phrase could suggest, the management of the environment as such, but rather the management of human impact upon the environment. The three main issues that affect managers are those involving politics (networking), programs (projects), and resources (money, facilities, etc.). Environmental management is therefore not the conservation of the environment solely for the environment's sake, but rather the conservation of the environment for humankind's sake.

Environmental management involves the management of all components of the biophysical environment, both living (biotic) and non-living (abiotic). The environment also involves the relationships of the human environment, such as the social, cultural and economic environment with the biophysical environment.

As with all management functions, effective management tools, standards and systems are required. An environmental management standard or system or protocol attempts to reduce environmental impact as measured by some objective criteria.

The ISO 14001 standard (ISO – International Standardization Organization – *Международная организация стандартизации, МОС*) is the most widely used standard for environmental risk management. Other environmental management systems (EMS) tend to be based on the ISO 14001 standard and many extend it in various ways:

Other strategies exist that rely on making simple distinctions rather than building top-down management systems. For instance, Ecological Intelligent Design divides products into consumables, service products or durables and unsaleables – toxic products that no one should buy, or in many cases, do not realize they are buying. By eliminating the unsaleables from the available purchase, better environmental management is achieved without systems.

Today's businesses must comply with many Federal, State and local environmental laws, rules, and regulations. It's vital to insure that your company followed the law and assumed important environmental liabilities.

GRAMMAR REVIEW

8 Translate the underlined sentences in the text. Mind gerund constructions. To learn more about gerund consult Appendix 1 §1.3 (GERUND AND ITS FUNCTIONS). Do exercises 9 – 11.

9. Define the function of *–ing* form in the sentence (subject or object),

translate the sentences.

1. Applying the method will give the results desired.
   Applying the method the technologists will get the results desired.
2. Dividing a unit of distance by a unit of time we get a unit of speed.
   Dividing a unit of distance by a unit of time gives a unit of speed.
3. Producing power is dependent mainly on the fuel and machinery available.
   Producing electricity by means of generators we get rather low efficiency.

10. Translate into Russian.

1. It is useful to consider a simplified model, and by making modifications to the model we can approach the more realistic situation.
2. Measuring NPP tells you how much organic material has been synthesized.
3. One way to estimate primary production is by finding the leaf area of the ecosystem.
4. Sustainable development is the idea of meeting the needs of the present without compromising the ability for future generations to meet their own needs.
5. Humans consume and produce for their own personal, short-term benefit, without considering the long-term effects of their actions.
6. The main task of environmental engineers is to protect public health by protecting, preserving, and enhancing the environment.
7. Environmental management involves managing the oceans, freshwater systems, land and atmosphere, according to sustainability principles.
8. There is no excuse for failing to fight against global warming.

11. Compare participle and gerund. Translate the sentences:

the **boiling** water a **smoking** man the **melting** ice the **freezing** liquid	the **boiling** point a **smoking** room the **melting** point the **freezing** point
The **reading** student is my friend.	There stands a **reading** lamp on the table.
Generators **producing** electricity get their power from steam or water	Another way of **producing** electricity is by means of generators.

turbines	
(When) **adding** heat we can change the state of a substance.	*Upon* **adding** heat we can change the state of a substance.
Mathematics is **developing** rapidly and is **entering** other sciences.	The purpose of this research is **developing** some new kinds of colored films.

INFORMATION SEARCH

12. Find more information about environmental management standards (or systems or protocols). Analyze their features and decide which standard is the most acceptable for:

- ***a big machine building plant;***
- ***a small food processing company;***
- ***a coal mining company.***

13. Learn to analyze sentence structure. Translate the sentences part by part.

Management … involves …
Management of the … atmosphere involves …
Management of the global atmosphere involves …
Management of the global atmosphere involves assessment of …
… carbon cycle …
… all aspects of the carbon cycle …
Management of the global atmosphere involves assessment of all aspects of the carbon cycle
… opportunities to address …
… to identify opportunities to address …
… climate change …
… human-induced climate change …
… to identify opportunities to address human-induced climate change …

Management of the global atmosphere involves assessment of all aspects of the carbon cycle to identify opportunities to address human-induced climate change.

… experts … issued …
… climate experts … issued …a statement

… 2,500 climate experts from 80 countries issued a keynote statement
… 2,500 climate experts from 80 countries issued a keynote statement that …and that …

… there is no excuse …
… there is no excuse for failing …
… there is no excuse for failing to act on global warming …

… shifts … may occur…
… shifts in climate may occur …
… abrupt or irreversible shifts in climate may occur …

… carbon reduction
… carbon reduction targets …
… without strong carbon reduction targets …
… without strong carbon reduction targets abrupt or irreversible shifts in climate may occur

… difficult … to cope with
… difficult for … societies to cope with
… difficult for contemporary societies to cope with
… that will be very difficult for contemporary societies to cope with.

In March 2009 at a meeting of the Copenhagen Climate Council 2,500 climate experts from 80 countries issued a keynote statement that there is no excuse for failing to act on global warming and that without strong carbon reduction targets abrupt or irreversible shifts in climate may occur that will be very difficult for contemporary societies to cope with.

14 Translate the text into Russian. Write out the words in bold into you dictionary.

Atmosphere

Management of the global atmosphere involves assessment of all aspects of the carbon cycle to identify opportunities to address human-induced climate change and this has become a major focus of scientific research because of the potential catastrophic effects on biodiversity and human communities. In March 2009 at a meeting of the Copenhagen Climate Council 2,500 climate experts from 80 countries issued a keynote statement that there is no excuse for failing to act on global warming and that without strong carbon reduction targets abrupt or irreversible shifts in climate may occur that will be very difficult for contemporary societies to cope with.

Other human impacts on the atmosphere include the air pollution in cities, the **pollutants** including **toxic chemicals** like **nitrogen oxides**, **sulphur oxides**, **volatile organic compounds** and **particulate matter** that produce **photochemical smog** and **acid rain**, and the **chlorofluorocarbons** that degrade the ozone layer.

11. Individually choose one of the texts and make a good translation. Write out new terms into your dictionary.

Oceans

Ocean circulation patterns have a strong influence on climate and weather and, in turn, the food supply of both humans and other organisms. Scientists have warned of the possibility, under the influence of climate change, of a sudden alteration in circulation patterns of ocean currents that could drastically alter the climate in some regions of the globe. Major human environmental impacts occur in the more habitable regions of the ocean fringes. Ten per cent of the world's population – about 600 million people – live in low-lying areas vulnerable to sea level rise. Trends of concern that require management include: over-fishing (beyond sustainable levels); coral bleaching due to ocean warming and ocean acidification due to increasing levels of dissolved carbon dioxide; and sea level rise due to climate change. Because of their vastness oceans also act as a convenient dumping ground for human waste. Remedial strategies include: more careful waste management, statutory control of overfishing by adoption of sustainable fishing practices and the use of environmentally sensitive and sustainable aquaculture and fish farming, reduction of fossil fuel emissions and restoration of coastal and other marine habitat.

Freshwater

Water covers 71% of the Earth's surface. Of this, 97.5% is the salty water of the oceans and only 2.5% freshwater, most of which is locked up in the Antarctic ice sheet. The remaining freshwater is found in lakes, rivers, wetlands, the soil, aquifers and atmosphere. All life depends on the solar-powered global water cycle, the evaporation from oceans and land to form water vapor that later condenses from clouds as rain, which then becomes the renewable part of the freshwater supply. Awareness of the global importance of preserving water for ecosystem services has only recently emerged as, during the 20th century, more than half the world’s wetlands have been lost along with their valuable environmental services. Biodiversity-rich freshwater ecosystems are currently declining faster than marine or land ecosystems making them the world's most vulnerable habitats. Increasing urbanization pollutes clean water supplies and much of the world still does not have access to clean, safe water. In the industrial world demand management has slowed absolute usage rates but increasingly water is being transported over vast distances from water-rich natural areas to population-dense urban areas and energy-hungry desalination is becoming more widely used. Greater emphasis is now being placed on the improved management of blue (harvestable) and green (soil water available for plant use) water, and this applies at all scales of water management.

Forests

Present-day forests occupy about a quarter of the world's ice-free land with about half of these occurring in the tropics. In temperate and boreal regions forest area is gradually increasing (with the exception of Siberia), but deforestation in the tropics is of major concern.

Forests moderate the local climate and the global water cycle through their light reflectance and evapotranspiration. They also conserve biodiversity, protect water quality, preserve soil and soil quality, provide fuel and pharmaceuticals, and purify the air. These free ecosystem services are not given a market value under most current economic systems, and so forest conservation has little appeal when compared with the economic benefits of logging and clearance which, through soil degradation and organic decomposition returns carbon dioxide to the atmosphere. The United Nations Food and Agriculture Organization (FAO) estimates that about 90% of the carbon stored in land vegetation is locked up in trees and that they sequester about 50% more carbon than is present in the atmosphere. Changes in land use currently contribute about 20% of total global carbon emissions. Climate change can be mitigated by sequestering carbon in reafforestation schemes, plantations and timber products. Also wood biomass can be utilized as a renewable carbon-neutral fuel. The FAO has suggested that, over the period 2005–2050, effective use of tree planting could absorb about 10–20% of man-made emissions – so monitoring the condition of the world's forests must be part of a global strategy to mitigate emissions and protect ecosystem services.

Cultivated land

Rice, wheat, corn and potatoes make up more than half the world's food supply.

Feeding more than six billion human bodies takes a heavy toll on the Earth's resources. This begins with the appropriation of about 38% of the

Earth's land surface and about 20% of its net primary productivity. Added to this are the resource-hungry activities of industrial agribusiness – everything from the crop need for irrigation water, synthetic fertilizers and pesticides to the resource costs of food packaging, transport (now a major part of global trade) and retail. Food is essential to life. But the list of environmental costs of food production is a long one: topsoil depletion, erosion and conversion to desert from constant tillage of annual crops; overgrazing; salinization; sodification; waterlogging; high levels of fossil fuel use; reliance on inorganic fertilizers and synthetic organic pesticides; reductions in genetic diversity by the mass use of monocultures; water resource depletion; pollution of waterbodies by run-off and groundwater contamination; social problems including the decline of family farms and weakening of rural communities.

All of these environmental problems associated with industrial agriculture and agribusiness are now being addressed through such movements as sustainable agriculture, organic farming and more sustainable business practices.

Extinctions

Although biodiversity loss can be monitored simply as loss of species, effective conservation demands the protection of species within their natural habitats and ecosystems. Following human migration and population growth, species extinctions have progressively increased to a rate unprecedented since the Cretaceous–Tertiary extinction event. Known as the Holocene extinction event this current human-induced extinction of species ranks as one of the worlds six mass extinction events. Some scientific estimates indicate that up to half of presently existing species may become extinct by 2100. Current extinction rates are 100 to 1000 times their prehuman levels with more than 10% birds and mammals threatened, about 8% of plants, 5% of fish and more than 20% of freshwater species.

The 2008 IUCN Red List warns that long-term droughts and extreme weather put additional stress on key habitats and, for example, lists 1,226 bird species as threatened with extinction, which is one-in-eight of all bird species. The Red List Index also identifies 44 tree species in Central Asia as under threat of extinction due to over-exploitation and human development and threatening the region's forests which are home to more than 300 wild ancestors of modern domesticated fruit and nut cultivars.

Biological invasions

In many parts of the industrial world land clearing for agriculture has diminished and here the greatest threat to biodiversity, after climate change, has become the destructive effect of invasive species. Increasingly efficient global transport has facilitated the spread of organisms across the planet. The potential danger of this aspect of globalization is starkly illustrated through the spread of human diseases like HIV AIDS, mad cow disease, bird flu and swine flu, but invasive plants and animals are also having a devastating impact on native biodiversity. Non-indigenous organisms can quickly occupy disturbed land and natural areas where, in the absence of their natural predators, they are able to thrive. At the global scale this issue is being addressed through the Global Invasive Species Information Network but there is improved international biosecurity legislation to minimize the transmission of pathogens and invasive organisms. Also, through CITES legislation there is control the trade in rare and threatened species. Increasingly at the local level public awareness programs are alerting communities, gardeners, the nursery industry, collectors, and the pet and aquarium industries, to the harmful effects of potentially invasive species.

15. In the group read the questions and let each student answer those related to his/her text.

1. What foods make up most of the world food supplies?
2. What are the bad effects of industrial agrobusiness?
3. What are the most dangerous factors of biological invasion?
4. What is current extinction rate compared with prehuman period?
5. What factors threaten wildlife?
6. How do forests serve ecosystem?
7. Which ecosystem (marine, freshwater, land) mostly suffers from human activities? Why?
8. What trends in the world ocean require management?

16. You will read the text "RENEWABLE ENERGIES". Before you read do the tasks below.

A. Answer the questions.

What is renewable energy?
Which of the energies listed below can be classified as renewable?

- Hydroelectric energy;
- nuclear electric power;
- natural gas;

- solar energy;
- geothermal energy;
- petroleum;
- wind energy;
- biomass.

B. Suggest your answers to these questions?

1) Which kind of energy was the first to be used by people?
2) Which kind of energy is the most widely used now?
3) Which kind of energy is the most environmentally friendly?

17. Read the texts and check your answers in the previous activities.

RENEWABLE ENERGIES

Biomass -- Energy From Plant And Animal Matter

Biomass is organic material made from plants and animals. Biomass contains stored energy from the sun, absorbed by plants in a process called photosynthesis. Some examples of biomass fuels are wood, **crops, manure, and some garbage**.

Biomass can pollute the air when it is burned, though not as much as fossil fuels. Burning biomass fuels does not produce pollutants like sulfur, that can cause acid rain. When burned, biomass does release carbon dioxide, a greenhouse gas. But when biomass crops are grown, a nearly equivalent amount of carbon dioxide is captured through photosynthesis.

Energy From The Sun

The sun has produced energy for billions of years. Solar energy is the sun's rays (solar radiation) that reach the earth. Solar energy can be converted into other forms of energy, such as heat and electricity.

The major disadvantages of solar energy are:

- The amount of sunlight that arrives at the earth's surface is not constant. It depends on location, time of day, time of year, and weather conditions.
- Because the sun doesn't deliver that much energy to any one place at any one time, a large surface area is required to collect the energy at a useful rate.

Using solar energy produces no air or water pollution but does have some indirect impacts on the environment. For example, manufacturing the photovoltaic cells used to convert sunlight into electricity, consumes silicon and produces some waste products. In addition, large solar thermal farms can also harm desert ecosystems if not properly managed.

Hydropower Generates Electricity

Of the renewable energy sources that generate electricity, hydropower is the most often used. It is one of the oldest sources of energy and was used thousands of years ago to turn a paddle wheel for purposes such as grinding grain. Because the source of hydropower is water, hydroelectric power plants must be located on a water source. Therefore, it wasn't until the technology to transmit electricity over long distances was developed that hydropower became widely used.

Some people regard hydropower as the ideal fuel for electricity generation because, unlike the nonrenewable fuels used to generate electricity, it is almost free, there are no waste products, and hydropower does not pollute the water or the air. However, it is criticized because it does change the environment by affecting natural habitats.

Energy From Wind

Wind is simple air in motion. It is caused by the uneven heating of the earth's surface by the sun. Today, wind energy is mainly used to generate electricity.

Like old fashioned windmills, today's wind machines use **blades** to collect the wind's kinetic energy. With the new wind machines, there is still the problem of what to do when the wind isn't blowing. At those times, other types of power plants must be used to make electricity.

Wind is a clean fuel; wind farms produce no air or water pollution because no fuel is burned.

The most serious environmental drawbacks to wind machines may be their negative effect on wild bird populations and the visual impact on the landscape.

Geothermal Energy

Geothermal energy is heat from within the earth. We can use the steam and hot water produced inside the earth to heat buildings or generate electricity. Geothermal power plants do not burn fuel to generate electricity, so their emission levels are very low. They release less than 1 percent of the carbon dioxide emissions of a fossil fuel plant. Geothermal plants use scrubber systems to clean the air of hydrogen sulfide that is naturally found in the steam and hot water. Geothermal plants emit 97 percent less acid rain - causing sulfur compounds than are emitted by fossil fuel plants. After the steam and water from a geothermal reservoir have been used, they are injected back into the earth.

18. Fill in the table with the information from the texts.

Energy	Technical disadvantages	Impact on environment

19. Here are the explanations why HYDROELECTRIC ENERGY, SOLAR ENERGY, GEOTHERMAL ENERGY, WIND ENERGY, and BIOMASS are called renewable energies. Read them and guess what kind of energy is meant in each case. Which kind of energy is not mentioned?

- It is free, and its supplies are unlimited.
- It will blow as long as the sun shines.
- Water is replenished by rainfall and the heat is continuously produced inside the earth.
- We can always grow more trees and crops, and waste will always exist.

20. Choose one of the texts about renewable energies and translate it into Russian.

Learn to analyze the graphs.

a) Study the left part of the graph and answer the questions.

1. What source does the most of the consumed energy come from?
2. What energy ranks the second in the consumption graph?
3. How much does coal make up in the consumption?
4. What does nuclear power amount to?
5. What is the share of renewable energies?

b) Analyze the right part of the graph.

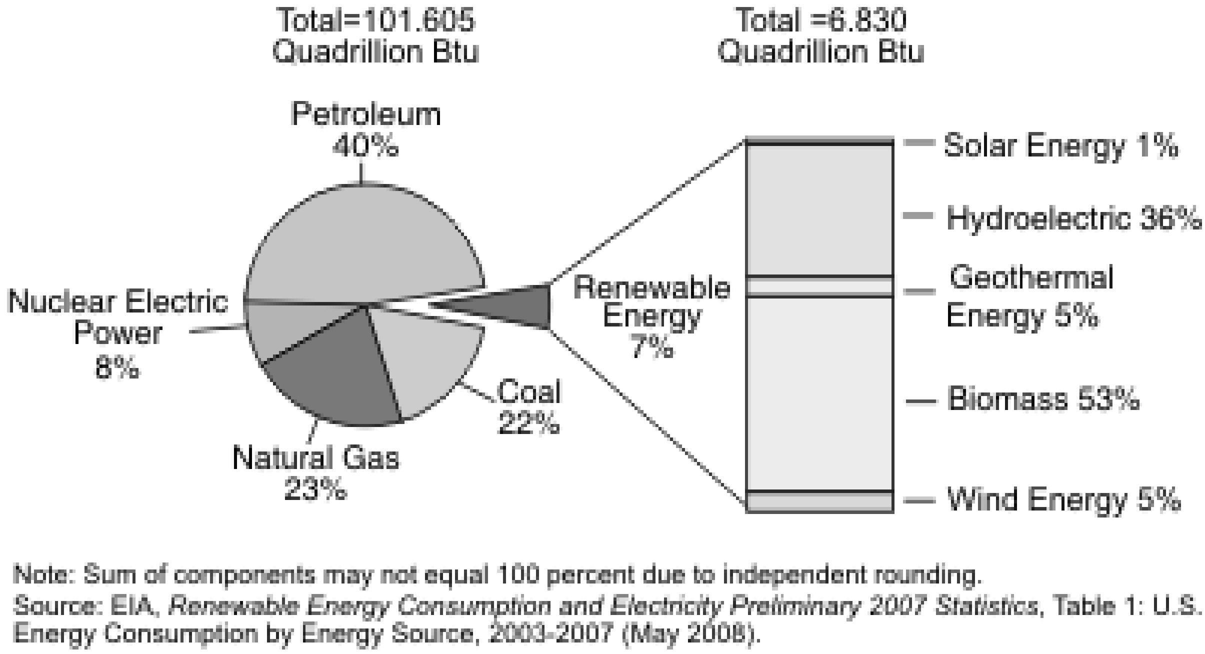


Figure 4 Renewable Energy Consumption

21. You will read the text HOW TO CLEN COAL. Before you read find English equivalents for these terms in the text.

Твердое топливо, захват и хранение углерода, дымовая труба, выброс углекислого газа, истощенные нефтяные и газовые месторождения, мировое потребление угля, сжиженный углекислый газ, течь, проблема утечки,

22. Read the text and match titles (a-g) with paragraphs (1-7).

a) A safe storage
b) Solving or postponing the CO2 problem?
c) A pilot project
d) A giant plant
e) Prospects for future development
f) Small project, high hopes
g) Too expensive?

HOW TO CLEAN COAL

Renewable energies won't be able to fully substitute ***fossil fuels*** *for years to come. Filtering CO2 from coal power plants, known as* ***carbon capture and storage****, will be crucial. The first pilot project is online in Germany. Can "clean coal" be a reliable solution to climate change?*

1. The **smokestacks** of the Schwarze Pumpe coal power plant in eastern Germany are an impressive sight. This giant plant towers over the surrounding fields and villages, supplying 1,600 Megawatts of energy for the region.

2. If you're concerned about global warming, however, you might be less impressed. The towers belch out around 36,000 tons of carbon dioxide every day – one of thousands of coal-fired plants worldwide that together produce around 20 percent of all greenhouse gas emissions and over 40 percent of **carbon dioxide (CO2) emissions**.

3. But hope is near, just hundreds of meters away, engineers are experimenting with what could be the future of the coal industry – carbon capture and storage (CCS). This technology traps carbon dioxide that would otherwise be released into the atmosphere when burning coal. Instead of releasing in the atmosphere for centuries, the captured CO2 can be liquefied and stored in places like **depleted oil and gas fields**.

4. Although the pilot project is very small in scale (50 times smaller than the neighboring coal power plant), hopes are high about the technology's potential to curb carbon dioxide emissions globally, particularly because global dependence on coal continues to grow rapidly. **Worldwide coal consumption** is expected to increase by 65 percent by 2030, with most of growing demand coming from India and China.

5. Some U.S. lawmakers have even proposed putting a moratorium on all new coal-fired power plants that do not have CCS facilities, despite the fact that the technology is probably at least a decade away from maturity.

6. Aside from further technical development, the other major obstacle to widespread use of CCS is its high cost. Utility Vatenfall wants to have a commercial CCS plant running by 2020, and aims to cut costs to 20 euros per ton of captured and stored CO2. But McKinsey & Company estimates current cost at between 60 and 90 euros – well above the current price of a ton of CO2 on the global carbon market. CCS technology also consumes energy and thus raises the cost of energy production.

7. Several environmental advocacy organizations have also voiced concerns about the environmental impacts of injecting **liquefied CO2** underground and deep into the oceans. There is also little knowledge about how long the CO2 will stay underground. The World Wide Fund for Nature (WWF) says that before investing billions of dollars, governments should be

certain that stored CO_2 will not **leak** for at least 100,000 years. After all, the aim is to solve – not merely delay – the CO_2 problem.

8. But the industry seems confident about the **leakage question**. Oil companies have long been pumping CO_2 into depleted oil and gas fields to maximize recovery, while Norwegian gas company StatoilHydro has been stripping CO_2 of natural gas and pumping it deep below the North Sea for over a decade now.

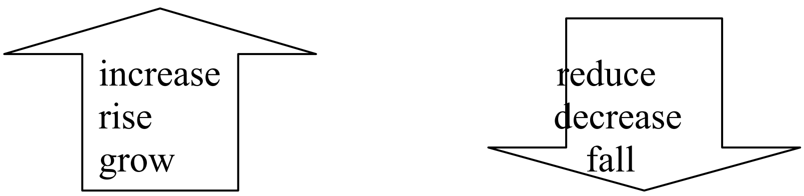
9. "If natural gas stays down below the earth with high pressure for several hundred million years, why shouldn't CO_2 stay down there?," says Daniel Kosel, an engineer who works at the Schwarze Pumpe facility.

10. The prospect of safe, cheap, and industrial-scale CCS offers an interesting perspective, particularly for countries that are most reliant on coal. Coal-rich countries like Canada, Australia, and the United States have already planned or launched pilot CCS projects. The U.S. alone has between 250 and 500 years of coal reserves and enough underground capacity to store its entire CO_2 emissions for another three centuries. The coal industry may find its key to survival in the low-carbon economy of the future. It's up to governments to decide whether to support this technology, or if in fact "no coal" is better than "clean coal."

23. Choose one of the passages from the text and translate it into Russian.

24. You will read the text CLIMATE CHANGE AND SOIL HEALTH. Before you read:

A. Remember the words



B. Separate the words into categories. Translate them using a dictionary.

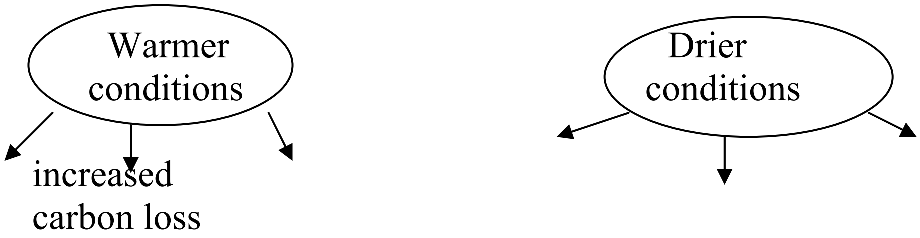
Simulate, anticipate, capacity, abundance, cumulative, reveal, moisture, expose, vulnerability, disseminate.

Nouns	Adjectives	Verbs

25. Read the text and find out how climatic changes influence the following factors of soil behavior:

- carbon content;
- water capacity;
- soil nutrients.

26. Complete the chart.



CLIMATE CHANGE AND SOIL HEALTH

A study produced by the Natural Environment Research Council (NERC) indicates that warmer, drier conditions will negatively impact the cycling of carbon, water and nutrients in the soil of shruland ecosystems, especially in northern Europe.

The effects of climate change on soil health have not been fully investigated, yet soil is an integral part of all ecosystems. In the context of the Vulcan project, warmer nighttime temperatures and *reduced* rainfall conditions were **simulated** in six shrubland ecosystems spanning southern and northern Europe. The goal was to **anticipate** changes in soil behaviour that can be expected over the next few decades as temperatures *rise* and the frequency of droughts increases.

NERC, a participant in the Vulcan project, monitored the effects of the modified weather on several key soil parameters. An alarming finding was that hotter temperatures led to increased carbon loss from the soil layer via respiration, constituting a positive feedback. On the other hand, in general, reduced rainfall led to decreased carbon loss. The overall effect was positive at the northern test sites in Denmark and Wales.

Drought conditions appeared to negatively affect soil water **capacity** over the **long run**. NERC also examined changes in the rate of generation of plant litter and its subsequent absorption into the organic soil reservoir. The most critical variable was found to be plant type, so the overall effect will depend on the number of species and their **abundance** in the shrubland ecosystem. Evidence of the **cumulative** effects of warmer, drier conditions was observed in the form of a 15 % decrease in organic matter content over a six-year period.

With respect to soil nutrients, the data **reveal** that nitrogen production increased when the test plots were **exposed** to higher temperatures, but only when soil **moisture** was within certain bounds. Unfortunately, the extended periods of drought are likely to push northern shrublands into the moisture danger zone. Phosphorus levels were relatively unaffected by the simulated changes in weather patterns.

The results of the Vulcan research demonstrate the **vulnerability** of shrubland ecosystems to climate change, particularly in northern Europe. NERC and its partners **disseminated** this knowledge through papers, meetings, newsletters and so forth in the hope of inspiring further action to limit climate change. In addition, the data can be used to improve soil parameterisation schemes in global climate models.

PROJECT WORK

27. Do some research about ecological problems in your region. Think about ways to improve the ecological conditions. Work out and present your project.

PART 4

WORKSITE ANALYSIS

1. Match the parts of the sentences. Translate them into Russian.

Industrial hygiene is	an essential first step that helps an industrial hygienist determine what jobs and work stations are the sources of potential problems.
Industrial hygienists use	factors or conditions that can cause sickness, impaired health, or significant discomfort in workers through chemical, physical, ergonomic, or biological exposures.
A worksite analysis is	environmental monitoring and analytical methods to detect the extent of worker exposure and employ engineering, work practice controls, and other methods to control potential health hazards.
Workplace hazards are	the science of anticipating, recognizing, evaluating, and controlling workplace conditions that may cause workers' injury or illness.

2. You will read the text “FROM THE HISTORY OF INDUSTRIAL HYGIEN”. Before you read do the tasks.

A. Match names of chemicals (1-5) to their Russian equivalents (a-e).

1) lead	a) медь
2) zinc	b) кислота
3) sulfur	c) сера
4) copper	d) цинк
5) acid	e) свинец

B. Find English equivalents for these terms in the text and write them down into your dictionary.

Отравление, превентивные меры, профессиональные болезни, меры безопасности, вредные условия труда, опасное воздействие, воздействие токсинов, реализовывать элементы техники безопасности и охраны труда.

3. Read the text and match parts of the sentences in the table to reproduce the history of industrial hygiene.

In the fourth century BC	Hippocrates	described the diseases of miners and prescribed preventive measures.
In the first century AD	Pliny the Elder	established the first state industrial hygiene programs.
In the second century AD	Galen	forced the British Parliament to pass the *Chimney-Sweepers Act*.
In 1556	Agricola	asserted that occupational diseases should be studied in the work environment and not in hospital wards.
In 1700	Bernardo Ramazzini	noted lead toxicity in the mining industry.
In 1788	Percival Pott	presented definitive proposals for eliminating unhealthful working conditions.
In the early 20th century	Dr. Alice Hamilton	described the pathology of lead poisoning.
In 1913	the New York Department of Labor and the Ohio Department of Health	devised a face mask to protect workers from exposure to dangerous gases.

FROM THE HISTORY OF INDUSTRIAL HYGIENE

There has been an awareness of industrial hygiene since antiquity. The environment and its relation to worker health was recognized as early as the fourth century BC when Hippocrates noted lead toxicity in the mining industry. In the first century AD, Pliny the Elder, a Roman scholar, perceived health risks to those working with zinc and sulfur. He devised a face mask made from an animal bladder to protect workers from exposure to dangerous gases. In the second century AD, the Greek physician, Galen, accurately described the pathology of lead **poisoning** and also recognized the **hazardous exposures** of copper miners to acid fumes.

In 1556, the German scholar, Agricola, advanced the science of industrial hygiene even further when, in his book *De Re Metallica*, he described the diseases of miners and prescribed **preventive measures**. The book included suggestions for mine ventilation and worker protection, discussed mining accidents, and described diseases associated with mining occupations such as silicosis.

Industrial hygiene gained further respectability in 1700 when Bernardo Ramazzini, known as the father of industrial medicine, published in Italy the first comprehensive book on industrial medicine, *De Morbis Artificum Diatriba (The Diseases of Workmen)*. The book contained accurate descriptions of the **occupational diseases** of most of the workers of his time. Ramazzini greatly affected the future of industrial hygiene because he asserted that occupational diseases should be studied in the work environment rather than in hospital wards.

In England in the 18th century, Percival Pott and his findings on the insidious effects of *soot* on chimney sweepers forced the British Parliament to pass the *Chimney-Sweepers Act of 1788*. The passage of the English Factory Acts beginning in 1833 marked the first effective legislative acts in the field of industrial safety. The Acts, however, were intended to provide compensation for accidents rather than to control their causes. Later, various other European nations developed workers' compensation acts, which stimulated the adoption of increased factory **safety precautions** and the establishment of medical services within industrial plants.

In the early 20th century in the U.S., Dr. Alice Hamilton led efforts to improve industrial hygiene. She observed industrial conditions first hand and startled mine owners, factory managers, and state officials with evidence that there was a correlation between worker illness and **exposure to toxins**. She also presented definitive proposals for eliminating **unhealthful working conditions**. And in 1913, the New York Department of Labor and the Ohio Department of Health established the first state industrial hygiene programs.

Today, nearly every employer is required **to implement the elements of an industrial hygiene and safety**, occupational health, or hazard communication program and to be responsive to the Occupational Safety and Health Administration (OSHA) and its regulations.

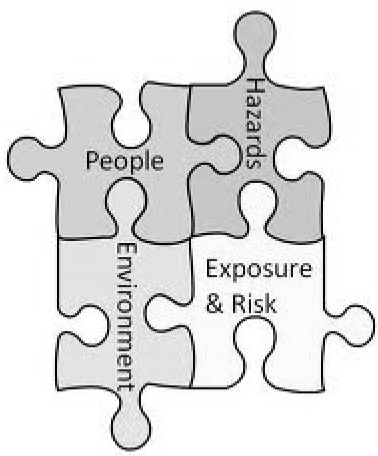
4. Complete the summary to the article with proper words. (Consult Appendix 4). Write a similar summary in Russian.

The article presents a (brief / extended) (overview / research / analyses) of industrial hygiene development from antiquity till modern times. It gives valuable (information / figures /test results) about the earliest and further safety precautions implemented to increase workers safety and eliminate unhealthy working conditions.

5. Read the text "WORKSITE ANALYSES" and complete the list of tasks by providing the verbs with nouns used in the text.

Example: measure and identify *exposures*
Reduce or remove _________________;
isolate ____________________;
eliminate ____________________;
substitute ____________________;
install ____________________;
inspect and maintain ________________;
provide ____________________;
schedule ____________________.

WORKSITE ANALYSIS



A worksite analysis is an essential first step that helps an industrial hygienist determine what jobs and work stations are the sources of potential problems. During the worksite analysis, the industrial hygienist measures and identifies exposures, problem tasks, and risks. The most-effective worksite analyses include all jobs, operations, and work activities. The industrial hygienist inspects, researches, or analyzes how the particular chemicals or physical hazards at that worksite affect worker health. If a situation hazardous to health is discovered, the industrial hygienist recommends the appropriate corrective actions.

Industrial hygienists recognize that engineering, work practice, and administrative controls are the primary means of reducing employee exposure to occupational hazards.

Engineering controls minimize employee exposure by either reducing or removing the hazard at the source or isolating the worker from the hazard.

Engineering controls include eliminating toxic chemicals and substituting non-toxic chemicals, enclosing work processes or confining work operations, and the installation of general and local ventilation systems.

Work practice controls alter the manner in which a task is performed. Some fundamental and easily implemented work practice controls include (1) changing existing work practices to follow proper procedures that minimize exposures while operating production and control equipment; (2) inspecting and maintaining process and control equipment on a regular basis; (3) implementing good housekeeping procedures; (4) providing good supervision; and (5) mandating that eating, drinking, smoking, chewing tobacco or gum, and applying cosmetics in regulated areas be prohibited.

Administrative controls include controlling employees' exposure by scheduling production and tasks, or both, in ways that minimize exposure levels. For example, the employer might schedule operations with the highest exposure potential during periods when the fewest employees are present. When effective work practices or engineering controls are not feasible or while such controls are being instituted, appropriate personal protective equipment must be used. Examples of personal protective equipment are gloves, safety goggles, helmets, safety shoes, protective clothing, and respirators. To be effective, personal protective equipment must be individually selected, properly fitted and periodically refitted; conscientiously and properly worn; regularly maintained; and replaced, as necessary.

6. Make a plan of the article in the form of questions. The first is done for you.

1. What is the main task of worksite analyses?
2. …

7. Write a detailed summary of the article WORKSITE ANALYSIS. Consult Appendix 4.

8. You are going to read the text CHEMICAL HAZARDS. Before you read learn these terms.

contaminant	загрязняющее вещество
particle	частица
solid	твердое тело
liquid	жидкость
volatile	летучий
evaporation	испарение
solvent	растворитель

9. Read the text CHEMICAL HAZARDS and guess Russian equivalent for the terms:

vapor dust fume
mist fiber

CHEMICAL HAZARDS

These are commonly classified as either particulate or gas and **vapor** contaminants. The most common particulate contaminants include dusts, fumes, mists, aerosols, and fibers. **Dusts** are solid particles that are formed or generated from solid organic or inorganic materials by reducing their size through mechanical processes such as crushing, grinding, drilling, abrading or blasting.

Fumes are formed when material from a volatilized solid condenses in cool air. In most cases, the solid particles resulting from the condensation react with air to form an oxide.

Fibers are solid particles whose length is several times greater than their diameter.

The term **mist** is applied to a finely divided liquid suspended in the atmosphere. Mists are generated by liquids condensing from a vapor back to a liquid or by breaking up a liquid into a dispersed state such as by splashing, foaming or atomizing. Aerosols are also a form of a mist characterized by highly respirable, minute liquid particles.

Gases are formless fluids that expand to occupy the space or enclosure in which they are confined. Examples are welding gases such as acetylene, nitrogen, helium, and argon; and carbon monoxide generated from the operation of internal combustion engines or by its use as a reducing gas in a heat treating operation. Another example is hydrogen sulfide which is formed wherever there is decomposition of materials containing sulfur under reducing conditions.

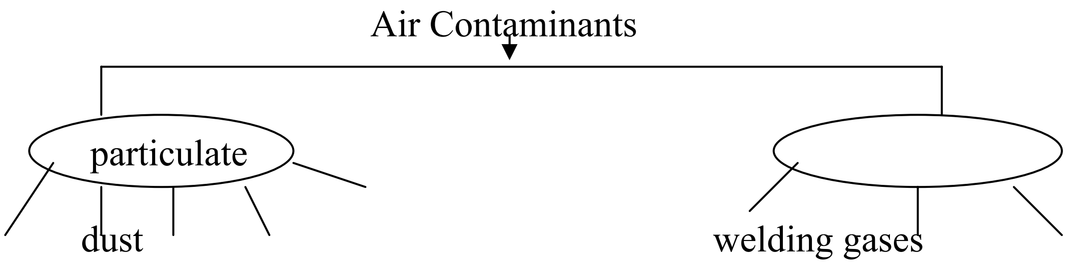
Liquids change into vapors and mix with the surrounding atmosphere through evaporation. Vapors are the volatile form of substances that are normally in a solid or liquid state at room temperature and pressure. They are formed by evaporation from a liquid or solid and can be found where parts cleaning and painting takes place and where solvents are used.

Airborne chemical hazards exist as concentrations of mists, vapors, gases, fumes, or solids. Some are toxic through breathing and some of them irritate the skin on contact; some can be toxic by absorption through the skin or through ingestion, and some are corrosive to living tissue.

The degree of worker risk from exposure to any given substance depends on the nature and potency of the toxic effects and the magnitude and duration of exposure.

10. Complete the classification and comment upon it. The phrase below will help you.

Air contaminants can be divided into two groups. They are…
Particulate contaminants include…
Such factors as … form the group of…



11. Read about biological hazards and write out:

- biological hazards;
- occupations which are exposed to biological hazards;
- methods preventing biological hazards.

BIOLOGICAL HAZARDS

These include bacteria, viruses, fungi, and other living organisms that can cause acute and chronic infections by entering the body either directly or through breaks in the skin. Occupations that deal with plants or animals or their products or with food and food processing may expose workers to biological hazards. Laboratory and medical personnel also can be exposed to biological hazards. Any occupations that result in contact with bodily fluids pose a risk to workers from biological hazards.

In occupations where animals are involved, biological hazards are dealt with by preventing and controlling diseases in the animal population as well as proper care and handling of infected animals. Also, effective personal hygiene, particularly proper attention to minor cuts and scratches, especially those on the hands and forearms, helps keep worker risks to a minimum.

In occupations where there is potential exposure to biological hazards, workers should practice proper personal hygiene, particularly hand washing. Hospitals should provide proper ventilation, proper personal protective equipment such as gloves and respirators, adequate infectious waste disposal systems, and appropriate controls including isolation in instances of particularly contagious diseases such as tuberculosis.

12. Read about physical hazards and fill in the table.

Type of physical hazards	Methods to provide workers' safety

PHYSICAL HAZARDS

These include excessive levels of ionizing and nonionizing electromagnetic radiation, noise, vibration, illumination, and temperature.

In occupations where there is exposure to ionizing radiation, time, distance, and shielding are important tools in ensuring worker safety. Danger from radiation increases with the amount of time one is exposed to it; hence, the shorter the time of exposure the smaller the radiation danger.

Distance also is a valuable tool in controlling exposure to both ionizing and non-ionizing radiation. Radiation levels from some sources can be estimated by comparing the squares of the distances between the worker and the source. For example, at a reference point of 10 feet from a source, the radiation is 1/100 of the intensity at 1 foot from the source.

Shielding also is a way to protect against radiation. The greater the protective mass between a radioactive source and the worker, the lower the radiation exposure.

Nonionizing radiation also is dealt with by shielding workers from the source. Sometimes limiting exposure times to nonionizing radiation or increasing the distance is not effective. Laser radiation, for example, cannot be controlled effectively by imposing time limits. An exposure can be hazardous that is faster than the blinking of an eye. Increasing the distance from a laser source may require miles before the energy level reaches a point where the exposure would not be harmful.

Noise, another significant physical hazard, can be controlled by various measures. Noise can be reduced by installing equipment and systems that have been engineered, designed, and built to operate quietly. Substituting quiet work methods for noisy ones is another significant way to reduce noise.

Also, treating floors, ceilings, and walls with acoustical material can reduce reflected or reverberant noise. In addition, erecting sound barriers at adjacent work stations around noisy operations will reduce worker exposure to noise generated at adjacent work stations.

It is also possible to reduce noise exposure by increasing the distance between the source and the receiver, by isolating workers in acoustical booths, limiting workers' exposure time to noise, and by providing hearing protection.

Another physical hazard, radiant heat exposure in factories such as steel mills, can be controlled by installing reflective shields and by providing protective clothing.

13. Read about ergonomic hazards and write out:

- types of ergonomic hazards;
- conditions which can cause ergonomic hazards;
- measures to avoid ergonomic hazards.

ERGONOMIC HAZARDS

The science of ergonomics studies and evaluates a full range of tasks including lifting, holding, pushing, walking, and reaching. Many ergonomic problems result from technological changes such as increased assembly line speeds, adding specialized tasks, and increased repetition; some problems arise from poorly designed job tasks. Any of those conditions can cause ergonomic hazards such as excessive vibration and noise, eye strain, repetitive motion, and heavy lifting problems. Improperly designed tools or work areas also can be ergonomic hazards. Repetitive motions or repeated shocks over prolonged periods of time as in jobs involving sorting, assembling, and data entry can often cause irritation and inflammation of hands and arms.

Ergonomic hazards are avoided primarily by the effective design of a job or jobsite and by better designed tools or equipment that meet workers' needs in terms of physical environment and job tasks. Through thorough worksite analyses, employers can set up procedures to correct or control ergonomic hazards by using the appropriate engineering controls (e.g., designing or redesigning work stations, lighting, tools, and equipment); teaching correct work practices (e.g., proper lifting methods); employing proper administrative controls (e.g., shifting workers among several different tasks, reducing production demand, and increasing rest breaks); and, if necessary, providing personal protective equipment. Evaluating working conditions from an ergonomics standpoint involves looking at the total physiological and psychological demands of the job on the worker.

Overall, industrial hygienists point out that the benefits of a well-designed, ergonomic work environment can include increased efficiency, fewer accidents, lower operating costs, and more effective use of personnel.

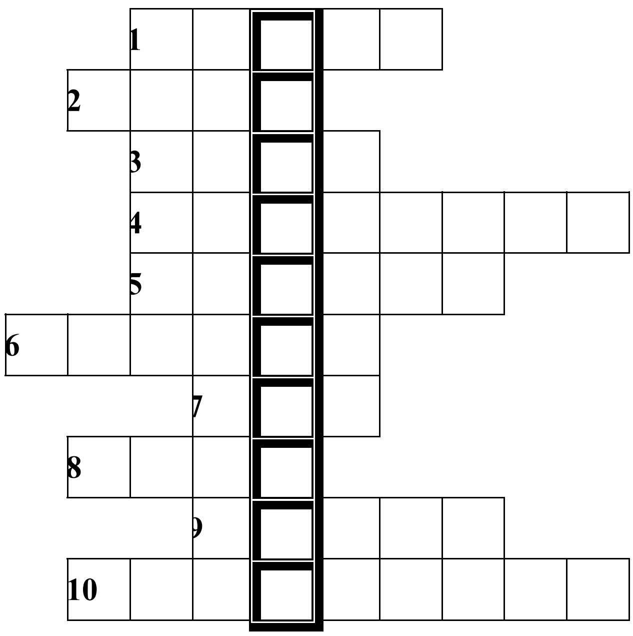
14. Do the crossword

Across:

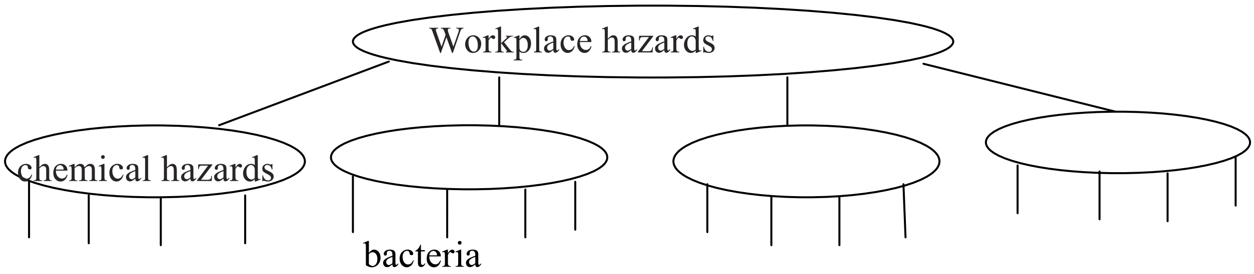
1) organism that can cause infection by entering the body;
2) volatile solids or liquids;
3) solid organic or inorganic particles formed as a result of mechanical processing of some material;
4) state of being uncovered or left without protection;
5) a tool to protect from radiation, noise, heat;
6) something likely to cause damage or loss;
7) formless fluids that expand to occupy the space or enclosure in which they are confined;
8) liquid in a dispersed state;
9) a loud or disturbing sound;
10) a slight continuous shaky movement.

Down:

a piece of equipment protecting against biological and chemical hazards.



15. Make a classification of workplace hazards.



13. Comment upon the classification of workplace hazards (See Activity 7). Below there are more verbs to help you.

To be classified into…
To comprise…
To consist of…
To be called…

16. Write an abstract to the four texts (Activities 6,8,9,10). Consult Appendix 3.

In this unit you will be asked to do some experiments.
Please, review SAFETY PRECAUTIONS before starting any experiment.

17. Five statements are NOT CORRECT. Find and correct them.

PREPARING
- Clear all surfaces before beginning experiments.
- Read the entire experiment before you start.
- Know the hazards of the experiments and anticipate dangers.

PROTECTING YOURSELF
- Follow the directions step by step.
- Perform several experiment at a time.
- Locate exits, fire blanket and extinguisher, master gas and electricity shut-offs, eyewash, and first-aid kit.
- Make sure there is adequate ventilation.
- Wear open-toed shoes.
- Keep floor and workspace neat, clean, and dry.
- Clean up spills immediately.
- Tie back long hair.
- Wear safety glasses or goggles, apron, and gloves
- Never eat, drink, or smoke in the laboratory or workspace.

USING EQUIPMENT WITH CARE

• Set up apparatus far from the edge of the desk.
• Use knives or other sharp, pointed instruments with care.
• Pull cords, not plugs, when removing electrical plugs.
• Check glassware for scratches, cracks, and sharp edges.
• Do not use reflected sunlight to illuminate your microscope.
• Do not touch metal conductors.

USING CHEMICALS

• Always taste and smell chemicals.
• Read labels carefully.
• Avoid chemical contact with skin and eyes.
• Do not touch chemical solutions.

HEATING SUBSTANCES

• Keep your face away from test tubes and beakers.
• When heating substances in a test tube, point the top of the test tube toward other people.
• Never leave apparatus unattended.
• Take care when lighting your Bunsen burner; light it with the airhole closed and use a Bunsen burner lighter rather than wooden matches.
•Turn off hot plates, Bunsen burners, and gas when you are done.
• Keep flammable substances away from flames and other sources of heat.

FINISHING UP

• Thoroughly clean your work area and any glassware used.
• Wash your hands.
• Be careful not to return chemicals or contaminated reagents to the wrong containers.
• Dispose of all chemicals according to all local, state, and federal laws.

18. You will read about WATER TESTING METHODS. Before you read do the tasks below.

A. Translate the derivatives and learn the words.

measure – измерять	measurement
add – добавлять	addition
compare – сравнивать	comparator
accuracy – точность	accurate
quality – качество	qualitative
quantity – количество	quantitative

B. Find these terms in the texts.

Шкала измерительного прибора, взвешенные частицы, реактив, компаратор цвета, луч света, немедленный результат, по капле, поверхностные источники водоснабжения, мутность, оседающие (в течение 1 ч) взвешенные твёрдые частицы, конечная точка, рассеивать свет, системы очистки воды, определение осаждаемости, отстаиваться, доза флокулянта (хлопьеобразующего агента), объем грязи

19. Read about water testing methods and say which of them you use or have ever used.

WATER TESTING METHODS

Colorimetric Method

This is defined as the measurement of a parameter when the concentration is directly proportional to color development and intensity after the addition of known volume of **reagent chemicals**.

To determine concentration, the color developed in the sample is either compared visually with manufacturer supplied standards (**color comparator**) or inserted into a photometer, colorimeter, or spectrophotometer to give results directly on a **meter scale**, or digitally via a discrete readout. Results are expressed as parts per million (ppm), milligrams per liter (mg/L), grains per gallon (gpg), etc.

Colorimetric methods using a photometer, colorimeter, or spectrophotometer offer a unique advantage. Many meters are battery powered and conveniently packaged for portability. To briefly describe their operation: **a light beam** is pointed at a sample. Depending upon the amount of color present, light will pass through the sample and be detected by a photodiode. With the aid of electronics, the results are displayed on a meter, either directly in concentration or as a percentage of light transmitted. Colorimetric test methods offer **on-the-spot results** and can test for a variety of common substances. Tests for chlorine, iron, manganese, copper, zinc, aluminum fluoride, ozone, nitrates, phosphates, sulfides, and many more materials are available.

Titrimetric Method

In this procedure a sample is taken, and reagent known as an **indicator reagent** is added to produce a color. A “titrant” or a reacting reagent is added **drop by drop** until a color change occurs. The point at which the color changes is called the **endpoint**. Titrimetric methods offer a number of titrant dispensing apparatuses: Titration methods are generally quite inexpensive, and are the preferred method in many procedures. Tests for acidity, alkalinity, carbon dioxide, hardness, dissolved oxygen, and chlorine are among the most common. Here, too, convenient packaging and simplicity are the key to portability and accuracy. This method is preferred in determining corrosion to water supplies, and offers the operator an easy, inexpensive approach to meeting lead/copper requirements.

Turbidimetric Method

Some test procedures do not use color as a way to determine results. Instead, a sample is taken and a reagent is added which produces **turbidity** or cloudiness in the sample. The greater the turbidity, the greater the concentration. As with the colorimetric method, turbidimetric results can be "read" using a visual comparator, or by the use of a colourimeter. Results are expressed in ppms or mg/L. Typical tests using this method are those for potassium and sulfates. Again, the mechanism employing this method can be totally portable and conveniently packaged as a kit.

Electrometric Method

One of the most commonly used: an electrode is inserted into a sample. A small current or voltage is produced and electronically amplified and read on a meter scale. Typical tests of this sort are for pH and conductivity, but a variety of substances can be measured using ion specific electrodes (ISE), including calcium,

nitrates, chlorine.

Generally, electrometric methods are initially quite costly and they require a high degree of care and maintenance because of the electrode systems.

Nephlometric Method

This method is specifically for measuring water turbidity. **Suspended matter** within a sample is measured via a specially designed meter which sends a focused light beam through the water sample. Suspended solids, dirt, and silt **scatter the light**. The scattering is measured by a photodiode at a 90° angle incident to the light source. Results are expressed as Nephlometric Turbidity Units (NTU's), and are more qualitative than quantitative.

Portable **battery-powered** units are available for field use. Private and municipal **water treatment systems** using **surface water supplies** such as lakes, streams, etc. are required to measure turbidity routinely as a guide to monitoring various water treatment systems like settling basins and sand filter performance. Continuous monitoring turbidity meters and recorders are becoming the rule rather than the exception.

Gravimetric Test Methods

These are essentially physical test procedures. They include monitoring **settleable** solids by means of **settleability tests**, and are primarily used as operational guideposts in both water and waste facilities. A sample is taken (usually one liter) thoroughly mixed and **allowed to settle**. Imhoff cones and settlometres are the common containers of choice here. The samples are timed at various intervals to determine the ratio of solids and the volume of solids that settle. Results can be transferable to plant operations to determine proper **flocculant dose**s, expected **sludge volume**s, adjusted waste and return sludge in wastewater facilities. These are relatively simple test methods that require no chemical or reagent to perform (except when determining flocculant dosages), and they provide valuable data to a water operator.

20. Fill in the table.

Water testing methods	Substances to test	Equipment to be used

21. Write a brief summary of the text WATER TESTING METHODS.

22. Write a detailed description of the water test which you most often perform or have performed.

23. Translate the text SAMPLING TECHNIQUE into Russian.

SAMPLING TECHNIQUE

All of the test methods described above require proper samples. Accurate sample volumes for each test are important. There are some other important points to remember.

- Choose the proper location in the water system from which to extract your sample.
- Let the spigot run a short period of time to obtain a representative sample. (**Note:** applies only to a first draw sample. For lead or copper, disregard this step.)
- Pour the correct volume of the sample into the test tube or jar. Accurate results require accurate sample volumes.
- Once the test is complete, dispose of both the waste reagent and the sample properly, and clean all test tubes thoroughly.

- Follow the test kit manufacturers' directions specifically. Do not alter the procedure to suit your needs or take shortcuts; this risks skewed results.
- Do not intermix different manufacturers' reagents, particularity colorimetric ones, unless they are the exact same concentration.

RESEARCH WORK

24. Choose one of the water quality parameters described in the text below; choose a water source. Test a sample from the source for the chosen parameter. If the test is not available find data about it.

Write a short report.

COMMON WATER QUALITY TERMS/PARAMETERS

Aesthetic Objective (AO) – levels of substances or characteristics of water that can affect its acceptance by consumers or interfere with practices for supplying good quality water.

Alkalinity – is not a specific substance but rather a combined effect of several substances. It is a measure of the resistance of water to a change in pH. The alkalinity of most prairie waters is in the range of 100 to 500 mg/L, which is considered acceptable. Water with higher levels is often used. Alkalinity is a factor in corrosion or scale deposition and may affect some livestock when over 1,000 mg/L.

Calcium and Magnesium – cause "hardness" in water. They are not hazardous to health but are undesirable because they may be detrimental for domestic uses such as washing, bathing and laundering. It also tends to cause encrustations in kettles, coffee makers and water heaters.

Coliforms (Fecal) or (E. Coli) or (Escherichia coli) - E. coli is a member of the total coliform group of bacteria and is the only member that is found exclusively in the faeces of humans and other animals. Its presence in water indicates not only recent faecal contamination of the water but also the possible presence of intestinal disease-causing bacteria, viruses, and protozoa.

Coliforms (Total) – The presence of these bacteria may indicate contamination in a water supply. This group of bacteria is found in feces, soil, and vegetation and is used as an indicator of the bacteriological quality of water. Coliforms are useful indicators of the possible presence of pathogenic bacteria and viruses.

Conductivity (E.C.) – is measured in decisiemens/meter (dS/m). It can be used to estimate the total dissolved solids in the water. Multiplying the conductivity in dS/m by 640 will give a good approximation of the total dissolved solids in mg/L. Conductivity tests are often used to assess water suitability for irrigation. Conductivity is sometimes expressed as microSiemens/cm (µS/cm OR uS/cm), which is 1000 times smaller as a unit than deci siemens per centimeter. (Eg 0.75 decisiemens/m=750 microsiemens/cm=0.750 millisiemens/cm). We have used the letter "u" within our tool to represent the "micro" prefix "µ". We have used the conversion of 1dS/m = 700 mg/L TDS within the tool because the federal guidelines have used this conversion for their guidelines values for TDS.

Fluoride – occurs naturally in most groundwater wells and can help prevent dental cavities. Between 1 and 1.5 mg/L is desirable. As fluoride levels increase above this amount, there is an increase in the tendency to cause tooth mottling. Fluoride levels less than 2 mg/L are not considered a problem for livestock.

Hardness – caused excessive soap consumption and scaling. Hardness is caused primarily by calcium and magnesium, but is expressed as a mg/L equivalent of calcium carbonate. Hard water causes soap curd, which makes bathroom fixtures difficult to keep clean and causes greying of laundry. Hard water will also tend to form scale in hot water tanks, kettles, piping systems, etc.

Iron – levels as low as 0.2 to 0.3 mg/L will usually cause the staining of laundry and plumbing fixtures. The presence of iron bacteria in water supplies will often cause these symptoms at even lower levels. Iron gives water a metallic taste that may be objectionable to some at 1 to 2 mg/L. Most water contains less than 5 mg/L iron, but occasionally, levels over 30 mg/L are found.

Maximum Acceptable Concentration (MAC) - levels of substances that are known, or suspected to, cause adverse effects on health.

NO3 nitrogen (Nitrate) – is often an indicator of contamination by human or livestock wastes, excessive fertilization or seepage from dump sites. The maximum acceptable concentration in drinking water is 10 mg/L. This figure is based on the potential for nitrate poisoning of infants. Adults can tolerate higher levels, but high nitrate levels may cause irritation of the stomach and bladder. The suggested maximum for livestock use is 100 mg/L.

Nitrate is converted to nitrite in the body. Nitrite causes asphyxiation by entering the bloodstream and reacting with hemoglobin (the red, oxygen-carrying pigment of the blood) to form methemoglobin, which is not able to carry oxygen to the body's tissue. Nitrate in water is approximately 10 times more soluble than in feed. Caution is needed to differentiate between nitrate and nitrate-N or nitrate as N. Nitrate = Nitrate-N * 4.4

NO2 nitrogen (Nitrite) – has an element of toxicity. Nitrite is usually an indicator of direct contamination by sewage or manure because nitrites are unstable and quickly become nitrates.

pH – expresses the intensity of the acid or alkaline condition of a solution. A pH of 7 indicates neutral conditions on a scale of 0 (acidic) to 14 (alkaline). The generally accepted range for pH in water is 6.5 to 8.5 with an upper limit of 9.5.

Sodium – is not considered a toxic metal. 5,000 to 10,000 milligrams per day are consumed by normal healthy adults without adverse effects. The average intake of sodium from water is only a small fraction of that consumed in a normal diet.

People suffering from certain medical conditions such as hypertension may require a sodium restricted diet, in which case the intake of sodium from drinking water could become significant.

Sodium is a significant factor in assessing water for irrigation and plant watering. High sodium levels affect soil structure and a plant's ability to take up water.

Sulphate (SO4) – concentrations over 500 mg/L can be a laxative to some humans and livestock. Sulphate levels over 500 mg/L may be a concern for livestock receiving marginal intakes of certain trace minerals. Very high levels of sulphates have been associated with some brain disorders in cattle and pigs.

Total Dissolved Solids (TDS) – comprise inorganic salts and small amounts of organic matter that are dissolved in water. The principal constituents are usually the cations calcium, magnesium, sodium and potassium and the anions carbonate, bicarbonate, chloride, sulphate and, particularly in groundwater, nitrate (from agricultural use).

Turbidity – Particles of matter are naturally suspended in water. These particles can be clay, silt, finely divided organic and inorganic matter, plankton and other microscopic organisms. Turbidity is a measurement of how light scatters when it is aimed at water and bounces off the suspended particles. It is not a measurement of the particles themselves. In general terms, the cloudier the water, the more the light scatters and the higher the turbidity. The treated water turbidity target is 0.1 NTU (nephelometric turbidity units).

25. Read the text AIR POLLUTION and write a brief summary to the text.

AIR POLLUTION

Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or damages the natural environment, into the atmosphere.

The atmosphere is a complex, dynamic natural gaseous system that is essential to support life on planet Earth. Stratospheric ozone depletion due to air pollution has long been recognized as a threat to human health as well as to the Earth's ecosystems.

An air pollutant is known as a substance in the air that can cause harm to humans and the environment. Pollutants can be in the form of solid particles, liquid droplets, or gases. In addition, they may be natural or man-made.[1]

Pollutants can be classified as either primary or secondary. Usually, primary pollutants are substances directly emitted from a process, such as ash from a volcanic eruption, the carbon monoxide gas from a motor vehicle exhaust or sulfur dioxide released from factories.

Secondary pollutants are not emitted directly. Rather, they form in the air when primary pollutants react or interact. An important example of a secondary pollutant is ground level ozone - one of the many secondary pollutants that make up photochemical smog.

Major primary pollutants produced by human activity include:

Sulfur oxides (SOx) – especially sulfur dioxide, a chemical compound with the formula SO2. SO2 is produced by volcanoes and in various industrial processes. Since coal and petroleum often contain sulfur compounds, their combustion generates sulfur dioxide. Further oxidation of SO2, usually in the presence of a catalyst such as NO2, forms H2SO4, and thus acid rain. This is one of the causes for concern over the environmental impact of the use of these fuels as power sources.

Nitrogen oxides (NOx) – especially nitrogen dioxide are emitted from high temperature combustion. Nitrogen dioxide is the chemical compound with the formula NO_2. It is one of the several nitrogen oxides. This reddish-brown toxic gas has a characteristic sharp, biting odor. NO_2 is one of the most prominent air pollutants.

Carbon monoxide – is a colorless, odorless, non-irritating but very poisonous gas. It is a product by incomplete combustion of fuel such as natural gas, coal or wood. Vehicular exhaust is a major source of carbon monoxide.

Carbon dioxide (CO_2) – a greenhouse gas emitted from combustion but is also a gas vital to living organisms. It is a natural gas in the atmosphere.

Volatile organic compounds – VOCs are an important outdoor air pollutant. In this field they are often divided into the separate categories of methane (CH_4) and non-methane (NMVOCs). Methane is an extremely efficient greenhouse gas which contributes to enhanced global warming. Other hydrocarbon VOCs are also significant greenhouse gases via their role in creating ozone and in prolonging the life of methane in the atmosphere, although the effect varies depending on local air quality.

Particulate matter – Particulates, alternatively referred to as particulate matter (PM) or fine particles, are tiny particles of solid or liquid suspended in a gas. In contrast, aerosol refers to particles and the gas together. Sources of particulate matter can be man-made or natural. Some particulates occur naturally, originating from volcanoes, dust storms, forest and grassland fires, living vegetation, and sea spray. Human activities, such as the burning of fossil fuels in vehicles, power plants and various industrial processes also generate significant amounts of aerosols.

Toxic metals – such as lead, cadmium and copper.

Chlorofluorocarbons (CFCs) – harmful to the ozone layer emitted from products currently banned from use.

Ammonia (NH_3) – emitted from agricultural processes. Ammonia is a compound with the formula NH_3. It is normally encountered as a gas with a characteristic pungent odor. Ammonia contributes significantly to the nutritional needs of terrestrial organisms by serving as a precursor to foodstuffs and fertilizers. Ammonia, either directly or indirectly, is also a building block for the synthesis of many pharmaceuticals. Although in wide use, ammonia is both caustic and hazardous.

Odors – such as from garbage, sewage, and industrial processes

Radioactive pollutants – produced by nuclear explosions, war explosives, and natural processes such as the radioactive decay of radon.

PROJECT WORK

26. **Find information about air pollution or water pollution indexes in your region or do an independent research. Write a report about air quality or water quality in your region and present it in class.**

GRAMMAR REVIEW

Revise WORD BUILDING (Appendix 2) and do the Activities 24–31.

27. **Use prefixes to form new words. Translate the words.**

re – to construct, to make, to build, to heat, to produce
super – man, critical, low, to cool, to heat
sub – group, way, normal, tropical, to divide
over – to work, to boil, to produce, to value, to pay, pressure
semi – automatic, conductor, official, circle
inter – national, atomic, act, change, communication
un – able, obtainable, capable, productive, important, successful, natural, limited, equal, known, practical
in – efficient, dependent, visible, complete, definite
im – possible, pure, measurable
non – parallel, ferrous, conductive, metallic

28. **Translate phrases into Russian. Mind prefixes.**

A lot of unsolved problems, under unusual conditions, inaccurate amount, irregular form, impossible situation, to misunderstand the drawing, to reassemble the model, to reread the article, supernatural phenomenon, to overcool the substance, to overheat the alloy, semiconductor materials, semiautomatic machine-tools, intercontinental communication.

29. **Read the sentences below and define the parts of speech words in bold belong to. Translate the phrases into Russian.**

To **conduct** a time service, a **conductor** of electricity, a **semiconductor** device, the **conductivity** of this metal, the **conduction** of electrons, good **conductance**, **conducting** capacity; to **observe** stars, an accurate **observation**, a careful **observer**, astronomical **observatory** instruments, an **observable** phenomenon; electric **power**, a **power** station, a **powerful** telescope, **technical** progress, highly skilled **technician**, modern **technique**.

30. **Use suffixes given below to form nouns. Translate the words.**

-ist: physic(s), telegraph, special, social
-er: transform, design, build, read, report, lectur(e)
-or: generat(e), escalat(e), construct, translate, act
-ing: engineer, build, read, draw, begin
-ment: measure, equip, employ, require, develop, manage, improve
-ion: construct, , illustrat(e), express
-ation: combin(e), inform, appl(y), accredit, confirm, implement
-sion: divi(de), deci(de), conver
-ssion: transmit(t), permi(t), admi(t)

31. Translate into Russian

Scientist, doctor, reporter, operator, measurement, multiplication, dimension, depth, width, beginning, division, production, drawing, conversion, subtraction, professor, specialist, profession, function, radiator.

32. Read adjectives below and use suffix -*ly* to change into adverbs. Translate the words.

Simple, normal, usual, complete, large, near, great, high, hard.

33. Use suffixes given below to form adjectives. Translate the words.

- ful: help, wonder, use, power
-less: use, help, power, motion, weight
- ic: period, metr(e), atmosphere(e), bas(e)
- al: physic(s), natur(e), experiment, mathematic(s)
- able: valu(e), change, measure(e), compare(e)
-ant: import, resist
- ent: differ, insist
-ive: effect, act

PART 5

SAFETY IN TECHNOSPHERE

1. Read th

Technosphere is the part of the physical environment affected through building or modification by humans.

- evolution has resulted in efficient use of materials and energy in systems to build and break down functional materials in a steady state.
- resources are exploited and unusable waste streams to soil, water, and air are produced.

2. You are going to read the text EMERGENCY. Before you read find English equivalents for these terms in the text and write them down into your dictionary.

Представлять непосредственную угрозу для здоровья, жизни, собственности или окружающей среды; срочное вмешательство; предотвращать ухудшение ситуации; уменьшение ущерба; последствия; реагирование в чрезвычайной ситуации.

EMERGENCY

An emergency is a situation which **poses an immediate risk to health, life, property or environment**. Most emergencies require **urgent intervention** to **prevent a worsening of the situation**, although in some situations, **mitigation of damage** may not be possible and agencies may only be able to offer help for **the aftermath**.

While some emergencies are self evident (such as a natural disaster which threatens many lives), many smaller incidents require the subjective opinion of an observer (or affected party) in order to decide whether it qualifies as an emergency.

The precise definition of an emergency, the agencies involved and the procedures used, vary by jurisdiction, and this is usually set by the government, whose agencies (emergency services) are responsible for emergency planning and management.

In order to be defined as an emergency, the incident should be one of the following:

– **immediately threatening to life**, health, property or environment;

– have already caused loss of life, health, property or environmental damage;

– have a high probability of escalating to cause immediate danger to life, health, property or environment

Whilst most emergency services agree on protecting human health, life and property, the environmental impacts are not considered sufficiently important by some agencies. This also extends to areas such as animal welfare, where some emergency organizations cover this element through the 'property' definition, where animals which are owned by a person are threatened (although this does not cover wild animals). This means that some agencies will not mount an **emergency response** where it endangers wild animals or environment, although others will respond to such incidents (such as oil spills at sea which pose a threat to marine life). The attitude of the agencies involved is likely to reflect the predominant opinion of the government of the area.

3. Complete the sentences to get a brief summary of the article.

The text presents (*a newspaper article / an encyclopedia article / a short story*).
It provides (*a general definition / a detailed description / results of a research*) of an emergency.
It is stressed that a situation may or may not be qualified as an emergency depending on (*government policy / government budget / emergency organization*).

4. You will read the text TECHNOLOGICAL HAZARDS. Before you read fill in the table below by matching hazards, causes and consequences (последствия). Suggest the missing causes and consequences by yourself.

Hazards	**Causes**	**Consequences**
Structural collapses		
Power outage		
Fires		

Radiation contamination		
Chemical contamination		
Transportation accidents		

Causes:
nuclear weapons are detonated or nuclear containment systems are abused;
engineering failures;
equipment error or human factor;
lightning, human negligence or arson.
Consequences:
business losses, medical emergencies, civil disorder;
deadly diseases, a long-term effect on the next generation;
great destruction, loss of life;
damage to human health and environment.

5. Read the text and check your answers in the previous activity.

TECHNOLOGICAL HAZARDS

Technological hazards are an increasing source of risk to people and their environment. This is an effect of the globalization of production, an increase of industrialization and a certain level of risk of accidents connected with production, processes, transportation and waste management. **Severe accidents** have happened which afflicted thousands of people. These have found expression in the public demand to provide technical and organizational tools for the **prevention and mitigation of disasters**.

Structural collapse

Structural collapses are often caused by **engineering failures**. Bridge failures may be caused in several ways, such as **under-design** (as in the Tay Bridge disaster), by corrosion attack (such as in the Silver Bridge collapse), or by aerodynamic flutter of the deck (as in Tacoma Narrows Bridge). Failure of dams was not infrequent during the Victorian era, such as the Dale Dyke dam failure in Sheffield, England in the 1860s, causing the Great Sheffield Flood. Other failures include balcony collapses or building collapses such as that of the World Trade Center.

Power outage

A power outage is an interruption of normal sources of electrical power. Short-term power outages (up to a few hours) are common and have minor effect, since most businesses and **health facilities** are prepared to deal with them. Extended power outages, however, can disrupt personal and business activities as well as medical and rescue services, leading to business losses and medical emergencies. Extended loss of power can lead to **civil disorder**, as in the New York City blackout of 1977. Power outages often accompany other types of disasters, such as hurricanes and floods, which hampers **relief actions**.

Recent notable power outages include the 2005 Java–Bali Blackout which affected 100 million people and the 2009 Brazil and Paraguay blackout which affected 60 million people.

Fire

Bush fires, forest fires, and mine fires are generally started by lightning, but also by **human negligence or arson**. They can burn thousands of square kilometers. If a fire intensifies enough to produce its own winds and "weather", it will form into a firestorm. A good example of a mine fire is the one near Centralia, Pennsylvania. Started in 1962, it ruined the town and continues to burn today. Some of the biggest city-related fires are The Great Chicago Fire, The Peshtigo Fire (both of 1871) and the Great Fire of London in 1666.

Casualties resulting from fires, regardless of their source or initial cause, can be aggravated by inadequate **emergency preparedness**. Such hazards as a lack of **accessible emergency exits**, poorly marked **escape routes**, or improperly maintained **fire extinguishers** may result in many more deaths and injuries than might occur with such protections.

Radiation contamination

When nuclear weapons are detonated or nuclear containment **systems are abused**, airborne radioactive particles (nuclear fallout) can scatter and irradiate large areas. Not only is it deadly, but it also has a long-term effect on the next generation for those who are contaminated. Ionizing radiation is hazardous to living things, and in such a case much of the affected area could be unsafe for human habitation. During World War II, United States troops dropped atomic bombs on the Japanese cities of Hiroshima and Nagasaki. As a result, the radiation fallout contaminated the cities' water supplies, food sources, and half of the populations of each city were stricken with disease. The Soviet republics of Ukraine and Belarus are part of a scenario like this after a reactor at the Chernobyl nuclear power plant suffered a meltdown in 1986. To this day, several small towns and the city of Chernobyl remain abandoned and uninhabitable due to fallout.

Chemical contamination

Many technological risks are associated with **the release of hazardous substances** which could affect human health or the environment by contamination in accident condition or with the production of such substances under certain conditions as fire.

Considering the amount and distribution of facilities using hazardous materials throughout the world, the risks posed by them to societies and the environment it has to be considered as an increasing global problem.

The following list indicates the type of actions which can constitute technological hazards:

release of chemicals to the atmosphere by **explosion**, fire;

release of chemicals into water (groundwater, rivers etc.) by tank rupture, **pipeline rupture**, chemicals dissolved in water (fire), **oil spills** in marine environment;

contamination by waste management activities;

releases and contaminations as a consequence of military actions (e.g. depleted uranium), or destruction of facilities;

releases as consequence of the industrial use of biological material (e.g. viruses, bacteria, fungi).

Transportation accidents

An aviation accident is defined as an occurrence associated with the operation of an aircraft in which a person is **fatally or seriously injured**, the aircraft sustains damage or structural failure or the aircraft is missing or is completely inaccessible.

The category of the vehicle can range from a helicopter, an airliner, or a space shuttle. The world's worst airliner disaster is the Tenerife crash of 1977, when miscommunications between and amongst air traffic control and an aircrew caused two fully-laden jets to collide on the runway, killing 583 people.

04 in Sri Lanka when 1,700 people died in the Queen of the Sea train disaster. Other notable rail disasters are the 1989 Ufa accident in Russia which killed 574, and the 1917 Modane train accident in France which killed 540.

Traffic collisions are the leading cause of death, and road-based pollution creates a substantial health hazard, especially in major conurbations. The greenhouse effect of road transport is a significant fraction of the anthropogenic warming effect, and the rapid consumption of fossil fuel accelerates the Hubbard peak.

6. Find English equivalents for these terms in the text and write them down into your dictionary.

Столкновение транспорта на дороге, смертельно или серьезно травмированный, разлив нефти, разрыв трубопровода, взрыв, выброс опасных веществ, доступные аварийные выходы, маршруты эвакуации, огнетушители, подготовленность к чрезвычайной ситуации, халатность человека или поджег, беспорядки в обществе, инженерная ошибка, помещения и оборудование медицинских учреждений, оказание помощи, недостаточный запас прочности, прекращение подачи электроэнергии, эксплуатировать систему с нарушением норм, серьезная авария, предотвращение катастроф, уменьшение ущерба,.

7. Reconstruct the phrases by matching the words from list *(a-l)* to the words from list (1-12).

a) extinguisher, b) risk, c) disorder, d) intervention, e) collision, f) response, g) negligence, h) exit, i) facilities, j) route, k) failure, l) substances

1) immediate ___________
2) urgent ___________
3) emergency ___________
4) engineering ___________
5) health ___________
6) civil ___________
7) human ___________
8) accessible ___________
9) escape ___________
10) fire ___________
11) hazardous ___________
12) traffic ___________

8. Complete the sentences below using the reconstructed phrases.

1) A situation which presents _________________ to people or environment is called an emergency.
2) _______________ can reduce damage and save people's lives.
3) Emergency agencies are organized to provide quick and efficient _______________.
4) The Tay Bridge collapse was caused by _______________.
5) _______________ can lead to many severe accidents such as fires and equipment breakdown.
6) Chemical contamination is associated with the release of _______________.
7) Every building must have _______________ for people to escape in case of fire.
8) The leading cause of transportation accidents is _________________.
9) _______________ is an active fire protection device used to control small fires, often in emergency situations.

10) Sometimes emergency situations may be worsened by ______________.

9. Speak about causes and consequences of technological accidents.

Model:
Structural collapses ***can be caused by*** engineering failures.
They ***can lead to*** deaths and business losses.

10. Write a brief summary of the text.

11. You will read the text EMERGENCY MANAGEMENT. Before you read do the tasks below.

A. Translate the nouns and write the verbs they are derived from.

Example: *recovery* *recover*
preparedness ________________
mitigation ________________
response ________________
management ________________

B. Write nouns derived from these verbs.

prevent ________________
reduce ________________
improve ________________
eliminate ________________
regulate ________________
evacuate ________________
protect ________________
maintain ________________
solve ________________

12. Read the text EMERGENCY MANAGEMENT and write a brief summary.

EMERGENCY MANAGEMENT

Figure 4 represents the four phases in emergency management.

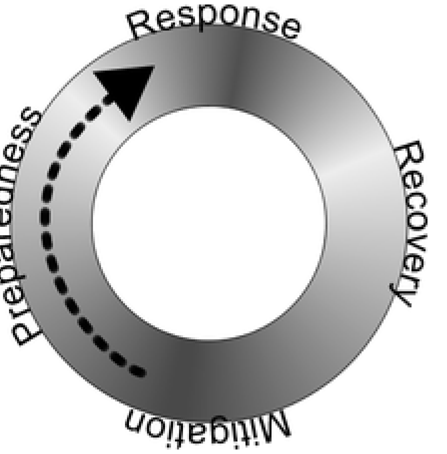


Figure 5 Phases in emergency management

Mitigation

Mitigation efforts are attempts to prevent hazards from developing into disasters altogether or to reduce the effects of disasters. The mitigation phase differs from the other phases in that it focuses on long-term measures for reducing or eliminating risk. Mitigation measures can be structural or non-structural. Structural measures use technological solutions like flood dams. Non-structural measures include legislation, land-use planning (e.g. the designation of nonessential land like parks to be used as flood zones), and insurance. Mitigation is the most cost-efficient method for reducing the effect of hazards although not always the most suitable. Mitigation includes providing regulations regarding evacuation, sanctions against those who refuse to obey the regulations, and communication of risks to the public.

Preparedness

Preparedness is a continuous cycle of planning, managing, organizing, training, equipping, exercising, creating, monitoring, evaluating and improving activities to improve capabilities of organizations to prevent, protect against, respond to, recover from natural disasters, acts of terrorism, and other man-made disasters.

Common preparedness measures include:

- communication plans with easily understandable terminology and methods;
- proper maintenance and training of emergency services, including mass human resources such as community emergency response teams;
- development and Activity of emergency population warning methods combined with emergency shelters and evacuation plans;

- stockpiling, inventory, streamline foods supplies, and maintain other disaster supplies and equipment;
- develop organizations of trained volunteers among civilian populations.

Another aspect of preparedness is casualty prediction, the study of how many deaths or injuries to expect for a given kind of event. This gives planners an idea of what resources need to be in place to respond to a particular kind of event.

Response

The response phase includes the mobilization of the necessary emergency services and first responders in the disaster area in order to provide the first aid and quick rescue efforts. This is likely to include a first wave of core emergency services, such as firefighters, police and ambulance crews. They may be supported by a number of secondary emergency services, such as specialist rescue teams.

A well rehearsed emergency plan developed as part of the preparedness phase enables efficient coordination of rescue.

There is a need for both discipline (structure, doctrine, process) and agility (creativity, improvisation, adaptability) in responding to a disaster.

Recovery

The aim of the recovery phase is to restore the affected area to its previous state. It differs from the response phase in its focus; recovery efforts are concerned with issues and decisions that must be made after immediate needs are addressed. Recovery efforts are primarily concerned with actions that involve rebuilding destroyed property, re-employment, and the repair of other essential infrastructure. Efforts should be made to "build back better", aiming to reduce the pre-disaster risks inherent in the community and infrastructure. An important aspect of effective recovery efforts is taking advantage of a ‘window of opportunity’ for the implementation of mitigative measures that might otherwise be unpopular. Citizens of the affected area are more likely to accept more mitigative changes when a recent disaster is in fresh memory.

13. Fill in the table with the information of the text.

Phases	*Aims*	*Measures*
Mitigation		technological solutions, legislation, land-use planning, regulations regarding evacuation, communication of risks to the public.
Preparedness	to improve capabilities of organizations to prevent, protect against, respond to, recover from natural disasters, acts of terrorism, and other man-made disasters	
Response		mobilization of the necessary emergency services and first responders such as firefighters, police and ambulance crews
Recovery		

14. Fill in prepositions if they are needed.

To reduce _________ hazards;
to prevent _______ fires;
to protect _________ flooding;
to provide ________ efficient tools;
to respond ________ emergency;
to recover ________ disaster.

15. Use the table in Activity 13 to speak about the phases of emergency management.

16. Read the text SUGAR REFINERY TRAINS FOR EMERGENCY RESPONSE and answer the questions.

1. What is ICS and what are its functions?
2. What are the duties of incident commander?
3. Who serves as an incident commander at an industrial enterprise?
4. What specialists are involved in ICS?
5. What are the three levels of emergency severity?
6. What is the role of police in case of technological incident?

SUGAR REFINERY TRAINS FOR EMERGENCY RESPONSE

Ever wondered how a factory or processing plant goes about handling an emergency such as a fire or chemical spill? That was the focus of initial training recently begun at Imperial Sugar Company's sugar refinery in Gramercy, Louisiana.

OSHA (Occupational Health and Safety Administration) requires organizations that potentially have to respond to emergencies involving hazardous materials. For this purpose a nationally recognized incident command system or ICS is organised. It presents a systematic approach that uses a standardized and unified command structure to safely mitigate emergencies.

Key elements of an incident command system include:

- standard terminology;
- modular organization;
- pre-designated incident facility;
- integrated communications;
- unified command structure;
- consolidated plan-of-action;
- comprehensive resource management.

Marc Holder, ICS trainer at the Gramercy plant, who has been an instructor for 20 years, first trained each of the Gramercy shift superintendents (мастер, начальник смены) in the role of incident commander.

The incident commander is responsible for overall management during an emergency. Specific duties include assessing the situation, establishing immediate priorities and determining objectives and strategies to be followed.

Next to be trained are those who will staff the emergency operations center (EOC), where operations, planning, logistics and administration of finances takes place.

Sydney Edmonston, also from Industrial Emergency Services, explained how the EOC might interact with the incident commander during an actual emergency.

Consider, for example, a forklift that causes a chemical spill after running into large tanks of phosphoric acid or chlorine. The incident command team on site might ask the EOC for a bulldozer to build earthen walls to prevent further chemical leakage into a ditch that surrounds the plant.

The planning people on the EOC would give it to logistics. Logistics would report back on what it would take to get the bulldozer and how much it would cost. The finance people would determine how to pay for the bulldozer.

Long before an incident ever happens, the planning group would run through different what-if scenarios, such as a fire that damages vital equipment. The team would plan in advance how to get the equipment quickly repaired or replaced to ensure the plant is running again as soon as possible.

"The idea is to get everybody into a common mindset, so that when an emergency happens, everyone at Imperial Sugar will know who's in what roles and what to do," said Edmonston.

Emergencies are classified according to three levels of severity: minor, moderate or significant danger. A chlorine cloud, which would impact communities outside the plant's fence, activates a level-3 incident. In that case, the plant has to notify state police.

The police will respond to observe and ensure public safety. They expect to know what the team is doing to mitigate the problem; whether it can be mitigated; how much chemical was spilled; and what has been done to keep it from contaminating the surroundings.

An incident command system makes it easier for multiple agencies and organizations to interact by establishing common roles in every emergency response team – whether used by a voluntary fire department, FEMA or a sugar refinery.

17. Write an Abstract of the article SUGAR REFINERY TRAINS FOR EMERGENCY RESPONSE.

18. Do this test to know how well you are prepared to an emergency.

1. What is the most common cause of accidents in the workplace?

a) Slips and trips.
b) Falling from a height.
c) Cutting your finger.

2. What should you do before eating a meal?

a) Wash your hands.
b) Find a knife and fork.
c) Take out your chewing gum.

3. What should you do if you have lost your safety equipment?

a) Tell your supervisor and get some more.
b) Share with your mate, one glove is better than none.
c) Carry on with the job it won't matter this once.

4. You notice the keys have been left in a fork lift truck and you know the driver has gone home, do you:

a) Tell your supervisor?
b) Decide to have a test drive?
c) Do nothing – it's not your problem?

5. You are asked to lift a heavy box, do you:

a) Ask your supervisor whether there are any lifting aids available?

b) Struggle to lift the box – you don't want to look weak in front of your mates?
c) Leave the box where it is – someone else can move it?

6. The fire alarm goes just as you are about to start your lunch, do you:
a) Vacate the building in accordance with instructions?
b) Ignore it – we are always having false alarms?
c) Wait until you have finished your sandwiches and then leave the building?

7. You come into work and notice some liquid spilled on the floor, do you:
a) Inform the care taker, who normally deals with this and warn your work colleagues?
b) Get a mop and bucket and clear it up yourself?
c) Leave it for someone else to sort out?

8. You slip and hurt your arm quite badly, do you:
a) Tell your supervisor/first aider, get it treated and enter the accident in the accident book?
b) Ignore it – your arm will feel better soon, you can use the other one?
c) Wait until you finish work and then go to casualty – you don't want to make a fuss?

***9. A manager asks you to do a task but you are unsure how to do it, should* you:**
a) Explain you have not done it before and ask them to show you how?
b) Have a go and use your initiative?
c) Refuse because it's not in your job description?

10. You are asked to do a task you consider dangerous, do you:
a) Calmly state that you are not willing to do the task until the safety measures in
place are explained to you?
b) Have a go – life is risky?
c) Shout aggressively at your supervisor about the state of the company?

Scoring
For each "a" score 3
For each "b" score 2
For each "c" score 1
Your results:
30 – excellent you are a safe learner;
25 – read Be Safe! again, don't be afraid to speak out if you think something is wrong;
20 or less – be risk aware, health and safety is also your responsibility.

19. Your partner and you will read different texts so that you could exchange the information. Before you read translate the words and memorize them.

1) occupational injuries
2) safety failures
3) maximum penalties
4) to break health and safety legislation
5) fatal injuries
6) to fall from a height
7) to be struck by a vehicle
8) burn injuries
9) to put safety control measures in place

20. Choose and read Text A or Text B.

Text A

Did you know...

- In the UK, there are 1.6million occupational injuries every year as well as 2.2million cases of ill health caused by work.
- Health and safety failures currently cost Britain's employers up to £6.5billion every year.
- There are around 2,000 cases of accidents involving chemicals at work reported every year.
- Car and van drivers who cover 25,000miles a year as part of their job have the same risk of being killed at work as coal miners. Work-related driving is one of the biggest single causes of all reportable accidents.
- The maximum penalties for breaking health and safety legislation are unlimited fines and up to two years in prison.
- The rate of fatal injuries in firms employing fewer than 50 employees (small firms) is more than twice that in firms employing more than 1,000 people.

The Government's Revitalising Health and Safety *strategy statement, launched in June 2000, set national targets for improving health and safety performance.*

Text B

Did you know...

- About 60 per cent of fatal injuries to workers occurred in construction, transport and storage, and in agriculture, forestry and fishing.
- The most common kinds of accident involved with fatal injuries are: falling from a height; being struck by a moving vehicle; and being struck by moving or falling objects. The make up about 75 per cent.
- More than 25million working days are lost annually as a result of occupational accidents, injuries and ill-health.
- Around 6,000 cases of occupational burn injuries and around 2,000 cases of accidents involving chemicals at work are reported each year.
- Only some 40 per cent of major occupational accidents are reported. Accident reporting by self-employed people is even worse (estimated reporting level of less than four per cent).
- Seventy per cent of occupational accidents could be prevented if employers put proper safety control measures in place.

The Government's Revitalising Health and Safety *strategy statement, launched in June 2000, set national targets for improving health and safety performance.*

21. Together with the partner say what these figures stand for in the texts. Write it down into the table.

Figures	Explanations
2.2million cases	
£6.5billion cases	
two years	
60 per cent	
2,000 cases	
1.6million cases	
25,000miles	
70 per cent	
25million working days	
75 per cent	
40 per cent	
6,000	
50 employees	

Figure 6 Rescue equipment

22. On the previous page you can see some pictures of rescue equipment. Lable the pictures with the names of the items.

Fire rescue harness, pulley, ropes and cords, ascenders, gas detector, supplied air system, head lamp, flash light, bosun's chair, personal floatation device (PFD), rescue helmet, hose reel jet nozzle, cascade toboggan, shovel, ice axe, first aid kit, ventilation and wall hooks, multipurpose fire extinguisher.

23. Define the purpose of each item in Figure 6. Consider the following purposes.

- Confined space rescue
- Fall rescue
- Water rescue
- Winter rescue
- Fire rescue

24. Read the text and write a brief summary.

FALL PROTACTION RESCUE EQUIPMENT

Historically, equipment used in industrial rescue work has been drawn from mountaineering and alpine rescue fields. This equipment emphasizes rope techniques and combinations of components rigged together for each rescue application. While the equipment is very light and versatile in the hands of professional rescue technicians, it requires considerable skill and experience to be used safely.

The current trend is toward equipment designed especially for the needs of industrial rescue teams. This equipment tends to have more redundant safety features and is often pre-rigged by the manufacturer to reduce the possibility of misuse during an emergency. New national standards are being developed to establish requirements for industrial rescue equipment. These new standards will simplify the task of selecting and using rescue equipment for industrial users.

Selecting the Right Equipment for the Job

A wide range of safety equipment is available for post-fall rescue. The type of equipment you select will depend on the circumstances of your pre-planned rescue response. Here again, we rely on the evaluation and planning performed by a competent person as part of the rescue plan to guide us in the selection of equipment suitable for specific applications.

There is no one-size-fits-all solution in rescue equipment. The equipment must be matched to the rescue plan and will vary to such a degree that equipment solutions for one rescue scenario could be completely inappropriate for another application. For recommendations on equipment designed for your rescue needs, contact your rescue equipment manufacturer.

Rescue Equipment Standards

The National Fire Protection Association, NFPA 1983 (2006 edition), provides guidelines to manufacturers of fiber ropes, harnesses and accessory equipment. This standard applies primarily to the professional fire services, but is also applicable to the needs of industrial rescue personnel. Equipment certified to NFPA 1983 (2006 edition) meets a very stringent strength and performance requirements suitable for the demands of emergency rescue.

The American National Standards Institute, ANSI Z359 Accredited Standards Committee for Fall Protection, has been working on a new standard for rescue equipment, ANSI Z359.4 (proposed). This new standard sets criteria for product design and testing. The ANSI Z359.4 standard will address requirements for the following types of equipment:

- Rescue Harnesses,
- Rescue Lanyards,
- Anchorage Connectors,
- Rope-and-Tackle Systems,
- Descender Devices,
- Three-Way Rescuers (self-retracting lanyards with emergency rescue capability),
- Rescue Hoists

25. Read the newspaper article about fire incidents and answer the questions.

1. Why did firefighters ask residents to be extra vigilant?
2. What was believed to be the reason of the fires?
3. What equipment did the firefighters use during the rescue operation in Linnet Close?
4. Where there any injured people? What kind of injuries did they get?
5. What do firefighters recommend people to do to prevent further fires?
6. How can people help the police?

A SPATE OF SERIOUS FIRES PROMPTS A STARK WARNING FROM FIREFIGHTERS

A spate of serious fires in the Orford area of Warrington has prompted a stark **warning** from firefighters.

Firefighters are asking residents **to be extra vigilant** after they were called to four separate incidents involving cars and homes earlier this morning (September 23). It is believed that these were all started **deliberately**.

The first incident was a car fire on Greenwood Close, this took place just before 5.30am. Within 20 minutes crews were called to a house fire on Grassmere Avenue.

Just after 6.23am firefighters were called to the most serious of the incidents a house fire in Linnet Close. Firefighters wearing breathing apparatus used hose reel jets to fight the fire that had developed in the ground floor of the house.

The three occupiers had to be treated for **smoke inhalation**. Firefighters also rescued 10 kittens from the house.

There was also a further fire in a home on Grassmere Avenue. Nobody was injured in this blaze.

Warrington Station Manager, Paul Jackson, explained: "This was an extremely serious spate of incidents and could easily have resulted in someone losing their life. We are working very closely with Cheshire Police to find out who could be responsible.

"In the meantime we would ask people to be on their guard and report any suspicious behaviour to Crimestoppers on 0800 555111.

"We would also encourage people to ensure that all windows and doors are secure."

Police and firefighters are appealing to the community to come forward with any information they have which could assist the investigation. Contact with Cheshire Police on 0845 458 0000.

Alternatively, information can be left anonymously on the Crimestoppers hotline 0800 555 111.

Firefighters will be in the area today carrying out Home Safety Assessments to local residents.

26. Write a report about a rescue operation you have participated in (as a rescuer or as a victim). Consider these questions as a plan.

1. Where and when did it start?
2. What were the reasons of the accident?
3. How quickly did the crew come?
4. What equipment did they use?

5. How many people suffered?
6. What injuries did they get?
7. What can people do to prevent accidents like that?

INFORMATION SEARCH

27. Learn about emergency service in your institute or any other company or organization. Consider its functions, structure, plan-of-action. Present the information to the class.

REVISION

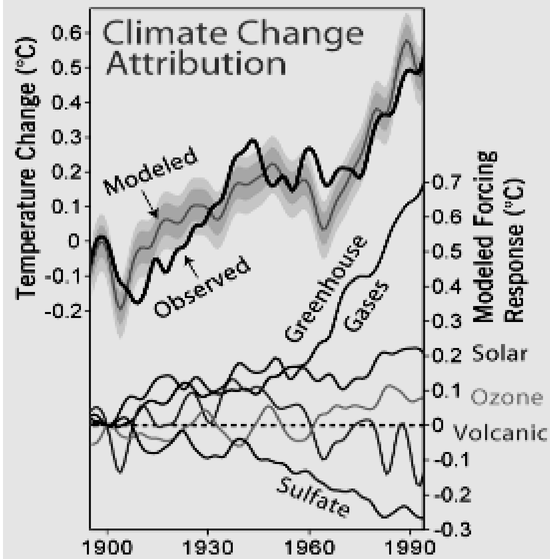
28. Label the pictures on the next page, then decide what specialist will probably do these tasks.

Using design knowledge to make better wastewater treatment facilities.
Designing a safe way to store nuclear waste.
Figuring out what to do with emissions in a large scale.
Figuring out what to do with rising levels of greenhouse gases in the atmosphere.
Analysing how to alter certain biologic interactions in order to optimize the survival of the system.
Examining how the harvesting of kelp effects the sea otter population.

Picture 1

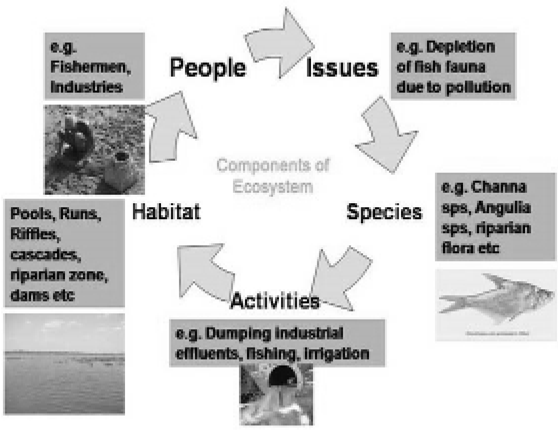
Picture 2

Picture 2



Picture 3

Picture 4



Picture 5

SELF-TRAINING READING

PROMINENT ENVIRONMENTAL ENGINEERS

Robert A. (Bob) Gearheart (**born 1938**) is an emeritus professor of Environmental Engineering at Humboldt State University, in Arcata, California.

Dr. Gearheart teaches courses in environmental impact assessment, hazardous waste management and water quality management.

His research interests include water and wastewater treatment, using appropriate technology, including constructed wetlands. He is also involved with a number of public and private sector agencies providing support for water supply facilities in developing countries, such as Indonesia, Kenya, Ghana, and Sierra Leone.

Dr. Gearheart has been involved with the development of Arcata's Integrated Wetland and Wastewater Treatment Facility and the Arcata Marsh. He continues to be active in ongoing research as the Arcata Marsh grows and matures. The Arcata Marsh serves as a sewage treatment plant, a recreation area, a wildlife sanctuary and aquaculture project. It is a good example of humans working in cooperation with the environment.

Dr. Gearheart received his B.A. in Biology and Mathematics from the University of North Texas, and his M.S. and Ph. D. in Civil Engineering from the University of Oklahoma.

Paul V. Roberts (November 27, 1938 - February 2006) was a prominent environmental engineer. Paul Roberts graduated with a B.S. degree in chemical engineering from Princeton University in 1960, and received a Ph.D. degree in chemical engineering from Cornell University in 1966.

Paul Roberts was a pioneer in applying fundamental principles of mass transport and chemistry to engineered environmental systems. His broad body of work spans such topics as reclaimed wastewater, drinking water disinfection, adsorption and volatilization of organic contaminants during water and wastewater treatment, contaminant transport in groundwater, and multiphase flow in porous media. He is perhaps best known for conceiving and directing the first and probably the most definitive field study ever conducted on the movement and fate of hazardous chemicals in groundwater at the Borden site in Canada. In this study, his team clearly demonstrated the scientific value of carefully designed large-scale field experiments to test hypotheses, to validate mathematical models, to generate understanding of important natural processes, and to uncover still more important questions in need of better theoretical understanding.

In addition to his individual research contributions Paul was an accomplished teacher and mentor.

Abel Wolman (June 10, 1892 – February 22, 1989) was an American inventor, scientist, professor and pioneer of modern sanitary engineering. His work in supplying clean water spanned eight decades.

Wolman was born, grew up, was educated, lived and died in Baltimore, Maryland. He graduated from the Baltimore City College in 1909, got a B.A. from the Johns Hopkins University in 1913 and then a B.S. in engineering from Hopkins in 1915. It was during his early years that he made his most important contribution. Working in cooperation with chemist Linn Enslow, he standardized the methods used to chlorinate Baltimore's drinking-water supply. His efforts there helped develop the plan for Baltimore's water supply so thoroughly and effectively that it remains well-provided for growth through the 21st century. His work also benefited water systems in New York, Detroit and Columbus, Ohio. A collection of his writings has been published: Water, Health and Society, Selected Papers.

Wolman taught for many years on the faculty of Johns Hopkins University, where he established the Department of Sanitary Engineering in 1937. He served as the department's chairman until his official retirement in 1962.

The Association presents the Abel Wolman Award of Excellence each year to recognize those whose careers in the water works industry exemplify vision, creativity, and excellent professional performance characteristic of Wolman's long and productive career.

INTERNATIONAL SAFETY STANDARDS

Threshold Limit Value (TLV)

The American Conference for Governmental Industrial Hygienists (ACGIH) has established guidelines for exposure to airborne contaminates. These guidelines are widely accepted and updated annually. The TLV of an airborne chemical represents the concentration of that chemical below which there is thought to be no significant adverse effect on most workers. In developing TLV's it should be assumed that workers may be repeatedly exposed, day after day, to the chemical.

Not every chemical will have a TLV. For more information on TLV's, refer to your *ACGIH Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* booklet. (2002 NSC Fundaments of IH workbook)

Permissible Exposure Limit (PEL)

PEL's are promulgated & enforced by OSHA. However, MSHA has used the term PEL in recent rule making, such as Part 62 (noise exposure) and at times refers to PEL's in the DPM regulations. In most part, the term PEL has the same meaning as TLV, however refers to an enforcing agency (OSHA or MSHA).

Recommended Exposure Limit (REL)

This limit is developed by the National Institute of Occupational Safety & Health. Often the REL is a time-weighted average for a 10-hour work day during a 40-hour work week.

Action Level (AL)

This is a level at which action is required. OSHA & MSHA requires an action level for some specific substances as well as for noise exposure. Many industrial hygiene professionals use the action level to evaluate workplace exposure: It is usually identified as half the PEL or TLV.

Categories of Exposure Limits

There are three important categories of exposure limits that apply to TLVs, PELs, and RELs: time-weighted average, short-term exposure limit, and ceiling.

Time-Weighted Average

This is the average concentration for an 8-hour workday or 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

Short-Term Exposure Limit (STEL)

This is a short-term TWA exposure to which workers can be continuously exposed for up to 15 minutes without suffering from irritation, chronic or irreversible tissue damage, or narcosis of sufficient degree to increase the likelihood of accident or injury.

Ceiling (C)

This is the concentration that should not be exceeded during any part of the work day.

Skin Designation

In looking up exposure limits, you may see a skin designation. This alerts you that there is a potential for significant exposure due to skin absorption. This designation is an alert that air sampling alone is insufficient to quantify exposure.

Chemical agents – crystalline silica, coal dust, diesel particulate matter (DPM), welding fumes, solvent vapors, oxides of nitrogen, etc.

Physical agents – noise, heat, and cold.

NEW ALGORITHMS FOR SNOW COVER, TEMPERATURE AND WETNESS

New algorithms created by the Norwegian Computing Institute enable more accurate prediction of snow characteristics from satellite data.

A large part of Europe depends on snow melt as a source of drinking water. In addition to its role in the hydrological cycle, snow is also an important component of the Earth's climate system. As such, significant social value can be lined by improving our knowledge of snow.

The Envisnow project set out to develop the necessary infrastructure to improve monitoring f snow parameters using earth observation data from satellites. Specifically, the Norwegian Computing Institute defined new algorithms to produce estimates of the fractional snow cover area (FSCA), the surface tempera-ire of snow (STS) and snow wetness.

FSCA calculations are made difficult by the fact that snow's spectral reflectance can vary according to several different factors. These include the age of the snowpack, its impurity content, the sun's elevation and the viewing angle of the satellite instrumentation, for example. The institute's solution was to employ both a metamorphosis model and an impurity model to produce a valid snow spectrum and a local bare ground spectrum. In the final step, a linear spectral mixing algorithm is used to estimate the FSCA.

With respect to the STS, atmospheric attenuation alters the snow's original blackbody radiation signature. To account for the effects of atmospheric composition and path length, the institute tested a number of different algorithms. The team identified a pre-existing algorithm as the optimal solution, particularly for polar regions. The institute adapted this algorithm to the Envisnow integrated snow information system and verified its performance with real earth observation and surface data.

Information about snow wetness provides valuable insight into the snowmelt process. The institute was able to enhance snow wetness prediction capabilities by combining snow grain size (SGS) measurements with STS measurements. A snow wetness class is determined based on the STS and the temporal evolution of SGS. As with the other new algorithms, the results were validated at a number of different locations.

The Norwegian Computing Institute's contribution to Envisnow represents a quantum leap forward as it is now possible to accurately estimate essential snow parameters throughout the entire snow season. The institute is consequently looking to license the new algorithms.

REPRODUCING NIGHT-TIME WARMING AND DROUGHT CONDITIONS

Italian ecologists have developed an innovative methodology for reproducing night-time warming and drought conditions like those forecast to affect Europe over the coming decades. The objective was to understand how local ecosystems will respond.

As greenhouse concentrations continue to rise in the earth's atmosphere, the temperature is expected to rise, not only during the day but also at night. Furthermore, rain is projected to fall less frequently, but more intensely, resulting in periods of drought followed by flash floods.

The question posed by the Vulcan project is how Europe's shrub ecosystems will cope with these changes. In order to answer this question, it was necessary to reproduce the expected warming and drought artificially in test plots.

Ecologists developed the methodology applied at the six test sites in Denmark, Spain, Italy, Hungary, the Netherlands and the United Kingdom. The experimental set-up was designed for durability with a galvanised steel frame covered with wave radiation. The HDPE was replaced with a transparent polyethylene curtain for the drought plots to allow solar radiation through, but not rain, which was removed via special rain gutters.

Due to the length of the experimental campaign, the extension and retraction of the coverings was fully automated. Light sensors ensured that the HDPE curtains moved into place following sunset and withdrew at sunrise, acting as a blanket to raise the surface temperature during the night. Similarly, a rain sensor activated the retraction of the covering so that equivalent soil moisture content was maintained with the control plots. To prevent damage in case of high winds, both the night-time temperature and drought plots were outfitted with wind sensors that withdrew the curtains when wind speeds exceed 10 m/sec.

At each of the six test sites, three nighttime and three drought plots, each covering $20m^2$, were created as well as several control plots. Similar steel frames were installed on the control plots to eliminate additional sources of variation. The experimental set-up enabled the Vulcan scientists to investigate the impact a warmer, drier climate may have upon important European ecosystems.

TALL TREES CAN INCREASE CARBON SEQUESTRATION

The relationship between carbon levels and biomass has long been known albeit not fully understood. In an effort to gain more knowledge and understanding of this relationship an EU-funded project grew and analysed several hectares of poplar trees.

To fully understand the effect of global change on biospheres, the experimental forests had to be specifically designed at an ecosystem level. Lab tests or small-scale experiments can provide information, but conditions are not as closely matched to real-life situations as desired.

The Euroface project therefore set out to grow a series of forests over a nine hectare area to be compared with six experimental plots. Each hectare of forest with one type of poplar would support 5 000 trees and these would then be used to assess elevated atmospheric $C0_2$ concentrations over a long-term period. This ecosystem-scaled project has had a spin off benefit, found primarily in the fact that it supports enough biomass to encourage investigations by numerous other research scientists. Armed with this amount of data, they can conduct investigations into a variety of different aspects of an ecosystems response to CO, enrichment.

The experimental plot was divided into six fields, with three different poplar genotypes planted at a density of 10 000 trees per hectare. Each tree was spaced one square metre apart and after the three-year long growth cycle, the trees reached a height of almost ten metres. A second rotation cycle later produced trees of 12m high, and in both cases, the total biomass of the trees were given to an electrical power plant to help produce C-neutral electrical power.

While the supply of timber for the production of energy proved to be an added bonus to the project research, its initial cause was to establish an infrastructure the larger scientific community could benefit from. Furthermore, the uptake and storage of carbon under conditions of global change can be quantified.

Net primary production of the experimental plots showed an increase of up to 36 % on the control. This being the case, rising atmospheric $C0_2$ could increase the potential for carbon sequestration. Further research and developmental support is sought, with current results available for demonstration.

WATER MANAGEMENT IN CITIES

As cities evolve the need for more sustainable systems of water resources and infrastructure becomes more apparent. This project sets out to investigate how existing systems can be improved with the help of computer tools.

The infrastructure of modern cities lags behind the rate of development that is needed for cities to sustain their populations in the future. There is an evident need to address the issue of sustainable management of urban water systems. This study addresses this by attempting to identify the principle problems urban water management is facing today and assessing the impact of pollution on groundwater resources.

The cities of Doncaster (United Kingdom), Ljubljana (Slovenia), Mt Gambier (Australia) and Rastatt (Germany) provided case studies for the project. They were selected due to their different approaches to the management of the existing urban water systems. A detailed description of the economic and demographic profile of four case study cities was provided. Data regarding the different hydrogeological and hydrological settings provides a backdrop for comparisons to be made. This is particularly due to the fact that they display significantly different approaches to the management of their respective existing urban water systems. The studies provide an overview of each city's water infrastructure and data about the groundwater quality.

These studies make up the AISUWRS project which has developed a number of models which are capable of predicting the effects of urban infrastructure on ground water contamination. Currently there are six models in total, including a pipeline leakage model and an unsaturated flow model, which predicts water transport to the aquifer. The unsaturated transport model predicts the transport of contaminants to the aquifer and the decision support system (DSS) model compares the costs of infrastructure rehabilitation with the costs of aquifer contamination.

PUTTING CLEANER VEHICLES ON THE STREET

A successful campaign implemented in the framework of the put more than 160 alternatively fuelled vehicles on the roads

Emissions from vehicles not only degrade local air quality, they also contribute to global climate change. Engineers are constantly striving to reduce these emissions and to make transport more sustainable.

Impressive emission reductions have been achieved with alternative fuels such as compressed natural gas (CNG), yet the market has been slow to adopt this technology.The Growth programme charged the Vivaldi consortium with boosting CNG usage across all sectors.

ECOLO, a Vivaldi partner based in Bremen, has implemented an extensive campaign in its hometown. The first goal was to educate the public about the environmental and other benefits of CNG versus conventional fuels (e.g. gasoline). ECOLO targeted a wide range of stakeholders, ranging from car dealers to taxi companies to service stations and even driving schools.

In addition to raising public awareness, it was also necessary to provide financial incentives since CNG-powered vehicles are still slightly more expensive than their gasoline-powered counterparts. ECOLO subsequently surpassed its original goal of receiving at least 250 applications for new CNG vehicles.

While not all approved applicants proceeded with a vehicle purchase, the Vivaldi project managed to put over 160 CNG vehicles in circulation in Bremen. Special signage on these vehicles will promote additional visibility for the project.

The majority of new CNG vehicle owners are businesses rather than private citizens, probably due to the higher allowance they were granted. Future actions will target increased private sector participation as well as expanding the vehicle range to include freighters and light trucks. Given its success, ECOLO also underlined the need to continue and enhance the CNG campaign.

EMERGENCY RESPONSE

Emergency response is a term for a series of appropriate actions and precautions in the event of a disaster. No matter the type of catastrophe, proper emergency response can protect family members and even save lives. By having a full knowledge of the surroundings, keeping a supply of rescue goods, and having a detailed plan with household members, emergency response can allow peace of mind and better chance of safety in any situation.

One primary key to proper emergency response is being acquainted with the potential for natural and man-made disasters in the surrounding area. Check weather patterns and history to determine if the area is subject to wildfires, floods, mudslides, earthquakes, tidal waves or severe storms, tornadoes, and hurricanes. Also be aware of any potential sources of man-made disasters in the local area. Chemical or nuclear plants can both cause problems in the event of leaks or spills.

Having determined the likely sources of a disaster, a good emergency repair plan can now be made. Take pains to ensure that residences are equipped with any necessary outbuildings that can provide protection during a disaster, such as tornado shelters. Make every person in the household aware of what to do during and immediately after an emergency occurs.

A first-aid kit is a vital part of any emergency response package. Bandages, antiseptic formula, sterile gauze, and basic pain medication should all be included. When possible, have back-up bottles of any chronically needed medications in the first aid kit. Blankets, warm clothing, and a spare pair of shoes can also be useful additions to a first-aid kit.

Food and clean water may become huge concerns if the aftermath of the disaster wears on for a while. Having a supply of canned goods, a canopener, and sufficient water for two weeks will be good preparation for most disasters. According to the American Red Cross, a sensible guide to how much water is needed is one gallon per person per day.

Consider investing in a solar-powered or hand-cranked radio. If the electricity is out for several days, this device allows listeners to get news updates on the situation and disaster relief efforts. An emergency response kit should also include several flashlights and batteries.

Emergency response allows people to act quickly and without panicking should an emergency occur. Knowing that plans have been made and supplies arranged can help take considerable worry and fear out of the process.

By following emergency response procedures and listening carefully for any contact or orders from emergency personnel, you can ensure a better chance of safety and survival in any situation.

MALABO FIRE DEPARTMENT RECEIVES SUPPORT FROM PUNTA EUROPA

In recent years, the city of Malabo has undergone rapid growth and development. Urban areas are becoming more crowded, and high-rise residential and commercial buildings are being built in Malabo Dos.

With this growth and new construction comes an increased risk of fires, which has stretched the capacity of the Malabo Fire Department (MFD). As a result, the MFD occasionally requests support from the Punta Europa Fire Departments, which creates operational risk for the Punta Europa entities.

To help develop modern fire-fighting capability for Malabo, Marathon Equatorial Guinea Production Limited (MEGPL) has partnered with the MFD to perform a comprehensive needs assessment of current equipment and training. The enhanced ability to fight fires in Malabo will help not only the local community, but also Punta Europa employees and their families.

Industrial Emergency Services (IES), a global fire safety and training company that also operates fire services for MEGPL and AMPCO, was contracted to do the baseline assessment.

The assessment began with tours of Malabo, Malabo Dos and surrounding communities to assess fire risk, vehicle access and water supplies. Next, IES and the MFD held detailed discussions to determine what equipment and training is needed to better prepare the MFD to protect the Malabo community from fire.

IES is conducting the assessment for free as part of its corporate social responsibility program, but working with the MFD has deeper significance for IES.

IES's donation of time and resources has allowed for MEGPL to release immediate funding for urgent items to improve the safety of firefighters. The MFD already has received high-quality Personal Protective Equipment (PPE), self-contained breathing apparatus (SCBA), and an air compressor to recharge the SCBA cylinders.

Deogracias Bokara, Community Services Coordinator in the MEGPL Social Responsibility Department, is the project lead. "This assessment will be the first phase of a multi-year project," notes Bokara. "A second phase in 2010 will focus on priority training for MFD leadership and personnel, address the maintenance and repair of existing equipment, and provide new equipment best suited to fight the types of fires most likely to occur in Malabo."

MEGPL Fire Department Captain Lonnie Mullen commented, "There is a partnership and brotherhood of firefighters, anywhere in the world we look out for each other." He continued, "It's a great honor to work with these guys."

Like in Malabo, some of the mainland companies are fairly structured and organized, while others are just beginning to establish themselves. EG LNG's National Content department has plans to offer training and other forms of support to SMEs in the mainland to help promote growth and development.

The EG LNG National Content team encourages businesses in the mainland to contact them to be added to the EG LNG database, which will be used to select contractors and suppliers for future projects and opportunities.

FEDERAL EMERGENCY MANAGEMENT AGENCY

The Federal Emergency Management Agency (FEMA) is a part of the U.S. Department of Homeland Security (since March 1, 2003). It coordinates actions, carrying out a role of federal government on prevention, mitigation of influence and liquidation of consequences of any accidents, both natural, and created by the man, including the terrorist acts.

FEMA's mission

FEMA's mission is coordination of actions on liquidation of consequences of accidents, from which are not capable to cope local authorities. The governor of state, in which there was an accident, should announce in state an extreme situation and send inquiry to the President of the USA that have interfered FEMA and Federal Government. Exception of this procedure is cases, when the accidents occur in federal territory or concern the federal property. The example can be served with explosion of a building of federal government in Oklahoma in 1995 or accident of a space shuttle «Columbia» in 2003.

Disaster strikes anytime, anywhere. It takes many forms - a hurricane, an earthquake, a tornado, a flood, a fire or a hazardous spill, an act of nature or an act of terrorism. It builds over days or weeks, or hits suddenly, without warning. Every year, millions of Americans face disaster, and its terrifying consequences.

FEMA's employees

FEMA has more than 6,651 full time employees. They work at FEMA headquarters in Washington D.C., at regional and area offices across the country, the Mount Weather Emergency Operations Center, and the National Emergency Training Center in Emmetsburg, Maryland. FEMA also has nearly 4,000 standby disaster assistance employees who are available for deployment after disasters. Often FEMA works in partnership with other organizations that are part of the nation's emergency management system. These partners include state and local emergency management agencies, 27 federal agencies and the American Red Cross.

FEMA's history

The Federal Emergency Management Agency coordinates the federal government's role in preparing for, preventing, mitigating the effects of, responding to, and recovering from all domestic disasters, whether natural or man-made, including acts of terror. FEMA can trace its beginnings to the Congressional Act of 1803. This act, generally considered the first piece of disaster legislation, provided assistance to a New Hampshire town following an extensive fire. In the century that followed, ad hoc legislation was passed more than 100 times in response to hurricanes, earthquakes, floods and other natural disasters.

By the 1930s, when the federal approach to problems became popular, the Reconstruction Finance Corporation was given authority to make disaster loans for repair and reconstruction of certain public facilities following an earthquake, and later, other types of disasters.

The 1960s and early 1970s brought massive disasters requiring major federal response and recovery operations by the Federal Disaster Assistance Administration, established within the Department of Housing and Urban Development (HUD). Hurricane Carla struck in 1962, Hurricane Betsy in 1965, Hurricane Camille in 1969 and Hurricane Agnes in 1972. The Alaskan Earthquake hit in 1964 and the San Fernando Earthquake rocked Southern California in 1971. These events served to focus attention on the issue of natural disasters and brought about increased legislation.

However, emergency and disaster activities were still fragmented. New hazards associated with nuclear power plants and the transportation of hazardous substances were added to natural disasters. More than 100 federal agencies were involved in some aspects of disasters, hazards and emergencies.

President Carter's 1979 Executive Order 12127 merged many of the separate disaster-related responsibilities into the Federal Emergency Management Agency (FEMA).

The new agency was faced with many unusual challenges in its first few years that emphasized how complex emergency management can be. Earlier the community came across such disasters and emergencies as the contamination of Love Canal, the Cuban refugee crisis and the accident at the Three Mile Island nuclear power plant. Later, the Loma Prieta Earthquake in 1989 and Hurricane Andrew in 1992 focused major national attention on FEMA. In 1993, President Clinton nominated James L. Witt as the new FEMA director. Witt became the first agency director with experience as a state emergency manager. He initiated sweeping reforms that streamlined disaster relief and recovery operations, insisted on a new emphasis regarding preparedness and mitigation, and focused agency employees on customer service. The end of the Cold War also allowed Witt to redirect more of FEMA's limited resources from civil defense into disaster relief, recovery and mitigation programs.

A new mission: homeland security

In 2001, President George W. Bush appointed Joe M. Allbaugh as the director of FEMA. Within months, the terrorist attacks of September 11th focused the agency on issues of national preparedness and homeland security, and tested the agency in unprecedented ways. The agency coordinated its activities with the newly formed Office of Homeland Security, and FEMA's Office of National Preparedness was given responsibility for helping to ensure that the nation's first responders were trained and equipped to deal with weapons of mass destruction.

Billions of dollars of new funding were directed to FEMA to help communities to face the threat of terrorism. Just a few years past its 20th anniversary, FEMA was actively directing its "all-hazards" approach to disasters toward homeland security issues. In March 2003, FEMA joined 22 other federal agencies, programs and offices in becoming the Department of Homeland Security. The new department, headed by Secretary Tom Ridge, brought a coordinated approach to national security from emergencies and disasters – both natural and man-made.

As it has been for almost 30 years, FEMA's mission remains: to lead America to prepare for, prevent, respond to and recover from disasters with a vision of “A Nation Prepared.”

APPENDIX 1
GRAMMAR REVEW

Таблица 1

Tenses in Active Voice

Aspect / Tense	Simple **(V)**	Continuous **(to be + Ving)**	Perfect **(to have + Ved/3)**
Present	I translate. He translate**s**. **Do** you translate? **Does** he translate? I **don't** translate. He **doesn't** translate.	I **am** translat**ing**. He **is** translat**ing**. We **are** translat**ing**. Are **you** translat**ing**. I **am** not translat**ing**.	I **have** translat**ed**. He **has** translat**ed**. **Have** you trans-lat**ed**? **Has** he translat**ed**? I **haven't** trans-lat**ed.**
Past	I translat**ed**. (I **went**. **2f.**) **Did** you translate? I **didn't** translate.	I **was** translat**ing**. We **were** translat**ing**. **Were** you translat**ing**. I **wasn't** translat**ing**.	I **had** translat**ed**. **Had** you trans-lat**ed**? I **hadn't** translat**ed**.
Future	I **will** translate. He will translate. Will you translate? I won't translate.	I **shall/will be** translat**ing**	I **will have** trans-lat**ed** **Will** you **have** translat**ed?** I **won't have** trans-lat**ed**

Таблица 2

Tenses in Passive Voice

Aspect / Tense	Simple **(to be + Ved/3f)**	Continuous **(to be + being + Ved/3f)**	Perfect **(to have + been + Ved/3)**
Present	The letter **is** translat**ed**. The letters **are** translat**ed**. **Is** the letter translat**ed**? **Are** the letters translat**ed**? The letter **isn't** translat**ed**. The letters **aren't** translat**ed**.	The letter **is being** translat**ed**. The letters **are being** translat**ed**. **Is** the letter **being** translat**ed**? **Are** the letters **being** translat**ed**? The letter **isn't being** translat**ed**. The letters **aren't being** translat**ed**.	The letter **has been** translat**ed**. The letters **have been** translat**ed**. **Has** the letter **been** translat**ed**? **Have** the letters **been** translat**ed**? The letter **hasn't been** translat**ed**. The letters **haven't been** translat**ed**.
Past	The letter wa**s** translat**ed**. The letters **were** translat**ed**. **Was** the letter translat**ed**? **Were** the letters translat**ed**? The letter **wasn't** translat**ed**. The letters **weren't** translat**ed**.	The letter **was being** translat**ed**. The letters **were being** translat**ed**. **Was** the letter **being** translat**ed**? **Were** the letters **being** translat**ed**? The letter **wasn't being** translat**ed**. The letters **weren't being** translat**ed**.	The letter **had been** translat**ed**. **Had** the letter **been** translat**ed**? The letter **hadn't been** translat**ed**.
Future	The letter **will be** translat**ed**. **Will** the letter **be** translat**ed**? The letter **won't be** translat**ed**.		The letter **will have been** translat**ed**. **Will** the letter **have been** translat**ed**? The letter **won't have been** translated

Таблица 3

Infinitives

Voice / Aspect	Active	Passive
Simple	to ask to build	to be asked to be built
Continuous	to be asking to be building	– –
Perfect	to have asked to have built	to have been asked to have been built
Perfect Continuous	to have been asking to have been building	– –

I am glad **to help** you. Я рад помочь тебе.
I am glad **to be helped**. Я рад, что мне помогают.
I am glad **to be helping** them. Я рад, что помогаю им.
I am glad **to have helped** him. Я рад, что помог ему.
I am glad **to have been helped**. Я рад, что мне помогли.

Таблица 4

Infinitive Functions

Функция	Место в предложении	Пример/Перевод
Подлежащее	Начало предложения	***To translate*** this article is difficult. ***Перевести*** эту статью сложно.
Обстоятельство	Начало или конец предложения	***To translate*** this article you must use a dictionary. ***Чтобы перевести*** эту статью, ты должен использовать словарь.
Определение	После существительного	The article ***to be translated*** tells about new developments in engineering. Статья, ***которую нужно перевести,*** рассказывает о новых разработках в технике.
Дополнение	После глагола-сказуемого	He asked me to translate the article. Он попросил меня ***перевести*** статью.
Часть сказуемого	После вспомогательного или модального глагола	I must ***translate*** the article. Я должен ***перевести*** статью. Our task is ***to translate*** the article. Наша задача ***перевести*** статью.

Таблица 4

The Objective Infinitive Construction

Глаголы, после которых употребляется сложное дополнение	Пример / перевод
Желание/нежелание: to want, to wish, to like, to dislike, to hate	I like people to tell the truth. Я люблю, когда люди говорят правду.
Чувственные восприятия и ощущения: to see, to watch, to notice, to hear, to feel (инфинитив без частицы to)	I saw him enter the room. Мы видели, что он вошел в комнату. I've never heard her sing. Я никогда не слышал, как она поет.
Умственная деятельность: to expect, to think, to believe, to suppose, to consider, to find, to know, to suspect, to understand, to mean	They expect us to come. они ожидали, что мы придем. We believe him to be a good teacher. Мы считаем, что он хороший преподаватель.
Побуждение, допущение: to make, to get, to order, to ask, to allow, to let	He made me do it again. Он заставил меня сделать это еще раз. Let her go home. Пусть она идет домой.

The Objective Infinitive Construction: sentence structure

подлежащее + глагол-связка + дополнение + инфинитив с/без **to**.
I want him to come tomorrow.
Я хочу, чтобы он пришел завтра.

Таблица 5

The Subjective Infinitive Construction

Глаголы, с которыми употребляется сложное подлежащее	Пример / перевод
В страдательном залоге: to know, to announce, to believe, to consider, to expect, to report, to say, to state, to suppose, to think, to understand.	The delegation is known to arrive soon. Известно, что делегация скоро прибудет. He is said to have been working here long. говорят, что он работает здесь давно. He is supposed to be in Moscow now. Предполагают, что он сейчас в Москве.
В действительном залоге: to seem, to appear, to happen, to prove.	He seems to work much. Кажется, он много работает. I happened to see such films. Мне случалось смотреть такие фильмы. She appeared to be studying now. Оказывается, она сейчас учится.

Окончание таблицы №5

С глаголом to be + прилагательное: likely, unlikely certain, sure.	The weather is likely to change. Погода, вероятно, изменится. She is unlikely to arrive today. Маловероятно, что она приедет сегодня. He is sure to come. Он обязательно придет.

The Subjective Infinitive Construction: sentence structure

подлежащее + глагол-сказуемое +инфинитив.

He ***is known*** to be a good scientist.

Известно, что он хороший ученый.

Таблица 6

Participles

Voice / Tense	Active	Passive
Simple	writing	being written
Perfect	having written	having been written
Past	-	written

Таблица 7

Functions of Participle I

Функция	Пример	Перевод
Определение а) перед определяемым словом б) после определяемого слова	***Running*** water is pure. The boy ***playing*** in the yard is my brother.	***Проточная*** вода чистая. Мальчик, ***играющий*** во дворе, – мой брат.
обстоятельство а) времени б) причины в) образа действия г) сравнения	***Entering*** the room he cried. ***Being busy***, he refused to go with us. They sat motionless, ***enjoying*** the sunset. This was said as if ***thinking*** aloud.	***Войдя*** в комнату, он закричал. ***Будучи занятым***, он отказался идти с нами. Они сидели без движения, **наслаждаясь** закатом. Это было сказано, как будто ***думая*** вслух.
Часть составного сказуемого	The effect of her words was ***terrifying***.	Эффект от ее слов был ***ужасающим***.

Таблица 8

Functions of Participles II

Функция	Пример	Перевод
Определение а) перед определяемым словом б) после определяемого слова	A ***written*** letter lay on the table. I received a letter ***written*** by my mother.	***Написанное*** письмо лежало на столе. Я получил письмо, ***написанное*** моей мамой.
Именная часть составного именного сказуемого	She looked ***surprised***. The door is ***locked***.	У нее ***удивленный*** вид. Дверь ***заперта***.
Часть простого сказуемого	The poem ***was learned*** by him by heart. He ***has*** just ***come.***	Стихотворение ***было выучено*** им наизусть. Он только что ***пришел***.
Обстоятельство а) времени б) причины в) условия	When ***given*** time to think, he always answered right. He kept silent for a moment ***surprised*** by my question. The question, if ***raised***, will cause a lot of discussion.	Когда ему *давали* время подумать, он всегда правильно отвечал. Он молчал некоторое время, ***удивленный*** моим вопросом. Если этот вопрос ***будет поднят***, он вызовет большую дискуссию.

Таблица 9

Gerund

Voice / Aspect	Active	Passive
Simple	writing	being written
Perfect	having written	having been written

Таблица 10

Functions of Gerund

Функция	Пример	Перевод
1. Подлежащее	**Smoking** is not allowed here.	*Курить (курение)* здесь не разрешается.
2. Часть составного именного сказуемого	His hobby **is driving** a car.	Его хобби – *водить (вождение)* машину.

Окончание таблицы №10

3. Часть составного глагольного сказуемого	I **began driving** when I was 14.	Я *начал водить* машину в 14 лет.
4. Дополнение:	I enjoy **listening** to music.	Я получаю удовольствие, когда *слушаю* музыку.
5. Определение	She has a habit **of listening** to music at night.	У нее привычка *слушать* музыку вечером.
6. Обстоятельство	After **receiving** good results they stopped experiments.	*Получив* хорошие результаты, они прекратили эксперименты.

Таблица 11

Word Building: Suffixes

Nouns	Adjectives	Verbs
-er (-or) -ee -tion -ness -ment -ity -hood	-able (-ible) -less -ful -ous -ive	-ise -ify

Таблица 12

Word Building: Prefixes

Prefixes	Meaning
anti	against (antisocial)
auto	of or by oneself (auto-pilot)
ex	former, out of (ex-wife, extract)
micro	small (microwave)
mis	badly/wrongly (misinform)
mono	one/single (monotonous)
multi	many (multi-purpose)
over	too much (overtired)
post	after (postgraduate)
pro	in favour of (pro-government)
pseudo	false (pseudo-scientific)
re	again or back (retype)
semi	half (semi-detached)
sub	under (submarine)
under	not enough (underworked)

APPENDIX 2

HOW TO MAKE A GOOD PRESENTATION

Preparation

It is essential to identify WHY you are giving your presentation. To help you establish your objective, ask yourself these three questions:

- Why am I giving this presentation?
- What knowledge do I expect my audience to take away with them?
- What action do I expect the audience to take at the end of my presentation?

- Divide your presentation into three or four main subject areas.
- Then make notes under each heading.
- Remember it is important to give facts, evidence and examples as well as opinions. Concrete examples bring your presentation to life and support your objective.

Opening

The opening is your chance to grab the audience's attention and make them sit up and listen to you. The opening section should take no more than a couple of minutes maximum. In your opening section you should include some or all of the following stages:

- Open with a bang!

Start with an incredible fact, a visual stimulus, a joke, an anecdote, a quote Anything which grabs the audience's attention and focuses them on the matter at hand.

- Welcome the audience.
- Be polite and welcome everyone to the presentation.
- Introduce yourself. Give a brief introduction of yourself if there are people in the audience you have never met.
- Say why are you there.

Tell the audience what the presentation is going to be about. Be careful, don't tell them YOUR objective, e.g. 'My objective is to sell you 100 computers for as high a price as possible', but turn it around, e.g. 'The reason I am here is to explain to you exactly why our computers are the best on the market.'

- Outline the structure of your presentation

Before you start, briefly run through the main points or subject areas you are going to talk about. Again this will help you to clearly organize your talk, but also it means the audience will be able to follow you much better.

- Give instructions about questions

Make sure your audience know when to ask questions. At the end? During? At half time? Keep them informed and make sure you don't lose control of them.

Possible language

Greeting:	Good morning, ladies and gentlemen. Good afternoon, everybody.
Introducing your subject:	Today I'm going to talk about … The purpose of my presentation is …
Outlining your structure:	To start with I'll describe … Then I'll mention … After that I'll consider… Finally, I'll summarise my presentation …
Giving instructions about questions:	Do feel free to interrupt me if you have any questions. I'll try to answer all your questions after the presentation.

Development

This is when you go back to your first point and start your presentation properly. Make sure you highlight when you are moving between points by using phrases such as 'Next, let's turn to …', or 'To conclude…' or by counting, 'Firstly,…secondly etc…'

Remember these key points while delivering the body of the presentation.

- Do not hurry.
- Be enthusiastic.
- Give time on visuals.
- Maintain eye contact.
- Modulate your voice.
- Look friendly.
- Keep to your structure.
- Remain polite when dealing with difficult questions.

Closing.
Closing is as important as opening. Your audience will remember the last few points more clearly than most of the presentation. This is the chance for you to leave a lasting impression and ensure that your objective has been achieved.

In conclusion:
- Sum up
- Give recommendations if appropriate
- Thank the audience
- Invite questions

Possible language

Summing up:	To conclude… In conclusion… Now, to sum up… So, let me summarise what I've said. Finally may I remind you some of the main points…
Giving recommendations:	In conclusion my recommendations are… I therefore suggest/recommend the following …
Thanking the audience:	Many thanks for your attention. May thank you all for being such an attentive audience.
Inviting questions:	Now I'll try to answer all the questions you may have. Are there any questions?

Let's sum up. Use the three parts of your presentation. In the opening part, you tell your audience what your message is going to be. In the main part, you tell your audience your real message. In the closing part, you summarize what your message was.

APPENDIX 3

Реферирование (Writing abstracts)

Реферирование представляет собой интеллектуальный творческий процесс, включающий осмысление, аналитико-синтетическое преобразование информации и создание нового документа – реферата, обладающего специфической языково-стилистической формой.

Реферат – это семантически адекватное изложение основного содержания первичного документа, отличающееся экономной знаковой оформленностью постоянством лингвистических и структурных характеристик и предназначенное для выполнения разнообразных информационно-коммуникативных функций в системе научной коммуникации.

Рефератом называется текст, передающий основную информацию подлинника в свернутом виде и составленный в результате ее смысловой переработки.

Реферирование иностранных источников имеет ряд особенностей. Начиная работу над рефератом, переводчик должен, прежде всего, правильно выбрать вид будущего реферата и наиболее целесообразный способ охвата первоисточника.

Большое значение имеет информативность реферативных переводов. Нельзя допустить, чтобы реферат был подменен развернутой аннотацией, как это часто происходит при реферировании иностранных источников. Необходимо передать не только то, о чем написана работа, но и сущность основных идей оригинала, содержащихся в нем методов, результатов, рекомендаций и предложений. Поэтому переводчик должен быть хорошим специалистом в соответствующей области знания и уметь выявлять наиболее информативные элементы текста.

Процесс работы над текстом первоисточника складывается из нескольких этапов:

1. ***Ознакомительное чтение***, в результате которого решается вопрос о целесообразности реферирования иностранного материала. На этом этапе переводчик просматривает заглавие, введение, оглавление, выводы, резюме. Затем он бегло читает текст и определяет научно-практическую значимость и информационную новизну источника. Ключевые слова , содержащиеся в заглавии, введении, рубриках оглавления, выводах создают содержательную установку, активизирующую в дальнейшем процесс осмысления текста.

2. ***Анализ вида первоисточника и выбор аспектной схемы изложения*** материала в будущем реферативном тексте (общий план изложения, план изложения отраслевой методики реферирования и т.д.).

3. ***Изучающее чтение текста***. Переводчик в данном случае не делает полного письменного перевода текста. Мысленное декодирование иноязычного текста происходит под влиянием установки на реферативный анализ. Необходимость выделения аспектов, обозначенных в плане изложения, активизирует мыслительную деятельность референта и придает ей поисковый характер.

5. ***Разбивка текста на «аспектные блоки»*** (разметка текста с помощью удобных для референта – переводчика обозначений).

6. ***Конструирование*** (синтез) новых высказываний на родном языке, в краткой лаконичной форме передающих основное смысловое содержание по каждому аспекту.

7. ***Запись фрагментов перевода***, полученных в результате вышеописанных преобразований, в последовательности, заданной планом изложения.

8. ***Критическое сравнение текстов*** реферата и первоисточника с позиции потребителя и внесение в случае необходимости изменений и дополнений в текст реферата.

9. ***Оформление и редактирование реферата***, когда переводчик должен придерживаться наиболее распространенной структуры, состоящей из трех элементов:

- заголовочной части (библиографическое описание первоисточника);
- собственно реферативной части, передающей основное смысловое содержание первоисточника;
- справочного аппарата (индекс, рубрикационный шифр, информация о таблицах, чертежах, графиках, иллюстрациях и т.д., примечания переводчика, фамилия переводчика или название организации, сделавшей перевод).

Таким образом, при реферировании речь идет, прежде всего, о сплошном чтении первоисточника, касается ли это использования текстовых частей документа или смысловой интерпретации текста. Главное это выбор информации, относящейся к основным элементам содержания документа, и наиболее компактное ее представление. Кроме того, в процессе реферирования происходит исключение второстепенных, малосущественных сведений, не относящихся к объекту исследования и его основным характеристикам.

Образцы клишированных рефератов на английском языке

The paper is devoted to (is concerned with) ….

The paper deals with ….
The investigation (the research) is carried out ….
The experiment (analysis) is made ….
The measurements (calculations) are made ….
The research includes (covers, consists of) ….
The data (the results of …) are presented (given, analyzed, compared with, collected)
….
The results agree well with the theory ….
The results proved to be interesting (reliable) ….
The new theory (technique) is developed (worked out, proposed, suggested, advanced) ….
The new method (technique) is discussed (tested, described, shown) ….
This method (theory) is based on ….
This method is now generally accepted ….
The purpose of the experiment is to show ….
The purpose of the research is to prove (test, develop, summarize, find) ….
Special attention is paid (given) to ….
Some factors are taken into consideration (account) ….
Some factors are omitted (neglected) ….
The scientists conclude (come to conclusion) ….
The paper (instrument) is designed for ….
The instrument is widely used ….
A brief account is given of ….
The author refers to …
Reference is made to ….
The author gives a review of ….
There are several solutions of the problem ….
There is some interesting information in the paper ….
It is expected (observed) that ….
It is reported (known, demonstrated) that ….
It appears (seems, proves) that ….
It is likely (certain, sure) ….
It is possible to obtain ….
It is important to verify ….
It is necessary to introduce ….
It is impossible to account for ….
It should be remembered (noted, mentioned) ….

APPENDIX 4

Аннотирование (Writing summaries)

Аннотация – это предельно сжатая характеристика материала, заключающаяся в информации о затронутых в источниках вопросах.

Аннотация включает характеристику основной темы, проблемы объекта, цели работы и ее результаты. В аннотации указывают, что нового несет в себе данный документ в сравнении с другими, родственными по тематике и целевому назначению.

Существуют различные виды аннотаций в зависимости от назначения аннотации или от вида документа, на который составляется аннотация. Аннотирование может осуществляться как на языке оригинала, так и на языке перевода.

С точки зрения *объема* аннотации подразделяются на краткие и развернутые (или подробные).

Краткая аннотация (brief summary), как правило, характеризует документ в определенном аспекте: уточнение тематического содержания, расшифровка или пополнение заглавия, оценка уровня материала и так далее.

Развернутая аннотация (detailed summary) часто представляет собой перечисление рубрик первичного документа. Она составляется в тех случаях, когда документ представляет значительный научный интерес, а также при описании многоаспектных документов (учебники, справочники, сборники и т.д.).

С точки зрения *метода анализа и оценки документа* аннотации можно разделить на ***описательные*** (или справочные) и ***рекомендательные*** (в том числе и критические).

Описательная аннотация дает общее представление о документе, в то время как рекомендательная аннотация характеризует тематику и содержание документа под определенным углом зрения. В информационной сфере наибольшее применение находит описательная аннотация.

В зависимости от *тематического охвата* содержания документа аннотации делятся на ***общие*** и ***специализированные***.

Общие аннотации характеризуют весь документ в целом, они не ориентированы на определенный круг потребителей. В специализированных аннотациях находят отражения только те части, те аспекты содержания документа, которые интересуют потребителей данной информационной системы (данного круга читателей).

В информационной практике используется, как правило, специализированная аннотация, рассчитанная на информирование специалиста определенной отрасли научной или практической деятельности. Такой вид аннотации целесообразен и при работе с литературой в учебном процессе – при подготовке рефератов, докладов и других научных работ студентами.

Аннотации всегда предпосылаются библиографические данные первоисточника (см. примеры аннотаций выше).

В аннотациях обычно содержатся следующие данные:

1) предметная рубрика;
2) тема;
3) сжатая характеристика материала;
4) выходные данные (автор и заглавие статьи, название и номер периодического издания, где помещена статья, место и время издания).

Образцы клишированных аннотаций на английском языке

The article deals with …
As the title implies the article describes ...
The paper is concerned with…
It is known that…
It should be noted about…
The fact that … is stressed.
A mention should be made about …
It is spoken in detail about…
It is reported that …
The text gives valuable information on…
Much attention is given to…
The following conclusions are drawn…
The paper looks at recent research dealing with…
The main idea of the article is…
It gives a detailed analysis of…
It draws our attention to…
It is stressed that…
The article is of great help to …
The article is of interest to …
….. is/are noted, examined, discussed in detail, stressed, reported, considered.

APPENDIX 5

ACTIVE VOCABULARY

abiotic	абиотический, неживой	logging	заготовка леса
abundance	изобилие	long-term	долгосрочный
accessible	доступный	lotic	проточный
accuracy	точность	meet the needs	удовлетворять потребности
accurate	точный	mist	легкий туман
acid	кислота	mitigation	смягчение последствий
acid rain	кислотный дождь	moisture	влага
acidity	кислотность	molecule	молекула
adapt	приспосабливать(ся), адаптировать(ся)	multicellular	многоклеточный
add	добавлять	natural habitats	естественная среда обитания
addition	добавка	negligence	халатность
advise	советовать	nitrogen	азот
aftermath	последствие	noise	шум
air pollution	загрязнение воздуха	nucleic acids	нуклеиновая кислота
alkalinity	щелочность	occupational disease	профессиональная болезнь
alternate	изменяться	odor	запах
aluminum	алюминий	oil spill	разлив нефти
ammonia	аммиак	on-the-spot results	немедленные результаты
analyze	анализировать	organic compound	органическое соединение
anticipate	ожидать	outer layer	внешний слой
antropogeneous	антропогенный	oxide	оксид
arson	поджег	ozone layer	озоновый слой
at one's disposal	в распоряжении	particle	частица
barren	без растительного покрова	particulate matter	твердые частицы
be exposed (to)	подвергаться воздействию	perform	выполнять
biodiversity	многообразие видов	pharmaceutical	фармацевтический
biota	биота (совокупность организмов определенного района)	phosphate	фосфат
biotic	биотический	photochemical smog	фотохимии
calcium	кальций		
capacity	емкость, мощность		
carbon dioxide	диоксид углерода		

carnivorous	плотоядный
cellular	клеточный
chlorine	хлор
chlorofluorocarbons	хлорфторуглерод
civil disorder	беспорядки в обществе
collect	собирать
color comparator	атлас цветов
community	сообщество
compare	сравнивать
condition	условие
conduct	проводить
conductivity	проводимость
conserve	сохранять
constituent	составляющий
consume	потреблять
consumption	потребление
contaminant	загрязнитель
contribute	содействовать
convert (into)	превращать
copper	медь
corrosion	коррозия
crops	зерновые
cumulative	накопительный
current	течение
danger	опасность
decomposer	биоредуктор
deplete	истощать
determine	определять
develop	развивать
disseminate	распространять
dissolve	растворять
diversity	многообразие
divide (into)	делить на
drainage basin	водосборный бассейн
dust	пыль
emergency exit	аварийный выход
emergency procedure	порядок действий в чрезвычайной ситуации
emergency switch	аварийный
	ческий смог
photosynthesis	фотосинтез
plant	растение
poison	яд, отравлять
pollinator	опылитель
pollutant	загрязняющее вещество
population	население
population-dense	плотно населенный
potassium	калий
precaution	предосторожность
precision	точность
preparedness	готовность
prevent	предотвращать
preventive measure	превентивные меры
primary consumer	первичный консумент
produce	производить
promote	продвигать
protect	защищать
protein	белок
purify	очищать
qualitative	качественный
quality	качество
quantify	исчислять(ся)
quantitative	количественный
quantity	количество
radioactive decay	радиоактивный распад
reach (into)	проникать
reagent chemical	реагент
recovery	восстановление
recycle	перерабатывать
relationships	отношения
release	освобождать
reliability	надежность
research	исследование
respiration	дыхание
response	реагирование

	выключатель
emission	выброс
emit	выпускать, выбрасывать
endangered species	вымирающие виды
engineering failure	инженерная ошибка
environment	окружающая среда
environmentally friendly	экологически чистый
equipment	оборудование
escape route	маршрут эвакуации
estimate	оценивать
evaluate	оценивать
evaporation	испарение
examine	проверять, осматривать
excessive	излишний
exchange	обмениваться
explosion	взрыв
explosive	взрывчатое вещество
expose	подвергать (воздействию)
exposure	воздействие
extinction	вымирание
faecal	фикальный
fertilizer	удобрение
fiber	клетчатка
fieldwork	полевые работы
fire extinguisher	огнетушитель
flocculant	хлопьеобразующий
fluoride	фторид
food chain	пищевая цепь
food web	пищевые сеть
fossil fuel	ископаемое топливо
fume	дым
fungi	грибки
garbage	мусор
habitable region	населенный район
hardhat	шлем-каска
hardness	твердость, жесткость
harmful	вредный
reveal	обнаруживать
safety	безопасность
safety compliance	соответствие требованиям безопасности
safety precaution	меры предосторожности
sample	образец
scale	шкала, масштаб
scatter	рассеивать
secondary consumers	вторичный консумент
settleability	осаждаемость
sewage	сточные воды
sewerage system	канализационая система
short-term	краткосрочный
maintain	поддерживать
mammal	млекопитающее
manganese	марганец
manure	навоз
measure	измерять
measurement	измерение
silicon	кремний
simulate	моделировать
slight	слабый
sludge	осадок, отстой
soil	почва
solid	твердое тело
solve	растворять
solvent	растворитель
species	вид, порода
storage	хранение
sulphur	сера
surface	поверхностный
surrounding	окружающая среда
survive	выживать
suspended matter	взвешенное вещество
sustain	поддерживать
sustainable	устойчивый

hazard опасное положение hazard reporting system система оповещения об опасности hazard warning system аварийная сигнализация hazardous опасный herbivore травоядное животное hydrosphere гидросфера impact воздействие improve улучшать industrial hygiene охрана труда inhabit населять injured травмированный input ввод, потребление insure обеспечивать, уверять intense сильный, интенсивный interact взаимодействовать iron железо liquefy делать жидким liquid жидкость	tertiary consumers третичный консумент toxic chemical токсичный химикат traffic collision столкновение на дороге trophic level трофический уровень turbidity помутнение under-design недостаточный запас прочности urban городской vapour пар vegetation растительность volatile летучий vulnerable уязвимый water supply водоснабжение water treatment очистка воды wildlife дикая природа

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Учебное издание

УЛЬЯНОВА Ольга Викторовна

ECOLOGY AND ENGINEERING

Учебное пособие

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Подписано к печати 26.01.11. Формат 60x84/16. Бумага «Снегурочка».
Печать XEROX. Усл.-печ. л. 11,39. Уч. -изд. л.10,31
Заказ 1335. Тираж 50 экз.

Национальный исследовательский Томский политехнический университет
Система менеджмента качества
Издательства Томского политехнического университета
сертифицирована
NATIONAL QUALITY ASSURANCE по стандарту ISO 9001:2008

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