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FOR ENVIRONMENTAL
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English for Environmental Engineering

Учебное пособие

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Учебное пособие предназначено для студентов бакариатов направления «Природообустройство и природопользование».

Пособие включает материал, связанный с общими вопросами природоохраны, природообустройства и управления природными ресурсами.

Пособие может быть использовано для занятий с магистрами и студентами, получающими дополнительную квалификацию по направлению «Переводчик в сфере профессиональной коммуникации».

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Предисловие

Учебное пособие предназначено для студентов бакалавриата второго курса направления «Природообустройство и водопользование» профиля «Природоохранное обустройство территории». Содержание пособия соответствует программным требованиям Федерального государственного образовательного стандарта.

Актуальность создания данного пособия обусловлена тем, что не существует учебных изданий по английскому языку, посвященных вопросам природообустройства и природоохраны.

Цель работы с пособием «English for Environmental Engineering» - обучение профессиональному иностранному языку. Пособие предназначено для обучения чтению и переводу профессиональных текстов, а также для овладения специализированной лексикой. Кроме того, работа с пособием поможет заложить основы аннотирования и реферирования англоязычных текстов.

Данная разработка направлена на формирование языковой и коммуникативной компетенций, а именно способности к обобщению, анализу, восприятию информации, способности аргументированно и ясно строить устную и письменную речь, умению адекватно переводить аутентичные тексты, развитию навыков просмотрового и изучающего чтения.

Пособие состоит из восемнадцати уроков. Выбор тем и последовательность их изучения обусловлены профессиональной тематикой профиля и внутренней логикой курса. Пособие освещает такие темы как рациональное использование природных ресурсов, источники загрязнения окружающей среды, последствия экологического загрязнения и методы оценки ущерба, методы восстановления загрязненных участков и т.д.

Каждый урок имеет четкую структуру. Занятие, как правило, начинается с упражнения на отработку произношения наиболее сложных слов, встречающихся в тексте. Затем следуют дотекстовые упражнения, которые могут быть направлены на развитие контекстуальной догадки, развитие навыка просмотрового чтения.

Работа с текстом всегда предполагает его полный перевод и подготовку небольшого отрывка на чтение. Также чтение текста может сопровождаться упражнением, например, на обучение прогнозированию.

Послетекстовые упражнения посвящены уточнению значения терминов и словосочетаний, встречающихся в тексте, овладению активной лексикой. Послетекстовые упражнения служат развитию дифференциации лексических единиц, словообразовательной догадки.

Для дальнейшего усвоения значений слов введены упражнения на адекватный перевод словосочетаний, формирование словосочетаний с использованием лексического минимума, а также на расширение или сокращение предложений.

Как правило, раздел завершается переводом предложений с русского на английский язык, или заданием на поиск информации, связанной с тематикой урока и подготовкой индивидуальной или групповой презентации.

Пособие может быть использовано на занятиях со студентами бакалавриата и магистратуры, а также со студентов, получающими дополнительную квалификацию по направлению «Переводчик в сфере профессиональной коммуникации», в самостоятельной работе студентов. Также пособие может оказаться полезным при подготовке к международным экзаменам по английскому языку.

Автор-составитель

UNIT ONE

ENVIRONMENTAL ENGINEERING

Exercise 1. Find the pronunciation of the following words and get ready to read them.

environmental, engineering, science, resources, area, chemistry, sewage, waste, reduction, pollution, synthesis, various, agricultural, biology, geography, hydrogeology, conveyance, quality, hazardous, ancient, utilized, sewer, aqueduct, drought, century, percentage, disease, cholera, death, society, widespread, world, yields, numerous, species, extinction, reproductive, cycle, vividly, birth, conservation, law, notable, example, Paris, further, preserving, enhancing, efficient, convert, product, Harappan, Roman, DDT, World War II, US, Bavaria.

Exercise 2. Guess the meaning of the words without a dictionary.

engineering, principle, resource, organism, management, synthesis, Biology, Ecology, Geography, Geology, Hydrogeology, Statistics, process, policy, civilization, degradation, region, modern, design, cholera, industrialized, control, cycle, conservation, construction, national, park, system, public, form, energy, product.

Exercise 3. Read and translate the text. Choose an abstract of ten lines and get ready to read it aloud.

Environmental engineering

Environmental engineering is the application of science and engineering principles to improve the environment (air, water, and/or land resources), to provide healthy water, air, and land for human habitation and for other organisms, and to remediate polluted sites.

Environmental engineering is a diverse field, which emphasizes several areas: process engineering, environmental chemistry, water and sewage treatment (sanitary engineering), waste reduction or management, and pollution prevention or cleanup. 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; Water treatment; Wastewater treatment; Statistics.

There are several divisions of the field of environmental engineering: Environmental impact assessment and mitigation; Wastewater treatment; Air quality management; Environmental policy; Contaminated land management and site remediation; Environmental health and safety; Hazardous waste management; Natural resource management; Noise pollution; Risk assessment; Solid waste management.

Development of environmental engineering

Ever since people first recognized that their health and well-being were related to the quality of their environment, they have applied thoughtful principles in attempt to improve the quality of their environment. The ancient Harappan civilization utilized early sewers in some cities. The Romans constructed aqueducts to prevent drought and to create a clean 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.

Modern environmental engineering began in London in the mid-19th century when Joseph Bazalgette designed the first major sewerage system that reduced the percentage of waterborne diseases such as cholera. The introduction of drinking water treatment and sewage treatment in industrialized countries reduced waterborne diseases from leading causes of death.

In many cases, as societies grew, actions that were intended to achieve benefits for those societies had longer-term impacts which reduced some environmental qualities. One example is the widespread application of DDT to control agricultural pests after World War II. While the agricultural benefits were outstanding and crop yields increased dramatically, numerous species were brought to the border of extinction due to the impact of the DDT on their reproductive cycles. The story of DDT 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 actions that would harm the environment have been developed by various societies. 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.

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 try to come up with new forms of energy and find ways to make it more efficient. They try to get people to convert to environmental friendly energy and products.

Exercise 4. Answer the questions.

1. Give the definition of environmental engineering.
2. What does environmental engineering deal with?
3. Name the disciplines which environmental engineering includes.
4. Find in the text some examples of environmental practice.

Exercise 5. Find the wrong statements.

1. Environmental engineering applies scientific and engineering principles to improve the environment.

2. The main task of environmental engineers is to come up with new forms of energy.
3. The ancient Harappan civilization used early sewers in cities.
4. Waterborne diseases became more frequent after the introduction of drinking water and sewage treatment.
5. The Romans constructed aqueducts to prevent drought and to create a clean water supply.
6. In 19-th century sewers were constructed in Paris.
7. Modern environmental engineering began in Rome in the mid-15th century.
8. Numerous species were brought to the border of extinction due to the impact of the DDT.
9. Londoners created laws restricting the development and degradation of alpine country.
10. The story of DDT was told in Rachel Carson's book.

Exercise 6. Give Russian equivalents to the following:

environmental engineering, application of science and engineering principles, to improve the environment, water and land resources, to remediate polluted site, process engineering, pollution prevention, synthesis of various disciplines, civil engineering, solid waste, environmental impact assessment, environmental impact mitigation, air quality management, contaminated land, site remediation, natural resource management, due to the impact, to harm the environment, new forms of energy.

Exercise 7. Read the words, say which part of speech they belong to and translate them into Russian.

environment, environmental; engineer, engineering; to apply, appliance, application; science, scientist, scientific; to improve, improvement; to provide, provider, provision; to remediate, remediation; to pollute, polluter, pollution; chemist, chemistry, chemical; to treat, treatment; to reduce, reduction.

Exercise 8. Match up words with their definitions.

waste reduction	the science that deals with all forms of life
Ecology	illness carried by or through water
Geology	distribution of water to some place
water treatment	study of Earth's physical features
aqueduct	process used to make water more acceptable for use
waterborne disease	is the process of reducing the amount of waste produced by a person or a society
Biology	study of the relationships between living things and their environments
Geography	study of rocks and minerals
Hydrogeology	study of water movement through rock
sewer	a channel built to bring water from a distance
water supply	a large pipe, usually buried, that carries off the liquid and solid waste

Exercise 9. Find pairs of synonyms.

to remediate, dangerous, earth, to create, minimisation, minimisation, main, to prevent, dirty, purification, to treat, illness, polluted, sewage, treatment, reduction, hazardous, sewer, to protect, land, to design, major, disease.

Exercise 10. Find pairs of antonyms.

Ancient, water, numerous, harm, land, healthy, good, construction, new, ill, to increase, solid, to lose, death, liquid, few, first, destruction, private, second, clean, dirty, modern, to find, major, public, birth, to reduce, old, minor.

UNIT TWO NATURAL RESOURCES

Exercise 1. Train the reading of these words:

Natural, resources, substances, that, exist, within, derived, the environment, them, survival, other, example, atmosphere, fuels, pasture, ocean, origin, biotic, biosphere, product, marine, organism, fuel, petroleum, thing, example, ores, iron, reserve, with, renewability, processes, agricultural, continuously, quantity, endangered, industrial, growth, carefully, exceeding, world, capacity, generated, these, than, nuclear, uranium, extremely, recycling, focus, quality, both.

Exercise 2. Do you know the following words in English?

натуральный, инженерия, принцип, ресурс, организм, синтез, биология, экология, субстанция, география, геология, гидрология, статистика, цивилизация, деградация, регион, модерн, дизайн, холера, контроль, цикл, консервация, конструкция, национальный, парк, система, публика, энергия, продукт, форма, экосистема, атмосфера, минерал, океан, биосфера, категория, органический, потенциальный, резерв, процесс, индустриальный, генерировать, радиоактивный, элемент, уран, формация, металлический, фокус.

Exercise 3. Read and translate the text. Divide the text into some parts and entitle them. Choose an abstract of ten lines and get ready to read it aloud.

Natural resources are substances that exist naturally within environments and form our eco-system. Natural resources can be derived from the environment. Many of them are essential for our survival while others are used for satisfying our wants. Some examples of natural resources include the following: Air, wind and atmosphere; Plants, forestry; Animals; Coal, fossil

fuels, rock and mineral resources; Soil, pasture; Water, oceans, lakes, rivers and groundwater.

Natural resources may be classified in different ways.

On the basis of origin, resources may be divided into biotic and abiotic.

Biotic resources are obtained from the biosphere, such as forests and their products, animals, birds and their products, fish and other marine organisms. Mineral fuels such as coal and oil are also included in this category because they are formed from organic matter.

Abiotic resources include non-living things. Examples include land, water, air and ores such as gold, iron, copper, silver etc.

Considering their stage of development, natural resources may be referred to potential and actual resources.

Potential resources are those that exist in a region and may be used in the future. Actual resources are those that have been surveyed, their quantity and quality determined and are being used in present times.

On the basis of status of development, they can be classified into potential resources, developed resources, stock and reserves.

With respect to renewability, natural resources can be categorized as renewable and non-renewable.

A natural resource is renewable if it is replaced by natural processes. Many renewable resources can be depleted by human use. Some of these, like agricultural crops, take a short time for renewal; others, like water or forests, take a comparatively longer time. Some of them, like sunlight, air, wind, etc., are continuously available and their quantity is not affected by human consumption.

Renewable resources are endangered by industrial developments and growth. They must be carefully managed to avoid exceeding the natural world's capacity to replenish them.

A non-renewable resource is a natural resource which cannot be produced, grown, generated, or used on a scale which can sustain its consumption rate. These resources often exist in a fixed amount, or are consumed much faster than nature can create them. Fossil fuels (such as coal, oil and natural gas) and radioactive elements (uranium) are examples. Since their rate of formation is extremely slow, they cannot be reproduced once they get depleted. Of these, the metallic minerals can be re-used by recycling them, but coal and oil cannot be recycled.

Exercise 4. Scan the text and find the definitions and examples of. Think and add your own examples of natural resources.

natural resources; biotic resources; abiotic resources; renewable resources; non-renewable resources.

Exercise 5. Give English equivalents to the following words and phrases. Don't use the dictionary, try to remind them.

природные ресурсы, окружающая среда, воздух, ветер, растения, лес, животные, птицы, рыба, уголь, ископаемое топливо, минералы, почва, вода, океан, река, озеро, грунтовые воды, нефть, природный газ, руда, золото, железо, медь, серебро, запас, возобновляемый, невозобновляемый, количество.

Exercise 6. Make up an annotation of the above text according to the model.

Annotation

New Energy from Old Sources

Ecological Journal, volume 82, №5, 2004, New York

The article is titled "New Energy from Old Sources". It is written by an ecologist of New York University - Professor J.

Brown. The article was published in Ecological Journal, volume 82, and №5, 2004, New York.

The paper focuses on the problems of energy sources. Recommendations are given on the usage of some unusual resources. The article is intended to assist ecologists, engineers and those who are interested in ecological problems.

Exercise 7. Make up an abstract (a brief summary) of the text according to the model.

Abstract

New Energy from Old Sources

Ecological Journal, volume 82, №5, 2004, New York

The headline of the article is "New Energy from old sources". The author of the article is an ecologist of New York University - Professor J. Brown. It is taken from Ecological Journal, volume 82, and №5, 2004, New York.

The article deals with the problems of sources of energy. It describes how people can get energy from unusual sources. The author outlines the problems of natural resources as well.

Accordingly the paper is devoted to the important problem of finding solutions of energy problems. Data are presented on the fact, that the stock of fossil at present time is the main source of energy and it is constantly reducing. Besides, the author brings to light the idea of developing some methods of realizing new sources of energy. Suggestions are made on the usage of energy from under-Earth stock of steam, reusing of deposit's energy.

Therefore the need is stressed to save more energy and to employ other sources of energy (the heat of the steam deposits, currents and tidal energy; the power of wind; subterranean hot waters, wave power, etc). Moreover, the article attempts to clarify the possibility heating dwelling-places with the warmth of the Sun's heat and supply energy for small villages from the

windmills. Suggestions are made on the usage of the solar cell. Finally the author comes to the conclusion that the problem of getting new energy must be thoroughly studied, as it is very actual and important today.

Thus, the mentioned sources can give good chance for getting energy in the future. It's safe to say, the article may be of importance for ecologists, engineers and those who are interested in ecological problems.

Exercise 8. Scan exercises 6 and 7 and write out the words and phrases, which you may use retelling other texts.

Exercise 9. How are the themes ‘Natural resources’ and ‘New sources of energy’ related? Tell what you know about renewable energy. Choose one topic and prepare a report:

1. Renewable energy.
2. Wind power.
3. Hydroelectricity.
4. Solar energy.
5. Biofuels.
6. Biomass.
7. Geothermal energy

You may use one of the following links to get some information:

http://en.wikipedia.org/wiki/Renewable_energy

http://en.wikipedia.org/wiki/Wind_power

<http://en.wikipedia.org/wiki/Hydroelectricity>

http://en.wikipedia.org/wiki/Solar_energy

<http://en.wikipedia.org/wiki/Biofuel>

<http://en.wikipedia.org/wiki/Biomass>

http://en.wikipedia.org/wiki/Geothermal_energy

UNIT THREE ECOSYSTEM

Exercise 1. Find the pronunciation of the following words, get ready to read them.

biological, particular, area, physical, with, community, major, substance, climate, temperature, autotrophic, manufacture, photosynthesis, consumer, especially, within, other, primary, bacteria, fungi, period, chemical, return, permanent, temporary, usually, through, materials cycles, include, nitrogen, oxygen, thing, then, exist, equilibrium, certain, species, enough, consequently, evolution, atmosphere, without, surface, the Earth, danger, might, extinction, wildlife, unreasonable, utilization, resource.

Exercise 2. Read and translate the following words and phrases without looking up a dictionary.

ecosystem, biological, physical, component, factor, community, inorganic, substance, climate, temperature, photosynthesis, energy, bacteria, permanent, nitrogen, carbon, oxygen, mineral salts, chemical substance, equilibrium, population, regulate, static, adapt, evolution, period, atmosphere, living organism, ozone.

Exercise 3. Look through the text and find the sentences, which mean:

1. Экосистема формирует ряд пищевых цепочек. 2. Экосистема состоит из четырех компонентов. 3. Первичный консумент получает энергию от растений. 4. Экосистема существует в состоянии равновесия. 5. Первые живые организмы появились в море. 6. Равновесие экосистемы может быть нарушено нерациональным использованием природных ресурсов. 7. Экосистемы постоянно меняются. 8. Экосистема состоит из всех организмов, живущих в определенном районе.

Exercise 4. Read and translate the text. Choose an abstract of ten lines and get ready to read it aloud.

ECOSYSTEM

An ecosystem is a biological environment consisting of all the organisms living in a particular area, as well as all the nonliving, physical components of the environment with which the organisms interact, such as air, soil, water, and sunlight. It is all the organisms in a given area, along with the nonliving (abiotic) factors with which they interact; a biological community and its physical environment.

There are 6 major components in an ecosystem:

1. inorganic substances;
2. organic compounds;
3. climate, temperature, wind, light and rain which affect all the processes in an ecosystem;
4. producer - an autotrophic organism of the ecosystem, usually any of the green plants which are able to manufacture food from simple inorganic substance in the process known as photosynthesis;
5. consumer - an organism, especially an animal, within an ecosystem that feeds upon plants or other animals;
Primary consumers obtain energy from plants. But secondary consumers feed on other animals.
6. decomposers, such as bacteria and fungi.

Bacteria destroy the flesh of dead animals, fungi break down plant material. They enable chemical substances to return to the physical environment.

Ecosystems can be permanent or temporary. Ecosystems usually form a number of food chains.

The main processes in ecosystems include food chains, materials cycles, development, evolution.

Food chains

The Sun's energy travels through an ecosystem. The proper transfer of energy through an ecosystem by (the producers, the consumers and the decomposers) is called a food chain.

Materials cycles

They include cycles of nitrogen, carbon, oxygen, water and mineral salts. Chemical substances move from the non-living environment to living things. They are then returned to the environment.

Development

An ecosystem exists in a state of equilibrium. It can support a certain number of plants and animals of different species. If the population of one animal increased, there would not be enough food and water for all the animals. Consequently, some would die. In this way the ecosystem regulates itself and returns to its state of equilibrium. Ecosystems are not static, they change all the time. Plants and animals are able to adapt to changes in the physical environment.

Evolution

During long periods of time ecosystems evolve. The evolution of an ecosystem is caused by factors inside and outside it. Consider the evolution of the atmosphere: when life began there was no oxygen in the atmosphere. Consequently, the Sun's rays prevented life from developing on land. The first living organisms developed under the sea. After the evolution of photosynthesis, the oxygen in the atmosphere increased and life expanded, complex living organisms developed. As the oxygen in the atmosphere increased, a layer of ozone was formed; life would be impossible without it on the surface of the Earth.

Today life on the Earth is in danger: man himself might destroy the equilibrium of ecosystem by pollution, extinction of wild-life and unreasonable utilization of the globe's natural resources.

Exercise 5. Match English phrases and their Russian equivalents.

biological environment, to affect all the processes in an ecosystem, primary consumer, secondary consumer, food chain, evolution of ecosystem, state of equilibrium, plants and animals of different species, population of animal, to be in danger, to adapt to changes, living organism, layer of ozone, to destroy the equilibrium of ecosystem, unreasonable utilization of natural resources.

состояние равновесия, популяция животного, эволюция экосистемы, живой организм, разрушить равновесие экосистемы, вторичный консумент, быть в опасности, озоновый слой, биологическая среда, влиять на все процессы в экосистеме, нерациональное использование природных ресурсов, пищевая цепочка, адаптироваться к переменам, первичный консумент, растения и животные разных видов.

Exercise 6. Paraphrase the italicized words.

organisms in ecosystem *interact*; *components* of ecosystem; inorganic *substances*; to *manufacture* food; to *obtain* energy from plants; fungi *break down* plant material; ecosystems *form* food chains; energy *travels* through ecosystem; *state* of equilibrium; *different* species; ecosystems *evolve*; life *began*.

Exercise 7. Use negative prefixes to make antonyms of the following adjectives.

legal, visible, moral, qualified, responsible, possible, interested, honest, grateful, active, patient, living, known, accurate, polite, modest, regular, safe, tidy, existent, correct, personal, legible.

Exercise 8. Choose a suitable English word.

биология - biology, biological, biologist; физический - physics, physical, physician; производить - produce, producer,

production; потребитель - consume, consumer, consumption; второй - second, secondary, secondly; разрушительный - destroy, destruction, destructive; существующий - exist, existent, existence; определенность - certain, certainly, certainty; дифференцировать -different, differentiate, differentiation; адаптация - adapt, adapter, adaptation; оживленный - life, live, lively.

Exercise 9. Read the text without a dictionary and give it a title. Render it in Russian.

Various species of plants, animals, fungi, and microorganisms that are connected as food and food consumers. Each of the successive feeding links consists of organisms that consume those of the preceding link in the chain. The number of links or sets of species in a food chain is usually no more than four or five.

At the base of every food chain are the producer species - the autotrophic organisms which synthesize organic matter. These are primarily green plants, consisting of water, inorganic salts, and carbon dioxide, that synthesize organic matter by assimilating the energy of sunlight.

The next link in a food chain consists of the consumer species - the heterotrophic organisms that consume organic matter. The primary consumers are herbivorous animals that feed on grass, seeds, fruit, the underground portion of plants (roots, tubers, and bulbs), and even, in the case of some insects, wood.

Exercise 10. Choose one of natural ecosystems and tell about it. Use one of the following links:

<http://en.wikipedia.org/wiki/Ecosystem>

<http://en.wikipedia.org/wiki/Category:Ecosystems>

UNIT FOUR LAND POLLUTION

Exercise 1. Find the pronunciation of the following words and abbreviations, get ready to read them.

misuse, causes, health, hazard, urban, exploitation, inadequate, agricultural, urbanization, series, diseases, both, mechanization, combustion, engine, infrastructure, visual, high, viable, wild-life, hedgerow, harvested, machinery, consequence, nutrients, foreign, pesticide, mixture, agent, virus, bacteria, antimicrobial, disinfectant, device, against, although, toxicity, especially, pavement, auxin, biodegradable, however, derived, trinitrotoluene, impurity, dioxin, insecticide, damage, first, century, organochlorine, Aldrin, Dieldrin, BHC, persistent, usage, nervous, endocrine, organophosphate, e.g., parathion, methyl, available, disrupted, aquatic, vegetation, acid, drainage, residential, vermin, liquid, leachate.

Exercise 2. Do you know the following words in Russian?

degradation, industrial, exploitation, adequate, practice, urbanization, industrialization, result, revolution, concentration, number, infrastructure, visual, mechanization, economically, farmer, intensive, monoculture, pesticide, mixture, agent, virus, antimicrobial, disinfectant, herbicide, dioxin, toxic, fatality, insecticide, group, synthetic, effect, endocrine, system, methyl, project, nation.

Exercise 3. Read the text and fill the gaps with the sentences under the text. Translate the text. Choose an abstract of ten lines and get ready to read it aloud.

LAND POLLUTION

Land pollution is the degradation of Earth's land surfaces often _____ . The causes of land pollution are health haz-

ard disposal of urban and industrial wastes, exploitation of minerals, and improper use of soil by inadequate agricultural practices. Urbanization and industrialization also result in land pollution. The Industrial Revolution set a series of events _____, causing diseases in both humans and other species of animals.

Increased mechanization

The concentration of population in cities, along with the internal combustion engine, _____. Roads cause visual, noise, light, air and water pollution, in addition to land pollution.

As the demand for food has grown very high, _____. The increase in field size makes it economically viable for the farmer but results in loss of shelter for wildlife, as hedgerows and copses disappear. When crops are harvested, the naked soil is left open to wind after the heavy machinery has compacted it. Another consequence of more intensive agriculture is the move to monoculture. This is unnatural, it depletes the soil of nutrients, allows diseases and pests to spread and makes farmers _____.

A pesticide is a substance or mixture of substances used to kill a pest. A pesticide may be a chemical substance, biological agent (such as a virus or bacteria), antimicrobial, disinfectant or device used against any pest. Although there are benefits to the use of pesticides, there are also drawbacks, _____.

Herbicides are used to kill weeds, especially on pavements and railways. They are similar to auxins and most are biodegradable by soil bacteria. However one group derived from trinitrotoluene have the impurity dioxin, _____.

Insecticides are used to rid farms of pests which damage crops. First insecticides used in the nineteenth century were inorganic. Now there are two main groups of synthetic insecticides. Organochlorines include DDT, Aldrin, Dieldrin and BHC. They are cheap to produce, potent and persistent. DDT was used on a

massive scale from the 1930s, and then usage fell _____. It affects the nervous and endocrine systems.

Organophosphates, e.g. parathion, methyl parathion and about 40 other insecticides are available nationally. Parathion is highly toxic, methyl-parathion is less so and Malathion is generally considered safe as it has low toxicity and is rapidly broken down in the liver.

Mining

Modern mining projects leave behind disrupted communities, damaged landscapes, and polluted water. Mining also affects ground and surface waters, the aquatic life, vegetation, soils, animals, and the human health. Acid mine drainage can cause damage to streams _____. The vast variety of toxic chemicals released by mining activities can harm animals and aquatic life as well as their habitat. The average mine disturbs over a thousand acres of land.

Increased waste disposal

There are various methods of waste disposal, they differ for developed and developing nations, for urban and rural areas, and for residential and industrial producers, _____.

Poorly managed landfills can create a number of adverse environmental impacts such as wind-blown litter, attraction of vermin, and generation of liquid leachate.

- 1) as the harmful environmental effects were realized
- 2) there is an increase in field size and mechanization.
- 3) which is very toxic and causes fatality even in low concentrations.
- 4) caused by human activities and their misuse of land resources.
- 5) to use chemical substances foreign to the environment.
- 6) but most of them are harmful for the environment in some degree.

- 7) which destroyed natural habitats and polluted the environment,
- 8) such as potential toxicity to humans and other organisms.
- 9) which in return can kill aquatic life.
- 10) led to the increased number of roads and infrastructure that goes with them.

Exercise 4. Read the following formulae and tell what they mean.

SO_x, SO₂, NO_x, NO₂, CO₂, CH₄, NH₃, O₃, C₆H₁₂O₆, CH₃CH₃, CH₂CH₂, CH₃CHO, CH₃CONH₂, CH₃CN, OCS, C₆H₅Cl, BrCH₂CH₂Br, C₆H₅OH.

Exercise 5. Make up some questions to the text in the form of a plan. Get ready to retell the text.

Exercise 6. Find in the text the following phrases:

загрязнение почвы, нерациональное использование земельных ресурсов, уничтожить естественную среду обитания, двигатель внутреннего сгорания, вызывать визуальное, шумовое, световое загрязнение, истощать почву, питательное вещество, использовать химические вещества враждебные для окружающей среды, использование пестицидов, избавить ферму от насекомых, которые уничтожают растения, воздействовать на нервную и эндокринную системы, высокотоксичное вещество, водная флора и фауна, причинить ущерб, методы утилизации отходов, плохо управляемая свалка, воздействие на окружающую среду.

Exercise 7. Translate the following word combinations. Mind that in the noun chain the last noun is the main one, the others become attributes.

farm crop cultivation, farm crop cultivation improvement, plant protection measures, great soil erosion difficulties, industry and

agriculture contribution, modern farm equipment requirement, new farm machinery and equipment deliveries, land reclamation work, fertilizers producing plant construction, world water resource distribution, ecosystem equilibrium state, soil nitrogen content analysis, farm machinery maintenance problems.

Exercise 8. Give synonyms and antonyms to the following words.

pollution; degradation; urban; waste; disease; human; internal; open; benefit; similar; to damage; synthetic; to include; cheap; toxic; safe; liquid; to increase; foreign; life.

Exercise 9. Give all possible derivatives of the nouns using suffixes -er, -or. Translate the words into Russian.

to lead, to write, to read, to visit, to speak, to sleep, to act, to direct, to conduct, to drive, to fight, to mine, to report, to sing, to skate, to swim, to teach, to travel, to sail, to invent, to found, to compose, to use, to make, to farm, to lose, to open.

Exercise 10. Make some questions to embrace the content of the text.

In Scotland in 1993, 14 million tons of waste was produced. 100,000 tons was toxic waste and 260,000 tons was controlled waste from other parts of Britain and abroad. 45% of the special waste was in liquid form and 18% was asbestos - radioactive waste was not included. Of the controlled waste, 48% came from the demolition of buildings, 22% from industry, 17% from households and 13% from business - only 3% were recycled. 90% of controlled waste was buried in landfill sites and produced 2 million tons of methane gas. 1.5% was burned in incinerators and 1.5% was exported to be disposed of or recycled.

UNIT FIVE

SOIL MANAGEMENT (Part I)

Exercise 1. Find the pronunciation of the following words and abbreviations, get ready to read them.

tillage, maintenance, supply, nutrient, acidity, erosion, traditionally, plough, loosens, sufficient, moisture, germinate, fertile, minimum, the aeration, pulverization, freer, circulation, contributes, plants, inhibiting, discouraging, acre, approximately, pounds, earthworms, fungi, protozoa, arthropods, algae, mammal, humus, final, relatively, reservoirs, residues, high-quality, renewed, livestock, fertility, pH, necessary, growth, potassium, phosphorus, calcium, sulphur, magnesium, quantities, require, minute, manganese, readily.

Exercise 2. Do you know the following words in English?

контроль, эрозия, традиционный, программа, минимум, аэрация, результат, пульверизация, циркуляция, фиксировать, тип, акр, фунт, материал, фаза, финал, резервуар, нутриент, структура, гумус, фракция, порция, практически, компост, фертильность, температура, фосфор, кальций, магний, минута, цинк.

Exercise 3. Train the reading of the following numbers.

Example:

104	one hundred and four
1,136	one thousand one hundred and thirty six
6,254,798	six million two hundred and fifty four thousand seven hundred and ninety-eight.

900 pounds, 2,400 pounds, 1,500 pounds, 133 pounds, 890 pounds, 7,954; 10,000; 10,325; 20,000; 100,000; 1,000,000; 10,000,000; 100,000,000; 1,000,000,000; 5,671,812; 847; 265;

4,603; 1,001; 1,250; 2,235; 375; 305; 2,075; 1,225,375; 3,734;
2,720,000; 145,896; 7,000; 5,550,000; 246; 206; 5,050; 5,005;
8,525,250; 1,002; 3,000; 400; 5,000,000; 8,005,240

Exercise 4. Read and translate the text. Choose an abstract of ten lines and get ready to read it aloud.

SOIL MANAGEMENT

Soil management involves six essential practices: proper tillage; maintenance of a proper supply of organic matter in the soil; maintenance of a proper nutrient supply; control of soil pollution; maintenance of the correct soil acidity; and control of erosion.

Tillage

The purpose of tillage is to prepare the soil for growing crops. This preparation is traditionally accomplished by using a plough that cuts into the ground and turns over the soil. This removes or kills any weeds growing in the area, loosens and breaks up the surface layers of the soil, and provides a bed of soil that holds sufficient moisture to permit the planted seeds to germinate. Traditional tillage may harm the soil if used continuously over many years, especially if the fertile topsoil layer is thin. Today, many farmers use a program of minimum or reduced tillage to conserve the soil.

Among the secondary but important benefits of tillage is the aeration resulting from pulverization. This aeration not only provides a freer circulation of oxygen and water but also results in increased biological activity in the soil, including that of organisms that fix atmospheric nitrogen. Tillage contributes to the health of plants by inhibiting plant diseases and by discouraging the development of various types of insects that harm plants.

Supply of organic matter

An acre of living topsoil contains approximately 900 pounds of earthworms, 2,400 pounds of fungi, 1,500 pounds of bacteria, 133 pounds of protozoa, 890 pounds of arthropods and algae, and even small mammals in some cases. Soil also contains dead organisms, plant matter, and other organic materials in various phases of decomposition. Humus, the dark-coloured organic material in the final stages of decomposition, is relatively stable. Both organic matter and humus serve as reservoirs of plant nutrients; they also help to build soil structure and provide other benefits.

Organic matter and humus are terms that describe different but related things. Organic matter refers to the fraction of the soil that is composed of both living organisms and once-living residues in various stages of decomposition. Humus is only a small portion of the organic matter. It is the end product of organic matter decomposition and is relatively stable. Humus contributes to well-structured soil that, in turn, produces high-quality plants.

Practically all the soil organisms depend on organic matter as their food source. Therefore, to maintain their populations, organic matter must be renewed from plants growing on the soil, or from compost. When soil livestock are fed, fertility is built up in the soil, and the soil will feed the plants. Rich organic matter and humus levels help to maintain favourable conditions of moisture, temperature, nutrients, pH, and aeration.

Nutrient supply

The nutrients most necessary for proper plant growth are nitrogen, potassium, phosphorus, iron, calcium, sulphur, and magnesium, all of which usually exist in most soils in varying quantities. In addition, most plants require minute amounts of substances known as trace elements, which are present in the soil in very small quantities and include manganese, zinc, copper,

and boron. Nutrients often occur in the soil in compounds that cannot be readily utilized by plants.

Exercise 5. Think of the questions to which the following sentences are answers:

1. Soil management involves six essential practices: proper tillage; maintenance of a proper supply of organic matter in the soil; maintenance of a proper nutrient supply; control of soil pollution; maintenance of the correct soil acidity; and control of erosion.
2. The purpose of tillage is to prepare the soil for growing crops.
3. Among the secondary but important benefits of tillage is the aeration resulting from pulverization.
4. Traditional tillage may harm the soil if used continuously over many years.
5. An acre of living topsoil contains approximately 900 pounds of earthworms.
6. Soil also contains dead organisms, plant matter.
7. Humus is only a small portion of the organic matter.
8. Rich organic matter and humus levels help to maintain favourable conditions of moisture, temperature, nutrients, pH, and aeration.
9. The nutrients most necessary for proper plant growth are nitrogen, potassium, phosphorus, iron, calcium, sulphur, and magnesium.
10. Trace elements include manganese, zinc, copper, and boron.

Exercise 6. Match the sentences to make the summary of the text.

1. Soil management includes some practices:
2. Humus is the result of organic matter decomposition
3. Organic matter and humus also help

4. To maintain the populations of soil organisms, organic matter must be
5. Traditional tillage may damage the soil,
6. Secondary benefits of tillage is
7. Practically all the soil organisms depend on
8. Both organic matter and humus serve as
9. The nutrients necessary for proper plant growth are
10. Today, many farmers use a program of minimum
11. Organic matter is composed of both
12. Rich organic matter and humus levels help

- a) especially if the fertile topsoil layer is poor.
- b) reservoirs of plant nutrients.
- c) or reduced tillage to save the soil.
- d) aeration which provides a circulation of oxygen and water.
- e) living organisms and once-living residues in various stages of decomposition.
- f) to provide favourable conditions of moisture, nutrients, pH, and aeration.
- g) proper tillage, supply of organic matter and nutrient, control of soil pollution and erosion.
- h) renewed from plants growing on the soil, or from compost.
- i) organic matter as their food source.
- j) to build soil structure and provide other benefits.
- k) and is relatively stable.
- l) nitrogen, potassium, phosphorus, iron, calcium, sulphur, and magnesium.

Exercise 7. Find the following phrases in the text.

рациональное использование почв, органическое вещество, снабжение питательными веществами, контролировать загрязнение почвы, кислотность почвы, контроль эрозии, подготовить почву, поверхностные слои почвы, наносить вред почве, плодородный верхний слой почвы, обеспечить

циркуляцию кислорода, биологическая активность, структура почвы, источник пищи.

Exercise 8. Find the odd word out.

soil, land, water; essential, insignificant, important; to pollute, to purify, to contaminate; correct, right, wrong; to permit, to forbid, to allow; thin, thick, fat; to conserve, to destroy, to save; disease, illness, health; small, big, tiny; food, provision, drink; rich, poor, wealthy; to help, to prevent, to assist; favourable, good, harmful.

Exercise 9. Give all possible derivatives of these words using suffixes -ist, -ism, -ian. Translate the words into Russian.

special, history, social, art, capital, economy, critic, international, to type, Darwin, piano, hero, science, technic, national, mathematics, physics, active, idiot, politics, music, electric, Russia, academy, Hungary, botany, Canada, romantic, India, material, library, mechanic.

Exercise 10. Read the additional text and translate it without dictionary:

Soils are made up of four basic components: minerals, air, water, and organic matter. In most soils, minerals represent around 45% of the total volume, water and air about 25% each, and organic matter from 2% to 5%. The mineral portion consists of three distinct particle sizes classified as sand, silt, or clay.

The two important characteristics of soil are texture and structure.

Soil texture refers to the relative proportions of sand, silt, and clay. A loam soil contains these three types of soil particles in roughly equal proportions. A sandy loam is a mixture containing a larger amount of sand and a smaller amount of clay, while a clay loam contains a larger amount of clay and a smaller amount of sand.

UNIT SIX
SOIL MANAGEMENT (Part II)

Exercise 1. Find the pronunciation of the following words and phrases, get ready to read them.

fertilizer, agricultural, World War II, waste-disposal practices, radioactive materials, disease-causing agents, plant growth, residue, effectiveness, chlorinated hydrocarbon, cultivated, organophosphorus, evaporation and vaporization, leaching, photodecomposition, acidity, maintenance, native vegetation, the ordinary procedure, annually, United States, hydrogen, caused, U.S. Department of Agriculture, terraces and diversions, unnecessary, irrigation, science of artificial application, agricultural, revegetation of disturbed areas, during periods, inadequate, suppressing, techniques, uniformly, neither, methods, center pivot irrigation.

Exercise 2. What do you think these words and expressions from the text mean?

plus, toxic, radioactive materials, effectiveness, hydrocarbon, compound, microbial, decomposition, adaptation, vegetation, procedure, application, million, metric, complex, calcium, mechanical, problem, action, department, erosion, transport, terrace, irrigation, period, adequate, consolidation, type, technique, general, uniform, modern, method, local, center.

Exercise 3. Read the following numbers.

Example:

1063	one thousand and sixty-three
1700	seventeen hundred
1707	seventeen hundred and seven
1965	nineteen sixty-five
2001	two thousand and one
the 70's	the seventies

a) in 1945, mid-1960's, in 2000, by 2009, since 1995, before 1736, in 1900, by 1806, the 80's, since 1700, after 1500, in 1505, by 1848, after 1615, 1005, since 1037, mid-2000, before 2005, by 2050

b) 4,568 million; 4631 dollars; 6250 pounds; 104; 1136 roubles; 1600 kilometres; 2000 metre; 1500; 6,008,750; 137; 425,712; 1,306,527; 583; 4,631; 75,254,520; 5624; 94,975,387.

Exercise 4. Entitle each paragraph or find a phrase in the text that will serve as a title of the paragraph. Read and translate the text. Choose an abstract of ten lines and get ready to read it aloud.

The increasing amounts of fertilizers and other agricultural chemicals applied to soils since World War II ended in 1945, plus industrial and domestic waste-disposal practices, led by the mid-1960s to increasing concern over soil pollution. Soil pollution is the build-up in soils of persistent toxic compounds, chemicals, salts, radioactive materials, or disease-causing agents, which have adverse effects on plant growth and animal health.

The effectiveness of a pesticide as well as the hazards of harmful residues depends largely on how long the pesticide remains in the soil. For example, DDT, a chlorinated hydrocarbon, has a half-life of three years in cultivated soils, while organophosphorus insecticides persist for only days or months. Insecticides persist longer if worked into the soil than if left on the surface. Herbicides applied to soils may not persist at all or may persist up to two years or longer, depending on the compound. Eventually, all pesticides disappear because of evaporation and vaporization, leaching, plant uptake, chemical and microbial decomposition, and photodecomposition.

Maintenance of specific soil acidities is important in soil management because it controls the adaptation of various crops and native vegetation to different soils. The ordinary procedure for correcting excess soil acidity is the application of lime in the form of limestone, dolomitic limestone, or burnt lime. About 18.14 million metric tons of limestone is used annually on United States farms. When lime is added, the hydrogen of the complex soil colloid is exchanged for the calcium of lime.

The mechanical loss of fertile topsoil is one of the greatest problems of agriculture. Such loss is almost always caused by erosion resulting from the action of water or wind. According to the U.S. Department of Agriculture, more than half of all fertile U.S. topsoil has been damaged to some extent by erosion. Commonly implemented practices to slow soil transport include terraces and diversions. Terraces, diversions, and many other erosion "control" practices are largely unnecessary if the ground stays covered year-round.

Irrigation may be defined as the science of artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Additionally, irrigation also has a few other uses in crop production, which include protecting plants against frost, suppressing weed growing in grain fields and helping in preventing soil consolidation.

Various types of irrigation techniques differ in how the water obtained from the source is distributed within the field. In general, the goal is to supply the entire field uniformly with water, so that each plant has the amount of water it needs, neither too much nor too little. The modern methods are surface irrigation, localized irrigation, drip irrigation, sprinkler irrigation, center pivot irrigation, sub-irrigation.

Exercise 5. Make up some questions of different types to cover the content of the text.

Exercise 6. Choose a suitable definition.

fertilizer	any of various organic compounds that contain only hydrogen and carbon
soil	a substance used to kill unwanted plants such as weeds
plant	the lightest gas, with no colour, taste or smell, that combines with oxygen to form water
pesticide	the amount of acid present in substance, often expressed in terms of pH
hydrocarbon	the raising of crops and livestock, or the science connected with improving the processes involved
insecticide	plants or plant life generally, as in a particular area
herbicide	an organic or inorganic substance added to soil to improve plant production or growth
vegetation	a chemical substance used to kill pests, esp. insects that harm crops
agriculture	the upper layer of the earth's surface
acidity	a substance used to kill insects
hydrogen	a living organism of the vegetable group

Exercise 7. Translate the following word combinations, paying attention to Participle 1 and Participle 2:

irrigated lands, irrigable lands, irrigating canals; changed conditions, changeable weather, man changing nature; methods used by the scientist, usable material, the scientist using this method; accepted plan, acceptable quality, people accepting plans; measured risk, measurable risk, measuring instruments; water

controlled, controllable water, measures controlling the use of water.

Exercise 8. Match the words to make collocations. Translate them.

toxic	material
application of	pesticide
effectiveness of	compound
soil	practice
radioactive	soil
disease-causing	techniques
cultivated	practice
surface	agriculture
waste-disposal	agent
fertile	pollution
irrigation	lime
chemical	decomposition
department of	topsoil
erosion control	irrigation

Exercise 9. Choose one topic from the lists fertilizers, herbicides, insecticides, pesticides, irrigation methods and prepare a report. You may use one of the following links to get information:

<http://en.wikipedia.org/wiki/Category:Fertilizers>

<http://en.wikipedia.org/wiki/Herbicide>

<http://en.wikipedia.org/wiki/Insecticide>

http://en.wikipedia.org/wiki/Category:Pesticides_by_country

<http://en.wikipedia.org/wiki/Irrigation>

UNIT SEVEN WATER POLLUTION

Exercise 1. Find the pronunciation of the following words, phrases and abbreviations, get ready to read them.

adequate, China, access, percent, estuarine, square, contaminant, conveyance, examples of sources, discharges, sewage, diffuse, originate, cumulative, gathered, leaching, spectrum, discoloration, sodium, waterborne diseases, alteration, electrical conductivity, eutrophication, disinfection by-products, chloroform, processing waste, petroleum hydrocarbons, fuels, gasoline, combustion byproducts, bush debris, volatile, VOC, hygiene, ammonia, phosphates, vehicles, drainage, thermal, coolant, invasion, thermophilic species, conducted in situ, TSS, turbidity, frequently, biochemical, BOD, COD, cadmium, mercury, TPH, microbial indicators.

Exercise 2. Give English equivalents of the following words and phrases:

океан, адекватный, проблема, глобальный контекст, миллион, сейф, национальный, процент, миля, сквер, классифицировать, кумулятивный эффект, типичный, специфический, спектр, химикат, патоген, физический, сенсорный, регулировать, концентрация, натуральный компонент, электрический, эвтрофикация, дезинфекция, хлороформ, инсектицид, гербицид, пестицид, дизель, мотор, гигиена, косметика, нитрат, фосфат, металл, мина, дренаж, пластик, термальный, экосистема, метод, коллекция, специализированный аналитический тест, принцип, биохимический, кадмий, ртути, тотальный, индикатор, монитор.

Exercise 3. Read the following abbreviations and tell what they mean.

DDT, BHC, VOC, TSS, BOD, COD, TPH, UV, NMVOC, CFC, POP, US, pH, ESP, SCR, DeNO_x, HFC, EIA, NEPA, ISO, LCA, GMP-RAM, INOVA, PRG, EPA, EU, MSW, HDPE, PET, PVC, LDPE, PP.

Exercise 4. Read the questions and find answers in the text that follows.

1. What are the sources of water pollution?
2. What are the specific water contaminants?
3. What is the main factor allowing to determine if water is contaminated?
4. What does thermal pollution mean?
5. What is the cause of thermal pollution?
6. How may water pollution be analyzed?
7. Which analytical method includes collection of water samples?

Exercise 5. Read and translate the text. Choose an abstract of ten lines and get ready to read it aloud.

WATER POLLUTION

Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans, groundwater). Water pollution affects plants and organisms living in water. Water pollution occurs when pollutants are released directly or indirectly into water without adequate treatment to remove harmful compounds.

Water pollution is one of the major problems in the global context. Some 90% of China's cities suffer from some degree of water pollution, and nearly 500 million people lack access to safe drinking water.

Source of water pollution are divided into point and non-point.

Point source pollution refers to contaminants that enter a waterway through a discrete conveyance, such as a pipe or ditch. Examples of sources in this category include discharges from plants or a city storm drain.

Non-point source pollution refers to diffuse contamination that does not originate from a single discrete source. Non-point source pollution is often the cumulative effect of small amounts of contaminants gathered from a large area. The leaching out of nitrogen compounds from agricultural land which has been fertilized is a typical example.

Causes of water pollution

The specific contaminants leading to pollution in water include a wide spectrum of chemicals, pathogens, and physical changes such as elevated temperature and discoloration. While many of the chemicals and substances that are regulated may be naturally occurring (calcium, sodium, iron, manganese, etc.), the concentration is often the key in determining what a natural component of water is, and what a contaminant is.

Many of the chemical substances are toxic. Pathogens can produce waterborne diseases in either human or animal hosts. Alteration of water's physical chemistry includes acidity (change in pH), electrical conductivity, temperature, and eutrophication.

Chemical and other contaminants

Contaminants may include organic and inorganic substances.

Organic water pollutants include:

Disinfection by-products found in chemically disinfected drinking water, such as chloroform; Food processing waste, which can include oxygen-demanding substances; Insecticides and herbicides; Petroleum hydrocarbons, including fuels (gasoline, diesel fuel), motor oil, and fuel combustion byproducts; Tree and bush debris; Volatile organic compounds (VOCs), such as industrial solvents; Various chemical compounds found in personal hygiene and cosmetic products;

Inorganic water pollutants include:

Acids from industrial discharges (especially sulfur dioxide from power plants); Ammonia from food processing waste; Chemical waste as industrial by-products; Fertilizers containing nutrients - nitrates and phosphates; Heavy metals from motor vehicles; Acid mine drainage; Trash (e.g. paper, plastic, or food waste);

Thermal pollution

Thermal pollution is the rise or fall in the temperature of a natural body of water caused by human influence. A common cause of thermal pollution is the use of water as a coolant by power plants and industrial manufacturers. Elevated water temperatures decreases oxygen levels (which can kill fish) and affects ecosystem composition, such as invasion by new thermophilic species.

Measurement of water pollution

Water pollution may be analyzed through several broad categories of methods: physical, chemical and biological. Most involve collection of samples, followed by specialized analytical tests. Some methods may be conducted in situ, without sampling, such as temperature measurement.

Common physical tests of water include temperature, solids concentration like total suspended solids (TSS) and turbidity.

Water samples may be examined using the principles of analytical chemistry. Frequently used methods include pH, biochemical oxygen demand (BOD), chemical oxygen demand (COD), nutrients (nitrate and phosphorus compounds), metals (including copper, zinc, cadmium, lead and mercury), oil and grease, total petroleum hydrocarbons (TPH), and pesticides.

Biological testing involves the use of plant, animal, and/or microbial indicators to monitor the health of an aquatic ecosystem.

Exercise 6. Choose the right endings of the following sentences:

1. Water pollution

- a) is method of purifying water.
- b) is the contamination of water.
- c) is method of chemical water testing.

2. Water pollution

- a) gives nutrition to marine organisms.
- b) provides equilibrium of ecosystem.
- c) affects plants and organisms living in water.

3. Point source pollution refers to contaminants that

- a) enter a waterway through a discrete conveyance, such as a pipe or ditch.
- b) enter a waterway from natural environment.
- c) does not originate from a single discrete source.

4. The concentration is often the key in determining

- a) the kind of pollutant.
- b) what is a natural component of water, and what is a contaminant.
- c) a method of pollution measurement.

5. Pathogens can produce waterborne diseases.

- a) treat from all diseases.
- b) reduce waterborne diseases.
- c) produce waterborne diseases.

6. Thermal pollution is

- a) a natural condition of water.
- b) useful for ecosystem of any water body.
- c) the rise or fall in the temperature of water caused by human influence.

7. A common cause of thermal pollution is the use of water

- in irrigation of agricultural lands.
- as a coolant by power plants and industrial manufacturers.
- in ecosystem life cycle.

8. Elevated water temperatures

- decreases oxygen levels.
- increases oxygen levels.
- destroys oxygen levels.

9. Water pollution may be analyzed through several methods:

- medical, sociological, mathematical.
- political, economical, physiological.
- physical, chemical and biological.

10. Some methods may be conducted in situ, without sampling,

- such as test on pesticides concentration.
- such as temperature measurement.
- such as chemical oxygen demand.

Exercise 7. Find in the text the following terms.

- Water beneath the earth's surface.
- An agent that causes disease, especially a living microorganism such as a bacterium or fungus.
- A disease caused by pathogenic microorganisms which are directly transmitted with contaminated water.
- A measure of the acidity or alkalinity of a substance.
- A process by which pollution from such sources as a leachate from fertilized fields causes water body to become overrich in organic and mineral nutrients.
- A clear, colourless, heavy, sweet-smelling liquid, once widely used in surgery.
- A heavy mineral oil used as fuel in diesel engines
- A fertilizer containing phosphorus compounds.

9. A system which allows water or waste liquids flow away from somewhere into the ground or down pipes.
10. An agent that produces cooling, especially a fluid that draws off heat by circulating through an engine.

Exercise 8. Translate the sentences paying attention to the words in bold type.

1. Water vapor rises and falls due to temperature **changes**.
2. Greenhouse effect **changes** climate.
3. Temperature changes **cause** either evaporation or precipitation.
4. The **cause** of animal's extinction is environmental pollution.
5. We should **water** flowers once a week.
6. All living organism need **water**.
7. What **measures** do we need to take?
8. Who usually **measures** temperature of water?
9. Squirrels make a **store** of food for winter.
10. They **store** food for winter.
11. **Waste** management is an important part of environmental engineering.
12. We shouldn't **waste** natural resources.

Exercise 9. Continue the row of synonyms using the words from the text.

quantity, volume; mixture, combination; poisonous, toxic; special, particular; difficulty, trouble; to take place, to happen; chief, main; secure, harmless; fabric, mill; element, ingredient; material, matter; trash, litter; practice, technique; to watch, to observe; frequently, repeatedly; ordinary, usual.

Exercise 10. Make nouns from the following words using suffixes –ment, -ness, -ship, -hood. Translate the words into Russian.

to develop, kind, to achieve, empty, leader, to move, dark, to arrange, to treat, great, to state, to improve, man, sad, to agree, effective, to equip, useful, to govern, citizen, to require, to measure, weak, to announce, child, busy, to pave, neighbour, ready, good, friend, happy.

UNIT EIGHT SEWAGE TREATMENT

Exercise 1. Find the pronunciation of the following words and phrases, get ready to read them.

Sewage, wastewater, acceptable, desired, existing, concentration, municipal, worldwide, pre-chlorination, algae, growth, aeration, dissolved, coagulation, flocculation, polyelectrolytes, thicker, sedimentation, suspended, particles, desalination, salt, disinfection, for example, aerated lagoons, activated sludge, residential, institutional, commercial, establishments, liquid, baths, sewers, commerce, permitted, recycled, flushing toilets, aerobic, pump, municipal, typically, subject, standards, require, specialized, conventional, primary, secondary, tertiary.

Exercise 2. Give Russian equivalents of the following words:

combination, municipal, arrest, aeration, coagulation, formation, separation, filtration, disinfection, lagoon, active, filter, institution, commercial, toilet, storm, septic, tank, biofilter, aerobic, system, transport, station, collection, subject, local, federal, regulation, standard.

Exercise 3. Read and translate the text. Put the words in second column into the correct form to fill the gaps in the sentences. Choose an abstract of ten lines and get ready to read it aloud.

SEWAGE TREATMENT

Sewage treatment, or domestic wastewater treatment, is the process of _____ contaminants from wastewater and household sewage, both runoff and domestic. Water _____ describes the proc-	remove
	treat

esses used to make water more _____ for a _____ end-use. The goal of all water treatment process is to remove _____ contaminants in the water, or reduce the _____ of such contaminants.

accept
 desire
 exist
 concentrate

The combination of following processes ____ for municipal drinking water treatment worldwide: pre-chlorination - for algae control and arresting any biological growth; aeration - along with pre-chlorination for removal of ____ iron and manganese; _____ - for flocculation; coagulant aids, also _____ as polyelectrolytes - to improve coagulation and for thicker floc formation; sedimentation - for solids separation, that is, removal of suspended solids _____ in the floc; filtration - removing particles from water; desalination - process of removing salt from the water; disinfection - for ____ bacteria.

use

dissolve
 coagulate
 know

trap

kill
 biology

_____ processes are also employed in the treatment of wastewater and these processes may include, for example, ____ lagoons, activated sludge or slow sand filters.

aerate

Origins of sewage

Sewage _____ by residential, institutional, and commercial and _____ establishments and _____ household waste liquid from baths, kitchens, and so on that is disposed via sewers. In many areas, sewage also includes liquid waste from industry and commerce.

create
 industry
 include

The separation and draining of household waste into greywater and blackwater _____ now more common in the _____ world, with greywater being permitted to be used for _____ plants or recycled for flushing toilets. Most sewage also in-

become
 develop
 water

cludes some surface water from roofs and may include water from stormwater runoff.

Process of treatment

Sewage can _____ close to where it is created (in septic tanks, biofilters or aerobic treatment systems), or collected and transported via a network of pipes and pump stations to a municipal treatment plant. Sewage collection and treatment is _____ subject to local, state and federal regulations and standards. Industrial sources of wastewater often require specialized treatment processes.

Conventional sewage treatment may involve four stages, called pre-treatment, _____, secondary and tertiary treatment.

treat

typical

prime

Exercise 4. Make up 5 questions which will embrace the content of the text.

Exercise 5. Write a brief summary of the text in Russian. After that try to retell it in English.

Exercise 6. Translate some phrases into English, using the text.

очистка сточных вод, процесс удаления загрязняющих веществ, уменьшить концентрацию загрязняющих веществ, очистка питьевой воды, предварительное хлорирование, противоводородослевая обработка воды, опреснение воды, аэрируемый отстойник, активированный ил, жидкие отходы, ливневый сток, аэробная очистка сточных вод, насосная станция, городская станция очистки сточных вод, федеральные постановления и стандарты, специализированный процесс очистки, первичная, вторичная и третичная очистка сточных вод.

Exercise 7. Put the following words into several groups according to the part of speech (verb, noun, adjective, adverb).

nature, natural, naturally, naturalize; form, format, formation, formal, formally; survive, survivor, survival; use, user, usage; satisfy, satisfaction, satisfactory; class, classic, classical, classify; produce, produce, product, production, productive, productively; organ, organic, organically, organism; category, categorize, categorization; continue, continuous, continuously, continuation; care, careful, carefully; create, creator, creation, creative, creatively.

Exercise 8. Find in the text:

a) antonyms to the following words:

artificial, to die, to destroy, to exclude, biotic, organic, past, long, moonlight, suddenly, to save, carelessly, slow.

b) synonyms to the following words:

important, wish, various, base, to separate, petroleum, metal, phase, existing, area, to refill, speed, limited, to waste.

9. What is this abstract about? Translate it without dictionary.

Reclaimed water is former wastewater that is treated to remove solids and certain impurities, and used in sustainable landscaping irrigation or to recharge groundwater aquifers. The purpose of these processes is sustainability and water conservation, rather than discharging the treated wastewater to surface waters such as rivers and oceans.

UNIT NINE STAGES OF SEWAGE TREATMENT

Exercise 1. Find the pronunciation of the following words, phrases and abbreviations, get ready to read them.

limb, raw, primary, clarifier, equipped, driven, continually, facility, designed, percentage, floatables, suspended, substantially, derived, detergent, majority, municipal, liquor, protozoa, biodegradable, soluble, molecules, bind, biomass, media, activated sludge, higher, tertiary, final, effluent, effectiveness, cloudiness, dosage, variables, generally, doses, against, chlorine, ultraviolet, chlorination, disadvantage, residual, carcinogenic, instead, iodine, UV radiation, viruses, incapable, reproduction, frequent, maintenance, odour, anaerobic, hydrogen sulphide, complaint, urban areas, bio-slimes, circulating, fluids, capture, metabolize, obnoxious.

Exercise 2. Guess the meaning of the words without a dictionary.

collect, design, municipal, system, class, biomass, media, operate, film, final, disinfection, microorganism, type, concentration, contact, dose, effective, ozone, ultraviolet, history, generate, carcinogenic, genetic, structure, virus, reproduction, lamp, septic, condition, gas, sulphide, urban, reactor, metabolism.

Exercise 3. Read and translate the text. Choose an abstract of ten lines and get ready to read it aloud.

STAGES OF SEWAGE TREATMENT

Pre-treatment

Pre-treatment removes materials such as trash, tree limbs, leaves, that can be easily collected from the raw wastewater

before they damage or clog the pumps and skimmers of primary treatment clarifiers.

Primary treatment

In the primary sedimentation stage, sewage flows through large tanks, commonly called primary clarifiers or primary sedimentation tanks.

Primary settling tanks are usually equipped with mechanically driven scrapers that continually drive the collected sludge towards a hopper in the base of the tank where it is pumped to sludge treatment facilities.

The dimensions of the tank should be designed to effect removal of a high percentage of the floatables and sludge. A typical sedimentation tank may remove from 60% to 65% of suspended solids, and from 30% to 35% of BOD from the sewage.

Secondary treatment

Secondary treatment is designed to substantially degrade the biological content of the sewage which is derived from human waste, food waste, soaps and detergent. The majority of municipal plants treat the settled sewage liquor using aerobic biological processes. The bacteria and protozoa consume biodegradable soluble organic contaminants (e.g. sugars, fats, organic short-chain carbon molecules, etc.) and bind much of the less soluble fractions into floc.

Secondary treatment systems are classified as fixed-film or suspended-growth systems.

Fixed-film or attached growth systems include trickling filters and rotating biological contactors, where the biomass grows on media and the sewage passes over its surface.

Suspended-growth systems include activated sludge, where the biomass is mixed with the sewage and can be operated in a smaller space than fixed-film systems. However, fixed-film systems can provide higher removal rates for organic material and suspended solids.

Tertiary treatment

The purpose of tertiary treatment is to provide a final treatment stage to raise the effluent quality before it is discharged to the environment (sea, river, lake, ground, etc.).

More than one tertiary treatment process may be used at any treatment plant. The main processes are removal of nutrients, nitrogen, phosphorus, sand filtration and sometimes disinfection.

Disinfection

The purpose of disinfection in the treatment of wastewater is to substantially reduce the number of microorganisms in the water to be discharged back into the environment. The effectiveness of disinfection depends on the quality of the water being treated (e.g., cloudiness, pH, etc.), the type of disinfection being used, the disinfectant dosage (concentration and time), and other environmental variables. Generally, short contact times, low doses and high flows all militate against effective disinfection. Common methods of disinfection include ozone, chlorine and ultraviolet light.

Chlorination remains the most common form of wastewater disinfection due to its low cost and long-term history of effectiveness. One disadvantage is that chlorination of residual organic material can generate chlorinated-organic compounds that may be carcinogenic or harmful to the environment.

Ozone is considered to be safer than chlorine because, it is generated onsite as needed and shouldn't be stored. Ozonation also produces fewer disinfection by-products than chlorination. A disadvantage of ozone disinfection is the high cost of the ozone generation equipment and the requirements for special operators.

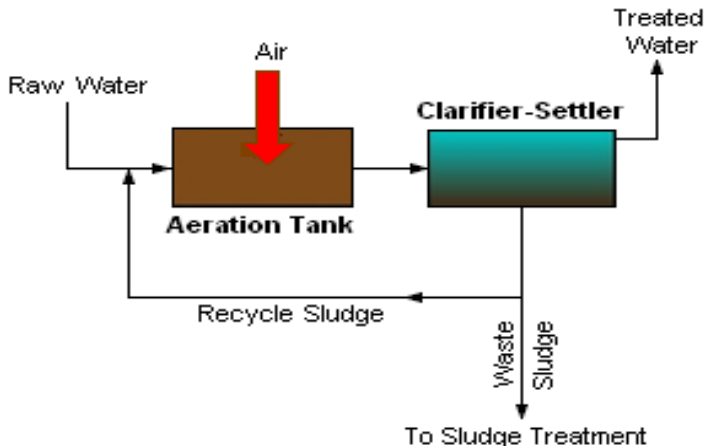
Ultraviolet (UV) light can be used instead of chlorine, iodine, or other chemicals. UV radiation causes damage to the genetic structure of bacteria, viruses, and other pathogens, making them incapable of reproduction. The key disadvantages of UV disin-

fection are the need for frequent lamp maintenance and replacement.

Exercise 4. Answer the questions.

1. What is the purpose of pre-treatment?
2. What kind of equipment is used during primary treatment?
3. What amount of solid waste may sedimentation tank remove?
4. What are the secondary treatment systems?
5. What are the main processes used during tertiary treatment?
6. What does effectiveness of disinfection depend on?
7. What are the advantages and disadvantages of each method of disinfection?

Exercise 5. Look at the picture and tell what kind of treatment technology is displayed here.



Exercise 6. Match the sentences to make the summary of the text.

Pre-treatment removes materials	and bind less soluble fractions into floc.
Primary settling tanks are equipped with	ozone, chlorine and ultraviolet light.
The scrapers drive the collected sludge to a hopper	the quality of the water, the type of disinfection, the disinfectant dosage and other factors.
The dimensions of the tank should be designed	removal of nutrients, nitrogen, phosphorus, sand filtration and sometimes disinfection.
Human waste and food waste are derived	to reduce the number of microorganisms in the water.
The majority of municipal plants treat the sewage liquor	to raise the effluent quality before it is discharged to the environment.
The bacteria and protozoa consume biodegradable soluble organic contaminants	such as trash, tree limbs, leaves, before they damage the primary clarifiers.
Secondary treatment systems are classified	where it is pumped to sludge treatment facilities.
The purpose of tertiary treatment is	using aerobic biological processes.
The main processes are	to effect removal of a high percentage of waste.
The purpose of disinfection is	during secondary treatment.
The effectiveness of disinfection depends on	as fixed-film or suspended-growth systems.
Common methods of disinfection include	mechanical scrapers.

Exercise 7. Which of the two Russian variants corresponds to the English equivalents:

sludge treatment – обработка осадка, обработка сточных вод; removal of floatables – добавление дезинфицирующих средств, удаление плавающих твердых частиц; food waste – пищевые отходы, пищевая цепочка; carbon molecule – молекула кислорода, молекула углерода; soluble fraction – растворимая фракция, нерастворимая фракция; active sludge – активированный уголь, активированный ил; raise the effluent quality – увеличить количество очищенной сточной воды; улучшить качество очищенной сточной воды; sand filtration – мембранная фильтрация, песчаная фильтрация; reduce the number of microorganisms in the water – уменьшить количество микроорганизмов в воде, увеличить количество микроорганизмов в воде; disinfection by-product – результат дезинфекции, побочный продукт дезинфекции.

Exercise 8. Say it in one word:

a device for compressing a fluid or gas, or moving it from one place to another, esp. through pipes; a large receptacle, container, or structure for holding a liquid or gas; destroying pathogenic microorganisms; oxygen in the form of molecules with three atoms, having a sharp smell, and being an effective oxidant; a substance or agent causing cancer; an element found in small amounts in sea water and used to prevent infection;

Exercise 9. Translate the sentences into English, using the words and phrases from the text “Stages of sewage treatment”.

1. Очистка сточных вод - комплекс процедур по удалению загрязнений, содержащихся в бытовых и промышленных сточных водах. Очистение происходит в несколько этапов:

механический; биологический; физико-химический; дезинфекция сточных вод.

2. На механическом этапе производится предварительная очистка сточных вод, чтобы подготовить их к биологической очистке. Далее сточные воды переходят в первичные отстойники для удаления взвешенных частиц.

3. В последнее время мембранная технология становится перспективным способом при очистке сточных вод.

4. Биологическая очистка предполагает уничтожение органической составляющей сточных вод микроорганизмами (бактериями и простейшими). Могут использоваться как аэробные, так и анаэробные микроорганизмы. На данном этапе сточные воды очищаются от органического азота и фосфора, проводится минерализация сточных вод,

5. Различают несколько вариантов биологической очистки. На данный момент основными являются использование активного ила, биофильтров и анаэробного брожения.

6. Для улучшения параметров очистки могут быть применены различные химические методы, например, хлорирование, озонирование, или эвапорация.

Exercise 10. Give all possible derivatives of these words using suffixes -ist, -ism, -ian. Translate the words into Russian.

special, history, social, art, capital, economy, critic, international, to type, Darwin, piano, hero, science, technic, national, mathematics, physics, active, idiot, politics, music, electric, Russia, academy, Hungary, botany, Canada, romantic, India, material, library, mechanic.

Exercise 11. Choose one topic from the List of waste water treatment technologies and prepare a report.

http://en.wikipedia.org/wiki/List_of_waste_water_treatment_technologies

UNIT TEN AIR POLLUTION

Exercise 1. Train the reading of the following words, phrases and abbreviations.

particulate, discomfort, particles, directly, volcanic eruption, rather, photochemical, sulphur oxides (SO_x), sulphur dioxide (SO₂), volcanoes, nitrogen oxides (NO_x), nitrogen dioxide (NO₂), combustion, carbon monoxide, odourless, carbon dioxide (CO₂), methane (CH₄), NMVOCs, extremely, referred, tiny, cadmium, chlorofluorocarbons (CFCs), ammonia (NH₃), pungent, odour, caustic, nuclear explosion, explosives, gaseous, ozone (O₃), POPs, capable, bioaccumulate, tissue, biomagnify, sources, anthropogenic, burning, stationary, incinerator, furnaces, vehicles, aerosol, nuclear weapon, germ warfare, rocketry, digestion, wildfires, sulphur, chlorine.

Exercise 2. Do you know the following words in English?

химический, дискомфорт, натура, газ, секунда, субстанция, озон, фотохимический, нота, оксид, диоксид, вулкан, карбон, монооксид, продукт, органика, компаунд, метан, глобальный, токсичный, хлорофторокарбонат, нуклеарный, минор, деградация, биологический, фотолитический, транспорт, аккумулировать, антропогенный, инсинератор, мобильный, дуст, контролировать, практика, менеджмент, аэрозоль, спрей, генерировать, продуцировать, хлорин, характеристика, каустический, температура.

Exercise 3. Read the text and find out:

1. The definition of air pollution.
2. Types of pollutants.
3. Some examples to each type of air pollutants.
4. Sources of air pollution.

Exercise 4. Translate the text. Choose an abstract of ten lines and get ready to read it aloud.

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.

Air pollutants

Pollutants can be in the form of solid particles, liquid droplets, or gases. Also they may be natural or man-made.

Pollutants can be classified as primary or secondary. Usually, primary pollutants are substances directly emitted from a process, such as ash from a volcanic eruption.

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 that makes up photochemical smog. Note that some pollutants may be both primary and secondary as they can be emitted directly or formed from other pollutants.

Major primary pollutants include:

Sulphur oxides (SO_x) and sulphur dioxide (SO₂). SO₂ is produced by volcanoes and in various industrial processes. Nitrogen oxides (NO_x) and nitrogen dioxide (NO₂) are emitted from high temperature combustion.

Carbon monoxide is a colourless, odourless, non-irritating but very poisonous gas. It is a product of incomplete combustion of fuel such as natural gas, coal or wood. Carbon dioxide (CO₂) is a greenhouse gas, vital to living organisms, emitted from combustion.

Volatile organic compounds are important outdoor air pollutants. They are often divided into categories of methane (CH₄) and non-methane (NMVOCs). Methane is an extremely efficient greenhouse gas which contributes to global warming.

Particulate matter, also referred to as fine particles, is tiny particles of solid or liquid suspended in a gas. Toxic metals, such as lead, cadmium and copper also can be air pollutants.

Chlorofluorocarbons (CFCs), which are harmful to the ozone layer, are emitted from currently banned products. Ammonia (NH₃) is emitted from agricultural processes. It is a gas with a characteristic pungent odour, caustic and hazardous. Radioactive pollutants produced by nuclear explosions, war explosives, and natural processes such as the radioactive decay of radon.

Secondary pollutants include:

Particulate matter formed from gaseous primary pollutants and compounds in photochemical smog. Ground level ozone (O₃) formed from NO_x and VOCs.

Minor air pollutants include:

Persistent organic pollutants (POPs) are resistant to environmental degradation through chemical, biological, and photolytic processes. Because of it, they are capable of long-range transport, bioaccumulate in human and animal tissue, biomagnify in food chains, and have potential significant impacts on human health and the environment.

Sources of air pollution can be classified into anthropogenic and natural.

Anthropogenic sources are mostly related to burning different kinds of fuel. Anthropogenic sources include:

Stationary sources as smoke stacks of power plants, factories, waste incinerators, furnaces and other types of fuel-burning heating devices; **Mobile** sources include motor vehicles, marine vessels, aircraft; **Chemical** sources as dust and smoke from controlled burn practices in agriculture and forestry management; **Fumes** from paint, hair and aerosol sprays and other solvents; **Waste** deposition in landfills, which generate methane; **Military**, such as nuclear weapons, toxic gases, germ warfare and rocketry.

Natural sources include:

Dust from natural sources; Methane, emitted by the digestion of food by animals; Radon gas from radioactive decay within the Earth's crust; Radon can also accumulate in buildings, especially in confined areas. Smoke and carbon monoxide from wildfires; Volcanic activity, which produce sulphur, chlorine, and ash particulates.

Exercise 5. Give a suitable definition to the following terms.

atmosphere, pollutant, smog, sulphur dioxide, volcano, nitrogen oxide, nitrogen dioxide, greenhouse gas, methane, radioactive, radon, natural environment, incinerator, vehicle, agriculture, forestry, aerosol, landfill, sulphur, chlorine.

Use English-English dictionary, or the following sites:

<http://dictionary.cambridge.org>

<http://www.wordsmyth.net>

<http://en.wikipedia.org>

Exercise 6. Match the words to make collocations. Translate them.

air, to cause, living, natural, solid, volcanic, photochemical, volatile organic, global, ozone, food, power, waste, aerosol, nuclear, Earth's.

smog, layer, incinerator, weapon, organism, compounds, crust, pollution, chain, particle, spray, environment, plant, eruption, warming, harm.

Exercise 7. Find a synonym to an underlined word.

air pollution, biological material, important example, ground level, various processes, high temperature combustion, poisonous gas, fine particles, banned product, human and animal tis-

sues, human health, kinds of fuel, waste deposition, generate methane, nuclear weapon, confined area.

Exercise 8. Word-building.

a) form nouns from verbs:

relate, define, express, derive, contain, solve, navigate, marry, transform, accommodate, move, improve, depart, act, compose, direct, found, invent, measure, disappoint, announce, collect, combine, connect, dictate, include, introduce, produce, restrict.

b) form adverbs from adjectives:

precise, common, equivalent, certain, equal, bitter, absolute, kind, happy, weak, sharp, short, soft, deep, bright, sweet, wide, simple, pure, identical, intense, bad, silent, rapid, quick, part, first, normal, important, honest, professional, safe, fair, sudden.

Exercise 9. Read the text and answer the following questions.

1. Which phenomenon is described in the text?
2. What is the cause of it?
3. What are the consequences of it? Expand on this topic.

Acid rain is a rain or any other form of precipitation that is unusually acidic, meaning that it possesses elevated levels of hydrogen ions (low pH). It can have harmful effects on plants, aquatic animals, and infrastructure through the process of wet deposition. Acid rain is caused by emissions of sulphur dioxide and nitrogen oxides which react with the water molecules in the atmosphere to produce acids. Governments have made efforts since the 1970s to reduce the release of sulphur dioxide into the atmosphere with positive results. Acid rain has adverse impacts on forests, freshwaters and soils, killing insect and aquatic life-forms as well as causing damage to buildings and having impacts on human health.

UNIT ELEVEN

AIR POLLUTION CONTROL

Exercise 1. Train the reading of the following words, phrases and abbreviations.

items, devices, either, exhaust, SO₂ emission, cyclonic, gravity, mixtures, variety, furnace, liquid, desulfurization, advantage, semidry, easier, expensive, initially, slurry, atomize, evaporates, neutralizes, alkali, precipitator, efficiency, ESP, induced, charge, impede, periodically, concentration, ppm, Refrigerated Vapour Condensation, Solvent Vapour Adsorption, flaring, chosen, allowable, option, reserved, expensive, bubbled, partial vacuum, incineration, regenerative, adsorption, exchanger, pre-heat, incinerator, activated, pressure, achieve, effectiveness, hundred, per million, conventional, target, catalytic, reduction, SCR, injected, ratio, tendency, carriers, Exxon, DeNO_x, optimum.

Exercise 2. Guess the meaning of the words without a dictionary.

transportation, cyclone, separator, rotational, spray, desulfurization, medium, soda, atomize, evaporate, neutralize, electrostatic, precipitator, fabric, minimally, periodically, offline, condensation, adsorption, vacuum, regenerate, pressure, selective, catalytic, reaction, optimum.

Exercise 3. Read and translate the text. Choose an abstract of ten lines and get ready to read it aloud.

AIR POLLUTION CONTROL

The following items are commonly used as pollution control devices by industry or transportation. They can either destroy contaminants or remove them from an exhaust stream before it is emitted into the atmosphere.

Particulate and SO₂ Emissions

A. Cyclone Separators

Cyclonic separation is a method of removing particulates from an air, gas or liquid stream, without the use of filters, through vortex separation. Rotational effects and gravity are used to separate mixtures of solids and fluids. The method can also be used to separate fine droplets of liquid from a gaseous stream.

B. Scrubbers

The term describes a variety of devices that use pollutants from a furnace flue gas or from other gas streams. In a wet scrubber, the polluted gas stream is brought into contact with the scrubbing liquid, by spraying it with the liquid, by forcing it through a pool of liquid, or by some other contact method, so as to remove the pollutants. The most common application is flue gas desulfurization using ammonia as the solvent or spray liquid.

C. Semidry Scrubbers

The advantage of semidry scrubbers is in that they remove contaminants by way of a solid waste that is easier to dispose of and less expensive. Initially, the scrubbing medium is wet (such as a lime or soda ash slurry), and a spray dryer is used to atomize the slurry into the gas which evaporates the water in the droplets. As this takes place, the acid in the gas neutralizes the alkali material and forms a fine white solid. Most of the white solids are removed at the bottom of the scrubber while some are carried into the gas stream and have to be removed by a filter or electrostatic precipitator. Although semidry systems cost 5-15% more than wet systems, when combined with a fabric filter, they can achieve 90-95% efficiencies.

D. Electrostatic Precipitators

An electrostatic precipitator (ESP) or electrostatic air cleaner is a particulate collection device that removes particles from a flowing gas (such as air) using the force of an induced electrostatic charge. Electrostatic precipitators are highly efficient filtration devices that minimally impede the flow of gases through

the device, and can easily remove fine particulate matter such as dust and smoke from the air stream. Periodically, the precipitators have to be taken offline and cleaned.

VOC (Volatile Organic Chemicals) Emissions

A. High VOC Concentrations

Three types of treatment are generally used for streams with high concentrations of VOC: Refrigerated Vapour Condensation, Solvent Vapour Adsorption, and Flaring. The method chosen is dependent on allowable release concentrations and the cost of the solvent.

Refrigerated vapour condensation can mean condensation at temperatures as low as -80°C . Due to the high cost of refrigeration, this option is usually reserved for expensive solvents whose recovery can justify the high operating costs.

Solvent vapour adsorption is a more common application where the VOC containing gas is bubbled through an organic solvent which "accepts" the VOC in the gas stream. The VOC are then released from the solvent by heat and a partial vacuum.

B. Moderate VOC Concentrations

For moderate concentrations of VOC, incineration or regenerative carbon adsorption is utilized. At temperatures between $750\text{-}1000^{\circ}\text{C}$, VOC are typically destroyed by 99%. Usually, a heat exchanger is used to preheat the gas stream with the flue gas to save on fuel costs for the incinerator.

Regenerative carbon adsorption is where a gas stream passes through a bed of activated carbon. The VOC are adsorbed into the carbon. This method can achieve 99% effectiveness for VOC concentrations.

Exercise 4. Make up some questions of different types to cover the content of the text.

Exercise 5. Scan the text again and find the sentences, which mean:

1. Refrigerated vapour condensation demands expensive medium.
2. The main media in wet scrubber control device is liquid.
3. Incineration is the best method to destroy medium concentrations of VOC.
4. Electrostatic Precipitators must be cleaned from time to time.
5. Semidry systems are more expensive than wet systems.
6. Activated carbon adsorbs VOC during regenerative carbon adsorption.
7. A heat exchanger is utilized before the incinerator to reduce the cost of procedure.
8. Cyclonic separation doesn't need any kind of filters.
9. Solvent vapour adsorption changes waste materials into heat.
10. Semidry scrubber may be more effective if they are used with fabric filters.
11. Cyclonic separator can be used to move away fine particles.
12. Semidry scrubber transforms waste into fine white solid.

Exercise 6. Read the following numerals in percentage terms and temperature characteristics.

Example:

5%	five percent
25-30%	from twenty-five to thirty percent
25°C	twenty-five degrees Celsius
32°F	thirty-two degrees Fahrenheit
-45°C	minus forty-five degrees Celsius
+92°F	plus ninety-two degrees Fahrenheit
27-30°C	from twenty-seven to thirty degrees Celsius

- a) 99%, 90%, 87%, 54%, 17%, 28%, 31%, 62%, 100%, 75%, 53%, 38%, 47%, 12%, 29%, 48%, 60%, 74%, 83%, 95%.

b) 5-10%, 90-95%, 10-15%, 75-80%, 60-65%, 40-45%, 20-30%, 80-85%, 50-60%, 30-35%, 50-70%, 5-20%, 15-30%.

c) 871°C, 1800°F, 981°C, 56°C, 35°F, 80°C, 1000°F, 250°C, 1500°F, 55°C, 100°F, 350°C, 500°F, 45°C, 75°F, 170°C, 90°F.

d) -80°C, +451°F, -123°C, +756°C, -52°F, +74°C, -95°F, +62°C, -240°F, +95°C, -358°F, +86°C, -176°F, +45°C, -543°F, +270°C, -658°F.

e) 750-1000°C, 100-600°F, 282-449°C, 1000-1600°F, 22-49°C, 50-65°F, 52-75°C, 400-550°F, 80-90°C, 2000-2500°F, 200-300°C, 563-748°F, 55-95°C, 350-450°F.

Exercise 7. Give Russian equivalents to the following phrases:

pollution control devices, to destroy contaminants, cyclonic separation, vortex separation, rotational effect, to separate mixtures of solids and fluids, furnace flue gas, wet scrubber, flue gas desulfurization, solvent liquid, semidry scrubber, to atomize the slurry into the gas, to evaporate water, alkali material, fine white solid, electrostatic precipitator, fabric filter, induced electrostatic charge, high VOC concentration, refrigerated vapour condensation, solvent vapour adsorption, allowable release concentration, regenerative carbon adsorption, is utilized, be destroyed by 99%, heat exchanger, bed of activated carbon.

Exercise 8. Find a synonym to an underlined word.

to destroy contaminant, to emit into the atmosphere, to remove particulates, variety of devices, contact method, advantage, solid waste, expensive, fine solid, gas stream, fabric filter, highly efficient, to clean, cost of the solvent, vapour adsorption, organic solvent, incineration, bed of activated carbon.

Exercise 9. Read the text without a dictionary and answer the questions:

1. What is the source of NO_x?
2. Why ammonia was chosen for selective catalytic reduction?
3. What substances can be derived during selective catalytic reduction?
4. Does Exxon Thermal De-nitrification need any catalyst?

NO_x Emissions

Nitrogen oxides are products of all conventional combustion processes. This abstract is devoted to some methods of NO_x emissions control.

A. Selective Catalytic Reduction (SCR)

In short, SCR is a process to reduce NO_x to nitrogen and water with ammonia in the presence of a catalyst between 540-840°F (282-449°C). Ammonia is used due to its tendency to react only with the contaminants and not with the oxygen in the gas stream. Ammonia is injected by means of compressed gas or steam carriers. Efficiencies near 90% have been reported with SCR.

B. Exxon Thermal De-nitrification

Similar to SCR, the Exxon Thermal DeNO_x process utilizes the NO_x/ammonia reaction. However, this process does not use a catalyst to aid the reaction. Optimum reaction temperatures are found between 1600°F (871°C) and 1800°F (981°C).

Exercise 10. Choose one topic from the List of air pollution control devices and prepare a report.

http://en.wikipedia.org/wiki/Air_pollution

UNIT TWELVE

GLOBAL WARMING

Exercise 1. Train the reading of the following words, phrases and abbreviations.

warming, unusually, century, primarily, greenhouse gases, doubled, enhanced, artificially, since, the Industrial Revolution, nearly, molecules, vapour, abundant, contributor, evaporates, relative humidity, thermal infrared radiation, further, absorption, cement, extremely, powerful, swamps, rice, cattle, nitrous oxide, persisting, approximately, vary, altitude, troposphere, exerts, automobile, burning, contributor, doubled, halocarbons, propellants, familiar, chlorofluorocarbons, another, synthesized, substitutes, CFC, HFC, stable, therefore.

Exercise 2. Guess the meaning of the words without a dictionary.

революция, молекула, энергия, абсорбировать, экстрa, доминантный, релятивный, радиация, цикл, продукция, абсорбция, цемент, агент, эффективный, рис, реактивный, атом, географический, локация, тропосфера, автомобиль, синтезировать.

Exercise 3. Read and translate the text. Choose an abstract of ten lines and get ready to read it aloud.

GLOBAL WARMING

Global warming is the unusually rapid increase in Earth's average surface temperature over the past century primarily due to the greenhouse gases. The global average surface temperature rose from 0.6 to 0.9°C (1.1 to 1.6°F) between 1906 and 2005, and the rate of temperature increase has nearly doubled in the last 50 years.

Enhanced greenhouse effect

Over the past 250 years, humans have been artificially raising the concentration of greenhouse gases in the atmosphere at an increasing rate. Since the Industrial Revolution began in about 1750, carbon dioxide levels have increased nearly 38% and methane levels have increased 48%.

The atmosphere today contains more greenhouse gas molecules, so more of the infrared energy emitted by the surface is absorbed by the atmosphere. As some of the extra energy from atmosphere radiates back down to the surface, Earth's surface temperature rises.

Greenhouse Gases

Water vapour is the most abundant of the greenhouse gases, and is the dominant contributor to the natural greenhouse effect.

As temperatures rise, more water evaporates from ground sources - rivers, oceans, etc. Because the air is warmer, the relative humidity can also be higher, also leading to more water vapour. Higher concentrations of water vapour are able to absorb more thermal infrared radiation from the Earth, further warming the atmosphere. The warmer atmosphere can then hold more water vapour, and the cycle continues.

Carbon dioxide is released into the atmosphere through both natural and human processes. Natural production and absorption of carbon dioxide is called carbon cycle. Human activities such as fuel burning (coal, oil, natural gas, and wood), cement production, and changes in land use are increasing the concentration of carbon dioxide in the atmosphere.

Methane, which comes from both natural and human sources, is an extremely powerful warming agent - even more effective than carbon dioxide - however its lifetime in the atmosphere is brief, only about 12 years.

In nature, methane is released through biological processes in low oxygen environments, such as swamps. Human activities,

including growing rice, raising cattle, using natural gas and coal mining, are increasingly adding methane in the atmosphere.

Nitrous oxide, known as "laughing gas", is a warming gas, persisting in the atmosphere for approximately 120 years. It is produced naturally from many biological sources in both soil and water. Human-related sources of nitrous oxide include agricultural soil management, sewage treatment, combustion of fossil fuel, and the production of a variety of acids.

Ozone is a highly reactive molecule composed of three atoms of oxygen. Ozone concentrations vary by both geographic location and altitude. At lower levels in the troposphere, ozone exerts a warming force upon the atmosphere, primarily due to human processes. Automobile emissions, industrial pollution, and the burning of vegetation increase the levels of carbon and nitrogen molecules which - when reacting to sunlight - produce ozone, an important contributor to photochemical smog. Levels of ozone have nearly doubled since the 1800s, and have increased by nearly 30% since the industrial revolution.

Halocarbons are compounds of human origins used primarily as cooling agents, propellants, and cleaning solvents. The most familiar type of halocarbons is the chlorofluorocarbons.

Another set of synthesized halocarbon compounds - created as substitutes to CFCs - are called HFCs (hydrofluorocarbons). While they are also greenhouse gases, they are less stable in the atmosphere and therefore have a shorter lifetime and less impact as a greenhouse gas.

Exercise 4. Train the reading of the following decimal fractions.

Example:

0.2	Nought point two; Zero point two
0.002	point nought nought two
1.1	One point one
1.25	One point two five

63.57 Sixty-three point five seven
64.705 Six four point seven nought five
2.5 to 5.6°C from two point five to five point six degrees
Celsius
1.7 to 3.2°F from one point seven to three point two
degrees Fahrenheit

a) 4.25; 0.43; 0.01; 3.36; 6.92; 8.71; 0.54; 0.005; 9.2416; 6.44;
0.35; 0.0064; 5.78; 65.12; 80.560; 10.8524; 0.0078; 56.458;
0.52; 45.2589; 57.25; 0.0089; 9.25; 14.236; 47.563; 0.0032.

b) 0.6 to 0.9°C; 1.1 to 1.6°F; 0.10 to 0.25°C; 2.9 to 3.5°F; 15.2
to 18.9°C; 5.6 to 8.4°F; 2.5 to 3.5°C; 8.1 to 10.6°F; 20.5 to
30.8°C; 7.4 to 9.3°F; 12.4 to 15.5°C; 19.6 to 21.8°F.

Exercise 5. Paraphrase the following sentences. Make them shorter and simpler as if you are going to retell the text.

1. Global warming is the unusually rapid increase in Earth's average surface temperature.
2. Humans have been artificially raising the concentration of greenhouse gases in the atmosphere.
3. The atmosphere today contains more greenhouse gas molecules.
4. As some of the extra energy from atmosphere radiates back down to the surface, Earth's surface temperature rises.
5. Water vapour is the most abundant of the greenhouse gases, and is dominant contributor to the natural greenhouse effect.
6. Higher concentrations of water vapour are able to absorb more thermal infrared radiation from the Earth.
7. Methane is even more effective than carbon dioxide; however its lifetime in the atmosphere is brief.
8. At lower levels in the troposphere, ozone exerts a warming force upon the atmosphere, primarily due to human processes.

9. Automobile emissions and the burning of vegetation increase the levels of carbon and nitrogen which produce ozone.

10. They are less stable in the atmosphere and therefore have a shorter lifetime and less impact as a greenhouse gas.

Exercise 6. Complete the table of corresponding words.

Verb	Noun	Adjective	Adverb
		global	
	warming		
			rapidly
increase			
	concentration		
		absorbable	
			effectively
contain			
	energy		
		dominant	
			relatively
emit			
	contributor		
			extremely
		humid	
evaporate			

Exercise 7. Expand the sentences using the words in brackets. Put these words into necessary forms.

1. Civilization utilized (Harappan, city, in, sewer, some, ancient)
2. The Romans constructed (prevent, aqueduct, to, drought)
3. Resources are (our, eco-system, natural, form, substance)
4. Resources are (the, from, obtain, biosphere, biotic)
5. Fuels are (organic, form, matter, mineral, from)
6. Resources can (human, be, use, many, deplete, renewable)

7. Ecosystem consist (of, area, in, live, organism, all, particular)
8. Producer is (inorganic, manufacture, from, simple, able, to, food, substance)
9. Consumer is (feed, plant, other, organism, that, or, animal, upon)
10. Ecosystems form (food, number, of, a, chain, usually)

Exercise 8. Read the text without a dictionary and tell in English what you have learned from it.

Natural greenhouse effect

Roughly 30% of incoming sunlight is reflected back into space by bright surfaces like clouds and ice. Of the remaining 70%, most is absorbed by the land and ocean.

The portion of the Sun's radiant energy that is not absorbed, scattered, or reflected (about 47%) passes through the Earth's atmosphere and warms its surface. Some of this energy is absorbed by naturally-occurring gases, including water vapour, carbon dioxide, methane, nitrous oxide, and ozone, which radiate the energy in all directions, including back to the Earth's surface.

This absorption and radiation of heat by the atmosphere - the natural greenhouse effect - is beneficial for life on Earth. If there were no greenhouse effect, the Earth's average surface temperature would be a very chilly -18°C (0°F) instead of the comfortable 15°C (59°F) that it is today.

Exercise 9. Choose one topic from the Category of greenhouse gases and prepare a report.

http://en.wikipedia.org/wiki/Category:Greenhouse_gases

UNIT THIRTEEN

EFFECTS OF GLOBAL WARMING

Exercise 1. Train the reading of the following words.

permeate, expansion, precipitation, glaciers, meters, predictions, anywhere, expansion, circulation, potentially, additionally, serious, approximately, quarter, decades, bleaching, weakens, ability, severe weather, frequent, evaporation, eventually, precipitation, further, flooding, drought, intensifying, unsuitable, previously, therefore, occur, usefulness, counterbalance, desertification, species, migration, hibernation, extinction, accustomed, penguins, further, native habitat, accommodating.

Exercise 2. Guess the meaning of the words without a dictionary.

continent, aspect, expansion, precipitation, meter, leader, circulation, potentially, serious, coral reef, decade, region, intensify, tropics, farming, pattern, migration, adaptation, arctic, polar, penguins, migratory.

Exercise 3. Read and translate the text. Divide the text into the meaningful parts and give them titles. Choose an abstract of ten lines and get ready to read it aloud.

The likely effects of global warming will not be limited to one country or even one continent and will permeate almost every aspect of the environment. Rising sea levels are the most common concern; taking place with a thermal expansion of the oceans, increased precipitation, and the melting of mountain glaciers. In the 20th century alone, sea levels rose 0.17 meters. Predictions for the next century range anywhere from 0.18 to 0.59 meters. Currently, the Arctic summer sea ice is about half as thick as it was in 1950. The melting Arctic sea ice does not contribute to sea-level rise, except for the expansion of seawater with increasing heat. However, melting Arctic sea ice

may lead to global changes in ocean circulation. Water from melted ice forms a layer at the sea surface that is less dense than the underlying water since it is less salty, potentially preventing the pattern of deep ocean currents from rising to the surface. Additionally, melting sea ice speeds up the warming of the Arctic. Increasing ocean temperatures could cause serious ecological damage. Approximately one quarter of the world's coral reefs have died over the last few decades, many of them affected by coral bleaching - a process directly tied to warming waters which weakens the coral animals. An increase in global temperature will likely enhance the ability for severe weather, which could mean stronger and more frequent storms. Warmer temperatures cause more evaporation of water, which, as part of the water cycle eventually leads to increased precipitation and further increasing the potential for flooding. With drought affecting some regions and heat intensifying in the tropics, many areas will become unsuitable for agriculture. In tropical areas that are already dry and hot, the ability to harvest food will likely decrease even with small increases in warming. However, warmer temperatures and increased precipitation can also make previously poor land more suitable for farming. Therefore with a changing climate, a global change in the agricultural pattern will occur. Yet, it is unknown if the increase in the usefulness of poor lands will counterbalance an increase in drought and desertification. Many species are affected by global warming, most often by changes in migration patterns, shorter hibernation times, relocation to new areas, and extinction due to lack of adaptation. For example, many animals accustomed to living in the arctic regions, such as polar bears and penguins, have been forced further out of their native habitat in search of more accommodating habitat closer to the poles. Animals that migrate, such as birds and butterflies, have begun extending their migratory range closer to the poles, arriving sooner and departing later.

Exercise 4. Correct false statements, according to the information from the text.

1. Almost all coral reefs have died over the last year, affected by coral bleaching.
2. Water of ocean currents is less salty and so may prevent water from melted ice from rising to the upper layers of ocean.
3. Many areas will become suitable for agriculture due to drought and hot weather.
4. An increase in global temperature will likely enhance the ability for stronger and more frequent storms.
5. Warmer temperature produces evaporation of water and decreases the possibility of drought.
6. Global warming will affect only few regions.
7. The melting of Arctic ice concerns only Arctic sea.
8. Water from melting ice slows down warming of the Arctic.

Exercise 5. Make sentences from the following letters.

1. Urbanization and industrialization also result in land pollution.
2. Roads cause visual noise, light, air and water pollution.
3. The consequence of intensive agriculture is move to monoculture.
4. Pesticide is a substance or mixture of substances used to kill a pest.
5. The purpose of tillage is to prepare the soil for growing crops.
6. Humus is organic material in the final stages of decomposition.
7. All soil organisms depend on organic matter as their food source.
8. Two important characteristics of soil are texture and structure.
9. Irrigation may be defined as science of application of water to soil.
10. Water pollution affects plants and organisms living in water.

Exercise 6. Tell in English what the following words and phrases mean.

global warming, environment, expansion, glacier, prediction, ecological damage, coral reefs, severe weather, storm, evaporation, flooding, drought, agriculture, desertification, species, migration, extinction, the Arctic, tropics.

Exercise 7. Make up sentences with the given words and phrases.

effects of global warming, environment, melting, sea-level rise, expansion, global changes, prevention, to cause ecological damage, evaporation of water, deforestation, acid rain, extinction of animals, solid waste, polluted air, to treat soil, fertilizer, changing climate, ecosystem, food chain, wastewater.

Exercise 8. Read the words, say which part of speech they belong to and translate them into Russian.

globe, global, globally; warm, warmly, warmer, warming; permit, permissive, permission; place, placement; expand, expansion, expansive; predict, predictable, prediction; circle, circular, circulation; prevent, prevention, preventive, deep, deeply, deepen, deepness; add, addition, additional, additionally; serious, seriousness, seriously; direct, directive, direction, directly; weak, weakly, weaken, weakness.

Exercise 9. Continue the row of synonyms using the words from the text.

probable, possible; to restrict, to bound; forecast, prognosis; to effect, to induce; nearly, roughly; to deplete, to exhaust; area, district; in advance, beforehand; polar, north; to move, to travel; to come, to reach; to leave, go away.

Exercise 10. Choose one topic from the category Effects of global warming and prepare a report.

http://en.wikipedia.org/wiki/Category:Effects_of_global_warming

UNIT FOURTEEN

ENVIRONMENTAL IMPACT ASSESSMENT

Exercise 1. Find out the pronunciation of the following words and abbreviations. Get ready to read them.

EIA, assessment, ensure, ensuing, association, IAIA, evaluating, biophysical, unique, adherence, predetermined, justify, legislation, policy, NEPA, increasingly, ISO, procedure, assessor, multitude, consumption, services, machinery, magnitude, threatened, species, entire, alternative, whole, available, analysis, LCA, ancillary, equipment, GMP-RAM, INOVA, fuzzy, arithmetic, parameter, variables, criteria, inaccurate, approximate, audit, performance, accuracy, success, reducing, rigorous, null, hypotheses, precautionary, liability, insurance, coverage, controversial, authority, nuclear, parliament, committee.

Exercise 2. Guess the meaning of the words without a dictionary.

позитивный, негативный, проект, социальный, экономический аспект, интернациональный, ассоциация, биофизический, уникальный, публичный, комментировать, потенциальный, рациональный, технический, объективный, стандартизация, сервис, серьезный, аэропорт, консервация, популяция, альтернативный, рекомендовать, анализ, экстракция, специфический, метод, генетически, параметр, шкала, субъективный, информация, эксперт, критерий, популяция,

Exercise 3. Read and translate the first paragraph. Which sentence can be called the main one in it? Can you prove why?

ENVIRONMENTAL IMPACT ASSESSMENT

An environmental impact assessment (EIA) is an assessment of the possible positive or negative impact that a proposed project

may have on the environment, together consisting of the natural, social and economic aspects.

The purpose of the assessment is to ensure that decision makers consider the ensuing environmental impacts when deciding whether to proceed with a project. EIAs are unique in that they do not require adherence to a predetermined environmental outcome, but rather they require decision makers to account for environmental values in their decisions and to justify those decisions in light of detailed environmental studies and public comments on the potential environmental impacts of the proposal.

EIAs began to be used in the 1960s as part of a rational decision making process. It involved a technical evaluation that would lead to objective decision making. EIA was made legislation in the US in the National Environmental Policy Act (NEPA) 1969. It has since evolved as it has been used increasingly in many countries around the world. The International Organization for Standardization (ISO) covers EIA and includes key steps for carrying out the assessment.

As well as direct effects, developments cause a multitude of indirect effects through consumption of goods and services, production of building materials and machinery, additional land use for manufacturing and industrial services, mining of resources etc. The indirect effects of developments are often more serious than the direct effects assessed by EIA. Large proposals such as airports or ship yards cause wide ranging national and international environmental effects, which should be taken into consideration during the decision-making process.

Broadening the scope of EIA can also benefit threatened species conservation. Instead of concentrating on the direct effects of a proposed project on its local environment some EIAs used a landscape approach which focused on much broader relationships between the entire population of species in question. As a result, an alternative that would cause least amount of negative

effects to the population of that species as a whole, rather than the local subpopulation, can be identified and recommended by EIA.

There are various methods available to carry out EIAs, industry specific and general methods:

Industrial products

Product environmental life cycle analysis (LCA) is used for identifying and measuring the impact on the environment of industrial products. These EIAs consider technological activities used for various stages of the product: extraction of raw material for the product and for ancillary materials and equipment, through the production and use of the product, right up to the disposal of the product, the ancillary equipment and material.

Genetically modified plants

There are specific methods available to perform EIAs of genetically modified plants. Some of the methods are GMP-RAM, INOVA etc.

Fuzzy Arithmetic

EIA methods need specific parameters and variables to be measured to estimate values of impact indicators. However many of the environment impact properties cannot be measured on a scale e.g. landscape quality, lifestyle quality, social acceptance etc. and moreover these indicators are very subjective. Thus to assess the impacts we may need to take the help of information from similar EIAs, expert criteria, sensitivity of affected population etc. To treat this information, which is generally inaccurate, systematically, fuzzy arithmetic and approximate reasoning methods can be utilised. This is called as a fuzzy logic approach.

At the end of the project, an EIA should be followed by an audit. An EIA audit evaluates the performance of an EIA by comparing actual impacts to those that were predicted. The main objective of these audits is to make future EIAs more valid and

effective. The two main considerations are: scientific - to check the accuracy of predictions and explain errors; management - to assess the success of mitigation in reducing impacts.

Exercise 4. Answer the following questions.

1. What does environmental impact assessment deal with?
2. What is the purpose of EIA?
3. When was EIA utilised for the first time and when it was legislated?
4. What is the name of EIA approach which focused on species in question?
5. Which EIA methods do you know?
6. What does LCA consider?
7. What are the purposes of EIA last step?

Exercise 5. Match the words to make collocations. Translate them.

extraction, to reduce, environmental impact, entire population, technical, species, to estimate, decision, life cycle, threatened species, genetically, lifestyle.

modified, evaluation, conservation, in question, values, assessment, analysis, maker, of raw material, of species, impacts, quality.

Exercise 6. Give all possible derivatives of the following words:

assess, decision, genetically, alternative, activity, various, to indicate, additional, value, proposal, to relate, study, specified, objective, information, systematically.

Exercise 7. Make up an annotation of the above text. The model is on page 13.

Exercise 8. Make up an abstract (a brief summary) of the above text. The model is on page 13.

Exercise 9. Expand the sentences using the words in brackets. Put these words into necessary forms.

1. urbanization result (land industrialization pollution in and)
2. they are (persistent insecticide cheap and produce synthetic to potent).
3. projects damages (disrupted modern community landscapes mining)
4. drainage can (streams acid cause damage to mine)
5. refers to (clay relative and soil proportion texture of sand silt)
6. pollutants can (of particle liquid in solid be or droplet form)
7. temperatures rise (from evaporate ground more as source water)
8. atmosphere (molecule more greenhouse contain today gas)

Exercise 10. What does this sentence define? Is it related with the theme of the main text?

Technique to assess environmental impacts associated with all the stages of a product's life from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling.

UNIT FIFTEEN ENVIRONMENTAL REMEDIATION

Exercise 1. Train the reading of the following words, phrases and abbreviations.

remediation, requirements, legislated, exist, advisory, USA, comprehensive, Preliminary Remediation Goals, PRGs, Environmental Protection Agency, EPA, Europe, Dutch, European Union, EU, Phase I Environmental Site Assessment, guide, strategy, sampling, nearby, ceiling, controversial, value, mechanism, superfund, abandoned, litigate, density, deducting, incentive, purchase, noise, discharge, concern, emanating, residential, permitted, exceedances, compliance, necessary, ensure, authorities, community, enforcement, breeches, jail, penalties, otherwise, expense, business, varied, ex-situ, in-situ, excavation, subsequent.

Exercise 2. Do you know the following words in Russian?

subject, agency, Europe, Dutch, strategy, company, test, site, mechanism, superfund, corporation, zone, monitoring, result, normal, business, excavation.

Exercise 3. Read the text and match the paragraphs with their titles. Translate the text. Choose an abstract of ten lines and get ready to read it aloud.

Funding remediation
Remediation standards
Remediation technologies

Emissions standards
Site assessment
Definition

1. Generally, remediation means providing a remedy, so environmental remediation deals with the removal of pollution or contaminants from environmental media such as soil, groundwater, sediment, or surface water for the general protection of

human health and the environment or from a brownfield site intended for redevelopment. Remediation is generally subject of many regulatory requirements, and also can be based on assessments of human health and ecological risks where no legislated standards exist or where standards are advisory.

2. In the USA the most comprehensive set of Preliminary Remediation Goals (PRGs) is from the Environmental Protection Agency (EPA) Region 9. A set of standards used in Europe exists and is often called the Dutch standards. The European Union (EU) is rapidly moving towards Europe-wide standards, although most of the industrialised nations in Europe have their own standards at present.

3. Once a site is suspected of being contaminated there is a need to assess the contamination. Often the assessment begins with preparation of a Phase I Environmental Site Assessment. The historical use of the site and the materials used and produced on site will guide the assessment strategy and type of sampling and chemical analysis to be done. Often nearby sites owned by the same company and have been reclaimed, levelled or filled, are also contaminated. For example, a car park may have been levelled by using contaminated waste in the fill. Ceiling dust, topsoil, surface and groundwater of nearby properties should also be tested, both before and after any remediation. This is a controversial step as: No one wants to have to pay for the cleanup of the site; If nearby properties are found to be contaminated it may have to be noted on their property title, potentially affecting the value; No one wants to pay for the cost of assessment.

4. In the US there has been a mechanism for taxing polluting industries to form a Superfund to remediate abandoned sites, or to litigate to force corporations to remediate their contaminated sites. Other countries have other mechanisms and commonly sites are rezoned to "higher" uses such as high density housing, to give the land a higher value so that after deducting clean up

costs there is still an incentive for a developer to purchase the land, clean it up, redevelop it and sell it on.

5. Standards are set for the levels of dust, noise, odour, emissions to air and groundwater, and discharge to sewers or waterways of all chemicals of concern or chemicals likely to be produced during the remediation by processing of the contaminants. These are compared against both natural background levels in the area and standards for industrial zones and against standards used in other recent remediations. If the emission is emanating from an industrial area, it does not mean that in a nearby residential area there should be permitted any exceedances of the appropriate residential standards.

Monitoring for compliance against standards is necessary to ensure that exceedances are detected and reported both to authorities and the local community.

Enforcement is necessary to ensure that continued or significant breaches result in fines or even a jail sentence for the polluter.

Penalties must be significant because otherwise fines are treated as a normal expense of running business. Compliance must be cheaper than to have continuous breaches.

6. Remediation technologies are many and varied but can be categorised into ex-situ and in-situ methods. Ex-situ methods involve excavation of effected soils and subsequent treatment at the surface, In-situ methods seek to treat the contamination without removing the soils.

Exercise 4. Make up some questions which will embrace the content of the text.

Exercise 5. Abridge, paraphrase and rearrange the following sentences as if you are going to retell the text.

1. Penalties must be significant because otherwise fines are treated as a normal expense of running business.

2. Remediation technologies are many and varied but can be categorised into ex-situ and in-situ methods.
3. Ceiling dust, topsoil, surface and groundwater of nearby properties should also be tested, both before and after any remediation.
4. In-situ methods seek to treat the contamination without removing the soils.
5. Monitoring for compliance against standards is necessary to ensure that exceedances are detected and reported both to authorities and the local community.
6. Often nearby sites owned by the same company and have been reclaimed, levelled or filled, are also contaminated.
7. Once a site is suspected of being contaminated there is a need to assess the contamination.
8. Ex-situ methods involve excavation of effected soils and subsequent treatment at the surface.
9. Standards are set for the levels of dust, noise, odour, emissions to air and groundwater, and discharge to sewers or waterways of all chemicals of concern.
10. The historical use of the site will guide the assessment strategy and type of sampling and chemical analysis to be done.
11. Enforcement is necessary to ensure that continued or significant breeches result in fines or even a jail sentence for the polluter.
12. Environmental remediation deals with the removal of pollution or contaminants from environmental media such as soil, groundwater, sediment, or surface water for the general protection of human health.
13. In the US there has been a mechanism for taxing polluting industries to form a Superfund to remediate abandoned sites.

Exercise 6. Find pairs of synonyms.

involve	dirty
special	value
phase	cure
allow	decision
provide	land
cost	specific
permanent	use
solution	let
utilize	constant
soil	supply
treat	stage
contaminated	include

Exercise 7. Find pairs of antonyms.

liquid	stand
effective	poison
contaminated	buy
ground	take
allow	increase
slowly	past
absorb	rarely
low	easy
reduce	forbid
difficult	high
remedy	useless
often	release
move	solid
present	quickly
give	water
sell	clean

Exercise 8. Read and translate the words with the same root.

General, generally, generate, generation; remediate, remediation, remedy; mean; meaning; meaningless, meaningful; provide, provision, provider; contaminate, contaminant, contaminative, contaminator; regulate, regulation, regulatory, regulative; ecologist, ecology, ecological; comprehend, comprehensive, comprehensively, comprehension; nation, national, nationalism, nationality, nationalize; individual, individually, individuality; guide, guidance; prepare, preparation; history, historian, historical; chemical, chemist, chemistry.

Exercise 9. Put these words in the correct order to make sentences.

1. granular / used / water / filter / a / activated / or / is / carbon / for / as / air.
2. sinks / water / commonly / to / used / tap / household / filter / in.
3. the / charged / from / and / activated / able / is / positively / to / carbon / water / ions / remove / negative.
4. technology / be / thermal / can / an / remediation / oxidation / effective / also.
5. of / approach / in / because / risks / this / dioxins / the / controversial / of / released the / is / atmosphere.
6. pose / any / high / exhaust / not / should / of / gases / incineration / risks / temperature.
7. to / different / can / technologies / an / extracted / oxidize / the / two / contaminants / be / vapour / employed / of / stream.
8. method / a / type / geology / soil / and / treat / and / may / on / be / depending / good / pump.
9. remediation / is / low / concentrations / more / reach / sufficiently / to / difficult / to / satisfy / it / standards.
10. deals / remediation / with / removal / the / of / pollution / soil / or / environmental / from / water.

Exercise 10. Read the additional text and translate it without dictionary.

The Environmental Outlook in Russia

January 1999

Among Russia's most important environmental problems: Water pollution is the most serious concern. Less than half of Russia's population has access to safe drinking water. While water pollution from industrial sources has diminished because of the decline in manufacturing, municipal wastes increasingly threaten key water supply sources, and nuclear contamination could leach into key water sources as well.

Air quality is almost as poor as water quality, with over 200 cities often exceeding Russian pollution limits, and is likely to worsen. The number of vehicles on the road has increased rapidly, and their emissions will offset reductions in industrial air pollution owing to reduced economic activity and greater reliance on natural gas.

Solid waste generation has increased substantially due to adoption of Western-style consumption patterns. Russian municipalities, however, lack management expertise and landfill capacity to cope with disposal problems.

Hazardous waste disposal problems are extensive and growing. Russian officials estimate that about 200 metric tons of the most highly toxic and hazardous wastes are dumped illegally each year in locations that lack effective environmental or public health protections or oversight.

Nuclear waste and chemical munitions contamination is so extensive and costly to reverse that remediation efforts are likely to continue to be limited largely to merely fencing off affected areas.

UNIT SIXTEEN

ENVIRONMENTAL REMEDIATION METHODS

Exercise 1. Train the reading of the following words, phrases and abbreviations.

dredging, hauling, aerating, advancements, bioaugmentation, biostimulation, SVOCs, oxidation, submersible, extracted, series, granular, solidification, stabilization, deficiencies, durability, binder, constituents, external, hydrogen peroxide, potassium permanganate, persulfates, ambient, mild, attenuation, bacteria, hydrogeology.

Exercise 2. Give English equivalents to the following words:
информация, медицина, гранула, гидрогеология, маркетинг, демонстрировать, тенденция, диверсификация, экспорт, митинг, финиш, контейнер, минимальный, сорбент, мутагенный, биография, абразивный, абсолютный.

Exercise 3. Scan the text and find out:

1. When does excavation involve aerating of soil?
2. What can excavation remediate?
3. Which absorbing material is used for oil-contaminated sites?
4. What is solidification used for?
5. Why in-situ oxidation is popular?
6. Which oxidants are used during in-situ oxidation?

Exercise 4. Read and translate the text. Choose an abstract of ten lines and get ready to read it aloud.

ENVIRONMENTAL REMEDIATION METHODS

Excavation

Excavation processes can be as simple as hauling the contaminated soil to a regulated landfill, but can also involve aerating

the excavated material in the case of volatile organic compounds. Recent advancements in bioaugmentation and biostimulation of the excavated material have also proven to be able to remediate semi-volatile organic compounds (SVOCs) onsite. If the contamination affects a river or bay bottom, then dredging of bay mud or other silty clays containing contaminants may be conducted. Recently, ExSitu Chemical oxidation has also been utilized in the remediation of contaminated soil. This process involves the excavation of the contaminated area into large bumed areas where they are treated using chemical oxidation methods.

Pump and treat

Pump and treat involves pumping out contaminated groundwater with the use of a submersible or vacuum pump, and allowing the extracted groundwater to be purified by slowly proceeding through a series of vessels that contain materials absorbing the contaminants from the groundwater. For oil-contaminated sites this material is usually activated carbon in granular form. Chemical reagents such as flocculants followed by sand filters may also be used to decrease the contamination of groundwater.

Depending on geology and soil type, pump and treat may be a good method to quickly reduce high concentrations of pollutants.

Solidification and Stabilization

Solidification and stabilization work has reasonably good results but also a set of serious deficiencies related to durability of solutions and potential long-term effects.

Stabilization and solidification is a remediation technology that relies on the reaction between a binder and soil to prevent or reduce the mobility of contaminants.

Stabilization involves the addition of reagents to a contaminated material (e.g. soil or sludge) to produce more chemically stable constituents.

Solidification involves the addition of reagents to a contaminated material to impart physical stability to contain contaminants in a solid product and reduce access by external agents (e.g. air, rainfall).

Conventional Stabilization and solidification is an established remediation technology for contaminated soils and treatment technology for hazardous wastes in many countries in the world.

In situ oxidation

New in situ oxidation technologies have become popular, for remediation of a wide range of soil and groundwater contaminants. Remediation by chemical oxidation involves the injection of strong oxidants such as hydrogen peroxide, ozone gas, potassium permanganate or persulfates.

Oxygen gas or ambient air can also be injected as a more mild approach. One disadvantage of this approach is the possibility of less contaminant destruction by natural attenuation if the bacteria which normally live in the soil prefer a reducing environment. The injection of gases into the groundwater may also cause contamination to spread faster than normal depending on the site's hydrogeology.

Exercise 5. Find the wrong statements.

1. Pump and treat involves aerating the material in the case of volatile organic compounds.
2. Solidification and stabilization able to remediate semi-volatile organic compounds (SVOCs).
3. In situ oxidation involves the excavation of the contaminated material.
4. Submersible or vacuum pump is utilised during dredging.
5. For oil-contaminated sites this material is hydrogen peroxide or ozone gas.
6. The usage of activated carbon into the groundwater may also cause contamination to spread faster.

7. Chemical oxidation isn't right method for soil and groundwater treatment.

Exercise 6. Match English words and phrases and their Russian equivalents.

silty clay	уменьшить степень загрязнения грунтовых вод
vacuum pump	перекись водорода
oil-contaminated site	скважинный насос
activated carbon in granular form	химическое оксидирование
sand filter	химически устойчивый компонент
to decrease the contamination of groundwater	введение сильных оксидантов
to reduce the mobility of contaminants	илистая глина
chemically stable constituents	перманганат калия
to reduce access by external agents	активированный уголь в гранулах
chemical oxidation	снизить доступ внешних агентов
injection of strong oxidants	вакуумный насос
hydrogen peroxide	снизить подвижность загрязняющих веществ
potassium permanganate	песочный фильтр
submersible pump	участок, загрязненный нефтью

Exercise 7. Make adjectives from the following words using suffixes – able, - ible. Translate the words into Russian.

to obtain, to accept, comfort, to compress, to agree, to depend, to support, fashion, to eat, to test, to avoid, to correct, to realize, misery, to prove, to express, to measure, reason, to modify, to reduce, to identify, to understand, vision.

Exercise 8. Find in the text synonyms to the following words.

digging, easy, to transport, to demonstrate, to influence, to let, to clear, petroleum, sector, outcome, important, to connect, continuance, possible, response, firm, steadiness, outer, technique, broad, defect, demolition, to expand.

Exercise 9. Find in the text antonyms to the following words.

complicated, old, to prohibit, to dirty, to rest, minor, changeable, liquid, internal, narrow, weak, merit, creation,

Exercise 10. Read the text without a dictionary. What is this text about?

Soil vapour extraction

Soil vapour extraction (SVE) is an effective remediation technology for soil. "Multi Phase Extraction" (MPE) is also an effective remediation technology when soil and groundwater are to be remediated coincidentally. SVE and MPE utilize different technologies to treat the off-gas volatile organic compounds (VOCs) generated after vacuum removal of air and vapours from the subsurface and include granular activated carbon (most commonly used historically), thermal and/or catalytic oxidation and vapour condensation. Below is a brief summary of each technology.

UNIT SEVENTEEN
WASTE MANAGEMENT:
CONCEPTS, HANDLING, TRANSPORT

Exercise 1. Find out the pronunciation of the following words, phrases and abbreviations. Get ready to read them.

recycling, expertise, rural, usage, hierarchy, "3 Rs", desirability, cornerstone, extended, integration, associated, generator, services, authorities, private, Australia, curbside, disposal, recyclables, municipality, requested, encourage, demolition, dumped, segregated, Australians, favour, captured, volume, Europe, communities, proprietary, Envac, conveys, conduits, scheduled, basis, Israel, Arrow Ecology, ArrowBio system, gravitational settling, screening, hydro-mechanical shredding, capable, huge, salvaging.

Exercise 2. Do you know the following words in Russian?

expertise, concept, classify, integration, party, formal, municipality, construction, Australian, favour, electricity, generation, metro, line, centre, basis, transfer, station, regional, Israel, gravitational, screening, hydro-mechanical, sorting, biogas.

Exercise 3. Read the text and fill the gaps with the sentences under the text. Translate the text. Choose an abstract of ten lines and get ready to read it aloud.

WASTE MANAGEMENT:
CONCEPTS, HANDLING, TRANSPORT

Waste management is the collection, transport, processing, recycling or disposal, and monitoring of waste materials. Waste management can involve solid, liquid, gaseous or radioactive substances, _____. Waste management practices differ for developed and developing nations, for urban and rural areas, and for residential and industrial producers.

Waste management concepts

There are a number of concepts about waste management _____ . Some of general, widely used concepts include:

Waste hierarchy refers to the "3 Rs": reduce, reuse and recycle, which classify waste management strategies according to their desirability in terms of waste minimization. The waste hierarchy remains the cornerstone of most waste minimization strategies. The aim of the waste hierarchy is to extract the maximum practical benefits from products and _____ .

Extended producer responsibility is a strategy designed to promote the integration of all costs associated with products throughout their life cycle (including end-of-life disposal costs) into the market price of the product.

Polluter pays principle is a principle where the polluting party pays for the impact caused to the environment. With respect to waste management, _____ to pay for appropriate disposal of the waste.

Waste handling and transport

Waste collection methods vary widely between different countries and regions. Domestic waste collection services are often provided by local government authorities, or by private industry. Some areas, especially in less developed countries, _____. Examples of waste handling systems include:

In Australia, curbside collection is the method of waste disposal. Every urban domestic household is provided with three bins: one for recyclables, one for general waste and one for garden materials - this bin is provided by the municipality if requested. Also, many households have compost bins. _____, municipalities provide large recycle bins, which are larger than general waste bins. Municipal, commercial and industrial, construction and demolition waste is dumped at landfills and some is recycled. Household waste is segregated: recyclables sorted and made into new products, and general waste is dumped in landfill areas.

Australians are in favour of the recycling of waste. Of the total waste produced in 2003, 30% of municipal waste, 45% of commercial and industrial waste and 57% of construction and demolition waste was recycled. Energy is produced from waste as well: some landfill gas is captured for fuel or electricity generation. Households and industries are not charged for the volume of waste they produce.

In Europe and a few other places around the world, a few communities use a proprietary collection system known as Envac, _____.

In Canadian urban centres curbside collection is the most common method of disposal, whereby the city collects waste, recyclables and organics on a scheduled basis. In rural areas people often dispose of their waste by hauling it to a transfer station. Waste collected is then transported to a regional landfill.

In Israel, the Arrow Ecology company has developed the ArrowBio system, which takes trash directly from collection trucks and separates organic and inorganic materials through gravitational settling, screening, and hydro-mechanical shredding. The system is capable of sorting huge volumes of solid waste, salvaging recyclables, _____.

- a) to generate the minimum amount of waste
- b) do not have a formal waste-collection system
- c) and turning the rest into biogas and rich agricultural compost
- d) with different methods and fields of expertise for each
- e) which conveys refuse via underground conduits using a vacuum system
- f) this generally refers to the requirement for a waste generator
- g) To encourage recycling
- h) which vary in their usage between countries or regions

Exercise 4. Make up an annotation and an abstract (a brief summary) of the above text. The model is on page 13.

Exercise 5. Think of the questions to which the following sentences are answers:

1. Waste management practices differ for developed and developing nations, for urban and rural areas, and for residential and industrial producers.
2. Waste hierarchy classifies waste management strategies according to their desirability in terms of waste minimization.
3. The waste hierarchy remains the cornerstone of most waste minimization strategies.
4. The polluting party pays for the impact caused to the environment.
5. Every urban domestic household is provided with three bins: one for recyclables, one for general waste and one for garden materials.
6. Municipal, commercial and industrial, construction and demolition waste is dumped at landfills and some is recycled.
7. Recyclables sorted and made into new products, and general waste is dumped in landfill areas.
8. Of the total waste produced in 2003, 30% of municipal waste, 45% of commercial and industrial waste and 57% of construction and demolition waste was recycled.
9. In Canadian urban centres curbside collection is the most common method of disposal.
10. Waste collected is then transported to a regional landfill.

Exercise 6. Find in the text the following terms.

1. process of recovering and reusing waste products
2. a means of destroying waste products, as by grinding into particles
3. a non-industrialized poor country that is seeking to develop its resources by industrialization

4. settled places outside towns and cities
5. a system in which people or things are arranged according to their importance
6. a detailed plan for achieving success in situations such as war, politics, business, industry or sport
7. work of building or making something, especially buildings, bridges, etc.
8. a site for the disposal of waste materials by burial
9. a gas produced by the biological breakdown of organic matter in the absence of oxygen
10. a channel, ditch, or pipe used to convey water or other liquid

Exercise 7. Which of the two English variants corresponds to the Russian equivalents:

контроль и утилизация отходов - waste management, waste recycling; переработка отходов – waste disposal, waste recycling; жидкие отходы - solid waste, liquid waste, развитые страны - developed nations, developing nations; городской район - urban area, rural area; бытовые отходы – industrial waste, domestic waste; служба сбора отходов - waste collection service; waste treatment equipment; метод утилизации отходов - method of waste disposal, method of waste minimization; bin for recyclables – контейнер для утилизируемых отходов, контейнер для строительного мусора; свалочный газ - by-products gas, landfill gas; на регулярной основе – on annual basis, on scheduled basis.

Exercise 8. Put the following words into several groups according to the part of speech (verb, noun, adjective, adverb).

waste, waster, wasteful; to manage, manger, management, manageable; collect, collector, collection, collectively; transport, transportable, transportation; process, processing, recycle,

recycling, disposal, disposable; monitor, monitoring, gas, gaseous, gasification, gasifier, gasify; concept, conception, conceptual; refer, referable, referee, reference, referent; strategic, strategically, strategy; desire, desirable, desirability; promote, promoter, promotion, promotional; serve, servant, service, study, student, studious.

Exercise 9. Translate the sentences paying attention to the words in bold type.

1. Heavy rains **result** in floods. 2. The **results** of global warming are extinction of species and deforestation. 3. The **place** is chosen already. 4. Everything is **placed** right. 5. **Land** is a synonym of soil. 6. The plane has **landed** already. 7. We were in the **cool** shadow of trees. 8. The fan **cooled** the room. 9. The room **emptied** rapidly after the lecture. 10. His pockets were **empty**. 11. She was a great **help** to us. 12. We **helped** them in their work. 13. A **warm** south wind was melting the snow. 14. A pleasant **warm** is felt near the sea. 15. Let's have some coffee to **warm** us.

Exercise 10. Translate the sentences into English using words and phrases from the text “Waste management: concepts, handling, transport”.

1. Городским властям пришлось создавать системы управления отходами для того, чтобы избежать неконтролируемого распространения отходов и предотвратить загрязнение окружающей среды.

2. Любая система управления отходами состоит из трех этапов: сбора, транспортировки и переработки.

3. Система сбора отходов предполагает наличие мест сбора бытовых отходов. В России это, как правило, площадки с контейнерами и мусоропроводы в многоэтажных домах.

4. В странах западной Европы активно внедряют систему раздельного или селективного сбора отходов, при которой

само население сортирует стекло, бумагу и картон и другие отходы.

5. В некоторых странах отходы собирают в мешки из специального пластика, который через полгода разрушается, не загрязняя окружающую среду.

6. Система транспортировки заключается в вывозе собранных отходов к местам переработки и захоронения.

7. Органические отходы в некоторых странах перерабатывают в компост.

8. Иерархия управления отходами основывается на трех принципах: утилизация, вторичное использование и переработка.

9. Стратегия, разработанная для включения в рыночную цену продукта затрат, необходимых на протяжении всего срока его эксплуатации (включая расходы на его утилизацию).

10. Стратегия, предусматривающая возмещение вреда, причиненного окружающей среде. В рамках проводимых мероприятий по управлению отходами производитель обязан оплачивать расходы на утилизацию отходов своего предприятия.

UNIT EIGHTEEN
METHODS OF SOLID WASTE DISPOSAL

Exercise 1. Train the reading of the following words, phrases and abbreviations.

integrated, benign, fraction, digestion, favoured, MSW, resource depleted society, plasma gasification, gasifier vessel, proprietary, torches, molecular, elemental, destruction, disposing, abandoned, quarries, properly, hygienic, relatively inexpensive, adverse, vermin, anaerobically, extraction, installed, perforated, convert, ash, Japan, facilities, furnace, micro-pollutant, widespread, beverage, separately, dedicated, HDPE, PET, jars, corrugated fibreboard boxes, PVC, LDPE, PP, relatively.

Exercise 2. What do you think these words and expressions from the text mean?

integrate, administration, favour, plasma, gasification, gasifier, convert, elemental, hygienic, install, perforate, Japan, boiler, micro, carton, fibre, box.

Exercise 3. Read and translate the text. Put the words in second column into the correct form to fill the gaps in the sentences.

METHODS OF SOLID WASTE DISPOSAL

Integrated waste management

Integrated waste management _____ LCA attempts to offer the most benign options for waste _____ . A number of broad studies have indicated that waste administration, and then source _____ and collection followed by reuse and recycling of the non-organic fraction, energy and	use manage separate
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<p>fertilizer production of the organic waste fraction via anaerobic digestion is the _____ method for mixed Municipal Solid Waste (MSW). Non-metallic waste resources not _____ as with incineration, and can be reused or recycled in a future resource depleted society.</p>	<p>favour</p>
<p>Plasma gasification A gasifier vessel _____ proprietary plasma torches in order _____ a gasification zone of up to 3,000 °F (1,650 °C) to convert solid or liquid wastes into a syngas. When municipal solid waste is subjected to this intense heat within the vessel, the waste’s molecular bonds break down into elemental components. The process results in elemental destruction of waste and _____ materials.</p>	<p>destroy</p> <p>utilize create</p> <p>hazard</p>
<p>Landfill _____ of waste in a landfill involves burying the waste, and this remains a common practice in most countries. Landfills were often established in abandoned or unused quarries, mining voids or borrow pits. A _____ designed and well-managed landfill can be a hygienic and relatively inexpensive method of disposing of waste materials. Older, poorly designed or poorly managed landfills can create a number of adverse _____ impacts such as wind-blown litter, attraction of vermin, and generation of liquid leachate. Another common by-product of landfills is gas (mostly composed of methane and carbon dioxide), which is produced as organic waste breaks down _____. This is a greenhouse gas, it also can create odour problems and kill surface vegetation.</p>	<p>dispose</p> <p>proper</p> <p>environment</p> <p>anaerobic</p>

Many landfills also have landfill gas extraction systems _____ to extract the landfill gas. Gas is pumped out of the landfill using perforated pipes and burnt in a gas engine to generate electricity.

install

Incineration

Incineration and other high temperature waste treatment systems are sometimes described as "thermal treatment". _____ convert waste materials into heat, gas, steam, and ash.

incinerate

It is used to dispose solid, liquid and _____ waste. It is recognized as a practical method of disposing of certain hazardous waste materials.

gas

Incineration is common in countries such as Japan as these countries generally do not require any area for landfills. Waste-to-energy (WtE) or energy-from-waste (EfW) are terms for facilities that burn waste in a furnace or boiler to generate heat, steam or _____. Combustion in an incinerator is not always perfect and there have been concerns about micro-pollutants in gaseous _____ from incinerator.

electric

emit

Recycling

The popular _____ of 'recycling' in most developed countries refers to the widespread collection and reuse of everyday waste materials such as empty beverage containers. Material for recycling may _____ separately from general waste using dedicated bins and collection vehicles, or sorted _____ from mixed waste streams.

mean

collect

direct

The most common recycled products include steel food and aerosol cans, HDPE and PET bottles, glass bottles and jars, paperboard cartons, newspapers, magazines, and corrugated fibreboard boxes.

PVC, LDPE and PP are also _____, although they are not commonly collected. These items usually _____ of a single type of material, making them relatively easy to recycle into new products.

recycle

compose

Exercise 4. Make up some questions to the text in the form of a plan. Get ready to retell the text.

Exercise 5. Give Russian equivalents of the following words and phrases:

integrated waste management; reuse; recycling; non-organic fraction; anaerobic digestion; Municipal Solid Waste; incineration; resource depleted society; plasma gasification; gasifier vessel; to convert solid or liquid wastes into a syngas; burying the waste; wind-blown litter; attraction of vermin; generation of liquid leachate; landfill gas extraction system; to generate heat, steam or electricity; gaseous emission; mixed waste stream; recycled products.

Exercise 6. Explain the following words or collocations in your own words.

study (= research); Municipal Solid Waste; resource depleted society; Plasma gasification; gasifier; plasma; syngas; elemental components; quarry, mining; vermin; by-product; organic waste; gas extraction system; incinerator; hazardous waste; energy-from-waste method; corrugated fibreboard.

Exercise 7. Translate the following sentences using words and phrases from the text 'Methods of solid waste disposal'

1. В настоящее время метод захоронения применяется ко всей массе отходов. Считается, что это дешевле всего. Однако в расчетах обычно не учитываются затраты, связан-

ные с обслуживанием полигона (на 100 ближайших лет), а также компенсация ущерба для окружающей среды.

2. Решение проблемы отходов заключено, как ни странно, в самих отходах: 35% отходов это ценное вторичное сырье, а еще около 35% - потенциальное удобрение.

3. Прессование, сортировка и компостирование отходов позволят снизить их объем в 7-16 раз. Для сравнения: сжигание уменьшает объем отходов всего лишь в 10 раз, но при этом повышается их токсичность, а обходится это в 3 раза дороже.

4. В ряде городов страны построены заводы по биотермической переработке ТБО с использованием отечественного оборудования. Компостирование мусора проводится в биотермических установках производительностью 20-30 тыс. т в год.

5. При сортировке мусора выделяют цветные и черные металлы, стекло, текстиль, макулатуру и другие инертные примеси. Получаемый компост используют сельские и городские хозяйства в качестве биотоплива и органического удобрения.

6. Мусоросжигание без предварительной сортировки приводит к выбросам в атмосферу вредных веществ, таких, например как диоксид серы, окись азота и углерода, токсичные углеводороды и тяжелые металлы.

7. Методы обезвреживания и переработки ТБО можно разделить на ликвидационные и утилизационные. По технологическому принципу методы обезвреживания и переработки ТБО разделяются на биологические, термические, химические, механические и смешанные.

8. Метод механизированного биотермического компостирования мировой практике начали применять в двадцатые годы, когда была доказана возможность обезвреживания ТБО за 20-30 суток в аэробных условиях.

Exercise 8. Give all possible derivatives of the following words:

private, pay, municipal, commerce, to construct, to demolish, favour, integrate, broad, to mix, to deplete, order, subject, design, hygienic, expensive, vegetation, perfect.

Exercise 9. Read the text without dictionary and tell what you have learned.

Energy recovery

The energy content of waste products can be harnessed directly by using them as a direct combustion fuel, or indirectly by processing them into another type of fuel. Recycling through thermal treatment ranges from using waste as a fuel source for cooking or heating, to anaerobic digestion and the use of the gas fuel, to fuel for boilers to generate steam and electricity in a turbine. Pyrolysis and gasification are two related forms of thermal treatment where waste materials are heated to high temperatures with limited oxygen availability. The process usually occurs in a sealed vessel under high pressure. Pyrolysis of solid waste converts the material into solid, liquid and gas products. The liquid and gas can be burnt to produce energy or refined into other chemical products. The solid residue can be further refined into products such as activated carbon. Gasification and advanced Plasma arc gasification are used to convert organic materials directly into a syngas composed of carbon monoxide and hydrogen. The gas is then burnt to produce electricity and steam.

Exercise 10. Choose one topic from the category Waste treatment technologies and make report. Use one of the following links:

http://en.wikipedia.org/wiki/Category:Waste_treatment_technology

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CONTENTS

Content	3
Unit 1. Environmental engineering.....	5
Unit 2. Natural resources.....	10
Unit 3. Ecosystem.....	15
Unit 4. Land pollution.....	20
Unit 5. Soil management (part I).....	25
Unit 6. Soil management (part II).....	31
Unit 7. Water pollution.....	36
Unit 8. Sewage treatment.....	43
Unit 9. Stages of sewage treatment.....	47
Unit 10. Air pollution.....	54
Unit 11. Air pollution control.....	59
Unit 12. Global warming.....	65
Unit 13. Effects of global warming.....	71
Unit 14. Environmental impact assessment.....	75
Unit 15. Environmental remediation.....	80
Unit 16. Environmental remediation methods.....	87
Unit 17. Waste management: concepts, handling, transport.....	92
Unit 18. Methods of solid waste disposal.....	99
References	105
Preface	106

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