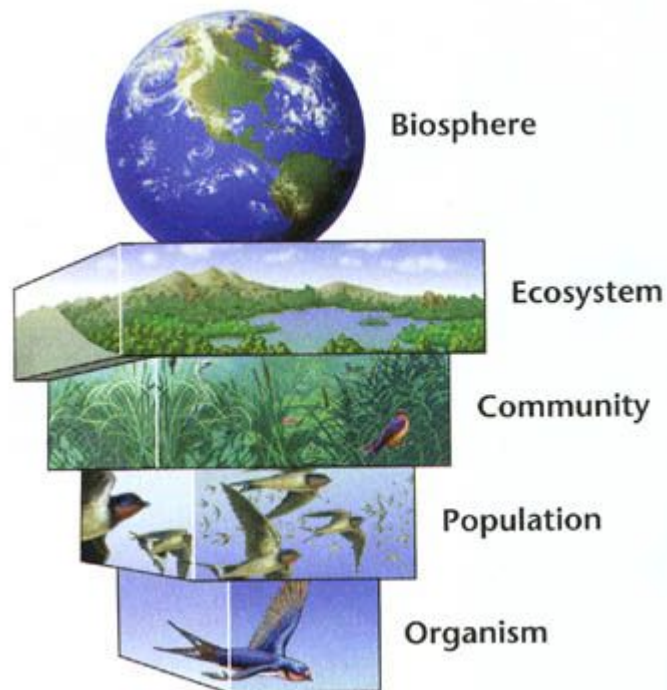


**М. Г. Прадівляний, О. Е. Марченко,
А. А. Слободянюк**

**АНГЛІЙСЬКА МОВА ДЛЯ СТУДЕНТІВ-ЕКОЛОГІВ.
ЧАСТИНА 1**



Міністерство освіти і науки України
Вінницький національний технічний університет

**М. Г. Прадівляний, О. Е. Марченко,
А. А. Слободянюк**

**ПОСІБНИК
АНГЛІЙСЬКА МОВА ДЛЯ СТУДЕНТІВ-ЕКОЛОГІВ.
ЧАСТИНА 1**

Навчальний посібник

Вінниця
ВНТУ
2016

УДК [811.111:62139] (075)

ББК [81.2Англ:32.96] 73

П68

Рекомендовано до друку Методичною радою Вінницького національного технічного університету Міністерства освіти і науки України (протокол № 7 від 22.12.2015 р.)

Рецензенти:

Н. Б. Іваницька, доктор філологічних наук, професор

В. І. Ключко, доктор педагогічних наук, професор

Прадівляний, М. Г.

П68 Англійська мова для студентів-екологів. Частина 1 : навчальний посібник / М. Г. Прадівляний, О. Е. Марченко, А. А. Слободянюк. – Вінниця : ВНТУ, 2016. – 60 с.

Посібник призначений для розвитку практичних умінь та навичок іншомовного спілкування та розуміння фахово спрямованої літератури іноземною мовою.

Рекомендується використання посібника як для проведення аудиторної, так і для позааудиторної роботи зі студентами вищих навчальних закладів, що спеціалізуються в галузі екології. В посібнику запропоновано вправи різного рівня складності, призначені як для роботи з викладачем, так і для самостійної роботи студентів.

УДК [811.111:62139] (075)

ББК [81.2Англ:32.96] 73

© М. Прадівляний, О. Марченко, А. Слободянюк, 2016

CONTENTS

Chapter 1. Student's life.....	4
Chapter 2. Ecology as a science.....	11
Chapter 3. Ecosystems.....	20
Chapter 4. Functioning of ecosystems.....	29
Chapter 5. Biosphere and its importance.....	38
Chapter 6. Population growth.....	46
References.....	58

CHAPTER 1 STUDENT'S LIFE

Text 1

University Life

Entering a university is a very important and interesting experience in a person's life, but at the same time it is an experience that will change our lifestyle and personality forever. It is also very frightening because we don't know if we **adjust to** a place where every single student has to stand on their own two feet and take responsibility for our education and future. This transition from high school to university is the most **significant** in our lives. There are several effects to this decision.

The first **effect** of entering a university is the fact that you have to get acquainted with the entire university environment. Being at junior high or at high school is completely different than being in a university, so you have to learn how to **survive** in it. During university studies you have to **search for** your own way to success because at a university teachers are not going to solve your problems.

The second and most important effect of entering a university is the responsible behavior you must develop during your way through the university. Entering a university forces you to be a responsible person because you are the only one who will **care about** you. During university studies you **are in charge of** your life and of the **decisions** that you **make** such as doing or not doing homework, going or not going to class, etc. Being a responsible person is essential for anyone in this world; without responsibility a person's life can be a mess and will never reach success.

Some students still live with their family, where their mothers **take care of** their everyday lives. Others may live at off-campus to enjoy new freedom. However, it is a good idea for all university students to live in a hostel on campus in the first year. In a hostel, we can make new friends more easily, we can learn to become independent, and we can spend more time on study.

Entering a university, as everything that is new in our lives, can be terrifying at first, but with a little bit of effort, it can become one of the greatest experiences of our lives. It is very important to enjoy our university studies because it will help us become independent and responsible people, only if we learn how to survive it.

Active Vocabulary

adjust to – пристосовуватись до

be in charge of – відповідати за

care about / of – піклуватися; доглядати

effect – наслідок

make decision – приймати рішення
search for – шукати
significant – важливий
survive – виживати

Text 2

For many first-year students, the University may be their first experience living away from home for an extended period of time. It is a definite break from home. The individual's usual sources of support are no longer present **to facilitate** adjustment to the **unfamiliar** environment. Here are tips for students which may provide realistic **expectations** concerning living arrangements and social life on campus.

The first few weeks on campus can be a lonely period. There may be **concerns** about forming friendships. When new students look around, it may seem that everyone else is **self-confident** and socially successful. The reality is that everyone is having the same concerns.

If they allow sufficient time, students usually find **peers** in the university to provide structure and a **valuable** support system in the new environment. The important thing for the student to remember in meeting new people is to be oneself.

Meaningful, new relationships should not be expected to develop overnight. It took a great deal of time to develop **intimacy** in high school friendships; the same will be true of intimacy in university friendships.

Increased personal freedom can feel both wonderful and frightening. Students can come and go as they choose with no one to "hassle" them. At the same time, things are no longer **predictable**. The strange environment with new kinds of procedures and new people can create the sense of being on an emotional roller-coaster. This is normal and to be expected.

Living with roommates can present special, sometimes intense, problems. **Negotiating** respect of personal property, personal space, sleep and relaxation needs can be a complex task. The complexity increases when roommates are of different ethnic/cultural **backgrounds** with very different values. Communicating one's **legitimate** needs calmly, listening with respect to a roommate's concerns, and being willing to compromise to meet each other's most important needs can **promote** resolution of **issues**.

It is unrealistic to expect that roommates will be best friends. Roommates may work out **mutually** satisfying living arrangements, but the reality is that each may tend to have his or her own circle of friends.

University classes are a great deal more difficult than high school classes. There are more reading assignments, and the exams and papers cover a greater amount of material. Instructors expect students to do more work outside the classroom. In order to survive, the student must take responsibility for his or her actions.

Active Vocabulary

background – передумова; підґрунтя; історія питання

concern – занепокоєння, турбота, тривога

expectation – очікування

facilitate – сприяти

intimacy – близьке знайомство; близькість

issue – питання, проблема

legitimate – законний, допустимий; виправданий, обґрунтований

mutually – обопільно, взаємно; спільно

negotiate – домовлятися (з ким-небудь); обговорювати умови

peer – рівний; який виходить від рівних, від членів своєї групи

predictable – передбачуваний

promote – сприяти, підтримувати, заохочувати

self-confident – самовпевнений

unfamiliar – незнайомий

valuable – коштовний, який високо цінується

Ex. 1. Fill in the blanks with appropriate words

a) independent, friends, freshmen, dormitory, study, chances, anxious, adapt

It is a good idea for all university students to live in a (1) _____ on campus in the first year. In a dormitory, they can make new friends more easily, they can learn to become (2) _____, and they can spend more time on (3) _____.

Firstly, living in a dormitory on campus would enable (4) _____ to make new friends more easily. Soon after entering university, many freshmen may feel (5) _____ about their new university lives. To find new good friends would be one of the best ways to (6) _____ to life in a new environment. Living in a dormitory would give them many (7) _____ to meet new people and make new (8) _____.

b) campus, laundry, students, become, studies, care, convenient, spend

Secondly, living in a dormitory on (1) _____ would enable freshmen to learn to (2) _____ independent. In a dormitory, without their family's help, they have to wake up by themselves, do the (3) _____ for themselves, and take (4) _____ of their own food and health. Living in a dormitory gives (5) _____ a good preliminary training for standing on their own feet in the future.

Finally, living in a dormitory on campus would enable freshmen to (6) _____ more time on studying. At university, students tend to have very heavy workloads and have to spend a lot of time on their (7) _____. At first, many freshmen may feel some difficulty to manage their time for studying. Living in a dormitory on campus would be more (8) _____ for study.

Ex. 2. Fill in the blanks with prepositions “of, with”

Living (1) _____ roommates can present special, sometimes intense, problems. Negotiating respect (2) _____ personal property, personal space, sleep, and relaxation needs can be a complex task. The complexity increases when roommates are (3) _____ different ethnic / cultural backgrounds (4) _____ very different values. Communicating one’s legitimate needs calmly, listening (5) _____ respect to a roommate’s concerns, and being willing to compromise to meet each other’s most important needs can promote resolution (6) _____ issues.

It is unrealistic to expect that roommates will be best friends. Roommates may work out mutually satisfying living arrangements, but the reality is that each may tend to have his or her own circle (7) _____ friends.

Ex. 3. Complete the beginning of the sentences

1. For most students, entering university is	a) only about finding a job.
2. Some students believe that university is	b) a terrifying and an overwhelming experience.
3. University classes are a great deal more difficult	c) that college is about finding yourself.
4. It is very important to enjoy our university studies	d) because it will help us become independent and responsible people.
5. When new students look around, it may seem	e) to enjoy new freedom.
6. During university studies you have to search	f) their first experience living away from home for an extended period of time.
7. My university experience has helped me realize	g) a lonely period.
8. For many first-year students, the university may be	h) that everyone else is self-confident and socially successful.
9. Others may live at off-campus	i) for your own way to success.
10. The first few weeks on campus can be	j) than high school classes.

Ex. 4. Make up questions to which the italicized words are the answers

1. Students usually find *peers* in the university to provide structure and a valuable support system in the new environment.
2. The important thing for the student to remember in meeting new people is *to be oneself*.
3. *New relationships* should not be expected to develop overnight.

4. It took *a great deal of time* to develop intimacy in high school friendships.
5. Increased personal freedom can feel both *wonderful and frightening*.
6. *Students* can come and go as they choose with no one to “hassle” them.
7. At the same time, things are no longer *predictable*.
8. The strange environment with new kinds of procedures and new people can *create the sense of being on an emotional roller-coaster*.

Ex. 5. Translate the words into Ukrainian and use them to make up your own sentences

Bachelor
basic general secondary education
complete
correspondence education
daytime education
ensure
high educational institution
higher education
Junior specialist
levels of accreditation
Master

Ex. 6. Translate the text into Ukrainian paying attention to the italicized words

The *higher education* constitutes integral part of the system of education of Ukraine as provided for by the *Law of Ukraine “On Education”*. It *ensures* the fundamental scientific, professional and practical training by the following educational and qualification degrees: “*Junior specialist*”, “*Bachelor*”, “*Specialist, Master*”.

The higher education is received in *high educational institutions* of the respective *levels of accreditation* on the basis of: *basic general secondary education, complete general secondary education* and educational-qualification degrees “*Junior specialist*” and “*Bachelor*”, as well as “*Specialist, Master*” as postgraduate education.

Training of specialists in higher educational institutions may be carried out with the interruption of work (*daytime education*), without interruption of work (*evening, correspondence education*), by the combination of these two forms, and for certain professions – without attending classes.

Ex. 7. Answer the following questions

1. What does the higher education constitute?
2. What law is the higher education in Ukraine provided by?
3. What training does the Law “On Education” ensure?
4. Where can one receive the higher education?

5. What are the levels of accreditation in educational institutions based on?
6. How do we call education with the interruption of work?
7. Is it possible to get higher education without interruption of work?

Ex. 8. Read the text without a dictionary. Then write true (T) or false (F) for the statements, correct the false statements

If you choose 25 hours per week you will have two classes each morning with different teachers, from 9 a. m. to 1 p. m. including a coffee break between the lessons, and an additional class in the afternoon.

You will be able to choose from a number of different programmes. These will vary from term to term but typical examples are: Business English, Pronunciation, English for Tourism, Writing Skills, Study of Newspapers, Extra Grammar and Vocabulary, Communication Activities.

You will choose two topics from these or others available at the time. Business English is always included. The lessons will be 1 or 1 and a half hours per afternoon (a total of 5 hours per week).

This flexible programme gives you the opportunity to work with different people and to study the aspects of the language which interest you.

1. You will have 3 classes a day.
2. A class in the afternoon is optional.
3. You'll be offered the widest choice of different programmes.
4. All these programmes are the same every year.
5. The school will choose topics for you.
6. Business School is optional.
7. The afternoon lessons must be 5 hours per week.
8. The programme is strict.
9. You can study the aspects of the language which meet your interest best of all.
10. You are given the opportunity to work with different people.

Ex. 9. It's interesting to know: Academic Degrees and Their Abbreviations

A.B. or B.A.	Bachelor of Arts
A.M. or M.A.	Master of Arts
B.B.S.	Bachelor of Business Science
B.C.L.	Bachelor of Civil Law
B.D.	Bachelor of Divinity
B.Lit, B. Litt. or Lit.B.	Bachelor of Letters (or Literature)
B.L.L. or L.L.B.	Bachelor of Laws

B.S., B.Sc., or Sc.B.	Bachelor of Science
C.E.	Civil Engineer
Ch.E.	Chemical Engineer
D.C.L.	Doctor of Civil Law
D.D. or S.T.D.	Doctor of Divinity
D.D.S.	Doctor of Dental Surgery
D.Litt., or Litt.D.	Doctor of Letters (or Literature)
D.M.D.	Doctor of Dental Medicine
D.S. or D.Sc.	Doctor of Science
D.V.M.	Doctor of Veterinary Medicine
E.E.	Electrical Engineer
J.D.	Doctor of Law
L.H.D.	Doctor of Humanities
L.L.D.	Doctor of Laws
M.B.A.	Master of Business Administration
M.C.E.	Master of Civil Engineering
M.D.	Doctor of Medicine
M.E.	Mechanical Engineer
M.S. or M.Sc.	Master of Science
Mus.B.	Bachelor of Music
Mus.D.	Doctor of Music
Ph.D.	Doctor of Philosophy
Ph.G.	Graduate in Pharmacy
S.T.B.	Bachelor of Sacred Theology
V.S.	Veterinary Surgeon

Ex. 10. Prepare reports using the Internet or other sources (catalogues, magazines, books, etc.) about the latest news, achievements in the field concerning the topic of the chapter

CHAPTER 2

ECOLOGY AS A SCIENCE

Text 1

Ecology

Ecology, or ecological science, is the scientific study of the distribution and **abundance** of living organisms and how the distribution and abundance are affected by interactions between the organisms and their environment. Ecology also provides information about the **benefits** of ecosystems and how we can use Earth's resources in ways that leave the environment healthy for future generations.

The environment of an organism includes both physical **properties**, which can be described as the sum of local abiotic factors such as **insolation** (sunlight), climate and geology, as well as the other organisms that **share its habitat**.

Ecology is usually considered a branch of biology, the general science that studies living organisms.

Organisms can be studied at many different levels, from proteins and **nucleic acids** (in biochemistry and molecular biology), to **cells** (in cellular biology), to individuals (in botany, zoology, and other similar disciplines), and finally at the level of populations, communities and ecosystems, to the biosphere as a whole; these **latterstrata** are the primary subjects of ecological **inquiries**.

Ecology is a multidisciplinary science.

Because of its focus on the higher levels of the organization of life on earth and on the **interrelations** between organisms and their environment, ecology **draws heavily on** many other branches of science, especially geology and geography, meteorology, **pedology**, chemistry and physics.

Thus, ecology is considered by some to be a holistic science, one that **over-arches** older disciplines such as biology which in this view become sub-disciplines contributing to ecological knowledge.

Common Terms

Ecosystem

An ecosystem is any geographic area that includes all of the organisms and nonliving parts of their physical environment. An ecosystem can be a natural **wilderness** area, a **suburban** lake or forest, or a heavily used area such as a city. The more natural an ecosystem is, the more ecosystem services it provides. These include cleansing the water (wetlands and **marshes**) and air (forests), **pollinating crops** and other important plants (**insects**, birds, bats), and **absorbing** and detoxifying **pollutants** (soils and plants).

Biodiversity

Short for biological **diversity**, biodiversity is the range of variation found among microorganisms, plants, **fungi** and animals. Some of this variation is

found within species, such as differences in shapes and colors of the flowers of a single species of plants. Biodiversity also includes the richness of species of living organisms on earth.

Environment

The environment is the surroundings of an organism including the physical and chemical environment, and other organisms with which it comes into contact. This term is most **frequently** used in a human context, often referring to factors affecting our quality of life.

Natural Resources

Natural resources are living and nonliving materials in the environment that are used by humans. There are two types: **renewable** (wildlife, fish, timber, water) and nonrenewable (fossil fuels and minerals).

Population

A group of individuals **belonging to** one species (of bacteria, fungi, plant or animal) living in an area.

Community

Populations of organisms of different species that interact with one another.

Active Vocabulary

absorb – усмоктувати, поглинати, абсорбувати

abundance – велика кількість, надлишок

belong to – належати, бути власністю

benefit – перевага, привілей; користь, благо; вигода

cell – клітина

crop – посів

diversity – розмаїтість, різноманіття

draw on – наближатися

frequently – часто

fungi pl (fungus) – гриб, грибок, плісінь

habitat – батьківщина, ареал, середовище перебування

inquiry – наукове дослідження

insect – комаха

insolation – освітлення сонячним промінням, сонячна радіація

interrelations – взаємовідносини

latter – останній (з двох названих), другий

marsh – болото, драговина

nucleic acid – нуклеїнова кислота

overarch – перекривати

pedology – ґрунтознавство

pollinate – запилювати

pollutant – забруднювач навколишнього середовища

property – властивість, якість; характеристика; здатність

renewable – поновлений, який можна відновити

share – брати участь, ділити, мати частку або частину
strata pl (stratum) – шар, пласт; формація
suburban – приміський
wilderness – дика місцевість, незаймана природа

Text 2

The Importance of Ecology

Humans are **dependent on** their environment, as are all other organisms. Any change in the environment even in distant parts of the planet affects living things and their environment elsewhere. All organisms are dependent on each other in many ways. **Destruction** of one organism in the environment can lead to the destruction of other organisms. The human environment includes the **entire** earth and may someday include other planets as well. Technological **advances** have given humans the ability to **exert** great **influence** over the environment of all living things. For this reason, it is necessary to have an understanding of ecology in order to **survive**.

Applied ecology is concerned with the practical **applications** of the theories of ecology. Among the many applications of ecology are those used in agriculture and medicine. Scientific study of the relations of organisms with their environments helps farmers grow crops in the right soils and climates; provide **livestock** with suitable food and shelter; **eliminate** harmful **pests**; and **breed** new varieties of plants and animals. Ecological knowledge helps in the fight against disease. For example, knowledge of the malarial mosquito's environmental niche makes it possible to help control malaria by draining the **swamps** in which the mosquitoes **breed**.

However, in their efforts to improve the environment humans often make mistakes through **lack of** ecological understanding. A notable example of an ecological catastrophe caused by seemingly **beneficial** human intervention in natural processes **occurred** in Borneo shortly after World War II. A program was undertaken there to control mosquitoes by spraying with DDT. The number of mosquitoes declined **drastically**, but the roofs of houses began to collapse because they were being eaten by **caterpillars**. The caterpillars had previously been held under control by certain predatory **wasps** – which had been killed off by the DDT.

In addition to spraying for mosquitoes, the villagers also sprayed inside their homes to kill flies. Previously, the houseflies had been more or less controlled by **lizards** called geckos. As the geckos continued eating houseflies, now **laden** with DDT, the geckos began to die. The dead or dying geckos were eaten by house cats. The cats, which were at the end of the food chain, also began to die from the DDT concentrated in the bodies of the geckos they were eating. So many cats died that rats began invading the houses, eating the villagers' food. The rats multiplied and eventually became potential **plague** carriers.

Humans have **destroyed** wildlife habitats in order to build cities, homes, factories and highways. They have **contaminated** the environment with such technological products and by-products as pesticides, motor **exhaust** fumes, industrial wastes and radioactive **fallout**. Nonrenewable resources such as **fossil** fuels are being consumed very fast, and their by-products cause pollution. As a result, the environment has been changed in ways that could eventually make the earth uninhabitable. Because of such problems, increasing attention is being paid to the study of ecology in schools, governments, and by interested groups elsewhere. By understanding ecology, people can take steps to reduce pollution, **deforestation**, and other negative fallouts of human activity, and the human cost associated with them.

Active Vocabulary

advance – прогрес, успіх, поліпшення
application – застосування, додаток, використання
applied – прикладний, практичний
beneficial – благотворний, корисний; цілющий
breed – розводити; розмножуватися, плодитися; давати приплід
caterpillar – гусениця
contaminate – забруднювати, заражати
deforestation – вирубка лісу
dependent on – залежний, обумовлений
destroy – руйнувати, знищувати, винищувати
destruction – зруйнування, знищення, умиртвіння
drastically – рішуче, круто, радикально, докорінно
eliminate – знищувати, ліквідувати
entire – повний, цілий, весь
exhaust – вихлопні гази (двигуна)
exert – напружувати (сили); додавати (зусилля)
fall out – випадання радіоактивних опадів
fossil – скам'янілість, копалина, викопні рештки
influence – вплив
lack of – нестача, брак; (повна) відсутність
laden – навантажений, який гнеться під вагою чого-небудь
livestock – домашня худоба, живий інвентар
lizard – ящірка
occur – траплятися, відбуватися
pest – сільськогосподарський шкідник, шкідлива комаха, паразит
plague – чума, моровиця
survive – залишитися в живих, вижити, вціліти
swamp – болото, драговина, трясовина
wasp – оса

Ex. 1. Fill in the blanks with appropriate words

a) generations, ecology, information, environment, world, resources, humans, connections.

(1) _____ is the study of the relationships between living organisms, including (2) _____, and their physical (3) _____ ; it seeks to understand the vital (4) _____ between plants and animals and the (5) _____ around them. Ecology also provides (6) _____ about the benefits of ecosystems and how we can use Earth's (7) _____ in ways that leave the environment healthy for future (8) _____.

b) rainforest, communities, different, ecologists, soil, interactions, bacteria, organisms.

(1) _____ study these relationships among (2) _____ and habitats of many (3) _____ sizes, ranging from the study of microscopic (4) _____ growing in a fish tank, to the complex (5) _____ between the thousands of plants, animals, and other (6) _____ found in a desert. Ecologists also study many kinds of environments. For example, ecologists may study microbes living in the (7) _____ under your feet or animals and plants in a (8) _____ or the ocean.

Ex. 2. Fill in the blanks with prepositions “of, with, in”

The many specialties within ecology, such as marine, vegetation and statistical ecology, provide us (1) _____ information to better understand the world around us. This information also can help us improve our environment, manage our natural resources, and protect human health. The following examples illustrate just a few (2) _____ the ways that ecological knowledge has positively influenced our lives.

(3) _____ the 1960s, ecological research identified two (4) _____ the major causes (5) _____ poor water quality (6) _____ lakes and streams – phosphorous and nitrogen – which were found (7) _____ large amounts (8) _____ laundry detergents and fertilizers. Provided (9) _____ this information, citizens were able to take the necessary steps to help restore their communities' lakes and streams – many (10) _____ which are once again popular for fishing and swimming.

Ex. 3. Complete the beginning of the sentences

1. Ecology, or ecological science, is	a) that includes all of the organisms and nonliving parts of their physical environment.
2. Biodiversity is the range of variation	b) belonging to one species (of bacteria, fungi, plant or animal) living in an area.
3. Community is	c) the general science that studies living organisms.

4. Ecology is usually considered as a branch of biology,	d) living things and their environment elsewhere.
5. Natural resources are living and nonliving materials in the environment	e) found among microorganisms, plants, fungi and animals.
6. Humans have destroyed wildlife habitats	f) the physical and chemical environment, and other organisms with which it comes into contact.
7. An ecosystem is any geographic area	g) in order to build cities, homes, factories, and highways.
8. The environment is the surroundings of an organism including	h) the scientific study of the distribution and abundance of living organisms
9. Population is a group of individuals	i) populations of organisms of different species that interact with one another.
10. Any change in the environment even in distant parts of the planet affects	j) that are used by humans.

Ex. 4. Make up questions to which the italicized words are the answers

1. *Ecologists* have discovered that marshes and wetlands filter toxins and other impurities from water.
2. Communities can *reap the benefit* of this ecological service.
3. Ecology is *confused with* environmental programs and environmental science.
4. *By using natural filtering systems*, we have the option to build fewer new treatment plants.
5. Ecologists have discovered that many plants and animals *produce chemicals that protect them from predators and diseases*.
6. The term “ecology” was introduced by the German biologist *Ernst Heinrich Haeckel* in 1866.
7. For example, the Pacific Yew tree produces a substance *which is used in cancer treatments*.
8. The science of ecology *attempts to explain* why plants and animals live where they do and why their populations are the sizes they are.
9. *Leaving some of these filtering ecosystems intact* can reduce the burden on water treatment plants that have been built to perform the same service.
10. The most common air pollutants *contain* carbon, sulfur and nitrogen.
11. Another example is a *substance found in horseshoe crabs, hemolymph*, that is used in leukemia treatments.
12. Some of these same chemicals have been synthesized *by scientists* or harvested from the organism and used *to treat human diseases*.

Ex. 5. Translate the words into Ukrainian and use them to make up your own sentences

to alleviate
brink of extinction
captive breeding efforts
cherished species
to control damage
crop damage
to decrease
familiar species
forest management
healthy forest ecosystems
maintaining ecosystems
pesticides
to prevent
unpredictable
wildfires

Ex. 6. Translate the text into Ukrainian paying attention to the italicized words

Endangered Species Protection

Some of our nation's most *cherished species*, such as the bald eagle and peregrine falcon, as well as countless other less *familiar species*, like the Virginia Big-Eared Bat and the American Burying Beetle, have either been brought back from the *brink of extinction* or their populations have been stabilized. These successes are the result of successful *captive breeding efforts*, reintroduction methods, and a greater understanding of species, in part because of ecological research.

Forestry Solutions

Ecological concepts have been applied to *forest management* and are slowly being integrated into traditional forest science. For example, ecological studies have shown that fire plays a key role in *maintaining healthy forest ecosystems* in certain types of forests. This knowledge has encouraged more research to find ways to use controlled fires to *prevent unpredictable and costly wildfires*.

Agricultural Solutions

Biological control is a technique that uses the natural enemies and predators of pests to *control damage* to crops. It is based in part on knowing the ecology of pests, which is used to understand when and where they are the most vulnerable to their enemies. Biological control *alleviates crop damage* by insects, saves money, and *decreases problems associated with pesticides*.

Ex. 7. Answer the following questions

1. What are the most cherished species?

2. What species have been brought back from the brink of extinction?
3. What are the reasons of extincted populations' stabilization?
4. How are ecological concepts being changed?
5. What can play a key role in maintaining healthy forest ecosystems?
6. Why was the research for controlled fires usage held?
7. What is biological control based on?
8. What are the main functions of biological control?

Ex. 8. Read the text, then put the sentences in the right order

Lots of local animals have been saved after the forest where they lived was destroyed by a new road. The animals are now living happily in another forest.

So what happened? Our reporter asked William Riley, the organizer of Greenline, for his story.

“Lots of animals lived in this area”, said William, “ but the council wanted to build a new road. We were told about the situation and we tried to stop them building the road. We organized demonstrations, and many local people signed a petition. But in the end the council won and the road was started. The places where the animals lived were destroyed and many of the animals died. So we collected the other animals and took them to a new area“.

“We were very angry about the road”, added William. “It was very important to save the animals. They won't be moved again”.

- A. The road was built.
- B. Someone told Greenline about the plans to build the road.
- C. The animals will stay in their new homes.
- D. The places where many animals lived were destroyed.
- E. The local council got permission to build the road.
- F. The members of Greenline took the animals to a new area.
- G. Greenline and local people protested against the road.
- H. The council wanted to build a new road where lots of animals lived.

Ex. 9. It's interesting to know: Where Can I Go for More Information or Assistance?

If you are interested in learning more about ecology, or would like to know what you can do to become involved, a number of resources are at your disposal. Public and university libraries offer articles, journals, and books on a range of ecological research.

Many environmental organizations have developed educational materials that focus on species and ecosystems, and offer tips on becoming involved in community activities that relate to the environment. Finally, professional ecological organizations can connect you with scientific experts in all types of ecological study, from those that specialize in wetland ecology, to those that

focus on endangered species, to those whose work emphasizes city environments.

In essence, ecologists seek to explain:

- life processes
- interactions, interrelationships, behaviors and adaptations of organisms
- the movement of materials and energy through living communities
- the successional development of ecosystems
- the abundance and distribution of organisms and biodiversity in the context of the environment

There are many practical applications of ecology in conservation biology, wetland management, natural resource management (agroecology, agriculture, forestry, agroforestry, fisheries), city planning (urban ecology), community health, economics, basic and applied science, and human social interaction (human ecology). Organisms and resources comprise ecosystems which, in turn, maintain biophysical feedback mechanisms that moderate processes acting on living (biotic) and nonliving (abiotic) components of the planet. Ecosystems sustain life-supporting functions and produce natural capital, such as biomass production (food, fuel, fiber and medicine), the regulation of climate, global biogeochemical cycles, water filtration, soil formation, erosion control, flood protection, and many other natural features of scientific, historical, economic or intrinsic value.

There are also many subcategories of ecology, such as ecosystem ecology, animal ecology and plant ecology, which look at the differences and similarities of various plants in various climates and habitats. In addition, physiological ecology, or ecophysiology, studies the responses of the individual organism to the environment, while population ecology looks at the similarities and dissimilarities of populations and how they replace each other over time.

Finally, it is important to note that ecology is not synonymous with environment, environmentalism, natural history or environmental science. It is also different from, though closely related to, the studies of evolutionary biology, genetics, and ethology.

Ex. 10. Prepare reports using Internet or other sources (catalogues, magazines, books, etc.) about the latest news, achievements in the field concerning the topic of the chapter

CHAPTER 3 ECOSYSTEMS

Text 1

The Ecosystem Concept

Some consider the ecosystem (abbreviation for “ecological system”) to be the basic unit in ecology. An ecosystem is an ecological unit consisting of a biotic **community** together with its environment. Examples include a **swamp**, a **meadow** and a river. It is generally considered smaller than a biome (“major life zone”), which is a large, geographic region of the earth’s surface with distinctive plant and animal communities. A biome is often viewed as a grouping of many ecosystems sharing similar features, but is sometimes defined as an **extensive** ecosystem spread over a wide geographic area.

The first principle of ecology is that each living organism has an ongoing and continual relationship with every other element that **makes up** its environment. The ecosystem is composed of two **entities**, the **entirety** of life (the community, or biocoenosis) and the medium that life exists in (the biotope). Within the ecosystem, species are connected and dependent upon one another in the food chain, and exchange energy and matter between themselves and with their environment.

The concept of an ecosystem can apply to units of variable size, such as a pond, a field or a piece of deadwood. A unit of smaller size is called a microecosystem. For example, an ecosystem can be a stone and all the life under it. A mesoecosystem could be a forest, and a macroecosystem a whole ecoregion with its **watershed**.

Some of the main questions when studying an ecosystem include:

How could the colonization of a **barren** area be carried out?

What are the ecosystem’s dynamics and changes?

How does an ecosystem interact at local, regional and global scale?

Is the current state stable?

What is the **value** of an ecosystem?

How does the interaction of ecological systems provide benefit to humans, especially in the provision of healthy water?

Ecosystems are not isolated from each other, but are interrelated. For example, water may circulate between ecosystems by the means of a river or ocean current. Water itself, as a liquid medium, even defines ecosystems. Some species, such as salmon or freshwater **eels** move between marine systems and fresh-water systems. These relationships between the ecosystems lead to the concept of a biome.

Active Vocabulary

barren – пустир, пустище

biocoenosis pl (biocoenoses) – сукупність популяцій різних видів
community – угруповання, ценоз, фітоценоз, зооценоз
eel – вугор, мінога, мурена
entirety – повнота, цілісність
entity – буття, існування
extensive – великий, широкий
makeup – складати, збирати
meadow – луг, лучка
swamp – болото, драговина, трясовина
value – цінність, важливість, корисність
watershed – водозбірна площа; басейн (ріки)

Text 2

What Is an Ecosystem

An ecosystem consists of the biological community that **occurs** in some locale, and the physical and chemical factors that make up its nonliving or abiotic environment. There are many examples of ecosystems – a pond, a forest, an **estuary**, grassland. The **boundaries** are not fixed in any objective way, although sometimes they seem **obvious**, as with the shoreline of a small pond. Usually the boundaries of an ecosystem are chosen for practical reasons having to do with the goals of the particular study.

The study of ecosystems mainly consists of the study of certain processes that link the living, or biotic, components to the nonliving, or abiotic, components. Energy transformations and biogeochemical cycling are the main processes that **comprise** the field of ecosystem ecology. As we learned earlier, ecology generally is defined as the interactions of organisms with one another and with the environment in which they occur. We can study ecology at the level of the individual, the population, the community and the ecosystem.

Studies of individuals are concerned mostly about physiology, **reproduction**, development or **behavior**, and studies of populations usually focus on the habitat and resource needs of individual species, their group behaviors, population growth, and what limits their **abundance** or causes **extinction**. Studies of communities examine how populations of many species interact with one another, such as **predators** and their **prey**, or competitors that share common needs or resources.

In ecosystem ecology we put all of this together and, **insofar** as we can, we try to understand how the system operates as a whole. This means that, rather than worrying mainly about particular species, we try to focus on major functional aspects of the system. These functional aspects include such things as the amount of energy that is produced by photosynthesis, how energy or materials flow along the many steps in a food chain, or what controls the rate of **decomposition** of materials or the rate at which **nutrients** are **recycled** in the system.

Active Vocabulary

abundance – велика кількість, надлишок

behavior – поведінка

boundary – кордон, межа

comprise – включати, становити, охоплювати, входити до складу

decomposition – розкладання, розпад, розщеплення

estuary – гирло (ріки), дельта, морський рукав

extinction – вимирання, припинення роду, зникнення (з лиця землі)

insofar – до такої міри

nutrient – живильна, поживна речовина

obvious – явний, очевидний, помітний, видимий

occur – зустрічатися, траплятися

predator – хижак

prey – жертва, здобич

recycle – повторно використовувати, повертати в оборот (відходи виробництва)

reproduction – відтворення, розмноження

Text 3

Processes of Ecosystems

Energy enters the biological system as light energy, or photons, is transformed into chemical energy in organic molecules by **cellular** processes including photosynthesis and **respiration**, and **ultimately** is converted to heat energy. This energy is **dissipated**, meaning it is lost to the system as heat; once it is lost it cannot be recycled. Without the continued **input** of solar energy, biological systems would quickly shut down. Thus the earth is an open system with respect to energy.

Elements such as carbon, nitrogen or phosphorus enter living organisms in a variety of ways. Plants obtain elements from the surrounding atmosphere, water or soils. Animals may also obtain elements directly from the physical environment, but usually they obtain these mainly as a **consequence** of consuming other organisms. These materials are transformed biochemically within the bodies of organisms, but sooner or later, due to excretion or **decomposition**, they are returned to an inorganic state. Often bacteria complete this process, through the process called decomposition or mineralization.

During decomposition these materials are not destroyed or lost, so the earth is a closed system with respect to elements (with the exception of a meteorite entering the system now and then). The elements are cycled endlessly between their biotic and abiotic states within ecosystems. Those elements whose supply tends to limit biological activity are called **nutrients**.

Active Vocabulary

cellular – клітинний, клітинної будови

consequence – наслідок, результат
decomposition – розкладання, розпад, розщеплення
dissipate – розсіювати, розганяти, розсіюватися, зникати
input – внесок
nutrient – живильна, поживна речовина
respiration – дихання
ultimately – в кінці кінців, в кінцевому рахунку, в остаточному підсумку

Ex. 1. Fill in the blanks with appropriate words

Millions, destroyed, problem, lost, people, lightning, replanted, properly, cost, mines, thrown, hectares.

Forest fires are a big 1) _____ in many parts of the world. Millions of 2) _____ of forests are damaged by fires every year. In some places whole forests are 3) _____.

Some fires are produced by 4) _____ and other natural causes. Most fires, however, are caused by 5) _____. Cigarette ends are 6) _____ away. Campfires are not put out 7) _____. Land is burnt by farmers before it is 8) _____. Often fires are used to clear forests for roads, 9) _____ or farms. About 37% of fires are started deliberately.

Fires 10) _____ a lot of money. 11) _____ of dollars are spent on fighting fires, and in some places new forests are planted. However, most of the trees are not replaced, so every year thousands of hectares of forests are 12) _____ forever.

Ex. 2. Join these sentences using the words in brackets

1. The soil is very thin. The soil is protected by the trees. (but)
2. A change in any one component of an ecosystem will cause subsequent changes throughout the system. Ecosystem components are so interconnected. (and)
3. The Africans catch fish in the rivers. The rivers are polluted by mud. (but)
4. Primary consumers such as insects and small fish may feed on some of plant matter. Insects and small fish are in turn eaten by secondary consumers, such as salmon. (and)
5. The aborigines have had enough. The aborigines have blocked the roads. (and)
6. Greedy politicians own the timber companies. Greedy politicians don't care about the people. (but)
7. The soil is not very rich. The soil cannot produce good crops. (and)
8. Humans are having effects on the very ecosystems on which they depend. As human populations increase and their encroachment on natural habitats expand. (but)
8. The young people will have no home. The young people will move to the

cities. (and)

9. Diversity also involves how numbers of individual species are apportioned.

Diversity involves not only the number of species in a community. (but)

10. The forest provides everything for the local people. The forest is being destroyed. (but)

11. The forest is being destroyed. The forest will not be replaced. (and)

12. The noise frightens the animals. The noise drives the animals away. (and)

Ex. 3. Complete the beginning of the sentences

1. Plants, animals, and other life forms on the Earth	a) of any terrestrial biome.
2. Ecosystems can be as small as a flea's intestines	b) and their relationship to their environments.
3. The entire Earth is also an ecosystem,	c) live together in ecosystems.
4. Biomes encompass all of the ecosystems	d) as the food chain.
5. Tropical rain forests have the most biodiversity	e) or as large as the Amazon basin.
6. Coral reefs are the most diverse	l) or herbivores, the plant-eating animals.
7. Ecosystems provide services to the planet	g) therefore, ecosystems can be nested inside each other.
8. Ecology is the study of the distribution and abundance of species	k) are primary producers, mostly photosynthesizers.
9. One of the primary concerns of ecologists is	i) that have similar climate and organisms.
10. This passing of energy is described	j) of any ocean ecosystem.
11. At the base of every food chain (the first trophic level)	h) and all of its inhabitants.
12. The second trophic level is inhabited by primary consumers	f) how food energy is passed from organisms at one trophic level (or energy level) to organisms at the next trophic level.

Ex. 4. Make up questions to which the italicized words are the answers

1. A *biome* is a large geographical region with a distinctive climate.

2. Plants, animals and microorganisms of a biome may be geographically separate but will have *similar adaptations*.

3. Grazing animals of the prairie biome are fast moving and *are adapted for* eating grass.

4. Terrestrial climate zones *are defined* primarily by temperature.
5. Ecosystems that are *found in polar regions* resemble those found on tops of high mountains.
6. New Orleans receives *57 inches (145 cm) of rainfall* annually due to its position near the Gulf of Mexico.
7. Lower elevations are dominated by lower latitude biomes, such as *desert or tropical*.
8. *To avoid wind and frigid temperatures*, plants grow small and close to the ground in tundra.
9. The tundra biome has low species diversity since few organisms have been able to adapt to its *harsh climatic conditions*.
10. *During the summer* insects flourish and birds and large mammals come out of hibernation.
11. The largest terrestrial biome is the boreal forest, which stretches *across Canada and northern Eurasia*.
12. Canada's boreal forest *is incredibly important for* the 3 billion North American songbirds that nest there each summer.

Ex. 5. Translate the words into Ukrainian and use them to make up your own sentences

affect
 bottom muck
 carnivores
 consumers
 decay
 decomposers
 determine
 herbivores
 omnivores
 plantfeeders
 polly-wogs
 producers
 provide
 substances

Ex. 6. Translate the text into Ukrainian paying attention to the italicized words

To learn more about the living parts of an ecosystem, you might visit a small pond. A pond ecosystem usually contains all of the nonliving factors mentioned above. The sun *provides* the energy of life. The climate *determines* how much rain falls in the area, the length of the growing season for plants, and whether the pond is covered with ice in winter. Theses factors can have a great effect on the life that the pond supports. The underlying rocks and soils

affect the chemistry of the water, which in turn helps determine what kinds of plants and animals live in the water. And the life of the pond affects the nonliving environment: when plants and animals die, their remains settle to the bottom and *decay* there, adding to the *bottom muck* and making the pond more shallow.

The living parts of the pond ecosystem (and of any ecosystem) can be divided into three groups:

Producers are green plants which capture radiant energy from the sun and convert it into food energy. They also take *substances* such as carbon dioxide, water, oxygen, nitrogen and sulfur from the environment and convert it into plant material that is used as food by other organisms. In fact, green plants might better be called converters than producers. Regardless, all other life in the pond ecosystem depends on green plants. The same is true of forests, prairies, tundra and oceans.

Consumers are animals that depend on green plants for food. Some feed directly on the plants while others eat animals that have eaten plants. The *plantfeeders* include tiny animals called zooplankton, which eat phytoplankton, and larger organisms, such as *polly-wogs*, insects and snails, which eat larger plants. The planteaters, or *herbivores*, get their energy directly from the green plants. The other consumers are either *carnivores* (which usually eat herbivores) or *omnivores* (which eat both plants and animals). The carnivores in a pond ecosystem include fish, herons, and insects such as giant water beetles. Raccoons and people are omnivores.

Decomposers are the third major group of organisms. They use dead plant and animal material as food. The decomposers break down this material, getting the energy they need to live and releasing minerals and other nutrients back into the environment. Most decomposers are simple plants such as bacteria and fungi. These microscopic organisms can be found everywhere in a pond, but are especially abundant at the bottom, where the dead parts of plants and animals settle. On land, decomposers are most abundant at or near the surface of the soil.

Ex. 7. Answer the following questions

1. What factors does a pond ecosystem contain?
2. What does the climate determine?
3. How does the life of the pond affect the nonliving environment?
4. What is the chemistry of the water affected by?
5. The living parts of any ecosystem is divided into four groups, isn't it?
6. What is the function of producers?
7. What substances are converted by the producers into plant material?
8. What does the life in the pond ecosystem depend on?
9. What organisms belong to plantfeeders?
10. Who can get energy directly from the green plants?

11. Raccoons and people are carnivores, aren't they?
12. Where can one find most decomposers?

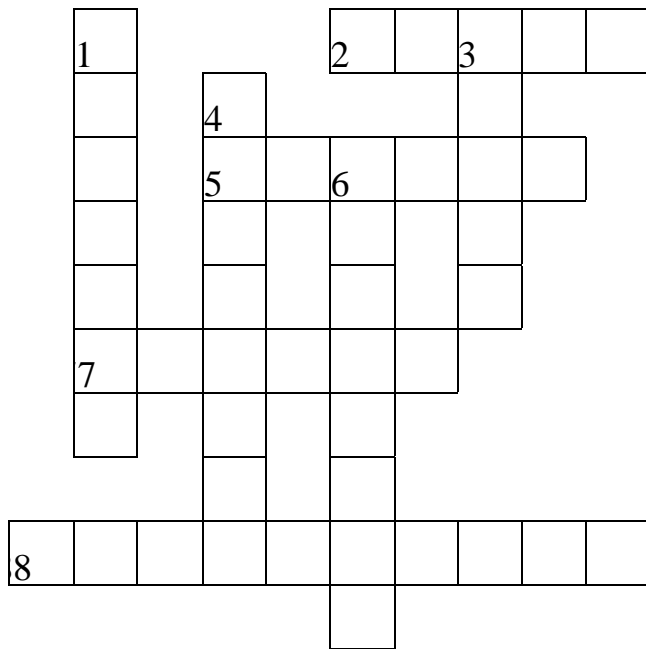
Ex. 8. Read the text and solve the crossword puzzle

Waves, surf, seas and swells. What's the difference? All four terms refer to the conditions of a large body of water's surface. The generic term *wave* refers to the undulations of the water's surface. In their graceful rise and fall, waves are a combination of sea and swell.

Swell results from the wind's past action on the water. It has a gentler, more rolling action than that of a wave. You can see swells in the open water even when the current wind is calm. The distance between successive crests is called the wavelength.

Sea refers to the distinct features of the wave, such as crests, caused by wind blowing across the water's surface.

Surf is the interaction of the waves and the shoreline. It is influenced by the height and energy of the waves. The topography of the coast also affects surf. A beach with a gentle, offshore slope, for example, will have small surf. A beach that drops off sharply will have larger surf.



Across

- 2) colorless liquid found in oceans
- 5) points toward; assigns meaning to
- 7) tops or summits of waves
- 8) has an effect on

Down

- 1) the outside of something
- 3) words or phrases with special meanings in science, art, etc.

- 4) describes smooth, beautiful ease of movement
- 6) qualities or characteristics

Ex. 9. It's interesting to know: Making Mold

Everyone knows that the Earth is teeming with all kinds of plants and animals. Biologists have identified more than a million animals and nearly 400,000 different types of plants. But plants and animals aren't the only organisms living on Earth. Another classification of living things is called the fungus kingdom.

Molds, yeasts and mushrooms are fungi. Mold grows on damp, decaying things like discarded food or dead trees. To see for yourself, try the following experiment.

Fill three small cups half full of coffee, and put three slices of bread in clear plastic sandwich bags.

Then place one bag of bread and one cup of coffee in each of these places: on a sunny windowsill; in a dark cabinet or closet; in the refrigerator.

Every day for two weeks, use a magnifying glass to observe the bread and coffee. Take notes on any changes you see. Draw a sketch if something appears.

If you don't see any change, keep checking for another two weeks.

What will you eventually discover? Fuzzy white stuff will appear on the coffee. White, green or black stuff will appear on the bread. This is mold – a type of living, growing thing that is neither a plant nor an animal.

Ex. 10. Prepare reports using Internet or other sources (catalogues, magazines, books, etc.) about the latest news, achievements in the field concerning the topic of the chapter

CHAPTER 4 FUNCTIONING OF ECOSYSTEMS

Text 1

The Transformation of Energy

The transformations of energy in an ecosystem begin first with the input of energy from the sun. Energy from the sun is **captured** by the process of photosynthesis. Carbon dioxide is combined with hydrogen (**derived** from the splitting of water molecules) to produce carbohydrates (CHO). Energy is stored in the high energy **bonds** of adenosine triphosphate or ATP.

The **prophet** Isaaah said “all flesh is grass”, earning him the title of first ecologist, because virtually all energy available to organisms **originates** in plants. Because it is the first step in the production of energy for living things, it is called primary production. **Herbivores** obtain their energy by consuming plants or plant products, **carnivores** eat herbivores, and **detritivores** consume the droppings and carcasses of us all.

Here is a simple food chain, in which energy from the sun, captured by plant photosynthesis, flows from trophic level to trophic level via the food chain. A trophic level is composed of organisms that make a living in the same way that is they are all primary producers (plants), primary consumers (herbivores) or secondary consumers (carnivores). Dead **tissue** and waste products are produced at all levels. **Scavengers**, detritivores and decomposers collectively account for the use of all such “waste” – consumers of carcasses and fallen leaves may be other animals, such as crows and beetles, but ultimately it is the microbes that finish the job of decomposition. Not surprisingly, the amount of primary production varies a great deal from place to place, due to differences in the amount of solar radiation and the availability of nutrients and water.

For some reasons, energy transfer through the food chain is inefficient. This means that less energy is available at the herbivore level than at the primary producer level, less yet at the carnivore level and so on. The result is a pyramid of energy, with important implications for understanding the quantity of life that can be supported.

Usually when we think of food chains we visualize green plants, herbivores and so on. These are referred to as **grazer** food chains, because living plants are directly consumed. In many circumstances the principal energy input is not green plants but dead organic matter. These are called detritus food chains. Examples include the forest floor or a woodland stream in a forested area, a salt marsh, and most obviously, the ocean floor in very deep areas where all sunlight is **extinguished** 1000’s of meters above.

Finally, although we have been talking about food chains, in reality the organization of biological systems is much more complicated than can be represented by a simple “chain”. There are many food links and chains in an

ecosystem, and we refer to all of these **linkages** as a food web. Food webs can be very complicated, where it appears that “everything is connected to everything else”, and it is important to understand what are the most important linkages in any particular food web.

Active Vocabulary

bond – хімічний зв’язок

capture – захопити, взяти силою, завоювати (приз)

carnivore – м’ясоїдна тварина

derive – встановлювати, виникати, походити, бути наслідком

detritivore – тварина, що харчуються мертвими організмами, особливо рослинними продуктами розпаду

extinguish – гасити

grazer – тварина, яка пасеться

herbivore – трав’яїдна тварина

linkage – з’єднання, зчеплення

originate – давати початок, започатковувати, породжувати, створювати

prophet – провісник, пророк, ознака, прикмета

scavenger – тварина, птах або риба, що харчуються падлом

tissue – тканина

Text 2

Controls on Ecosystem Function

Now that we have learned something about how ecosystems are put together and how materials and energy flow through ecosystems, we can better address the question of “what controls ecosystem function”? There are two dominant theories of the control of ecosystems. The first, called bottom-up control, states that it is the nutrient **supply** to the primary producers that ultimately controls how ecosystems function. If the nutrient supply is increased, the resulting **increase** in production of autotrophs is **propagated** through the food web and all of the other trophic levels will **respond** to the increased **availability** of food (energy and materials will cycle faster).

The second theory, called top-down control, states that predation and grazing by higher trophic levels on lower trophic levels ultimately controls ecosystem function. For example, if you have an increase in predators, that increase will result in fewer grazers, and that decrease in grazers will result in turn in more primary producers because fewer of them are being eaten by the grazers. Thus the control of population numbers and overall productivity “cascades” from the top levels of the food chain down to the bottom trophic levels.

So, which theory is correct? Well, as is often the case when there is a clear **dichotomy** to choose from, the answer lies somewhere in the middle. There is

evidence from many ecosystem studies that both controls are operating to some degree, but that neither control is complete. For example, the “top-down” effect is often very strong at trophic levels near to the top predators, but the control weakens as you move further down the food chain. Similarly, the “bottom-up” effect of adding nutrients usually stimulates primary production, but the stimulation of secondary production further up the food chain is less strong or is absent.

Thus we find that both of these controls are operating in any system at any time, and we must understand the relative importance of each control in order to help us to predict how an ecosystem will behave or change under different **circumstances**, such as in the face of a changing climate.

Active Vocabulary

availability – наявність, доступність

circumstances – обставини, умови, стан справ (in / under the circumstances – за даних обставин)

dichotomy – послідовний поділ на дві частини, дихотомія

increase – збільшення, зростання, ріст, розширення

propagate – розмножувати, розводити, плодитися

respond – реагувати на що-небудь

supply – постачання, поставка

Ex. 1. Fill in the blanks with appropriate words

Secondary, compare, transfer, biomass, plants, eaten, trophic, available, energy, material, amount, primary.

In every ecosystem energy is trapped and stored by 1) _____ – the primary producers. Some of this 2) _____ is transferred to the animals that eat the plants. They are the 3) _____ consumers. Animals that eat other animals are known as 4) _____ consumers, because they receive the energy from the plants second hand, via the primary consumers. In some circumstances, the secondary consumers are 5) _____ by the third stage consumers. Ecologists refer to each of these stages as a 6) _____ level. At each stage, some energy is passed to the next level, where it is then stored as plant 7) _____. Some energy is always lost in the 8) _____ from one trophic level to the next. The 9) _____ of living material in each trophic level is known as the standing crop, whether plant or animal. This represents the amount of potential energy 10) _____ to the next level. The size of the standing crop can be expressed as 11) _____. Ecologists can use these figures to 12) _____ ecosystems and understand how they work.

Ex. 2. Open the brackets and put the verbs into the proper forms

During, from, into, down, by, of, in, for, between, to, within, out.

Energy is transferred 1) _____ organisms in food webs from producers to consumers. The energy is used by organisms to carry 2) _____ complex tasks.

The vast majority of energy that exists in food webs, originates 3) _____ the sun and is converted 4) _____ chemical energy by the process of photosynthesis in plants. A small proportion of this chemical energy is transformed directly into heat when compounds are broken 5) _____ 6) _____ respiration in plants. The majority 7) _____ the chemical energy is stored in plants being transformed into other forms 8) _____ an assortment of consumers, such as cows, rabbits, horses, sheep, caterpillars and other insects eating plants.

Some of the stored chemical energy in a producer, such as grass is stored as chemical energy 9) _____ the fat or protein in the first order consumers that eat the grass. This energy is available 10) _____ higher order consumers. At each stage of a food chain, most of the chemical energy is converted 11) _____ other forms such as heat, and is not remained 12) _____ the ecosystem.

Ex. 3. Multiple choice. Identify the letter of the choice that best completes the statement or answers the question

1. *Carnivores eat _____ .*

- a) herbivores
- b) plants
- c) mostly green plants
- d) trees

2. *What is a food chain?*

- a) it shows how each living thing gets its food
- b) it shows how food moves in an ecosystem
- c) the ratio of herbivores to carnivores
- d) none of the above

3. *Herbivores eat _____.*

- a) microorganisms
- b) everything
- c) lot of meat
- d) plants

4. *Most animals are part of _____ food chains.*

- a) two
- b) four
- c) many
- d) three

5. *What percent of the sunlight energy is transformed by the food chain?*

- a) 90%
- b) 20%
- c) 50%
- d) 10%

6. *What is an ecosystem?*

- a) ecosystems are functional units that result from the interactions of abiotic and cultural components
- b) ecosystems are functional units that result from the interactions of abiotic, biotic, and components
- c) ecosystems are functional units that result from the interactions of abiotic, biotic, and cultural components
- d) ecosystems are functional units that result from the interactions of cultural components

7. *Which is not a primary resource in the ecosystem?*

- a) space
- b) water
- c) food
- d) minerals

8. *Biomes are _____.*

- a) areas with different animals
- b) areas of earth with different climate, plants and animals
- c) areas with similar climate
- d) areas of earth with similar climate, plants and animals

9. *Which process uses the energy from the sunlight?*

- a) photosynthesis
- b) decomposition
- c) chlorophyll
- d) ATP

10. *Further along the food chain _____ energy is available.*

- a) more
- b) less

11. *When organisms adjust their tolerance to abiotic factors, the process is called _____.*

- a) adaptation
- b) allocation
- c) adoption
- d) warming up

12. *Which are abiotic factors?*

- a) fish
- b) fungi
- c) water
- d) fox

Ex. 4. Make up questions to which the italicized words are the answers:

1. An ecosystem consists of *a number of living organisms and their physical environment*.
2. There are *6 major components* in an ecosystem.
3. The *main* processes in ecosystems include food chains, materials cycles, development and evolution.
4. The Sun's energy *travels through* an ecosystem.
5. *An ecosystem* exists in a state of equilibrium.
6. The proper transfer of energy through an ecosystem by the producers, the consumers and the decomposers is called *a food chain*.
7. The evolution of an ecosystem *is caused by* factors, inside and outside it.
8. Today life on the Earth is in danger *because* of wildlife extinction.
9. Man himself destroys *the equilibrium of ecosystem*.
10. Chemical substances move *from the nonliving environment to living things*.
11. Materials cycles include cycles of *nitrogen, carbon, oxygen, water and mineral salts*.
12. Bacteria and fungi enable chemical substances to return *to the physical environment*.

Ex. 5. Translate the words into Ukrainian and use them to make up your own sentences

biome
characteristic
determine
distinct
distinguish
equator
latitude
prairie
prevail
topography

Ex. 6. Translate the text into Ukrainian paying attention to the italicized words

A *biome* is a major land ecosystem, a large land area that has a *distinct* kind of plant life. It may include ecosystems of many kinds, but the whole area is *distinguished* by a particular kind of plant life such as grassland, rain forest, or whatever characterizes the biome.

The location of biomes over the earth is *determined* mostly by climate, especially by rainfall and temperature. And climate itself is determined by many factors including *latitude* (distance from the *equator*), ocean currents, topography, and the *prevailing* winds.

The biomes themselves don't begin and end sharply. They blend together at their borders, sometimes over a span of many miles. This zone between two biomes or between two ecosystems is called an ecotone. There are ecotones all around us – the shore of a pond, the bank of a stream, the edge between a forest and a meadow. Usually there is a great variety of life in ecotones because animals living there have the best of two worlds, getting food, shelter, and other necessities from two different ecosystems.

Within the boundaries of biomes you may find areas with plant life quite different from that of the whole biome. Often this is an effect of *topography*. The climate at the top of a mountain ridge is cooler than that of the surrounding land, so plants usually found in a more northern biome may grow on the ridge.

Even though the word “biome” may be new to you, you often think in terms of these major ecosystems. The words “desert” or “*prairie*” bring to mind pictures of these areas, with their *characteristic* plants and animals.

Ex. 7. Choose the correct answer or answer the following questions

1. A biome is characterized by a particular kind of _____
 - a) human life
 - b) animal life
 - c) plant

2. What may biome include?

3. What is the whole area of a biome distinguished by?

4. Location of biomes is determined by _____
 - a) people
 - b) climate
 - c) industry

5. What factors may influence a biome?

6. Do the biomes have some definite borders?

7. Zones between two biomes or between two ecosystems are called _____
 - a) shelters
 - b) ecogeography
 - c) ecotones

8. Give the examples of ecotones.

9. Is there any variety of life in ecotones?

10. Topography can effect _____

- a) distance from the equator
- b) types of plant life
- c) gravitational forces

11. Where can one find an effect of topography?

12. Ecotones are _____

- a) zones between two biomes or two ecosystems
- b) areas with a distinct kind of plant life
- c) places of equal pressure

Ex. 8. Read the text without a dictionary. Then write true (T) or false (F) for the statements, correct the false statements

Deserts cover about 14 per cent of the earth's land surface and occur on all continents. Only ten inches of rain or less falls each year, and much of this evaporates quickly because of the high temperatures, frequent strong winds, and bright, cloudless days. Desert climates do vary however. The more northern deserts are often bitter cold in winter, with some snowfall. The Sahara Desert of northern Africa is the hottest and biggest; the Gobi of Mongolia is the coldest.

As in all biomes, the desert is home for plants and animals that are specially adapted for life in that environment. Many desert plants have small leaves or no leaves; this helps them conserve water. Cactus plants store water and swell up during the rainy season, then shrink as the dry months pass and most of the water is used. Some plants avoid the problem of water supply entirely. During the brief rainy season they sprout, grow, and flower. For a few days the desert is a colorful carpet of flowers. Then the plants die. Their seeds have tough coats which protect them until the next rainfall.

Most desert mammals drink little or no water. They get the water they need from their food, and stay in burrows or in shade during the heat of the day. Some even go into a deep sleep during the driest months of the year.

Compared to the deciduous forests and grasslands, deserts have not been changed much by man. But people are turning to deserts more and more for farmland and home sites. Desert soils are often fertile and produce abundant crops if irrigation water is brought to them. To get this water, people sometimes tap supplies that have been stored for centuries deep beneath the desert floor. Once this "mined" water is gone, the farms have to be abandoned unless another source is found.

Other biomes include grassland, the tropical deciduous forest, the savanna, and the Mediterranean scrub forest. The last kind occurs where there are mild, wet winters and long, dry summers.

1. Many desert plants have small leaves or no leaves and this helps them conserve water.
2. Some plants and animals can live without water.
3. Some desert mammals go into a deep sleep during the wettest months of the year.
4. During the brief dry season the desert looks like a colorful carpet of flowers.
5. People are afraid of turning to deserts for farmland and home sites.
6. Much of the rain evaporates quickly because of low temperature and frequent strong winds.
7. Plant seeds have tough coats which protect them until the next rainfall.
8. Some desert plants shrink as the dry months pass and most of the water is not used.
9. Once the water is gone, the farms have to be abandoned unless another source of water is found.
10. Deserts are incredibly rich with plant and animal life.
11. Some plants avoid the problem of water supply entirely.
12. Like the plants, desert animals must live on as little water as possible.

Ex. 9. It's interesting to know: Animal Intelligence

Many animals, from a flea to an elephant, can be taught to perform tricks. But these acts tell us little about learning ability. An animal's intelligence is measured by how it manages a new situation and how well it solves problems.

The maze is one method scientists use to test animal intelligence. A maze contains a number of confusing pathways. In a scientific test, the animal's task is to discover the path that leads to food or some other reward. How many attempts does the animal make to find its way through the blind alleys of the maze? And how long does the animal remember what it has learned? The answers to these questions are strong indications of the animal's learning and memory capacities.

Which animals are smarter? In learning how to solve new problems, vertebrates are usually superior to invertebrates. Chimpanzees, dogs, cats, and rats make high scores on various tests. But there are wide differences among individual animals of the same species. Some bees, ants, and cockroaches, for example, are much brighter than other members of the same colony.

Here are a few fascinating facts about animal intelligence:

Many fish have color vision and can recognize each other by color patterns on the head.

Squirrels, like some birds, have a sense of numbers.

An octopus can run mazes and differentiate between a circle, a square, and a triangle.

Toads and frogs learn to respond to their caretakers

Ex. 10. Prepare reports using the Internet or other sources (catalogues, magazines, books, etc.) about the latest news, achievements in the field concerning the topic of the chapter

CHAPTER 5 BIOSPHERE AND ITS IMPORTANCE

Text 1

Biosphere

Biosphere, relatively thin life-supporting **stratum** of Earth's surface, extending from a few kilometres into the atmosphere to the deep-sea **vents** of the ocean. The biosphere is a global ecosystem composed of living organisms (biota) and the abiotic (nonliving) factors from which they **derive** energy and nutrients.

Before the coming of life, Earth was a **bleak** place, a rocky globe with **shallow** seas and a thin band of gases – largely carbon dioxide, carbon monoxide, molecular nitrogen, hydrogen sulfide, and water **vapour**. It was a **hostile** and **barren** planet. This strictly inorganic state of the Earth is called the geosphere; it consists of the lithosphere (the rock and soil), the hydrosphere (the water), and the atmosphere (the air). Energy from the Sun **relentlessly** bombarded the surface of the primitive Earth, and in time – millions of years – chemical and physical actions produced the first evidence of life: formless, jellylike **blobs** that could collect energy from the environment and produce more of their own kind. This generation of life in the thin outer layer of the geosphere established what is called the biosphere, the “zone of life”, an energy-**diverting** skin that uses the matter of the Earth to make living substance.

The biosphere is a system characterized by the continuous cycling of matter and an **accompanying** flow of solar energy in which certain large molecules and cells are self-reproducing. Water is a major **predisposing** factor, for all life depends on it. The elements carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur, when combined as proteins, lipids, carbohydrates, and nucleic acids, provide the building blocks, the fuel, and the direction for the **creation** of life. Energy flow is required to maintain the structure of organisms by the formation and splitting of phosphate bonds. Organisms are cellular in nature and always contain some sort of enclosing membrane structure, and all have nucleic acids that store and **transmit** genetic information.

All life on Earth depends ultimately upon green plants, as well as upon water. Plants **utilize** sunlight in a process called photosynthesis to produce the food upon which animals feed and to provide, as a by-product, oxygen, which most animals require for **respiration**. At first, the oceans and the lands were **teeming** with large numbers of a few kinds of simple single-celled organisms, but slowly plants and animals of increasing **complexity evolved**. Interrelationships developed so that certain plants grew in association with certain other plants, and animals associated with the plants and with one another to form communities of organisms, including those of forests, grasslands, deserts, dunes, bogs, rivers, and lakes. Living communities and their nonliving

environment are **inseparably interrelated** and constantly interact upon each other. For **convenience**, any segment of the landscape that includes the biotic and abiotic components is called an ecosystem.

Active Vocabulary

accompany – супроводжувати

barren – безплідний, неродючий

bleak – холодний, суворий (про погоду), позбавлений рослинності, сумний, похмурий

blob – безформний предмет

complexity – складність, заплутаність, що-небудь складне

convenience – зручність; for convenience, for convenience's sake – для зручності

creation – утворення, виникнення

derive – встановлювати, простежувати походження, виникати, походити, впливати, бути наслідком

diverting – розважальний, забавний

evolve – розвиватися, еволюціонувати; (into) розвиватися, перетворюватися

hostile – ворожий, неприязний, недружелюбний

inseparably – невіддільно, неподільно; нерозривно; нерозлучно

interrelate (with) – взаємозв'язувати, знаходитися у взаємозв'язку

predispose – привертати, схилити, створювати схильність

relentlessly – безжально

respiration – дихання

shallow – мілке місце, мілководдя, мілина, обмілина

stratum – шар, пласт; формація

teem – кишіти, буюти

transmit – передавати

utilize – використовувати, утилізувати

vapour – пара, пар, випаровування, водяна пара

vent – вхідний або вихідний отвір; вентиляційний отвір; віддушина, повітряний клапан

Text 2

The Importance of the Biosphere

The continued functioning of the biosphere is dependent not only on the **maintenance** of the **intimate** interactions among the myriad species within local communities but also on the looser yet **crucial** interactions of all species and communities around the globe. The Earth is **blanketed** with so many species and so many different kinds of biological communities because populations have been able to adapt to almost any kind of environment on Earth through natural selection. Life-forms have evolved that are able to survive in the ocean depths, the **frigid** conditions of Antarctica, and the near-boiling temperatures of geysers.

The great richness of adaptations found among different populations and species of living organisms is the Earth's greatest resource. It is a richness that has evolved over millions of years and is **irreplaceable**.

It is therefore startling to realize that our **inventory** of the Earth's diversity is still so incomplete that the total number of living species cannot be **estimated** more closely than between 3 and 30 million species. Decades of continuous research must be carried out by systematists, ecologists, and geneticists before the inventory of biodiversity provides a more **accurate** count. The research has been slow. Only recently, as the extinction rate of species has been increasing rapidly, have societies begun to realize the interdependence of species. To **sustain** life on Earth, more than the few animal and plant species used by humans must be preserved. The flow of energy and the cycling of nutrients through ecosystems, the regulation of populations, and the stability of biological communities, all of which support the continued maintenance of life, rely on the **diversity** of species, their adaptations to local physical conditions, and their coevolved relationships.

Despite the limited scientific knowledge of most species, ecological studies during the 20th century made great **headway** in **unraveling** the mechanisms by which organisms coevolve with one another and adapt to their physical environment, thereby shaping the biosphere.

The need to understand how the biosphere functions has never been greater. When human population levels were low and technological abilities **crude**, societies' **impact** on the biosphere was relatively small. The increase in human population levels and the harvesting of more of the Earth's natural resources has altered this situation, especially in recent decades. Human activities are causing major alterations to the patterns of energy flow and nutrient cycling through ecosystems, and these activities are **eliminating** populations and species that have not even been described but which might have been of central importance to the maintenance of ecosystems.

Active Vocabulary

accurate – точний, правильний

blanket – покривати

crucial – вирішальний, ключовий

crude – сира нафта, нафта-сирець

diversity – різноманітність, різноманіття

eliminate – знищувати, ліквідувати

estimate – оцінювати, давати оцінку, виносити судження

frigid – холодний

headway – просування вперед, прогрес

impact – вплив, наслідки

intimate – близький

inventory – список, перелік

irreplaceable – незамінний, невідшкодовний

maintenance – підтримка, збереження, продовження

sustain – надавати підтримку, надавати сил, підкріплювати, підтримувати, не дати припинитися, обірватися

unravel – розгадувати

Ex. 1. Fill in the blanks with appropriate words

Spheres, bottom, biosphere, surface, describe, hydrosphere, trenches, level.

The 1) _____ is made up of the parts of Earth where life exists. The biosphere extends from the deepest root systems of trees, to the dark environment of ocean 2) _____, to lush rain forests and high mountaintops.

Scientists 3) _____ the Earth in terms of spheres. The solid surface layer of the Earth is the lithosphere. The atmosphere is the layer of air that stretches above the lithosphere. The Earth's water — on the surface, in the ground, and in the air — makes up the 4) _____.

Since life exists on the ground, in the air, and in the water, the biosphere overlaps all these 5) _____. Although the biosphere measures about 20 kilometers (12 miles) from top to 6) _____, almost all life exists between about 500 meters (1,640 feet) below the ocean's 7) _____ to about 6 kilometers (3.75 miles) above sea 8) _____.

Ex. 2. Multiple choice. Identify the letter of the choice that best completes the statement

1. *What is a biosphere?*

- a) any individual living thing
- b) all organisms and the parts of earth where they exist
- c) a chemical process

2. *What is the term for a group of organisms of the same species in a particular area?*

- a) biosphere
- b) ecosystem
- c) population
- d) environment

3. _____ *is the study of interactions among organisms and their environments.*

- a) ecology
- b) biosphere
- c) habitat
- d) ecosystem

4. *The inner layer of the atmosphere that extends about 11 miles above sea level and contains most of the planet's air is called _____.*

- a) troposphere
- b) stratosphere

- c) hydrosphere
- d) biosphere

5. *Volcanoes and earthquakes relate to the following sphere:*

- a) biosphere
- b) atmosphere
- c) geosphere
- d) anthrosphere

6. *What is the part of the Earth that supports life?*

- a) ecology
- b) ecosystem
- c) biotic
- d) biosphere

7. *A place where an organism lives is called its _____.*

- a) biome
- b) habitat
- c) ecosystem
- d) biosphere

Ex. 3. Complete the beginning of the sentences

1. People play an important part n	a) into smaller biotic units called communities.
2. The addition of oxygen to the biosphere allowed	b) a complex community of living and nonliving things functioning as a single unit.
3. The biosphere is sometimes thought of as one large ecosystem	c) is called an ecosystem.
4. The scientists were under the sway of a firm belief	d) national governments and remain under the sovereign jurisdiction of the states where they are located.
5. Ecosystems may be further subdivided	e) that natural systems are self-regulating.
6. For convenience, any segment of the landscape that includes the biotic and abiotic components	f) maintaining the flow of energy in the biosphere.
7. Biosphere reserves are nominated by	g) did not change these views.
8. The life supporting zone of the earth where atmosphere, hydrosphere and lithosphere meet,	h) the questions that climate scientists were starting to bring.

interact and make life possible,	
9. More complex models	i) is known as biosphere.
10. The science of biology was in no condition to answer	j) more complex life-forms to evolve.

Ex. 4. Make up questions to which the italicized words are the answers:

1. Strictly inorganic state of the Earth is called the *geosphere*.
2. *Energy from the Sun* relentlessly bombarded the surface of the primitive Earth.
3. All life on Earth depends *ultimately* upon green plants, as well as upon water.
4. Any segment of the landscape *that includes the biotic and abiotic components* is called an ecosystem.
5. It is a richness that has evolved *over millions of years* and is irreplaceable.
6. Modern deserts appeared *due to human activities*.
7. Several things should be *emphasized*.
8. Sometimes the history of a word can tell us *a lot* about what the word means.
9. Suess *combined* two words to make biosphere.
10. The biosphere is the habitat for *all life on the planet*.

Ex. 5. Translate the words and word combinations into Ukrainian and use them to make up your own sentences

degradation
destroy
due to
human-induced deforestation
illiterate
interaction
prohibitive
sound

Ex. 6. Translate the text into Ukrainian paying attention to the italicized words

People have been *destroying* the biosphere at all times. The modern deserts of Australia, Africa, Central Asia, North and South America appeared *due to the human-induced deforestation* of the continents over tens of thousand years. However, this most dramatic in its consequences biospheric degradation occurred at a slow pace unnoticeable during the life span of a single generation. Modern rates of biospheric *degradation* are catastrophic. The various elements of this degradation are intruding our everyday life. In order to slow this degradation down to the degree when it is unnoticeable by a particular generation, it is necessary to cut down global population numbers by at least tenfold. The stationary stable state of the biosphere with slowly recovering

biospheric functions is only possible if the global human population numbers are reduced hundredfold.

Several things should be emphasized. First, the current global population number of humans, over 6 billion people, is absolutely *prohibitive* with respect to the task of stopping the degradation of the biosphere. Second, the degradation can be ultimately stopped via the radical, hundredfold reduction of population numbers, if only the modern humanity takes on a scientifically *sound* approach in their *interactions* with the biosphere. On the other hand, even if the global human population numbers are dramatically reduced, but we people continue the present-day *illiterate* practices of interacting with the biosphere, in particular, with the natural forests, the biosphere will be destroyed anyway. Appearance of continent-scale deserts during the time period when humans were by far not as numerous as they are today proves the latter statement.

Ex. 7. Read the previous text again. Then write true (T) or false (F) for the statements, correct the false statements:

1. Modern deserts appeared due to human activities.
2. Many generations of people are responsible for the most dramatic consequences of biospheric degradation.
3. Modern rates of biospheric degradation are unnoticeable and not intruding our everyday life.
4. It is necessary to cut down global population numbers by at least tenfold in order to slow down this degradation.
5. The current global population is acceptable if only the modern humanity takes on a scientifically sound approach in their interactions with the biosphere.
6. People should change their attitude towards forests on the planet.
7. It is impossible for the biosphere to recover, it will be destroyed anyway.

Ex. 8. It's interesting to know:

Sometimes the history of a word can tell us a lot about what the word means. The word biosphere was first used by English-Austrian geologist Eduard Suess. It appeared more than a hundred years ago in his book *The Face of the Earth*. Suess combined two words to make biosphere. Bio means life. Sphere refers to the round Earth. The biosphere is the part of our planet that supports life. Suess made up this word because he wanted people to see how all life on Earth is related. He did not want to just focus on living things separately. We now use the word biosphere to explain how all life on Earth is connected. In *The Face of the Earth*, Suess used a plant as an example of his idea. The plant feeds itself through its roots deep in the soil. At the same time, it rises into the air to breathe. The soil and the air are part of two different spheres, yet the plant interacted in both. Suess wrote that on “the surface of continents it is possible to single out an independent biosphere”. The biosphere is the habitat for all life on the planet. The biosphere is home to life in all its forms, with all its relationships.

Ex. 9. Use the following questions to make up your own dialogues

1. What is biosphere?
2. What is biosphere characterized by?
3. What does all life on Earth depend on?
4. Can people control the extinction rate of species?
5. Why should it be controlled?
6. Why is it important to understand how the biosphere functions?
7. What should be done to slow down biospheric degradation?
8. Who was the first to use the word biosphere?

Ex. 10. Prepare reports using the Internet or other sources (catalogues, magazines, books, etc.) about the latest news, achievements in the field concerning the topic of the chapter

CHAPTER 6

POPULATION GROWTH

Text 1

Why Study Population Growth

Population ecology is the study of how populations – of plants, animals, and other organisms – change over time and space and **interact** with their environment. Populations are groups of organisms of the same species living in the same area at the same time. They are described by characteristics that include:

1. population size: the number of individuals in the population
2. population **density**: how many individuals are in a particular area
3. population growth: how the size of the population is changing over time.

If population growth is just one of many population characteristics, what makes studying it so important?

First, studying how and why populations grow (or **shrink!**) helps scientists make better **predictions** about future changes in population sizes and growth rates. This is essential for answering questions in areas such as biodiversity conservation (e.g., the polar bear population is declining, but how quickly, and when will it be so small that the population is at risk for **extinction**?) and human population growth (e.g., how fast will the human population grow, and what does that mean for climate change, resource use, and biodiversity?).

Studying population growth also helps scientists understand what causes changes in population sizes and growth rates. For example, fisheries: scientists know that some salmon populations are declining, but do not necessarily know why. Are salmon populations declining because they have been overfished by humans? Has salmon habitat disappeared? Have ocean temperatures changed causing fewer salmon to survive to **maturity**? Or, maybe even more likely, is it a combination of these things? If scientists do not understand what is causing the declines, it is much more difficult for them to do anything about it. And remember, learning what is probably not affecting a population can be as informative as learning what is.

Finally, studying population growth gives scientists **insight** into how organisms interact with each other and with their environments. This is especially meaningful when considering the potential **impacts** of climate change and other changes in environmental factors (how will populations **respond** to changing temperatures? To **drought**? Will one population prosper after another declines?).

One of the most challenging applications of population growth research is to predict human population growth. The human population surpassed six billion people in 1999, and is expected reach nine billion before 2050. It is somewhat surprising to realize that it took all of human history for the human population to

reach one billion people – which happened around 1800 – then a little over 100 years to double to two billion, and just 40 years to double from three to six billion! The recent explosive (think exponential!) growth has been **facilitated** by advances in agriculture, science, and medicine, which have enabled more people to survive and have longer lifespans.

Active Vocabulary

density – щільність, густина, концентрація, компактність, інтенсивність

drought – посушливість, сухість (клімату)

extinction – вимирання (племені, виду тварини), припинення (роду)

facilitate – полегшувати, допомагати, сприяти

impact – вплив, наслідки

insight – проникливість, здатність проникнення в сутність

interact – взаємодіяти, впливати, впливати один на одного

maturity – зрілість, повний розвиток

prediction – пророкування, прогноз, пророцтво

respond – реагувати

shrink – стискатися, зіщулюватися, зменшувати, скорочувати, стискати

Text 2

Many people (including national leaders) worry that population growth **depletes** resources and can **trigger** social or economic catastrophe if it is not contained. Most of the projected population growth during this century will take place in developing nations. These countries have faced many challenges in recent decades, including low levels of education, poor health standards, **poverty**, scarce housing, natural resource depletion, wars, and economic and political domination by other countries.

Countries in this situation generally have **devoted** less energy to addressing environmental issues than their wealthier neighbors, so these problems have intensified. Especially in the poorest countries, therefore, future population growth is likely to make environmental **deterioration** worse (although it does not automatically follow that countries with low population growth rates will have cleaner environments).

Societies' environmental impacts take two major forms. First, we consume resources such as land, food, water, soils, and services from healthy ecosystems, such as water filtration through wetlands. Over-consumption uses up or severely depletes supplies of non-renewable resources, such as fossil fuels, and depletes renewable resources such as fisheries and forests if we use them up faster than they can **replenish** themselves.

Second, we **emit** wastes as a product of our consumption activities, including air and water pollutants, toxic materials, greenhouse gases, and excess nutrients. Some wastes, such as untreated **sewage** and many pollutants, threaten

human health. Others **disrupt** natural ecosystem functions: for example, excess nitrogen in water supplies causes **algal** blooms that deplete oxygen and kill fish.

Rising population growth rates in the 1950s **spurred** worries that developing countries could deplete their food supplies. Starting with India in 1951, dozens of countries launched family planning programs with support from international organizations and western governments. Total **fertility** rates in developing countries declined from six children per woman to three between 1950 and 2000. National programs were particularly effective in Asia, which accounted for roughly 80 percent of global fertility decline from the 1950s through 2000.

These programs sought to speed the demographic **transition** by convincing citizens that having large numbers of children was bad for the nation and for individual families. Generally they focused on educating married couples about birth control and distributing contraceptives, but some programs took more **coercive** approaches. China imposed a limit of one child per family in 1979, with two children allowed in special cases.

In some parts of China the one-child policy reportedly has been enforced through methods including forced abortions and sterilizations. Forced sterilizations also occurred in India in the 1970s. These policies have spurred some Indian and Chinese families to practice selective abortion and **infanticide** of female babies, since boys are more valued culturally and as workers. Population sex ratios in both countries are **skewed** as a result. In 2005 there were 107.5 males per 100 females in India and 106.8 males per 100 females in China, compared to a worldwide average of 101.6 males per 100 females. Females slightly outnumber males on every continent other than Asia.

Economies tend to become more high-polluting during early stages of economic development because they first adapt inexpensive technologies that are relatively inefficient – for example, simple manufacturing systems and basic consumer goods such as cars. As **income** rises and technologies diffuse through society, consumers start to value environmental quality more highly and become more able to pay for it.

Probably the most serious of environmental problems we face as humans is overpopulation. People are in the frame of mind that if we run out of room in one town, we can just simply spread out more. We can move people into areas that are less populated, and we can continue to reproduce and expand at an alarming rate. What most people don't understand when they continue to build more stores and houses is that we are quickly running out of the natural resources necessary to **sustain** the population we have right now. We rely on and defer to our scientists or our politicians.

Active Vocabulary

coercive – примусовий

deplete – виснажувати, вичерпувати (запас), спустошувати

deterioration – погіршення, псування, ушкодження, зношування
devote – присвячувати, віддавати (ся) повністю, відводити
disrupt – розривати, руйнувати
fertility – фертильність, народжуваність (у демографії)
income – дохід, доходи; надходження, прибуток
infanticide – дітовбивство
poverty – бідність, убогість
replenish – знову наповнювати або поповнювати
sewage – нечистоти, стічні води
skew – перекошувати
spur – спонукувати, підбурювати (часто spur on)
sustain – підтримувати, захищати, задовольнити
transition – перехід
trigger – ініціювати, викликати (що-н.), дати початок (чому-н.)

Text 3

Fresh Water and Overpopulation

Fresh Water

Fresh water is one of the biggest concerns with overpopulation, and this poses a huge environmental threat. The government sustains the rights to fresh water, whether it is from **melting** snow **pack** in the mountains or a freshwater lake. Different cities have what is known as “water rights” from a certain mountain area’s snowmelt, or certain freshwater lakes and streams. There are more people consuming water, however, than being replaced and the result is that we now have dried up lake beds which create dust **particles**. These dust particles are then polluting the environment and the air we breathe. So, not only is there not enough fresh water for the current population to drink, but the air is getting polluted with dust particles that contribute to health problems.

Biodiversity

Another problem we face is the lack of biodiversity. As the population grows, there is more demand for certain plants: trees for paper, food, plant **fibers** for clothing, etc. We thought the solution was to simply re-plant whatever we consume. This has led to problems, however, in biodiversity. Because many of the plants and crops we sow are of the same age and genetic makeup, they are more **susceptible** to problems from disease and pests. Plants which may have had slightly different genetic makeup may have had a small impact on loss due to disease, but when they are all from the same genetic **strain** we face the issue of total **annihilation** of a particular crop. The greater the population, however, the greater the demand for certain crops, meaning less biodiversity.

Landfills

For decades, many landfill managers have been emphasizing just how quickly they are running out of space. The more people there are on the planet, the more waste is being produced. Some of this waste is quite toxic, and even

landfills which are double-lined are finding that some toxic substances are **leaching** into the soil and the groundwater supply. This poses even more of a risk to our freshwater supply, and can contribute to the **decimation** of many species sharing the earth today.

Overpopulation

One of the biggest environmental problems we face today is overpopulation. The current population will continue to use the Earth's resources, decimating the land and **wreaking havoc** on the natural biodiversity of the Earth. Not only are we draining the Earth's freshwater supplies, we are **eradicating** many species of plant life, as well as completely filling landfills with toxic waste. We are expanding at such a rapid rate that farmers (whose fields are getting smaller) cannot maintain enough crops to feed the population we currently have. There simply aren't enough resources on this Earth to continue to sustain overpopulation. We either wait for science to discover, create or work out how to solve these problems while we continue to self-destruct, or we take the matter into our own hands and make a significant impact where we can by having fewer children and therefore reducing our numbers fast.

Active Vocabulary

annihilation – повне знищення

eradicate – виривати з коренем, знищувати, викорінювати

fiber – волокно, фібра, нитка

havoc – спустошення, розорення, руйнування

leach – вилуговувати, висолоджувати

melt – танути

pack – паковий лід, пак

particle – частинка, нескінченно мала частинка речовини

strain – перевищувати, виходити за межі, зловживати

susceptible (to) – чутливий, уразливий

wreak – наносити шкоду

Ex. 1. Fill in the blanks with appropriate words

Moderate, number, widespread, hunters, support, multiplied, back, reached, introduced.

For the last 50 years, world population _____ more rapidly than ever before, and more rapidly than it is projected to grow in the future. In 1950, the world had 2.5 billion people; and in 2005, the world had 6.5 billion people. By 2050, this _____ could rise to more than 9 billion (see chart "World Population Growth, 1950 – 2050").

Anthropologists believe the human species dates _____ at least 3 million years. For most of our history, these distant ancestors lived a precarious existence as _____ and gatherers. This way of life kept their total numbers

small, probably less than 10 million. However, as agriculture was _____, communities evolved that could _____ more people.

World population expanded to about 300 million by A. D. 1 and continued to grow at a _____ rate. But after the start of the Industrial Revolution in the 18th century, living standards rose and _____ famines and epidemics diminished in some regions. Population growth accelerated. The population climbed to about 760 million in 1750 and _____ 1 billion around 1800.

Ex. 2. Multiple choice. Identify the letter of the choice that best completes the statement

1. Why have population structures changed?

- a) people are living longer
- b) government policy
- c) social changes

2. Why are fewer babies being born?

- a) fewer marriages
- b) availability of contraceptives
- c) medical advances

3.) To maintain a stable population what fertility rate is required?

- a) 2.1
- b) 3
- c) 5.2

4. What is the impact of an ageing population?

- a) people get older
- b) pension provision
- c) fewer schools

5. How might this population change have an impact on industry?

- a) loss of market
- b) increased prices
- c) lack of workers

6. How might falling birth rates be reduced?

- a) financial incentives
- b) access to family planning
- c) limit numbers

7. *Why do people migrate?*

- a) to see relatives
- b) better life
- c) for a holiday

8. *What negative impact can migration have?*

- a) cheap labour
- b) higher taxes
- c) racial tensions

9. *Which of these is an example of forced migration?*

- a) scotland to Australia
- b) caribbean to the UK
- c) rwanda to Tanzania

10. *What is the environmental impact of forced migration?*

- a) deforestation
- b) drought
- c) war

Keys:

1. Why have population structures changed?

People are living longer.

The change results from two processes: older people are living longer and fewer babies are being born.

2. Why are fewer babies being born?

Availability of contraceptives.

Contraceptives are more easily available. However there are five other reasons as well.

3. To maintain a stable population what fertility rate is required?

2.1

To maintain a stable population, a level of 2.1 is required. Across Europe fertility rates are decreasing.

4. What is the impact of an ageing population?

Pension provision

It is increasingly difficult for governments to provide good pensions, funded by the working population.

5. How might this population change have an impact on industry?

Lack of workers

In the longer term, companies may have difficulty recruiting youthful workers.

6. How might falling birth rates be reduced?

Financial incentives

Giving financial inducements for third children, paid maternity leave and providing free child care centres.

7. Why do people migrate?

Better life

People move for better living conditions, health care, education, employment prospects and higher wages.

8. What negative impact can migration have?

Racial tensions

Cultural differences can lead to racial tensions.

9. Which of these is an example of forced migration?

Rwanda to Tanzania

The civil war in Rwanda killed one million people forcing millions to flee into neighbouring countries.

10. What is the environmental impact of forced migration?

Deforestation

Deforestation, as refugees seek wood for fuel and for shelter.

Ex. 3. Complete the beginning of the sentences

1. If population growth is just one of many population characteristics,	a) what causes changes in population sizes and growth rates.
2. Another problem we face	b) on every continent other than Asia.
3. Studying population growth also helps scientists understand	c) cannot maintain enough crops to feed the population we currently have.
4. We are expanding at such a rapid rate that farmers	d) and we can continue to reproduce and expand at an alarming rate.
5. In countries like China, the government has put policies in	e) probably less than 10 million.

place	
6. We can move people into areas that are less populated,	f) lead to racial tensions.
7. It is increasingly difficult for governments to provide	g) what makes studying it so important?
8. Cultural differences can	h) that regulate the number of children allowed to a couple.
9. Females slightly outnumber males	i) good pensions, funded by the working population.
10. This way of life kept their total numbers small,	j) is the lack of biodiversity.

Ex. 4. Make up questions to which the italicized words are the answers:

1. For thousands of years, a very small part of the population had *enough money to live in comfort*.
2. *This* created the first imbalance between the two rates.
3. Today there are *effective* medicines which can increase the chance of conception and lead to rise in birth rate.
4. Getting their children married at an early age increases the chances of *producing more kids*.
5. Medical science made *many discoveries* thanks to which they were able to defeat a whole range of diseases.
6. The effects of overpopulation are quite *severe*.
7. Rise in the number of vehicles and industries have badly affected *the quality of air*.
8. *When a country becomes overpopulated*, it gives rise to unemployment as there fewer jobs to support large number of people.
9. Government of various countries might have to come with various policies related to *tax exemptions to curb overpopulation*.
10. Families that are facing a hard life and choose to have four or five children *should be discouraged*.

Ex. 5. Translate the words and word combinations into Ukrainian and use them to make up your own sentences

access
adverse
affordable
availability
awareness
gradually
implement
mitigation
sustain

takeover
unintended
viable

Ex. 6. Translate the text into Ukrainian paying attention to the italicized words

In order to reduce the *adverse* impacts of overpopulation, *mitigation* measures, such as spreading *awareness* and education about overpopulation, enacting birth control measures and regulations, and providing universal *access* to birth control devices and family planning, must be taken. In countries like China, the government has put policies in place that regulate the number of children allowed to a couple, and some leaders and environmentalists are suggesting that the United Nations *implement* a China-like one-child policy globally to help control and reduce overpopulation *gradually*. Others, such as Gerard K. O'Neill, Marshall T. Savage and John S. Lewis, have suggested building space habitats in asteroid belts or the Venusian atmosphere as *viable* solutions to successfully *sustaining* current population growth rates. Stabilizing human overpopulation, outside of relying on an undesirable United Nations global *takeover* of the bedroom or waiting to send future populations to space, is possible through widespread *availability* of family planning, spreading awareness on the causes and effects of overpopulation, providing easier access to birth control devices and implementing social norms, such as social marketing strategies, to educate the public, particularly in developing countries, about overpopulation and provide them with the tools they need to make the decisions they want. Worldwide, nearly 40% of pregnancies are *unintended*, which equates to about 80 million unintended pregnancies each year and, according to the United Nations Population Fund, an estimated 350 million women in the poorest countries of the world either not wanting their last child, not wanting another child or wanting to space their pregnancies, but lack access to information and *affordable* means and services to determine the size and spacing of their families.

Ex. 7. Translate the following passage into English:

Земля поступово стає перенаселеною. Сьогодні на планеті мешкає понад 6 мільярдів людей. Якщо населення і надалі зростатиме такими темпами, до середини цього століття на Землі буде 10 мільярдів чоловік. Головною причиною швидкого зростання населення є те, що людей народжується більше, ніж помирає. Сучасна медицина досягла величезних успіхів у лікуванні багатьох хвороб і сприяла зростанню тривалості життя людини; водночас рівень народжуваності залишається високим, особливо в країнах Азії та Африки. Життя людей кардинально відрізняється від життя інших живих істот на планеті. Люди вирощують сільськогосподарські культури, переробляють їх, запаковують продукти харчування та

перевозять їх на далекі відстані. Завдяки транспортним засобам люди можуть діставатись у віддалені місця за короткий час. Для цього, а також для забезпечення людей теплом і освітленням, використовуються різні види палива. На відміну від тварин, люди намагаються пристосувати довкілля до своїх потреб, споживаючи величезні обсяги ресурсів та енергії. Все це допомагає зробити життя людей комфортнішим, але може завдати серйозної шкоди екосистемам, в яких вони живуть.

Ex. 8. It's interesting to know:

There are several popular questions and answers concerning the problem of overpopulation:

Why is population an important topic?

The human race has an enormous impact on this planet! We control and modify the Earth more than any other species. How do we meet the needs of human beings and also preserve Earth's finite resources, biodiversity, and natural beauty? This is the fundamental question of our time, and the challenge is becoming more problematic as we add more people. Meanwhile, in every locality, it's important to know how fast population is growing, so that we can build sufficient sewers, roads, power plants, and schools.

Do we know exactly how many people there are in the world today?

No. There are so many people on this planet that counting them up, exactly, is impossible. However, experts believe there are more than 7 billion people in the world today. This is a fairly reliable estimate. World population in 2014 was over 2 times greater than it was in 1965, 4 times greater than 1910, and 10 times greater than 1730. After growing very slowly for tens of thousands of years, world population has grown very rapidly in the last few centuries and continues to do so.

How fast is the world's population growing?

In terms of net gain (births minus deaths), we are adding over 200,000 people to this planet every *day*, or 140 every minute. That equates to 70 million more people every year, about the same as the combined population of California, Texas, and Washington. Although we have made encouraging progress in slowing the growth rate, any rate of growth is unsustainable in the long term, so we must stabilize population soon for the good of future generations.

Are there any parts of the world where population is not growing?

Yes. Roughly speaking, populations are holding stable in Japan and Western Europe. Populations are decreasing somewhat in Russia and some Eastern European countries. Growth in several southern African countries has slowed due to higher death rates because of AIDS. But population is growing either

rapidly or very rapidly in every other part of the world right now, including India, Pakistan, Nigeria, the Democratic Republic of Congo, Bangladesh, Uganda, the United States of America, Australia, Ethiopia and China. In other words, population has stabilized where about 1.2 billion people live and is still increasing very rapidly where 4 billion people live – those who can least afford it. Result: the annual net gain of over 70 million people!

I've heard some say the world population crisis is over and that it's not a problem anymore. Is this true?

No, absolutely not. First of all, we are vastly overpopulated right now with over 7 billion people. Cornell University professor David Pimentel's research shows that about 2 billion people is the number the planet can sustainably support, if everyone consumes the same amount of resources as the average European (which is less than the average American). Secondly, U. N. experts predict that world population will increase for at least the next 50 years, with a "most likely" prediction of 9 billion people by the year 2050. There probably will be additional growth beyond that.

There's no doubt that the worldwide average number of children per woman has come down over the last 50 years – from more than 5 to less than 3 – but: (1) the current average is still well above replacement level, which would be 2.1 children per woman, and (2) the number of women having children is about twice what it was in 1960. There is also huge "demographic momentum", since half the world's population is age 24 or younger – either having children now, or poised to have them in the next 10 to 15 years – so that any changes we make today may not have a visible effect until a generation has passed!

Finally, people are living longer all over the world and will continue to do so, with a resultant slowdown in death rates. Thus, there's a big imbalance in the birth to death ratio: currently about 5 births for every 2 deaths worldwide.

So much of the world is still empty space – can't people just move to less crowded places?

A lot of that space isn't empty: vast tracts of farmland are necessary to feed the people who live in cities and towns, and forests are necessary to produce wood and oxygen. Much of the land that hasn't been settled by people simply isn't habitable: it's too dry, too cold, or too rocky. Besides, the people who are most overcrowded are struggling to exist on less than a dollar a day, they don't have the money to move!

Ex. 9. Use the following questions to make up your own dialogues:

1. What are the biggest issues that arise from overpopulation, and why are they so bad?
2. In the future, do you foresee the problem of overpopulation getting worse or better, and to what degree?

3. Is there anything that you can do to help lessen the effects of overpopulation on the environment?
4. Why should people be concerned about overpopulation now, as opposed to waiting until it becomes more apparent?
5. What do you think are the main factors contributing to overpopulation?
6. Are there any solutions to end starvation?
7. In what areas of the world is overpopulation having the biggest effects and how?

Ex. 10. Prepare reports using the Internet or other sources (catalogues, magazines, books, etc.) about the latest news, achievements in the field concerning the topic of the chapter

REFERENCES

1. Desonie Dana. Biosphere. Ecosystems and Biodiversity Loss / Desonie Dana. – New York : Chelsea House, 2008. – 206 p.
2. Pollock Steve. Eyewitness Ecology / Pollock Steve. – London, New York, Munich, Melbourne and Delhi : Education, 2005. – 72 p.

Навчальне видання

**Прадівлянний Микола Григорович
Марченко Олена Едуардівна
Слободянюк Алла Анатоліївна**

**АНГЛІЙСЬКА МОВА ДЛЯ СТУДЕНТІВ-ЕКОЛОГІВ.
ЧАСТИНА 1**
Навчальний посібник

Редактор Т. Хайдарова

Оригінал-макет підготовлено А. Слободянюк

Підписано до друку

Формат 29,7×42¼. Папір офсетний.
Гарнітура Times New Roman.
Друк різнографічний. Ум. друк. арк.
Наклад пр. Зам.

Вінницький національний технічний університет,
навчально-методичний відділ ВНТУ.
21021, м. Вінниця, Хмельницьке шосе, 95,
ВНТУ, к. 2201.
Тел. (0432) 59-87-36.
Свідоцтво суб'єкта видавничої справи
серія ДК № 3516 від 01.07.2009 р.

Віддруковано у Вінницькому національному технічному університеті
в комп'ютерному інформаційно-видавничому центрі.
21021, м. Вінниця, Хмельницьке шосе, 95,
ВНТУ, ГНК, к. 114.
Тел. (0432) 59-87-38.
publish.vntu.edu.ua; email: kivc.vntu@gmail.com.
Свідоцтво суб'єкта видавничої справи
серія ДК № 3516 від 01.07.2009 р.