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И. И. Копейкина

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 также тексты для перевода и общего понимания.

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**ПРЕДИСЛОВИЕ**

Учебное пособие предназначено для самостоятельной работы студентов-бакалавров экологического факультета, обучающихся по специальности “Экология и природопользование”. Данное пособие рассчитано на лиц, имеющих базовую подготовку по английскому языку, овладевших лексическим и грамматическим минимумом для осуществления речевой деятельности в ситуациях социально-бытовой сферы общения.

Целью пособия является развитие речевой профессиональной деятельности на английском языке во внеурочное время. Реализация этой цели осуществляется благодаря специально подобранным аутентичным текстам, содержание которых полностью соответствует тематике учебной программы. Тексты пособия не адаптированы, взяты из современных источников и отражают богатство и разнообразие современного английского языка. Рядом с названием каждого текста дано количество печатных знаков, содержащихся в тексте.

Пособие состоит из трёх разделов. Первый раздел “READING” включает в себя тексты разного уровня трудности, что даёт возможность преподавателю учитывать индивидуальные особенности студентов при выборе домашнего задания. Тексты предназначены для развития умения читать и понимать их содержание без словаря, а также умения перевода со словарём.

Во второй части пособия “SPEAKING”содержаться диалоги, целью которых является развитие навыков говорения, а в третьей части “ QUIZZING” – студентам предлагаются тесты с ключами, способствующие более глубокому усвоению материала (особенно экологических терминов), пройденного на занятиях.

В конце пособия дан грамматический справочник “ГРАММАТИКА В ТАБЛИЦАХ”.

**PART I**

**READING**

**Text 1**

**Nature and Ecology (801)**

**Read the text and answer the question:**

Why is it necessary to take serious measures to create a system of ecological security?

**Vocabulary:**

riches – богатства

interference – вмешательство

harmful substances – вредные вещества

forever – навсегда

concern – озабоченность

Since ancient times Nature has served man, being the source of his life. For thousands of years people lived in harmony with environment and it seemed to them that natural riches were unlimited. But with the development of civilization man’s interference in nature began to increase.

Every year world industry pollutes the atmosphere with about 1000 million tons of dust and other harmful substances. Many cities suffer from smog. Vast forests are cut and burn in fire. Their disappearance upsets the oxygen balance. As a result some rare species of animals, birds, fish and plants disappear forever, a number of rivers and lakes dry up.

The pollution of air and the world’s ocean, destruction of the ozone layer is the result of man’s careless interaction with nature, a sign of ecological cities. Environmental protection is of a universal concern. That is why serious measures to create a system of ecological security should be taken.

**Text 2**

**Nature Protection (3519)**

**Read and translate the text using a dictionary:**

Computers project that between now and the year of 2030 we are going to have increase of the average temperature between 1,5–4,5 Degrees C. Sea levels would rise by several metres, flooding coastal areas and ruining vast tracts of farmland. Huge areas would be infertile and become uninhabitable. Water contamination could lead to shortages of safe drinking water. It looks like the end of civilization on the Earth.

For hundreds of thousands of years the human race has thriven in Earth’s environment. But at the end of the 20th century, we were at a crucial turning point. We have upset nature’s sensitive equilibrium releasing harmful substances into the air, polluting rivers and oceans with industrial waste and tearing up the countryside to accommodate our rubbish. These are the consequences of the development of civilization. We are to stop it by joint efforts of all the people of the world.

The range of environmental problems is wide. But the matters of people’s great concern nowadays are atmosphere and climate changes, depletion of the ozone layer, freshwater resources, oceans and coastal areas, deforestation and desertification, biological diversity, biotechnology, health and chemical safety. United Nations Environment Program (UNEP) concentrates its activities on these issues.

One of the most alarming forms of air pollution is acid rain. It results from the release into the atmosphere of sulphur and nitrogen oxides that react with water droplets and return to earth in the form of acid rain, mist or snow. Acid rain is killing forests (nearly every species of tree is affected). It has acidified lakes and streams and they can’t support fish, wildlife, plants or insects.

The protective layer of the Earth, the ozone layer, which protects the Earth from the sun’s destructive ultraviolet rays, is being damaged by chlorofluorocarbons. They are released by the daily use of industrial and household products: refrigerators, air conditioners, foam insulation, cleaning chemicals, food packaging. In the ozone layer they attack the ozone molecules making a “hole”. This “hole” allows more UV rays to penetrate to the Earth. It increases the risk of skin cancer, weakens the immune system of people. Besides, UV rays influence the oceans, the growth of plankton, an essential part of the marine-life food chain in the negative way reduce economically important crops (rice, cotton, soy beans). The life cycle is going to be undermined by the ozone.

It’s generally agreed that the destruction of the tropical forest has a major impact on the world climate. The tropical rain forest is a natural recycler, provider and protector for our planet. It recycles carbon, nitrogen and oxygen, helps determine temperature, rainfall and other climatic conditions and supports the most diverse ecosystem in the world. Deforestation could cause one fourth of all species on earth to vanish in the next 25 years. These forests in Amazonia, South-East Asia and West and Central Africa are being destroyed at an alarming rate of 42 million acres per year.

We have only a few years to attempt to turn things around. We must review our wasteful, careless ways, we must consume less, recycle more, conserve wildlife and nature, act according to the dictum “think locally, think globally, act locally”. To my mind, we are obliged to remove factories and plants from cities, use modern technologies, redesign and modify purifying systems for cleaning and trapping harmful substances, protect and increase the greenery and broaden ecological education. These are the main practical measures, which must be taken in order to improve the ecological situation.

Some progress has been already made in this direction. 159 countries, members of the UNO, have set up environmental protection agencies. They hold conferences discussing ecological problems, set up environmental research centres and take practical urgent measures to avoid ecological catastrophe. There are numerous public organizations such as Greenpeace that are doing much to preserve environment. The 5th of June is proclaimed the World Environmental Day by the UNO and is celebrated every year.

**Text 3**

**The Problem of Environmental Protection in Great Britain (1057)**

**Read the text and answer the questions:**

1. What is an international issue of great importance?

2. What are green belts?

3. Who is responsible for water pollution control in Scotland?

4. What is the total emission of smoke in the air?

**Vocabulary:**

purification — очистка

voluntary — добровольный

petrol — бензин

emission — выброс

layer — слой

Environmental protection is an international issue of great importance and Great Britain pays much attention to it. There are nearly 500,000 protected buildings and 7000 conservation areas of architecture of historical

Total emissions of smoke in the air have fallen by 85 per cent since 1960. Most petrol stations in Britain stock unleaded petrol interest in Britain. The Government supports the work of the voluntary sector in preserving the national heritage. The Government is committed to the control of gases emission, which damages the ozone layer.

They also contribute to the greenhouse effect, which leads to global warming and a rise in sea levels. Britain stresses the need for studying the science of climate change. Green belts are areas where land should be left open and free from urban sprawl. The Government attaches great importance to their protection. National parks cover 9 per cent of the total land area of England and Wales. The National Rivers Authority protects island waters in England and Wales.

In Scotland the River purification authorities are responsible for water pollution control. Great Britain takes care of its environment for themselves and next generations.

**Text 4**

**Ecology (1477)**

**Read the text and answer the question:**

What ecological problems are mentioned in the text?

**Vocabulary:**

recently – недавно

reduction – сокращение

interfere – вмешиваться

violate – нарушать

Ecology is the study that helps to preserve the Earth, its plants and animals. It is also supposed to study the environment and the relationship between human activities and nature. Until recently this relationship was in balance. However, at present times we have to face such ecological problems as acid rain, global warming, loss of rare species, ozone reduction, etc. Many scientists think that it is connected with industrial boom and development of civilization in the world. Building numerous factories people have started to interfere intensively in nature. Every year world industry pollutes the atmosphere with tons of dust and other harmful things. As a result many species of animals and plants disappear forever, including fish and birds. Many large cities suffer from factory smog. Their activity pollutes the air, the water, the forests and the land.

Apart from factories there are lots of vehicles in the streets of every more or less developed city. It includes cars, motorbikes, buses, minivans, trucks and other types of transport which use fuel. First of all, they exhaust toxic gases into the air. Secondly, they are considered to be the main noise offenders in the city. This problem progresses as the number of cars increases from year to year. As a result the level of harmful substances in the air also increases. Another problem which is worth mentioning is the tree cutting. Trees are a source of oxygen and clean air. So, by doing this people simply violate the biological balance. All the above mentioned ecological problems are the result of man’s careless interaction with nature. Ecologists claim that environmental protection should become of a global concern and serious measures should be taken to create ecological security.

**Text 5**

**Ecological Problems (1923)**

**Read the text and answer the question:**

What steps have been carried onward to protect nature?

**Vocabulary:**

enterprise – предприятие

grain – зерно, зерновые культуры

suffer – страдать

damage – ущерб

Since ancient times Nature has served Man, being the source of his life. For thousands of years people lived in harmony with environment and it seemed to them that natural riches were unlimited. But with the development of civilization man's interference in nature began to increase.

Large cities with thousands of smoky industrial enterprises appear all over the world today. The by-products of their activity pollute the air we breathe, the water we drink, the land we grow grain and vegetables on.

Every year world industry pollutes the atmosphere with about 1000 million tons of dust and other harmful substances. Many cities suffer from smog. Vast forests are cut and burn in fire. Their disappearance upsets the oxygen balance. As a result some rare species of animals, birds, fish and plants disappear forever, a number of rivers and lakes dry up. The pollution of air and the world's ocean, destruction of the ozone layer is the result of man's careless interaction with nature, a sign of the ecological crises.

The most horrible ecological disaster befell Ukraine and its people after the Chernobyl tragedy in April 1986. About 18 percent of the territory of Belarus was also polluted with radioactive substances. A great damage has been done to the agriculture, forests and people's health. The consequences of this explosion at the atomic power-station are tragic for the Ukrainian, Belorussian and other nations.

Environmental protection is of a universal concern. That is why serious measures to create a system of ecological security should be taken. Some progress has been already made in this direction. As many as 159 countries – members of the UNO – have set up environmental protection agencies. Numerous conferences have been held by these agencies to discuss problems facing ecologically poor regions including the Aral Sea, the South Urals, Kuzbass, Donbass, Semipalatinsk and Chernobyl.

An international environmental research centre has been set up on Lake Baikal. The international organization Greenpeace is also doing much to preserve the environment. But these are only the initial steps and they must be carried onward to protect nature, to save life on the planet not only for the sake of the present but also for the future generations.

**Text 6**

**Ecological Disasters (1608)**

**Read and translate the text using a dictionary:**

Many years ago people lived in greater harmony with nature and environment than they do now. Ecological ignorance of people leads to the destruction of nature and worsens the living conditions for all living beings.

A great number of ecological catastrophes took place in the 20th and 21st centuries and most of them are the results of men’s activity. There is no need to enumerate everything that happened in order to understand the horrible consequences of these numerous disasters. It would be quite enough to have a look at some of them.

One of the largest catastrophes occurred on the 26th of April, 1986. It was the explosion of one of the energy blocks at the Chernobyl Nuclear Power Plant in Ukraine. It is considered to be the worst nuclear plant disaster in history. Due to this explosion there was highly radioactive fallout into the atmosphere which covered thousands of square kilometers of land. The most contaminated zones included Ukraine, Russia and Belarus and affected directly about 2,600,000 inhabitants. Some of them died in the first ten years, some were evacuated out of the place. After the accident in Chernobyl, soil and forest areas were polluted with radioactive elements. Besides that, the health of the population was seriously damaged which resulted in increase of infantile mortality, cancer or thyroid and in increase of the amount of children born with leukemia, malformations, tumors and other affections.

Another ecological disaster which is recognized as one of the greater causes of oceanic contamination is the petroleum spills. These spills lead to the death of aquatic birds, fish and other creatures of the oceans. As a result, the ecological balance is broken and then, fishing, navigation or usages of recreational zones become impossible.

**Text 7**

**Global Warming (2264)**

**Read and translate the text using a dictionary:**

Global warming is sometimes referred to as the greenhouse effect. The greenhouse effect is the absorption of energy radiated from the Earth's surface by carbon dioxide and other gases in the atmosphere, causing the atmosphere to become warmer.

Each time we burn gasoline, oil, coal, or even natural gas, more carbon dioxide is added to the atmosphere. The greenhouse effect is what is causing the temperature on the Earth to rise, and creating many problems that will begin to take place in the coming decades.

Today, however, major changes are taking place. People are conducting an unplanned global experiment by changing the face of the entire planet. We are destroying the ozone layer, which allows life to exist on the Earth’s surface.

All of these activities are unfavorably changing the composition of the biosphere and the Earth's heat balance. If we do not slow down our use of fossil fuels and stop destroying the forests, the world could become hotter than it has been in the past million years.

Average global temperatures have risen 1 degree over the last century. If carbon dioxide and other greenhouse gases continue to spill into the atmosphere, global temperatures could rise five to 10 degrees by the middle of the next century. Some areas, particularly in the Northern Hemisphere, will dry out and a greater occurrence of forest fires will take place.

At the present rate of destruction, most of the rain forests will be gone by the middle of the century. This will allow man-made deserts to invade on once lush areas. Evaporation rates will also increase and water circulation patterns will change.

Decreased rainfall in some areas will result in increased rainfall in others. In some regions, river flow will be reduced or stopped all together completely. Other areas will experience sudden downpours that create massive floods.

If the present arctic ice melting continues, the sea could rise as much as 2 meters by the middle of the next century. Large areas of coastal land would disappear. Plants and other wildlife habitats might not have enough time to adjust to the rapidly changing climate. The warming will rearrange entire biological communities and cause many species to become died out.

The greenhouse effect and global warming both correspond with each other. The greenhouse effect is recalled as incoming solar radiation that passes through the Earth’s atmosphere but prevents much of the outgoing infrared radiation from escaping into outer space. It causes the over-heat of the air and as a result, we have the global warming effect. As you see, greenhouse effect and global warming correspond with each other, because without one, the other doesn't exist.

**Text 8**

**Water Pollution (2687)**

**Read and translate the text using a dictionary:**

Water pollution occurs mostly, when people overload the water environment such as streams, lakes, underground water, bays or seas with wastes or substances harmful to living beings.

Water is necessary for life. All organisms contain it, some drink it and some live in it. Plants and animals require water that is moderately pure, and they cannot survive, if water contains toxic chemicals or harmful microorganisms. Water pollution kills large quantity of fish, birds, and other animals, in some cases killing everything in an affected area.

Pollution makes streams, lakes, and coastal waters unpleasant to swim in or to have a rest. Fish and shellfish harvested from polluted waters may be unsafe to eat. People who polluted water can become ill, if they drink polluted water for a long time, it may develop cancer or hurt their future children. The major water pollutants are chemical, biological, and physical materials that lessen the water quality. Pollutants can be separated into several different classes:

The first class is petroleum products: oil, fuel, lubrication, plastics. The petroleum products get into water by accidental spills from ships, tanker trucks and when there are leaks from underground storage tanks. Many petroleum products are poisonous for animals. Spilled oil damages the feathers of birds and the fur of animals, often it causes death.

The second class is pesticides and herbicides. There are chemicals used to kill harmful animals and plants. If they penetrate into streams, rivers, lakes, these chemicals can be very dangerous. The chemicals can remain dangerous for a long time. When an animal eats a plant that’s been treated with it, the poisons are absorbed into the tissues and organs of the animals.

When other animals feed on a contaminated animal, the chemicals are passed up to them. As it goes up through the food chain, the chemical becomes more harmful, so animals at the top of the food chains may suffer cancers, reproductive problems, and death. Nitrates can cause a lethal form of anemia in infants.

The third class is heavy metals, such as, mercury, selenium, uranium, radium, cesium, etc. They get into the water from industries, automobile exhausts, mines, and natural soil. Heavy metals also become more harmful as they follow the food chain. They accumulate in living being’s cells and when they reach high levels of concentration in the organism, they can be extremely poisonous, or can result in long-term health problems. They can sometimes cause liver and kidney damage.

The fourth class is fertilizers and other nutrients used to promote plant growth on farms and in gardens. The fifth class is infectious organisms and pathogens. They enter water through sewage, storm drains, runoff from farms, etc.

The last one is thermal pollution. Water is often taken from rivers, lakes or seas to be used in factories and power plants. The water is usually returned to the source warmer than when it was taken. Even a small temperature change in a body of water can drive away the fish and other species that were originally there, and attract other species in place of them. It breaks a balance and can cause serious circumstances in future.

**Text 9**

**Environmental Movement in Russia (2192)**

**Read and translate the text using a dictionary:**

The Russian environmental movement presents several puzzles to scholars interested in the development of civil society in post-soviet Russia. Although environmental issues mobilized thousands of citizens during the perestroika era and environmental conditions in Russia remain dire, environmental protest has declined. In spite of the decline in protest events, however, the number of Russian environmental organizations increased steadily during the 1990s. The overall number of environmental organizations, their geographical dispersal throughout Russia, and their increasing professionalism all seem to signify the development of a vibrant sector within civil society. The mere creation of NGOs is not a measure of civil society development, however. This paper adopts two strategies for assessing Russian environmentalists’ contribution to civil society. First, informed by Western theories of civil society development, the paper asks whether Russian environmental organizations are able to act as intermediaries between state and society. Then, in an effort to pinpoint unique features of the country’s social transformation, the paper uses interview data from 84 green organizations located in five Russian regions to explore the goals and activities of environmentalists and to ask how green activists relate to state and societal actors.

A close examination of the Russian environmental movement reveals that green organizations have a mixed record of effectiveness in acting as intermediaries. They have struggled to present policy alternatives and monitor the government while largely failing to mobilize the population and encountering hostility from government officials. Yet a narrow assessment of environmental organizations’ relative strength or weakness along these criteria overlooks an increasingly diverse sector of green activism. In fact we see different types of organizations emerging from within the environmental movement, broadly related their leaders’ professional backgrounds. Environmental leaders influence the organizations’ activities, strategies, and partners, and these choices have different consequences for how civil society develops. A blanket charge of ineffectiveness also obscures the way in which the Soviet legacy continues to affect the development of the green movement, both as an enabling and constraining factor.

**PART II**

**SPEAKING**

**Dialogues on Environmental Problems**

**Dialogue 1**

**Student 1:** I thought that ancient people were “environmentally friendly” and lived in harmony with nature. Some people (such as the American Indians) did indeed respect and protect their environment. But there are many examples of ancient people who destroyed land they inhabited.

**Student** **2**: I’ve read that the great city of Ur was destroyed by floods after the inhabitants had removed the trees around the headwaters of the river Euphrates to use as fuel for their fires.

**Student** **3**: The dodo was a large bird, rather like a turkey, that lived on the island of Mauritius in the Indian Ocean. When the first humans arrived in Mauritius in the early 16th century, they found that the dodos were quite tame. The settlers killed the dodos partly for food and partly for sport. By 1680, less than 200 years after the first human settlement on Mauritius, the last dodo was dead. Only the expression “as dead as a dodo” lives on in the English

language.

**Student** **4**: People are cutting down rainforests. And they control the world’s weather. They act as the lungs of the planet. Our ocean and seas are polluted. The reason is that Man uses them

as dumps.

**Student** **5**: True, some people cut down the forests; but some people plant and grow trees that protect the environment. People develop new, safe technologies that don’t harm or destroy the environment. People have made many great discoveries. People can cure many diseases. In this sense Man is a creator.

**Dialogue 2**

You and your friend are discussing the ecological situation in your city. Discuss the following ecological problems and choose the one you both find most serious:

 – air pollution

 – rubbish

 – water pollution

 – noise

**What’s your opinion about the ecological situation in**

**your city?**

**Student 1:** I don’t think that it is awful but of course there are some problems.

**Student 2:** I can’t agree with you. In my opinion, our city is in a sorry state. And the most important problem is air pollution. Every day a huge number of plants and factories emit lots of harmful substances into the atmosphere of our city so the concentration of harmful substances in the air is over ten times the admissible level. Besides, a great increase in the use of private cars has caused an increase in a new kind of air pollution. The most dangerous pollutant from cars is lead. Even small amounts of it can affect the brain and nervous system of people. What is more, breathing poisonous air may lead to serious lung diseases. Do you agree with me?

**Student 1:** Absolutely! However, we can do something to decrease the level of harmful substances in the air. For example, car owners should install special filters on their cars, besides the government should move all plants and factories outside the city. And of course we should plant more parks because trees produce oxygen and clean the air. In my opinion, water pollution is a far more serious problem.

**Student 2:** Why do you think so?

**Student 1:** First of all, industrial pollution has made the water in our river completely undrinkable and thousands of fish die every year as a result of the illegal dumping of waste into our river by factories and plants. If this trend continues, one day we won’t have any fish at all. Another problem is that people consume too much water so in the future we won’t have enough fresh water for

everybody.

**Student 2:** I don’t think that the situation is so critical because we have lots of water underground. We can also improve the quality of water in our river by installing different purifying systems. What is more, we can recycle rain water and use it to water plants or for washing.

**Student 1:** Yes, I agree with you. The building of new water facilities is now less important than using what we already have efficiently and wisely. And what about rubbish? Don’t you think that our city is slowly turning into a big landfill site? Then there are loads of litter everywhere. People throw it on the ground instead of putting it into a litter bin.

**Student 2:** I can see what you mean but the reason is that there aren’t enough litterbins in public places. If there were more litterbins, our city would be much cleaner.

**Student 1:** But the main problem is that we’re producing a huge amount of rubbish each year – millions and millions of tons of it. And the existing landfill sites are nearly full. Where are we going to put all our rubbish in the future? Finding new sites isn’t easy. I’m afraid that soon we won’t have enough landfill sites to dispose of our rubbish.

**Student 2:** I’m with you there. Of course we’ve all got to try and reduce the amount of rubbish we throw away. We can do that by buying unpackaged goods, like fruit and vegetables, rather than goods which are wrapped and packaged in plastic. Besides, we shouldn’t dump our rubbish without thinking which things, such as bottles and paper, can be recycled. But what about noise?

**Student 1:** You can’t be serious! Is it an ecological problem?

**Student 2:** Of course it is. Although noise is not a chemical and cannot be seen like a broken car, it is a kind of pollution. Noise is all around us, wherever we live, and we do not notice it most of the time because we’ve got used to it. Yet excessive noise can lead to serious psychic disorders. And don’t forget about people living near the airport. They suffer from the noise of large and powerful jet airliners taking off and landing.

**Student 1:** I’ve never thought that noise can be a real

problem:

**Student 2:** Yes, it’s a serious problem because loud noise can make people ill. People who are exposed to loud noises all the time become very nervous and upset. Moreover, they run a risk of

going deaf.

**Student 1:** That’s terrible. But I think that other people in our city are also exposed to loud noise, for example, noise from cars, buses or trains. Besides, when people listen to loud music they may disturb their neighbors. And the power of our music centers is growing all the time. Of course, we don’t pay attention to it but the effects can be dangerous.

**Student 2:** I completely agree with you. We can install different air filters and water treatment facilities or recycle rubbish but we don’t know how to fight against the growing noise around us. That’s why I think that noise pollution is the most serious environmental problem in our city.’

**Dialogue 3**

**Interviewer:** Why are people all over the world so much concerned about environmental problems?

**Respondent:** The first thing to be said is that they are the problems of all peoples and nations. If land belongs to the countries and certain people, the air and water of the ocean do not belong to any country or man but used by everybody. It is our common treasure. Then I must say that environment is not only our life, but also the future of the Earth.

**Interviewer:** Why is water pollution so dangerous?

**Respondent:** There are many reasons to be troubled by the water pollution. The first reason is that water is life for the whole planet. We drink only fresh water, but the circulation of the water on the Earth is such that the quality of fresh water and the quality of salted water of the World Ocean are closely connected. The second reason is richness of the water in food supplies. Sea products such as crabs and lobsters are rich in vitamins and good for health, they are considered to be delicious, luxurious food. Fish is rich in many important substances. Water weeds are used as food both by people and animals, they also take part in the oxygen restoring.

**Interviewer:** How does water get polluted?

**Respondent:** Ships let trash into it, sometimes oil flows from broken ships. The temperature of the World Ocean grows slightly but it results in enormous growth of some water weeds which absorb oxygen and pollute the water with the trash of their

vital activity.

**Interviewer:** Is air pollution dangerous?

**Respondent:** Yes, it is. Breathing polluted air causes many diseases, damages buildings and forests.

**Interviewer:** Can a man help Nature somehow?

**Respondent:** Yes, there are many ways to help Nature. Every man’s work will be little but there are many of us and together we can help a lot.

**Interviewer:** What can you do to help Nature?

**Respondent:** I can reduce the usage of gas, electricity and drinking water, I can reuse many things (clothes, for example). I can recycle paper, cans and bottles. At the same time I can help birds feeding them in winter and also I can stop picking flowers and damaging trees.

**Interviewer:** Is it important to protect plants and animals?

**Respondent:** Yes, it is. Plants produce oxygen and vitamins which people and animals cannot live without. Plants and animals are one big ecological system. If we harm one part of it, we can destroy our own life. The main area producing oxygen is in the Amazon region. The second is Siberia in Russia.

**Interviewer:** Is it dangerous to pollute land?

**Respondent:** Yes, very much. We eat plants, but if the land is polluted, the plants become poisonous. If we eat them, we ruin

our health.

**Interviewer:** What can happen if we do not stop

the pollution?

**Respondent:** The life on the Earth will die out.

**Dialogue 4**

**Jane**: Hello Mary! How are you?

**Mary**: I am fine and what about you?

**Jane**: I am fine too. But why do you look so worried, my dear friend?

**Mary**: No, I am not worried at all. I am just thinking about the causes of global warming and its harmful effect.

**Jane**: Oh, I see. It is really a much talked issue in the present world. But I do not know much about it. What is global warming?

**Mary**: Oh, yes! Global warming is the gradual increase of world’s temperature. The greenhouse effect is the most likely cause of this global warming.

**Jane**: The greenhouse effect seems somewhat complicated to me. Please tell me something about it.

**Mary**: Okay! The greenhouse effect is the gradual warming of the air around the earth as a result of heat being trapped by environmental pollution.

**Jane**: Strange indeed! What might be the effects of global warming?

**Mary**: The effects of global warming might be serious and dangerous. It is predicted that by midway through the next century world temperatures may rise by as much as 4ᴼC.

**Jane**: What will happen then if temperature rises by as much as 4ᴼC?

**Mary**: This will greatly reduce mankind's ability to grow food and damage wildlife and wilderness.

**Jane**: Oh, my God! I see a horrible situation is waiting for us due to global warming.

**Mary**: Yes, indeed! Besides, due to global warming, the ice in the Polar Regions will melt. This will naturally raise the sea level of water and flood coastal areas.

**Jane**: Really global warming is a great threat for our existence in this world. We must work to stop this global warming. How can we stop global warming?

**Mary**: We have to work to reduce the emission of carbon dioxide and plant trees more and more to stop this global warming. Thank you.

**PART III**

**QUIZZING**

**Ecology: Questions and Answers**

1. **What is Ecology?**

Ecology is the field of Biology that studies the relations between living beings and between living beings and the

environment.

1. **What is species?**

Species is the set of living beings able to cross among themselves generating fertile offspring. This concept however does not apply to individuals of exclusive asexual reproduction and other definitions have been proposed. For example, “species is a set of living beings that evolve in a common manner all of them considered ancestors of the same type in relation to common

descendants”.

1. **What is population?**

Population is the set of individuals of the same species found in a given place in a given time.

1. **What is a community?** **What is the difference between the concepts of community and population?**

Community is the set of populations of living beings that live in the same region and interact with each other. In Ecology population is a set whose members (living in a given place in a given time) are part of the same species. Community is a set of populations of different species (living in a given place in a given time).

1. **What is the difference between ecological niche and habitat?**

Ecological niche is the set of peculiar activities, resources, and strategies that a species explores to survive and reproduce. Habitat is the place where the species lives to explore its ecological niche. In other words, it can be said that habitat is the “address” of the species and the ecological niche is the “profession” of the species.

1. **What are biotic factors?**

Biotic factors are the living beings (plants, animals, and microorganisms) that are part of a given environment.

1. **What are abiotic factors?**

Abiotic factors are the nonliving elements that constitute a given environment, like light, temperature, minerals, water, gases, atmospheric pressure, etc.

1. **What is an ecosystem?**

Ecosystem is a system composed of biotic and abiotic factors in interaction.

1. **What is biosphere?**

Biosphere is the set of all of the ecosystems of the planet.

1. **What are autotrophic beings? What are heterotrophic beings?**

Autotrophic beings are those that can produce their own food, i.e., that make organic material from inorganic compounds. Heterotrophic beings are those that need to incorporate organic material to nourish them. Therefore, heterotrophs depend on the production of the autotrophs.

1. **What are the processes that autotrophic beings use to produce organic material from inorganic substances?**

Autotrophic beings make organic material by photosynthesis or by chemosynthesis. There are photosynthetic autotrophs, like plants, and chemosynthetic autotrophs, like some bacteria.

1. **What is a biome?**

Biome is a prevailing ecosystem constituted by similar biotic and abiotic factors present in one or more regions of the planet.

1. **What are the major terrestrial biomes?**

The major terrestrial biomes are tundra, taiga (or boreal forest), temperate forest, tropical forest, grassland and desert.

1. **What are the typical vegetation and the typical fauna of the tundra?**

Tundra has vegetation formed mainly by mosses and lichens. In the fauna the dense furred animals, like caribous, musk oxen and polar bears, and migratory birds are found.

1. **What are the typical vegetation and the typical fauna of the taigas?**

Taiga, or the boreal forest, is characterized by coniferous trees, pine forests. There are also mosses, lichens, small bushes, and angiosperms. In the taiga many mammals, like moose, wolves, foxes and rodents, migratory birds and great diversity of insects are found.

1. **What are the typical vegetation and the typical fauna of the temperate forests?**

In the temperate forest, deciduous trees predominate. Mammals are found in great number, like bears and deer.

1. **What are deciduous trees?**

Deciduous trees are plants that lose their leaves in a period of the year. In the case of the deciduous of the temperate forest, the fall of the leaves occurs in the autumn. The loss of leaves is a preparation to face the cold months of the winter: roots, stem and branches are more resistant to low temperature and snow than the leaves; without leaves the metabolic rate of the plant is reduced; the decaying fallen leaves help to nourish the soil.

1. **What is the typical localization of the tropical forests regarding latitude?**

Tropical rain forests, like the Amazon forest and the Congo forest, are typically located in low latitude, i.e. in the equatorial and tropical zones.

1. **What are the typical vegetation and the typical fauna of the tropical forests?**

In the vegetation of the tropical forests, broad-leafed evergreen trees predominate. On the top of the trees, epiphytes and lianas grow. Many varieties of pteridophytes can be found in these forests. Regarding the fauna, the abundance, and diversity is also great: there are monkeys, rodents, bats, insectivores, felines, reptiles, amphibians, and invertebrates, mainly insects.

1. **How can the abundance and diversity of living beings in the tropical forests be explained?**

The biodiversity of these ecosystems can be explained by the great availability of the main abiotic factors for photosynthesis. Since these factors are abundant, plants can perform maximum photosynthetic activity, living and reproducing easily. With great amount and diversity of producers (autotrophs), the consumers (heterotrophic animals and microorganisms) also have abundant food and a complex food web emerges creating many different ecological niches to be explored. So it is possible the appearing of varied living beings as well as the existence of large populations.

1. **Why are the tropical forests also known as stratified forests?**

In tropical forests, tall trees of several species have their crowns forming a superior layer under which diverse other trees and plants develop forming other inferior layers. From the upper layer to the inferior layers the penetration of light lowers gradually and the exposition to wind and rain, the moisture and the temperature vary. Different compositions of abiotic factor condition the prevailing of different vegetation in each layer.

1. **What is the typical vegetation of the grasslands?**

Grasslands are mainly formed of herbaceous (non-woody) vegetation: grass, bushes, and small trees.

1. **How are the grasslands of North America and of South America respectively called?**

The steppe grasslands of North America are called prairies. The grasslands of South America are known as “pampas” (the steppe grassland) and “cerrado” (the savannah grassland).

1. **How are grasslands classified?**

Grasslands may be classified into steppes and savannahs. In the steppes, the prevailing vegetation is grass, like in the pampas of South America and in the prairies of North America. The fauna is mainly formed by herbivores, like rodents and ungulates. The savannahs present small trees, like for example the Brazilian cerrado or the African savannahs. The fauna is diverse; in the Brazilian cerrado there are animals like emus, lizards, armadillos, jaguars, etc., and many types of insects; the African savannahs are the home of great herbivores and carnivores, like zebras, giraffes, antelopes, lions and leopards.

1. **What are the typical vegetation and the typical fauna of the deserts?**

The predominant fauna of the desertic ecosystems is formed by reptiles, like lizards and snakes, terrestrial arthropods and small rodents. In these areas plants very adapted to dry climate may be found, like the cactus, that are plants that do not have real leaves and thus lose less water, along with grasses and bushes near places where water is available.

1. **Which terrestrial vertebrate group is extremely rare in deserts?**

Amphibians are terrestrial vertebrates extremely rare in desertic environments (although there are few species adapted to this type of ecosystem). Amphibians are rare in deserts because they do not have permeable skin and so they easily lose water by evaporation and desiccate. They also need an aquatic environment to reproduce, since their fecundation is external and their larva is

water-dependent.

1. **What are plankton, nekton, and benthos?**

Plankton, nekton, and benthos are the three groups into which aquatic living beings may be divided. The plankton is formed by the algae and small animals that float near the water surface carried by the stream. The nekton is composed of animals that actively swim and dive in water, like fishes, turtles, whales, sharks, etc. The benthos comprehends the animals ecologically linked to the bottom, including many echinoderms, benthonic fishes, crustaceans, mollusks, and annelids.

1. **What are the phytoplankton and the zooplankton?**

Phytoplankton and zooplankton are divisions of the plankton. The phytoplankton comprehends the autotrophic floating beings: algae and cyanobacteria. The zooplankton is formed by the heterotrophic planktonic beings: protozoans, small crustaceans, cnidarians, larvae, etc.

1. **What is the group of aquatic beings composed of large number of photosynthetic beings?**

A large number of photosynthetic beings is found in the plankton, i.e., in the surface of aquatic ecosystems. This is because light is abundant on the surface.

1. **What is the primary energy source for life on earth?**

The primary energy source for life on earth is the sun. The sun plays the important role of keeping the planet warmed and it is the source of the luminous energy used in photosynthesis. This energy is converted into organic material by the photosynthetic autotrophic beings and consumed by the other living beings.

1. **What is the main means by which autotrophic beings obtain energy?**

The main means by which autotrophs obtain energy is photosynthesis. (There are also chemosynthetic autotrophs.)

1. **Which is the autotrophic group responsible for the production of most part of the molecular oxygen of earth?**

Algae and cyanobacteria of the phytoplankton are the organisms that contribute most for the production of molecular oxygen.

1. **How are the autotrophic beings called in the ecological study of food interactions?**

In Ecology, autotrophic beings are called producers because they synthesize the organic material consumed by the other living beings of an ecosystem. An ecosystem cannot exist without producers.

1. **How are the heterotrophic beings divided in the ecological study of food interactions?**

Heterotrophs are divided into consumers and decomposers. An ecosystem can exist without consumers but it cannot be sustained without decomposers. Without the decomposers, the organic material would accumulate causing environmental degradation and later death of the living beings.

1. **What is a food chain?**

Food chain is the linear not branched sequence in which a living being serves as food for the other, from the producers until the decomposers.

1. **How is energy transferred along a food chain?**

The energy flux along a food chain is always unidirectional, from the producers to the decomposers.

1. **What are tropic levels? How many tropic levels can a food chain have?**

Tropic levels correspond to positions on a food chain. Therefore, producers always belong to the first tropic level and decomposers to the last tropic level, consumers that eat directly the producers belong to the second tropic level and so on. There is no limit regarding the number of tropic levels on a chain, since many orders of consumers can exist.

1. **What are primary consumers? Can food chain present quaternary consumers without having secondary or tertiary consumers? Can a tertiary consumer of one chain be a primary or secondary consumer of another chain?**

Primary consumers are living beings that eat autotrophic beings, i.e. they eat the producers. Primary consumers always belong to the second tropic level of a chain. A food chain cannot have consumers of superior orders without having the consumer of the inferior orders. A consumer however can participate in several different chains not always belonging to the same consumer order in each of them.

1. **What is the difference between the concepts of food chain and food web?**

The chain concept is a theoretical model to study the energy flux in ecosystems. Actually, in an ecosystem the organisms are part of several interconnected food chains, forming a food web. Therefore, the chain is a theoretical linear sequence and the web is a more realistic representation of nature in which the food chains interconnect forming a web.

1. **What are the three main types of tropic pyramids studied in Ecology?**

The three types of tropic pyramids studied in Ecology are the numeric pyramid, the biomass pyramid, and the energy pyramid. Generally, the variable dimension of the pyramid is the width and the height is always the same for each represented strata of living beings. The width therefore represents the number of individuals, or the total mass of these individuals or the available energy in each tropic level.

1. **What do numeric pyramids represent?**

Numeric pyramids represent the number of individuals in each tropic level of a food chain.

1. **In a numeric pyramid to which tropic level does the base always refer?**

In a numeric pyramid the base corresponds to the first tropic level, i.e., to the producers. The top level of the pyramid corresponds generally to the last consumer order of the food chain (since the number of individual decomposers, most of them microorganisms, is too large to be represented).

1. **In a numeric pyramid, is it possible the base to be smaller than the other levels?**

Since the numeric pyramid represents the quantity of individuals in each trophic level of the food chain, inferior tropic levels with fewer individuals than the superior tropic levels may exist. For example, a single tree can serve as food to millions of insects.

1. **In the short range what will happen to the levels above and below a population of secondary consumers of a numeric pyramid if a large number of individuals from this population dies?**

If an intermediate level of a numeric pyramid has its variable dimension decreased, i. e., if the number of individuals of such level is reduced, the number of individuals of the level below will increase and the number of individuals of the level above will be reduced. That happens because the individuals of the level below will face less predators and the individuals of the level above will have less available food.

1. **What do biomass pyramids represent?**

Biomass pyramids represent the sum of the masses of the individuals that participate in each tropic level of a food chain.

1. **What is dry mass?**

When biomasses are compared often, the concept of dry mass is used. The dry mass is the total mass less the water mass of an individual. The total mass is also called fresh mass. To use dry mass instead of fresh mass is utile because among living beings, there are differences related to the proportion of water within their body and such differences can distort the quantitative analysis of incorporated organic material.

1. **What do energy pyramids represent?**

Energy pyramids represent the amount of available energy in each tropic level of the food chain.

1. **Into which type of energy is the light used in photosynthesis transformed?**

The luminous energy used in photosynthesis is transformed into chemical energy.

1. **Can the amount of available energy in a given tropic level to be larger than the available energy in inferior tropic levels? What does that condition means to the conformation of the energy pyramids?**

A superior tropic level always has less available energy than inferior tropic levels. This is because in each tropic level only a fraction of the organic material of the level below is incorporated into the consumers (into their bodies), the other part is eliminated as waste or is used in the metabolism as energy source. Therefore it is never possible to have energy pyramids with inverted conformation, i.e., with the tip to the bottom and the base to the top. It is also not possible to have superior tropic levels with variable dimension larger than inferior ones. In every energy pyramid, from the base to the top, the size of the variable dimension decreases.

1. **What is the gross primary production of an ecosystem? How does GPP relate to photosynthesis?**

Gross primary production of an ecosystem, or GPP, is the quantity of organic material found in a given area in a given period. Since only autotrophs produce organic material and photosynthesis is the main production process, GPP is a result of the

photosynthesis.

1. **What are the factors that for influencing photosynthesis also interfere with the gross primary productivity?**

Mainly water and light, but also mineral salts, temperature, and carbon dioxide are factors that interfere with the gross primary productivity.

1. **What are the destinations of the organic material fabricated by the producers?**

Part of the organic material synthesized by the producers is consumed as energy source for the metabolism of the own producer individual. Other part is incorporated (into the body) and become available to heterotrophic beings of the ecosystem. In each following tropic level part of the organic material is used in the metabolism of the individuals of the level, other part is eliminated as waste and only a fraction is incorporated and become available as food for the following level.

1. **What is the formula of the net primary production (NPP)? How does NPP relate to the energy pyramids?**

Net primary production is the gross primary productivity less the organic material consumed as energy source in the metabolism of the producers: NPP = GPP – (organic material spent in aerobic respiration). It represents the organic material available in the first tropic level. The base of the energy pyramids must represent the NPP and not the GPP since the idea of these pyramids is to show the available energy in each trophic level of the food chain.

1. **What are biogeochemical cycles?**

Biogeochemical cycles are representations of the circulation and recycling of matter in nature. The main biogeochemical cycles studied in Ecology are the water cycle, the carbon cycle, and the nitrogen cycle.

1. **What is the respective importance of water, carbon, and nitrogen for the living beings?**

Water is the main solvent of the living beings and it is necessary practically for all biochemical reactions, including as reagent of photosynthesis. Many properties of water are very important for life. Carbon is the main chemical element of organic molecules; carbon dioxide is also reagent of photosynthesis and product of the energetic metabolism of the living beings. Nitrogen is a fundamental chemical element of amino acids, the building blocks of proteins that in their turn are the main functional molecules of the living beings; nitrogen is also part of the nucleic acid molecules, the basis of reproduction, heredity, and protein synthesis.

1. **What is the water cycle?**

The water cycle represents the circulation and recycling of water in nature. Liquid water on the planet surface is heated by the sun and turns into water vapor that gains the atmosphere. In the atmosphere large volumes of water vapor, form clouds that when cooled precipitate liquid water as rain. Therefore, water comes back to the planet surface and the cycle is completed. As possible steps of the cycle, water may still be stored in subterranean reservatory or under the form of ice in mountains and oceans and it may also be used in the metabolism of living beings, incorporated into the body of the individuals or excreted through urine, feces, and transpiration.

1. **Why is the sun the “motor” of the water cycle?**

The sun can be considered the motor of the water cycle because upon its energy the transformation of liquid water into water vapor depends. Therefore, the sun is the energy source that makes water to circulate in nature.

1. **What is the carbon cycle?**

The carbon cycle represents the circulation and recycling of the chemical element carbon in nature because of the action of living beings. Photosynthetic beings absorb carbon as carbon dioxide available in the atmosphere and the carbon atoms become part of glucose molecules. During the cellular respiration of these beings, part of this organic material is consumed to generate ATP and in this process, carbon dioxide is returned to the atmosphere. Other part is incorporated by the photosynthetic organisms into the molecules that compose their structure. The carbon atoms incorporated into the producers are transferred to the next tropic level and again part is liberated by the cellular respiration of the consumers, part becomes constituent of the consumer body and part is excreted as uric acid or urea (excretes later recycled by decomposer bacteria). Therefore, carbon absorbed by the producers in photosynthesis returns to the atmosphere through cellular respiration along the food chain until the decomposers that also liberate carbon dioxide in their energetic metabolism. Under special conditions in a process, that takes millions of years carbon incorporated into organisms may also constitute fossil fuels stored in deposits under the surface of the planet as fossil fuels burn the carbon atoms return to the atmosphere as carbon dioxide or carbon monoxide. The burning of vegetable fuels, like wood, also returns carbon to the atmosphere.

1. **What is the main biological process that consumes carbon dioxide?**

The main biological process that consumes carbon dioxide is photosynthesis.

1. **How is carbon dioxide made by producers and**

**consumers?**

Carbon dioxide is made by producers and consumers through cellular respiration.

1. **What are fossil fuels?**

Fossil fuels, like oil, gas, and coal, form when organic material is preserved from the complete action of decomposers, generally buried deep and under pressure during millions of years. Under such conditions, the organic material transforms into hydrocarbon fuels. Fossil fuels are natural reservatory of carbon. When oxygen is present, these fuels can be burned and carbon dioxide and carbon monoxide are released to the atmosphere.

1. **What is the most abundant form under which nitrogen is found in nature?**

The most abundant nitrogen-containing molecule found in nature is molecular nitrogen (N2). The air is 80% constituted of molecular nitrogen.

1. **Under which form is nitrogen fixed by the living beings?**

Most living beings cannot use molecular nitrogen to obtain nitrogen atoms. Producers fix nitrogen mainly from nitrate (NO3). Some plants also fix nitrogen from ammonia. Consumers and decomposers acquire nitrogen through digestion of mainly proteins and nucleic acids from the body of other living beings.

1. **What is the nitrogen cycle?**

The nitrogen cycle represents the circulation and recycling of the chemical element nitrogen in nature. The nitrogen cycle depends on the action of some specialized bacteria. Bacteria of the soil called nitrogen-fixing bacteria present in plant roots absorb molecular nitrogen from the air and liberate nitrogen under the form of ammonia. The decomposition of organic material also produces ammonia. In the soil and roots (mainly of leguminous), a first group of chemosynthetic bacteria called nitrifying bacteria, the produces energy consuming ammonia and releasing nitrite (NO2). The second group of nitrifying bacteria, the nitrobacteria, uses nitrite in chemosynthesis releasing nitrate (NO3). In the form of nitrate, nitrogen is then incorporated by the plants to be used as constituent of proteins and nucleic acids and the element then follows along the food chain. Nitrogen returns to the atmosphere by the action of denitrifying bacteria that use nitrogen-containing compounds from the soil and release nitrogen gas

(molecular nitrogen).

1. **Why is leguminous crop rotation used in agriculture?**

Leguminous crop rotation and other crop rotations are used in agriculture because in these plants many bacteria important for the nitrogen cycle live. The leguminous crop rotation (or conjointly with the main crop) helps the soil to become rich in nitrates that then are absorbed by the plants. Green manure, the covering of the soil with grass and leguminous, is a way to improve the fixation of nitrogen and it is an option to avoid chemical fertilizers.

1. **What is biodiversity?**

Biological diversity is the variety of species of living beings of an ecosystem. In ecosystems, more biodiverse, like tropical forests, a great variety of plants, microorganisms, and animals live; in ecosystems less biodiverse, like deserts, there are less variety of living beings.

1. **How does biological diversity relate to the characteristics of the abiotic factors of an ecosystem?**

The availability of abiotic factors, like light, moisture, mineral salts, heat and carbon dioxide, conditions more or less biodiversity of an ecosystem. Photosynthesis depends on water and light, and plants need mineral salts, carbon dioxide, and adequate temperature for their cells to work. In environments where these factors are not restrictive, the synthesis of organic material (by photosynthesis) is maximum, plants and algae can reproduce easier, the population of these beings increases, potential ecological niches multiply and new species emerge. The large mass of producers makes viable the appearing of a diversity of consumers of several orders. In environments with restrictive abiotic factors, like deserts, the producers exist in little number and less diversity, a feature that thus extends to consumers and conditions fewer ecological niches to be explored.

1. **How does the vegetal stratification of an ecosystem influence the biological diversity?**

The vegetal stratification of an ecosystem, like the strata of the Amazon Rainforest, creates vertical layers with peculiar abiotic and biotic factors, dividing the ecosystem into several different environments. Therefore, in the superior layer near the crowns of big trees, the exposition to light, rain, and wind is greater but moisture is lower comparing to the inferior layers. As one goes down the strata, the penetration of light diminishes and moisture increases. Regarding the biotic factors, communities of each stratum present composition, features, food habits, and reproduction strategies, etc., also different. Such variations in the abiotic and biotic factors make the selective pressure upon the living beings also diversified, there are more ecological niches to be explored and more varied beings emerge during the evolutionary process.

1. **Despite having a great biodiversity why, is the Amazon Rainforest under risk of desertification?**

The natural soil of the Amazon Rainforest is not too fertile but it is enriched by the vegetal covering made of leaves and branches that fall from the trees. Deforestation reduces this enrichment. In deforestation zones, the rain falls directly on the ground causing erosion, “washing” large areas (leaching) and contributing to make the soil even less fertile. Besides that, the deforestation disallows the recycling of essential nutrients for plants, like nitrogen. In this manner, those regions and their neighboring regions undergo desertification.

1. **How can a great biological diversity protect an ecosystem from environmental damages?**

Why are less biodiverse ecosystems under the risk of suffering deep biological harms if submitted to even small changes? In ecosystems with more biodiversity, the food webs and ecological interactions among living beings are more complex and diverse. In these ecosystems, environmental changes can easier be compensated by the multiplicity of available resources, foods, and survival options. In ecosystems with less biodiversity, the individuals are more dependent on some beings that serve them as food and they interact with a small number of different species. In these ecosystems, generally, abiotic factors are restrictive and the species are more specialized to such conditions and more sensitive to environmental changes. Even small environmental harms can cause big disturbances in the equilibrium of the ecosystem.

1. **Is monoculture a system that contributes to great biological diversity of an ecosystem?**

Monoculture means that in a large area a single crop (only one species of plant) is cultivated. Therefore, monoculture does not contribute to the formation of a community with great variety of species in the area. Since there is only a single type of producer the types of consumers that can live in the area are also restricted.

1. **What are some economic applications that can be generated by very bio-diverse ecosystems?**

Very biodiverse areas present enormous economic potential. They can be source of raw material for the research and production of medicines, cosmetics, chemical products, and food. They are depository of genetic wealth that can be explored by biotechnology. They are source of species for agriculture. They can also be explored by the ecological tourism.

1. **What are the main causes of the loss of the biological diversity nowadays?**

The biggest dangers to the biological diversity today are fruits of the human action. The main of them is the destruction of habitats caused by the growth of the cities, deforestation, pollution, and fires. The second is the invasion of ecosystems by nonnative species introduced by humans; these species change the equilibrium of ecosystems causing harm. Other big dangers are the predatory hunting and fishing and the global warming.

1. **What is inharmonious ecological interaction?**

Inharmonious, or negative, ecological interaction is that in which at least one of the participating beings is harmed.

1. **How are ecological interactions classified?**

Ecological interactions are classified as intraspecific or interspecific interactions and as harmonious or inharmonious

interactions.

1. **What are intraspecific and interspecific ecological**

**interactions?**

Intraspecific ecological interactions are those between individuals of the same species. Interspecific ecological interactions are ecological interactions between individuals of different

species.

1. **What is inharmonious ecological interaction?**

Inharmonious, or negative, ecological interaction is that in which at least one of the participating beings is harmed.

1. **What is harmonious ecological interaction?**

Harmonious, or positive, ecological interaction is that in which none of the participating beings is harmed.

1. **What are the main intraspecific ecological interactions?**

The main harmonious intraspecific ecological interactions are colonies and societies. The main inharmonious intraspecific ecological interactions are intraspecific competition and cannibalism.

1. **What are colonies and societies?**

Colonies are functional integrated aggregates formed by individuals of the same species. Colonies are often confounded with a single individual. Examples are the coral reefs, by-the-wind sailors, and filamentous algae. Societies are interactions for labor division and collaboration among individuals of the same species. Human societies are examples of ecological societies; other species, like bees, ants, termites, wolves and dolphins form societies.

1. **What is competition? Which type of ecological interaction is competition?**

Competition is the ecological interaction in which the individuals explore the same ecological niche or their ecological niches partially coincide and therefore competition for the same environmental resources takes place. Competition is harmful for all participating beings and thus it is classified as an inharmonious (negative) ecological interaction.

1. **What is an example of intraspecific competition?**

Intraspecific competition practically occurs in all species, for example, the competition of humans for a job.

1. **Why is cannibalism an inharmonious intraspecific ecological interaction?**

In cannibalism an individual eat other of the same species (occurs in some insects and arachnids). Since it is an interaction between beings of the same species and at least one of them is harmed (the other is benefited) the classification as inharmonious intraspecific ecological interaction is justified.

1. **What are the main interspecific ecological interactions?**

The main harmonious interspecific ecological interactions are protocooperation, mutualism and commensalism. The main inharmonious interspecific ecological interactions are interspecific competition, parasitism, predatism and ammensalism.

1. **What is protocooperation?**

Protocooperation is the ecological interaction in which both participants benefit and that is not obligatory for their survival. Protocooperation is a harmonious (positive) interspecific ecological interaction. Examples of protocooperation are: the action of the spur-winged plover that using its beak eats residuals from crocodile teeth; the removal of ectoparasites from the back of bovines by some birds that eat the parasites; the hermit crab that live inside shells over which sea anemones live (these offer protection to the crab and gain mobility to obtain food).

1. **What is mutualism?**

Mutualism is the ecological interaction in which both participants benefit and that is obligatory for their survival. Mutualism is a harmonious (positive) ecological interaction. Mutualism is also known as symbiosis. Examples of mutualism are: the association between microorganisms that digest cellulose and the ruminants or insects within which they live; the lichens, formed by algae or cyanobacteria that make organic material for the fungi and absorb water with their help; nitrifying bacteria of the genus Rhizobium that associated to leguminous offer nitrogen to these plants.

1. **What is commensalism?**

Commensalism is the ecological interaction in which one individual benefit while the other is not benefited neither harmed. Commensalism is a harmonious (positive) ecological interaction, since none of the participants is harmed. Example of commensalism are the numerous bacteria that live in the skin and in the digestive tube of humans without being pathogenic neither beneficial. They are innocuous bacteria living in commensalism with humans.

1. **What are some examples of interspecific competition?**

Examples of interspecific competition are the dispute among vultures, worms, flies, and microorganisms for carrions and the competition between snakes and eagles for rodents.

1. **What is parasitism?**

Parasitism is the ecological interaction in which a being lives at the expense of other. The parasite often does not cause immediate death of the host since it needs the host alive to survive. Parasitism is an inharmonious (negative) interspecific ecological interaction, since although one participant benefit the other is harmed.

1. **What is predatism?**

Predatism is the ecological interaction in which one individual mutilates or kills other to get food. Predatism is an inharmonious (negative) ecological interaction since one participant is harmed.

1. **Is herbivorism a form of predatism?**

Herbivorism is the form of predatism in which first order consumers feed from producers (plants or algae). For example, birds and fruits, humans and eatable vegetable, etc. (There are proposals to consider the herbivorism of leaves a form of parasitism and the herbivorism of entire plants and seeds a form of predatism).

1. **What is ammensalism?**

Ammensalism is the ecological interaction in which an individual harms other without obtaining benefit. Ammensalism is an inharmonious (negative) ecological interaction since one participant is harmed. One of the best examples of ammensalism is the one established between humans and other species under extinction due to human actions like habitat devastation by fires, ecological accidents, leisure hunting, etc. Other example is the red tide, proliferation of algae that by intoxication can lead to death of fishes and other animals.

1. **What is ecological succession?**

Ecological succession is the changing sequence of communities that live in a ecosystem during a given time period.

1. **What are pioneer species? What is the role of the pioneer species?**

Pioneer species are those first species that colonize places where previously there were no living beings, like, for example, algae that colonize bare rocks. In general, pioneers species are autotrophs or maintain harmonious ecological interaction with autotrophic beings (like autotrophic bacteria, herbaceous plants, lichens). The pioneer community is formed of species able to survive under hostile environments. The presence of these species modifies the microenvironment generating changes in abiotic and biotic factors of the ecosystem undergoing formation. Therefore, they open way to other species to establish in the place by the creation of new potential ecological niches.

1. **What is the difference between primary ecological succession and secondary ecological succession?**

Primary ecological succession is the changing sequence of communities from the first biological occupation of a place where previously there were no living beings. For example, the colonization and the following succession of communities are in a bare rock. Secondary ecological succession is the changing sequence of communities from the substitution of a community by a new one in a given place. For example, the ecological succession from the invasion of plants and animals are in an abandoned crop or land.

1. **What is the climax stage of an ecological succession?**

The climax stage is the stage of the ecological succession in which the community of an ecosystem becomes stable and does not undergo significant changes. In the climax community practically all ecological niches are explored and the biodiversity is the greater possible. In this stage the biomass, the photosynthesis rate and the cellular respiration reach their maximum levels and thus the net primary production (NPP = organic material made by the producers – organic material consumed in the cellular respiration of the producers) tends to zero. At the climax, the amount of oxygen released by photosynthesis is practically equal to the oxygen consumed by respiration. (This is one more reason why it is wrong to say that the Amazon Rainforest, an ecosystem at climax stage, is “the lung” of the earth. Other reasons are lungs are not producers of oxygen; the algae and cyanobacteria of the phytoplankton are the main producers of the molecular oxygen of the planet.)

1. **How do biodiversity, the total number of living beings, and the biomass respectively vary during the ecological succession?**

Biodiversity, the number of living beings, and the biomass of an ecosystem tend to increase as the succession progresses and they stabilize when the climax stage is reached. At the initial stage of the succession the use of carbon dioxide and the fixation of carbon into the biomass are high, since the total number of living beings in the ecosystem is increasing. At the climax stage, the use of carbon dioxide by photosynthesis equals the production by cellular respiration and the fixation of carbon into the biomass tends

to zero.

1. **What is a population?**

In Biology population is a set of individuals of the same species living in a given place and in a given time.

1. **What is population density?**

Population density is the relation between the number of individuals of a population and the area or volume they occupy. For example, in 2001 the human population density of the United States (according to the World Bank) was 29.7 inhabitants per square kilometer and China had a population density of 135.4 humans per square kilometer.

**100. What is population growth rate?**

Population growth rate (PGR) is the percent variation between the numbers of individuals in a population in two different times. Therefore, the population growth rate can be positive or negative.

**101. How different are the concepts of migration, emigration, and immigration**

Migration is the moving of individuals of a species from one place to other. Emigration is the migration seen as exit of individuals from one region (to other where they will settle permanently or temporarily). Immigration is the migration seen as the settling in one region (permanently or temporarily) of individuals coming from other region. Therefore, individuals emigrate “from” and immigrate “to”.

**102. What are the main factors that affect the growth of a population?**

The main factors that make populations grow are births and immigration. The main factors that make populations decrease are deaths and emigration.

**103. What are some examples of migratory animals?**

Examples of migratory animals are: southern right whales from Antarctica, that procreate in the Brazilian coast; migratory salmons that are born in the river, go to the sea and return to the river to reproduce and die; migratory birds from cold regions that spend the winter in tropical regions; etc.

**104. What is biotic potential?**

Biotic potential is the capability of growth of a given population under hypothetical optimum conditions, i.e., in an environment without limiting factors to such growth. Under such conditions, the population tends to grow indefinitely.

**105. What is the typical shape of a population growth curve? How the biotic potential can be represented in the same graphic?**

A typical population growth curve (number of individuals x time, linear scale) has sigmoidal shape. There is a short and slow initial growth followed by a fast and longer growth and again a decrease in growth preceding the stabilization or equilibrium stage. The population growth according to the biotic potential curve however is not sigmoidal, it is only crescent and points up to the infinite of the scale (there is not a decreasing stage in any equilibrium).

**106.** **What is environmental resistance?**

Environmental resistance is the action of limiting abiotic and biotic factors that disallow the growth of a population, as it would grow according to its biotic potential. Actually, each ecosystem is able to sustain a limited number of individuals of a given species. The environmental resistance is an important concept of population ecology.

**107. What are the main limiting factors for the growth of a population?**

The factors that limit the growth of a population can be divided into biotic factors and abiotic factors. The main abiotic limiting factors are availability of water and light, availability of shelter. The main limiting biotic factors are population density and inharmonious (negative) ecological interactions (competition, predatism, parasitism, ammensalism).

**108. How do the availability of water and light and the climate affect the growth of a population?**

The availability of water and light and the climate are abiotic factors that limit the growth of a population. Since the producers are the responsible for the synthesis of organic material transferred along the food chains of an ecosystem, water and light affect the availability of food and a population cannot grow beyond the number of individuals the environment is able to feed. For example, in the desert, the biomass is relatively small and populations that live in this ecosystem are smaller (comparing to same species in environments with large available biomass). The climate, including the temperature, affects the population growth because excessive change in this factor, as the occurrence of droughts or floods, may cause significant population decline; small climatic changes can also alter the photosynthesis rate and reduce the availability of food in the ecosystem.

**109. How do populations of predators and preys vary in predatism?**

Whenever a predator population increases at the first moment, the prey population tends to decrease. At a second moment, the decrease of the prey population and the bigger population density of predators make the predator population to decrease. The prey population then revert the tendency to decrease and begins to grow. If variations in the size of the populations occur in an unexpected intensity, for example, due to ecological accidents killing many preys, the prey-predator equilibrium is disturbed and both species can be harmed. The existence of the predator sometimes is fundamental for the survival of the prey population, since the absence of predatism favors the proliferation of the prey and, in some cases, when the excessive proliferation creates a population size over the sustenance capacity of the ecosystem, environmental degradation occurs and the entire prey population is destroyed.

**110. What is the relation between environmental resistance and the population growth according to the biotic potential curve and the real population growth curve?**

The difference between the real population growth curve (number of individuals x time) and the population growth according to the biotic potential curve of a given population is a result of the environmental resistance.

**111. How different is the growth according to the biotic potential of a viral population from the growth according to the biotic potential of a bacterial population?**

The growth curve according to the biotic potential of virus and bacteria both present positive ex­ponential pattern. The difference between them is that in each time period bacteria double their population while the viral population multiplies dozen or hundred times. The viral population growth curve thus has more intense growth. This happens because bacteria reproduce by binary division, each cell generating two daughter cells, while each virus replicate generating dozens or even hundreds of new virus.

**112. What are age pyramids?**

Age pyramids are graphical representations in form of superposed rectangles each representing the number of individuals included in age ranges into which a population is divided. Generally, the lower age ranges are represented more to the bottom of the pyramid, always below higher ranges, and the variable dimension that represents the number of individuals is the width (there are age pyramids however, in which the variable dimension is the height).

**113. What are the analyses provided by the study of human age pyramids?**

The study of human age pyramids can provide the following analysis: proportion of individuals in economically active age, proportion of elderly (indicating the quality of the pension and health systems), proportion of children and youth (indicates need for job generation and educational services), reproductive profile (shows the population growth tendency), and postnatal survival rate (indicates quality of the health system, hygiene conditions, nutrition, and poverty), longevity profile etc. It is possible to suppose whether a population belongs to a rich and industrialized society or to a poor country since the patterns of the age pyramids differ according to these conditions.

**114. What are the main characteristics of the age pyramids of developed countries?**

In a stabilized human population, the age pyramid has narrower base since the reproduction rate is not so high. The adult age ranges are generally wider than the infantile ranges showing that in practice there is no population growth. There are a proportionally high number of old individuals meaning that the life quality is elevated and the population has access to health services and good nutrition. These are features of the age pyramids of developed countries.

**115. What is pollution?**

Pollution is the contamination of an ecosystem by factors that are harmful for the equilibrium of its biotic or abiotic constituents.

**116. Is pollution always caused by humans?**

In most cases, pollution is caused by the human activity. Other species and some abiotic factors however can also pollute an ecosystem. For example, the red tide is created by proliferation of some algae and the volcano dust is a consequence of the internal activity of the planet.

**117. Why waste is considered one of the major environmental issues?**

The environmental problem concerning waste worsens with the industrial development and the global growth of consumption societies in the XX and XXI centuries, factors that cause the immense volume of residuals produced by humankind in the last decades. The increased waste generation raises the issue about what to do with waste since nature is not able to degrade and resorb with adequate speed and efficiency most part of the residuals. Therefore, the several kinds of waste accumulate, polluting the environment and creating danger to humans and nature.

**118. What are the main types of waste?**

The waste can be classified into many types or fractions, each of them carrying its own different environmental problem: organic waste, recyclable waste, non-recyclable waste, toxic waste, nuclear toxic waste, and space waste.

The organic waste is easier resorbed by nature, but the speed and the geographical concentration of its production due to urbanization generate pollution of rivers, lakes, proliferation of disease vectors and environmental degradation of towns. The recyclable waste is composed of residuals that can be reprocessed, used again by humans, like plastics and metals. The problem regarding recyclable waste is that the separation of such material is not culturally diffused and there is not enough social organization to use them; so the recyclable waste is mixed to other wastes increasing even more the volume of waste depositories. The non-recyclable waste is formed of residuals that the technology cannot yet recycle, like ceramics, photographic paper, mirrors, cigarettes, plasticized papers, etc.; this kind of waste in the future may become recyclable waste and should be separated.

The toxic waste includes industrial chemical residuals that are harmful for life and the environment, like contaminated medical waste and the domestic waste containing insecticides and medicines; the toxic waste is one of the major environmental problems since it puts the life of humans and other living beings in danger. The nuclear toxic waste is made of materials that release invisible dangerous radiation for many years.

The nuclear toxic waste is produced in the extraction of nuclear minerals (like uranium), by nuclear reactors and nuclear plants, in hospitals where Nuclear Medicine is performed and in research centers; although the nuclear waste is often put in armored recipients the risk of accidents is permanent. Space waste is the waste produced by the activity of humans in the space from the second half of the XX century; it consists of inn operant satellites, rocket pieces, and other equipment that remains orbiting the earth or other celestial bodies or even traveling across the space.

**119. What is selective waste collection?**

Recyclable waste is the waste that can be reprocessed and used again. Waste recycling depends on the separation of the recyclable residuals from non-recyclable ones and on the classification of the recyclable into plastics, metals, papers, etc. The function of the selective waste collection is to ease that separation for the waste to be sorted in the point of origin. Selective collection also helps the creation of environmental conscience in the people that produce the waste.

**120. What is the cost-benefit relation regarding sewage treatment as a strategy to fight water pollution?**

To treat sewage is much cheaper for society. The non-treated sewage pollutes rivers, lakes and the sea, being a cause of diseases transmitted through water. For the society, the costs of these diseases are much higher than the cost of the sewage treatment. One of the most economical systems to treat sewage is the aerobic treatment system, reservatories kept much oxygenated for aerobic bacteria to decompose organic material.

**121. What is eutrophication?**

Eutrophication is the process of excessive increasing of nutrients, like phosphate and nitrate, in water due to direct deposition of non-treated sewage. The nutrients act as fertilizers leading to abnormal proliferation of aquatic algae. With the exaggerated growth of the alga population, the number of aerobic bacteria that make decomposition of organic material also increases. The proliferation of these bacteria depletes the dissolved oxygen killing fishes and other animals. Besides, the lack of oxygen causes the decomposition to be assumed by anaerobic bacteria. Anaerobes multiply and release hydrogen sulfide that makes water improper to other living beings and with a putrid smell.

**122. What is a biodigester?**

Biodigester is equipment that produces carbon dioxide, hydrogen sulfide, and fuel gases (biogases) like methane from organic material under decomposition (dung, food waste, sugar cane waste, etc.). The biogas is used in heating, as energy for motors and machines and it has even industrial uses. Bio-digesters are widely used in public waste depositories and in rural areas. Besides producing biogas the organic waste can be turned into good quality fertilizer.

**123. What are the environmental harms caused by mercury pollution? What are the main sources of mercury pollution?**

Mercury is a metal that when present in the water of rivers, lakes, and seas contaminates fishes, crustaceans, mollusks and other living beings. The mercury accumulates along the food chain and in each following trophic level; the amount of the metal within the individuals is higher. When humans eat contaminated animals they also became contaminated and severe nervous system injuries may come out. The main sources of mercury pollution are gold mining and the use of derived substances in industry and agriculture. Examples of other heavy metals that cause toxic pollution are lead, cadmium, and chromium.

**124. What are persistent organic pollutants (POPs)?**

POPs, or persistent organic pollutants, are toxic substances formed from organic compounds. POPs are made in several industrial processes, like the production of PVC, paper whitened by chlorine, herbicides, insecticides and fungicides, and in the incineration of waste. Examples of POPs are dioxins, furanes, chlordane, DDT, and hexachlorbenzene. POPs are toxic and highly harmful since, likewise the heavy metals, they are bio-accumulative, i.e., they are not degraded by the body and accumulate even more in each following trophic level of the food chains. In humans, POPs can cause cancer and nervous, immune, and reproductive impairments.

**125. Is the upward move of the warm air good or bad for the dispersion of pollutants?**

The upward move of warm air is a natural method of dispersion of pollutants. The air near the ground is hotter because the sun heats the soil and the soil heats the air nearby. Since it is less dense, the warm air tends to move towards higher and colder strata of the atmosphere. Such movement helps the dispersion of

pollutants.

**126. Does thermal inversion occur in the winter or in the summer?**

Pollutant low altitude thermal inversion occurs in the winter. In this period of the year, the sun heats the soil less and the natural upward move of warm air decreases. Therefore, the pollutants form a low altitude layer between the cold air layer near the ground and another layer of warmer air above. The pollutant layer over industrial areas or big urban concentrations reduces the penetration of the sun energy and the air bellow takes an even longer time to warm.

**127. Why does thermal inversion increases air pollution? What harms can thermal inversion cause to humans?**

Thermal inversion confines at low altitude, layer of pollutants that would have been dispersed by the natural upward move of warm air. The solid particles present in the atmosphere cause health problems, like the exacerbation of asthma and other pulmonary diseases, cough, respiratory unease and ocular discharges; later the pollution can also trigger the appearing of cardiovascular and neoplastic diseases.

**128. What is the role of the ozone layer for the living**

**beings?**

Ozone, O3, is a gas of the atmosphere that filters ultraviolet radiation from the sun disallowing most of that radiation of reaching the surface of the planet. Ultraviolet radiation is harmful for living beings because it is a mutagen and can cause cancer (mainly skin cancer), other DNA mutations, and even burns.

**129. What are the main chemical compounds that destroy the ozone layer?**

The mains chemical compounds that destroy the ozone layer are the CFCs, chlorofluorocarbons, or freons, substances used in the past in refrigerators, air conditioners and spray cans. Chlorofluorocarbons react with ozone in the high atmosphere releasing molecular oxygen and therefore the amount of ozone in the atmosphere is reduced. Other substance that destroys the ozone layer is methyl bromide, used in agricultural insecticides.

**130. What is nuclear pollution?**

Nuclear pollution consists in radiations emanated from atomic nuclei, these radiations are high injurious for the living beings. They can be originated from the extraction of radioactive minerals, nuclear plant reactors, nuclear research centers, hospitals, and medical centers that use radioisotopes, nuclear bomb explosions, or accidents with transportation, handling, or storage of nuclear material. Nuclear materials remain dangerous for many years, contaminating the environ­ment with radiation that can cause cancer, immune impairment, congenital deficiencies, burns, and even death. The damage is proportional to the intensity of the exposition to the radiation. Its persistent feature and high aggression power make nuclear pollution one of the major environmental problems of our time.

**131. What is plutonium reprocessing? Why is it a big environmental issue?**

Plutonium is the highly radioactive chemical element produced from uranium by nuclear plants. Plutonium can be reprocessed and used again in nuclear plants or in other destinations, like the making of nuclear bombs. Plutonium reprocessing nowadays, however, is done only in some countries like France, Russia and Britain and the countries that have nuclear plants, like Japan, Australia, etc., send their atomic waste by ship to those plutonium reprocessing centers. Besides the inherent risks of the storage of nuclear waste, plutonium reprocessing brings the risks of the transport of radioactive material across the oceans. The "nuclear ships" often travel near the coast of many countries posing danger to their populations.

**132. What is transgenic food?**

Transgenic beings are animals, microorganisms and plants that contain recombinant DNA, i.e., genes from other plants, microorganisms or animals artificially inserted into their genetic material. Transgenic beings are made for scientific and economic purposes, in this last case with the intention of improving their commercial features. For example, bacteria that produce human insulin are transgenic beings made by biotechnology. The main targets of the transgenic technology are the eatable vegetables, like soy, corn, potato, and tomato.

**133. Why are transgenics considered to be a threat to the environmental safety?**

Transgenic can be dangerous to the entire biosphere since the transfer of genes between species may have immediate and long-term unpredictable consequences. The creation of new species by nature is a slow process, dependent on causal mutations and natural selection, a relatively safe process for the ecological equilibrium. It is impossible to know how the fast and artificial introduction of transgenic beings in nature affects ecosystems. Pathogenic agents may be involuntarily created in laboratories, spreading unknown diseases; transgenic species may uncontrollably proliferate destroying ecological interactions that have taken thousands of years to be established; the ingestion of transgenic food also has unpredictable effects.

**134. What is biologic control?**

Biological control is a natural method to control the size of animal, microorganism or plant populations. Biological control is based on the knowledge of inharmonious (negative) ecological interactions between species. Using such knowledge a parasite, competitor or predator species is introduced in an ecosystem in order to attain reduction of the population of another species with which it has inharmonious ecological interaction. The biological control presents the advantage of substituting the use of pesticides and other toxic chemical products in the control of plagues and diseases. It however should be employed with caution under serious previous study to avoid harmful ecological disequilibrium. A kind of biological control of some species can be done by the introduction of previously sterilized males that do not generate

offspring.

**135. What is bioremediation?**

Bioremediation is the use of microorganisms, like bacteria and fungi, to degrade noxious substances turning them into nontoxic or less toxic substances. Bioremediation employs microorganisms whose metabolism uses contaminants as reagents. Bioremediation is used, for example, in the decontamination of environments polluted by oil spill. In this process, bacteria that use hydrocarbons as substrate for their cellular respiration are employed.

**136. What is global warming?**

Global warming is the increase in the temperature of the planet due to accumulation of some gases in the atmosphere, especially gases that retain the solar energy reflected by the planet surface. The main gas that causes the global warming is carbon dioxide, CO2, but other gases act as “warming gases” too, like methane, CH4, and nitrous oxide, N2O.

1. **Environment Vocabulary Quiz**

**Directions: Match the vocabulary words on the left with the definitions on the right.**

|  |  |
| --- | --- |
| 1) extinct2) pollutant3) endangered species4) poacher5) conservation6) evolution7) smog8) habitat9) atmosphere10) biosphere11) greenhouse effect | a) the natural environment of a plant or animal.b) contaminating material that pollutes.c) the continuous modification and adaptation of organisms to their environments through selection, hybridization, and the like.d) a species of plant or animal that is in danger of becoming extinct.e) a haze caused by the effect of sunlight on foggy air that has been polluted by vehicle exhaust gases and industrial smoke.f) the mass of gases surrounding the earth or any other celestial body.g) one who illegally hunts on another’s property.h) no longer existing, as an animal species.i) the warming trend on the surface and in the lower atmosphere of a planet, held by scientists to occur when solar radiation is trapped, as by emissions from the planet.j) the part of the earth and its atmosphere in which living organisms can exist.k) the act of preserving and protecting from loss, destruction, or waste. |

1. **Environment Quiz**
2. What do you call the rain that contains chemical waste and causes damage to plants and animals?
3. smog b) acid rain c) monsoon rain d) seasonal rain
4. What is the term used to describe a substance that can be broken down and eaten up by mi­croorganisms like bacteria?
5. compound b) environment friendly c) biodegradable

d) recycled

1. We all know that the Kaziranga sanctuary is a place where rhinos can live safely away from hunters. What is the term used for such careful use and protection of nature?
2. bio-friendly b) ecofriendly c) degradation d) conservation
3. What is the natural environment of a living organism called?
4. habitat b) surroundings c) environment d) biosphere
5. Most of the oil that we use is imported into our country from other nations. The oil is carried in huge sea going tankers. Sometimes these tankers get damaged and the oil leaks into the oceans and seas. What is such an accidental discharge of oil into water bodies called?
6. water pollution b) oil spill c) oil leak d) tanker leak
7. Name the phenomenon because of which the earth’s atmospheric temperature is increasing causing widespread environmental changes?
8. reverse effect b) greenhouse effect c) geothermal effect

d) bio-thermal effect

1. What is a substance that dirties the air, water or ground – thereby harming the living organisms called?
2. pesticides b) non-biodegradable c) pollutant

d) environmental friendly

1. What is the term used for the pollution and damage caused by release of heated water into rivers and lakes that can harm animal and plant life?
2. thermal pollution b) geothermal pollution c) bio-thermal pollution d) isothermal pollution
3. Have you heard that the ultraviolet radiations from the sun may cause skin cancer? Can you say which layer of the earth’s atmosphere protects the earth from these dangerous ultraviolet radiations of the sun?
4. stratosphere b) ozonosphere c) ionosphere d) troposphere
5. What is the process of collecting, processing and reusing waste materials called?
6. recycling b) reworking c) reusing d) reprocessing
7. **Ecology Quiz**

**Identify the letter of the choice that best completes the statement or answers the question.**

1. The science dealing with interactions among organisms and between organisms and their environment is called …
2. economy b) modeling c) recycling d) ecology
3. All of the members of a particular species that live in one area are called …
4. biome b) population c) community d) ecosystem
5. Which of the following descriptions about the organization of an ecosystem is correct?
6. Communities make up species, which make up

populations.

1. Populations make up species, which make up communities.
2. Species make up communities, which make up populations.
3. Species make up populations, which make up communities.
4. What is the original source of almost all the energy in most ecosystems?
5. carbohydrates b) sunlight c) water d) carbon
6. The algae at the beginning of the food chain are …
7. consumers b) decomposers c) producers d) heterotrophs
8. An organism that uses energy to produce its own food supply from inorganic compounds is called a (an) …
9. heterotroph b) consumer c) detritivore d) autotroph
10. Which of the following organisms does not require sunlight to live?
11. chemosynthetic bacteria b) algae c) trees d) photosynthetic bacteria
12. An organism that cannot make its own food is

called a (an) …

1. heterotroph b) chemotroph c) autotroph d) producer
2. Organisms that obtain nutrients by breaking down dead and decaying plants and animals are called …
3. decomposers b) omnivores c) autotrophs d) producers
4. What is an organism that feeds only on plants called?
5. carnivore b) herbivore c) omnivore d) detritivore
6. What is an ecological model of the relationships that form a network of complex interactions among organisms in a community from producers to decomposers?
7. food web b) an ecosystem c) food chain d) a population
8. What animals eat both producers and consumers?
9. herbivores b) omnivores c) chemotrophs

d) autotrophscarbon

1. Only 10 per cent of the energy stored in an organism can be passed on to the next trophic level. Of the remaining energy, some is used for the organism’s life processes, and the rest is …
2. used in reproduction b) stored as body tissue c) stored as fat d) eliminated as heat
3. The repeated movement of water between Earth’s surface and the atmosphere is called …
4. the water cycle b) the condensation cycle c) precipitation

d) evaporation

1. Which of the following is not recycled in the biosphere?
2. water b) nitrogen c) carbon d) energy
3. Organisms need nutrients in order to …
4. utilize hydrogen and oxygen b) carry out essential life functions c) recycle chemical compounds d) carry out nitrogen fixation
5. The average year-after-year conditions of temperature and precipitation in a particular region is the region’s …
6. weather b) latitude c) ecosystem d) climate
7. All of the following factors contribute to Earth’s climate except …
8. latitude b) biomes and ecosystems c) transport of heat

d) shape and elevation of land mass

1. The greenhouse effect is …
2. the result of an excess of carbon dioxide in the atmosphere
3. a natural phenomenon that maintains Earth’s temperature range
4. the result of the differences in the angle of the sun’s rays
5. an unnatural phenomenon that causes heat energy to be radiated back into the atmosphere
6. Each of the following is an abiotic factor in the environment except …
7. plant life b) soil type c) rainfall d) temperature
8. Which is a biotic factor that affects the size of a population in a specific ecosystem?
9. average temperature of the ecosystem
10. type of soil in the ecosystem
11. number and kinds of predators in the ecosystem
12. concentration of oxygen in the ecosystem
13. During a long period when there is no rainfall, a mountain lion may temporarily leave its usual hunting territory to drink from a farm pond. This behavior is probably

due to …

1. its need to find different foods to eat
2. the change in an abiotic factor in its environment
3. its need to find a new habitat
4. the change in a biotic factor in its environment
5. An organism’s niche is …
6. the way the organism uses the range of physical and biological conditions in which it lives
7. all the physical and biological factors in the organism’s environment
8. the range of temperatures that the organism needs

to survive

1. a full description of the place an organism lives
2. Several species of warblers can live in the same spruce tree only because they …
3. have different habitats within the tree
4. eat different foods within the tree
5. occupy different niches within the tree
6. can find different temperatures within the tree
7. An interaction in which one organism captures and feeds on another organism is called …
8. competition b) symbiosis c) mutualism d) predation
9. No two species can occupy the same niche in the same habitat at the same time …
10. because of the interactions that shape the ecosystem
11. unless the species require different abiotic factors
12. because of the competitive exclusion principle
13. unless the species require different biotic factors
14. A symbiosis in which both species benefit is …
15. commensalism b) mutualism c) predation d) parasitism
16. The symbiotic relationship between a flower and the insect that feeds on its nectar is an example of …
17. mutualism because the flower provides the insect with food, and the insect pollinates the flower
18. parasitism because the insect lives off the nectar from the flower
19. commensalism because the insect does not harm the flower and the flower does not benefit from the relationship
20. predation because the insect feeds on the flower
21. The series of predictable changes that occurs in a community over time is called …
22. population growth b) ecological succession c) climax community d) climate change
23. What is one difference between primary and secondary succession?
24. Primary succession is slow and secondary succession is rapid.
25. Secondary succession begins on soil and primary succession begins on newly exposed surfaces.
26. Primary succession modifies the environment and secondary succession does not.
27. Secondary succession begins with lichens and primary succession begins with trees.
28. Which two biomes have the least amount of precipitation?
29. tropical rain forest and temperate grassland b) tropical savanna and tropical dry forest c) tundra and desert d) boreal forest and temperate woodland and shrub land
30. A biome is identified by its particular set of abiotic factors and its …
31. average precipitation and temperature b) characteristic ecological community c) distance from the equator d) specific geographical location
32. One of the main characteristics of a population is its …
33. change over time b) geographic distribution c) dynamics

d) habitat

1. Which are two ways a population can decrease in size?
2. immigration and emigration b) increased death rate and immigration c) decreased birthrate and emigration d) emigration and increased birthrate
3. As resources in a population become less available, population growth …
4. declines rapidly b) increases slowly c) reaches carrying capacity d) enters a phase of exponential growth
5. A biotic or an abiotic resource in the environment that causes population size to decrease is a …
6. carrying capacity b) limiting nutrient c) limiting factor

d) growth factor

1. All of the following are limiting factors except …
2. immigration b) competition c) predation d) human

disturbances

1. If a population grows larger than the carrying capacity of the environment, the …
2. death rate may rise b) birthrate may rise c) death rate must fall d) birthrate must fall
3. Each of the following is a density-dependent limiting factor except …
4. competition b) predation c) crowding d) disease
5. **Biosphere Quiz**
6. Which of these objects is not found in the biosphere of the Earth?
7. bald eagle b) great white shark c) core of the Earth

d) Amazon rain forest

1. Which of these is not a biome?
2. equatorial rainforest b) your backyard c) scrub desert

d) tundra

1. Which of these organisms is not found in the food web?
2. producers b) consumers c) decomposers d) all are found in the food web.
3. Which of these factors does not limit the success of

populations?

1. physical limitations b) geographic limitations c) corporate limitations d) competition limitations
2. Which of these items will not be found in soil?
3. dead leaves b) ground up rocks c) microorganisms / microbes d) all are found in soil.
4. Which of these processes do not cause erosion?
5. Landslide b) sunlight c) stream d) lichen
6. Which of these processes does not match up with the natural resource?
7. digging : chickens b) drilling : oil c) mining : gold d) fishing : tuna
8. If you chose a career as an environmental manager, what would you not do in your job?
9. monitor populations b) test for pollutants c) record data

d) You would do all of these tasks.

1. Which of these is not a renewable energy source?
2. oil b) wind c) solar energy d) hydrothermal
3. What do you need to do so that we use fewer natural

resources?

1. reduce b) reuse c) recycle d) You should do all of these things.

**ANSWERS TO THE QUIZZES**

1. **Environment Vocabulary Quiz**
2. h) 2) b) 3) d) 4) g) 5) k) 6) c) 7) e) 8) a) 9) f) 10) j) 11) i)
3. **Environment Quiz**
4. Acid rain. 2. Biodegradable. 3. Conservation. 4. Habitat.

5. Oil spill. 6. Greenhouse effect. 7. Pollutant. 8. Thermal pollution. 9. Ozonosphere. 10. Recycling.

1. **Ecology Quiz**

**1**. ecology **2**. population **3**. Species make up populations, which make up communities. **4**. sunlight **5**. producers **6**. autotrophy **7**. chemosynthetic bacteria **8**. heterotroph **9**. decomposers **10**. herbivore **11**. food web **12**. omnivores **13**. eliminated as heat **14**. the water cycle **15**. energy **16**. carry out essential life functions **17**. climate **18**. biomes and ecosystems **19**. a natural phenomenon that maintains Earth’s temperature range **20**. plant life **21**. number and kinds of predators in the ecosystem **22**. the change in an abiotic factor in its environment. **23**. The way the organism uses the range of physical and biological conditions in which it lives. **24**. occupy different niches within the tree.

**25**. predation **26**. because of the competitive exclusion principle **27**. mutualism **28**. Mutualism because the flower provides the insect with food, and the insect pollinates the flower. **29**. ecological succession **30**. Secondary succession begins on soil and primary succession begins on newly exposed surfaces. **31**. tundra and desert **32**. characteristic ecological community **33**. geographic distribution **34**. decreased birthrate and emigration **35**. reaches carrying capacity **36**. limiting factor **37**. immigration **38**. death rate may rise **39**. predation

1. **Biosphere Quiz**
2. **Core of the Earth**

The core of the Earth is not a part of the biosphere. It plays a role in protecting the Earth so a biosphere can exist, but it is not in the biosphere. Birds in the air, fish in the ocean, and plants in the forests are all integral parts of the biosphere.

1. **Your Backyard**

Your backyard is not a biome. While your backyard may have a very small ecosystem in action, it is not an official biome. Biomes are large regions that support similar types of species. Those species have certain adaptations that allow them to live in the specific area. Examples of biomes include rainforests, deserts, tundra, woodlands, and grasslands. Organisms that are well suited for rainforests can move around the region, but probably could not survive on the arctic tundra.

1. **All are found in the food web.**

All of these types of organisms are found in the food web (or food chain). Producers include plants that create their own food supplies. Consumers eat the producers and other consumers. When consumers die, the decomposers go to work and break down their bodies. The nutrients are returned to the Earth where producers can use them again.

1. **Corporate Limitations**

Corporations do not limit the success of populations (yet). While a corporation may pollute the air and create a hazardous environment, those chemicals would be defined as physical limits. Physical limitations include all hazardous environments to the organisms. Those hazards usually involve extremes in climates. Geographic limitations such as mountain ranges regularly limit the development of populations. Competition limitations are more difficult to see. If there is an animal that hunts all of your food, your population will have some troubles.

1. **All are found in soil**.

All of those items are found in healthy soils. Different types of soils hold different amounts of those materials. Very rich and productive soil has large amounts of organic matter and microorganisms. Even desert soil has these items, just very small amounts. Another limitation of desert soil is the amount of water available for plants.

1. **Sunlight**

Sunlight does not directly cause erosion. The light can cause chemical reactions in the water and rocks, but the rocks to not directly break down. Landslides strip soil and rocks off the sides of hills. Streams carry running water over the surface of the Earth. As that water moves, it carries away bits of soil and rock. The Grand Canyon was created by running water. Lichen are small microorganisms that live on rocks and trees. They slowly break down molecules and eat away at the surface of the rocks.

1. **Digging: Chickens**

We hope this one was easy. You don’t need to dig to find chickens. Chickens are raised on farms. Humans are able to pull oil out of the ground by drilling and then pumping. We find gold in large mines. The process of fishing gathers many different types of species. We chose tuna because you probably had it for lunch.

1. **You would do all of these tasks.**

You would need to do all of those tasks if you were an environmental manager. These managers are responsible for specific areas of land and the health of the environment. They may be in charge of land around a factory or working for a city. Their ultimate goal is to make sure that business can continue to thrive while making sure that the environment and its organisms do not suffer. They may monitor pollution, natural resources, native populations, human health, air quality, water purity, and many other factors. A good manager will also maintain large amounts of data that show a history of the environment.

1. **Oil**

Oil is not a renewable energy source. One day we will run out of oil to pump out of the ground and there will never be any more. Wind can turn windmills that generate electricity. Solar energy hits the Earth and powers solar panels. Hydrothermal power comes from water that is heated deep within the Earth. Over millions of years, those vents will move, but there will always be new locations around the Earth that can provide super-heated water sources.

1. **You should do all of these things.**

The western world consumes most of the world's natural resources. We like our packages, our bottles, our computers, our food, and all of the rest of it. We like stuff. Compared to the rest of the world, we use a lot of stuff. Unfortunately, there are not enough natural resources to go around. We need to reduce the amount of things we use (such as packaging), reuse the things we can (such as clothing), and recycle the objects we don't need anymore (such as plastic bottles). The limited resources we have on Earth will then last longer for everyone.

**ГРАММАТИКА В ТАБЛИЦАХ**

**Времена активного залога**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Indefinite** | **Continuous** | **Perfect** | **Perfect****Continuous** |
| **Present** | I askHe askWe askYou askThey ask | I am askingHe is askingWe are askingYou are askingThey are asking | I have askedHe has askedWe have askedYou have askedThey have asked | I have been askingHe has been askingWe have been askingYou have been askingThey have been asking |
| Do I ask? | Am I asking? | Have I asked? | Have I been asking? |
| I do not ask | I am not asking | I have not asked | I have not been asking |
| **Past** | I askedHe askedWe askedYou askedThey asked | I was askingHe was askingWe were askingYou were askingThey were asking | I had askedHe had askedWe had askedYou had askedThey had asked | I had been askingHe had been askingWe had been askingYou had been askingThey had been asking |
| Did I ask? | Was I asking? | Had I asked? | Had I been asking? |
| I did not ask | I was not asking | I had not asked | I had not been asking |
| **Future** | I shall (will) askHe will askWe shall askYou will askThey will ask | I shall be askingHe will be askingWe shall be askingYou will be askingThey will be asking | I shall have askedHe will have askedWe shall have askedYou will have askedThey will have asked | I shall have been askingHe will have been askingWe shall have been askingYou will have been askingThey will have been asking |
| Shall I ask? | Shall I be asking? | Shall I have asked? | Shall I have been asking? |
| I shall not ask | I shall not be asking | I shall not have asked | I shall not havebeen asking |
| **Future in the Past** | I should askHe would askWe should askYou would askThey would ask | I should be askingHe would be askingWe should be askingYou would be askingThey wouldbe asking | I should have askedHe would have askedWe should have askedYou would have askedThey would have asked | I should have been askingHe would have been askingWe should have been askingYou would have been askingThey would have been asking |
| I should not ask | I should not be asking | I should not have asked | I should not have been asked |

**Времена пассивного залога**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Indefinite** | **Continuous** | **Perfect** | **Perfect****Continuous** |
| **Present** | I am askedHe is askedWe are askedYou are askedThey are asked | I am being askedHe is being askedWe are being askedYou are being askedThey are being asked | I have been askedHe has been askedWe have been askedYou have been askedThey have been asked |  –  |
| Am I asked? | Am I being asked? | Have I been asked? |  –  |
| I am not asked | I am not being asked | I have not been asked | – |
| **Past** | I was askedHe was askedWe were askedYou were askedThey were asked | I was being askedHe was being askedWe were being askedYou were being askedThey were being asked | I had been askedHe had been askedWe had been askedYou had been askedThey had been asked |  –  |
| Was I asked? | Was I being asked? | Had I been asked? |  –  |
| I was not asked | I was not being asked | I had not been asked |  –  |
| **Future** | I shall be askedHe will be askedWe shall be askedYou will be askedThey will be asked |  –  | I shall have been askedHe will have been askedWe shall have been askedYou will have been askedThey will have been asked |  –  |
| Shall I be asked? |  –  | Shall I have been asked? |  –  |
| I shall not be asked |  –  | I shall not have been asked |  –  |
| **Future in the Past** | I should be askedHe would be askedWe should be askedYou would be askedThey would be asked |  –  | I should have been askedHe would have been askedWe should have been askedYou would have been askedThey would have been asked |  –  |

**Глаголы, используемые с герундием**

**и инфинитивом**

|  |  |  |
| --- | --- | --- |
| **Verbs** | **Gerund** | **Infinitive** |
| **begin** – начинать**like (love)** – нравиться**loathe** – чувствовать отвращение, ненавидеть**hate** – ненавидеть, не хотеть, испытывать неловкость**remember** – помнить, напоминать (“не забудь”)**forget** – забывать**regret** – сожалеть**try** – пытаться, стараться**prefer** – предпочитать**be afraid** (of) – бояться | а) Сказуемое обозначает деятельность или процесс. (Но использование инфинитива также возможно):She **began crying** (to cry).I **like cooking** (= enjoy вообще).He **loathes travelling** by air (вообще).She **hates getting** to the theatre late (= очень не любит).I **remember posting** your letter (= помню, как делал это)I **forgot calling** you the day before (о прошедшем действии)I **regret saying** (having said) that you were mistaken (речь идёт о настоящем или предшествующем действии).**Try knocking** at the back door if nobody hears you at the front door (попытаться что-л. сделать в виде эксперимента).I **prefer walking** to cycling (вообще).I don’t like dogs. I’**m** always **afraid of being bitten** (опасение). | а) Сказуемое обозначает умственную деятельность или что думает/ощущает человек:I **began** **to feel** dizzy.б) Подлежащее выражено неодушевлённым предметом:The barometer **began to fall**.с) Глагол-сказуемое стоит в форме Continuous:It’**s beginning to freeze**.I **like to cook** my meals (нахожу это верным или соответствующим моим убеждениям):I **loathe** **to put up** here (в частности).I **hate to trouble** you (сожаление).He **remembered to post** the letter (не забыл отправить)Don’t **forget to call** me tomorrow (действие происходит в то же время или позже).I **regret to say** that you were mistaken (сожаление = I’m sorry that I must now tell you).**Try to get** here early (приложить определённые усилия).I **prefer to wait** here (в частности).He **was afraid to tell** his parents that he had broken the window (не желание). |

**Соединительные и переходные слова**

|  |  |
| --- | --- |
| **Temporal (временные)**thenat that timefrom then onuntil thenuntil that timenowat this timeat presentnow and thenfrom very beginninginitiallyfirstlyfinallyeventuallyat lastin the endmeanwhileall this timeby and bylatersome time latersoonafterwardsnextafter some timeafter a whileas a resultin a whilepresently**Spatial (пространственные)**hereclose (to)next (to)adjacent (to)nearbyon the left/rightopposite (to)on top offurtherin the distancetherehere and there**General Transitions** *Opposition*butyetneverthelesshowevernor*Addition – дополнение*andalsoin addition (to it)furthermoremoreover*Сomparison – сравнение*similarly (to)unlikeby contraston the one handon the other handgenerallyin general | тогдав то время, тогдас того временидо того временидо того временисейчас, теперьсейчас, теперьсейчас, в настоящий моментвремя от времени, иногдас самого началавначалево-первыхв конце концов в конечном счётев конце концов, наконецв конце концовтем временем, между темвсё это времявскорепозднеечерез некоторое времявскоревпоследствии, потом, позжепотом, затемчерез некоторое времявскоре, немного погодяв результатевскоревскоре, теперь, сейчасздесьоколорядом с, околопримыкающий, смежныйнеподалёку, поблизостислева/справанапротивсверх, вдобавокдальше, далеев отдалении, вдали, вдалекетамтут и там, туда и сюда**(общие переходы)***противопоставление*о, а, тем не менее, однаконо, всё жевсё жеоднако, тем не менеетакже, тоже неитакже, тоже, к тому жевдобавок, к тому же, кроме того, более тогоболее, сверх того, кроме тогоподобно, такжев отличие отв противоположностьс одной стороныс другой стороныобычно, как правиловообще |

**Таблица неправильных глаголов**

|  |  |  |
| --- | --- | --- |
| **Infinitive** | **Past** **Indefinite** | **Past** **Participle** |
| ariseawakebebearbearbeatbecomebeginbendbindbitebleedblowbreakbreedbringbroadcastbuildburnburstbuycastcatchchooseclingcomecostcreepcutdealdigdodrawdreamdrinkdrivedwelleatfallfeedfeelfightfindfleeflingflyforbidforgetforgivefreezegetgivegogrindgrowhanghavehearhidehitholdhurtkeepknowlayleadleanleaplearnleavelendletlielightlosemakemeanmeetpayputreadrideringriserunsawsayseeseeksellsendsetshakeshaveshedshineshootshowshrinkshutsingsinksitsleepslidesmellsowspeakspeedspellspendspillspinspitsplitspoilspreadspringstandstealstickslingstrikestriveswearsweepswellswimswingtaketeachteartellthinkthrowunderstandwakewearweepwinwindwrite | возникатьбудить; просыпатьсябытьрождатьносить, выноситьбитьстановитьсяначинать(ся)гнуть(ся), сгибать(ся)связыватькусатьистекать кровьюдутьломатьвыводить, разводитьприноситьпередавать по радиостроитьгореть, жечьразрыватьсяпокупатьбросать, кидатьловить, схватыватьвыбиратьприлипать, цеплятьсяприходитьстоитьползатьрезатьиметь дело; торговатькопатьделатьтащить; рисоватьвидеть сны; мечтатьпитьгнать, везти, ехатьобитать; останавливаться подробноесть (принимать пищу)падатькормить(ся)чувствоватьсражатьсянаходитьспасаться бегствомкидать, бросатьлетатьзапрещатьзабыватьпрощатьзамерзать, замораживатьполучать; становитьсядаватьиди, ехатьточить; молотьрасти, выращиватьвисеть, вешатьиметьслышатьпрятатьударять; поражатьдержатьповредить, ушибитьдержать, хранитьзнатькластьвестиприслонятьсяпрыгатьучитьсяоставлять, уезжатьдавать взаймыпозволять; сдавать внаёмлежатьзажигать, освещатьтерятьделать; заставлятьзначить; подразумеватьвстречатьплатитькластьчитатьездить верхомзвонить; звенетьподниматьсябежатьпилитьговорить, сказатьвидетьискатьпродаватьпосылатьпомещать, ставить; заходить (о солнце)трястибрить(ся)проливать (слёзы, кровь)сиять, светитьстрелятьпоказыватьсморщиватьсязакрыватьпетьпогружаться; тонутьсидетьспатьскользитьпахнуть; нюхатьсеятьговоритьспешить; ускорятьпроизносить слово по буквамтратить, проводить проливатьпрястьплеватьраскалывать(ся)портитьраспространять(ся)прыгатьстоятькрастьприклеивать(ся)жалитьударять; бастоватьстремитьсяклясться, бранитьсяместипухнуть, раздуватьсяплаватькачать(ся); размахиватьбратьобучать, учитьрватьрассказыватьдуматьбросатьпониматьбудитьноситьплакатьвыигрыватьзаводить (часы); писать | aroseawoke/awakedwas, wereboreborebeatbecamebeganbentboundbitbledblewbrokebredbroughtbroadcast/-edbuiltburntburstboughtcastcaughtchoseclungcamecostcreptcutdealtdugdiddrewdreamt/-eddrankdrovedweltatefellfedfeltfoughtfoundfledflungflewforbadeforgotforgavefrozegotgavewentgroundgrewhunghadheardhidhitheldhurtkeptknewlaidledleant/leanedleapt/leapedleant/leanedleftlentletlaylit/lightedlostmademeantmetpaidputreadroderangroseransawedsaidsawsoughtsoldsentsetshookshavedshedshoneshotshowedshrankshutsangsanksatsleptslidsmelt/smelledsowedspokespedspelt/spelledspentspill/spilledspanspatsplitspoilt/spoiledspreadsprangstoodstolestuckstungstruckstrovesworesweptswelledswamswungtooktaughttoretoldthoughtthrewunderstoodwoke/wakedworeweptwonwoundwrote | arisenawoke/awakedbeenbornbornebeatenbecomebegunbentboundbittenbledblownbrokenbredbroughtbroadcast/-edbuiltburntburstboughtcastcaughtchosenclungcomecostcreptcutdealtdugdonedrawndreamt/-eddrunkdrivendwelteatenfallenfedfeltfoughtfoundfledflungflownforbiddenforgottenforgivenfrozengotgivengonegroundgrownhunghadheardhid/hiddenhitheldhurtkeptknownlaidledleant/leanedleapt/leapedlearnt/learnedleftlentletlainlit/lightedlostmademeantmetpaidputreadriddenrungrisenrunsawnsaidseensoughtsoldsentsetshakenshavenshedshoneshotshownshrunkshutsungsunksatsleptslidsmelt/smelledsownspokenspedspelt/spelledspentspilt/spilledspunspatsplitspoilt/spoiledspreadsprungstoodstolenstuckstungstruckstrivenswornsweptswollenswumswungtakentaughttorntoldthoughtthrownunderstoodwoken/wakedwornweptwonwoundwritten |

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**ОГЛАВЛЕНИЕ**

ВВЕДЕНИЕ………………………………………………………3

PART I. REAING…………………………………………………4

PART II. SPEAKING……………………………………………17

PART III. QUIZZING…………………………………………...24

ГРАММАТИКА В ТАБЛИЦАХ……………………………....68

СПИСОК ЛИТЕРАТУРЫ……………………………………...79