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АНГЛИЙСКИЙ ЯЗЫК

ПРОФЕССИОНАЛЬНО ОРИЕНТИРОВАННЫЕ ТЕКСТЫ ДЛЯ СТУДЕНТОВ-ГЕОГРАФОВ

Практическое пособие

для студентов специальности
1-31 02 01 «География (научно-педагогическая деятельность)»

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Практическое пособие содержит десять текстов для чтения, а также комплекс упражнений, направленных на развитие у будущих специалистов навыков смысловой компрессии текстового материала.

Предназначено для студентов специальности 1 – 31 01 01 – 02 «География (научно-педагогическая деятельность)» и направлено на развитие и совершенствование у них навыков чтения и пересказа профессионально ориентированных текстов на английском языке.

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ОГЛАВЛЕНИЕ

ПРЕДИСЛОВИЕ

Важность использования в учебном процессе текстов по направлению специальности для обучения студентов иноязычному общению очевидна: работа с подобным материалом дает возможность продемонстрировать будущим специалистам особенности профессионального речевого поведения англоязычного мира, что положительным образом сказывается на изучении языка. Кроме того, чтение профессионально направленных текстов способствует приобретению новых знаний по географии, расширению кругозора, повышению мотивации к изучению предмета, совершенствованию стратегий понимания читаемого и, таким образом, профессиональному и лингвистическому росту.

Практическое пособие состоит из десяти разделов, каждый из которых содержит текст географического профиля, предназначенный для изучающего чтения и реферирования, ряд упражнений и заданий, направленных на проверку понимания прочитанного, на развитие умений смысловой компрессии текстового материала и совершенствование навыков говорения.

Представленный в пособии материал может использоваться для организации аудиторной и внеаудиторной учебной деятельности по английскому языку в рамках учебной программы высшего образования. Изучение одного раздела рассчитано на одно практическое занятие.

Пособие следует рассматривать в качестве дополнения к основным учебникам по английскому языку для неязыковых факультетов, и работа по нему должна проводиться параллельно с работой по этим учебникам.

Настоящее пособие адресовано студентам геолого-географического факультета, проходящих курс обучения по специальности 1-31 02 01 «География (научно-педагогическая деятельность)» и владеющих английским языком в объеме школьной программы.

UNIT 1. PHYSICAL AND HUMAN GEOGRAPHY

Ex. 1. Read these words and try to guess their meaning.

Physical geography, human geography, transportation, economic activities, population, religion, migration [maɪˈgreɪʃn], minerals, atmosphere, meteorology, climatology [klaɪməˈtɒlədʒɪ], pedology, geomorphology, biogeography, hydrology [haɪˈdrɒlədʒɪ], urban [ˈɜːbən] geography, climate ['klaɪmɪt].

Ex. 2. Study the following vocabulary.

Behavior [bɪˈheɪvɪə] – поведение

fossil fuel – ископаемое топливо

human society [ˈhjuːmən səˈsaɪətɪ] – человеческое общество

landform – ландшафт, рельеф, пейзаж

multidisciplinary approach [ˌmʌlti'dɪsəplɪnəri] – междисциплинарный подход

pedology – почвоведение

recreational activities – рекреационная деятельность, отдых и развлечение

similar – похожий, подобный, аналогичный

soil – почва

strength – сильная сторона, преимущество

variety [və'raɪətɪ] – разнообразие, множество

weakness – слабое место, недостаток.

Ex. 3. Read the text and be ready to check your understanding.

Geography consists of at least two different sub-fields of knowledge with similar methodology: physical geography and human geography. ***Physical geography*** studies rocks and minerals, landforms, soils, animals, plants, water, atmosphere, rivers and other water bodies, environment, climate and weather, oceans. ***Human geography*** is interested in population, settlements, economic activities, transportation, recreational activities, religion, political systems, social traditions, human migration, agricultural systems.

Geography is also a discipline that integrates a wide variety of subject matter. Physical geography's primary subdisplines study the Earth's atmosphere (meteorology and climatology), animal and plant life (biogeography), physical landscape (geomorphology), soils (pedology), and waters (hydrology). Some of the dominant areas of study in human

geography include: human society and culture (social and cultural geography), behavior (behavioral geography), economics (economic geography), politics (political geography), and urban systems (urban geography).

The study of geography can also involve a holistic synthesis. Holistic synthesis connects knowledge from a variety of academic fields in both human and physical geography. For example, the study of the enhancement of the Earth's greenhouse effect and the resulting global warming requires a multidisciplinary approach for complete understanding. The fields of climatology and meteorology are required to understand the physical effects of adding greenhouse gases to the atmosphere's radiation balance. The field of economic geography provides information on how various forms of human economic activity contribute to the emission of greenhouse gases through fossil fuel burning and land-use change. Combining the knowledge of both of these academic areas gives us a more comprehensive understanding of why this serious environmental problem occurs.

The holistic nature of geography is both a strength and a weakness. Geography's strength comes from its ability to connect functional interrelationships that are not normally noticed in narrowly defined fields of knowledge. The most obvious weakness associated with the geographical approach is related to the fact that holistic understanding is often too simple and misses important details of cause and effect.

Ex. 4. Give the English equivalent.

Почвоведение, взаимодействие, ландшафт, геоморфология, гидрология, социально-экономическая география, парниковые газы, проблемы окружающей среды, поведение, геоурбанистика (география городов), ископаемое топливо.

Ex. 5. Match the synonyms.

A: Pedology, population, holistic, burning, society.

B: Nation, community, wholesome, combustion, pedosphere.

Ex. 6. Match the words with their definitions.

1. The mixture of gases that surrounds a planet.
2. The top layer of the earth in which plants, trees, etc. grow.
3. The remains of an animal or a plant which have become hard and turned into rock.

4. People in general, living together in communities.
5. To do things in a particular way.
6. The customs, beliefs, art, way of life and social organization of a particular country or a group.

Atmosphere, society, culture, behavior, fossil, soil.

Ex. 7. Answer the following questions.

1. What are the two main sub-fields of geography?
2. What does Physical Geography study?
3. What is Human Geography interested in?
4. What disciplines make up the sphere of geography?
5. What is the subject matter of climatology?
6. What is the subject matter of pedology?
7. What is hydrology about?
8. What is urban geography involved into?
9. In what way do physical and urban geography interrelate?
10. What are the strong and weak points of geography?

Ex. 8. Say if the statement is true or false. If the statement is false, you are to correct it.

1. Geomorphology studies animal and plant life.
2. Geography is a multidisciplinary sphere.
3. No weaknesses are typical of the multidisciplinary approach that Geography uses to understand things.
4. Human geography is made up of such fields of knowledge as geomorphology, pedology, biogeography, meteorology and climatology, hydrology.
5. Human economic activity can contribute to the emission of greenhouse gases.

Ex. 9. Finish the sentences.

1. Geography consists of…
2. Physical geography studies…
3. Human geography is interested in…
4. Physical geography's primary subdisplines study…
5. The study of geography can also involve a holistic synthesis that connects knowledge from…
6. The fields of climatology and meteorology are required to understand…

7. The field of economic geography provides information on how…
8. The holistic nature of geography is both…
9. Geography's strength comes from its ability…
10. The most obvious weakness associated with the geographical approach is related to the fact that…

UNIT 2. TIME AND SPACE IN PHYSICAL GEOGRAPHY

Ex. 1. Read these words and try to guess their meaning.

Phenomena, the spatial patterns, the measurement, absolute, perceive, conceptualize, concrete space, abstract space, to distill, spatial information, units of measurement, scale, an investigator, a researcher, soil bacteria, the boreal forest, life span.

Ex. 2. Study the following vocabulary.

Appropriate – надлежащий, подходящий

as such – таким образом, как таковой

boreal forest – тайга

compare – сравнивать

concept – понятие

distill – фильтровать

human created – созданный человеком

in a relative fashion – относительно

in terms of – с точки зрения, в отношении

life span – время жизни, период существования

measurement [ˈmeʒərmənt] – измерение

perceive [pəˈsiːv] – осознавать, воспринимать

represent – представлять

researcher [rɪˈsɜːtʃə] – исследователь

scale – масштаб, шкала

spatial [speɪʃl] – пространственный

tract of land – участок земли.

variable – переменный.

Ex. 3. Read the text and be ready to check your understanding.

The concepts of ***time*** and ***space*** are very important for understanding the function of phenomena in the natural world. Time is important to Physical Geographers because the spatial patterns they study can often only be explained in **historic** terms. The measurement of time is not

absolute. Time is perceived by humans in a relative fashion by using human created units of measurement. Examples of human created units of time are the measurement of seconds, minutes, hours, and days.

Geographers generally conceptualize two types of space. ***Concrete space*** represents the real world or environment. ***Abstract space*** models reality in a way that distills much of the spatial information contained in the real world. Maps are an excellent example of abstract space. Finally, like time, space is also perceived by humans in a relative fashion by using human created units of measurement.

Both time and space are variable in terms of ***scale***. As such, researchers of natural phenomena must investigate their subjects in the appropriate temporal and/or spatial scales. For example, an investigator studying a forest ecosystem will have to deal with completely different scales of time and space when compared to a researcher examining soil bacteria. The trees that make up a forest generally occupy large tracts of land. For example, the boreal forest occupies millions of hectares in Northern Canada and Eurasia. Temporally, these trees have life spans that can be as long as several hundred years. On the other hand, soil bacteria occupy much smaller spatial areas and have life spans that can be measured in hours and days.

Ex. 4. Give the English equivalent.

Явления, физическая география, исследовать, тайга, продолжительность жизни, почвенные бактерии, исследователь, шкала, переменный, участок земли, фильтровать, понятие, относительно, время жизни.

Ex. 5. Match the synonyms.

A: distill, researcher, tract of land, bacterium, concrete.

B: material/physical, germ, investigator, piece of land, filter.

Ex. 6. Match the words with their definitions.

1. An area or a place.
2. A range of levels or numbers used for measuring something.
3. What is measured in minutes, hours, days, etc.
4. A person who carries out an investigation.
5. All the plants and living creatures in a particular area considered in relation to their physical environment.
6. The simplest and smallest form of life.
7. A large area of land that is thickly covered with trees.

8. The top layer of the earth in which plants, trees, etc. grow.

Researcher, time, space, forest, ecosystem, bacterium, scale, soil.

Ex. 7. Answer the following questions.

1. Why are the concepts of time and space important?
2. The special patterns the Physical Geographers study can only be explained in geological terms, can't they?
3. What are the examples of human created units of time?
4. What type of space Geographers generally conceptualize?
5. What is concrete space?
6. Maps are an excellent example of concrete space, aren't they?
7. Why is time so important for Physical Geographers?
8. What do researchers of natural phenomena investigate?
9. Where can you find boreal forests?
10. What is a life span of soil bacteria?

Ex. 8. Say if the statement is true or false. If the statement is false, you are to correct it.

1. Only time is variable in terms of scale.
2. The concepts of time and space are not so important for understanding the function of phenomena in the natural world.
3. The measurement of time is not absolute.
4. Maps are an excellent example of concrete space.
5. The boreal forest occupies millions of hectares in Northern Canada and Eurasia.

Ex. 9. Finish the sentences.

1. The concepts of time and space are very important for…
2. Time is important to Physical Geographers because…
3. The measurement of time is not…
4. Examples of human created units of time are…
5. Concrete space represents…
6. Abstract space models…
7. Maps are an excellent example of…
8. An investigator studying a forest ecosystem will have to deal with…
9. The boreal forest occupies…
10. Soil bacteria occupy much smaller spatial areas and have life spans that can be measured…

UNIT 3. MAPS

Ex. 1. Read these words and try to guess their meaning.

Graphical, thematic [θɪˈmætɪk], topographic, a geographical phenomenon, location, a coordinate system [kəʊˈɔːdɪnɪt], azimuth ['æzɪməθ], polar axis, the Prime Meridian [məˈrɪdɪən], compass direction, instrument, GPS, satellite [ˈsæt(ɪ)laɪt], a sensor, emission of radiation, a device, an aerial photograph, climate [‘klaimit], GIS, digital [ˈdɪʤɪtl], data, database, software, cartography, process [ˈprəʊsəs], a spatial perspective, Greenwich Mean Time (GMT) [ˈgrenɪʧ].

Ex. 2. Study the following vocabulary.

Accuracy (to an accuracy of) – точность (с точностью до)

reduced scale – уменьшенный масштаб

deployment – вывод на орбиту

dimension – измерение

Geographical Coordinate System – географическая система координат

GPS – глобальная система местоопределения

grid – система координат, сетка координат

grid system – система координат, сетка координат

grid line – линия сетки координат

grid north – условный север, север по координатной сетке

latitude – широта (географическая)

launch a satellite – запускать спутник

location based information – информация о местонахождении

longitude – долгота (географическая)

magnetic north – магнитный север, истинный север

map projection – проекция карты, картографическая проекция

ratio – пропорция, соотношение

reference map – опорная карта

remote sensing – дистанционное зондирование, аэрофотосъемка

satellite – спутник

scale – масштаб

store – хранить

bearing system – несущая система, навигационная система

three-dimensional grid system – трехмерная система координат

TIROS – спутник «Тирос»

triangulation – триангуляция, тригонометрическая съемка

two-dimensional grid – двухмерная система координат

Universal Transverse Mercator System – прямоугольная система координат, универсальная поперечная проекция Меркатора, универсальная проекция Меркатора

wavelength band – диапазон волн

weather forecasting – прогноз погоды, метеорологический прогноз.

Ex. 3. Read the text and be ready to check your understanding.

Geographers use maps for a variety of purposes. A map can be defined as a graphical abstraction of the real world. Most maps describe features of the Earth's surface in two-dimensions. Maps can be of two general types: *reference maps* and *thematic maps*. An example of a reference map is *a topographic map*. This type of map focuses on providing location based information. Thematic maps usually display the spatial distribution of one geographical phenomenon or the geographical relationship that occur between two or more phenomena.

It is extremely difficult to draw maps true to life. For this reason, maps are normally drawn at a reduced scale. Map scale can be expressed as the ratio between map and actual ground distance.

Finding locations on maps is usually done with a coordinate system. The two most common systems found on maps are Geographical Coordinate System and the Universal Transverse Mercator System. The Geographic Coordinate System places a three-dimensional grid system over the Earth's surface and locations are determined relative to two coordinates: latitude and longitude. Measurements of latitude determine location in a north-south direction relative to a point at the center of the Earth's polar axis. Longitude measures the west-east position of points on the Earth's surface relative to a circular arc called the Prime Meridian.

The Universal Transverse Mercator System uses a two-dimensional grid to find location of the Earth's surface. It is also based on the Transverse Mercator map projection. This system is more complicated than Geographic Coordinates as location is determined relative to 60 – six degree longitude wide zones that run north-south.

Direction on maps and the real world can be measured relative to true, grid, or magnetic north. On maps, the easiest way to measure direction is relative to the lines produced by the Universal Transverse Mercator System. These grid lines are aligned relative to grid north.

Finally, compass direction can be described either by using the azimuth or the bearing systems.

One useful field instrument for determining location on the Earth's surface under field conditions is a GPS (global positioning system). A GPS uses triangulation and a network of satellites to calculate location to an accuracy of less than 30 meters.

Remote sensing is any process that collects data about an object from a remote location. Geographers use a number of mechanical devices to achieve this process. These devices contain advanced sensors that can capture information via the reflection or emission of radiation from objects. Devices used for remote sensing are constructed to sense certain wavelength bands. The objects that are sensed have particular spectral signatures and one has to match the object to the sensor. The simplest and most common device employed by Geographers to carry out remote sensing is aerial photographs.

In the 1960s, the deployment of high altitude satellite caused a revolution in remote sensing. Many orbiting objects were outfitted with sensors to complete specific remote sensing jobs. Remote sensing of the Earth's climate for weather forecasting began with the launching of a number of satellites called TIROS. Over time sensors became more sophisticated and some of them were used to monitor the Earth's surface for a number of applications outside of weather forecasting (LANDSAT, SPOT, and RADARSAT).

Geographic Information Systems (GIS) are another important tool used by Geographers. These systems combine computer cartography with database management software. GIS is used to: a) measure natural and human phenomena and processes from a spatial perspective; b) store these measurements in digital form used a computer database and digital maps; c) analyze collected measurements to produce new data or discover relationships; and d) depict the measured or analyzed data in some type of display.

Ex. 4. Give the English equivalent.

Долгота, широта, система координат, истинный север, условный север, опорная карта, дистанционное зондирование, прогноз погоды, географическая система координат, прямоугольная система координат, масштаб, полярная ось, нулевой меридиан, среднее время по Гринвичу, диапазон волн.

Ex. 5. Insert the necessary word.

1. If the map has a… larger than 1:125,000 these distortions are insignificant. 2. Can you find Black Hill on the…? 3. She hits the ball with great… 4. The… of a circle is its diameter. 5. They wanted to move to a warmer…

Axis, climate, map, scale, accuracy.

Ex. 6. Match the words with their definitions.

1. The relation between the actual size of something and its size on a map.
2. An electronic device that is sent into space and moves around the earth or another planet. It is used for communicating by radio, television, etc. and for providing information.
3. A line around the world dividing north and south.
4. The distance of a place east or west the Greenwich Meridian.
5. A measurement in space, for example the height, width or length of something.
6. A description, for example on the radio or TV, of what the weather will be like tomorrow or for the next few days.

Weather forecasting, longitude, latitude, satellite, scale, dimension.

Ex. 7. Match the synonyms.

A: aerial photography, grid, location, the Prime Meridian, instrument, remote, tool.

B: device, distant, remote sensing, tool, coordinate system, place, the Greenwich Meridian.

Ex. 8. Match the opposites.

A: longitude, grid north, Geographical coordinate system, reference map, high, wide.

B: thematic map, latitude, hardware, low, the Universal Transverse System, narrow.

Ex. 9. Answer the following questions.

1. What is a map?
2. What is a reference map?
3. What is a thematic map?
4. What are the two most common coordinate systems?
5. What is special about the Geographic coordinate system?

6. What is GPS?

7. What is the most common device for carrying out remote sensing?

8. What for is GIS used?

Ex. 10. Say if the statement is true or false. If the statement is false, you are to correct it.

1. Thematic maps display the spatial distribution of one geographical phenomenon or the geographical relationship that occur between two or more phenomena.

2. The Universal Transverse Mercator System uses three-dimensional grid to find location.

3. The abbreviation "GPS" stands for geographic information system.

4. Remote sensing is any process that collects data about an object from a remote location.

5. A revolution in remote sensing took place in 1900s.

6. The abbreviation "GIS" stands for global positioning system.

Ex. 11. Finish the sentences.

1. Maps can be of two general types:…

2. Map scale can be expressed as the ratio between…

3. The two most common coordinate systems found on maps are:…

4. In the Geographic coordinate system, locations are determined relative to 2 coordinates:…

5. A GPS uses triangulation and a network of satellites to calculate location to an accuracy of…

6. Remote sensing is any process that collects data about an object from…

7. Devises used for remote sensing are constructed to sense…

8. Remote sensing of the Earth's climate for weather forecasting began with launching of…

UNIT 4. EVOLUTION OF THE UNIVERSE

Ex. 1. Read these words and try to guess their meaning.

To expand, atom ['ætəm], the Big Bang, observation, galaxy, afterglow, cosmic background radiation, explosion, a blackbody,

helium ['hiːliəm], homogeneously [həˈmɒʤɪnɪəslɪ], indicate ['ɪndɪkeɪt], cosmologist [kɒz'mɒlədʒɪst], postulate ['pɔstjuleɪt], collapse [kə'læps].

Ex. 2. Study the following vocabulary.

Acceptance – одобрение, признание, положительное отношение

accurate – точный

background radiation – радиоактивный фон, фоновая радиация, остаточное излучение

Big Crunch – Большое сжатие, Большой хлопок, Большое схлопывание

blackbody curve – характеристика излучения черного тела

coalesce [ˌkəʊəˈles] – объединиться

community – сообщество

ending – концовка

error – ошибка

expand – расширять(-ся)

explosion – взрыв

finite [ˈfaɪnaɪt] – конечный, ограниченный

give birth – порождать

high-density – высокоплотный

homogeneous [hɒmə(ʊ)ˈʤiːnɪəs] – однородный

incredible – невероятный

infinite – бесконечный

initial – первоначальный

insignificant [ɪnsɪgˈnɪfɪk(ə)nt] – незначительный

matter – вещество, материя

occur – случаться, происходить

oscillating ['ɔsɪleɪtɪŋ] – качающийся, генерирующий, колеблющийся

postulate [ˈpɒstʃəleɪt] – теоретически допускать

prediction – предсказание, прогноз

predictions – предсказания

satellite – спутник

state – состояние

suggest – предлагать, предполагать.

Ex. 3. Read the text and be ready to check your understanding.

About 11 to 15 billion years ago all of the matter and energy in the Universe was concentrated into an area the size of an atom. At this moment, matter, energy, space and time did not exist. Then suddenly, the Universe began to expand at an incredible rate and matter, energy, space and time came into being (the Big Bang). As the Universe expanded, matter began to coalesce into gas clouds, and then stars and planets. Our solar system formed about 5 billion years ago when the Universe was about 65 % of its present size. Today, the Universe continues to expand.

Why do Most Scientists Accept the Big Bang Theory?

The acceptance of this theory by the scientific community is based on a number of observations. These observations confirm specific predictions of ***the Big Bang theory***. Predictions associated with the Big Bang theory are as follows.

1. ***If the Big Bang did occur, all of the objects within the Universe should be moving away from each other***. In 1929, Edwin Hubble documented that the galaxies in our Universe are indeed moving away from each other.

2. ***The Big Bang should have left an "afterglow" from the explosion***. In the 1960s, scientists discovered the existence of cosmic ***background radiation***, the so-called "afterglow" after the Big Bang explosion. Our most accurate measurements of this cosmic radiation came in November 1989, by the Cosmic Background Explorer (COBE) satellite. The measurements from this satellite tested an important prediction of the Big Bang theory. This prediction suggests that the initial explosion that gave birth to the Universe should have created radiation with a spectrum that follows a blackbody curve. The COBE measurements indicated that the spectrum of the cosmic radiation varied from a blackbody curve by only 1 %. This level of error is considered insignificant.

3. ***If the Universe began with a Big Bang, extreme temperatures should have caused 25 percent of the mass of the Universe to become helium.*** This is exactly what is observed.

4. ***Matter in the Universe should be distributed homogeneously***. Astronomical observations from the Hubble Space Telescope do indicate that matter in the Universe generally has a homogeneous distribution.

How will the Universe End?

Cosmologists have postulated two endings to the Universe. If the Universe is infinite or has no edge, it should continue to expand forever. A Universe that is finite or closed is theorized to collapse when expansion stops because of gravity. The collapse of the Universe ends when all matter and energy is compressed into the high energy, high-density state from which it began. This scenario is of course called ***the Big Crunch***. Some theorists have suggested that the Big Crunch should produce a new Big Bang and the process of an expanding Universe will begin again. This idea is called ***the oscillating Universe theory***.

Ex. 4. Give the English equivalent.

Вещество, незначительный, расширяться, гелий, космолог, распространять, бесконечный, теоретически допускать, черное тело.

Ex. 5. Match the opposites.

A: Big Crunch, accurate, initial, ending, infinite.

B: finite, inaccurate, final, Big Bang, beginning.

Ex. 6. Answer the following questions.

1. What theories of ending to the Universe Cosmologists have postulated?
2. What is the Big Bang Theory?
3. Why do Most Scientists Accept the Big Bang Theory?
4. What is an "afterglow"?
5. When did our solar system form?
6. Is matter in the Universe distributed homogeneously?
7. What is the oscillating Universe theory?
8. Does the collapse of the Universe end when all matter and energy is compressed into the high energy?
9. What does the COBE satellite prediction?
10. Who documented that the galaxies in our Universe are indeed moving away from each other?

Ex. 7. Match the words with their definitions.

1. An electronic device that is sent into space and moves around the earth or another planet. It is used for communicating by radio, television, etc. and for providing information.
2. A source of power, such as fuel, used for driving machines, providing heat, etc.
3. Watching something/somebody carefully
4. A group of people who share the same job, interests, etc.
5. The sudden and violent bursting.
6. Physical substance in general that everything in the world consists of.
7. A large round object in space that moves around a star.
8. Powerful and very dangerous rays that are sent out from radioactive substances.

Matter, energy, planets, system, observation, community, explosion, radiation, satellite.

Ex. 8. Say if the statement is true or false. If the statement is false, you are to correct it.

1. About 11 to 15 billion years ago matter, energy, space and time did not exist.
2. The Universe stopped expanding.
3. Our solar system formed about 5 million years ago.
4. If the Universe began with a Big Bang, extreme temperatures couldn't have caused 25 percent of the mass of the Universe to become helium.
5. If the Universe is infinite or has no edge, it should stop expanding.

Ex. 9. Finish the sentences.

1. About 11 to 15 billion years ago all of the matter and energy in the Universe was concentrated into an area…
2. The Universe began to expand at an incredible…
3. As the Universe expanded, matter began to coalesce into…
4. Our solar system formed about…
5. If the Big Bang did occur, all of the objects within the Universe should be…
6. The initial explosion that gave birth to the Universe should have created radiation with a spectrum…
7. If the Universe is infinite or has no edge, it should…
8. A Universe that is finite or closed is theorized to collapse when…
9. The collapse of the Universe ends when all matter and energy is…

UNIIT 5. EARLY HISTORY OF THE EARTH

Ex. 1. Read these words and try to guess their meaning.

Cosmic ['kɔzmık], lithosphere ['lıθəʊsfıə, carbon dioxide [ˈkɑːbən daıˈɒksaıd], nitrogen ['naıtrədʒən], ammonia (NH3) [ə'məunıə], methane (CH4) ['mi:θeın], sulfur ['sʌlfə], iodine ['aıədiːn], bromine ['brəʊmi:n], chlorine ['klɔ:ri:n], argon ['ɑ:gɔn], accumulate [ə'kju:mjuleıt], photo-dissociation, photosynthesis ['fəutəu'sınθısıs], ultraviolet radiation ['ʌltrə'vaıəlıt], reptile ['reptaıl].

Ex. 2. Study the following vocabulary.

Algae – водоросли

ammonia [əˈməʊnɪə] – аммиак

build up – наращивание, увеличение

chemosynthetic – хемосинтетический

common – представленный, распространенный

constituent – компонент, составной элемент

cool – охлаждать(ся)

creation – создание

duration – продолжительность

dust – пыль

early atmosphere – ранняя атмосфера

emergence – появление, возникновение

escape – исчезать, уходить, покидать

exist – существовать

expansion – расширение, распространение

flowering plant – цветковое растение

hold – держать, удерживать, проводить

helium [ˈhiːlɪəm] – гелий

hydrogen – водород

invertebrate [ɪnˈvɜːrtɪbrət] – беспозвоночный

land plants – наземные растения, эмбриофиты

level off – сровнять, выравнивать

living atmosphere – атмосфера, пригодная для жизни

lump together – смешивать(ся)

mammal – млекопитающее

marine invertebrates – морские беспозвоночные

modify – изменять

particle – частица

precipitation – осадки (атмосферные)

quantity – количество

release – пуск, освобождение, высвобождение

secondary – вторичный

solidification [səˌlɪdɪfɪˈkeɪʃən] – отвердевание, застывание

stage – этап, стадия

sulfur [ˈsʌlfər] – сера

terrestrial – земной, наземный

terrestrial life [təˈrestrɪəl] – геобиоз, живое население почвы

water vapor – водяной пар

Ex. 3. Read the text and be ready to check your understanding.

Scientists believe the Earth began its life about 4.6 billion years ago. The Earth formed as cosmic dust lumped together to form larger and larger particles until 150 million years had passed. At about 4.4 billion years, the young Earth had a mass similar to the mass it has today. The continents probably began forming about 4.2 billion years ago as

the Earth continued to cool. The cooling also resulted in the release of gases from the lithosphere, much of which formed the Earth's early atmosphere. Most of the Earth's early atmosphere was created in the first one million years after solidification (4.4 billion years ago). Carbon dioxide, nitrogen, and water vapor dominated this early atmosphere. Below you can see the three major stages of development of the atmosphere (Table 1).

Table 1

Name of Stage	Duration of Stage (Billions of Years Ago)	Main Constituents of the Atmosphere	Dominant Processes and Features
Early atmosphere	4.4 to 4.0	H_2O, HCN, ammonia (NH_3), methane (CH_4), sulfur, iodine, bromine, chlorine, argon	Lighter gases like hydrogen and helium escaped to space. All water was held in the atmosphere as vapor because of high temperatures.
Secondary atmosphere	4.0 to 3.3	First, H_2O, CO_2, and nitrogen (N) are dominant. Cooling of the atmosphere causes precipitation and the development of the oceans. By 3.0 billion CO_2, H_2O, N_2 are dominant. O_2 begins to accumulate.	Continued release of gases from the lithosphere. Water vapor clouds common in the lower atmosphere. Chemosynthetic bacteria appear on the Earth some time between 3.9 and 3.5 billion years ago. Life begins to modify the atmosphere.
Living atmosphere	3.3 to Present	N_2 – 78 %, O_2 – 21 %, Argon – 0.9 %, CO_2 – 0.036 %	Development, evolution and growth of life increases the quantity of oxygen in the atmosphere from <1 % to 21 %. 500 million years ago concentration of atmospheric oxygen levels off. Humans begin modifying the concentrations of some gases in the atmosphere beginning around the year 1700.

As the Earth continued to cool, the water vapor found in the atmosphere condensed to form the oceans and other fresh water bodies on the continents. Oxygen began accumulating in the atmosphere through

photo-dissociation of O2 from water, and by way of ***photosynthesis*** (life). The emergence of living organisms was extremely important in the creation of atmospheric oxygen and ozone. Without ozone, life could not exist on land because of harmful ***ultraviolet radiation***.

Most of the build up of oxygen in the atmosphere occurred between 2.1 and 1.5 billion years ago as a direct result of photosynthesis from ocean based plants like algae. At about 450 million years ago, there was enough oxygen in the atmosphere to allow for the development of a stratospheric ozone layer that was thick enough to keep terrestrial life protected from ultraviolet radiation. As a result, terrestrial life began its development and expansion at this time. Below, you can see the timing of the evolutionary development of some of the Earth's dominant forms of life before and after 450 million years before present (BP):

- Marine Invertebrates 570 Million Years Ago;
- Fish 505 Million Years Ago;
- Land Plants 438 Million Years Ago;
- Amphibians 408 Million Years Ago;
- Reptiles 320 Million Years Ago;
- Mammals 240 Million Years Ago;
- Flowering Plants 140 Million Years Ago.

Ex. 4. Give the English equivalent.

Застывший, расширяться, бесконечный, незначительный, теоретически допускать, черное тело, распространять, беспозвоночный, млекопитающие, фотодиссоциация, цветковое растение, гелий, водород, количество, вторичный, затвердевание, сера, земной.

Ex. 5. Match the opposites.

A: terrestrial, solidification, living, common, invertebrate.

B: vertebrate, aquatic, non-living, melt, rare.

Ex. 6. Match the words and their definitions.

1. Very simple plants that grow in or near water.
2. One of the large land masses of the earth such as Europe, Asia and Africa.
3. The gradual growth of something so that it becomes more advanced, stronger.
4. Causing damage or injury to something or somebody.

5. The layer of rock that forms the outer part of the earth.

6. A gas that is present in air and water and is necessary for people, animals and plants to live.

7. A very small piece of matter.

Continent, lithosphere, particle, development, oxygen, harmful, algae.

Ex. 7. Answer the following questions.

1. When did the continents probably begin forming?
2. What did the cooling of the Earth result in?
3. What dominated early atmosphere?
4. What are the three major stages of development of the atmosphere?
5. How did the oxygen begin accumulating in the atmosphere?
6. Why life could not exist on land without ozone?
7. What was extremely important in the creation of atmospheric oxygen and ozone?
8. When did the most of the buildup of oxygen in the atmosphere occur?
9. What kept terrestrial life protected from ultraviolet radiation?
10. Why was all water held in the atmosphere as vapor?

Ex. 8. Say if the statement is true or false. If the statement is false, you are to correct it.

1. Scientists believe the Earth began its life about 4.6 billion years ago.
2. At about 4.4 billion years, the young Earth had a mass similar to the mass it was two years ago.
3. Most of the build up of oxygen in the atmosphere occurred between 2.1 and 1.5 million years ago.
4. Humans began modifying the concentrations of some gases in the atmosphere beginning around the year 1700.
5. Terrestrial life began its development and expansion 700 million years ago.

Ex. 9. Finish the sentences.

1. Scientists believe the Earth began its life about…
2. At about 4.4 billion years, the young Earth had a mass…
3. The continents probably began forming…
4. Most of the Earth's early atmosphere was created in…
5. As the Earth continued to cool, the water vapor found in the atmosphere condensed…

6. Oxygen began accumulating in the atmosphere through…

7. Most of the build up of oxygen in the atmosphere occurred between…

8. At about 450 million years ago, there was enough oxygen in the atmosphere to allow…

9. Marine invertebrates appeared…

10. Mammals appeared…

UNIT 6. THE GAIA HYPOTHESIS

Ex. 1. Read these words and try to guess their meaning.

Hypothesis [haɪ'pɔθɪsɪs], extraterrestrial, regulate ['regjuleɪt], methane ['mi:θeɪn], average global temperature ['æv(ə)rɪdʒ], greenhouse effect, mechanism ['mekənɪz(ə)m], important.

Ex. 2. Study the following vocabulary.

Abiotic environment – неживая среда

abundant – обильный, богатый, изобилующий

alter – менять(ся), изменять(ся)

breaking point – переломный момент

carbon dioxide (C02) – углекислый газ

cause – вызывать, способствовать

composition – состав

continually – постоянно

conversion – превращение

currently – на текущий момент

disturbance – беспокойство, нарушение, волнение, тревога

energy output – выходная энергия, отдача мощности

extraterrestrial – внеземной, космический, внеатмосферный

fluctuate – колебаться

greenhouse effect – парниковый эффект

hydrogen [ˈhaɪdrədʒən] – водород

intentional – намеренный

limestone – известняк

lock up – блокировать, запирать

methane [ˈmi:θeɪn] – метан

modify – менять, изменять

oxidation – окисление, оксидация

peat – торф

remove – удалять

respond – реагировать

state – утверждать, заявлять.

Ex. 3. Read the text and be ready to check your understanding.

In 1965, ***J. E. Lovelock*** published the first scientific paper suggesting ***the Gaia hypothesis***. The Gaia hypothesis states that the temperature and composition of the Earth's surface are actively controlled by life on the planet. It suggests that if changes in the gas composition, temperature or oxidation state of the Earth are caused by extraterrestrial, biological, geological, or other disturbances, life responds to these changes by modifying the abiotic environment through growth and metabolism. In simplier terms, biological responses tend to ***regulate*** the state of the Earth's environment in their favor.

The evidence for Gaia is as follows.

1. If not continually replaced by ***biotic*** activities gases like ***methane*** and ***hydrogen*** would become non-existant in the atmosphere in a few decades.

2. ***Carbon dioxide*** (C02) in the Earth's atmosphere is far less abundant than chemistry alone would allow. If life was deleted carbon dioxide would become 30 times more abundant. Large quantities of carbon dioxide are currently locked up by living organisms.

3. The Sun's energy output has increased by 30 % in the past 3.5 billion years. Yet, historical climate data indicates that the temperature of the Earth has only fluctuated by about 5° Celsius from the current ***average global temperature*** of 15° Celsius. Computer climate models suggest that a 30 % reduction in solar radiation would create a global average temperature of between –10 and –52° Celsius all things being equal. These results indicate that levels of atmospheric carbon dioxide must have been much higher in the past when the Sun was less powerful. Extra atmospheric carbon dioxide would have created a greater ***greenhouse effect*** and warmer temperatures. These results also indicate that some ***mechanism*** must have removed carbon dioxide from the atmosphere as the Sun's output of radiation increased over the Earth's geologic history. This mechanism is the conversion of atmospheric carbon dioxide into ***fossilized organic matter*** (***natural gas***, ***oil***, ***coal***, ***limestone***, and ***peat***). In other words, Gaia!

This theory is ***important*** to Physical Geography and other Earth Sciences for the following reasons:

- the Gaia theory suggests that the abiotic and biotic environment is made up of many complex interrelationships;
- many of these complex interrelationships are quite delicate and may be altered by human activity to a breaking point;

- the theory suggests that humans must learn to respect Gaia by reducing their intentional modification of the Earth's abiotic and biotic components.

Ex. 4. Give the English equivalent.

Неживая среда, метан, водород, углекислый газ, парниковый эффект, известняк, гипотеза.

Ex. 5. Match the opposites.

A: abiotic, abundant, extraterrestrial, intentional, reason.

B: cause, terrestrial, occasional, scarce, biotic.

Ex. 6. Answer the following questions.

1. What did J. E. Lovelock publish in 1965?
2. What does the Gaia hypothesis state?
3. The Sun's energy output has increased, hasn't it?
4. Would carbon dioxide become more abundant if life was deleted?
5. What do computer climate models suggest?
6. What would have created a greater greenhouse effect and warmer temperatures?
7. What is the evidence for Gaia?
8. Did the Sun's output of radiation increase or decrease over the Earth's geologic history?
9. Why is Gaia theory so important to Physical Geography?
10. According to the theory how can humans learn to respect Gaia?

Ex. 7. Match the words and their definitions.

1. Not involving biology or living things.
2. A period of ten years.
3. To make something greater in amount, number, value, etc.
4. The way in which two or more things or people are connected and affect each other.
5. Petroleum.
6. A soft black or brown substance formed from decaying plants just under the surface of the ground, especially in cool wet areas. It is burned as a fuel or used to improve garden soil.
7. Making something less or smaller.

Decade, abiotic, reduction, peat, oil, interrelationship, increase.

Ex. 8. Say if the statement is true or false. If the statement is false, you are to correct it.

1. The Gaia hypothesis states that the temperature and composition of the Earth's surface are actively controlled by life on the planet.
2. Biological responses don’t tend to regulate the state of the Earth's environment in their favor.
3. Large quantities of carbon dioxide are currently locked up by living organisms.
4. Levels of atmospheric carbon dioxide must have been much higher in the past when the Sun was less powerful.
5. The Gaia hypothesis states that life on the planet is actively controlled by the temperature and composition of the Earth's surface.

Ex. 9. Finish the sentences.

1. The Gaia hypothesis states…
2. If changes in the gas composition, temperature or oxidation state of the Earth are caused by extraterrestrial, biological, geological, or other disturbances…
3. If not continually replaced by biotic activities gases like methane and hydrogen would…
4. If life was deleted CO2 would become 30 times more abundant…
5. Computer climate models suggest that a 30 % reduction in solar radiation would create…
6. The theory suggests that humans must respect Gaia by…

UNIT 7. THE OZONE LAYER

Ex. 1. Read these words and try to guess their meaning.

Stratosphere [ˈstrætəˌsfɪə], approximately [ə'prɔksɪmɪtlɪ], thinning, the ozone hole, DNA, cataract, suppression [sə'preʃ(ə)n] of immune system, absorption [əb'zɔ:pʃ(ə)n], collision [kə'lɪʒ(ə)n], chlorofluorocarbons (CFCs) [ˈklɒrəflɔːrəkɑːbənz].

Ex. 2. Study the following vocabulary.

Adverse – неблагоприятный, негативный

altitude – высота

approximately [əˈprɒksɪmətlɪ] – приблизительно

chlorofluorocarbons (CFCs) – хлорфторуглеводороды

cleaner – очиститель

collision – столкновение

cooling – охлаждение

coverage – покрытие, охват, зона

DNA – ДНК

harmful – вредный

human-made – антропогенный

impact – влияние, воздействие

increase – увеличивать

level off – выровняться

loss – потеря, утрата

occur – случаться, происходить

prior to – до

propellant [prə'peləntˌ] – топливо, заряд

recent – недавний

reduction – сокращение, уменьшение

refrigerant [rɪ'frɪʤ(ə)rənt] – охладитель, охлаждающий агент

shield – щит, заслонять

skin – кожа

spray can – аэрозольный баллончик

stable – устойчивый, стабильный

sterilant – стерилизующее средство

styrofoam – пенопласт, пенополистирол

suppression – подавление

Ex. 3. Read the text and be ready to check your understanding.

The ozone layer is a region of concentration of the ***ozone*** molecule (O3) in the Earth's atmosphere. The layer sits at an altitude of about 10–50 kilometers, with a maximum concentration in the ***stratosphere*** at an altitude of approximately 25 kilometers. In recent years, scientists have measured a seasonal thinning of the ozone layer primarily at the South Pole. This phenomenon is being called ***the ozone hole***.

The ozone layer naturally shields Earth's life from the harmful effects of the Sun's ***ultraviolet (UV) radiation***. A severe decrease in the concentration of ozone in the ozone layer could lead to the following harmful effects:

- an increase in the incidence of ***skin cancer*** (ultraviolet radiation can destroy acids in ***DNA***);
- a large increase in cataracts and Sun burning;
- suppression of immune systems in organisms;
- adverse impact on crops and animals;

- reduction in the growth of phytoplankton found in the Earth's oceans;

- cooling of the Earth's stratosphere and possibly some surface climatic effect.

Ozone is created naturally in the stratosphere by the combining of ***atomic oxygen*** (O) with ***molecular oxygen*** (O2). This process is activated by sunlight. Ozone is destroyed naturally by the absorption of ultraviolet radiation, and by the collision of ozone with other atmospheric atoms and molecules.

Since the late 1970s, scientists have discovered that stratospheric ozone amounts over Antarctica in springtime ***(September – November)*** have decreased by as much as 60 %. Satellite measurements have indicated a 2 % decrease in ozone between 65 degrees North – 65 degrees South per decade since 1978. A reduction of about 3 % per year has been measured at Antarctica where most of the ozone loss is occurring globally. During the late 1990s, large losses of ozone were recorded above Antarctica year after year in the months of September and August. In some years, spring levels of stratospheric ozone were more than 60 % lower than the levels recorded months prior to the seasonal development of the hole.

It appears that human activities are altering the amount of stratospheric O3. The main agent responsible for this destruction was human-made ***chlorofluorocarbons*** or ***CFCs***. First produced ***by General Motors Corporation*** in 1928, CFCs were created as a replacement to the toxic refrigerant ***ammonia***.

CFCs have also been used as a propellant in spray cans, cleaner for electronics, sterilant for hospital equipment, and to produce the bubbles in styrofoam. CFCs are cheap to produce and are very stable compounds, lasting up to 200 years in the atmosphere. By 1988, some 320,000 metric tons of CFCs were used worldwide.

In 1987, a number of nations around the world met to begin formulating a global plan, known as ***the Montreal Protocol***, to reduce and eliminate the use of CFCs.

NASA's Earth Probe –Total Ozone Mapping Spectrometer home page has the latest images describing the current status of global stratosphere ozone levels in the atmosphere.

The average areal coverage of the Antarctic ozone hole has now leveled off at about 24 million square kilometers. Scientists believe that

the ozone hole over Antarctica will maintain this size for some time. In the nearest future, the ozone hole should begin to recover and be completely gone by about 2070.

Ex. 4. Give the English equivalent.

ДНК, стратосфера, высота, рак, поглощение, защита, хлорфторуглеводороды, озоновая дыра, молекулярный кислород, вредное воздействие, истощение озонового слоя, аэрозольный баллончик, устойчивые (химические) соединения, столкновение, уровень.

Ex. 5. Match the opposites.

A: increase, human-made, harmful, cooling, loss.

B: acquisition, natural, decrease, harmless, warming.

Ex. 6. Answer the following questions.

1. What is the definition of the ozone layer?
2. What is the ozone hole?
3. What is the altitude of the ozone layer?
4. Where and when have scientists discovered that stratospheric ozone amounts have decreased?
5. Who is responsible for altering the amount of stratospheric O3?
6. What was the Montreal Protocol created for?
7. What are the advantages and disadvantages of CFCs?
8. Why did General Motors Corporation start using CFCs?
9. What could severe decrease in the concentration of ozone in the ozone layer lead to?
10. What contains CFCs?

Ex. 7. Match the words with their definitions.

1. The height above sea level.
2. A substance formed by a chemical reaction of two or more elements.
3. An opening, a hollow space in something.
4. The powerful effect that something or somebody has on somebody or something.
5. A layer or part of a system. Thinness of something.
6. No longer having something.
7. To change something.

Hole, layer, altitude, impact, loss, compounds, alter.

Ex. 8. Say if the statement is true or false. If the statement is false, you are to correct it.

1. Ozone is created naturally in the stratosphere by the combining of atomic oxygen (O) with molecular oxygen (O2).
2. By 1990, some 320,000 metric tons of CFCs were used worldwide.
3. During the late 1990s, large losses of ozone were recorded above Antarctica year after year in the months of September and August.
4. Since the late 1970s, scientists have discovered that stratospheric ozone amounts over Antarctica in winter have decreased by as much as 60 %.
5. Scientists believe that in the nearest future, the ozone hole should begin to recover and be completely gone by about 2070.

Ex. 9. Finish the sentences.

1. The ozone layer sits at an altitude of…
2. In recent years, scientists have measured a seasonal thinning of the ozone layer primarily at…
3. Ozone is created naturally in the stratosphere by the combining…
4. Ozone is destroyed naturally by the absorption of…
5. The main agent responsible for the destruction of ozone was…
6. The average areal coverage of the Antarctic ozone hole has now leveled off at about…
7. Scientists believe that the ozone hole over Antarctica will maintain…
8. The ozone hole should be completely gone by…

UNIT 8. THE GREENHOUSE EFFECT

Ex. 1. Read these words and try to guess their meaning.

Process [ˈprəʊsəs], carbon dioxide [ˈkɑːbən daɪˈɒksaɪd], water vapor, methane [ˈmiːθeɪn], longwave radiation, ozone, energy, photosynthesis [fəʊtəʊˈsɪnθɪsɪs], greenhouse gas, the Industrial Revolution, portion [pɔːʃn], absorption [əbˈzɔːpʃn], concentration, computer modeling, negative.

Ex. 2. Study the following vocabulary.

Aid – помогать

cloud cover – слой облаков, облачный покров

emit – испускать, излучать

equation [ɪˈkweɪʒ(ə)n – уравнение

evaporation – испарение

heat – нагревать

infrared radiation [ˌɪnfrəˈreɪd] – инфракрасное излучение

longwave – длинноволновой

on average – в среднем

outgoing – излучаемый

particle – частица

reach – достигать, добираться

reduce – сокращать, уменьшать

reflect – отражать.

Ex. 3. Read the text and be ready to check your understanding.

The greenhouse effect is a naturally occurring process that aids in heating the Earth's surface and atmosphere. It results from the fact that certain atmospheric gases, such as ***carbon dioxide***, ***water vapor***, and ***methane***, are able to change the energy balance of the planet by absorbing ***longwave radiation*** emitted from the Earth's surface. Without the greenhouse effect life on this planet would probably not exist as the average temperature of the Earth would be a chilly –18° Celsius, rather than the present 15° Celsius.

As energy from the Sun passes through the atmosphere a number of things take place. A portion of the energy (26 % globally) is ***reflected*** or ***scattered*** back to space by clouds and other atmospheric particles. About 19 % of the energy available is absorbed by clouds, gases (like ***ozone***), and particles in the atmosphere. Of the remaining 55 % of the solar energy passing through the Earth's atmosphere, 4 % is reflected from the surface back to space. On average, about 51 % of the Sun's radiation reaches the surface. This energy is then used in a number of processes, including the heating of the ground surface; the melting of ice and snow and the evaporation of water; and plant ***photosynthesis***.

The heating of the ground by sunlight causes the Earth's surface to become a radiator of energy in the longwave band (sometimes called ***infrared radiation***). This emission of energy is generally directed to space. However, only a small portion of this energy actually makes it back to space. The majority of the outgoing infrared radiation is absorbed by the ***greenhouse gases***.

Absorption of longwave radiation by the atmosphere causes additional heat energy to be added to the Earth's atmospheric system.

The now warmer atmospheric greenhouse gas molecules begin radiating longwave energy in all directions. Over 90 % of this emission of longwave energy is directed back to the Earth's surface where it once again is absorbed by the surface. The heating of the ground by the longwave radiation causes the ground surface to once again radiate, repeating the cycle described above, again and again, until no more longwave is available for absorption.

The amount of heat energy added to the atmosphere by the ***greenhouse effect*** is controlled by the concentration of greenhouse gases in the Earth's atmosphere. All of the major greenhouse gases have increased in concentration since the beginning of ***the Industrial Revolution*** (about 1700 AD). As a result of these higher concentrations, scientists predict that the greenhouse effect will be enhanced and the Earth's climate will become warmer. Predicting the amount of warming is accomplished by computer ***modeling***. Computer models suggest that a doubling of the concentration of the main greenhouse gas, ***carbon dioxide***, may raise the average global temperature between 1 and 3° Celsius. However, the numeric equations of computer models do not accurately simulate the effects of a number of possible negative ***feedbacks***. For example, many of the models cannot properly simulate the negative effects that increased cloud cover would have on the radiation balance of a warmer Earth. Increasing the Earth's temperature would cause the oceans to evaporate greater amounts of water, causing the atmosphere to become cloudier. These extra clouds would then reflect a greater proportion of the Sun's energy back to space reducing the amount of solar radiation absorbed by the atmosphere and the Earth's surface. With less solar energy being absorbed at the surface, the effects of an enhanced greenhouse effect may be counteracted.

Ex. 4. Give the English equivalent.

Инфракрасное излучение, солнечная энергия, испарение, длинноволновая радиация, в среднем, частица, отражать, излучать, облачный покров, водяной пар, поглощение, углекислый газ, метан, промышленная революция, водяной пар, в результате, космическое пространство, в среднем.

Ex. 5. Match the opposites.

A: to aid, heating, plant, available, gas.

B: unavailable, cooling, liquid, to disturb, animal.

Ex. 6. Match the synonyms.

A: to aid, heating, plants, start, water.

B: warming, flora, liquid, to help, begin.

Ex. 7. Answer the following questions.

1. Is the greenhouse effect a natural phenomenon?
2. What for do we need the greenhouse effect?
3. What greenhouse gases can you name?
4. What is the role of greenhouse gases?
5. What would the average temperature be on the Earth without the greenhouse effect?
6. What happens when energy from the Sun passes through the atmosphere?
7. What will happen to the oceans if the Earth's temperature increases?

Ex. 8. Match the words with their definitions.

1. Information about how good or useful something or somebody's work is.
2. Any substance like air that is neither a solid nor a liquid.
3. Having or using electromagnetic waves which are longer than those of red light in the spectrum, and which cannot be seen.
4. The largest part of a group of people or things.
5. The process by which green plants turn carbon dioxide and water into food using energy obtained from light from the sun.
6. One part of something larger.
7. The outside or top layer of something.
8. The process of making something, or of becoming, warm or warmer.

Feedback, photosynthesis, infrared, gas, portion, majority, surface, warming.

Ex. 9. Say if the statement is true or false. If the statement is false, you are to correct it.

1. As energy from the Sun passes through the atmosphere, a portion of the energy (26 % globally) is reflected or scattered back to space by clouds and other atmospheric particles.
2. As energy from the Sun passes through the atmosphere, about 97 % of the energy available is absorbed by clouds, gases (like ozone), and particles in the atmosphere.
3. As energy from the Sun passes through the atmosphere, 55 % is reflected from the surface back to space.

4. On average, about 65 % of the Sun's radiation reaches the surface.

5. The heating of the ground by sunlight causes the Earth's surface to become a radiator of energy in the longwave band.

Ex. 10. Finish the sentences.

1. The greenhouse effect aids in heating…
2. Without the greenhouse effect life on this planet would…
3. The majority of the outgoing infrared radiation is…
4. Absorption of longwave radiation by the atmosphere causes…
5. The amount of heat energy added to the atmosphere by the greenhouse effect is controlled by…
6. All of the major greenhouse gases have increased in concentration since…
7. Computer models suggest that a doubling of the concentration of the main greenhouse gas, carbon dioxide, may raise…
8. Increasing the Earth's temperature would cause the oceans…

UNIT 9. GREENHOUSE GASES: CARBON DIOXIDE AND CHLOROFLUOROCARBONS

Ex. 1. Read these words and try to guess their meaning.

Carbon dioxide [ˈkɑːbən daɪˈɒksaɪd], methane [ˈmiːθeɪn], nitrous oxide [naɪtrəs ˈɒksaɪd], chlorofluorocarbon [klɒrəflɔːrəˈkɑːbən], tropospheric ozone, the Montreal Protocol, electricity generation, vegetation [vedʒɪˈteɪʃn], natural prairie [ˈpre(ə)rɪ], forested ecosystems, deforestation, agricultural systems.

Ex. 2. Study the following vocabulary.

Account for – насчитывать

artificially – искусственно

average – средний

contribution – вклад, взнос, роль

conversion – превращение

due to – из-за, по причине

emission – выделение, излучение, выхлоп

enhancement – усиление

fossil fuel combustion – горение/возгорание ископаемого топлива

human caused – антропогенный, вызванный деятельностью человека

generation – выработка

measurements – меры, действия, мероприятия

primarily – главным образом

quantify – вычислить, посчитать

reduce – сокращать, уменьшать

space heating – отопление, обогрев помещений.

Ex. 3. Read the text and be ready to check your understanding.

A number of gases are involved in the human caused enhancement of the greenhouse effect. These gases include: ***carbon dioxide*** (CO2); ***methane*** (CH4); ***nitrous oxide*** (N2O); ***chlorofluorocarbons*** (CFxClx); and ***tropospheric ozone*** (O3). Of these gases, the single most important gas is ***carbon dioxide*** which accounts for about 55 % of the change in the intensity of the Earth's greenhouse effect. The contributions of the other gases are 25 % for ***chlorofluorocarbons***, 15 % for ***methane***, and 5 % for ***nitrous oxide***. ***Ozone's*** contribution to the ***enhancement*** of greenhouse effect is still yet to be quantified.

Average concentrations of atmospheric ***carbon dioxide*** in the year 2005 were about 380 parts per million. Prior to 1700, levels of carbon dioxide were about 280 parts per million. This increase in carbon dioxide in the atmosphere is primarily due to the activities of humans. Beginning in 1700, societal changes brought about by ***the Industrial Revolution*** increased the amount of carbon dioxide entering the atmosphere.

The major sources of this gas include fossil fuel combustion for industry, transportation, space heating, electricity generation and cooking; and vegetation changes in natural prairie, woodland, and forested ecosystems. Emissions from fossil fuel combustion account for about 65 % of the extra carbon dioxide now found in our atmosphere. The remaining 35 % is derived from deforestation and the conversion of prairie, woodland, and forested ecosystems primarily into agricultural systems. Natural ecosystems can hold 20 to 100 times more carbon dioxide per unit area than agricultural systems.

Artificially created ***chlorofluorocarbons*** are the strongest greenhouse gas per molecule. However, low concentrations in the atmosphere reduce their overall importance in the enhancement of the greenhouse effect. Current measurements in the atmosphere indicate that the concentration of these chemicals may soon begin declining because of reduced emissions. Reports of the development of ozone holes over the North and South Poles and a general decline in global stratospheric ozone levels over the last two decades has caused many nations to cutback on their production and use of these chemicals. In 1987,

the signing of ***the Montreal Protocol*** agreement by forty-six nations established an immediate timetable for the global reduction of chlorofluorocarbons production and use.

Ex. 4. Give the English equivalent.

Ископаемое топливо, антропогенный, обогрев помещений, средний, углекислый газ, производство электричества, вырубка леса, прерия/степь, хлорфторуглероды, растительность, сократить производство, появление озоновых дыр, десятилетие.

Ex. 5. Match the chemical elements with their symbols (or abbreviations).

A: chlorofluorocarbons, methane, nitrous oxide, carbon dioxide, tropospheric ozone.

B: CH4, NO, CO2, CFCs, O3.

Ex. 6. Answer the following questions.

1. What greenhouse gases do you know?
2. What is the contribution of different gases to the enhancement of greenhouse effect?
3. What was the average concentration of atmospheric carbon dioxide in the year 2005.
4. What are the major sources for greenhouse gases in the atmosphere?
5. What is the strongest greenhouse gas per molecule?
6. When was the Montreal Protocol agreement signed?
7. What is the Montreal Protocol about?

Ex. 7. Match the words with their definitions.

1. A quantity of something.
2. An action or a service that helps to cause or increase something.
3. The process of burning.
4. The process of preparing food.
5. A contract.
6. The production of something.
7. A country. All the people in a country, population.
8. The system of buses, trains, etc. provided for people to travel from one place to another.

Contribution, generation, transportation, combustion, cooking, amount, nation, agreement.

Ex. 8. Say if the statement is true or false. If the statement is false, you are to correct it.

1. Carbon dioxide accounts for about 35 % of the change in the intensity of the Earth's greenhouse effect
2. Prior to 1700, levels of carbon dioxide were about 80 parts per million.
3. The increase in carbon dioxide in the atmosphere is primarily due to the activities of plants and animals.
4. Emissions from fossil fuel combustion account for about 95 % of the extra carbon dioxide now found in our atmosphere.
5. Agricultural systems can hold 20 to 100 times more carbon dioxide per unit area than natural ecosystems.
6. Artificially created chlorofluorocarbons are the weakest greenhouse gas per molecule.
7. Ozone's contribution to the enhancement of greenhouse effect is still yet to be quantified.

Ex. 9. Finish the sentences.

1. A number of gases involved in the human caused enhancement of the greenhouse effect. They are…
2. Carbon dioxide accounts for…
3. Average concentrations of atmospheric carbon dioxide in the year 2005 were…
4. Prior to 1700, levels of carbon dioxide were…
5. This increase in carbon dioxide in the atmosphere is primarily due to…
6. The major sources of this gas include…
7. Emissions from fossil fuel combustion account for…
8. The remaining 35 % is derived from…
9. Natural ecosystems can hold 20 to 100 times more…

UNIT 10. GREENHOUSE GASES: METHANE AND NITROUS OXIDE

Ex. 1. Read these words and try to guess their meaning.

Methane ['mi:θeɪn], primary sources ['praɪm(ə)rɪ], rice cultivation, termite ['tɜ:maɪt], oil and gas, anaerobic ['ænə'rəubɪk], graze animals, scientific data, quadruple ['kwɔdrup(ə)l], similar processes, deforestation,

farming, nitrous oxide [ˈnaɪtrəs ˈɒksaɪd], stratosphere ['strætəsfɪə], the stratospheric ozone, photochemical smog [ˌfəʊtəʊ'kɛmɪkl.

Ex. 2. Study the following vocabulary.

Accurate estimate – точные подсчеты

accurate measurements – точные измерения

anaerobic conditions – анаэробные условия

annually – ежегодно

assumption – предположение

biomass burning – сжигание биомассы

buildup – наращивание, повышение, расширение

coal mining – добыча угля

contribution – роль, вклад

conversion – превращение

crop – урожай

data – информация, данные

decompose – разлагаться

digestion – пищеварение, расщепление

drill – бурить

emission rates – скорость выделения/распространения

enhance – способствовать, стимулировать

enhancement – усиление

fertilizers – удобрения

flooding – потоп, наводнение

fossil fuel combustion – воспламенение горючих ископаемых

herbaceous – травяной, травянистый

landfill – свалка, полигон

land-use change – изменение характера землепользования, трансформация угодий

natural gas deposits – залежи природного газа

nevertheless – тем не менее, однако

oil and gas extraction – добыча угля и газа

organic wastes – органические отходы

ranching – животноводство, скотоводство

rangeland – пастбище

rice paddy – рисовая плантация, рисовое поле

soil fertilization – внесение в почву местных удобрений

store – хранить

total column ozone – общее содержание озона в атмосферном столбе

wastes – отходы.

Ex. 3. Read the text and be ready to check your understanding.

Since 1750, ***methane*** concentrations in the atmosphere have increased by more than 150 %. The primary sources for the additional methane added to the atmosphere (in order of importance) are rice cultivation, domestic grazing animals, termites, landfills, coal mining, and oil and gas extraction.

Anaerobic conditions associated with rice paddy flooding result in the formation of methane gas. However, an accurate estimate of how much methane is being produced from rice paddies has been difficult to obtain. More than 60 % of all rice paddies are found in India and China where scientific data concerning emission rates are unavailable.

Nevertheless, scientists believe that the contribution of rice paddies is large because this form of crop production has more than doubled since 1950. Grazing animals release methane to the environment as a result of herbaceous digestion. Some researchers believe the addition of methane from this source has more than quadrupled over the last century. Termites also release methane through similar processes. Land-use change in the tropics, due to deforestation, ranching, and farming, may be causing termite numbers to expand. If this assumption is correct, the contribution from these insects may be important.

Methane is also released from landfills, coal mines, and gas and oil drilling. Landfills produce methane as organic wastes decompose over time. Coal, oil, and natural gas deposits release methane to the atmosphere when these deposits are excavated or drilled.

The average concentration of ***nitrous oxide*** in the atmosphere is now increasing at a rate of 0.2 to 0.3 % per year. Sources for this increase include land-use conversion; fossil fuel combustion; biomass burning; and soil fertilization. Most of the nitrous oxide added to the atmosphere each year comes from deforestation and the conversion of forest, savanna and grassland ecosystems into agricultural fields and rangeland. Both of these processes reduce the amount of nitrogen stored in living vegetation and soil through the decomposition of organic matter. Nitrous oxide is also released into the atmosphere when fossil fuels and biomass are burned.

However, the combined contribution of these sources to the increase of this gas in the atmosphere is thought to be minor. The use of nitrate and ammonium fertilizers to enhance plant growth is another source of nitrous oxide. Accurate measurements of how much nitrous oxide is being released from fertilization have been difficult to obtain. Estimates suggest that the contribution from this source may represent from 50 % to 0.2 % of nitrous oxide added to the atmosphere annually.

Ozone's role in the enhancement of the greenhouse effect has been difficult to determine scientifically. Accurate measurements of past

long-term (more than 25 years in the past) levels of this gas in the atmosphere are currently unavailable. Concentrations of ozone gas are found in two different regions of the Earth's atmosphere.

The majority of the ozone (about 97 %) found in the atmosphere is localized in the ***stratosphere*** at an altitude of 15 to 55 kilometers above the Earth's surface. In recent years, the concentration of ***the stratospheric ozone*** has been decreasing because of the buildup of ***chlorofluorocarbons*** in the atmosphere.

Since the late 1970s, scientists have discovered that ***total column ozone*** amounts over Antarctica in the springtime have decreased by as much as 70 %. Satellite measurements have indicated that the zone from 65° North to 65° South latitude has had a 3 % decrease in stratospheric ozone since 1978. Ozone is also highly concentrated at the Earth's surface. Most of this ozone is created as an artificial by-product of ***photochemical smog***.

Ex. 4. Give the English equivalent.

Удобрения, горючие ископаемые, залежи природного газа, органические отходы, скотоводство, пастбище, рисовое поле, внесение в почву местных удобрений, общее содержание озона в атмосферном столбе, добыча угля и газа, урожай, добыча угля, сжигание биомассы, анаэробные условия, вырубка леса, фермерство.

Ex. 5. Match the synonyms.

A: oil, annually, crop, to store, burning.

B: petroleum, combustion, to keep, harvest, every year.

Ex. 6. Match the words with their definitions.

1. The amount of fruit, grain, etc. that is grown for one season.
2. A fact or piece of information.
3. An act of cutting down or burning trees in an area.
4. An area of land where large amounts of waste material are buried under the earth.
5. A deep hole under the ground where minerals such as coal, gold, etc. are dug.
6. A measurement of the speed at which something happens.

Datum, rate, crop, deforestation, mine, landfill.

Ex. 7. Answer the following questions.

1. What are the primary sources for the additional methane added to the atmosphere?
2. What do anaerobic conditions associated with rice paddy flooding result in?
3. Due to what does land-use change in the tropics?
4. Why do landfills produce methane?
5. What is the average concentration of nitrous oxide in the atmosphere?
6. Where is the majority of the ozone found in the atmosphere localized?
7. How is most of the ozone concentrated at the Earth's surface created?

Ex. 8. Say if the statement is true or false. If the statement is false, you are to correct it.

1. Sources for the increase in nitrous oxide include land-use conversion; fossil fuel combustion; biomass burning; and soil fertilization.
2. Most of the nitrous oxide added to the atmosphere each year comes from gas and oil excavation.
3. Burning of fossil fuels and biomass is thought to be a crucial source to the increase of nitrous oxide in the atmosphere.
4. Accurate measurements of how much nitrous oxide is being released from fertilization have been difficult to obtain.
5. Estimates suggest that the contribution from fertilization may represent from 100 % to 0.1 % of nitrous oxide added to the atmosphere annually.

Ex. 9. Finish the sentences.

1. Since 1750, methane concentrations in the atmosphere have increased by…
2. The primary sources for the additional methane added to the atmosphere are…
3. Anaerobic conditions associated with rice paddy flooding result in…
4. More than 60 % of all rice paddies are found in…
5. Coal, oil, and natural gas deposits release methane to the atmosphere when…
6. The average concentration of nitrous oxide in the atmosphere is now increasing at a rate of…
7. Sources for this increase include…

8. The use of nitrate and ammonium fertilizers to enhance plant growth is another source of…

9. The majority of the ozone (about 97 %) found in the atmosphere is localized in…

10. In recent years, the concentration of the stratospheric ozone has been decreasing because of…

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1. Physical Geography [Electronic resource]. – Mode of access : http://www.physicalgeography.net/. – Date of access : 01.09.2020.

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