МИНИСТЕРСТВО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ

РОССИЙСКИЙ ГОСУДАРСТВЕННЫЙ
ГИДРОМЕТЕОРОЛОГИЧЕСКИЙ УНИВЕРСИТЕТ

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СБОРНИК

текстов, упражнений и контрольных работ
для студентов, изучающих английский язык

Учебное пособие для ВУЗов

Под общей редакцией Т.Н. Ласточкиной

Рекомендовано Учебно-методическим объединением по образованию
в области гидрометеорологии в качестве учебного пособия
по дисциплине Английский язык
для студентов высших учебных заведений,
обучающихся по направлению Гидрометеорология

РГГМУ

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Пособие состоит из двух разделов. Первый раздел предназначен для студентов I курса и являет
общим для студентов всех специальностей. Второй раздел предназначен для студентов II курса и состо
из четырёх блоков, каждый из которых предназначен для студентов определённой специальност
Метеорология, Экология, Океанология, Гидрология.

Основной целью пособия является как приобретение, так и систематизация и углубление полученны
ранее навыков перевода и работы со специальной английской литературой.

ПРЕДИСЛОВИЕ

Предлагаемый сборник текстов, упражнений и контрольных работ имеет целью выработку у дентов навыков чтения и перевода научно-технической литературы на английском языке, а также витие умений понимать содержание прочитанного.

Программа изучения английского языка на заочном факультете предусматривает изучение основных мматических явлений, поэтому каждый текст рассчитан на изучение (либо повторение) и закрепление ыков перевода одной-двух грамматических конструкций и некоторого лексического материала.

Пособие состоит из двух разделов. Первый раздел предназначен для студентов I курса и является щим для студентов всех специальностей. Тексты № 1–3 и упражнения к ним предназначены для работки в группах начинающих. Тексты № 4–8 с упражнениями предназначены для групп должающих. Однако, порядок работы над текстами может быть изменен по усмотрению подавателя. Перед началом работы над текстом рекомендуется выполнить лексико-грамматические ания к нему в порядке, предложенном преподавателем. По окончании работы над текстом студенты полняют один из вариантов контрольной работы. Варианты № 1–5 даны для начинающих, варианты 6–10 – для продолжающих.

Второй раздел предназначен для студентов II курса и состоит из четырёх блоков. Первые четыре ста каждого блока прорабатывают начинающие студенты указанной специальности, последующие сть текстов – студенты, продолжающие изучать английский язык. Дополнительные тексты с № 11 по 15 расположены в порядке возрастания сложности и могут быть использованы как в аудитории, так и а с целью повторения грамматических конструкций и пополнения словарного запаса. По окончании оты над текстами студенты выполняют один из вариантов контрольной работы. Варианты № 1, 2 полняют начинающие, варианты № 3, 4 – продолжающие.

При выполнении контрольных работ следует переписать английский текст, расположив его в левой овине тетрадного листа. Справа от него рекомендуется написать перевод на русский язык, оставляя этом широкие поля для рецензента.

В качестве дополнительного материала студенты могут пользоваться любыми грамматическими авочниками и пособиями, а также общими словарями и словарями по специальности.

The earth has many treasures in it. They are called MINERALS. The word MINERAL is the name anything that is not a plant or an animal.

There are thousands of different kinds of minerals in the earth. Most of them are deep in the ground. C and oil are minerals. So are sand and salt and iron.

Some minerals are very beautiful. People wear them in jewelry.

Coal is a mineral that comes from deep in the earth. It is found between layers of rock. These layers of c came from plants and trees that grew a very long time ago.

Scientists change coal into many other things. That is how they make aspirin tablets. We get other me cines from coal, too. And we get bright dyes for our clothes and our paints. Plastic toys and nylon cloth made of a chemical that comes from coal.

Stones can be very valuable when they have certain metals in them. You do not see any metal when y look at a stone because the metal is joined with other minerals.

Aluminum is a metal that we know very well. We see it and use it every day. Aluminium does not rus iron does. It is strong and light in weight. This makes it useful for building airplanes and trains. There minerals in the earth that we do not see at all. They are part of the soil itself. Plants take up some of th minerals from the soil. The minerals become part of each plant as it grows.

We eat many plants, such as fruits and vegetables. That is how we get the minerals that our bodies nee be healthy. Plants give us calcium and phosphorus to grow strong bones and teeth. They give us iron to m red blood cells.

УПРАЖНЕНИЯ

I. Вставьте нужную форму глагола to be.

1.I ... a student.
2.My parents ... scientists.
3.Iron ... a metal.
4.The earth ... a great ball of rock.
5.Quartz, copper, gold and diamonds ... minerals.
6.Talc ... one of very soft minerals.
7.Granite ... useful for building because it ... very strong.
8.Oceans ... thousands of miles wide.
9.Asteroids ... small planets in our solar system.
10. Most of the water ... in the oceans.
11. Many minerals ... deep in the ground.

II. Выберите правильный вариант и переведите предложения.

1. There is / are many kinds of stones.
2. There is / are much water on earth.
3. There is / are ways to get metals out of rock.

There is / are a star in the sky.
There is / are the sun and millions of stars in the sky.
There is / are about 2,500 known minerals in the world.
There is / are three basic climatological zones on earth.

III. Выберите правильную форму глагола. Переведите предложения.

Minerals have / has different colours.
The water cycle have / has no beginning or end.
The earth have / has crust all around it.
Air always have / has some water vapour in it.
Seven planets of our solar system have / has satellites.
Some parts of the earth have / has hot or warm water under the ground.
Gravity is a force that every planet, star and moon have / has.

IV. Распределите существительные на две колонки. В левую колонку запишите существительные в инственном числе, в правую – во множественном.

Plant, leaves, layer, mineral, nuclei, bodies, medicines, cloth, things, water, dyes, phosphorus, teeth, air, il, soil, clouds, rain, thousands, men.

Образуйте там, где это возможно, множественное число от единственного и наоборот.

V. Выберите правильную форму глагола.

plants grows / grow
they makes / make
people wears / wear
this makes / make
clouds forms / form
water vapour goes up / go up
you sees / see
droplets falls / fall
air condenses / condense
we uses / use

VI. Выберите правильную форму вспомогательного глагола (don't, doesn't).

Plants … grow in the desert.
Pluto … get light from the sun.
Mercury and Venus … have satellites.
Cold weather … continue into June.
Air … always have the same humidity.
Glaciers … move very fast.

over again.

Evaporation. The sun is the great mover of water. It evaporates water from damp ground and from leaves of plants. It evaporates water from ponds, rivers, oceans and other bodies of water. This water is carr into the sky as vapour as the sun warms the air. Warm air is lighter than cold air so warm air always rises. invisible water vapour goes up with the warm air.

Condensation. When warm, moist air meets cold air, the moisture forms into tiny drops that we can s This step in the water cycle is called condensation. Moist air in the sky condenses into droplets, which fc clouds. When you see a cloud, you see water droplets.

Precipitation. Often clouds are formed and that's all. They drift through the sky but no rain falls. At ot times the droplets of moisture in cloud combine. When the drops get too big and heavy to float in the air, tl fall to earth as rain. This step in the water cycle is called precipitation. When the weather is cold, the drop turn to ice and fall as snow. Sometimes they grow large and fall as hail.

УПРАЖНЕНИЯ

I. Поставьте глаголы в скобках в Present Indefinite. Предложения переведите.

1. The thermometer (to tell) the temperature of the air. (he)
2. Water (to evaporate) from rivers, lakes and oceans. (she)
3. The sun and all the planets (to travel) around the center of the galaxy. (мн. число)
4. Air (to be) a mixture of many gases.
5. The droplets of water (to form) a cloud.
6. Warm air always (to rise). (he)
7. Large amounts of precipitation (to fall) on the land and (to form) rivers. (мн. число)
8. Glaciers (to move) very slowly. (мн. число)
9. All pure water (to have) the same composition. (she) - неисчис.
10. Water (to freeze) at zero degrees and (to boil) at a hundred degrees. (she)
11. Small amounts of earth's water (to be) in glaciers and ice.
12. Water vapour (to consist) of fine water droplets. (he)

II. Какие вспомогательные глаголы (глаголы-связки) нужно употребить при постановке общ вопроса к предложениям 1 и 2 абзацев ?

III. Сделайте данные предложения вопросительными и отрицательными.

1. The water of the earth moves from one place to another.
2. Sunlight heats ocean water.
3. The water vapour goes up.
4. Warm air is light.
5. Water droplets and ice crystals make a cloud.

IV. Употребите глаголы в скобках в страдательном залоге. Переведите.

. All rocks (to make) of one or more minerals.
. Most waves (to cause) by wind.
. A cloud (to make) of millions of water droplets.
. Water (to need) by every kind of plant and animal.
. Pressure (to measure) by a barometer.
. Clouds (to see) in most parts of the earth.
. Air at the equator (to heat) by the sun all day.
. Clouds (to form) when warm, moist air meets cold air high in the sky.

V. Выберите русский эквивалент для выделенных слов. Обоснуйте свой выбор.

. The sun is the great mover of water. It (она, это, оно, он) evaporates water from damp ground and from leaves of plants.
. This water is carried into the sky as (так как, в виде, когда, как) vapour as (когда, так как, в качестве, как) the sun warms the air.
. Warm air is lighter than cold air so (поэтому, так, такой, как) warm air always rises.
. The moisture forms (формы, образуют, формируется, для) into tiny drops.
. Moist air in the sky condenses into droplets, which form (формы, образуют, формируется, для) clouds.
. When the drops get too big and heavy, they fall as (так, как, когда, в виде) rain.
. When weather is cold, the droplets turn to ice and fall as (так как, как, когда, в виде) snow.

VI. В правой колонке найдите антонимы слов, расположенных в левой колонке.

dry	a) hot
big	b) sink
rise	c) wet
float	d) small
tiny	e) high
cold	f) fall
light	g) huge
low	h) heavy
often	i) seldom

VII. Найдите в тексте английские эквиваленты следующих словосочетаний и слов:

влажная земля	7.	крошечные капли
водоёмы	8.	погода
тёплый воздух	9.	испарение
холодный воздух	10.	осадки
водяной пар	11.	конденсация

Our earth is very, very old – much older than we can imagine.

When the earth was first formed, it was very hot. It was so hot that everything was all melted. Even such things as iron and rock were soft and runny. They flowed like a syrup.

The earth was just a soft ball. It was hotter than a furnace.

Slowly the earth cooled. It took a very long time. As the earth became cooler, a hard crust formed around it. The crust was made of cooled-off rock. The earth was no longer as hot as fire, but it was still much too hot for anything to live on it. A long time went by. In some places, great cracks could be seen as the rock crust moved. In other places, the crust folded upward like a piece of crumpled paper. The folded parts made the mountains.

Air and steam escaped out through the cracks from deep inside the earth. Thick clouds of steam filled the sky. No sunlight could come through.

The earth kept cooling off. The cooling made the steam gather together into tiny drops of water. The drops became bigger and heavier, until they fell to earth as rain. For years and years, great floods of water poured down.

The water ran into all the low places. That is how the oceans and lakes were formed.

When the steam was gone, the air was clear. Sunshine came through to the earth at last.

УПРАЖНЕНИЯ

I. Поставьте глаголы в скобках в Past Indefinite Active.

1. Coal is made of the remains of plants that (to live) many millions of years ago.
2. At that time much of the earth's surface (to be) flat and swampy.
3. In the swamps (to grow) huge forests of ferns, mosses and large trees.
4. As the plants (to die) they (to fall) into the swamps and (to begin) to rot.
5. Billions of years ago, the earth already (to contain) large oceans.
6. In former times, methane and ammonia (to be) the principal constituents of the earth's atmosphere.
7. In the course of millions of years, the atmosphere of the earth (to change).
8. Venus once (to have) an atmosphere of methane and ammonia.
9. Igneous rock (to start out) deep under the ground.
10. At one time it (to be) so hot that it (to be) a gluey liquid.
11. Most igneous rock (to cool) and (to harden) underneath the earth.
12. But some of the liquid – lava – (to break) through the earth's surface.
13. It (to flow) out from volcanoes, and then (to harden).
14. During the early phases of the earth's history, layers of clouds (to cover) the planet from pole to pole.
15. Many millions of years ago the earth (to be) very hot.

II. Поставьте глаголы в скобках в Past Indefinite Passive.

1. One of the thermometers (to invent) by Anders Celsius.

2. Data (to transmit) back to earth.
3. Many mountains (to make) from rock that (to push) up from the bottom of the ocean.
4. Sedimentary rock (to make) from sand, mud, or clay that (to wash) down from the land into sea.
5. During the period of humid and warm climate, the continents (to cover) by dense, tropical jungle.
6. During the later phases of the Ice Age, the northern regions (to bury) under a layer of ice about half a mile thick.
7. At that time, most of the earth's water (to trap) deep inside its rocks.

III. Образуйте словосочетания со значением «намного (гораздо) + сравнительная степень прилагательного» по образцу: гораздо теплее – much warmer – со следующими словами: cold, high, heavy, hard, long, thick, large, good.

Заполните пропуски в предложениях:

1. All the stars are (намного дальше) away from the earth.
2. Some clouds form (намного выше) in the sky than others.
3. The sun is (гораздо горячее и ярче) than anything on earth.

IV. Выберите правильный вариант прилагательного.

1. Rivers are salty / less salty than oceans.
2. A diamond is the hardest / harder of all minerals.
3. The sun looks big/bigger and bright/brighter than any other star because it is so much near / nearer to us.
4. Water becomes biggest / bigger when it turns into ice.
5. When things are cooled, they get small / smaller.
6. Each century is about fourteen seconds long / longer than the previous one.
7. The oldest / older meteorites are 4.6 billion years old.
8. Hydrogen atoms are sixteen times light / lighter than oxygen atoms.
9. Mercury is the planet nearer / nearest to the sun.
10. Mercury is only a little large / larger than the moon.
11. Next to air, water is important / more important for human life than anything else.
12. Hydrogen is the lighter / lightest thing in the world.

V. Переведите предложения, содержащие конструкцию «the + сравнительная степень прилагательного + the + сравнительная степень прилагательного».

1. The higher the temperature, the more water vapour the air can hold.
2. The longer and harder the wind blows, the bigger the waves are.
3. The higher the mountain is, the less thick the air is.
4. The farther west we travel, the flatter the land is

1.	a) coal	b) iron	c) oil	d) jewelry
2.	a) plant	b) animal	c) flower	d) tree
3.	a) heavy	b) damp	c) moist	d) wet
4.	a) snow	b) air	c) hail	d) rain
5.	a) to rise	b) to ascend	c) to form	d) to go up
6.	a) sunny	b) cool	c) rainy	d) windy
7.	a) land	b) ground	c) mountains	d) earth
8.	a) sky	b) river	c) ocean	d) sea
9.	a) more	b) clear	c) heavier	d) hotter
10.	a) crust	b) move	c) flow	d) melt

ТЕКСТ 4

GENERAL EFFECTS

Man produces more than a million different kinds of products, both as waste and as useful products that eventually end up as waste. We are mobilizing many materials at rates greater than the global rates of geological erosion and deposition, great enough to change their global distributions. We are using more than 40 per cent of the total land surface and have reduced the total amount of organic matter in land vegetation by about one-third.

Natural ecosystems still provide us many services. Almost all potential plant pests are controlled naturally. Insects pollinate most vegetables, fruits, berries, and flowers. Commercial fish are produced almost entirely in natural ecosystems. Vegetation reduces floods, prevents erosion, and air-conditions and beautifies the landscape. Natural ecosystems cycle matter through green plants, animals, and decomposers, thus eliminating wastes. Organisms regulate the amount of nitrates, ammonia, and methane in the environment. On a geological time scale, life regulates the amount of carbon dioxide, oxygen, and nitrogen in the atmosphere. Natural ecosystems also serve important recreational and aesthetic needs of man.

УПРАЖНЕНИЯ

I. Раскройте скобки, выбрав подходящее по смыслу слово.

1. My friends read lots of books (last year, tomorrow).
2. He will go to England (soon, yesterday).
3. She came home late (next day, yesterday).
4. It rains in autumn (often, last year).
5. We lived in the country (next year, last month).

II. Составьте утвердительные предложения из следующих слов.

1. English, can, she, now, speak.

. rain, today, may, it.
. must, here, stay, you, long.
. ought, my, more, friend, often, visit, to, me.
. attend, lessons, must, students.

III. Поставьте глагол в скобках в Present Continuous.

. The Earth (to move).
. I (to sit) at my table and (to write) now.
. It (to rain) now.
. We (to study) English now.
. The teacher (to explain) a new rule at present.

IV. Поставьте глагол в скобках в Present или Past Indefinite.

. There (to be) many rivers in Britain.
. Air always (to have) some moisture.
. It (to be) very cold last week.
. He (to read) English books in the original.

V. Найдите соответствия.

air	азот
water	пар
cloud	погода
rain	волна
vapour	воздух
wave	вода
nitrogen	роса
dew	облако
weather	дождь

ТЕКСТ 5
PARTICLES IN THE ATMOSPHERE

Fine particles change the heat balance of the earth because they both reflect and absorb radiation from the ın and the earth. Large amounts of such particles enter the troposphere from natural sources such as sea spray, ind-blown dust, volcanoes, and from the conversion of naturally occurring gases into particles.

Man introduces fewer particles into the atmosphere than enter from natural sources. However man intro- ıces significant quantities of sulfates, nitrates, and hydrocarbons. The

such changes would result in a warming or cooling of the earth's surface.

Particles also act as nuclei for condensation or freezing of water vapour. Precipitation processes can certainly be affected by changing nuclei concentrations. However, we do not believe that the effect of man-made nuclei will be significant on a global scale.

УПРАЖНЕНИЯ

I. Переведите следующие предложения, обращая внимание на значение глагола to be.

1. My friend is to come at ten.
2. Her purpose is to enter the University.
3. Our task is to study well.
4. The teacher is to be there before five.
5. My aim is to learn English.

II. Употребите глагол в скобках в Past Indefinite Active или Past Indefinite Passive.

1. Saint Petersburg University (to found) in 1724.
2. This house (to build) last year.
3. America (to discover) by Columbus.
4. Machines (to move) by electricity.
5. New books (to give) to the students.

III. Поставьте «to» перед глаголом, где это необходимо.

1. Let us … go home.
2. He started … translate a new article.
3. My friend can … speak French.
4. He ought … do this laboratory work.
5. He is … come there at 9.

IV. Найдите соответствия.

corrode	выветривать
erode	сточные воды
waste	ржаветь
stream	дымка
smog	поток
power	скорость
mist	сила
rate	туман
shower	ливень

V. Употребите глагол в скобках в Past Indefinite или Present Perfect.

1. He already (to read) some stories by this writer.
2. Popov (to invent) the radio in 1895.
3. Many years ago the climate here (to be) like that in the Crimea.
4. He (to be) to England already three times.
5. The student (to pass) exams on geography in 2000.

ТЕКСТ 6

CLIMATE IN THE PAST

Our knowledge of climate in the remote past is derived from geological evidence and the study of fossils. For the past few hundred million years, the earth's climate has been characterized by alternate ice ages and warm interglacial periods. An ice age is generally believed to occur when some mechanism, such as shift in the tilt of the earth's axis in space or natural cycle of precipitation and freezing at the poles, causes the polar ice caps to spread over substantial areas in lower latitudes. Fossil evidence has confirmed that ice ages have occurred regularly in the earth's history. Studies disclose that the glaciers advanced and withdrew four times during this ice age. As the ice sheets advanced, the climate south of them is known to have become colder and wetter. When they withdrew, southern latitudes grew warmer and drier. The evidence suggests that at the height of the last ice age, what is now the Sahara Desert was arable, vegetated land supporting human and animal life.

Prior to the onset of this age, the world is known to have been much warmer than today. Glaciers did not exist in the Arctic or on Antarctica.

УПРАЖНЕНИЯ

I. Выберите верную глагольную форму.

1. Boys have always been interested in books … (described, describing) the life of people in the past.
2. Who is that man … (told, telling) something interesting.
3. The test … (written, writing) by this student was very difficult.
4. Flights to the moon … (described, describing) by great writers were interesting to read.

II. Переведите следующие предложения, обращая внимание на функцию Participle I.

1. A new broadcasting station has begun to function.
2. The news was exciting.
3. Whistling, Tom left the house.
4. Weather permitting, we shall start at seven.
5. My friend saw me coming along the street.

III. Употребите [illegible]

5. Winter (to follow) by spring.

IV. Найдите соответствия.

earth's surface	водяной пар
ocean currents	смесь газов
toxic substance	переменное количество
thin layer	течения океана
water vapour	токсическое вещество
variable quantity	поверхность земли
gases mixture	тонкий слой

V. Измените время глаголов – Past Indefinite на Present Indefinite.

1. Peter got up from his seat and quickly went up to the window.
2. He heard some strange sounds in the distance.
3. The boy stood ready to fight.
4. Everything was all right.

ТЕКСТ 7

IMPACT ON FRESH WATER ECOSYSTEMS

Effects of acidification of rivers and lakes were discovered in the mid-1960s over large areas of northern Europe and North America, well before effects on forests became manifest. On Sweden lakes larger than I hectare today about one quarter is acidified. The composition of diatoms started to change in the 1950s, indicating a shift to a more acidic situation, and that tendency increased markedly in the 1960s and 1970s. Similar trends have been reported from several regions in North America, where hundreds of lakes with pH values below 5 have lost most or all of their fish stocks. Effects of acidification are most noticeable during the spring snowmelt when large amounts of NO_3^- and H^+ are mobilized and cause a surge of acidity and mass mortality of fish. Mortality is attributed to the elevated levels of aluminum, mobilized during the snowmelt, which is toxic to fish. Severe depletion of fisheries has already taken place. Acidification may also lead to the mobilization of metals from sediments. In particular the mobility of mercury appears to be enhanced, but also of copper. Areas sensitive to acidic deposition are such with carbonate-free bedrock. Watercourses in such areas are poorly buffered with ionic strength.

УПРАЖНЕНИЯ

I. Переведите следующие предложения, обращая внимание на функцию герундия.

1. He is found of reading.

. He objected to sending them an invitation to the conference.
. They began designing a new house.
. Reading is very useful.
. His coming was unexpected.

II. Употребите глаголы в скобках в нужной видо-временной форме.

. Our teacher (to leave) for Moscow next week.
. My friends (to go) to France last summer.
. They already (to provide) the laboratory with modern equipment.
. At present there (to be) about a hundred technical institutions in Great Britain.
. This student just (to graduate) from the University.

III. Найдите соответствия.

меть значение	excess of water
отличие от	deficiency of water
авать возможность	saline water
едостаток воды	to give an opportunity
збыток воды	unlike
олёная вода	to be of importance
лотность	density

IV. Сделайте следующие предложения отрицательными.

I have read this article today.

He got up early on Monday.

They have had a lot of spare time this week.

He wrote a letter to his friend a day ago.

My friend is watching TV now.

This student was translating a text from 10 to 11 yesterday.

V. Переведите следующие словосочетания, используя нужный вариант глагольной формы.

Проблемы, решенные ими.

a) solved b) solving c) solve

Написанное письмо.

a) writing b) written c) wrote

Метод, использованный нами.

a) using b) used c) use

ТЕКСТ 8

THERMAL POLLUTION

Thermal pollution is a problem associated with nuclear power plants. The reactors heat the water in very large quantities. When this water is discharged back into the rivers after use, it is very damaging to marine life Furthermore, wastes in hot water absorb oxygen more rapidly than in cool water. Thermal pollution can help to create excessive growth of algae. The ecological cycle is disrupted. Therefore nuclear technology can be improved. For example, it is possible to build cooling towers at nuclear plants. In these towers the heated water is cooled before being released back to the river or lake. It is also possible to create new lakes of great scenic and recreational value in which the pure but heated water can be cooled.

Thus through the use of the technique, temperature variations in water, whether from natural or artificial causes can be ascertained.

УПРАЖНЕНИЯ

I. Поставьте глагол в скобках в Present Indefinite Passive или Past Indefinite Passive.

1. This book (to publish) last year.
2. The result of the experiment (to show) in this article.
3. The data (to obtain) experimentally last week.
4. Objects with negative stability (to call) unstable.
5. We (to show) the house and the garden.
6. I (to tell) about it yesterday.

II. Переведите следующие предложения, обращая внимание на место причастий.

1. Hydrogen is the lightest element known.
2. The technique employed uses a single probe.
3. The coming session will be difficult.
4. Performing the experiment he used a new method.

III. Переведите следующие предложения, обращая внимание на предлоги перед герундием.

1. You must aim at obtaining accurate results.
2. I think of trying another approach.
3. The droplets are capable of being photographed.
4. He succeeded in obtaining the reliable results.
5. The book is aimed at acquainting the readers with modern achievements in astrophysics.

IV. Выберите правильный перевод.

1. The expedition has returned this week.
   a) экспедиция должна вернуться на этой неделе

b) экспедиция вернулась на этой неделе

c) экспедиция вернётся на этой неделе

2. He was to make a speech at the conference.
   a) он выступил на конференции
   b) он должен был выступить на конференции
   c) его попросили выступить на конференции
3. The student was listened to with great interest.
   a) студент слушал с большим интересом
   b) студент слушает выступление с большим интересом
   c) студента слушали с большим интересом
4. This book will be much spoken about.
   a) об этой книге будут много говорить
   b) эта книга расскажет о многом
   c) эта книга должна о многом рассказать

V. Определите, где используется Participle I, а где – Participle II. Переведите словосочетания: the rising sun, a broken cup, packed things, the falling snow, a lost key, dried fruit, smiling faces, lost time.

КОНТРОЛЬНАЯ РАБОТА

Вариант № 1

WEATHER AND CLIMATE

When you talk about the weather, you mean the air. Weather is what the air is like in any one place at any one time. How hot or cold is the air ? How much dampness, or moisture, is in it ? How fast is the air moving ? How heavily does it press on the earth ? The answers to these questions tell about the weather.

Weather tells what the air is like in a place at any one time. Climate tells what the weather is like in general, all year round. If a place has much more dry weather than wet weather, we say it has a dry climate. If it has much more hot weather, we say it has a hot climate. Yuma, Arizona, for example, has a hot, dry climate. On most summer, spring and fall days in Yuma, the weather is dry, sunny, and hot. But on a winter morning, the weather may be rainy and cool. Later that same day, the weather may be dry, sunny, and cool. Weather changes each day. Climate stays much the same one year after another.

Each place in the world has its own climate. But many climates are so much alike that scientists group them all into just twelve types. Each type describes how hot or cold and how dry or wet a place is.

КОНТРОЛЬНАЯ РАБОТА

ВАРИАНТ № 2

SOIL

Soil is the dark-brown covering over most land. It can be a few inches or a few feet thick. Some people call soil «dirt».

Soil is made mostly of tiny bits of rock of different sizes. It also has in it tiny pieces of dead plants and

water – ice – takes up more space than liquid water. So the ice pushed against both sides of a crack. It split the rock into stones. Rain and rivers washed the stones down rocky mountains and wore then down into smaller rocks and pebbles. After millions of years, a layer of very tiny pieces of rock built up on top of the earth. Pieces of dead plants and animals got mixed in with the bits of rock. This mixture is soil.

КОНТРОЛЬНАЯ РАБОТА

ВАРИАНТ № 3

CLOUDS

Day and night, earth's surface waters evaporate. They release water vapour into the air. When conditions are right, the water vapour changes back into tiny droplets of liquid water. We see this as a cloud.

Before clouds can form, two things must happen. (1) The air that contains the water vapour must be cooled (2). There must be tiny particles, such as dust, mixed with the air.

Clouds come in all shapes and sizes. On some days you see small puffs of clouds that may disappear before your eyes. On an overcast day, clouds form a blanket overhead. Such a cloud blanket acts as a heat barrier. The clouds keep the sun from heating the earth's surface as much in the daytime. At night the cloud blanket keeps the earth's surface from cooling as rapidly.

Meteorologists classify clouds based on several criteria. They look, for instance, at a cloud's shape, altitude, and extent of coverage.

Fog is simply a cloud on the ground. Fog is made up of small water droplets that are held in the air, just like a cloud. But it is at ground level. And it reduces visibility to less than 1 km.

КОНТРОЛЬНАЯ РАБОТА

ВАРИАНТ № 4

WHAT MAKES CLIMATES DIFFERENT ?

The location of a place on the earth decides its climate. If you live far to the north, you live in a cold climate. The same is true if you live very far to the south. The sun's rays hit these areas at a great slant and don't warm the land very much. But if you live somewhere around the middle of the earth – near the equator – your hometown probably has a climate that is hot all year round. That is because the sun's rays hit this area fairly directly. The more directly the sun's rays hit a place, the warmer that place is. If you live near the equator, your hometown not only gets more sun, but it also gets more rain than places very far north or south.

How high up you live also makes a difference in the climate. If you live in the mountains, you have a cooler climate.

If you live near the ocean, your winters are probably less cold and your summers less hot than those in places far from the ocean. But your hometown usually has more rain than those inland places do. Winds and the movement of water in the ocean near your home help to make the climate the way it is.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 5
AN «OCEAN» OF AIR

We live at the bottom of an ocean of air. At sea level, the air is quite heavy, or dense. Air is a mixture of veral kinds of gases. It is mostly nitrogen (78%) and oxygen (21%). Most of the air is within 16 km (10 miles) earth. The higher we go the less dense the air becomes. The last thin traces are several thousands of miles ove the planet.

Earth's atmosphere gives us warmth and protection. It gives us the oxygen we breathe. It stores heat and otects us from the bitter cold of outer space. And it shields us from the sun's harmful ultraviolet radiation.

Like the seas, our ocean of air is always in motion. Like the seas earth's atmosphere has air «currents». ergy from the sun drives those currents. The sun heats earth most at the equator. Here the sun's rays strike th's surface most directly. Here the circulation pattern of earth's atmosphere begins. This circulation is like iant heat engine that gets its energy from the sun.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 6
MEDITERRANEAN CLIMATE

A special type of climate referred to as "summer drought, winter rain " occurs in various parts of the world niddle latitudes, notably in Mediterranean countries, from which it takes its name. It arises from the annual t, with the sun, of the subtropical high pressure belt and the temperate latitude low pressure belt. In the thern hemisphere in summer the subtropical high moves north to affect the Mediterranean and corresponding udes elsewhere; in winter these areas come under the influence of the temperate latitude depressions.

The Mediterranean Sea itself being cool in summer and warm in winter tends to enhance this pressure ct. These changes give rise to dry, sunny summers and comparatively wet, stormy winters. By contrast, ıy parts of the world have at least as much rain in summer as in winter, some have more. In the United states, Mediterranean type of climate occurs in California. For people all over the world, the most popular vacation holiday resort areas are those with warm, sunny climates like Mediterranean.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 7
OPTICAL PHENOMENA

A rainbow is an arc of coloured light that displays all the colours of the visible spectrum, violet on the le and red on the outside. The center of the circle is the point opposite with the sun (the sky considered as nere surrounding the earth). The centre, therefore, is never above the horizon, and the rainbow is never er than a half circle; the higher the sun in the sky, the smaller the rainbow. The light from the sun is

cannot be distinguished. When a veil of cirrostratus cloud covers the sky, various rings of whitish light ca haloes are seen around the sun or moon. They are caused by the refraction of light by the ice crystals of wl the cloud is composed.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 8
TEMPERATE CLIMATE

Temperate climates are those, which do not have tropical or polar extremes. The changes between winter, while stimulating, are not so extreme as to be frustrating.

There are two variations of temperate climate, maritime and continental. The maritime climate is stror influenced by the oceans, which maintain fairly steady temperatures, remaining relatively warm in winter cool in summer. Since the prevailing winds are westerly in the temperate zone, the oceanic influence is car inland on the western sides of the land masses. This is particularly marked in Europe where mountain barr run mostly from west to east thus allowing winds from the ocean to penetrate far into the interior. Marit weather is characteristically changeable with warm and cold, wet and dry spells lasting several days, but ra longer. Western Europe's winters are, as a rule, particularly mild for the latitude because the Gulf Stream ma the northeast Atlantic abnormally warm. The influence of the ocean decreases toward the east in North Ame and Europe, and the climate becomes more continental with hotter summers and more severe winters.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 9
POLAR AND ARCTIC CLIMATES

The polar regions are perpetually covered by ice and snow. During the long summer days – six mo continuous daylight at the Poles – the sun is too low in the sky to cause appreciable melting and the tempera rarely rises above the freezing point. The long polar night is a period of intense frost. The lowest air temp tures at the earth surface have been recorded in Antarctica, well below -100° F (-73° C).

The north polar region is covered by the frozen Arctic Ocean, a vast plain covered with snow except wl the ice is laid bare by the winds. Antarctica, on the other hand is a great mountainous continent covered v ice, in places many thousands of feet thick. Human life in the normal sense is impossible in these fro regions. During the last twenty years, however, scientific parties of many nations have become establishe Antarctica. Apart from the extreme cold, the main hazards are the fearsome blizzards, winds of gale force v driving, drifting snow that make outdoor activity impossible. In the northern hemisphere, the ice cap that co almost all Greenland makes it similar to Antarctica.

КОНТРОЛЬНАЯ РАБОТА

ВАРИАНТ № 10

ENVIRONMENTAL PROTECTION

The air we breath, the soil on which we stand and walk, the water we drink are all part of the environment. he seas are in danger. They are filled with poison, which kills fish and sea animals. Fish and reptiles can't live them because of the shortage of oxygen in the water. If people drink this water they can die too. Air pollution also a very serious problem. The ozone layer protects us from radiation. If there are holes in the ozone layer traviolet radiation can get to the earth. These holes are the result of air pollution. It is dangerous to be in direct ınlight because ultraviolet radiation can cause skin cancer. Nuclear power stations can go wrong and cause ıclear pollution. Nuclear pollution cannot be seen, but its effects can be terrible. Both clean air and clean ater are necessary for our health. If people want to survive they must solve these problems quickly. Man is ginning to understand that his environment is not just his own town or country, but the whole earth.

II КУРС

МЕТЕОРОЛОГИЯ

ТЕКСТ 1

MEASUREMENT OF TEMPERATURE

In order to obtain the true temperature of the free air it is very important that the temperature-measuring struments be exposed properly. It is necessary that they should be placed in an open space where the circula-ɔn of air is quite unobstructed, but they cannot be exposed freely to the sky and the direct rays of the sun. This usually accomplished by mounting the instruments in an instrumental shelter, which is nothing more than a hite wooden box with louvered sides, which allow free movement of air. In addition to protecting the instruments om direct and reflected radiation, the shelter also serves to keep them dry.

In order that the observed temperatures may be representative of conditions in the free air, it is important at the location of the shelter be typical of the nearby area. It is also required that the shelters be so installed at the thermometers should be about 4½ feet above the ground. In cities, the shelters are sometimes necessarily stalled on roops of buildings but temperatures obtained in such locations are of doubtful validity as an indica-ɔn of the thermal climate of the city.

Лексика к тексту

ıobstructed	беспрепятственный
ovement	движение
flect	отражать
stall	устанавливать

УПРАЖНЕНИЯ

II. Найдите соответствия.

necessary	свободный
ray	отражать
require	получать
wooden	прямой
important	требовать
direct	деревянный
free	необходимый
obtain	луч
reflect	важный

III. Приведите русские эквиваленты следующих английских слов:
hydrometer, barometer, correction, atmosphere, spray, equator, anticyclone.

ТЕКСТ 2
ANTICYCLONES

An anticyclone is an area of high pressure bounded by closed isobars, circular or oval in form. The ci lation of the air is clockwise in the northern hemisphere and anticlockwise in the southern hemisphere. W cannot exceed a small speed in an anticyclone, and the weather is generally quiet and settled. In an anticycl in contrast to the depression, there is an inflow of air at the high levels and an outflow nearer the surface. T throughout the greater part of the troposphere there is a slow subsidence of air, which brings about an incr in the stability of the system, often with the formation of a temperature inversion. The descending air is war by compression, with the result that the relative humidity is decreased.

In summer these factors usually bring about a clear sky and fine, warm weather. In winter, on the o hand, there frequently occurs the condition known as "anticyclonic gloom", widespread stratocumulus clou the base of the inversion.

Because of the possibility of radiation fog with clear skies and the stagnant air, anticyclones are o associated with poor visibility and, in heavily polluted air, smog. Even in summer, sea and coastal fogs form and be a hazard to inexperienced sailors.

Лексика к тексту

clockwise	по часовой стрелке
anticlockwise	против часовой стрелки
inflow	приток, наплыв

outflow	выход, истечение
subsidence	падение
inversion	инверсия
stratocumulus	слоисто-кучевые облака

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. What is an anticyclone ?
2. What circulation of the air is in the northern and in the southern hemispheres ?
3. What does an anticyclone bring about in summer ?
4. What is anticyclonic gloom ?

II. Найдите соответствия.

quiet	возможность
surface	из-за
to bring about	спокойный
compression	уменьшать
to occur	поверхность
possibility	вызывать
to decrease	сжатие
because of	циклон
depression	возникать

ТЕКСТ 3

SNOW

Ice crystals that mass together form flakes of snow. Obviously in the cloud levels where the snow originates the temperature must be below freezing. If the temperature is high enough between the cloud level and the ground the snow will melt as it falls and turn to rain. At temperatures only a little above freezing partial melting takes place. Snow can reach ground level with temperatures as high as 4^0. At these higher temperatures the snow consists of large flakes because the partial melting allows the smaller flakes to stick together. If the temperature is well below freezing the snowflakes are small, dry and powdery. Powdery snow, when settles on the ground, is not slippery.

The depth of snow can be measured on a graduated pole placed vertically in an open situation. For estimating equivalent rainfall the observation should be made daily, or at even shorter intervals, because over a period of time the snow layer contracts by melting, and it compresses under its own weight. If a raingauge is used it must either be heated to melt the snow as it falls, or the snow must be melted by the observer when he reads the

rainfall дождевые осадки, жидкие осадки

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. Where does the snow originate ?
2. At what temperature can snow reach ground level ?
3. How can the depth of snow be measured ?
4. How should the observation for estimating equivalent rainfall be made ?

II. Найдите соответствия.

flake	таять
to melt	измерять
to consist of	превращать
to allow	нагревать
dry	падать
to measure	состоять из
to heat	снежинка
to turn	позволять
to fall	сухой

ТЕКСТ 4
FRONTS

Fronts are the boundary regions between different air masses, usually warm and cold ones. Throughout a air mass conditions are more or less uniform, but sharp changes occur in comparatively narrow regions at th fronts. These changes give rise to thick cloud and rain and this is why fronts are such important features i weather study.

The most significant fronts are those having warm, damp air on one side and cold, usually dry, air on th other. The warm air being lighter tends to rise above the heavier, cold air.

Alternatively, the heavy cold air may be thought of as cutting under the lighter warm air. In either case th surface separating the two air masses will be not vertical but sloping, with the warm air uppermost, the cold ai lying underneath in the form of a wedge.

Fronts are usually several hundreds of miles long and extend vertically to the upper part of the troposphere As a rule they move more or less steadily sideways, although occasionally they are stationary. If the cold air i retreating, so that as the front passes over a place the temperature there goes up, the front is called a warm fron If the cold air is advancing the temperature change is reversed and the front is called a cold front, which is mor steeply sloped than a warm front.

Лексика к тексту

give rise возникать

uppermost	самый верхний
underneath	вниз
wedge	клин

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. What are fronts ?
2. What do the most significant fronts consist of ?
3. Where does the warm air tend to rise ?
4. How do fronts extend ?
5. Which front is called warm ?

II. Найдите соответствия.

narrow	различный
thick	значительный
significant	устойчиво
cold	плотный, толстый
comparatively	проходить
steadily	холодный
to pass	узкий
damp	сравнительно
different	сырой

ТЕКСТ 5
HURRICANES

The true hurricane is a storm originating in warm tropical seas characterized by winds in excess of 33 m/s blowing around a centre of low pressure, called the eye, where the air is calm. The ring of winds is accompanied by very heavy rain. The period of highest frequency in the West Indian-Atlantic area is between August and October. A ship caught in one of these storms will experience tremendous gusts of wind, heavy rain, squalls and huge waves. When a hurricane reaches land it can cause widespread damage, far more than tornado because of its greater diameter and accompanying effects. The most favoured course for the storm is initially westwards and then a turn polewards. Today, a hurricane is kept under close watch as soon as it forms and all ships are warned hourly of its position.

The hurricane is an extreme example of convection. Its energy supply is water from the sea, and if this is cut off by the hurricane crossing the coast the storm lessens in violence and ultimately dies away. Those

Лексика к тексту

hurricane	ураган
gust	порыв ветра
squall	шквал
convection	конвекция
recurvature	изгиб назад
gale	очень сильный ветер
oppressive	гнетущий, душный

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. What is the true hurricane characterized by ?
2. What will a ship experience during a hurricane ?
3. What can a hurricane cause when it reaches land ?
4. What is the eye of a hurricane ?

II. Найдите соответствия.

pressure	пересечь
frequency	тяжёлый
to experience	волна
calm	топливо
heavy	испытывать
course	частота
fuel	давление
to cross	направление, курс
wave	спокойный
to accompany	душный
oppressive	сопровождать

III. Приведите русские эквиваленты следующих английских слов:
equator, hemisphere, absorption, thermal, pressure, aerosol, observation.

ТЕКСТ 6
THUNDERSTORMS

A thunderstorm is rain or hail accompanied by thunder and lightning. The main condition for its occurrence is great atmospheric instability, giving rise to rapid convection to great heights of masses of very moist air. It is marked by a towering anvil-shaped cumulonimbus cloud, with a dark turbulent base; the cloud rises to 30.000 feet or more.

The thunder and lightning arise from electrical charges. In the turbulent conditions inside the cloud the raindrops are broken up; the smaller droplets are carried to the top of the cloud, the larger ones remaining at lower levels. Or the drops may freeze, throwing off small ice spicules, which are carried to the top of the cloud. These processes of separation lead to the separation of electric charges. When the insulation of the air breaks down, a lightning stroke results, sometimes entirely within the cloud, but sometimes from the cloud to the earth. The lightning travels along these channels, usually branched, hence the name forked-lightning, at a distance it is often obscured by clouds and only seen as a flash of diffuse light called sheet-lightning.

On passing through the air the lightning momentarily gives rise to great heat, causing sudden expansion and contraction of the air, which results in shock or sound waves that are heard as thunder. Sound travels a mile in about five seconds, so that time in seconds between seeing the lightning and hearing the thunder if divided by five, results in the approximate distance of lightning, in miles.

Лексика к тексту

ıail	град
ɔccurrence	распространение, местонахождение
ɔonvection	конвекция
ɨpicule	мельчайшие иголочки
nsulation	изоляция, обособление
o obscure	затемнять, затмевать
ɛxpansion	расширение
ɔontraction	сжатие
ıpproximate	приблизительный
ınvil-shaped cumulonimbus	ливневые грозовые облака в форме наковальни

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

. What is a thunderstorm ?
. What is the main condition for occurrence of thunderstorms ?
. What do electrical charges cause ?
What processes lead to the separation of electrical charges ?

lightning	электрический заряд
separation	гром
raindrop	молния
electric charge	дождевая капля
great height	условия
condition	большая высота
instability	влажный воздух

ТЕКСТ 7

VISIBILITY, FOG AND MIST

Visibility is the greatest distance at which objects may be recognized. At weather observing stations number of objects at known distances are selected and the visibility recorded as the distance of the farthes recognizable object.

Fog is said to occur when the visibility is below 1,000 meters (400 yards). In everyday life, however, i particular for road traffic, fog means a visibility of 200 yards or less. Visibility conditions somewhat above th fog limit are called mist, or haze. Mist is caused by water droplets, haze – by dust or smoke.

Fog is caused by cooling and condensation of moist air. The earth cools rapidly, chilling air in contact wit it, and the condensed moisture appears as fog, which deepens as the cooling continues. The thickest groun fogs occur in mild, damp air because of the large amount of water vapour available for condensation. Groun fog tends to accumulate in valleys and over low-lying ground, because cold air, being heavy, collects there. It i worse in the country or parks than in city areas, for the heating of the buildings keeps urban areas warmer whe a current of mild damp air flows over a cold surface, advection fog occurs. It is especially a feature of sea area and the adjacent coasts in spring and early summer when the water is still cold.

Лексика к тексту

Visibility	видимость	adjacent	смежный
to recognize	узнавать	advection	адвекция
traffic	уличное движение	available	доступный
haze	туман	moisture	влажность
mist	туман (лёгкий), мгла		

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. What is visibility ?
2. At what visibility does fog occur ?

3. What are mist and haze caused by ?
4. Where does ground fog tend to accumulate ?
5. In what conditions does advection fog occur ?

II. Найдите соответствия.

to occur	сохранять
droplet	количество
dust	однако
amount	возникать
to appear	доступный
to keep	капелька
however	особый
particular	пыль
available	появляться

III. Приведите русские эквиваленты следующих английских слов:
calibration, equilibrium, transportation, depression, hemisphere, acceleration, coagulation.

ТЕКСТ 8
COMPOSITION OF THE ATMOSPHERE

The atmosphere of the Earth is an envelope of gases permanently attached to the planet in its journey around the Sun. The ability of a planet to retain an atmosphere depends on balance between gravitational attraction, temperature and the nature of the gases concerned. The Earth is large enough to retain nitrogen and oxygen. However hydrogen must have escaped into space at an early stage in the evolution of the planet.

Although air is a mixture of gases, we can think of it as of one gas called clean dry air mixed with the gas water vapour, together with impurities. Clean dry air consists mainly of four gases: nitrogen (78 %), oxygen (21 %), argon and carbon dioxide (less than 1 %). The most variable component of the atmosphere is water vapour. It is the most important gas in the atmosphere for meteorologist. Without water vapour there would be no weather. The atmosphere also contains the so-called rare gases and the gas ozone (O_3). The latter is almost entirely concentrated in a layer lying between 20 and 40 km above sea-level. The importance of the ozone layer lies in its ability to absorb ultra-violet radiation from the Sun.

Meteorologists usually consider that they are mainly interested in the atmosphere up to a height of about 80 km.

Лексика к тексту

attraction притяжение

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. What is the atmosphere of the Earth ?
2. What does the ability of a planet to retain the atmosphere depend on ?
3. What is the composition of clean dry air ?
4. What gas is the most important for meteorologist ?
5. Why is the ozone layer very important for our life ?

II. Найдите соответствия.

escape	водяной пар
attraction	высота
envelope	путешествие
dry air	способность
water vapour	улетучиваться
layer	оболочка
ability	притяжение
height	сухой воздух
journey	слой

ТЕКСТ 9

CLOUD-FORMING PROCESSES

When water in the atmosphere condenses, it first becomes visible as a cloud, if it is at some upper level, or a fog, if it rests on the ground. Clouds consist of minute water droplets, so small that they float in the air and are carried about by the air currents. If the air were absolutely clean and pure the water vapour, on cooling, would not readily condense into droplets of visible size. But in fact the air is full of minute particles of dust, smoke and salt from sea spray, sometimes thousands of them in a cubic inch. They stimulate the formation of ice crystals and water droplets around them and are called condensation nuclei. Clouds have a great variety of forms, from the towering thundercloud to the flat gray pall of a dull winter day. These forms arise from the different processes of cooling by which the vapour is condensed.

The main process of cooling is decompression or expansion arising from the upward movement of air. When this movement occurs in an unstable atmosphere, the air rises in large bubbles or columns. At a given height that depends on the original temperature and humidity of the rising air, condensation begins; this level marks the base of the cloud. The top of the rising column is marked by building cauliflower-like heads, which continue to rise until they reach a stable layer.

Лексика к тексту

current	поток, течение
to stimulate	побуждать, возбуждать, стимулировать
nuclei	ядра
towering	увеличивающийся, возвышающийся
thundercloud	грозовая туча
expansion	расширение
humidity	влажность
cauliflower	цветная капуста

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. What can be observed when water in the atmosphere condenses ?
2. What do clouds consist of ?
3. What stimulates the formation of ice crystals and water droplets around them ?
4. What forms do clouds have ?
5. What do different forms of clouds arise from ?

II. Найдите соответствия.

visible	высота
level	вершина
particle	уровень
variety	видимый
to arise from	частица
spray	разнообразие
movement	брызги
top	возникать
to float	движение
height	плавать

ТЕКСТ 10

HUMIDITY

Although water is, chemically, a very simple substance, it has some unusual properties. Unlike the other constituents of air, it is found abundantly in all three states, solid (snow and ice), liquid and vapour, in the same locality and often at the same time. The ease with which

heat of water is unusually large. Another important property of water is its ability to supercool when very pure.

In the lower layers of the atmosphere there is enough water vapour. At a given temperature water vapour has a definite saturation value, which can be expressed either as its density or as its pressure. Saturation vapour pressure (or density) increases rapidly with temperature. There are several ways of defining the water vapour content of the atmosphere. One is by specifying the partial pressure of the vapour (e) or its density (p_w). These measures define the vapour concentration or absolute humidity of the air. The most familiar measure is the relative humidity, defined as the ratio of the actual vapour pressure and the saturation vapour pressure over a water surface, expressed as a percentage.

The presence of water vapour in the atmosphere is a matter of fundamental importance for both the climatologist and the weather forecaster.

Лексика к тексту

humidity	влажность
acquire	приобретать, достигать
release	освобождать
saturation	насыщение, степень насыщения

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. What properties does the water have ?
2. What is the latent heat of water ?
3. How does saturation vapour pressure increase ?
4. How can the water vapour content of the atmosphere be defined ?
5. Is the presence of water vapour in the atmosphere important for weather-forecaster ?

II. Найдите соответствия.

substance	количество
liquid	важность
property	достаточно
unusually	свойство
density	давление
pressure	вещество
importance	необычно
quality	жидкость
enough	плотность
vapour	тепло
heat	пар

ДОПОЛНИТЕЛЬНЫЕ ТЕКСТЫ

ТЕКСТ 11

THE WINDS OF THE WORLD

Wind is the motion of the air over the surface of the Earth.

There are the climatic zones of the Earth. Such zones are generally classified according to their temperatures – the hot tropics, the temperature midlatitudes and the frigid polar regions. The zones can be distinguished according to prevailing winds, such as the equatorial doldrums (regions of calms or light variable winds punctuated by squalls and thunderstorms); the trade-wind belts of mainly north-easterly (in northern hemisphere) and south-easterly (in the southern hemisphere) and finally the polar easterlies. The existence of such well-defined zones is evidence of a global underlying climatic pattern of air movement called the general circulation of the atmosphere.

The fundamental cause of the motion of the air over the globe is the unequal heating of the Earth's surface by the Sun. The driving force of the wind arises from differences of pressure. In the northern hemisphere winds blow anticlockwise around a center of low pressure and clockwise around a center of high pressure, but the rule is reversed in the southern hemisphere.

ТЕКСТ 12

FORECASTING WITHOUT CHARTS

The oldest method of forecasting weather depends mainly upon studying the sky, but it is often supplemented by observing the behaviour of the barometer and taking note of wind, air temperature and humidity.

Precipitation is likely within a few hours if cirrus clouds moving eastwards are followed by low clouds and the pressure falls.

Precipitation is unlikely if the sky and any ground mists clear quickly after dawn and small detached cumulus clouds appear during the day. This is an indication of the approach of a summer anticyclone, and the prediction is more certain if a barometer rises and winds are light, north-westerly or easterly. A clear sky in the evening with low humidity generally means low night temperatures in the spring, autumn and winter, with perhaps ground frost or even air frost. The official services rely almost entirely on synoptic charts, using both the physical reasoning and experience.

The basis of the forecast is the prognostic chart based on the so-called "numerical forecasting" (dynamical methods).

ТЕКСТ 13

CLIMATIC ELEMENTS

Climatic elements are the components of the climate. The combination of all elements occurring at a given moment makes the weather; the average weather – that is, the average state of the atmosphere – is called the climate. The climate depends upon the climatic factors, such as geographic latitude, geographic longitude, altitude, distribution of land and water, which practically do not vary over long periods – for example, the

with one another.

It is not possible to enumerate all the elements, because their number can be increased arbitrarily, but the following may be listed:

1. radiation, incoming and outgoing;
2. temperature of the air and of the surface of the earth;
3. wind direction and velocity;
4. humidity and evaporation;
5. precipitation;
6. cloudiness and sunshine;
7. snow cover;
8. atmospheric pressure.

The last item is included because of its intimate relation to the instantaneous and average states of weather and atmosphere. The difficulty is that these items do not really represent single elements, but groups of elements

The incoming radiation, for example, is divided into two main parts: direct radiation from the sun and radiation from the sky. Each part can be subdivided into any number of elements.

TEKCT 14
THE MEASUREMENT AND CHARACTERISTICS OF WIND

One of the most obvious features of natural wind is its unsteadiness. Near the ground it comes and goes in a rapid series of gusts and lulls. In technical language the wind is usually highly turbulent. This is an important characteristic that has to be reckoned with in the design of anemometers, instruments for measuring wind.

In modern meteorology wind is usually measured as velocity, that is a compound of speed and direction Speed is given either in knots or in meters per second. Direction is given either with reference to the points o the compass or as degrees from true north.

Winds of force above 9 are not experienced in land; when they do occur, trees are uprooted and building suffer damage. Meteorologists confine the term "hurricane" to special kinds of storms that are often met with in warm tropical seas. The term "gale" is used only when the average speed of the wind exceeds 34 knots (17-20 m/s) for at least 10 minutes. Isolated gusts or brief, sudden squalls are not gales. When the speed of the wind i more than 64 knots (33 m/s) meteorologists use the term "hurricane".

For the measurement of wind speed there are many possibilities. Many meteorological stations hav anemographs, instruments for recording simultaneously the speed and direction of the wind, usually at th height of 10 m.

TEKCT 15
EFFECT OF RELATIVE HUMIDITY

Relative humidity, expressed as a percentage, represents the ratio of the water vapour present in the air t the vapour, which the same air could contain if saturated. The relative humidity at the air above the wate affects evaporation in so far as, when considered with air temperature, it determines the actual vapour pressure This is a measure of the amount of water, in the form of vapour, present in the atmosphere above the water. Th temperature of the water being higher than the temperature of the air, evaporation will take place mainly throug the turbulence in the boundary layer of the air, even though the relative humidity is 100 per cent near the wate

surface. When air and water temperatures are equal, the vapour pressure gradient, which determines the rate of evaporation, is proportional to the saturation deficit, that is, 100 % minus the relative humidity.

Under normal fair weather conditions, and in most regions, relative humidity slowly decreases upward from the earth's surface. Vapour pressure, on the other hand, normally decreases rapidly because of the temperature gradient. During storm periods temperature and humidity inversions and irregular variations are common.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 1
METEOROLOGY

Meteorology is the study of the air and the changes that take place in the air. Since the daily variations of the different conditions of the air are what is known as «weather», it is with the second phase of the subject that we shall be especially concerned. One cannot doubt the importance of meteorology to the well-trained mariner. When at sea, his common natural surroundings are the sea and the air. Of the two, it is the air that has the more fundamental relationship to the seaman since the condition of the sea surface is merely a reflection of the prevailing and past conditions of the atmosphere. There is scarcely a seasoned mariner who has at some time experienced the full fury of the air when out in the open seas. Obviously, then, a knowledge of the weather and its expected changes will contribute greatly to efficient navigation and seamanship. Since a complete knowledge of weather conditions over a large area depends on observations from many points, they must be taken accurately and correctly to be of any value.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 2
WEATHER AND SHIPPING

Modern shipping is less affected by weather, nevertheless, weather services are necessary for their successful commercial operation and sometimes for their safety. These include synoptic reports from which the ships' officers may construct weather charts for their own locality and warnings of adverse weather, particularly gales and fog.

Any ship will obviously be slowed by strong head winds and by the high waves which strong winds generate. There is now a service operated in conjunction with forecasting services. It tells the ship's master either the route that will enable him to complete the voyage in the shortest time or the best course.

Our knowledge of ocean weather has been built almost entirely on meteorological observations by merchant ships. All the observations are entered in log books that are studied and summarized. From these data aknowledge of the climate of the ocean areas has been built up and published in tables and atlases.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 3
THE FORMATION AND NATURE OF CLOUDS

When the surface of the Earth is heated by the Sun, or when cool air moves horizontally into a warmer region, there is a difference in density in the vertical and the warmer air tends to ascend. This is the process known as convection, and it is responsible for the appearance of cumulus clouds, beginning at the level at which the air becomes cold enough for its water vapour to be saturated. Another method by which air is forced

clouds, which are frequently very persistent. The largest cloud systems are those that accompany depressions.

Finally, on a clear, calm night there is considerable radiational cooling of the surface, usually with deposition of dew. Slight air movements can spread this cooling to the layers of air near the surface, and fog forms. Sea fogs are the result of warm, moist air of tropical origin moving over the cool seas of the higher latitudes.

Cloud amount, the fraction of the sky covered by clouds, is reported in oktas, or eighths of the sky. A completely cloudless sky is thus reported as 0/8 and overcast sky as 8/8.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 4
EVAPORATION

Evaporation is the process by which water is changed from the liquid or the solid state into the gaseous state through the transfer of heat energy. At every free water surface, whether it is a lake, a wet field, or a droplet on the leaf of a plant there is a continuous interchange of molecules of water. The more rapidly moving molecules escape from the water into the air; other molecules from the air are caught in the water and augment the mass. When the sum total of the interchange represents a loss of molecules from the water, there is evaporation. When the opposite condition prevails, there is condensation. When the interchange of molecules is equal, evaporation is zero. The mere fact that the relative humidity in the open air above a water surface is 100 % does not mean that evaporation is zero, as vapour pressure gradient causes a flow of water vapour, even at 100 % relative humidity. Furthermore, water vapour weighs only 0.6 times as much as the dry gases of the atmosphere and continually tends to rise. Atmospheric turbulence, however, is the principal cause of vapour transfer in the atmosphere above land and water surfaces.

II КУРС
ЭКОЛОГИЯ

ТЕКСТ 1
ENVIRONMENTAL PROTECTION

The poisoning of the world's land, air, and water is the fastest-spreading disease of civilization. If present trends continue for the next several decades, our planet will become uninhabitable.

The seas are in danger. They are filled with industrial and nuclear waste, pesticides and chemicals. These pollutants are very harmful. One day nothing will be able to live in the seas. The Mediterranean is already nearly dead.

Air pollution is a very serious problem. Industry and transport are major sources of air pollution. Industrial enterprises emit tons of harmful substances. People are affected seriously. Dust or smoke containing poisons causes problems to human health. They are also the main reason for the greenhouse effect and acid rains.

Modern cities are very noisy places. Steady exposure to sound at levels more than 90 decibels causes loss of hearing. Other effects of noise on man include harmful physiological as well as psychological effects. People are beginning to realize that environmental problems are really problems for everyone. They join and support various international green parties such as «Greenpeace».

Лексика к тексту

environmental	окружающая среда
environmental protection	защита окружающей среды
disease	болезнь
to spread	распространяться
trend	тенденция
uninhabitable	непригодный для жилья (жизни)
pollution	загрязнение
acid rains	кислотные дожди
greenhouse effect	парниковый эффект
to emit	выбрасывать
emission	выброс
harmful substances	вредные вещества

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. What is the fastest-spreading disease of civilization ?
2. What will happen to our planet if present trends continue ?
3. What is happening to the oceans, seas and rivers ?
4. Do you think it is possible to save the Mediterranean ?
5. Is air pollution a serious problem ? Why ?
6. What is the main cause of the greenhouse effect and acid rains ?
7. Have you heard of «Greenpeace» ?

II. Найдите соответствия.

to realize	выбрасывать
to emit	яды
danger	здоровье
health	продолжать
harmful	опасность
poisons	понимать
emission	вредный
to join	выброс
to continue	присоединяться
disease	болезни

ТЕКСТ 2
ECOLOGY AND ENVIRONMENT

A primary feature of life on earth is that organisms do not exist in isolation; instead the entire biosphere is composed of a range of ecosystems each of which contains a number of species and a number of microenvironments. A forest, or a lake, provides examples of typical ecosystems, but the scale can vary widely; the entire biosphere constitutes the earth's ecosystem.

A primary feature of an ecosystem is that it tends toward self-regulation. Solar energy is absorbed by the green plants of an ecosystem, to provide, through photosynthesis, the basic energy input, which is gradually consumed by metabolism through the food chain and dissipated as heat. Thus there is a flow of energy through

some energy being lost as heat – until it is all dissipated. Geological processes and climatic change bring slow changes in the composition and structure of ecosystems, as does the constant geographic movement of species and continued genetic evolution. Abnormal weather, fire and similar phenomena bring rapid changes.

Лексика к тексту

species	вид, разновидность	tend	иметь тенденцию
microenvironment	микросреда	successive	последующий
photosynthesis	фотосинтез	dissipate	рассеивать, разгонять
input	потребление	consume	потреблять, расходовать

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. What is entire biosphere composed of ?
2. What is the primary feature of life on the earth ?
3. What is the primary feature of an ecosystem ?
4. How is the basic energy input provided ?
5. What is the way of energy flow through an ecosystem ?
6. What processes influence the composition and structure of ecosystem ?

II. Найдите соответствия.

isolation	последующий
forest	потребление
self-regulation	изменение климата
entire biosphere	виды
solar energy	среда
successive	саморегуляция
input	лес
environment	солнечная энергия
species	вся биосфера
climatic change	изоляция

III. Приведите русские эквиваленты следующих английских слов:
protection, conservation, aerosol, circulation, spray, absorption, international.

ТЕКСТ 3

ECOLOGY

Ecology is a branch of science, which treats the world of nature – including its human component at certain levels of biological organization. It is the study of the living organisms' interactions with each other and with

their environment. Particular concern of the ecologists is with the «higher» level of life organization: from population to biosphere. The functional unit in ecology is the ecosystem because it includes all of the interactions of communities with both their living (biotic) and their nonliving (abiotic) environments.

Ecology is a multidisciplinary science. Facts about ecological systems are drawn from biology, geology, chemistry, physics and other sciences. Originally ecology was treated as environmental biology. Modern ecology has to deal with environmental problems caused by human activities. People have always affected the natural environment. But the population growth along with emergence of industrial world economy during the last two centuries has increased the magnitude, complexity and rate of these modifications. Today environment is not just modified by human action: it is radically transformed. Global satellite observations of the Earth have revealed that about 60 per cent of land surface is to some extent damaged by industrial, agricultural, and other human activities, whereas no more than 40 per cent of land remains intact.

Лексика к тексту

environment	окружающая среда
population	популяция, население
to deal with	иметь дело с …
to cause	быть причиной, вызывать
to damage	повреждать, причинять ущерб
intact	нетронутый, неповреждённый
to respond to	реагировать на …

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. What does ecology study ?
2. What is the functional unit of ecology ?
3. What kind of interactions does ecosystem include ?
4. Where are the facts about ecological systems drawn from ?
5. What does modern ecology have to deal with ?
6. How have people affected the natural environment ?

II. Найдите соответствия.

branch	спутник
level	включать
science	нетронутый
activity	рост
magnitude	отрасль, ветвь
satellite	уровень
observation	наука
include	деятельность

ТЕКСТ 4

THE EARTH AND THE SOLAR SYSTEM

The earth is a member of the solar system of which the sun is the centre. Nine planets, including the earth, revolve around the sun. The earth takes 365 ¼ days to make a complete revolution about the sun. The earth is far away from the sun. Its average distance from the sun is 93, 003, 000 miles.

The earth is almost spherical in form. Its diameter is about 8,000 miles. The average density of the earth is 5.52 g/cm^3, and it increases toward the earth's centre. The temperature also increases toward the centre.

The earth rotates on its own axis once in about 24 hours. Its satellite, called the moon, is controlled by the earth. It revolves around the earth once in about 28 days. The moon is much smaller than the earth. The moon is the cause of ocean tides, which have been of some importance for many millions of years of the earth's history. The geological influence of the sun upon the earth is far greater than that of the moon. It is the chief source of the earth's light, heat and energy which have made largely or wholly possible not only the work of rock weathering, streams, glaciers, and winds, but also plant and animal growth and progressive development.

Лексика к тексту

almost	почти	revolution	оборот
average	средний	to revolve	вращаться
axis, axes	ось, оси	light	свет
cause	причина	influence	влияние
certainly	конечно	complete	полный
chief	главный, основной	heat	тепло
considerable	значительный	density	плотность
increase (n., v.)	увеличение, увеличивать		

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. How many days does the earth take to make a complete revolution about the sun ?
2. What is the moon controlled by ?
3. What is the chief source of the earth's heat, light and energy ?
4. Which planet is smaller, the moon or the earth ?
5. How does the temperature of the earth change toward the centre ?

II. Найдите соответствия.

revolution	рост

density	развитие
geological influence	спутник
chief source	луна
average	оборот
considerable	средний
satellite	главный источник
moon	значительный
growth	плотность
development	геологическое влияние

ТЕКСТ 5
POLLUTANTS IN AIR

Air pollution is an age-old problem. First of all, there are nature's own pollutants, composed of flying dry earth particles, yeast, pollens, moulds and bacteria. For many centuries, smoke from burning coal was the most harmful source of air pollution. It not only caused a wide range of ailments but also coated city buildings in deepest black. In the early 1900 s, motor vehicles began spewing out carbon monoxide, which now accounts 52 per cent of our total tonnage of airborne pollutants. Finally, since world war II, synthetic chemistry has been emitting a new mixture of compounds into the breathing space around us. The stuff we inhale is a kind of weak broth of chemicals and water vapour. The ingredients react with one another or come under the influence of the sun's energy, so that the broth undergoes constant changes. It heats up and cools down, rises and falls, and is moved by winds.

Studies have shown that, in general, automobiles and trucks are the major contributors to air pollution, accounting for 60 per cent of total tons emitted. Industry takes the next largest share of the responsibility with a contribution of 18 per cent. Electric power generating plants contribute 13 per cent. Space heating and garbage disposal contribute 6 and 3 per cent, respectively.

Polluted air is also laden with a variety of small particles. This particulate matter escapes from many different manufacturing processes. It also comes from burning fuels, garbage, incineration, and accidental fires.

Particulate matter may contain microscopic chemical droplets and minute fragments.

Лексика к тексту

particulate matter	твёрдое вещество	garbage	мусор
pollutants	загрязнители	broth	бульон
yeast	дрожжи	ailment	нездоровье
pollen	пыльца	source	источник
airborne	переносимые по воздуху	mould	плесень

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. What are nature's own pollutants composed of ?

5. What is the major contributors to air pollution ?

II. Найдите соответствия.

dry	вдыхать
particle	пар
coal	мусор
compound	плесень
vapour	сухой
to inhale	уголь
contribution	частица
mould	соединение (вещество)
garbage	вклад

III. Приведите русские эквиваленты следующих английских слов:
spray, absorb, protection, circulation, condition, urban, international.

ТЕКСТ 6
POLLUTION OF WATER

There was a time when rivers, lakes and oceans seemed infinitely renewable. They served as bottomless sinks into which one could pour almost anything to make it disappear. Factories that needed plenty of water for washing and cooling during production were usually situated on the banks of lakes or rivers. This gave them the added convenience of being able to flush wastes straight into the water. It was hoped that wastes would disintegrate on their way downstream or come to rest on the bottom forever.

Some of the dirtiest industrial wash water comes from steel mills. Tons of metallic particles, acids, oils and poisons, such as phenol, ammonia, and cyanide, are emitted in steel making mills.

Textile furnishing is another industry that pours out far dirtier water than it takes in. Cancer- causing dyes, salt, and organic particles drain into the nation's streams by the millions of pounds each year.

Paper manufacturing, too, soaks up water in trillions of gallons, then spews it back brown and foaming and full of sludge.

Dozens of other industries pour wastes into the water virtually untreated.

Лексика к тексту

renewable	обновлённый	furnishing	отделка

bottomless	бездонный, неизмеримый	sludge	густая грязь
to pour	лить(ся), вливать(ся)	foam	пена
to flush	сбрасывать, сливать	cyanide	цианид
phenol	фенол	ammonia	аммиак

УПРАЖНЕНИЯ

1. Определите, какие из данных предложений не соответствуют содержанию текста.

1. Rivers, lakes and oceans didn't serve as bottomless sinks into which one could pour almost anything.
2. Factories were usually situated on the banks of the rivers and lakes.
3. Acids, poisons and oils do not come from steel mills.
4. Cancer may be caused by some chemicals, for example salts, dyes, phenols, and so on.

Найдите соответствия

dirty	краситель
bottomless	берег
bank	сливать
wastes	частица
poison	яд
particle	грязный
dye	добавлять
to add	бездонный
to flush	отходы

ТЕКСТ 7

AIR POLLUTION AND WEATHER CONDITIONS

Air pollution crises usually result from weather conditions. Normally in daytime air temperature will decrease from the ground upward. Warmer air near the ground will rise and will become cool. This upward movement of air will carry pollutants away from the zone where people live. Wind will carry them away from their area of origin, disperse them and mix them. Under certain conditions, however, the normal air temperature gradient changes. A mass of warm air may move it with a weather front and overlay the colder air below. A temperature inversion will result. Inversions also occur as a result of the cooling of the air near the ground during winter. This creates a stagnant layer of cold air and winter mists of the countryside. With such inversions the upward movement of air is prevented and pollutants are trapped within the zone where human activities are concentrated.

Inversions persist for several or more days when there is little horizontal air movement to carry pollutants away from their source. The frequency at which inversions occur varies from one place to another. Air pollution is known to affect all plant and animal life.

inversion	инверсия
stagnant	стоячий (о воде)
mist	туман, дымка
to create	создавать

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. What do air pollution crises usually result from ?
2. How will air temperature change in daytime ?
3. Where will upward movement of air carry pollutants ?
4. Why do inversions occur ?
5. How long do inversions persist ?

II. Найдите соответствия.

air pollution	загрязнение воздуха
pollutants	частота
condition	погодный фронт
weather front	дымка
stagnant layer	загрязнители
mist	источник
air movement	условие
source	неподвижный слой
frequency	движение воздуха

III. Приведите русские эквиваленты следующих английских слов:

insecticide, cultivation, petroleum, conservation, emission, irrigation, manifestation.

ТЕКСТ 8

WASTE DISPOSAL

The disposal of sewage and other wastes produced by human activities is a problem, which confronted the human race since populations first concentrated in towns and cities.

Diarrhoea, dysentery, typhoid fever and cholera are diseases transmitted by human wastes. The water dispersal of urban water supplies has done much to remove these diseases as serious causes of death in industrial countries. As time passed and population grew, the load of waste materials in the streams and other water bodies began to exceed the capacity of water to disperse, dilute, or to provide the means for breaking down

these materials. The excess of nutrients provided to these waters an excessive enrichment by such nutrients as nitrates and phosphates. This disrupted biological balances caused undesirable «blooms» of algae. Oxygen deficient or anaerobic conditions developed in which only anaerobic forms of life could exist.

To meet these difficulties sewage disposal plants were built. In them the solid organic matter is separated from the liquid. These solids, when processed, disinfected and dried have potential value as fertilizer. Furthermore, the liquid effluents, still highly charged with nutrient materials were disposed of.

Лексика к тексту

disposal	удаление, обезвреживание	liquid	жидкость
sewage	сточные воды	anaerobic	анаэробный
diarrhoea	понос	algae	водоросли
dysentery	дизентерия	capacity	способность
typhoid fever	тиф		

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. What diseases are transmitted by human wastes ?
2. How did the load of wastes on water bodies change with population growth ?
3. What did the excess of nutrients provide to waters ?
4. What did oxygen deficient conditions cause ?

II. Найдите соответствия.

human activity	существовать
population growth	питательные вещества
human wastes	обогащение
nutrients	твёрдое вещество
enrichment	рост населения
solid matter	деятельность человека
algae	отходы
to exist	водоросли

ТЕКСТ 9

URBANIZATION AND ENVIRONMENT

Urbanization is not destructive to the environment. With proper planning and control it could enhance and not detract from environmental quality.

But pollution of air, water and land, concentrated in urban areas, has become universal problem, threatening man's health. Diseases associated with urban living in developing nations have increased greatly despite advances in medicine.

lands that surround the metropolis and through which transport corridors pass. Lands that could be used for agriculture, forestry or recreation are often used for urban purposes because of their accessibility or ease of development. Always the consequence of urban pollution on such environments are severe. Although the external effects of urbanization are impressive most people are directly affected by the environment within the city itself. Pollution has been a major contributor to the decline of environmental quality within the city.

Лексика к тексту

urbanization	урбанизация
destructive	разрушительный
pollution	загрязнение
disease	болезнь
spread (n., v.)	распространение, распространяться
development	развитие
consequence	последствия

УПРАЖНЕНИЯ

I. Определите предложения, которые не соответствуют содержанию текста.

1. Urbanization is destructive to the environment.
2. Pollution of air, water and lands doesn't concentrate in urban areas.
3. The greatest effect of spreading urbanization has been the intensification of pollution.
4. The spread of cities has not effected the lands that surround these cities.
5. Lands that could be used for agriculture are never used for urban purposes.

II. Найдите соответствия.

sea coast	связывать
developing nations	ухудшение
decline	здоровье человека
air pollution	болезнь
environment	загрязнение воздуха
associate	окружающая среда
destructive	развивающиеся страны
disease	морской берег
man's health	увеличивать
to increase	разрушительный

ТЕКСТ 10

A YELLOW-GREEN GAS

For most of us, chlorine is a common household product. We use the chlorine compounds in our laundry bleach, our water supply and our swimming pools. One of the most widely used chemicals today, liquid chlorine in concentrated form is also one of the deadliest. When liquid chlorine is allowed to escape from its pressurized tank, it mingles with air and expands into a yellow-green gas that has a sweetish odour. This gas can kill who inhale it in less than a minute by actually corroding the lungs. So corrosive is concentrated chlorine gas that it even disintegrates the coins.

Workers must know how to neutralize various corrosive chemicals. Chlorine, for example, is neutralized with caustic soda, known to chemists as sodium hydroxide. Water tends to combine with chlorine to form hydrogen chloride and fill the air with a deadly mist. Hydrogen chloride is extremely irritating substance, it burns the skin and eyes, and, if inhaled, it may permanently damage the lungs and other organs. Hydrogen chloride contributes its share of acid rain. It can also come to water. And waters that were once so clear are rapidly filling with mosses, algae and fungi.

Лексика к тексту

chlorine	хлор	fungi	грибы, плесень
laundry	прачечная	algae	морские водоросли
to mingle	смешивать (ся)	moss	лишайник
odour	запах	hydrogen chloride	хлористый водород
to inhale	вдыхать	to disintegrate	разрушать
lung	лёгкое		

УПРАЖНЕНИЯ

I. Найдите в тексте ответы на следующие вопросы.

1. Where do we use chlorine compounds ?
2. Why is chlorine dangerous for people ?
3. What odour does a yellow-green gas have ?
4. How is chlorine neutralized ?
5. What substance forms when chlorine combines with water ?
6. Is hydrogen chloride an irritating substance ?

II. Найдите соответствия.

liquid chlorine	лёгкие
fungi	быстро
coin	вдыхать
skin	соединяться
lungs	выделяться

to combine	грибы
rapidly	кислотный дождь
acid rain	химикалии

ДОПОЛНИТЕЛЬНЫЕ ТЕКСТЫ

ТЕКСТ 11
ECOLOGY

Ecology is a science, which studies the interactions of living organisms with each other and environment. The ecosystem is the functional unit in ecology. It is a natural organic unity of a biologic community and its nonliving environment.

A primary feature of an ecosystem is that it tends toward self-regulation. Thus there is a flow of energy through an ecosystem starting from solar energy, passing through successive forms of chemical energy until it is all dissipated.

Modern ecology has to deal with environmental problems caused by human activities. Man has adjusted ecologically to the biosphere in which he evolved. It is easiest to do this by looking at man in three stages of his cultural evolution. Man is the hunter, man is the herder-farmer and man is the technologist. Today environment is radically transformed by human action. More than 50 % of land surface is to some extent damaged by agricultural, industrial and other human activities.

ТЕКСТ 12
A MEASURE OF SUCCESS

One rather simple way for people in almost any community to nurse their surroundings back to health is to plant trees or tall hedges. Greenbelts such as tree-lined streets, gardens, parks and forests, all serve as powerful anti-pollution buffers. They reduce heat, noise and glare, filter out dust and block odours of gasoline exhaust.

A recent study revealed that a two-and-a-half acre stand of beech trees could remove sixty-eight tons of dust from the air. Plants and their soil absorb sulfur dioxide, ozone, hydrocarbons and carbon monoxide. Parks are life savers in big cities. In another experiment, a dense hedgerow prevented 40 per cent of the lead content in the air from filtering through to the other side.

Many environmental rescue projects have been entirely successful.

And what each of us can do about contaminated air, water and food. First of all, it is important to be aware of danger, handle materials with care, store things safely. Various filters can be obtained for improving unsafe drinking water, although caution must be exercised here because water filters must be well engineered to be truly effective.

TEKCT 13
AIR POLLUTION

Air pollution is very dangerous because of its threatening the life and health of people. People can be affected seriously and can be even killed by polluted air. Particulate matter in the air, in the form of dust or smoke has caused problems to human health. To this was added the byproducts of the combustion of coal and later of petroleum. World War II, radioactive elements from nuclear explosions and power plants and the wide range of new chemical pesticides have joined the list of poisons in the air. To these a whole range of other materials produced by industry or transportation can be added. People are adding now new and potentially dangerous chemical pollutants to the air faster than they can analyze the effects or dangers from the existing ones. A crisis stage has been reached in many places. Air pollution crises usually result from weather conditions. Pollutants may be carried away from their source to another places.

Air pollution is regarded primarily as a threat to human health. Air pollution also directly damages buildings and other structures. The cost of repair and prevention runs into hundreds of millions of dollars.

TEKCT 14
OIL IN THE OCEANS

A tanker is burning at sea. It has been aflame for a week, and each hour some 10,000 gallons (38,000 liters) of petroleum pour from its side into the ocean. Firefighters have stopped trying to extinguish the blaze until they can bring more chemicals and equipment to there.

When the fire is finally put out, it may take as long as six more weeks to transfer the remaining oil to other tankers.

Such accidents are common. Modern tankers are gigantic, only an inch (25 mm) thick skin of steel separates the precious black mud in the hold from the salt water outside. As many as 240 million gallons (912 million liters) of petroleum are imported into the United States every day. Every year, U.S. waters are polluted by more than 10 million gallons (38 million liters) of oil.

These accidents leave behind hundreds of dead birds, blackened beaches, and fish that tastes of petroleum. Oil spills harm plant and animal life of the underwater shoreline and cause considerable economic hardship to people in coastal towns. Cleaning up after the spill is cumbersome and expensive. It is especially difficult in cold climates such as Alaska, where the oil may congeal and solidify.

TEKCT 15
INDUSTRY IS OUR NEIGHBOUR

A cloud of poison spreads its blight across a peaceful countryside. Different chemical wastes ooze into our homes. Thousands of barrels of oil spill into the oceans. Radioactive gases escape into the air. These are only a few of the recent assaults on our planet caused by poor handling of hazardous industrial materials. Today, wherever scientists turn to investigate, they find contaminated wildlife, fish, water and foodstuff. The effects on human health have been devastating.

toxic, carcinogenic, mutagenic and teratogenic.

blight	гибель
ooze	сочиться
assault	нападение
teratogenic	тератогенный

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 1
DECOMPOSITION

The longer we are in contact with toxic pollutants, the greater the danger they pose. Most naturally occurring chemicals are biodegradable. This means that they are quickly broken down by some form of life, usually by bacteria. Such biological transformation has evolved over millions of years and is part of the natural cycle of living material.

Many of the new materials synthesized by chemists in recent years, however, are not part of this cycle. They decompose very slowly, depending on chemical reactions that might take place in soil or water, or in the presence of sunlight. Chlorinated hydrocarbons, for example, the group of chemical compounds that are active as insecticides and herbicides, require some ten to fifteen years to decompose to half their potency in soil. Certain pollutants, such as lead, never change. They remain dangerous forever.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 2
COSMIC RAYS

Cosmic rays, so called because they reach us from outer space, are most penetrating of all rays. Cosmic rays are, perhaps, the most interesting of all. This research is occupying the attention of scientists in all parts of the world.

How do we know that these rays originate outside the earth and even outside the solar system ? First of all, with the rise of height their intensity increases. They could not originate in the sun, for they are always present, regardless of the position of the sun. This fact also makes it difficult to assume that they come from small spot in the Milky Way, because they fall on all parts of the earth at all times.

But whatever may be the origin of the rays their effect is definitely measurable. Everywhere on the surface of the earth, no less than at the bottom of the sea, cosmic rays are cutting off outer electrons, «ionizing» the atom. Their energy is terrific.

Cosmic rays present a fascinating subject for speculation, but we cannot investigate very much farther until we have greater knowledge of the subject. This is being continually obtained by observation from numerous stations in all parts of the world.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 3
WEATHER AND INDUSTRIAL ACTIVITY

Weather affects industrial processes around the world in a variety of ways. Many examples may be cited in which use is made of the daily forecasts. More ice-cream is consumed on a hot day than on a cool one, and forecasts are helpful to the manufacturers for anticipating the likely demand. Forecasts of dull, wet weather are useful to film companies. In these examples, reliable forecasts of adverse weather can involve considerable savings for the manufacturer or operator.

High humidity, especially when combined with high temperature is a cause of the rapid deterioration of materials by rusting, rotting or the growth of moulds and fungi. Manufacturers of products are well advised to take into account the climate in the destination and to take the necessary protective measures.

Climatic data are helpful in the design of houses, offices and factories; temperature determines the insulating properties of the walls and the capacity of the heating system. The occurrence of strong and specially gusty winds is a factor in the design of tall buildings and bridges.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 4
CO_2 AND CLIMATE

CO_2 is a natural trace gas without toxic properties (unless very high concentrations), which can enhance plant growth (photosynthesis). It influences also the global heat balance («greenhouse effect») by absorbing infrared radiation and contributing the absorbed heat to other gases in the atmosphere. The global CO_2 problem results largely from the combustion of fossil fuels, and from deforestation and oxidation of soil carbon.

The atmospheric CO_2 content has been steadily rising since preindustrial levels of about 260 ppm to at present about 370 ppm. Energy projections for the future suggest that early in the second half of the 21 century a level of about 600 ppm will be reached. Climate model calculations suggest that this will result in a global warming of 1.5-4.5 ^{0} C, with even greater increase towards the polar regions, which may contribute to significant climate change. Besides, the higher atmospheric CO_2 content will enhance photosynthesis differentially in different groups of plants, and depending on precipitation and temperature under which the plants grow; as precipitation and evaporation are also subject to climate change.

II КУРС
ОКЕАНОЛОГИЯ
ТЕКСТ 1
SURFACE DISTRIBUTION OF TEMPERATURE AND SALINITY

The general distribution of temperature is closely related to that of the density. In high latitudes, the temperature is low from the surface to the bottom. The bottom and deep waters that spread out from high latitudes

relatively high temperature that is found in middle and lower latitudes and within which strong currents ar present, and stratosphere to the nearly uniform masses of cold deep and bottom water.

The general distribution of salinity is more complicated than that of temperature. Within the oceanic strato sphere the salinity is very uniform, but within the troposphere it varies greatly, being mainly related to th excess of evaporation over precipitation.

The water of the greatest density is formed in high latitudes and because this water sinks and fills all ocea basins, the deep and bottom water of all oceans is cold. Only in a few isolated basins in middle latitude relatively warm deep and bottom water is encountered. When spreading out from the regions of formation th bottom water receives small amounts of heat from the interior of the earth, but its effect on the temperatur distribution is imperceptible.

Лексика к тексту

density	плотность	latitude	широта
bottom	дно	current	течение
deep	глубокий	layer	слой
thickness	толщина	evaporation	испарение
precipitation	осадки	interior	внутренняя часть
to depend	зависеть	to decrease	уменьшаться
to sink	погружаться	to spread	распространяться

УПРАЖНЕНИЯ

I. Найдите соответствия.

to depend partly on	сильно изменяться
to decrease rapidly	частично зависеть от
to vary greatly	по аналогии с
to be closely related to	быстро уменьшаться
from analogy with	быть тесно связанным с

II. В правой колонке найдите слова, противоположные по значению словам из левой колонки.

high	warm
surface	cooling
heating	low
decrease	bottom
cold	increase
big	small

III. Найдите в тексте английские эквиваленты следующих русских слов и словосочетаний: общее распределение, донные воды, средние широты, верхний слой, сильные течения, термины, переходный слой, однородные массы, бассейны океана, малое количество.

IV. Придумайте подзаголовки к каждому абзацу текста.

V. Найдите в тексте подтверждение следующих высказываний.

1. There exists some analogy between ocean and the atmosphere.
2. The salinity is not uniform from the surface to the bottom.
3. There are some ocean basins of relatively warm deep and bottom water.

ТЕКСТ 2
OCEAN CURRENTS

Ocean currents are like vast rivers that run through the comparatively motionless seas around them, rivers that make the Amazon seem a creek. Many forces affect their behaviour. Water at the surface in the tropics is quite warm, and at the poles it is very cold. Warm water expands and becomes lighter; colder water – up until the point of freezing, when it starts to expand – becomes dense and heavy. As the cold polar water sinks, the warm water from the Equator flows out to take its place. Thus, polar water moves along the bottom toward the tropics, while tropical water moves north and south in the direction of the poles.

The process is speeded up by the prevailing winds on either side of the Equator, which regularly blow toward the west because of the earth's eternal rotation. The warm surface water near the Equator is therefore pushed generally westward by these winds. When these currents are blocked by the presence of continents, they have to move somewhere. In the northern hemisphere they turn toward the left – a phenomenon known as the Coriolis effect.

Currents in the Pacific are less obvious than those in the Atlantic because the Pacific is so much larger. The north equatorial current of the Pacific flows west unit it strikes the Philippines. Then it is driven north, past Japan, where it has the name of the Kuroshio Current. It splits around Japan, one stream going north to the Arctic, the other flowing toward North America where it runs south down the coast toward the Equator and is known as the California Current. The equivalent of the Kuroshio Current in the North Atlantic is the Gulf Stream. Because it flows across the route of so much sea traffic, it has been more extensively studied than any other ocean river.

Лексика к тексту

river	река	force	сила
to affect	влиять	to seem	казаться
to expand	расширяться	rotation	вращение
stream	поток	north	север
south	юг	east	восток
west	запад	to become	становиться
to flow	течь	to move	двигаться
wind	ветер	to blow	дуть
to turn	поворачивать	surface	поверхность

tropics, poles, start (v), polar, Equator, process, regular, block (v), continent, effect, phenomenon, equivalent.

II. Найдите в тексте английские эквиваленты следующих русских словосочетаний:

точка замерзания, в направлении тропиков, по обе стороны экватора, в западном направлении, северное полушарие.

III. Укажите слова, выпадающие из данных тематических рядов:

1. ocean, river, wind, sea, creek;
2. cold, warm, heavy, lighter, dense;
3. Atlantic, America, Pacific, Japan, Coriolis;
4. tropical, equatorial, number, polar, eternal.

IV. Заполните таблицу.

	Yes	No	No evidence
1. Water at the surface in the tropics is quite cold.			
2. In the northern hemisphere currents turn right because of the Coriolis effect.			
3. The Coriolis effect is zero at the Equator.			
4. The Pacific is much larger than the Atlantic.			
5. The Gulf Stream is the current in the North Atlantic that has not been extensively studied.			

ТЕКСТ 3

ACTION AT SEA SURFACE

The temperature of the sea water may be raised by the absorption of radiation entering the sea surface. This radiation may come directly from the sun, in which case it will include sunlight; or it may come from the clouds and the atmosphere, in which case it will consist mainly of the longer heat waves. The longer waves are absorbed in the immediate neighbourhood of the sea surface; the shorter waves, including those of light, penetrate to some little distance, but this distance is very small compared with oceanic depth.

The temperature of the sea water may also be raised by direct conduction of heat from a warmer atmosphere but this effect is small.

The temperature of the sea water may be lowered by the process of radiation from the sea through the sea surface; by the process of evaporation from the sea surface, and also by direct conduction of heat to a cooler atmosphere.

As the state is supposed to be stationary, the ocean must lose as much heat as it gains. The gain takes place chiefly in lower latitudes, and the loss in higher latitudes, so that within the ocean itself there must be a continual passage of heat from lower to higher latitudes.

Лексика к тексту

sea	море	depth	глубина
water	вода	gain (v, n)	приобретать, увеличение, прирост
surface	поверхность	latitude	широта

sun	солнце	state	состояние
clouds	облака	conduction	проводимость
heat	теплота	absorption	поглощение
light	свет		

УПРАЖНЕНИЯ

I. Найдите соответствия.

little distance	иметь место
cooler atmosphere	низкие широты
lower latitudes	солнечный свет
higher latitudes	маленькое расстояние
to take place	более прохладная атмосфера
passage of heat	высокие широты
sunlight	прохождение тепла

II. По модели образуйте цепочки из существительных и переведите их на русский язык.

speed of wind – wind speed

temperature of the sea water; surface of the sea; waves of heat; conduction of heat; process of radiation; process of evaporation.

III. Определите, какие из ниже перечисленных утверждений не соответствуют действительности.

1. Radiation entering the sea surface may only come directly from the sun.
2. The effect of direct heat conduction from a warmer atmosphere is small.
3. The temperature of the sea water may not be lowered by the process of radiation from the sea through the sea surface.
4. The ocean must lose as much heat as it gains.

IV. Ответьте на вопросы по тексту.

1. Каким образом можно повысить температуру морской воды ?
2. Каким образом можно её понизить ?
3. В каких широтах происходит прирост тепла в океане, а в каких – потеря ?

ТЕКСТ 4

SOME PHYSICAL PROPERTIES OF SEA WATER

Water is one of the most remarkable compounds in nature. Most of the processes of mankind's environment ultimately depend on its unique physical properties. The waters of the land originate in the sea, where the ocean basins hold some 1372 million km^3 of salt water. From this vast store some 334,000 km^3 of fresh water are

and contract when cooled, but water only partially follows this rule. At temperatures below 4^0 C it expands with further cooling, and upon freezing at nearly O^0 C it expands suddenly by about 9 percent. If this abnormality did not exist, ice would sink to the bottom instead of floating at the surface and thus forming a kind of «protective shield» to delay, or prevent, further freezing of the water. If ice were to sink, the polar waters would gradually be frozen solid, with the exception of a thin melted water layer at the surface in summer.

The heat capacity of water is the highest of all liquids and solids in nature. This enables water, especially the water of the oceans, to store great quantities of heat, which can be released to the atmosphere at different places and times.

Лексика к тексту

compound	составляющая	range	диапазон
nature	природа	to heat	нагреваться
environment	окружающая среда	to cool	охлаждаться
property	свойство	ice	лёд
store	запас	to sink	погружаться, опускаться
evaporation	испарение	to delay	удерживать
precipitation	осадки	to descend	опускаться
flow	поток, течение	to melt	таять
to freeze	замерзать	liquid	жидкость
to boil	кипеть	solid	твёрдое тело
to depend	зависеть		

УПРАЖНЕНИЯ

I. Найдите соответствия.

ocean basin	газообразная форма
salt water	точка кипения
fresh water	бассейн океана
atmospheric cycle	диапазон температур
freezing point	солёная вода
gaseous form	точка замерзания
temperature range	атмосферный цикл
boiling point	пресная вода

II. Определите исходные формы следующих слов и переведите:

ultimately, chemically, physically, actually, nearly, partially, suddenly, gradually, especially.

III. Найдите соответствия в русском языке следующих английских слов и словосочетаний:

process, unique, physical, continent, gaseous form, material substances, per cent, abnormality, to prevent, polar, release, different.

IV. Найдите в тексте подтверждение следующих высказываний.

1. The waters of the land originate in the sea.
2. Water behaves physically in a unique way.
3. Water has high heat capacity.

ТЕКСТ 5
OCEANOGRAPHY

Oceanography is the general name given to the scientific study of the oceans, with an emphasis on their character as an environment.

The basic goal of oceanographic study is to obtain a clear and systematic description of the oceans, sufficiently quantitative to permit us to predict their behavior in the future with some certainty. While we can do this in a general fashion for some characteristics and in some regions, we are able to predict details with confidence. In other words, there is still a great deal of study to be done and understanding to be achieved.

Generally the individual scientist studying the ocean devotes himself to investigations in one of the sciences, but very often supporting information may be obtained from observations in other sciences. In fact, oceanography is not yet too highly specialized, and there is much cooperation between those working in the different sciences.

There are many reasons for developing our knowledge of the oceans. As sources of food, of chemicals and of power, they are as yet only exploited to a very minor degree. They form a sink into which industrial waste is dumped, but they do not form a bottomless pit into which material like radioactive waste can be thrown without due thought being given to where it may be carried by currents. The vast heat capacity of the oceans exerts a significant effect on the climate of the land, while the continuous movement of the currents and waves along the coast must be taken into account when piers, breakwaters and other structures are built. In all these applications, and in many others, aknowledge of the circulation of the ocean is needed.

Лексика к тексту

oceanography	океанография	environment	окружающая среда
study	изучение, изучать	goal	цель
description	описание	science	наука
observation	наблюдение	source	источник
food	пища	power	(здесь) энергия
degree	степень	sink	приёмник сточных вод

УПРАЖНЕНИЯ

I. Найдите соответствия в русском языке следующих английских слов:
character, region, detail, information, cooperation, reason, chemicals, material, circulation, form (v).

II. Найдите в тексте английские эквиваленты следующих русских словосочетаний:
научное исследование океана, основная цель, предсказать детали с уверенностью, отдельный учёный, посвящать себя, непроточное движение, климат земли, циркуляция океана, вдоль побережья.

III. Образуйте прилагательные от существительных:
science, base, system, industry.

IV. Образуйте существительные от глаголов:
to describe, to predict, to investigate, to inform, to observe, to cooperate, to apply, to circulate.

V. Найдите в тексте предложения, где говорится о ...
1. основной цели океанографического исследования.
2. связи океанографии с другими науками.
3. необходимости развивать нашу систему знаний об океане.

ТЕКСТ 6
DISTRIBUTION OF DENSITY

The distribution of density of the ocean waters is characterized by two features. In a vertical direction the stratification is generally stable, and in a horizontal direction differences in density can exist only in the presence of currents. The general distribution of density is therefore closely related to the character of the currents, but in every ocean region water of a certain density which sinks from the sea surface tends to sink to and spread at depths where that density is found.

Since the density of sea water depends on its temperature and salinity, all processes that alter the temperature or the salinity influence the density. At the surface the density is decreased by heating, addition of precipitation, melt-water from ice, or runoff from land, and is increased by cooling, evaporation or formation of ice. If the density of the surface water is increased beyond that of the underlying strata, vertical convection currents arise that lead to the formation of a layer of homogeneous water. Where intensive cooling, evaporation, or freezing takes place, the vertical convection currents penetrate to greater and greater depths until the density has attained a uniform value from the surface to the bottom. When this state has been established, continued increase of the density of the surface water leads to an accumulation of the densest water near the bottom, and, if the process continues in an area, which is in free communication with other areas, this bottom water of great

density spreads to other regions. Where deep or bottom water of greater density is already present, the sinking water spreads at an intermediate level.

Лексика к тексту

feature	черта, особенность	value	величина
direction	направление	bottom	дно
presence	наличие	level	уровень
salinity	солёность	decrease	уменьшение, уменьшать
precipitation	осадки	evaporation	испарение
layer	слой	ice	лёд
increase	увеличение, увеличивать		

УПРАЖНЕНИЯ

I. В правой колонке найдите слова, противоположные по значению словам в левой колонке.

vertical	to decrease
surface	melting
to increase	bottom
cooling	horizontal
freezing	heating

II. Найдите в тексте английские эквиваленты следующих русских словосочетаний:
различия в плотности, при наличии течений, стремится погружаться, зависеть от, вертикальные конвекционные течения, приводить к, накопление, слой однородной воды, промежуточный уровень.

III. Заполните таблицу.

Statement	Right	Wrong	No Evidence
1. At the surface density is decreased by heating. 2. In some latitudes convection currents do not lead to the formation of deep or bottom water. 3. The general distribution of density is closely related to the character of the winds. 4. The bottom water is not homogeneous and shows therefore a definite temperature – salinity relationship.			

ТЕКСТ 7

VARIATIONS OF SURFACE SALINITY

Major factors that determine the surface salinity are differences in evaporation minus precipitation over the sea surface, turbulent mixing, and advection by currents. To some degree, runoff of river water, ice melting, and freezing have to be considered locally. The relationship between the average meridional salinity distribu-

These variations do not seem to depend on differences in E - P. It is more likely that such periodic surface salinity variations in the North Atlantic have resulted from periodic salinity fluctuations in the Labrador Current. This current injects higher or less high salinity water into the North Atlantic Current, which spreads its characteristics by mixing and turbulent diffusion in the northeasterly and southeasterly directions. Similar advection and mixing processes may explain periodic and aperiodic salinity variations in other parts of oceans as a result of the general oceanic circulation, its average direction, and seasonal variations. In some areas such advection and lateral mixing phenomena may completely mask the variations caused by difference in E-P.

Long-period salinity fluctuations in some adjacent seas have been studied in greater detail where data were available, especially in northwest European waters. In this area a general increase of surface salinity since 1900 seems to be established, although the amount of this increase is different in different months.

Лексика к тексту

evaporation	испарение	to result from	быть результатом
precipitation	осадки	current	течение
relationship	связь, соотношение	increase	рост, увеличение
average	среднее	difference	различие
area	территория, область	cause	вызывать
to exceed	превышать	adjacent	соседний
direction	направление		

УПРАЖНЕНИЯ

I. Найдите соответствия в русском языке следующих английских слов:
factor, locally, equator, indication, fluctuation, periodic, inject, characteristic, result, most, detail, advection, process.

II. Найдите соответствия.

turbulent mixing	годовой ход
runoff or river water	меридиональное распределение
ice melting	снеготаяние
annual variation	сток речных вод
general oceanic circulation	общая циркуляция океана
seasonal variations	турбулентное перемешивание
meridional distribution	сезонные изменения

III. Назовите форму единственного числа следующих существительных:
maxima, minima, phenomena, data.

IV. Заполните таблицу.

	Yes	No	No evidence
1. Surface salinity is determined by E - P.			
2. The surface salinity has a minimum in mid-latitudes.			
3. Salinity is the total amount of solid material dissolved in a kilogram of sea water.			
4. In some areas advection and mixing phenomena may mask the variations caused by difference in E - P.			
5. The general distribution of salinity is more complicated than that of temperature.			
6. Long-period salinity fluctuations European waters have been studied.			

ТЕКСТ 8

MAJOR FEATURES OF SEA SURFACE TEMPERATURE DISTRIBUTION

In the absence of large-scale ocean currents, if heat gains and losses of solar radiation at the sea surface were the only causes of temperature variations, the temperature distribution in the surface layers of the ocean would be simple. The isotherms would extend mainly in the zonal direction, showing a decrease of temperature from equatorial to polar regions. Some irregularities might show up in coastal regions and over the oceans as a result of the complicated heat budget of the earth.

The actual temperature distribution at the sea surface appears to be far removed from a simple zonal arrangement of isotherms. The outstanding feature, besides the general decrease of temperature from the equator to the poles, is the temperature difference between the eastern and western parts of the ocean along parallels, especially in the Northern Hemisphere. In higher latitudes, the European side of the North Atlantic has proved to be much warmer than the American side with a maximum around 50 ^{0} N. In middle latitudes this difference decreases rapidly and in subtropical and tropical regions the American side is warmer. A similar trend is indicated in low and middle latitudes of the south Atlantic; however, in subantarctic regions, as a result of land and water distribution, the American side is found to be warmer than the waters south of Africa. The decrease of sea surface temperature from tropical and subtropical regions to polar regions is not evenly distributed over the oceans.

Лексика к тексту

absence	отсутствие	variation	изменение
large-scale	крупномасштабный	latitude	широта
current	течение	cause	причина
heat	теплота	gain	прирост, увеличение
loss	потеря	to decrease	уменьшаться, убывать,
decrease	уменьшение, убывание, понижаться, понижение		

УПРАЖНЕНИЯ

I. Подберите русские эквиваленты следующих английских слов:

при отсутствии, единственные причины, простираться в зональном направлении, тепловой баланс земли, зональное распределение, северное полушарие, южная Атлантика, средние широты, субтропические регионы.

III. Выберите правильный перевод выделенных слов.

1.If heat gains (увеличивает / увеличение) and losses of solar radiation at sea surface were the only causes of temperature variations, the temperature distribution would be simple.

2.The European side is much warmer than the American side with a maximum around (вокруг)50 ^{0} N.

3.In middle latitudes this difference decreases (уменьшения / уменьшается) rapidly.

IV. Найдите в тексте ответы на следующие вопросы.

1.Каким образом были бы расположены изотермы в случае отсутствия крупномасштабных течений?

2.Каким был бы характер распределения температур поверхности океана в этом случае ?

3.Каково фактическое распределение температур ?

4.Где особенно это заметно ?

5.Равномерно ли уменьшается температура поверхности океана, в направлении от тропиков к полярным регионам ?

ТЕКСТ

WAVES

There appear to be three more or less distinct actions involved in the creation of waves by wind. In the first place, frictional drag causes the water to move along with the wind; and this forward movement is part of the wave motion. In the second place, the air moving over a crest is accelerated and rarefied and at the same time sucks the wave up, in the trough it is slowed down and compressed, thus forcing the water down. Finally, the wind tends to form an eddy behind the crest of the wave. This results in a downward push of the wind against the rear of the wave.

The size of the waves increases with the force of the wind. By size is meant the height (vertical distance from trough to crest) and length (horizontal distance between successive crests). The bigger the waves are, the faster they travel onward. Contrary to what might be expected, wind can generate waves, which travel somewhat faster than the moving air itself. This is because the wind, being faster than the circular motion, can accelerate it, in spite of the fact that the wave shape outruns the particles of air. When, however, the velocity of the wave has grown to nearly one and a half times that of the wind, it can increase no farther and at that juncture the wave has likewise reached its maximum size in that particular wind.

It is not only the velocity of the wind, which governs the size of waves, but also the length of time it acts upon them. The transfer of energy from wind to wave is a slow process and in a storm it takes many hours for the maximum size to be attained.

Лексика к тексту

wind	ветер	frictional drag	отставание за счёт трения
to cause	заставлять	crest	гребень
to move	двигаться	trough	подошва (волны)
to suck up	поглощать, всасывать	eddy	водоворот
rear	задняя (тыловая) часть	size	размер
particle	частица	force	сила
velocity	скорость	height	высота
transfer	перенос, передача	length	длина
to result in	приводить к …		

УПРАЖНЕНИЯ

I. Заполните таблицу.

	True	False
1. There are two actions involved in the creation of waves by wind.		
2. The size of the waves increases with the force of the wind.		
3. The bigger the waves are, the slower they travel onward.		
4. The size of the waves doesn't depend on the length of time it acts upon them.		

II. Распределите по рубрикам приведённые ниже слова и словосочетания:

Wave	Wind

crest, eddy, size, trough, force, rear, air particle, shape, velocity, water, energy.

III. Найдите соответствия.

to move along with	воздействовать на
forward movement	вопреки
to tend	двигаться вместе с
contrary to	прогрессивное движение
to travel onward	иметь тенденцию
to act upon	при такой ситуации
at that juncture	двигаться вперёд

ТЕКСТ 10

THE ANTARCTIC ICE

For the human race, the most important thing about the Antarctic is the amount of ice on it. It is not yet

average depth of 7,500 feet. In some places it rises to more than 15,000 feet and in others it is more than three miles deep, its weight having depressed the land below the sea level.

The Antarctic ice amounts to about 1 or 2 per cent of all the water in the world – as much as there is in the whole North Atlantic – and if it all melted it would raise the world's sea levels by several hundred feet. There is enough water in the Antarctic to provide the world with rain for the next fifty years. Whether this great mass of ice is melting or growing is of considerable interest to seaports everywhere. The oceans that wash the beaches of the United States have risen from two to nine inches since 1940. Is this due to the sinking of the land, or to the melting of the Antarctic icecap ? Calculations of scientists are reassuring: at that time the Antarctic was said to be growing by the accumulation of 187 billion tons of ice every year.

Лексика к тексту

amount	количество	to sink	опускаться, погружаться
to amount	составлять, равняться	to cover	покрывать
important	важный	average	средний
feet	футы	depth	глубина
sheet	покров	to rise	возвышаться, подниматься
thousand	тысяча	level	уровень
hundred	сотня	to melt	таять
considerable	значительный	to raise	возвышать, поднимать
deep	глубокий	to provide	обеспечивать
weight	вес	to grow	расти

УПРАЖНЕНИЯ

I. Подберите русские эквиваленты следующих английских слов:
human, to form, to combine, mile, to depress, per cent, mass, seaport, calculation, accumulation.

II. Найдите в тексте соответствия следующих русских слов и словосочетаний:
человеческая раса, в геологическом смысле, некогда, в настоящее время, в семь раз больше, уровень моря, ледяной покров, представлять интерес, происходить вследствие.

III. Определите, какие из приведённых ниже слов являются синонимами, а какие – антони-мами:

land – earth	fairly – quite
to calculate – to count	to begin – to stop
below – above	area – region
not yet – already	largest – smallest

IV. Заполните пропуски в предложениях.

1. The most important thing about the Antarctic is the amount of … on it.
2. The ice sheet … an area the size of the Europe and the United States combined.
3. There is enough water to provide the world with … for the next fifty years.
4. The … that wash the beaches of the United States have risen from two to nine … since 1940.
5. Is this due to the … of the land or to the … of Antarctic icecap ?

V. Найдите в тексте ответы на следующие вопросы.

1. Как изменилась толщина ледяного покрова в Антарктике в последнее время ?
2. Какой континент занимает второе место по размеру ледяного покрова ?
3. Что произойдёт, если ледяной покров Антарктики полностью растает ?

ДОПОЛНИТЕЛЬНЫЕ ТЕКСТЫ

ТЕКСТ 11

A DEFINITION OF OCEANOGRAPHY

Oceanography consists basically of measuring things in the sea and assigning them some sort of number on a scale, then interpreting the result and fitting these into already known basic laws of physics and biology or, if necessary, synthesizing new laws for them. Observations such as the temperature of the water, and its saltiness; the depth from the surface to the bottom; the amount of oxygen; the number of different animal and plant species; the speed and direction, and the depth and volume of an ocean current; and the heights of waves can all be measured and assigned figures. In most cases the measuring can be done by technicians, not requiring the skills of true oceanographers.

Oceanographers used to be described as «sailors who use long words». Their science was «anything that has to be studied from a ship». What with instruments such as satellites, computers, submarines and moored buoys oceanographers now can do many things that do not require their presence on the deck of a vessel, but the elite among them are still those who go to sea.

An oceanographer today has to study all the basic sciences – physics, chemistry, biology, geology, and meteorology – they relate to the sea. Any real oceanographer is also something of a sailor, or at least knows the language of sailing. Although in practice all ocean scientists specialize, they must know a good deal about all the related subjects because all studies of the sea must be like the sea itself, three-dimensional.

ТЕКСТ 12

EQUATORIAL CURRENTS

The currents on the east coast of Africa are in striking contrast, having surface temperatures must higher than those on the west coast. In the South Indian Ocean a wide Equatorial Current flows from east to west, part of it washing east Madagascar. This equatorial water is warm, its temperature

rial Current is driven forward by the S.W. monsoon, its speed frequently attaining 4 knots near the equator, 7 knots in Somalia. The water is very warm, the surface temperature being 82^0 or higher in most of the ocean north of the equator. By November the winter monsoon is established and the ocean current is reversed, the surface water being driven southwest by the N.E. winds. Off East Africa it goes as far as the equator, the coastal water being about 3^0 cooler than the ocean.

TEKCT 13
THERMODYNAMICS OF THE OCEAN

If the atmosphere and the ocean are considered together as one physical system, they constitute a heat engine in which energy is taken in at certain places and given out at other places and motion is maintained according to the principles of thermodynamics.

When the oceans are considered as a separate physical system, motion is maintained in several ways. The winds drive the surface waters, and then certain circulations ensue. Heat is taken in by the surface waters in high latitudes, and to this extent the oceans themselves behave as a heat engine. The processes of evaporation and precipitation, with the influx from rivers, remove water from certain parts of the oceans and replace it at other parts, and compensation currents are required.

Below the surface of the ocean, mixing is the only process by which the density of the sea-water may be appreciably changed. The effect of mixing is a general tendency towards uniformity. But in the surface waters of the ocean, differences of density are continually being re-established. By the process of vertical mixing due to turbulence, the changes introduced at and very near to the sea-surface are propagated downwards. The rate and extent of this propagation depend on the intensity of the vertical turbulence.

In so far as the turbulence is lateral or along the current, it will not change the density. The only changes of density will be those due to turbulent motions, which cut across the surfaces of equal density. In general, appreciable changes of density will only be effected as the water travels over long distances and hence the motion will be approximately along surfaces of equal density.

It will be seen that, even for the deep circulation of the ocean, the effect of the wind is of importance.

TEKCT 14
SOUND IN THE SEA

The speed of sound (longitudinal waves) in water is given by the relation V= v (E/p) where E is the adiabatic compressibility and p is the density. As these quantities depend on temperature, salinity and pressure so does the sound speed. The speed of sound at a salinity of 34.85 % (deepwater average) and 0^0 C is 1445 m/s. It increases by approximately 4 m/s per C^0 rise of temperature, by 1.5 m/s per 1‰ increase in salinity and by 18 m/s per 1000 m increase in depth (due to the corresponding increase in pressure). A consequence of these variations of sound speed with water properties and depth and the typical vertical distributions of these properties is an in situ sound speed minimum at depths ranging from near the surface at high latitudes (low temperature in the upper water) to over 1000 m at low latitudes. Salinity variations have very little effect on sound

speed. The wider range of temperature variations in the ocean and their stronger effect on sound speed changes make it possible to study acoustic propagation with vertical temperature profiles alone.

In clear ocean water, sunlight may be detectable (with instruments) down to 1000 m but the range at which man can see details of objects in the sea is rarely more than 50 m and usually less. Being denied the use of his eyes in the sea, man has made much use of sound waves to obtain information. With echo-sounders the depth to the bottom may be measured up to the maximum in the ocean.

ТЕКСТ 15

COLOUR OF SEA WATER

A number of investigators have considered the reasons for the colour of the seaб which ranges from deep blue to green or even greenish-yellow. The number of records of sea colour is not great but broadly speaking the deep or indigo blue colour is characteristic of tropical and equatorial seas particularly where there is little biological production. At higher latitudes, the colour changes through green-blue to green in polar regions. Coastal waters are generally greenish. There are two factors contributing to the blue colour of open ocean waters at low latitudes where there is little particulate matter. In deep water if one looks downward from below the surface, as when snorkelling, the light which one sees is mainly that scattered by the molecules of the water. Because the molecules scatter the short-wave (blue) light much more than the long-wave (red) light the colour seen is selectively blue. In addition, because the red and yellow components of sunlight are rapidly absorbed in the upper few meters, the only light remaining to be scattered from the bulk of the water is the blue light. If one looks at the sea from above the surface, in addition to the blue light scattered from the body of the water one sees some skylight reflected from the surface and the two components add together. If the sky is blue, the sea will still appear deep blue, but if there are clouds the white light reflected from the sea surface will dilute the blue scattered light from the water and the sea will appear less intensely blue. If there is green phytoplankton on the water their chlorophyll content will absorb the blue light and shift the water colour to green. The organic products from plants may also add yellow dyes to the water and these will absorb blue and shift the apparent colour toward the green. In some coastal regions, rivers bring in dissolved organic substances, which emphasize the yellowish-green colour. The red colour occurring sporadically in some coastal areas, the so-called «red tide», is caused by blooms of species of phytoplankton of a reddish-brown colour.

КОНТРОЛЬНАЯ РАБОТА

ВАРИАНТ № 1

DISTRIBUTION OF WATER AND LAND

The earth is predominantly a water globe. Expressed in percent, land covers about 29 % and water 71 % of the earth's surface. The distribution of land and water is asymmetrical, since land areas are concentrated mainly in the Northern Hemisphere. Continental land

three major ocean basins. The Atlantic Ocean is separated from the Pacific Ocean by a line along the shortest distance from Cape Horn to the South Shetland Islands. The boundary between the Atlantic and Indian Oceans is arbitrarily chosen at the meridian of the Cape of Good Hope. The Pacific and Indian Oceans are separated by a boundary following the line from the Malay Peninsula through Sumatra, Java, and Tasmania, following further the meridian of 147° E to Antarctica. Because of their unique physical oceanographic characteristics, it is desirable to consider not only the North Polar Sea but also the water surrounding the Antarctic Continent separately from the three world oceans. This does not mean that these waters are independent of the adjacent oceans, not one of the oceans is completely independent of any of the others. The physical characteristics of the waters surrounding the Antarctic Continent, however, are unique in many ways. The Antarctic Ocean can be oceanographically separated from the three world oceans, for instance, by the subtropical convergence, which can be followed, with minor interruptions, around the globe between about 40° and 50° S.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 2

OCEANOGRAPHY AS A SYSTEMATIC SCIENCE

Oceanography as a systematic science started in the early part of the nineteenth century together with her sister science, meteorology. Three factors that led to a rapid development of this young branch of geographical sciences can be recognized.

The first factor was the urgent need of depth measurements for engineering purposes. The laying of trans-atlantic cables was one of the practical reasons for exploring the third dimension of the oceans. Based on previous experience, existing sounding methods were rapidly improving.

The second factor that led to a rapid upsurge of systematic oceanographic and marine-meteorological research had also a pragmatic origin. Sailing vessels had reached high perfection and were striving for record voyages. A general knowledge of winds, waves, storms, currents, fog occurrence, ice distribution, and other meteorological and oceanographic information was needed to navigate more efficiently and more safely.

The motivation for the third factor came mainly from an academic, or scientific field. For a long time, zoologists and biologists believed that the depths of the sea were virtually without life. When transatlantic cables were recovered for repair from the bottom of the sea, all kinds of sea life were discovered attached to the cables that had lain at the bottom at depths below 3000 m; and biologists started marine explorations. The era of the systematic exploration of the deep sea had started.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 3

Systematic order in the collection of ships observations and the increased accuracy to be obtained by the use of instruments came only after the beginning of the nineteenth century. The regular navigation of the sea necessary for the expansion of trade and commerce rapidly increased the knowledge of surface conditions,

which were recorded in thousands of ships' journals or merchant marine ships. However, these are not sufficient to give a broad comprehension of oceanographic phenomena. This has led to the oceanographic expeditions that have contributed so much to the science of seas. The task of deep-sea expeditions is first to determine the shape of the sea bottom and to measure as accurately as possible the physical-chemical condition of sea water between the bottom and the surface. Of major importance are the horizontal and vertical variations of the oceanographic factors: temperature, salinity, and dissolved gases. Variations in the first of these indicate the variations in density and the latter ones allow a correlation with marine biology, which requires the knowledge of the environment of marine life. In addition to this more statistical knowledge of the physical-chemical structure of the sea it is also desirable to know something about the circulation of water masses. To determine the movements of water masses, the forces causing them and their seasonal variations in time as well as local variations and transports is the main problem of modern oceanography.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 4
THE NORWEGIAN SEA

In the Norwegian Sea, Atlantic water is found off the west coast of Norway, where it flows to the north, losing some of its heat content to the atmosphere and being somewhat diluted by excess precipitation. On the right-hand side of the Atlantic water is the Norwegian coastal water, which has a lower salinity, owing to runoff, and a considerable annual range in surface salinity and temperature. On the left-hand side of the Atlantic water are found water masses which have been formed by mixing between the Atlantic water and the Arctic water which flows south, along eastern Greenland. The latter is characterized by low salinity and temperatures below 0^0 C. The mixed water in the central and western parts of the Norwegian Sea has a salinity around 34.90 ‰, and at the surface the temperature which varies considerably during the year. In winter the surface layers are cooled, but before reaching freezing point the waters attain a higher density than that of the deeper waters and therefore sink to the bottom. By this process, first described by Nansen (1906), the bottom water of the Norwegian Sea is renewed. As further evidence for the correctness of the explanation, Helland-Nansen and Nansen (1909) point out that surface samples, taken by sailing vessels to the northeast of Jan Hayen in March to May, show temperatures between -1.2^0 and -1.9^0, and salinities between 34.70 ‰ and 34.94 ‰. The uniform bottom water fills all the basins of the Norwegian Sea at depths below 600 m the temperatures above 1500 m being somewhat higher. The North Sea waters have, in general salinities between 34,.00 ‰, but Atlantic water of salinity above 35.00 ‰ is Sound in a tonguelike area to the south of a line from Scotland to the west coast of Norway and in another tonguelike area extending northwest from the English Channel.

II КУРС
ГИДРОЛОГИЯ

ТЕКСТ 1
THE DEFINITION AND THE CENTRAL CONCEPT OF HYDROLOGY

Hydrology is the science that relates to water. It is concerned with the occurrence of water in the earth, physical and chemical reactions with the rest of the earth, and its relation to the life on the earth. It includes the

as its tools, but in doing so, it has developed a technique and subject matter that are distinct from those of the basic sciences.

The central concept in the science of hydrology is the so-called hydrologic cycle – a convenient term to denote the circulation of the water from the sea, through the atmosphere, to the land; and thence, with numerous delays, back to the sea by overland and subterranean routes and in part, by way of the atmosphere; also the many short circuits of the water that is returned to the atmosphere without reaching the sea.

The science of hydrology is especially concerned with the second phase of this cycle – that is, with the water in its course from the time it is precipitated upon the land until it is discharged into the sea or returned to the atmosphere. It involves the measurement of the quantities and rates of movement of water at all times and at every stage of its course.

Лексика к тексту

science	наука	definition	определение
earth	земля	concept	понятие
property	свойство	description	описание
technique	технические приёмы	to return	возвращаться
to precipitate	выпадать в виде осадков	to discharge	стекать
measurement	измерение	quantity	величина

УПРАЖНЕНИЯ

I. Приведите русские эквиваленты следующих английских слов:
physical, chemical, reaction, substance, geology, basic, cycle, term, circulation, atmosphere, phase.

II. Приведите английские эквиваленты следующих русских словосочетаний:
наука о земле, физические и химические свойства воды, основное понятие, циркуляция воды, удобный термин, скорость движения воды, надземные и подземные пути.

III. Найдите русские эквиваленты следующих английских словосочетаний:
to be concerned with; with respect to; to develop a technique; the occurrence of water; the rest of the earth; the relation to the life on the earth; a subject matter.

IV. Ответьте на следующие вопросы.

1. К чему имеет отношение наука гидрология ?
2. Каково основное понятие гидрологии ?
3. Какая из фаз гидрологического цикла особенно интересует науку ?

ТЕКСТ 2

THE HYDROLOGIC CYCLE

The hydrologic cycle is the descriptive term applied to the general circulation of water from the seas to the atmosphere, to the ground and back to the seas again. The cycle may be considered to begin with the water of the oceans. Water from the ocean surface is evaporated into the atmosphere. This vapour is condensed by various processes and falls to the earth as precipitation. Some of this precipitation falls directly on the seas, and some falls on land surfaces. A portion of the precipitation fallen on the land is retained temporarily in the soil, in surface depressions and on vegetation and other objects until it is returned to the atmosphere by evaporation and transpiration. The remainder, moving by devious surface and underground channels to rivers, lakes and eventually to the sea, is likewise subject to evaporation and transpiration throughout its travels. Actually all phases of the cycle are occurring simultaneously. On a worldwide basis the volumes of moisture involved in each phase of the cycle are relatively constant; but viewed in terms of a limited area, such as a small river basin, the quantities in any part of the cycle vary through wide limits. It is this variation that is the primary subject of study in hydrology. For example, a temporary unbalance of the cycle in which great volumes of water are concentrated in the streams result in a flood. Conversely, small or negligible amounts of water in precipitation phase of the cycle lead to drought.

Лексика к тексту

to evaporate	испарять(ся)	stream	поток, течение
vapour	пар	drought	засуха
to condense	конденсировать	to fall	выпадать
precipitation	осадки	moisture	влага

УПРАЖНЕНИЯ

I. Найдите соответствия.

general circulation	растительный покров
surface depression	испарение
soil	общая циркуляция
vegetation	бассейн реки
underground channel	поверхностная впадина
transpiration	наводнение
evaporation	почва
river basin	транспирация
flood	подземный канал

II. Найдите английские эквиваленты следующих русских словосочетаний:

2. The remainder is subject (подвержен / предмет) to evaporation throughout its travels (движение / двигается).
3. This variation is the subject (предмет / подвергать) of study in hydrology.
4. An unbalance of the cycle results in (результат / приводит к) a flood.
5. Small amounts (количество / составляет) of water lead to a drought.

ТЕКСТ 3
RIVERS

Rivers and lakes are products of rainfall. In landlocked areas the rivers run to the lowest part of the drainage area and form a lake. A region of this kind is called an inland drainage area. The slope of the ground determines the way in which water runs. The amount of rain that sinks into the earth depends on the permeability of the soil, on the slope of the ground, and on the rate of rainfall. The rivers in impermeable ground rise with great rapidity at first and then move slowly. They fall as rapidly as they rise. In permeable ground the rise and fall of rivers is always slow.

The basin of a river is the tract of country, which it drains. This is also called the drainage area, the catchment basin, and the watershed.

The vertical height of a river surface in feet above low water at a place is called the stage of the river. As the water of a river moves, it is joined by water from other rivers, these latter rivers are called tributaries or affluents; the place of meeting with the main stream is the confluence. The slight inclination of a river surface in the direction in which water flows, is called the slope. The greater the volume of a river, usually, the less its slope. The velocity of water in a river is greater the greater its slope, the greater the area of its cross-section and the greater the depth of the water.

The characteristics of a river as to its customary rise and fall, greatest and least discharge of water, character of slope and area of cross-section at different stages and in different parts of its course constitute its regimen.

Лексика к тексту

rainfall	осадки	lake	озеро
slope	уклон	to sink	(здесь) впитываться
permeability	водопроницаемость	rate	скорость
rise (v, n)	подниматься, подъём	fall (v, n)	понижаться, понижение
to drain	дренировать	volume	объём
velocity	скорость	cross-section	поперечное сечение

УПРАЖНЕНИЯ

I. Найдите соответствия.

drainage area / catchment basin / watershed	приток
river stage	водосбор
tributary / affluent	режим реки
confluence	уровень воды в реке
river regimen	расход воды
main stream	главная река
discharge of water	слияние

II. Переведите на русский язык следующие английские словосочетания:
landlocked areas, inland drainage area, rate of rainfall, river surface, impermeable ground.

III. Найдите в тексте определения следующих понятий:
водосбор, приток, уровень воды в реке, режим реки.

IV. Найдите в тексте ответы на следующие вопросы.

1. Где и каким образом образуются озёра ?
2. От каких факторов зависит уклон речной поверхности, и на какие факторы он оказывает влияние?
3. Чем определяется направление движения воды в реке ?

ТЕКСТ 4
EVALUATION OF WATER RESOURCES

The purpose of a water resources survey is to determine the source, extent and dependability of usable water supply. An inventory of water is the basic requirement for planning, designing and operating water resources projects. In general, planning of water resources development requires data on precipitation, river stage, river discharge, sediment transport, yield and storage of ground water, as well as other related data such as evapotranspiration and temperature.

The amount of precipitation is a direct indication of water available in an area. Precipitation data have a direct bearing on how to solve problems such as drainage of storm water, control of soil erosion and determination of the quantity of water needed to irrigate crops. Also important is indirect computation of surface runoff and flood flow from precipitation data.

Streamflow records provide the basic data for most water resources investigations. The importance of having enough streamflow data for designing water projects can hardly be exaggerated. The streamflow is the measure both of the quantity of water that can be utilized, and of discharge that should be controlled. Sediment

ing on its intended use such as irrigation, or domestic and industrial water supply. Thus, the determination of water quality is also essential.

Лексика к тексту

source	источник	dependability	зависимость
supply	запас	data	данные
drainage	осушение	requirement	требование
to utilize	использовать	to control	управлять
quality	качество	measure (n, v)	мера, измерять
quantity	количество		

УПРАЖНЕНИЯ

I. Приведите русские эквиваленты следующих английских слов:
to plan, to design, to operate, project, problem, region.

II. Найдите соответствия.

sediment load	ливневая вода
ground water	заиление
evapotranspiration	эрозия почв
soil erosion	речной сток
surface runoff	паводковый сток
floodflow	суммарное испарение
streamflow	грунтовая вода
silting	поверхностный сток

III. Приведите английские эквиваленты следующих русских словосочетаний:
районы пустынь, незагрязнённая вода, промышленное водоснабжение, данные об осадках, расход реки, уровень воды в реке, ирригационный канал, перенос наносов, запас грунтовых вод, количество осадков, данные о речном стоке.

IV. Ответьте на следующие вопросы.

1. Какова цель обзора водных ресурсов ?
2. Является ли количество осадков прямым показателем количества воды, имеющейся в данном регионе ?
3. Какие основные данные требуются для большинства исследований в области водных ресурсов ?
4. Что играет важную роль в заилении водохранилищ ?
5. Где в районах пустынь расположена пригодная к употреблению вода?

ТЕКСТ 5

HYDROLOGY DEFINED

Hydrology in a broad and literal sense is the science of water, its properties, phenomena and distribution. Hydrology is the science that treats of the waters of the earth, their occurrence, circulation and distribution, their chemical and physical properties, and their reaction with their environment, including their relation to living things. That is, the domain of hydrology embraces the full history of water on the earth.

Generally, five separate subdivisions of the science are recognized: a) hydrometeorology – the study of problems intermediate between the fields of hydrology and meteorology, b) limnology – the study of lakes, c) cryology – studies dealing with snow and ice, d) geohydrology – studies related to subsurface water and e) potomology – the study of surface streams. However, very few hydrologic problems can be limited to but one of these branches. More often, because the phenomena are so interrelated, solutions to these problems can only be attained by a completely interdisciplinary approach by scientists from one or more of these branches. Implicit in these discussions is the fact that hydrology is an extremely broad science and integrates them for its own interpretation and use. Supporting sciences such as physics, mathematics, chemistry, geology, geography, agriculture, fluid mechanics, statistics, operation research, forestry, economics, law and computer science are but a few which may be used in hydrologic investigations.

Лексика к тексту

property	свойство	subsurface water	подземные воды
distribution	распределение	branch	отрасль
environment	окружающая среда	phenomenon	явление
science	наука	study	изучение
earth	земля		

УПРАЖНЕНИЯ

I. Найдите соответствия.

chemical and physical properties	лесоводство
living things	сельское хозяйство
agriculture	химические и физические свойства
fluid mechanics	живые существа
forestry	механика жидкости

II. Закончите предложения подходящими по смыслу словами, опираясь на содержание текста.

1. Hydrology is the science that treats of ...
2. Hydrometeorology is the study of problems intermediate between the fields of ...
3. Limnology is the study of ...

The hydrologic cycle is a concept, which considers the processes of motion, loss and recharge of the earth's waters. The hydrologic cycle may be divided into three principal phases: a) precipitation, b) evaporation, and c) runoff, surface and groundwater. Further, it is of interest to note that at some point in each phase there usually occurs: a) transportation of water, b) temporary storage and, c) change of state. That is, for example, in the precipitation atmospheric phase there occurs vapour flow, vapour storage in the atmosphere and condensation or formation of precipitation created by a change from vapour to liquid or solid state. It follows that quantities of water going through individual sequences of the hydrologic cycle can be evaluated by the so-called hydrologic equation, which is a simple waterbudget equation defining the process. It should be recognized that the hydrologic cycle has no beginning or end, as water evaporates from the land, oceans and other water surfaces to become part of the atmosphere. The moisture evaporated is lifted, carried and temporarily stored in the atmosphere until it finally precipitates and returns to the earth either on land or oceans. The precipitated water may be intercepted or transpired by plants, may run off over the land surface to streams (surface runoff) or may infiltrate into the ground. Much of the intercepted water and surface runoff is returned to the atmosphere by evaporation. The infiltrated water may be temporarily stored as soil moisture and evapotranspired or percolated to deeper zones to be stored as groundwater which may be used by plants or flow out as springs or seep into streams as runoff and finally evaporate into the atmosphere to complete the cycle. From the preceding discussion, it is obvious that the hydrologic cycle is subject to various complicated processes of precipitation, evaporation, transpiration, interception, infiltration, percolation, storage and runoff.

Лексика к тексту

motion	движение	stream	река, поток
loss	потери, затраты	vapour	пар
recharge	пополнение	quantity	количество
phase	фаза	equation	уравнение
precipitation	осадки	moisture	влага
evaporation	испарение	interception	задержание
runoff	сток	transpiration	транспирация
to flow out	вытекать	infiltration	инфильтрация
to seep into	просачиваться	storage	накопление
percolation	просачивание		

УПРАЖНЕНИЯ

I. Найдите соответствия.

surface runoff	поток пара
groundwater runoff	почвенная влага

transportation of water	уравнение водного баланса
temporary storage	подповерхностный сток
vapour flow	русловое накопление
vapour storage	поверхностный сток
condensation	грунтовая / подземная вода
hydrologic equation	накопление пара
soil moisture	перенос воды
groundwater	конденсация

II. Заполните таблицу следующими словами:

concept, to consider, process, motion, runoff, further, phase, for example, transpiration, groundwater, equation, that is, quantity, interception.

Общенаучная лексика	Термины	Связующие термины

III. Найдите в тексте ответы на следующие вопросы.

1. Что такое гидрологический цикл ?
2. Каковы три основные фазы цикла ?
3. Что происходит с осадками, достигающими поверхности земли ?
4. Назовите основные процессы, происходящие в гидрологическом цикле ?

ТЕКСТ 7

THE WATER TABLE

The water table normally coincides with the free surface of lakes and streams. Between such openwater bodies, a water table, not confined impermeable strata, follows in modified form the contours of the land. It is higher under the hills than under the adjacent valleys. The contours of the water table do not show as pronounced variations as does the land surface, because of the tendency of water to seek its own level. The water table since its position is dependent on the continued accretion of groundwater, fluctuates with annual variations in rainfall, being both lower and flatter after dry spells than after rainy periods. For various reasons the water table in some areas intersects the land surface, and springs, or seeps result. Wet-weather seeps occur when a water table, raised by protracted rains, cuts the land surface. Occasionally a body of groundwater will be found above a bed of impervious or relatively impervious material. Such a locally anomalous condition is called a perched water table. A water table confined from above by an impermeable layer so that the water is under pressure represents artesian conditions. The slope of the upper surface of the water table is dependent on the flow conditions within the zone of saturation. Where the

Лексика к тексту

to coincide	совпадать	level	уровень
to confine	ограничивать	to depend on	зависеть
hill	холм	rainfall	осадки
valley	долина	to intersect	пересекать
bed	русло	spring	источник, ручей, ключ
pressure	давление	stratum	слой, пласт
to flow	течь	to occur	залегать
accretion	нанос, нарастание		

УПРАЖНЕНИЯ

I. Приведите русские эквиваленты следующих английских слов:
normally, form, contour, variation, tendency, position, fluctuate, reason, result, locally, naturally.

II. Найдите соответствия.

openwater body	напорное состояние
impermeable layer	поверхностный водоток, питающий грунтовые воды
annual variations	подвешенная вода
perched water table	непроницаемый слой
artesian condition	аллювиальный конус выноса
perched water	водоупор
alluvial fan	годовые колебания
influent stream	открытый водоём
stream bed	подвешенный водоносный горизонт
impervious material	речное русло

III. Найдите в тексте английские эквиваленты следующих русских словосочетаний:
водонепроницаемые слои, прилегающие равнины, ярковыраженные колебания, поверхность земли, подземный водоём, зона насыщения, сухие периоды.

IV. Найдите в тексте предложения, где говорится о …

… об очертаниях зеркала грунтовых вод;
… о зависимости колебания зеркала грунтовых вод;
… об образовании ручьев;
… об определении напорного состояния.

ТЕКСТ 8

EFFECT OF LAKES AND SWAMPS ON CLIMATE

Lakes and swamps return moisture to the air by evaporation. Changes in their areas affect the amount of evaporation and runoff and may change the amount of precipitation. Large lakes or swamps affect some elements of the climate of adjacent areas. Air passing over water areas is cooled in summer and warmed in winter.

Reduction in lake and swamp areas reduces evaporation from water surfaces but does not entirely eliminate it, as the exposed drained areas supply moisture to the air by evaporation of soil moisture and transpiration by plants. Although drainage of such areas may affect the total runoff from a drainage basin, the factors affecting runoff are so numerous and complex that very careful records would be required to show differences resulting from any one factor. Drainage of water areas has usually been accompanied by other changes in the drainage basin, and any changes in runoff have been the composite result of all the factors involved.

Increasing lake areas may increase evaporation and in turn increase precipitation. In the general rainfall cycle all moisture reaching the surface of the earth is returned to the air as vapour or eventually reaches the ocean as surface or underground flow. It is only by changing the moisture entering the air over land surfaces that the total moisture received by the air can be changed, as runoff reaching the ocean does not essentially affect its evaporating area or rate of evaporation. It has been estimated that the moisture capacity of the air under usual condition is equivalent to a depth of water of about 1 inch. Consequently any material change in the quantity of vapour discharged into the air must be reflected relatively soon in a change in the moisture returning to the earth as precipitation.

Лексика к тексту

air	воздух	difference	различие
to affect	влиять	to increase	увеличивать
to reduce	уменьшать	change (v, n)	изменять, изменение
plant	растение	record	наблюдение

УПРАЖНЕНИЯ

I. Найдите в тексте английские термины:

испарение, сток, почвенная влага, транспирация, водосбор, площадь водосбора, осадки.

II. Переведите на русский язык следующие словосочетания:

the amount of precipitation; moisture capacity; exposed drained areas; rate of evaporation; adjacent areas; general rainfall cycle; surface/under ground flow; quantity of vapour discharged.

III. Ответьте на следующие вопросы.

1. На что влияют изменения площади озёр и болот ?
2. Как изменяется испарение с уменьшением площади озёр и болот ?
3. Какой фактор может увеличивать количество осадков ?

At its source, while rain is falling, direct surface runoff moves in thin sheets over the surface of the earth and is largely governed by the laws of laminar flow, velocity being directly proportional to gradient. Soon, however, these sheets find surface depressions formed during previous rains. The depth of flow increases. It becomes turbulent and follows the laws of turbulent flow, velocity being approximately proportional to the square root of the gradient. While moving in thin sheets, surface runoff cannot attack soil protected by vegetation. As the rills increase in size, however, the ground surface is attacked and, where the slopes are steep, gullies are formed. Unless the gullies are protected by the root systems of vegetation, they deepen rapidly the sides cave, the water becomes heavily laden with sediment, and the forces of degradation are in active control.

The rate of progress toward the formation of surface watercourses is primarily dependent upon the character and condition of the surface of the earth and frequency of intense rainfall. Steep, unprotected slopes of fine, granular soils quickly become more gullied and produce rapid surface runoff. Relatively level land, particularly if the soil is granular, permits ready infiltration and groundwater recharge and produces well-sustained stream flow that tends to maintain well-defined watercourses.

Лексика к тексту

sheet	слой (воды)	rill	борозда, ручеёк
depression	впадина	gully	овраг
soil	почва	root	корень
gradient	градиент, уклон	sediments	наносы
channel	русло	recharge	питание

УПРАЖНЕНИЯ

I. Приведите русские эквиваленты следующих английских слов:

vegetation, proportional, attack, protect, degradation, active, control, progress, character, system.

II. Найдите в тексте английские эквиваленты следующих русских словосочетаний:

ламинарный поток, прямо пропорционально, поверхностные впадины, турбулентный поток, квадратный корень, корневая система растений, зернистая почва, быстрый поверхностный сток, инфильтрация, питание подземных вод, речное русло.

III. Заполните таблицу.

Statement	Yes	No
1. Velocity of surface runoff governed by the laws of laminar flow is equal to gradient.		
2. Soil protected by vegetation is not attacked by surface runoff.		
3. The formation of surface watercourses is dependent upon the character of the earth surface.		
4. Steep, unprotected slopes of granular soils do not produce rapid surface runoff.		

ТЕКСТ 10
FLOODS

A flood is a relatively high flow as measured by either gage height or discharge rate. Gage readings indicate levels of the water surface at measuring stations. Whenever the stream channel in an average section is overtaxed, causing overflow of adjacent land definitely outside the usual channel boundaries, the stream is said to have reached flood stage. Relative magnitudes of flood peaks may be expressed in various terms, including either height above low water, height above flood stage, or the corresponding rate of discharge. Furthermore, any flow of sufficient volume or duration to impede traffic across an arrowy or other intermittent drainage channel may locally be called a flood.

Flood flows are normally the direct or indirect result of precipitation, even though the runoff may be delayed or modified by the processes of freezing and thawing, surface inequalities or indentations, interception on vegetal cover or through infiltration, underground flow, and temporary storage in or release from reservoirs through either natural or artificial means of detention and regulation. Owing to differences resulting from variations in initial soil moisture and the effect of land use, tillage, vegetal cover, and leaf mold or forest litter, and owing to differences in geologic structure, a given rainfall may produce only a moderate rise in the streams of one area and flood conditions in those of another area; and owing to the varying moisture content of the soil the same amount of rainfall on a given area may produce a greater rise in the stream at one time than at another. Moreover, a gentle rainfall extending over several hours or days may result in only slight increase of stream flow, whereas the same amount of precipitation in a few minutes or hours may produce high flood crests of brief duration.

Лексика к тексту

gage	водомерный пост	freezing	замерзание
reading	показание прибора	thawing	таяние
to measure	измерять	indentation	вогнутость
overflow	разлив	detention	задержание
height	высота	regulation	регулирование
tillage	обработка земли	reservoir	водохранилище

УПРАЖНЕНИЯ

I. Найдите соответствия.

gage height	речное русло
discharge rate	паводковый уровень
stream channel	отметка над нулём поста
flood stage	дренирующее русло
flood peak	расход
drainage channel	паводковый сток
flood flow	пик паводка

река, осадки, сток, русловое накопление, просачивание, задержание осадков, растительный покров, почвенная влага, жидкие осадки.

III. Закончите предложения, опираясь на содержание текста.

1. A flood is …
2. Gage readings indicate …
3. Relative magnitudes of flood peaks may be expressed in …
4. Flood flows are …
5. A gentle rainfall extending over several hours or days may result in …

ДОПОЛНИТЕЛЬНЫЕ ТЕКСТЫ

ТЕКСТ 11

EVAPOTRANSPIRATION

Some water is returned to the atmosphere as a vapour through evapotranspiration, a term combining direct evaporation from the soil and other moist surfaces and plant transpiration. The amount of water returned through evapotranspiration depends upon the amount of water available, the solar energy supplied, and the temperature and humidity of the air. Heat, water, and carbon dioxide combine in the process of photosynthesis to manufacture plant matter. Heat, in excess of that needed for optimum photosynthesis, is dissipated by the plant through conduction and radiation. Much of the water required by plants is used to regulate their temperature, which otherwise would rise to a point that would cause them to wither and die.

The Beaverdam Creek basin loses large quantities of water by evapotranspiration during the warm summer. These losses decrease rapidly as the growing season closes in the autumn and are nearly zero in the winter. As the weather warms in the spring, the growing resumes, and evapotranspiration increases, reaching a high again in the summer. This variation in evapotranspiration loss with the time of the year is approximately the same from year to year, providing the vegetative cover is not significantly altered.

ТЕКСТ 12

SWAMPS

Swamps may be regarded as shallow lakes where the small depths of water and the slight range of fluctuation permits the growth of aquatic vegetation. Swamps occur mainly in areas of flat gradient and narrow stream channels. On steeper slopes vegetation may be sufficiently dense to retard runoff and prevent channel erosion, resulting in swamp conditions. Swamps tend to become filled from the growth of vegetation and from silting. Many swamps are old lakes in the later stage of filling.

Swamps are generally divided into inland or fresh-water swamps and coastal or sea-water swamps. The inland swamps include lake swamps resulting from the filling of lakes and growth of aquatic vegetation; river swamps along plains and deltas subject to frequent overflow; spring swamps formed by the discharge of spring; flat-land swamps on poorly drained land, such as the Great Dismal Swamp in Virginia; and raised bogs on flat lands of small runoff where precipitation exceeds the evaporation. Coastal swamps are frequently formed between high and low tides.

TEKCT 13
FREEZE-UP

Formation of an ice cover is dependent upon such factors as the heat exchange with the atmosphere, and the change in heat storage due to inflow and outflow. Although the northward-flowing Mackenzie has its source in southern climes where warmer temperatures prevail later into fall, water reaching the delta is not appreciably warmer than that standing in the delta lakes. Ice formation, however, begins first around the shallow perimeters of delta lakes, then in the small tributary and distributary channels, and finally in the major channels. The difference in the time of ice cover formation may be ascribed to greater mixing and depth in channels than in lakes, rather than to the inflow temperatures of southern waters. Depth may be a critical factor as the heat losses to the atmosphere per unit volume of water in channels would be less than in lakes.

Lake ice development begins in the latter half of September and by the first week in October most lakes in the delta are icecovered. The centers of deeper lakes may remain open for an additional week or ten days and open areas may also persist for a similar period where rills and small creeks enter. During the second week of October, ice begins to run in the major channels and shortly thereafter large patches of skim ice have formed. By mid-October major channels are about five-tenths ice-covered and the minor tributary and distributary ones are fully covered. Within the ten days major channels are fast from bank to bank except for the occasional open areas, which may persist until the latter part of December. The persistence of open holes may be accounted for by the reduction in heat flow to the atmosphere caused by ice cover formation, mixing, and the continuous input of less frigid water from upstream areas.

TEKCT 14
LAKES

Lakes are bodies of water filling depressions in the earth's surface. They range in area from small ponds to inland seas and in depth from a few feet to 2,000 feet. Although lakes are usually continuous during their geologic life, many are temporary, becoming alternately filled and dry, owing to fluctuations in their water supply and to evaporation. Lakes are important in topography and water supply of many drainage areas. Lakes represent a natural form of storage, which usually is beneficial in regulating stream flow, although lakes of large area and shallow depth may lose a large proportion of their inflow by evaporation. Lakes are used for water supply for municipal use, power, irrigation, and navigation. Many lakes have been converted into artificial reservoirs by raising their surface by dams or by lowering and controlling their outlets. The proportion of a drainage area that may be maintained as water surface varies widely. Lakes have a very slight range in level where their area and outlet capacity are large. Some lakes fluctuate through a wide range both within the year and over longer periods. Lakes that exist only after brief periods of inflow and soon evaporate to dryness are called playas; these are of wide occurrence in desert areas.

Swamps include lakes so shallow that aquatic vegetation grows within the lake area. Swamps also occur on sloping lands where vegetation grows rankly enough to restrict drainage. Many swamps and shallow lakes have been drained in order that the reclaimed areas may be used for agriculture. The variations in size, climatic conditions, character of origin and uses for different lakes make it difficult to generalize in regard to their

land.

ТЕКСТ 15

THE PROBLEM OF FLOOD ESTIMATION

The problem of flood estimation is a peculiarly difficult and complicated one. The natural laws governing floods are both recognizable and generally appreciated; the difficulty lies in their application.

Where they are available, actual records of floods are preferable to theoretical computations. The engineer is generally concerned with ascertaining either the worst flood conditions that may be anticipated from a given catchment, or the frequency with which what may be described as a normal flood is likely to occur. He may have detailed records of several floods from the given catchment, but he must decide what relation these bear to the maximum probable flood or what is the magnitude and frequency of the normal flood. Floods may occur yearly or even more frequently, but their intensity will vary and one of exceptional severity may possibly be met with once only in a hundred years. Complete security can only be obtained by ascertaining the maximum possible flood and making due provision for this. But it may not be economically possible to do so, and one may have to be content with insuring to a lesser degree against damage. From this aspect flood frequency comes into account.

Excepting in certain special cases, the magnitude of flood depends on the intensity and distribution of rainfall and on the characteristics of the catchment. In most countries rainfall data are more extensive than river flow data, and long period rainfall records will give a clue as to the frequency of floods and as to the relation any recorded flood bears to the maximum flood probable.

КОНТРОЛЬНАЯ РАБОТА

ВАРИАНТ № 1

FLOODS

Climate, physiography, and geology are the principal overall factors affecting the size and distribution of floods. Melting snow, increased precipitation, and sharply lowered evapotranspiration losses during the winter and early spring predispose the area to floods during those periods. In addition, high-intensity rainfall in connection with thunderstorm activity occasionally results in flooding during the summer. A major factor affecting floods is the extensive ground-water reservoir, underlying the Malad Valley. The thick sequence of highly porous alluvial deposits constituting the recharge areas of the ground-water reservoir extends for a considerable distance up the major tributary valleys and along the periphery of the Malad Valley. These deposits tend to absorb overland flow and thereby delay the arrival of runoff to stream channels. Thus despite the rugged peripheral uplands surrounding the valley, high flows in the Malad River and its principal tributaries usually are subject to considerable dampening. Channel storage also is an important factor in attenuating flood peaks in the downstream reaches of the Malad River.

Although the physical environment of the basin tends to reduce flood peaks, antecedent conditions can lower the effectiveness of the normally porous surface deposits.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 2
HYDROLOGY

The science of hydrology encompasses the behaviour of water as it occurs in the atmosphere, on the surface of the ground, and underground. Although man has been greatly affected by water in the development of his civilization, and although there is an enormous literature on this subject, it is not yet possible to call hydrology an exact science because when given a factor such as rainfall, one cannot accurately deduce the resulting deposition of the water in scientific and mathematical terms. This inaccuracy is due to the great complexity of the hydrologic cycle, the lack of accurate observational data, and the almost innumerable combinations of hydrologic phenomena that occur in nature. Two phases of the water cycle – rainfall and runoff measured as stream flow – are such commonplace phenomena that many are apt to think that much is known about the behaviour of water. On the contrary, much is yet to be learned, for science is only now escaping from an almost complete dependence on empirical relationship between these hydrologic factors. Hydrology provides the engineer with the basic data and methods required to solve problems relating to the regulation, control and utilization of water.

КОНТРОЛЬНАЯ РАБОТА
ВАРИАНТ № 3
GROUND WATER

Ground water, as defined by geologists and engineers, comprises only that portion of the ground, which lies within the zone of saturation or below the water table. It does not include the suspended water, which is held in the ground above that zone but does include the water, which lies below a perched water table. Water above the zone of saturation and near the ground surface is of major importance in connection with agriculture because of its relation to plant growth. Much of this water, of course, is utilized and transpired by vegetation and is thus returned to the atmosphere without penetrating deeply below the surface or becoming a part of the body of ground water. Not all water, therefore, that enters the ground becomes ground water, since only a part, and in some places only a minor part reaches the zone of saturation.

Two general conditions of ground-water occurrence are recognized:

1) water table or unconfined conditions in which the water is under atmospheric pressure, and

2) artesian or confined conditions in which the water is under pressure produced by an overlying impervious confining layer.

In many areas following heavy rain or in the spring of the year a perched water table may exist above the main water table. Such a condition, which is generally temporary, is produced by the presence of relatively impervious layers above the water table.

Ground water, like surface water, flows as a result of differences of pressure; if the surface is not confined, the difference in pressure is the result of surface slope; without slope (or difference of pressure), neither ground water nor surface water can have lateral motion.

With the coming of cold weather the water in a stream is gradually cooled, its temperature being intermediate between that of the cold air on the surface and that of the warm rock of the river bed, which still retains the heat of the summer, within the mass of the water temperatures tend to be uniform, the water being continually stirred by turbulent currents. This uniformity is further aided by the sinking of the cold, dense surface layers and the welling up of the warm, lighter bottom layer. Occasionally temperature stratification occurs in deep, quiet pools. The water cools degree by degree until the entire mass close to the freezing point. Finally the surface film of water is cooled below the freezing point and suddenly changed into needlelike crystals of ice that are slightly lighter than water.

The degree of turbulence compared with the rapidity of freezing now causes the ice formation to follow one of three general courses. When turbulence is large, the crystals are carried below the surface and the entire body of water is converted into a milky mixture of ice and water. This is called «frazil ice» and causes considerable trouble at power plants and control gates. When the floating crystals touch any surface that has a temperature even a fraction of a degree below the freezing point (such as a submerged portion of a steel rack or a mass of sheet ice), the crystals instantly adhere and form a spongy, rapidly growing mass that can quickly choke even large waterway openings.

СОДЕРЖАНИЕ

Предисловие	3
I курс. Тексты, упражнения	4
Контрольные работы	17
II курс. Метеорология	21
Дополнительные тексты	33
Контрольные работы	35
II курс. Экология	36
Дополнительные тексты	48
Контрольные работы	50
II курс. Океанология	51
Дополнительные тексты	65
Контрольные работы	67
II курс. Гидрология	69
Дополнительные тексты	82
Контрольные работы	84

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