

МИНИСТЕРСТВО ОБРАЗОВАНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ

УЧРЕЖДЕНИЕ ОБРАЗОВАНИЯ
«БРЕСТСКИЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ»

Кафедра иностранных языков технических специальностей

WATER USE

Пособие по английскому языку
для студентов специальности 1-70 04 03

**«Водоснабжение, водоотведение
и охрана водных ресурсов»**

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Данное пособие предназначено для студентов специальности «Водоснабжение, водоотведение и охрана водных ресурсов»(1-70 04 03).

Цель пособия – подготовить студентов к чтению и пониманию научно-технической литературы на английском языке по изучаемой специальности, а также совершенствовать навыки устной речи по предлагаемой тематике.

Пособие составлено из статей оригинальной английской и американской технической литературы по водоснабжению, водоотведению и очистке сточных вод. Каждый текст сопровождается предтекстовыми упражнениями с целью снятия лексических трудностей при чтении текста. Послетекстовые упражнения предназначены для контроля понимания прочитанного и развития речи на основе текста.

К пособию прилагаются тексты для дополнительного чтения.

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UNIT 1 ECOLOGY

Task 1. Match the following English words with their Russian equivalents. Remember their meaning.

- | | |
|--------------------|-------------------|
| 1. boundless | a. поколение |
| 2. waste materials | b. безграничный |
| 3. protection | c. уменьшать |
| 4. to save | d. защита |
| 5. to recycle | e. разгружать |
| 6. generation | f. перерабатывать |
| 7. measure | g. вещество |
| 8. to discharge | h. отходы |
| 9. substance | i. мера |
| 10. to reduce | j. спасти |

Task 2. Read the text.

ECOLOGY

It is a small world we live in, and it is high time for all of us to realize it. Nature seemed to be boundless and endless. Millions of cars and smoky factories pollute and spoil the air we breathe in. It is hurting our lungs as well as the life of animals, birds and plants. We don't know what to do with waste materials of our industry, so we pour them into water, bury them into soil, shoot them into atmosphere. As a result, radiation represents one of the main problems nowadays.

With development of our civilization we have become dangerous to the planet and to ourselves.

In many countries environmental protection agencies and research centers are up. Such organizations as "Green Peace" and "Friends of the earth" care for ecology in their countries. There are over 300 nature centers in British cities and more than 30 in London. Children go there with their teachers to study and enjoy nature. There are a lot of environment groups in Britain: "Friends of the earth", "Green Peace", London Wildlife Trust, etc.

People need wood and paper, so we cut down our forests. And today we do all we can to protect them. We have learned that forests are very valuable. They give us wood, which we use in many new ways. People do their best to protect our forests. Each of us can help to protect the forests. We can plant young trees and protect them.

People all over the world do everything to save nature.

Ecology group activities:

- how to help wild birds in winter;
- water pollution;
- problem of wild flowers;
- how to plant a tree.

There are a lot of ways to save the Earth. We must remember 3: reduce, reuse, recycle. Woodsy Owl, a mascot of the Forest Service, an agency in USA. We must take care of our nature, because if we dirty it we'll die. We must save our planet for future generations.

The problem of relations between man and nature is becoming more and more important. Every year, according to statistics, hundreds of millions tons of toxic substances are discharged into the air and the World Ocean. Smog kills people, brings illness, ruins great monuments of history and culture.

Ekaterinburg, its region and, the majority of Russian cities and towns are no exception. We are short of drinking water, tap water is dirty, air is dirty, rivers and lakes are polluted with industrial waste which causes the water to lose its oxygen and changes the river's or lake's flora and fauna. The cleaning of rivers has stopped due to lack of money. The Thames has

been polluted and its fauna partly ruined.

The pollution of the Mediterranean Sea is a tragic subject, indeed. Nobody doubts that filtering equipment is very expensive. But the task of the present generation is to save this beautiful world.

So, what anti-pollution measures can be taken? It depends, you know. In Moscow, e.g. some factories have been moved out of the city. Some new motorways have been built. They have money, they can afford it. And Ekaterinburg with its two hundred industrial enterprises can't. But Ekaterinburg is a green city and there are some nice spots in it.

Industrial enterprises should be provided with purification plants. And, of course, special legislation on nature conservation is required.

What do you personally do to save nature?

Task 3. Mark the statements as true or false. Correct the false statements.

1. Millions of cars and smoky factories pollute and spoil the air we breathe in.
2. With development of our civilization we haven't become dangerous to the planet and to ourselves.
3. Such organizations as "Green Peace" and "Friends of the earth" don't care for ecology in the countries.
4. We must take care of our nature, because if we dirty it we'll die.
5. The pollution of the Mediterranean Sea is a tragic subject.
6. Industrial enterprises should be supplied with purification plants.

Task 4. Paste the words to complete the sentences.

Nature, to save, generation, protection, conservation, waste materials

1. People don't know what to do with _____ of our industry, so we pour them into water, bury them into soil.
2. In many countries environmental _____ agencies and research centers are up.
3. People all over the world do everything _____ nature.
4. The problem of relations between man and _____ is becoming more and more important.
5. But the task of the present _____ is to save this beautiful world.
6. Special legislation on nature _____ is required.

Task 5. Answer the questions.

1. What are the ways people influence the environment?
2. Which of them are the most dangerous ones?
3. Is human influence on the environment irreversible?
4. What or who is the source of major damage to the Earth and all humans, animals and plants living on it?
5. How can society regulate environmentally dangerous activity?

Task 6. Select arguments for and against the following statements. Use the given constructions.

Problem	For	Against
1. Man-made changes to the environment are irreversible.	The basic reason for it is that....	But the point is....
2. We are not able to stop the continued degradation of the environment.	However.... Surely....	The reason is that....
3. Human impact on the environment makes it less rich and less diverse.	I think it is right....	I can hardly agree with it....

Task 7. Investigate the ecological change in your country. Make a short presentation in class.

UNIT 2 WATER

Text 1

Task 1.

a) Before reading the text "Water" look through the following words.

- a shelter — кров, убежище;
 average — средний;
 a supply — снабжение;
 a pottery — гончарное дело;
 hygiene — гигиена

b) Choose the right meaning of the underlined words.

- 1) but not all water helps him to survive (выживать, существовать);
- 2) ancient civilizations rose on the banks of the Nile (банки, берега);
- 3) under the tropical sun women have to carry water again (добывать, носить);
- 4) housewives carry a few liters of water from springs and rivers (вёсны, ручьи);
- 5) people are so short of water there (недостаток, короткий).

c) Choose the right explanation.

- | | |
|-----------|---|
| shelter | to be thirsty |
| a) house; | a) a state when a man wants to eat; |
| b) shop; | b) a state when a man wants to breathe; |
| c) inn. | c) a state when a man wants to drink. |

housewife

- a) a woman who lives in one and the same place;
- b) a woman who looks after her house;
- c) a woman who looks after somebody's child.

d) Choose the right synonyms to the underlined words.

- 1) man can live for some time without food (water, meal, meat);
- 2) if the water is not clean (clear, pure, innocent);
- 3) the surface of the earth (ground, land, soil);
- 4) he needed something to keep water in (carry, support, store);
- 5) the greatest number of town people needing new water services (work, job, facilities).

e) Answer the questions.

- 1) Is water important for the life of a man?
- 2) Can a man live without water?
- 3) How many days is it possible to live without water?
- 4) Do you know how much water there is in our body?
- 5) What do we use water for?

Task 2. Read the text.

WATER

There is no life without water. Man can live without clothes, without shelter, and even for some time without food. Without water he soon dies. But not all water helps him to survive: if it is not clean, then also he may die before his time.

Some people say that man and his story is «a question of water and little else». All his food has water, from about 60% to as much as 95%. His body is about 70% water. The surface of the earth is 70% water to an average depth of over 4 kilometers. But often man does not have enough water.

Water played an important part in man's progress. He needed something to carry and keep water in, and so the idea of pottery was born. Ancient civilizations rose on the banks of the

Nile, the Tigris, and other rivers. But then the world's population was not so large as it is now. And industry is thirsty, too. We need 3.5 liters of water to produce a kilogram of dry cement, 10 liters to produce one liter of petrol, 100 liters to produce one kilogram of paper, and so on.

The greatest number of town people needing new water services lives in South-Central and South-East Asia. The needs are greatest in India, Indonesia, the Philippines, Nigeria, Brazil and Pakistan.

Under the tropical sun women have to carry water again, again and again. In the dry parts of Africa, where there is little surface water and no ground water, housewives spend most of their time carrying a few liters of water from springs and rivers which are sometimes as much as 15 kilometers or three good hours' walk away. People there are so short of water that they use it mostly or only for drinking and very little or nothing is left for hygiene.

The earth has as much water as it ever had: no more, no less. But with every year the population of the world gets larger and larger.

In the climb up the ladder of civilization, first things come first; one of those things is certainly a clean, plentiful and convenient water supply in all parts of the world.

Task 3. Complete the sentences.

1. Our food is...
 - a) from about 60% to 95% water.
 - b) from about 70% to 95% water.
 - c) from about 50% to 75% water.
2. Man's body consists of...
 - a) 60% of water.
 - b) 70% of water.
 - c) 95% of water.
3. The surface of the Earth is...
 - a) 40% water.
 - b) 70% water.
 - c) 95% water.
4. We need 10 liters of water to produce...
 - a) a kilogram of dry cement.
 - b) a kilogram of paper.
 - c) a liter of petrol.
5. In tropical countries women spend most of their time carrying water because...
 - a) pottery is not developed.
 - b) rivers and springs are a long way off their homes.
 - c) they need a lot of water for drinking and hygiene.
6. Man often does not have enough water because...
 - a) the world's population gets larger and larger.
 - b) the earth doesn't have as much water as it ever had.
 - c) industry pollutes water.

Task 4. Mark the statements as true or false. Correct the false statements.

- a) All water helps man to survive.
- b) The idea of pottery was born because man needed something to carry and keep water in.
- c) Ancient civilizations rose on the banks of large rivers.
- d) Such countries as India, Indonesia, the Philippines, Nigeria, Brazil and Pakistan have a plentiful and convenient water supply.
- e) When people are short of water they use it only for drinking and hygiene.

Task 5. Prepare a report about the importance of water for mankind.**Text 2****Task 1. Read the following international words and find their Russian equivalents.**

chemical, physical, biological, pesticides, degradation, geology, topography, bacteria, microorganisms, population, to generate, phosphorus, potential, resources

Task 2. Choose Russian equivalents of the given English words and word combinations.

a particular purpose	1) атмосферное влияние
aquatic plants	2) переносимый по воздуху
complicated interconnections	3) водоочистные станции
atmospheric contributions	4) конкретная цель
natural landscape features	5) серьезная болезнь
the vulnerability of surface water	6) слив
wastewater treatment plants	7) внимательный
sewer	8) сложные взаимосвязи
airborne	9) просачивание
severe illness	10) естественные особенности местности
discharge	11) ранимость поверхностных вод
seepage	12) водные растения
sediment	13) осадочная порода
Diligent	14) канализационная труба

Task 3. Read the text.**Water Quality**

Photo courtesy of Glenn Phillips,
IMEC

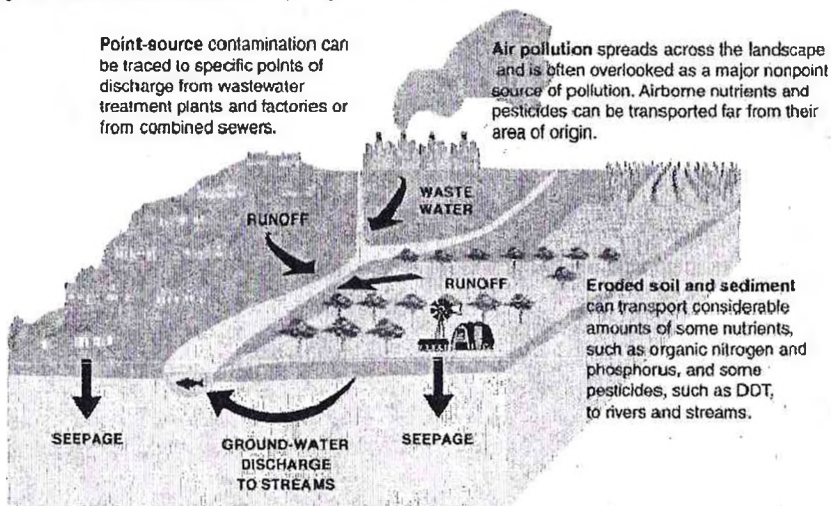
Water quality is a term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose. Although scientific measurements are used to define a water's quality, it's not a simple thing to say that "this water is good", or "this water is bad". After all, water that is perfectly good to wash a car with may not be good enough to serve as drinking water at a dinner party for the President! When the average people ask about water quality, they probably want to know if the water is good enough to be used at home, to be served in a restaurant, etc., or if the quality of our natural waters is suitable for

aquatic plants and animals.

As the diagram above shows, assessment of the occurrence of chemicals that can harm water quality, such as nutrients and pesticides in water resources, requires recognition of complicated interconnections among surface water and ground water, atmospheric contributions, natural landscape features, human activities, and aquatic health. The vulnerability of surface water and ground water to degradation depends on a combination of natural landscape features, such as geology, topography, and soils; climate and atmospheric contributions; and human activities related to different land uses and land-management practices.

More and more nowadays we are hearing about situations where the quality of our water is not good enough for normal uses. Bacteria and microorganisms have gotten into drinking-water supplies, sometimes causing severe illness in a town; chemical pollutants have been detected in streams, endangering plant and animal life; sewage spills have occurred, forcing people to boil their drinking water; pesticides and other chemicals have seeped into the ground and have harmed the water in aquifers; and, runoff containing pollutants from roads and park-

ing lots have affected the water quality of urban streams.



Yes, water quality has become a very big issue today, partly because of the tremendous growth of the Nation's population and urban expansion and development. Rural areas can also contribute to water-quality problems. Medium- to large-scale agricultural operations can generate in animal feed, purchased fertilizer, and manure, more nitrogen and phosphorus than can be used by crops or animals. These excess nutrients have the potential to degrade water quality if incorporated into runoff from farms into streams and lakes. All this growth puts great stress on the natural water resources, and, if we are not diligent, the quality of our waters will suffer.

Task 4. Mark the statements as true or false. Correct the false statements, using the following phrases:

To my mind...

I am not sure, but...

Personally I suppose that...

1. Water quality is a term used to describe the physical and biological characteristics of water.
2. The vulnerability of surface water and ground water to degradation depends only on climate and atmospheric contributions.
3. Air pollution is often considered as a major point-source of pollution.
4. Eroded soil and sediment can transport a great number of harmful nutrients and pesticides to rivers and streams.
5. Water quality is a big problem nowadays, mainly because of the great increase of the population of the Earth.

Task 5. Decide which translation is correct.

1. Although scientific measurements are used to define a water's quality, it's not a simple thing to say that "this water is good", or "this water is bad".

а) Благодаря использованию научных подсчетов для определения качества воды, можно легко сказать, что «эта вода - хорошая» или «эта вода - плохая».

б) Несмотря на то, что используются научные подсчеты для определения качества воды, нелегко сказать, что «эта вода - хорошая» или «эта вода - плохая».

с) Хотя используются научные подсчёты, нелегко определить качество воды, предположив, что «эта вода - хорошая» или «эта вода - плохая».

2. Run off containing pollutants from roads and parking lots have affected the water quality of urban streams.

a) Слив, содержащий загрязняющие агенты с дорог и мест парковки автотранспорта, повлиял на качество городских вод.

b) Слив, содержащий загрязняющие агенты с дорог и мест парковки автомобилей, влияет на качество питьевой воды.

с) Слив загрязняющих агентов с дорог и мест парковки автомобилей не всегда влияет на качество городских вод.

3. Rural areas can also contribute to water-quality problems.

a) Проблемы качества воды часто возникают в сельскохозяйственных районах.

b) Зоны сельского хозяйства также могут способствовать возникновению проблем качества воды.

с) Сельскохозяйственные зоны также являются источниками возникновения проблем качества воды.

4. This growth puts great stress on the natural water resources, and, if we are not diligent, the quality of our waters will suffer.

a) Этот рост может повлиять на натуральные водные ресурсы, но если мы будем внимательны, качество воды не пострадает.

b) Если мы не будем внимательны, качество нашей воды может пострадать вследствие огромного давления этого роста.

с) Этот рост оказывает огромное давление на натуральные водные ресурсы, и, если мы не будем внимательны, качество нашей воды пострадает.

Task 6. Ask your groupmates.

a) how they can define "water quality";

b) what assessment of the occurrence of harmful chemicals in water resources depends on;

c) what the main sources of pollution are;

d) what kinds of pollutants can be detected in water;

e) what factors can contribute to water-quality problems.

Task 7. Make up a summary of the article.

UNIT 3 GROUND WATER

Text 1

Task 1. Before reading the text "What is Ground Water?" get acquainted with the following words.

arid area	засушливый район
aquifer	водоносный слой
beneath	внизу, ниже
to condense	уплотнять, сгущать, сжимать
depth	глубина
desert	пустыря
diagram	диаграмма, график, схема
immense	огромный
to measure	измерять

to occur	происходить, случаться, встречаться, попадаться
pore	пора
precipitation	осадки
to saturate	насыщать, пропитывать
to simplify	упрощать(ся), делать более простым, легким
to squeeze	сжимать, сдавливать, стискивать
to support	поддерживать, обеспечивать
shallow	мелкий, мелководный
surface	поверхность
tiny	очень маленький, крошечный
to underlie	лежать под чем-л.
vegetation	растительность
water table	горизонт грунтовых вод, зеркало грунтовых вод

Task 2. Combine the following nouns with the adjectives and use them in your own sentences.

water	a) fresh	ground	a) saturated
	b) drinking		b) arid
	c) ground		c) porous
	d) clean		d) unsaturated
	e) cool		e) desert
	f) surface		f) wet
	g) polluted		g) fertile
	h) reclaimed		

What is Ground Water?

These kids probably think there is some kind of magic happening here. They pull down a lever and out of the ground below their feet comes clear, cool freshwater. They may not realize that there is an immense amount of water in aquifers below the earth's surface. In fact, there is a hundred times more water in the ground than is in all the world's rivers and lakes.

Some water underlies the Earth's surface almost everywhere, beneath hills, mountains, plains, and deserts. It is not always accessible, or fresh enough for use without treatment, and it's sometimes difficult to locate or to measure and describe. This water may occur close to the land surface, as in a marsh, or it may lie many hundreds of feet below the surface, as in some arid areas of the South. Water at very shallow depths might be just a few hours old; at



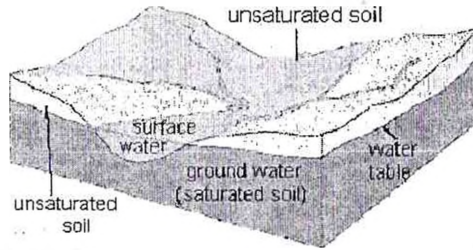
moderate depth, it may be 100 years old; and at great depth or after having flowed long distances from places of entry, water may be several thousands of years old.

Ground water occurs only close to the Earth's surface. There must be space between the rock particles for ground water to occur, and the Earth's material becomes denser with more depth. Essentially, the weights of the rocks above condense the rocks below and squeeze the open pore spaces deeper in the Earth. That is why ground water can only be found within a few miles of the Earth's surface.

Ground water is an important part of the water cycle. Ground water is the part of precipitation that seeps down through the soil until it reaches rock material that is saturated with water. Water in the ground is stored in the spaces between

rock particles (no, there are no underground rivers or lakes). Ground water slowly moves underground, generally at a downward angle (because of gravity), and may eventually seep into streams, lakes, and oceans.

Here is a simplified diagram showing how the ground is saturated below the water table. The ground above the water table may be wet to a certain degree, but it does not stay saturated. The dirt and rock in this unsaturated zone contain air and some water and support the vegetation on the Earth. The saturated zone below the water table has water that fills the tiny spaces (pores) between rock particles and the cracks (fractures) of the rocks.



Task 3. Match the synonyms.

- | | |
|-----------------|---------------|
| 1. earth | a) some |
| 2. beneath | b) space |
| 3. condense | c) ground |
| 4. several | d) wet |
| 5. pore | e) below |
| 6. saturated | f) squeeze |
| 7. ground water | g) immense |
| 8. stream | h) zone |
| 9. great | i) freshwater |
| 10. area | j) river |

Task 4. Form...

a) nouns from the following verbs using appropriate suffixes;
to happen, to realize, to treat, to locate, to measure, to describe, to occur, to enter, to condense, to precipitate, to store, to move, to saturate

b) adjectives from nouns.

depth, mountain, distance, pore, dirt

Task 5. Agree or disagree with the following statements. In your answers use the following conversational formulas of agreement and disagreement:

That's right;

True;

What you say is absolutely correct;

I fully agree with you;

I'm afraid you are not right;

Sorry but you are mistaken, etc.

- There is a great amount of water in aquifers below the earth's surface.
- Ground water underlies the Earth's surface almost everywhere but it is sometimes difficult to find.
- The closer the water occurs to the land the older it is.

4. The Earth's material becomes denser with less depth.
5. Water in the ground is stored in the spaces like in rivers or lakes.
6. Ground water may eventually get into streams, lakes, and oceans.
7. The ground above the water table always stays saturated.

Task 6. Translate the sentences from English into Russian.

1. You may not realize that there is an immense amount of water in aquifers below the earth's surface.
2. Ground water is not always accessible, or fresh enough for use without treatment, and it's sometimes difficult to locate or to measure and describe.
3. Water at very shallow depths might be just a few hours old; at moderate depth, it may be 100 years old; and at great depth or after having flowed long distances from places of entry, water may be several thousands of years old.
4. Ground water is the part of precipitation that seeps down through the soil until it reaches rock material that is saturated with water.
5. The saturated zone below the water table has water that fills the tiny spaces (pores) between rock particles and the cracks (fractures) of the rocks.

Task 7. Give the answers to the questions.

1. Does freshwater occur in rivers and lakes only?
2. Can water be accessible everywhere in the world?
3. Is there any dependence of the water age on its depth?
4. Why can ground water be found only within a few miles of the Earth's surface?
5. What is the role of ground water in the water cycle?
6. Why does ground water moves underground at a downward angle?
7. How do you understand the term "the water table"?
8. How is the ground saturated with water below the water table?

Task 8. Correct the plan of the article.

1. Water age depends on its location.
2. Soil saturation.
3. Water occurs under ground.
4. Ground water occurs only close to the Earth's surface.
5. Ground water as a part of the water cycle.

Task 9. Prepare a short summary of the article.

Text 2

Task 1. Get acquainted with the following words.

bedrock	коренная подстилающая порода
cavity	впадина, котловина, яма
confining layer	водоупор, кровля (водоносного пласта)
cross-section	поперечное сечение, поперечный разрез
dense	плотный
direction	направление
to drip	капать, падать каплями
to dry up	высыхать, пересыхать
edge	кромка, край; грань, граница
existence	существование

exposed	незащищенный, уязвимый, беззащитный
fracture	трещина, разлом, разрыв
impermeable	непроницаемый, герметический; не пропускающий (жидкость и газ)
limestone	известняк
to penetrate	проникать внутрь, пропитывать, пронизывать
to pool	объединять в общий фонд, складываться
porous	пористый, губчатый
to pour	лить(ся), наливать, разливать (into), выливать
to reveal	обнаруживать, показывать
rock	горная порода, камень
sandstone	песчаник
saturated	влажный, промокший, насыщенный, сатурированный
sedimentary rock	осадочная порода
space	пространство
sponge	убка, губчатое вещество
void	пустота, вакуум, пробел, пропуск, пустое место
wrap	покров, оболочка

Task 2. Try to guess the meaning of the following international words.

to accumulate, a cycle, a factor, granite, gravity, horizontal, material, plastic, a pore, a sponge, to tend, a type, vertical, to visualize

Task 3 Read the text.

Why is there Ground Water?

A couple of important factors are responsible for the existence of ground water.

(1) Gravity.

Nothing surprising here - gravity pulls water toward the center of the Earth. That means that water on the surface will try to seep into the ground below it.

(2) The Rocks below Our Feet.

The rock below the Earth's surface is the bedrock. If all bedrock consisted of a dense material like solid granite, then even gravity would have a hard time pulling water downward. But Earth's bedrock consists of many types of rock, such as sandstone, granite, and limestone. Bedrocks have varying amounts of void spaces in them where ground water accumulates. Bedrock can also become broken and fractured; creating spaces that can fill with water. And some bedrock, such as limestone, is dissolved by water -- which results in large cavities that fill with water.

In many places, if you looked at a vertical cross-section of the earth you would see that rock is laid down in layers, especially in areas of sedimentary rocks. Some layers have rocks that are more porous than others, and here water moves more freely (in a horizontal manner) through the earth. Sometimes when building a road, the layers are revealed by road cuts, and water can be seen seeping out through the exposed layers.

Try as it might, gravity doesn't pull water all the way to the center of the Earth. Deep in the bedrock there are rock layers made of dense material, such as granite, or material that water has a hard time penetrating, such as clay. These layers may be underneath the porous rock layers and, thus, act as a confining layer to slow down the vertical movement of water. Since it is more difficult for the water to go any deeper, it tends to pool in the porous layers and flow in a more horizontal direction across the aquifer toward an exposed surface-water body, like a river.

Visualize it this way: get two sponges and lay one on top of the other. Pour water (precipitation) on top and it will seep through the top sponge downward into the bottom sponge. If you stopped adding water, the top sponge would dry up and, as the water dripped

out of the bottom sponge, it would dry up too. Now, put a piece of plastic wrap between the sponges, creating your "confining layer" (making the bottom sponge an impermeable rock layer that is too dense to allow water to flow through it). Now when you pour water on the top sponge, the water will seep downward until it hits the plastic wrap. The top sponge will become saturated, and when the water hits the plastic wrap it won't be able to seep into the second sponge. Instead, it will start flowing sideways and come out at the edges of the sponge (horizontal flow of ground water). This happens in the earth all the time -- and it is an important part of the water cycle.

Task 3. Fill in the table using appropriate suffixes. The first one is done as an example.

VERB	NOUN	PARTICIPLE I, II
<i>pollute</i>	<i>pollution</i>	<i>polluted</i>
	seepage	
vary		
	visualization	laying
move		
	dissolvent	
		existing

Task 4. Fill in the English equivalents of the Russian word combinations in bold type.

- Bedrock can become broken and fractured creating **пространства** that can fill with water.
- Some layers have rocks that are более **пористые** than others.
- Как ни старайся**, gravity doesn't pull water all the way to the center of the Earth.
- Представьте себе это следующим образом**: get two sponges and lay one on top of the other.
- The top sponge will become **насыщена водой**.
- It is an important part of the **круговорота воды**.

Task 5. Choose a better translation.

- Earth's bedrock consists of many types of rock.
 - Коренная подстилающая порода земли состоит из различных типов породы.
 - Коренная подстилающая порода земли состоит из различного камня.
- If you looked at a vertical cross-section of the earth you would see that rock is laid down in layers.
 - Если вы посмотрите на вертикальный срез земли, вы увидите, что горная порода лежит слоями.
 - Если бы вы посмотрели на вертикальный срез земли, вы бы увидели, что горная порода лежит слоями.
- Water can be seen seeping out through the exposed layers.
 - Можно увидеть, как вода просачивается сквозь незащищенные слои.
 - Вода может просачиваться сквозь незащищенные слои.
- Deep in the bedrock there are rock layers made of dense material.
 - Глубоко в коренной подстилающей породе земли есть слои породы, сделанной из твердого материала.

- b) Глубоко в коренной подстилающей породе земли есть слои породы, состоящие из плотного материала.
5. These layers may be underneath the porous rock layers.
- a) Эти слои могут находиться под слоями пористой породы.
- b) Эти слои могут находиться под пористыми каменными слоями.
6. When you pour water on the top sponge, the water will seep downward until it hits the plastic wrap.
- a) Когда вы льете воду на верхнюю губку, вода будет сочиться вниз, пока не натолкнется на пластиковую преграду.
- b) Когда вы нальете воду на верхнюю губку, вода будет сочиться вниз, пока не натолкнется на пластиковую преграду.

Task 6. Answer the following questions.

1. What are the two factors responsible for the existence of ground water?
2. Why does water on the surface try to seep into the ground below it?
3. What materials does Earth's bedrock consist of?
4. Where can ground water accumulate?
5. How can large cavities filled with water appear in the ground?
6. Why does water sometimes move more freely (in a horizontal manner) through the earth?
7. Why can't gravity pull water all the way to the center of the Earth?

Task 7. Try to shorten two sentences into one as shown in the example.

Nothing surprising here - gravity pulls water toward the center of the Earth. That means that water on the surface will try to seep into the ground below it.

The water on the surface seeps into the ground due to gravity.

1. Earth's bedrock consists of many types of rock, such as sandstone, granite and limestone. And some bedrock, such as limestone, is dissolved by water – which results in large cavities that fill with water.
2. In many places of the earth rock is laid down in layers, especially in areas of sedimentary rocks. Some layers have rocks that are more porous than others, and here water moves more freely (in a horizontal manner) through the earth.
3. Deep in the bedrock there are rock layers made of dense material, such as granite, or material that water has a hard time penetrating, such as clay. Since it is more difficult for the water to go any deeper, it tends to pool in the porous layers and flow in a more horizontal direction across the aquifer toward an exposed surface-water body, like a river.
4. The top sponge will become saturated, and when the water hits the plastic wrap it won't be able to seep into the second sponge. Instead, it will start flowing sideways and come out at the edges of the sponge.

Task 8. Describe:

1. the factors responsible for ground water existence;
2. the types of rock in the Earth's bedrock;
3. a vertical cross-section of the earth;
4. the cause of the horizontal movement of ground water;
5. the experiment showing the phenomenon of saturation.

UNIT 4 WATER POLLUTION

Text 1

Task 1. Match the following English words with their Russian equivalents. Remember their meaning.

- | | |
|------------------------|------------------|
| 1. mixture | a. приостановить |
| 2. irrigation | b. свойства воды |
| 3. to contribute | c. смесь |
| 4. recreation | d. внести вклад |
| 5. properties of water | e. ухудшать |
| 6. to relocate | f. отдых |
| 7. to deteriorate | g. качество воды |
| 8. contamination | h. загрязнение |
| 9. to suspend | i. ирригация |
| 10. water quality | j. переместить |

Task 2. Read the text.

NATURE OF WATER POLLUTION

The terms water pollution and air pollution both imply the presence of undesirable foreign matter in an otherwise "pure" or "natural" substance. However the concept of pure water is quite different from that of pure air. Air is a mixture of several components, water, however, is a single compound, not a mixture. Therefore the chemist thinks of "pure water" as a substance consisting of molecules of only one type – those represented by the formula H_2O . However, most drinking water contains small quantities of dissolved salts; these substances often contribute to its taste.

The pollution of water is the addition of undesirable foreign matter which deteriorates the quality of the water. Water quality may be defined as its fitness for the beneficial uses which it has provided in the past – for drinking by man and animals, for the support of a wholesome marine life, for irrigation of the land, and for recreation. Pollutant foreign matter may be either non-living, such as compounds of lead and mercury, or living, such as microorganisms.

Liquids are intermediate between gases and solids in their readiness to accept contamination. The attractive forces between molecules in the liquid state are strong enough that a sample of liquid (for example, a raindrop) holds itself together. However, the attractive forces are not so strong as they are in solids; they are not strong enough to prevent the molecules from sliding past one another. Such molecular relocations manifest themselves in the familiar phenomenon of liquid flow. Now, when a molecule of liquid relocates, it leaves behind a vacant site, or a "hole". This vacancy can be occupied by another molecule of the same type, or by a molecule of a foreign substance.

A contaminant may be harboured by a liquid without being dissolved in it. If we grind our piece of lead to a fine powder and stir it into the water, the suspended lead is a pollutant. However, the ease with which foreign matter can be suspended in a liquid also depends to some extent on the mutual attraction between the foreign particles and the liquid molecules.

Water is not a typical liquid. One of the consequences of the unique physical and chemical properties of water is that it invites or accepts pollution readily, sometimes through mechanisms that are quite unexpected. Of course, water is the universal liquid medium for living matter; it is therefore uniquely prone to pollution by living organisms, including those that carry disease to man. Contamination pathways that involve suspension, solution, and biochemical

change are not necessarily separate and distinct from each other, and many of these complex processes can occur only in water.

Therefore, to understand water pollution, we must first consider the nature of water itself.

Task 3. Mark the statements as true or false. Correct the false statements.

1. Water is a mixture of several components, air, however, is a single compound, not a mixture.
2. Most drinking water contains small quantities of dissolved salts.
3. Pollutant foreign matter may be only non-living, such as compounds of lead and mercury.
4. Liquids are intermediate between gases and solids in their readiness to accept contamination.
5. The vacancy can be occupied by another molecule of the same type, or by a molecule of a foreign substance.
6. To understand water pollution, we must not consider the nature of water itself.

Task 4. Complete the sentences according to the text.

1. The terms water pollution and air pollution both imply...
2. The pollution of water is the addition...
3. The attractive forces are not strong enough...
4. A contaminant may be harboured...
5. One of the consequences of the unique physical properties of water...
6. Water is the universal liquid...

Task 5. Match the words and the definitions.

- | | |
|-------------------|--|
| 1. pollution | a. helpful or useful; |
| 2. substance | b. a substance that consists of two or more elements; |
| 3. to deteriorate | c. firm and usually hard, without spaces or holes, and not liquid or gas; |
| 4. beneficial | d. damage caused to the environment by harmful chemicals and waste; |
| 5. contamination | e. one or more connected atoms of a substance; |
| 6. compound | f. type of solid or liquid, for example, a chemical material; |
| 7. to relocate | g. to move to a new place; |
| 8. liquid | h. to become worse; |
| 9. molecule | i. a substance such as water that flows, and is not solid or gas; |
| 10. solid | j. to make smth dirty or dangerous by adding smth such as chemicals to it; |

Task 6. Answer the following questions.

1. What does the term water pollution imply?
2. What does most drinking water contain?
3. What are the beneficial uses of water?
4. Why are the attractive forces in liquids not so strong as in solids?
5. What happens when a molecule of liquid relocates?
6. What does the ease with which foreign matter can be suspended in a liquid depend on?

Text 2.

Task 1. Remember the meanings of the following English words. Match them with their Russian equivalents.

- | | |
|-------------|--------------|
| 1. moisture | a. принимать |
| 2. to cause | b. влага |

3. to harm
4. to originate
5. environment
6. to adapt
7. to expose
8. dense
9. to exhaust
10. evergreen

- с. вечнозелёный
- d. причинить вред
- e. плотный
- f. окружающая среда
- g. исчерпывать
- h. порождать
- i. быть причиной
- j. подвергать

Task 2. Read the text.

Acid Rain: Do you Need to Start Wearing a Rainhat?

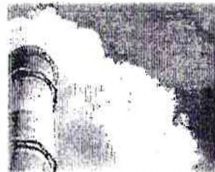


Depending on where you live, maybe you've heard of acid rain. Now, acid rain is not pure acid falling from the sky, but rather it is rainfall or atmospheric moisture that has been mixed with elements and gases that have caused the moisture to become more acidic than normal. Pure water has a pH of 7, and, generally, rainfall is somewhat on the acidic side. But, acid rain can have a pH of about 5.0-5.5, and can even be in the 4 range in the northeastern United States, where there are a lot of industries and cars.

Causes of acid rain

"Acid rain is caused by human activity"

Acid rain is a uniquely human-related phenomenon. The burning of fossil fuels (coal and oil) by power-production companies and industries releases sulfur into the air that combines with oxygen to form sulfur dioxide (SO_2). Exhausts from cars cause the formation of nitrogen oxides in the air. From these gases, airborne sulfuric acid (H_2SO_4) and nitric acid (HNO_3) can be formed and be dissolved in the water vapor in the air. Although acid-rain gases may originate in urban areas, it is often carried for hundreds of miles in the atmosphere by winds into rural areas. That is why forests and lakes in the countryside can be harmed by acid rain that originates in cities.



Credit: Tennessee Valley Authority (TVA)

Effects of acid rain



Acid-rain damage, Stamba Poremba, Poland
Credit: C. Martin, The Environmental Picture Library

The environment can generally adapt to a certain amount of acid rain. Often soil is slightly (due to naturally occurring limestone, which has a pH of greater than 7). Because bases counteract acids, these soils tend to balance out some of the acid rain's acidity. But in areas, such as some of the Rocky Mountains and parts of the northwestern and southeastern United States, where limestone does not naturally occur in the soil, acid rain can harm the environment.

Some fish and animals, such as frogs, have a hard time adapting to and reproducing in an acidic environment. Many plants, such as evergreen trees, are damaged by acid rain and acid fog. I've seen some of the acid-rain damage to the evergreen forests in the Black Forest of Germany. Much of the Black Forest was indeed black because so much of the green pine needles had been destroyed, leaving only the black trunks and limbs! You also might notice how acid rain has eaten away the stone in some cities' buildings and stone artwork.

Geographic distribution of acid rain

Acidity in rain is measured by collecting samples of rain and measuring its pH. To find the distribution of rain acidity, weather conditions are monitored and rain samples are collected at sites all over the country. The areas of greatest acidity (lowest pH values) are located in the Northeastern United States. This pattern of high acidity is caused by the large number of cities, the dense population, and the concentration of power and industrial plants in the Northeast. In addition, the prevailing wind direction brings storms and pollution to the Northeast from the Midwest, and dust from the soil and rocks in the Northeastern United States is less likely to neutralize acidity in the rain.

Acid rain and stone

When you hear or read in the media about the effects of acid rain, you are usually told about the lakes, fish, and trees in New England and Canada. However, we are becoming aware of an additional concern: many of our historic buildings and monuments are located in the areas of highest acidity. In Europe, where buildings are much older and pollution levels have been ten times greater than in the United States, there is a growing awareness that pollution and acid rain are accelerating the deterioration of buildings and monuments.

Stone weathers (deteriorates) as part of the normal geologic cycle through natural chemical, physical, and biological processes when it is exposed to the environment. This weathering process, over hundreds of millions of years, turned the Appalachian Mountains from towering peaks as high as the Rockies to the rounded knobs we see today. Our concern is that air pollution, particularly in urban areas, may be accelerating the normal, natural rate of stone deterioration, so that we may prematurely lose buildings and sculptures of historic or cultural value.

☞ By the way, no, you don't need to start wearing a rainhat.

Task 3. Complete the sentences according to the text.

1. Acid rain is not pure acid falling from the sky...
2. Exhausts from cars cause...
3. That is why forests and lakes in the countryside...
4. Some fish and animals, such as frogs, have...
5. To find the distribution of rain acidity...
6. There is a growing awareness that pollution and acid rain...

Task 4. Decide whether the statements are true or false.

1. Pure water has a pH of 9, and, generally, rainfall is somewhat on the acidic side.
2. Acid rain is not a uniquely human-related phenomenon.
3. In parts of the northwestern and southeastern United States, where limestone naturally occurs in the soil, acid rain cannot harm the environment.
4. The areas of greatest acidity are located in the Northeastern United States.
5. Many of our historic buildings and monuments are located in the areas of highest acidity.
6. We may lose buildings and sculptures of historic or cultural value.

Task 5. Match the words with their definitions.

- | | |
|------------------|--|
| 1. acid | a. to spread smth; |
| 2. to exhaust | b. smoke or cloud that is difficult to see through; |
| 3. to distribute | c. a process that starts to happen more quickly; |
| 4. to monitor | d. a type of liquid chemical substance that can burn holes in the things it touches; |
| 5. environment | e. a large amount of smth in the same place; |
| 6. harm | f. the waste gas that is produced when a machine is working; |
| 7. to damage | g. to have a bad effect on smth; |

- | | |
|-------------------|--|
| 8. dense | h. to watch smth carefully for a period of time to see how it changes; |
| 9. concentration | i. damage or hurt; |
| 10. to accelerate | j. the conditions in which you live and work, that effect your life |

Task 6. Answer the questions.

1. What is acid rain caused by?
2. What areas can be harmed mostly by acid rain?
3. Can the environment adapt to a certain amount of acid rain?
4. What damage was done to the evergreen forests in the Black Forest of Germany?
5. Where are the areas of greatest acidity located?
6. It is interested to know if stone deteriorates when it is exposed to the environment?

Text 3

Task 1. Match the following English words with their Russian equivalents. Remember their meaning.

- | | |
|------------------|---------------------|
| 1. ground water | a. поглощение |
| 2. to coagulate | b. сырая вода |
| 3. sedimentation | c. грунтовая вода |
| 4. fluctuation | d. очистить |
| 5. to aerate | e. сгустить |
| 6. absorption | f. колебание |
| 7. bacteria | g. бактерии |
| 8. treatment | h. обработка |
| 9. to purify | i. отложение осадка |
| 10. raw water | j. проветрить |

Task 2. Read the text.

PURIFICATION OF WATER

The problem of protecting natural water resources has grown very pressing for many countries since the beginning of the second half of the 20th century. The development of human society, the growth of civilization and social and technical progress has resulted in the changing of the composition of natural water resources. The rivers, lakes and ground waters contain today a considerable amount of the products of mechanical, chemical and biological pollution.

Water taken from its natural source – the ground lakes or rivers – contains many objectionable elements. It may possess gases of an obnoxious nature, bacteria, mineral elements, mud, and suspended vegetable growths which render it unpalatable. Some of this objectionable materials may be eliminated readily, other require complex treatment. Untreated water contains a number of contaminants of natural and man-made origin, the presence of which in drinking water, is undesirable or dangerous. All identified contaminants are typically divided into the following types: suspended solids, heavy metal ions, dissolved organic matter, microorganisms, and phytoplankton / zooplankton.

The process of purification generally employed in making water safe for water supply include coagulation, filtration and disinfection. Water from some sources must be treated also for the removal of colour, taste and odor. Coagulation is commonly effected by adding to the water a salt of aluminium (usually aluminium sulphate) or ferric iron. A precipitate forms and causes a clumping of the bacteria and other foreign particles which then settle out during the several hours of sedimentation; in this way 85% or more of the bacteria and suspended particles can be removed. Some of the mineral elements, such as certain forms of iron, are removed by this

means. The suspended materials require a coagulation and settling process, and bacteria are eliminated with the addition of chemicals and sand filtration. The mineral elements which render the water hard must be separated by a chemical process in which the objectionable element is replaced by one that is favourable. Removal of heavy metals from raw water is carried out by the active absorption centers on the top surface of the titanium coagulant. The effectiveness of removing heavy metals is dependent upon their concentration in the untreated water, ionic charge, and ionic radius. Using this coagulant, the iron content is 35 times lower, chrome - 10 times lower, copper - 15 times lower, and silicon - 5 times lower. With the application of a special brand of titanium coagulant, the concentration of arsenic in treated water is lowered by a factor of 100. Depending on the composition of the source water, the amount of the titanium coagulant required is 2-3 times less than the amount of traditionally used aluminum coagulants. Traditional coagulants purify water of not more than 60% of organic compounds, which are for the most part ionic organic compounds.

The unique capability of the titanium coagulant is its ability to deeply purify water of organic compounds. This is related to the active adsorptive centers, formed on the outer surface during the coagulation of the flocs, which sorb ionic organic compounds, and the large number of micropores which is able to bind nonionic organic compounds.

The removal of organic compounds from raw water by using the titanic coagulant increases up to 90% as compared to sulfate aluminum (60-80%), which requires a dose that is 2-3 times higher. This is confirmed by observations of a seasonal water source content fluctuation.

The obnoxious gases are removed by aerating the water. Activated carbon is sometimes added before sedimentation to remove tastes and odors.

In the process of filtration the water is allowed to pass through layers of fine sand to remove remaining germs and particles. Chlorine is commonly used to destroy harmful bacteria persisting in a municipal water supply after the other treatments. Chlorine dioxide has more recently been found effective as a destroyer of bacteria as well as a means of removing unwanted tastes and odors. Other means of destroying germs include the use of ozone and of ultraviolet light. Some water suppliers are aerated, i.e., exposed to the action of air and sunlight either through sprays or by running over coarse gravel; taste and odor are improved and some germs are destroyed. A filtration plant may use one or a combination of all these processes, the water undergoing a complete change as it passes through the plant.

Task 3. Mark the statements as true or false. Correct the false statements.

1. The development of human society, the growth of civilization and social and technical progress has not resulted in the changing of the composition of natural water resources.
2. Water taken from its natural source contains many objectionable elements.
3. The process of purification generally employed in making water safe for water supply includes coagulation and filtration.
4. Coagulation is commonly effected by adding to the water a salt of aluminium.
5. Traditional coagulants purify water of not more than 95% of organic compounds, which are for the most part ionic organic compounds.
6. A filtration plant may use one or a combination of all the processes, the water undergoing a complete change as it passes through the plant.

Task 4. Arrange the following statements according to the contents of the text.

1. All identified contaminants are typically divided into the following types: suspended solids, heavy metal ions, dissolved organic matter, microorganisms, and phytoplankton / zooplankton.
2. The suspended materials require coagulation and settling process, and bacteria are eliminated with the addition of chemicals and sand filtration.

3. The obnoxious gases are removed by aerating the water.
4. The unique capability of the titanium coagulant is its ability to deeply purify water of organic compounds.
5. Untreated water contains a number of contaminants of natural and man-made origin, the presence of which in drinking water is undesirable or dangerous.
6. The effectiveness of removing heavy metals is dependent upon their concentration in the untreated water, ionic charge, and ionic radius.

Task 5. Match the words and their definitions.

- | | |
|-------------------|---|
| 1. to eliminate | a. smth that a country, a person, etc has which they can use; |
| 2. purification | b. removal of dirt or unwanted parts from smth; |
| 3. objectionable | c. a very small living thing that can make you ill; |
| 4. germ | d. to make smth happen suddenly; |
| 5. to contaminate | e. smth unpleasant; |
| 6. obnoxious | f. to completely get rid of smth; |
| 7. sediment | g. small pieces of a solid substance that form a layer at the bottom of a liquid; |
| 8. odor | h. to make smth dirty or dangerous by adding smth such as chemicals to it; |
| 9. to precipitate | i. extremely unpleasant or rude; |
| 10. resource | j. a smell, especially an unpleasant one |

Task 6. Answer the questions.

1. Why has the problem of protecting natural water resources grown very pressing for many countries since the beginning of the second half of the 20th century?
2. What kind of the products of pollution do natural sources of water contain?
3. What is the essence of the process of purification?
4. What is the unique capability of the titanium coagulant?
5. In what way are the obnoxious gases removed?
6. May a filtration plant use one or a combination of all the processes of purification?

UNIT 5 WATER SUPPLY

Text 1

Task 1. Read the following international words and find their Russian equivalents.

atmosphere, proportion, phenomenon, reservoir, depression, to classify, gravel, sanitary, standard, modern, location, protection, mineral, resources, flora

Task 2. Read the text. Define its main idea.

Water Supply

Water is an important part of nature which surrounds us and of those natural conditions we are changing constantly and ever more intensively: the flora, the soil, the mountains, mineral resources, the deserts, the marshes, the steppes and the taiga.

Water passes through a very interesting natural cycle. The atmosphere which surrounds the earth's surface contains water which varies in amount in direct proportion to the temperature of its gases. Water is also evaporated into atmosphere. Atmosphere which has become saturated with water precipitates its moisture when the temperature lowers. This phenomenon is termed rainfall. The moisture falls to the earth and finds its way into a number of reservoirs provided by nature.

Vast depressions in the earth are filled with water through the medium of natural water

sources such as rivers, lakes, etc. over the earth's surface. These bodies of water are classified as inland lakes and are excellent sources of water.

Sometimes the rainfall finds its way into the soil and forms water bodies at various levels because of the impervious nature of the under soil. Often a water body deep in the soil consists of a sand or gravel stratum which connects or empties into the basin of an inland lake and provides a splendid source of water supply through the medium of a drilled well.

Man uses water for domestic and sanitary purposes and returns it to the source through sewage disposal system. Industry likewise replaces water diverted to its use. Hence the cycle is completed but it is of prime importance that the supply be protected against pollution, for if it fouls no one can predict how disastrous may be the results.

An adequate supply of pure, wholesome and palatable water is essential to the maintenance of high standards of health and to provide the convenience modern society demands. In some localities water is available in unlimited quantities and converting it to use is not a difficult problem. This is especially true of towns situated on large inland lakes or rivers. On the other hand there are cities where geographical location requires elaborate systems of water supply, and to provide a satisfactory supply of water in these localities becomes a large engineering task.

The importance of a sufficient supply of water for domestic and industrial purpose has long been a deciding factor in the location of cities. The earliest settlers realized this need and took advantage of natural water sources by establishing colonies in close proximity to them.

Water may be taken from any sources of water for human consumption after it has undergone a preliminary treatment to assure its purity. As man's communities grew in population, the demand for water increased and the need for protection of the source of water supply against the possibility of contamination became evident. Progress and civilization have called for elaborate and various systems and methods of water treatment.

Task 3. Find Russian equivalents of the given English words and word combinations.

natural water sources	1. обработка воды
body of water	2. загрязнение
inland lake	3. при помощи, посредством
water supply	4. материковые озера
water treatment	5. естественные источники воды
purity	6. загрязнять (ся)
contamination	7. водный массив
sewage disposal system	8. водоснабжение
pollution	9. подпочва
through the medium	10. загрязнение (заражение)
undersoil	11. потребление
consumption	12. беспримесность
moisture	13. влага
to foul	14. система удаления сточных вод

Task 4. Give the Russian equivalent with the same root to each of the following.

<i>Example:</i>	reservoir — водоем (резервуар)
	natural — естественный
	adequate — достаточный
	unlimited — неограниченный
	colony — население
	protection — защита
	progress — развитие

Task 5.

a) Define which of the following words are nouns and which ones are adjectives.

rainfall, natural, undersoil, gravel, disposal, palatable, essential, available, geographical, industrial, communal

b) Form nouns from the following verbs, using suffixes "tion", "ion". Translate them.

to locate, to distribute, to saturate, to classify, to connect, to complete, to pollute, to situate, to consume, to populate, to contaminate, to create

Task 6. Translate the sentences, paying attention to the words in bold type.

1. This is especially true of towns **situated** on large inland rivers and lakes. 2. The earlier colonies were usually **situated** near natural water sources. 3. An adequate supply of water is essential to satisfy modern society **demands**. 4. To maintain high standards of health modern society **demands** an adequate **supply** of water. 5. Natural water sources can wholly **supply** the need for water in this town. 6. The term "**well**" may not mean a dug or sunk **well** but a service pool **adopted** as a communal or regular water supply. 7. This kind of water distribution system cannot be **adopted** in this locality. 8. The possibility of contamination **became** evident for the community grew in population and the demand **for** water increased. 9. Industry replaces water **diverted** to its use. 10. The attention was **diverted** from this problem.

Task 7. Choose the right continuation of the following sentences.

1. An adequate supply of pure wholesome and palatable water...

- a) ...is especially true of towns situated on large inland lakes or rivers. b) ...is essential for the maintenance of high standards of health. c) ...may be taken from any source of water. d) ...should be protected from contamination by filtration.

2. There are cities whose geographical location...

- a) ...makes water pass through a very interesting cycle of treatment. b) ...requires elaborate systems of water supply. c) ...makes the problem of water supply very difficult. d) ...calls for modern systems of water treatment.

3. The earliest settlers took advantage of natural water sources by...

- a) ...building water power stations on them. b) ...establishing their colonies near them. c) ...providing sufficient water supply for their needs. d) ...using water without much preliminary treatment.

4. Due to man's vast activities at the present time...

- a) ...various systems and methods of water treatment are required. b) ...water must be obtained in unlimited quantities. c) ...many inland lakes cannot be used as sources of water supply. d) ...splendid sources of water supply are drilled wells.

Task 8. Find the sentence which expresses the main idea of the text.

1. On the earth water can be obtained from different natural sources.
2. At present the problems of water supply and treatment are the most essential for mankind.
3. Water taken from natural sources such as rivers and lakes often requires aeration.

Task 9. Put the following sentences in chronological order.

1. An adequate supply of water is one of the main requirements for maintaining high standards of health. 2. Vast depressions in the earth filled with water and known as inland lakes are excellent sources of water. 3. The rivers and lakes contain a great amount of chemical and biological pollution. 4. Nowadays the problem of water treatment has become very urgent. 5. On the earth water passes through a very interesting physical cycle. 6. Water bodies deep in

the soil are excellent sources of water. 7. Man after using water returns it to the source by means of sewerage systems; thus the cycle is completed. 8. Water is an important part of nature. 9. Man's earliest settlements were always close to natural water sources.

Task 10. Answer the following questions, using not less than three statements.

1. Why were man's earliest communities established close to natural water sources?
2. Why must natural water undergo treatment before consumption?

Task 11. Make up a plan of the text for retelling.

Task 12. Read the following text for a minute and give the answer to the following question.

Why is a treatment plant required in a water-supply system?

Elements of a Water-Supply System

A water-supply system consists essentially of the following parts: a source of supply, which may be a lake, stream, spring, or well; a reservoir for storing water for use during periods when demand is greater than the daily flow of water; conveying the water from the source of supply to the community is accomplished by means of a pipe line or a conduit; removing impurities from the water to make it suitable for use requires a treatment plant; and a distribution system of pipes is used for delivering the water throughout the various streets of the community.

Some systems are simpler and consist only of a source of supply, a main pipe-line, and a small amount of distribution piping; others are more complicated and include, in addition to the elements previously listed, distribution reservoirs, pumping plants, and other accessories.

Text 2

Task 1. Try to guess the meaning of the international words, define their part of speech and make up your own word combinations with them.

business	department
diameter	engineering
gravity	to oppose
organization	population
pressure	private
public	to reduce
reservoir	resident
system	vital

Task 2. Match the words with their Russian equivalents. Remember their meaning.

- | | |
|-----------------|---------------------|
| 1. to exist | a) домашний |
| 2. to withdraw | b) хранить |
| 3. to store | c) забирать |
| 4. domestic | d) скапать |
| 5. tremendous | e) доступный |
| 6. to cover | f) сельский |
| 7. to dig (dug) | g) высота |
| 8. rural | h) доставить |
| 9. amount | i) хранение |
| 10. to fetch | j) пещерный человек |
| 11. to deliver | k) создавать |
| 12. to create | l) труба |
| 13. friction | m) опокрывать |

- | | |
|----------------|----------------------|
| 14. available | n) огромный |
| 15. altitude | o) существовать |
| 16. pipe | p) трение |
| 17. purpose | q) противопоставлять |
| 18. to supply | r) большинство |
| 19. caveman | s) принести, достать |
| 20. facilities | t) обеспечивать |
| 21. urban | u) количество |
| 22. to provide | v) цель |
| 23. exchange | w) снабжать |
| 24. to oppose | x) городской |
| 25. storage | y) услуги |
| 26. majority | z) обмен |

Public-supply Water



Fairmount Water Works (1815–1911), Philadelphia, Pa.
(Photo courtesy of Philadelphia Water Department.)

Of course, some of the most important uses for water are at our homes. Domestic water use is water used for indoor and outdoor household purposes – all the things you do at home: drinking, preparing food, bathing, washing clothes and dishes, brushing your teeth, watering the yard and garden, and even washing the dog. Domestic water use just covers self-supplied domestic water withdrawals – those people and organizations that use their own wells to supply their water, as opposed to public-supplied water.

Water generally gets to our homes in one of two ways. Either it is delivered by a city water department or people supply their own water, normally from a well. Water delivered to homes is called “public-supplied” and water that people supply themselves is called “self supplied”. People who supply their own water almost always use ground.

No doubt the first public-supply water system was when Jack the Caveman was hired by his neighbours to fetch a bucket of water from the Dinosaur River in exchange for some delicious prehistoric bran muffins. Organized systems still exist all over the world. Their aim is to get water, clean it and deliver it to local residents.

Public water-supply systems, which you might know better as the city water departments, are vitally important to all populations. These are government or privately-run facilities that withdraw water from rivers, lakes, reservoirs, and wells and then deliver it to our homes, businesses, and schools. The majority of the population (about 84 percent) of Europe nowadays gets their water in this manner. You probably get your home drinking water this way. When the population was a lot more rural, people used to have to dig their own wells and create storage tanks for their water supply. But with the majority of urban (living in big cities) people the public-supply systems do that work for us. All we do is turn on the tap and pay the bills!

So just how does your city supply water to you? A great deal of engineering goes into supplying our water needs. Cities have to have a means of storing a tremendous amount of water so it is available when we need it. Probably, somewhere near you (at a higher altitude), a river was dammed to form a reservoir. These reservoirs can be very large or they may cover just a few acres. Sometimes a well is dug to supply ground water to the storage reservoir. Closer to your home might be a water tower, which will always be built on high ground.

But no matter where your water comes from, simple gravity is used to get it into your drinking glass at home. Water flows through water pipes from the reservoir or tank to your home. The pipes start out large and get smaller (about 1-inch) by the time they get to your house. Gravity provides water pressure to send water on its way to you. The water pressure must be strong enough to sometimes go uphill to get to your house, and as the water flows in the pipes, friction between the water and the pipe walls reduces the water pressure. Water pressure is kept up by gradually reducing the diameter of the pipe.

Task 3. Form...

a) nouns from the following verbs using appropriate suffixes;

to deliver, to create, to store, to exist, to prepare, to withdraw, to provide

b) verbs from following nouns.

pressure, organization, exchange, population, government, facility, reservoir, reduction, coverage

Task 4. Find the antonyms in the text.

indoor, self-supplied, rural, withdraw

Task 5. Change the words in brackets to suit the sentence.

1. Jack the Caveman ... by his neighbours to fetch a bucket of water from the Dinosaur River ... some delicious prehistoric bran muffins. (hire; exchange)
2. Water that people supply themselves ... "self supplied". (to call)
3. When the population was a lot ... rural, people ... to have to dig their own wells. (much; to use)
4. Probably, somewhere near you at a ... altitude a river ... to form a reservoir. (high; to dam)
5. Water pressure ... by ... reducing the diameter of the pipe. (to keep up; gradual)

Task 6. Make up your own sentences using the following words and word combinations.

domestic water withdrawals	to supply with
to exist all over the world	in exchange for
to withdraw water from	to turn on the tap
in this manner	rural people used to
drinking water	

Task 7. Give the answers to the questions.

1. What is domestic water use?
2. What are the two ways in which water gets to our homes?
3. What is the aim of any water-supply system?
4. Does public or self-supplied water occur more often in the world?
5. What do public water-supply organizations withdraw water from?
6. How did rural population supply themselves with water?
7. Why do cities need a means of storing water?
8. What is the role of gravity in delivering water to your house?
9. How is water pressure kept up in the system?

Task 8. Agree or disagree to the following statements. In your answers use the following conversational formulas of agreement and disagreement:

That's right;

It's true;

What you say is absolutely correct;

I fully agree with you;

I'm afraid you are not right;

Sorry but you are mistaken, etc.

1. The most important uses for water are at our homes.
2. Domestic water use just covers self-supplied domestic water withdrawals.
3. When the population was a lot more rural, people couldn't store water for their domestic use.
4. With the public-supply systems we just turn off the tap and pay the bills.
5. A great deal of engineering is involved in supplying our water needs.
6. In cities water must be available when we need it.
7. As the water flows in the pipes, friction between the water and the pipe walls increases the water pressure.

Task 9. Develop the idea.

1. Domestic water use is water used for indoor and outdoor household purposes.
2. Water generally gets to our homes in one of two ways.
3. Public water-supply systems are vitally important to all populations.
4. Our city is supplied with water from the reservoir.
5. Water flows through water pipes from the reservoir to our homes thanks to gravity.

Task 10. Make up a plan of the article and retell it according to your plan.

Text 3

Task 1. Find the Russian equivalents of the given English words and word combinations.

project	1. компания
impracticable	2. фонтан
campaign	3. общественный
prototype	4. проект
fountain	5. кампания
public	6. декрет
primitive	7. регулярный
alternate	8. переменный (через день)
to train	9. тренировать (ся)
civilized	10. примитивный
regular	11. неосуществимый
decree	12. цивилизованный
company	13. бак
tank	14. цистерна
cistern	15. прототип

Task 2. Read the text. Find the paragraphs which describe water supply problems in different countries.

From the History of Water Supply

Water is power not only in the hydraulic sense, but in relation to progress and culture; campaigns as well as fortresses have been lost, projects rendered impracticable and communities have decayed for want of water.

Nature has provided prototypes for most of man's devices and, just as the streams and rivers anticipated water distribution systems, so tanks, cisterns and reservoirs have their natural counterparts in water-holes and natural pools.

Long after man had found ways and means to organize water supplies, find them where they were hidden and lead them to where he wanted them, streams and pools in their natural state have served as communal water supplies, even in more or less civilized Europe.

Many of the so-called "wells" of medieval Britain, for example, were untouched pools or gushing springs. The same applies of course to a great many "wells of the East" and in old writings the term "well" may not mean a dug well at all but a surface pool adopted as a communal or regular water supply.

The history of conduits or public fountains as communal water supplies starts at least as far back as the 13th century. In the "conduit age" — the centuries immediately following the Middle Ages a water carrier was a common sight.

The 17th century marks the beginning of the new order in communal organization and in relation to water supply, the beginning of large-scale schemes.

All through London's history until modern times, the question of water supply continued to be a problem. In the 18th century even with the appearance of larger water companies the water supply was far from being satisfactory.

At York, before the formation of the present water company in 1846 one half of the city was supplied for 2 hours on Mondays, Wednesdays and Fridays and the other half on Tuesdays, Thursdays and Saturdays, no supply being given on Sundays.

Water drawn from the river Thames was in a state that was offensive to the sight as the intake was found to be only three yards from the outlet of a great sewer. As a matter of fact it took 2 outbreaks of cholera to pass a Bill for an improved water supply in the middle of the 19th century.

In spite of the progress made in the field of water supply in many countries, there is much to be done yet. In Asia, Africa, Central and South America outside the great cities, methods are primitive as ever they were; village ponds are still used in Africa and Asia for drinking, washing and bathing and as watering places for cattle, in Madagascar in recent years people have had to carry their water bottles several miles and, as some of them can only do the journey twice a week, they have trained themselves to do with the minimum of water, drinking only on alternate days and never washing during a drought.

In Japan, running water is still a luxury, even in the great cities: the average households have to carry water from a central source, while the villages rely on springs and streams.

The speedy industrialization of our country has also made the problem of water very acute.

The requirements of water supply in Minsk both for the people and industry are fully met by some water treatment stations. In our capital water consumption per capita is very high, namely, it is more than 500 liters per day.

Some projects of new water treatment stations are being considered to satisfy the growing needs of water in our capital.

Task 3. Choose the correct Russian translation of the given English words and word combinations.

water distribution system
counterpart
water hole
medieval
gushing spring
surface pool
conduit

1. поверхностный водоем
2. средневековый
3. бьющий, фонтанирующий источник
4. трубопровод
5. водопровод
6. водопроводная система
7. водоснабжение

public fountains
intake
outlet
running water

8. водозабор
9. сток, вытекание
10. общественные колодцы
11. прототип, дубликат

Task 4. Choose the right continuation of the following sentences.

1. Water is a great power not only in the hydraulic sense...
 - a) ...because in many countries the problem of water supply is very acute.
 - b) ...because the changing of the composition of natural water resources is the result of the development of human society.
 - c) ...because water is one of the main factors in the life of community.
 - d) ...because highly industrialized countries suffer from the contamination of water.
2. Long after man had found means to organize water supplies...
 - a) ...in many countries there is much to be done in the field of water supply.
 - b) ...we are now used to constant water supply.
 - c) ...rivers, streams and pools in their natural state served as communal water supplies.
 - d) ...he used water for domestic and sanitary purposes.
3. In Minsk the requirements of water supply are fully met, so...
 - a) ...some important measures were adopted to ensure its quality.
 - b) ...it was necessary to design some new large-scale projects.
 - c) ...the water consumption per capita is very high.
 - d) ...industrialization is the main source of water contamination.

Task 5. Find out which of the following statements reveal the main contents of the text and which sentences reflect its details.

1. Water is one of the main factors in man's life. 2. Man copied nature when constructing water reservoirs and water distribution systems. 3. Many of the so-called "wells" of medieval Britain were gushing springs. 4. In 1846 at York one half of the city was supplied with water only for 2 hours per day. 5. In many countries of Asia, Africa and Central and South America the methods of water supply are very primitive. 6. The intake of the water drawn from the river Thames was only three yards from the outlet of a great sewer. 7. The fast development of industry in our country has made the problem of water supply very acute. 8. Our state pays great attention to the preservation of natural water sources.

Task 6. Put all the sentences in chronological order.

1. People began to build large-scale water projects only in the 17th century. 2. Water is one of the most important factors for the existence of a community. 3. In many parts of the Earth people suffer from insufficient supply of pure wholesome water. 4. Man's devices for water storage and distribution have their prototypes in nature. 5. Water taken from its natural sources - ground lakes or rivers - contains many harmful elements. 6. In the 18th and 19th centuries the problem of water supply in the Metropolis of Great Britain was still very acute and the great city was constantly suffering from the shortage of water supply. 7. Present day water consumers are used to constant water supply.

7. Make up a plan of the text for retelling.

UNIT 6 SEWERAGE

Text 1

Task 1. Read the following international words and find their Russian equivalents.

to result, residence, institution, products, operation, decomposition, production, to manufacture, combination, combined, process, method, sanitary, paste, disinfection, bacteria, chemicals

Task 2. Read the text. Define its main problems.

Sewerage

The problem of protecting natural water resources has grown very pressing for many countries since the beginning of the second half of the 20th century. The development of human society, the growth of civilization and social and technical progress has resulted in the changing of the composition of natural water resources. The rivers, lakes and ground waters contain today a considerable amount of the products of mechanical, chemical and biological pollution.

The waste products that result from the daily activities in a community are of two general types: namely, the liquid waste, known as sewage and the solid wastes, known as refuse. The different wastes of which sewage is composed are the following: the wastes from lavatories, baths, sinks, and laundry tanks in residences, institutions, and business buildings; certain liquid wastes from various types of manufacturing or industrial plants, and, in many communities, the surface run-off that results from storms or street-flushing operations.

Sewage may also be divided according to its source into the following three classes. The sewage from residences, institutions and business buildings is called domestic sewage, sanitary sewage or house sewage; that resulting from manufacturing or industrial processes is known as industrial waste; and that from run-off during or immediately following storms is called storm sewage. A combination of domestic sewage, industrial waste and storm water is called combined sewage.

Both sewage and refuse must be removed promptly in order to avoid endangering the health of the community and also prevent decomposition of the materials of animal or vegetable origin and the subsequent production of nuisances and odorous.

The removal of all kinds of sewage is usually accomplished by means of sewers. The sewers are placed in the streets at several feet below the ground surface. The general process of removing sewage is designated as sewerage and the entire system of sewers including a sewage treatment plant is known as a sewerage system.

The method of sewage treatment to be adopted in a particular case will depend almost entirely on local conditions. It may consist only of the discharge of the raw sewage into a stream or a large body of water. The usual methods of sewage treatment consist either of preliminary treatment alone or of primary treatment followed by secondary treatment.

During primary treatment the larger and heavier solid particles settle out from the liquid. These solid particles that settle out form a slimy paste which is known as sludge.

The partly clarified sewage that has been given primary treatment generally contains much decomposable materials. Therefore, further treatment which is known as secondary treatment is usually required.

An auxiliary treatment which may be used with either primary or secondary treatment is disinfection or the killing of the most of the bacteria in the sewage by means of chemicals.

Task 3. Find the Russian equivalents of the given English words and word combinations.

waste products	1. осветленный
refuse	2. канализационная труба (коллектор)
domestic sewage	3. первичная обработка
industrial waste	4. промышленные сточные воды
sewer	5. канализация (процесс удаления)
sewerage	6. водоочистное сооружение (станция)
treatment plant	7. отстой, ил, осадок
discharge	8. твердые отбросы
sludge	9. сток
decomposable	10. химикалии
primary treatment	11. способный к разложению

chemicals
pollution
water body
clarified
sewage

12. загрязнение
13. водоем, водный массив
14. сточные воды
15. продукты отхода
16. бытовые сточные воды

Task 4. Give the Russian equivalent with the same root to each of the following.

Example: activity – деятельность (активность)

1. community - община
2. residence - жилье
3. storm - буря
4. sanitary - гигиенический
5. adopt - принимать, усваивать
6. local - местный
7. conditions - условия
8. composition - состав
9. disinfection - обеззараживание

Task 5 Form nouns from the following verbs using suffixes "tion" or "ment".

to produce, to treat, to decompose, to combine, to accomplish, to adopt, to settle, to disinfect

Task 6. Translate the sentences paying attention to the words in bold type.

1. The waste products **that** result from the daily activities in a community are of two general types. 2. The sewage from residences is called domestic sewage, **that** from industrial processes industrial waste. 3. Sanitary conditions in the capital are much better than **those** in other cities of the country. 4. It is known **that** the method of sewage treatment depends on local conditions. 5. Hamburg was the first city **that** had a complete systematic sewerage system. 6. How far **that** was in advance in the rest of the world may be understood from the fact **that** there are no real advances in new principles from **that** time up to the present day.

Task 7. Put the following sentences in chronological order.

1. Both sewage and refuse must be removed promptly in order to avoid endangering the health of the people.
2. The sewage may pass through some type of a settling tank with or without the application of different chemicals.
3. The methods of sewage treatment are different and depend wholly on local conditions.
4. Secondary treatment is required to remove decomposable materials from the sewage.
5. Sewage is composed of different types of wastes which result from the daily activities of a community.
6. Sewage may also be classified according to its source.
7. The removal of sewage is done by sewers which are a part of a sewerage system.
8. The killing of bacteria is accomplished by means of chemicals.
9. Heavier particles settle out from the liquid during primary treatment.

Task 8. Choose the correct answer to the following question.

Why must sewage undergo secondary treatment?

- a) ...because sewage and refuse products result from daily activities of a community,
- b) ...because primary treatment is not sufficient as the sewage still contains much decomposable material,
- c) ...because chemicals help to kill the bacteria in the sewage,
- d) ...because the health of the community is in great danger.

d) ...that there were hundreds or even thousands of houses which were connected by great underground drains.

2. The sewers in adjoining parishes were of different elevation so...

a) ...sanitation was as little considered as the utilization of steam for power purposes.

b) ...a junction of them was impracticable.

c) ...the public recognition of the importance of good sewerage systems was growing.

d) ... there were hundreds of houses which had no drainage whatever.

3. After 2 outbreaks of cholera a royal commission was appointed...

a) ...to find new ways of water treatment.

b) ...to inquire into sanitary improvements for London.

c) ...to produce reports clearly showing the need for extensive sewerage works.

d) ...to make landlords connect their houses with sewers.

4. While London grew and became a great metropolis, the centre of the world's commerce, ...

a) ...it was impracticable to make an adequate survey as a basis for planning sewers.

b) ...the connection between a contaminated water supply and the spreading of diseases was evident.

c) ...sanitation was as little considered as magnetism or the use of steam for power purposes.

d) ... it was only a central authority that could make a systematic study of sewerage work possible.

5. Nowadays the problem of good sanitation is closely connected with that of protecting the purity of natural water reservoirs...

a) ...since the chemical industry causes the worst pollution.

b) ...since highly industrialized countries suffer greatly from water contamination.

c) ...since the same body of water serves both as a source of water and recipient of sewage and storm drainage.

d) ...since public health depends greatly on good sewerage.

Task 5. Put the following sentences in chronological order.

1. Progress in sanitation in London did not keep pace with the growth and development of the city.

2. Man built sewers in ancient times.

3. The first steps to study sanitary conditions in London were made in the first half of the 19th century.

4. Public health depends to a large extent on good sanitary conditions in a community.

5. Rapid industrialization calls for new, more elaborate water treatment methods.

6. The problem of good sanitation and that of protecting the purity of natural water reservoirs are mutually dependent.

7. Progress in sanitation in the European continent started only as late as the second half of the 19th century.

8. Industry causes the worst water pollution.

9. Today rivers, lakes and ground water contain considerable amounts of the products of mechanical, chemical and biological pollution.

10. Both sewage and refuse must be removed promptly.

11. The lack of an adequate survey of the capital made planning and execution of sewerage work impossible.

Task 6. Define which of the following statements reveal the main contents of the text and which sentences reflect its details.

1. The progress of sanitation in London was typical for the largest cities of Great Britain and the United States.

2. There were hundreds of streets in London in the 19th century that had no sewers.

3. Much information is available about sewers built in ancient times.
4. Highly industrialized countries suffer greatly from the rapid rate of water contamination.
5. Hamburg had a sewerage system built according to modern ideas of convenience.
6. The sewers in adjoining parishes in London were of different elevation.
7. Great underground drains were built in ancient Rome.
8. An act of Parliament for better local management of the metropolis laid the basis for the sanitation of London.

Task 7. Make up a plan of the text for retelling.

UNIT 7 WASTEWATER TREATMENT

Text 1

Task 1. Before reading the text "Wastewater Treatment" make sure you know the following words. Make your own sentences using these words.

to aerate	наполнять свежим воздухом, вентилировать; газировать, сатурировать
aquatic	водяной, водный
to assume	допускать, предполагать
beach	берег
concern	забота, беспокойство
to contribute	содействовать, способствовать
dangerous	опасный, рискованный
to decay	гнить, разлагаться
to depend on	зависеть от
to discharge	выпускать, сливать, выливать
disease	болезнь
effluent	сброс, отток, отвод сточных вод (после очистки нечистот)
fishery	рыбная ловля, рыболовство, рыбные места
habitat	место распространения, ареал, естественная среда
to handle	обходиться, управляться, справляться с чем-л., выносить, выдерживать
harmful	вредный, пагубный, губительный
to involve	включать в себя, содержать, касаться, затрагивать
marsh	болото, топь
migratory	мигрирующий (о животных, растениях)
to cope with	справиться с
to overwhelm	губить, разорять, сокрушать, разбивать
oxygen	кислород
primary	первоначальный, первичный
priority	первенство, преимущество, приоритет
recreation	отдых, восстановление здоровья
to reduce	ослаблять, понижать, сокращать, уменьшать
to release	отпускать, выпускать
runoff	сток
sewage	сточные воды, нечистоты
share	доля, часть
shoreline	береговая линия
species	вид, род, порода
substance	вещество
suspended	solid взвешенные твердые частицы, твердая взвесь
to teem with	водиться, изобиливать (в каком-л. месте)

to treat
wastewater

обрабатывать
сбросная вода, сточные воды

Wastewater Treatment



We consider wastewater treatment as a water use because it is so interconnected with the other uses of water. Much of the water used by homes, industries, and businesses must be treated before it is released back to the environment. If the term "wastewater treatment" is confusing to you, you might think of it as "sewage treatment". Nature has an amazing ability to cope with small amounts of water wastes and pollution, but it would be overwhelmed if we didn't treat the billions of gallons of wastewater and sewage produced every day before releasing it back to the environment. Treatment plants reduce pollutants in wastewater to a level nature can handle.

Wastewater is used water. It includes substances such as human waste, food scraps, oils, soaps and chemicals. In houses, this includes water from sinks, showers, bathtubs, toilets, washing machines and dishwashers. Businesses and industries also contribute their share of used water that must be cleaned. Wastewater also includes storm runoff. Although some people assume that the rain that runs down the street during a storm is fairly clean, it isn't. Harmful substances that wash off roads, parking lots, and rooftops can harm our rivers and lakes.

Why treat wastewater?

It's a matter of caring for our environment and for our own health. There are a lot of good reasons why keeping our water clean is an important priority:



Fisheries

Clean water is critical to plants and animals that live in water. This is important to the fishing industry, sport fishing enthusiasts, and future generations.



Wildlife Habitats

Our rivers and ocean waters teem with life that depends on shoreline, beaches and marshes. They are critical habitats for hundreds of species of fish and other aquatic life. Migratory water birds use the areas for resting and feeding.



Recreation and Quality of Life

Water is a great playground for us all. The scenic and recreational values of our waters are the reasons many people choose to live where they do. Visitors are drawn to water activities such as swimming, fishing, boating and picnicking.



Health Concern

If it is not properly cleaned, water can carry dangerous diseases. Since we live, work and play so close to water, harmful bacteria have to be removed to make water safe.

The major aim of wastewater treatment is to remove as much of the suspended solids as possible before the remaining water, called effluent, is discharged back to the environment. As solid material decays, it uses up oxygen, which is needed by the plants and animals living in the water. "Primary treatment" removes about 60 percent of suspended solids from wastewater. This treatment also involves aerating (stirring up) the wastewater to put oxygen back in. Secondary treatment removes more than 90 percent of suspended solids.

Task 2. Find the following terms in the article. In which meaning are they used in the text?

- | | |
|--------------|------------------|
| to release | to discharge |
| to treat | to decay |
| to overwhelm | to aerate |
| to handle | suspended solids |
| to remove | critical |
| to care for | aquatic life |
| to reduce | to contribute |

Task 3. Match the synonyms.

- | | |
|---------------|--------------|
| 1. involve | a. dangerous |
| 2. discharge | b. withstand |
| 3. wastewater | c. sewage |
| 4. cope with | d. material |
| 5. reason | e. mean |
| 6. substance | f. release |
| 7. harmful | g. cause |

Task 4. Choose the correct preposition.

- Much of the water used by homes, industries, and businesses must be treated before it is released the environment.
(out of, back to; into)
- If the term "wastewater treatment" is confusing to you, you might think it as "sewage treatment."
(of; about; over)
- "Primary treatment" removes about 60 percent of suspended solids wastewater.
(away; out of; from)
- Visitors are drawn to water activities swimming, fishing, boating and picnicking.
(like; as; such as)
- houses, this includes water from sinks, showers, bathtubs, toilets, washing machines and dishwashers.
(at; in; within)
- It's a matter of caring our environment and our own health.
(for; of; about)

Task 5. Fill in the table. The first one is done as a model.

VERB	NOUN	ADJECTIVE/PARTICIPLE
<i>pollute</i>	<i>pollution</i>	<i>polluted</i>
	treatment	
interconnect		critical
		productive
recreate		
	danger	

Task 6. Mark the statements as true or false. Correct the false statements, using the following phrases:

To my mind ...

I'm not sure but...

Personally I suppose that...

1. The rain that runs down the street during a storm is fairly clean.
2. Clean water is critical to plants and animals that live in water.
3. "Primary treatment" involves aerating (stirring up) the wastewater, to put hydrogen back in.
4. Treatment plants produce pollutants in wastewater to a level nature can handle.
5. Wastewater includes substances such as human waste, food scraps, oils, soaps and chemicals.
6. Secondary treatment removes 100 percent of suspended solids.

Task 7. Look through each episode and choose a better answer.

1. The first episode speaks about...
 - a. wastewater treatment in Belarus;
 - b. an idea of wastewater treatment.
2. From the second episode we learn about...
 - a. possible sources of wastewater;
 - b. human use of water.
3. The next part shows...
 - a. the reasons for keeping water clean;
 - b. water use in wildlife.
4. The last passage deals with...
 - a. the process of wastewater treatment;
 - b. man's role in sewage treatment.

Task 8. Answer the following questions.

1. Can nature cope with water wastes without man's help?
2. What are the sources of wastewater?
3. How can runoff contribute to the water pollution?
4. Fish and water birds need clean water to live, don't they?
5. Why do many people choose water to live by?
6. How can dirty water be dangerous for man's health?
7. What is effluent water?
8. How do you understand the term "wastewater treatment"?

Task 9. Develop the idea. Use the information from the article and your own knowledge.

1. Nature has an amazing ability to cope with small amounts of water wastes and pollution, but ...
2. Wastewater is used water. It includes ...
3. There are a lot of good reasons why to keep our water clean.
4. Water is a great playground for us all.
5. If water is not properly cleaned, it can be dangerous.
6. The aim of wastewater treatment is ...

Task 10. Make up a dialogue on the following situations.

1. I wonder why it is necessary to treat wastewater.
2. Wastewater treatment is a concern of man not nature.

Text 2

Task 1. Before reading the text "A Visit to a Wastewater-treatment Plant" make sure you know the following words.

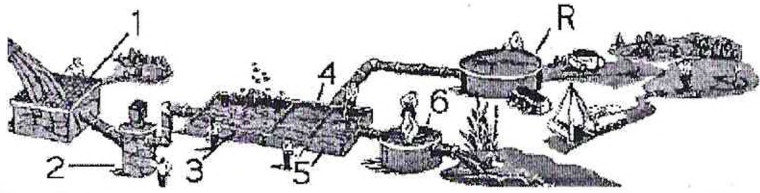
aeration tank	аэротанк
to cause	быть причиной, причинять, вызывать
concrete	бетон
to decay	гнить, разлагаться
to deal with	иметь дело с кем-л.
to digest	переваривать(ся), разлагать(ся), гнить, перегнивать
to dissolve	растворять(ся)
to eliminate	устранять, исключать, уничтожать, ликвидировать
to enclose	вкладывать
to expose	подвергать действию (радиации, солнца и т. п.)
facility	оборудование, приспособление
fertilizer	удобрение
to float	плавать, держаться на поверхности воды
to force	оказывать давление, заставлять,
to get rid of	освободиться, избавиться
grit	крупнозернистый песчаник
to include	заключать, включать в себя
item	отдельный предмет (в списке и т. п.)
landfill	закапывание мусора, мусорная свалка
to locate	располагать в определенном месте
matter	вещество; вопрос, дело
pollutant	загрязняющий агент
to pump	качать, выкачивать, закачивать
to rely on	надеяться, полагаться
to remain	оставаться
to remove	удалять, устранять
to replenish	наполнять(ся), пополнять(ся)
residual	остаток, остаточный продукт
to screen	экранировать, сортировать, тщательно отбирать
scum	пена (на поверхности какой-л. жидкости), отбросы, отходы
to settle out	отстаиваться, давать осадок, оседать
sludge	густая грязь, слякоть
surface	поверхность
treatment	обработка

Task 3. Read the text.

A Visit to a Wastewater-treatment Plant

Here's a step-by-step guide describing what happens at each stage of the treatment process and how pollutants are removed to help keep our waterways clean.

The Primary Treatment Process



1. Screening

Wastewater entering the treatment plant includes items like wood, rocks, and even dead animals. Unless they are removed, they could cause problems later in the treatment process. Most of these materials are sent to a landfill.

2. Pumping

The wastewater system relies on the force of gravity to move sewage from your home to the treatment plant. So wastewater-treatment plants are located on low ground, often near a river into which treated water can be released. If the plant is built above the ground level, the wastewater has to be pumped up to the aeration tanks (item 3). From here on, gravity takes over to move the wastewater through the treatment process.

3. Aerating

One of the first steps that a water treatment facility can do is to just shake up the sewage and expose it to air. This causes some of the dissolved gases (such as hydrogen sulfide, which smells like rotten eggs) that taste and smell bad to be released from the water. Wastewater enters a series of long, parallel concrete tanks. Each tank is divided into two sections. In the first section, air is pumped through the water. As organic matter decays, it uses up oxygen. Aeration replenishes the oxygen. Bubbling oxygen through the water also keeps the organic material suspended while it forces "grit" (coffee grounds, sand and other small, dense particles) to settle out. Grit is pumped out of the tanks and taken to landfills.

4. Removing Sludge

Wastewater then enters the second section or sedimentation tanks. Here, the sludge (the organic portion of the sewage) settles out of the wastewater and is pumped out of the tanks. Some of the water is removed in a step called thickening and then the sludge is processed in large tanks called digesters.

5. Removing Scum

As sludge is settling to the bottom of the sedimentation tanks, lighter materials are floating to the surface. This "scum" includes grease, oils, plastics, and soap. Slow-moving rakes skim the scum off the surface of the wastewater. Scum is thickened and pumped to the digesters along with the sludge. Many cities also use filtration in sewage treatment. After the solids are removed, the liquid sewage is filtered through a substance, usually sand, by the action of gravity. This method gets rid of almost all bacteria, reduces turbidity and colour, removes odours, reduces the amount of iron, and removes most other solid particles that remained in the water. Water is sometimes filtered through carbon particles, which removes organic particles. This method is used in some homes, too.

6. Killing Bacteria

Finally, the wastewater flows into a "chlorine contact" tank, where the chemical chlorine is added to kill bacteria, which could pose a health risk, just as is done in swimming pools. The chlorine is mostly eliminated as the bacteria are destroyed, but sometimes it must be neutralized by adding other chemicals. This protects fish and other marine organisms, which can be harmed by the smallest amounts of chlorine. The treated water (called effluent) is then discharged to a local river or the ocean.

R. Wastewater Residuals

Another part of treating wastewater is dealing with the solid-waste material. These solids are kept for 20 to 30 days in large, heated and enclosed tanks called "digesters". Here, bacteria break down (digest) the material, reducing its volume, odours, and getting rid of organisms that can cause disease. The finished product is mainly sent to landfills, but sometimes can be used as fertilizer.

Task 3. Find and translate the sentences with the English equivalents of the following Russian words.

Свалка, аэротанк, наполнять, вещество, оседать, крупнозернистый песчаник, разлагаться, отстойник, густая грязь (ил), обрабатывать, сгущение, автоклав, отходы на поверхности воды, всплывать на поверхность воды, «грабли», снимать с поверхности, избавлять, мутность воды, устранять, отвод сточных вод (после очистки нечистот), сливать, остаточный продукт

Task 4. Form nouns from the following verbs using appropriate suffixes.

to aerate, to digest, to fertilize, to filtrate, to sew, to treat

Task 5. Choose the English equivalent of the Russian word.

- | | |
|-----------------------------|--|
| 1. экранирование | a) pumping
b) screening
c) aerating |
| 2. крупнозернистый песчаник | a) grit
b) scum
c) sludge |
| 3. остаточный продукт | a) pollutants
b) particles
c) residuals |
| 4. сгущение, коагуляция | a) thickening
b) processing
c) digestion |
| 5. автоклав | a) sedimentation tank
b) chlorine tank
c) digester |

Task 6. Fill in the gaps with the proper words in brackets. Identify their parts of speech.

1. Wastewater (enter, entered, entering) the treatment plant includes items like wood, rocks, and even (die, dead, dying) animals.
2. They could cause problems (late, later, latest) in the treatment process.
3. (Bubble, Bubbled, Bubbling) oxygen through the water also keeps the organic material (suspend, suspended suspending) while it forces "grit" to settle out.
4. This method gets rid of almost (every, all) bacteria, reduces turbidity and colour, removes odours, reduces the amount of iron, and removes (another, other, the other) solid particles that remained in the water.
5. (This, That) protects fish and other marine organisms, which can be harmed by (small, smaller, the smallest) amounts of chlorine.
6. The finished product is (main, mainly) sent to landfills, but sometimes can be used (like, as, such as) fertilizer.

Task 7. Choose a better translation.

1. The wastewater system relies on the force of gravity to move sewage from your home to the treatment plant.

a) Система сточных вод полагается на силу гравитации, которая перемещает нечистоты из вашего дома на очистную установку.

b) Канализационная система рассчитана на воздействие силы притяжения при перемещении сточных вод из вашего дома на очистную установку.

2. Some of the water is removed in a step called thickening and then the sludge is processed in large tanks called digesters.

a) Остальная вода удаляется стадией, которая называется коагуляция, а потом густая грязь перерабатывается в больших резервуарах, которые называются автоклавы.

b) Остальная вода перемещается на стадию коагуляции, а потом ил перерабатывают в больших резервуарах, которые называются автоклавы.

3. The chlorine is mostly eliminated as the bacteria are destroyed, but sometimes it must be neutralized by adding other chemicals.

a) Когда бактерии разрушатся, хлор в основном ликвидируется, но иногда его необходимо нейтрализовать добавлением других химических веществ.

b) Хлор в основном устраняют, когда бактерии разрушаются, но иногда его добавление должно нейтрализовать другие химические вещества.

Task 8. Mark the statements as true or false. Correct the false statements.

1. Most of the materials removed from wastewater are sent to a landfill.
2. If the plant is built above the ground level, the wastewater cannot be pumped up to the aeration tanks.
3. As organic matter decays, it releases oxygen.
4. Sedimentation tanks are large tanks called digesters.
5. Sludge is light materials like oils and plastics floating on the water surface.
6. The method of filtration gets rid of all bacteria and solid particles.
7. All wastewater residuals are buried in the ground.

Task 9. Identify the stages of wastewater treatment.

1. Moving sewage to the treatment plant.
2. Settling the organic portion of the sewage out of the wastewater.
3. Adding chlorine to kill bacteria.
4. Removing solid wastes from wastewater.
5. Removing floating wastes from wastewater.
6. Processing the finished waste products.
7. Replenishing water with oxygen.

Task 10. Try to shorten some sentences into one as shown in the example.

Wastewater entering the treatment plant includes items like wood, rocks, and even dead animals. Unless they are removed, they could cause problems later in the treatment process. Most of these materials are sent to a landfill.

Solid wastes like wood and rocks are removed from wastewater and sent to a landfill not to cause problems later in treatment process.

1. The wastewater system relies on the force of gravity to move sewage from your home to the treatment plant. So wastewater-treatment plants are located on low ground, often near a river into which treated water can be released.

2. One of the first steps that a water treatment facility can do is to just shake up the sewage and expose it to air. This causes some of the dissolved gases (such as hydrogen sulfide, which smells like rotten eggs) that taste and smell bad to be released from the water.

3. Wastewater then enters the second section or sedimentation tanks. Here, the sludge (the organic portion of the sewage) settles out of the wastewater and is pumped out of the

tanks. Some of the water is removed in a step called thickening and then the sludge is processed in large tanks called digesters.

4. Many cities also use filtration in sewage treatment. After the solids are removed, the liquid sewage is filtered through a substance, usually sand, by the action of gravity. This method gets rid of almost all bacteria, reduces turbidity and color, removes odors, reduces the amount of iron, and removes most other solid particles that remained in the water.

5. The chlorine is mostly eliminated as the bacteria are destroyed, but sometimes it must be neutralized by adding other chemicals. This protects fish and other marine organisms, which can be harmed by the smallest amounts of chlorine.

6. Another part of treating wastewater is dealing with the solid-waste material. These solids are kept for 20 to 30 days in large, heated and enclosed tanks called 'digesters.' Here, bacteria break down (digest) the material, reducing its volume, odors, and getting rid of organisms that can cause disease. The finished product is mainly sent to landfills, but sometimes can be used as fertilizer.

Task 11. Describe the process of wastewater treatment. Express your opinion on the problem of water wastes.

Text 3

Task 1. Read the title of the article and suppose where treated water can be used.

Using Reclaimed Wastewater

With the scarcity of water in some parts of the world and with water conservation being so important nowadays, the reuse of treated wastewater is becoming more important. No, you don't have to worry about your drinking water at home coming right from a sewage-treatment plant (as a successful test of this has been done!!), but effluent water is being used for certain aims throughout the world. Though most of the treated water is discharged to a local river or the ocean.

The use of reclaimed wastewater helps people in two ways:

1. Reclaimed water can supply needed water for some purposes.
2. Reclaimed wastewater frees up fresh water that can be used somewhere else, such as for drinking water.

California is a good place to go to see how reclaimed wastewater is being consumed. The East Bay Municipal Utility District has a working water reclamation project that benefits the community in these ways:

1. Conserves drinking water
2. Reduces pollution into San Francisco Bay
3. Provides water for irrigation and industrial purposes

Their project results in saving of about 5.5 billion gallons per year. Eventually the project will save enough water to provide drinking water to 83,000 households.

So, what exactly is reclaimed wastewater used for? A lot of it goes toward watering golf courses and landscaping alongside public roads, firefighting, various chemical industries, etc. Some industries, such as power-generation plants can use reclaimed wastewater. A lot of water is needed to cool power-generation equipment, and using wastewater for this purposes means that the facility won't have to use higher-quality water that is best used somewhere else.

Task 2. Find a synonym to each word in the article.

- | | |
|----------------|----------------|
| 1. to reclaim | 5. to supply |
| 2. sewage | 6. to consume |
| 3. fresh water | 7. to conserve |
| 4. aim | 8. facility |

Task 3. Define the constituents of the following words.

wastewater, sewage-treatment, throughout, somewhere, household, alongside, firefighting, power-generation, higher-quality.

Task 4. Make up sentences of your own using the following word-combinations.

to reuse treated water
to provide water for
reclamation projects help to
high-quality water
using wastewater means
to conserve drinking water
to discharge treated water to

Task 5. Choose the correct continuation of the following sentences.

With the scarcity of water in some parts of the world...

a) you don't have to worry about your drinking water at home.

b) the reuse of treated wastewater is becoming more important.

2. Most of the treated water is ...

discharged to a local river or the ocean. is used to cool power-generation equipment.

3. Reclaimed water...

a) can be used as drinking water.

b) can supply needed water for some other purposes.

4 A lot of reclaimed wastewater goes toward...

a) supplying houses with running water.

b) watering golf courses and landscaping alongside public roads, firefighting, various chemical industries.

Mark the statements as true or false. Correct the false statements.

1. You have to worry about your drinking water at home coming right from a sewage-treatment plant.

2. Reclaimed water can supply needed water for different purposes.

3. Reclaimed wastewater can be used as drinking water.

4. Reclaimed wastewater in California produces pollution into San Francisco Bay.

5. Some industries, such as power-generation plants can use effluent water.

6. Saving of about 5.5 billion gallons of water per year will conserve enough water to provide drinking water to 83,000 households.

Task 7. Answer the questions.

1. Why is the reuse of treated water becoming so important nowadays?

2. How does the use of reclaimed water help people?

3. Which way does the water reclamation project in California benefit the community?

4. What is effluent water used for?

5. How is treated water used in your community?

Task 8. Make up a plan and give a short summary of the article.

UNIT 8 WHAT IS HYDROLOGY?

Task 1. Read the following international words and find their Russian equivalents.

natural, hydrology, atmosphere, reservoir, industry, irrigation, electric, fundamental, transport, process, evaporation, infiltration, component, mathematical, principle, to control, erosion, analyses, to organize, effect, project, statistics, physics, biology, professional, engineer

Task 2. Look up in the dictionary and find a synonym to the first word in each row.

- | | |
|------------------------|--|
| 1. supply (of water) | a) provision; b) evaporation; c) quality |
| 2. to evolve | a) to start; b) to develop; c) to organize |
| 3. property | a) quantity; b) seepage; c) characteristics |
| 4. environment | a) atmosphere; b) surroundings; c) ground |
| 5. flooding | a) overflow of water; b) irrigation; c) drainage |
| 6. to prevent | a) to continue; b) to stop; c) to begin |
| 7. hazardous wastes | a) polluted streams; b) pure water; c) dangerous releases |
| 8. challenging careers | a) risky jobs; b) difficult, but interesting professions;
c) boring occupations |

Task 3. Find the following words and word combinations in the text and read sentences containing them.

химические отходы; разрешить проблемы, связанные с водой; каждая фаза водного цикла; испаряться непосредственно с поверхности земли; описывать количество и качество воды; люди, обученные гидрологии; проводить анализы для определения возможных поставок воды; достаточная подготовка по другим предметам; область, заслуживающая рассмотрения

Task 4. Read the text.

Hydrology is the Study of Water

Water is one of our most important natural resources. Without it, there would be no life on earth. The supply of water available for our use is limited by nature. Although there is plenty of water on earth, it is not always in the right place, at the right time and of the right quality. Adding to the problem is the increasing evidence that chemical wastes improperly discarded yesterday are showing up in our water supplies today. Hydrology has evolved as a science in response to the need to understand the complex water systems of the Earth and help solve water problems. Hydrologists play a vital role in finding solutions to water problems, and interesting and challenging careers are available to those who choose to study hydrology.

Water has Many Aspects to Study

Hydrology is the science that encompasses the occurrence, distribution, movement and properties of the waters of the Earth and their relationship with the environment within each phase of the water cycle. All of the physical, chemical and biological processes involving water as it travels through the water cycle are of interest to those who study water. There are many pathways the water may take in its continuous cycle of falling as rainfall or snowfall and returning to the atmosphere. It may be captured for millions of years in polar ice caps. It may flow to rivers and finally to the sea. It may soak into the soil to be evaporated directly from the soil surface as it dries or be transpired by growing plants. It may percolate through the soil to ground water reservoirs (aquifers) to be stored or it may flow to wells or springs or back to streams by seepage. The cycle of water may be short, or it may take millions of years. People tap the water cycle for their own uses. Water is diverted temporarily from one part of the cycle by pumping it from the ground or drawing it from a river or lake. It is



Future hydrologists learn how to take a water-quality sample.

used for a variety of activities such as households, businesses and industries; for irrigation of farms and parklands; and for production of electric power.

After use water is returned to another part of the cycle: perhaps discharged downstream or allowed to soak into the ground. Used water normally is lower in quality, even after treatment, which often poses a problem for downstream users. The hydrologist studies the fundamental transport processes to be able to describe the quantity and quality of water as it moves through the water cycle (evaporation, precipitation, streamflow, infiltration, ground water flow, and other components).

What do Hydrologists Do?

Hydrologists apply scientific knowledge and mathematical principles to solve water-related problems in society: problems of quantity, quality and availability. They may be concerned with finding water supplies for cities or irrigated farms, or controlling river flooding or soil erosion. Or, they may work in environmental protection: preventing or cleaning up pollution or locating sites for safe disposal of hazardous wastes. Persons trained in hydrology may have a wide variety of job titles. Scientists and engineers in hydrology may be involved in both field investigations and office work. In the field, they may collect basic data, oversee testing of water quality, direct field crews and work with equipment. Many jobs require travel, some abroad. A hydrologist may spend considerable time doing field work in remote and rugged terrain. In the office, hydrologists do many things such as interpreting hydrologic data and performing analyses for determining possible water supplies.

Much of their work relies on computers for organizing, summarizing and analyzing masses of data, and for modeling studies such as the prediction of flooding and the consequences of reservoir releases or the effect of leaking underground oil storage tanks. The work of hydrologists is as varied as the uses of water and may range from planning multimillion dollar water projects to advising homeowners about backyard drainage problems.

Careers in Hydrology

Students who plan to become hydrologists need a strong emphasis in mathematics, statistics, geology, physics, computer science, chemistry and biology. In addition, sufficient background in other subjects--economics, public finance, environmental law, government policy--is needed to communicate with experts in these fields and to understand the implications of their work on hydrology. Communicating clearly in writing and speech is a basic requirement essential for any professional person. Hydrologists should be able to work well with people, not only as part of a team with other scientists and engineers, but also in public relations, whether it be advising governmental leaders or informing the general public on water issues. Hydrology offers a variety of interesting and challenging career choices for today and tomorrow. It's a field worth considering.

Task 5. Choose the best continuation. Sometimes two variants are correct.

1. Hydrologists play a vital role in...
 - a) constructing buildings.
 - b) projecting roads.
 - c) finding solutions to water problems.
2. Hydrology is the science that...
 - a) deals with the problems of water supply.
 - b) includes the occurrence, distribution, movement and properties of the waters of the Earth.
 - c) studies the occurrence, distribution, movement and properties of the waters of the Earth and their relationship with the environment within each phase of the water cycle.
3. The cycle of water...
 - a) is very short.

- b) may be short, or it may take millions of years.
- c) takes a lot of time.
- 4. Scientists and engineers in hydrology...
 - a) work mostly in field investigations.
 - b) spend little time on office work.
 - c) may be involved in both field investigations and office work.
- 5. In the office, hydrologists...
 - a) may collect basic data.
 - b) may perform analyses for determining possible water supplies.
 - c) work with equipment.
- 6. Students who plan to become hydrologists must be especially good at...
 - a) literature and languages.
 - b) maths, geology, physics and biology.
 - c) economics, environmental law and government policy.

Task 6. Choose the correct questions to the following statements.

1. Hydrology has evolved as a science in response to the need to understand the complex water systems of the Earth and help solve water problems.
 - a) What is hydrology?
 - b) Why has hydrology evolved as a science?
 - c) What does hydrology help to understand?
2. Interesting and challenging careers are available to those who choose to study hydrology.
 - a) What is available to those who choose to study hydrology?
 - b) Are interesting and challenging careers available to those who choose to study hydrology?
 - c) What may be available to those who choose to study hydrology?
3. After use, water is returned to another part of the cycle: perhaps discharged downstream or allowed to soak into the ground.
 - a) After use, water is returned to another part of the cycle, isn't it?
 - b) Is water returned to another part of the cycle after use?
 - c) Where is water returned to after use?
4. Hydrologists apply scientific knowledge and mathematical principles to solve water-related problems in society.
 - a) What helps hydrologists to solve water-related problems in society?
 - b) What do hydrologists apply to solve water-related problems in society?
 - c) How do hydrologists solve water-related problems in society?
5. Persons trained in hydrology may have a wide variety of job titles.
 - a) Do persons trained in hydrology have a wide variety of job titles?
 - b) May persons trained in hydrology have a wide variety of job titles?
 - c) What may persons trained in hydrology have?
6. Communicating clearly in writing and speech is a basic requirement essential for any professional person.
 - a) Communicating clearly in writing and speech is a basic requirement essential for any professional person, isn't it?
 - b) What is a basic requirement essential for any professional person?
 - c) What important factor must be essential for any professional person?

Task 7. Ask your groupmates.

- a) what hydrology is;
- b) what the pathways are the water may take in its continuous cycle;

- c) what water is used for;
- d) what hydrologists study;
- e) what hydrologists do in the field investigations;
- f) what hydrologists are busy with in the office;
- g) in what subjects future hydrologists need a strong emphasis;
- h) what basic requirements are essential for a professional hydrologist

Task 8. Make up a plan of the text for retelling.

Task 9. Answer the following questions.

- 1) Where are you studying?
- 2) What is the title of your faculty?
- 3) Why have you chosen exactly this faculty?
- 4) What speciality will you obtain after graduating from the University?
- 5) Where would you like to work as a hydrologist?
- 6) Must a hydrologist have a good grounding in psychology and sociology? Why?
- 7) What kind of outlook should hydrologists have in order to be successful in their work?
- 8) How do the rapid technological advances influence the day-to-day work of hydrologists?

Supplementary Reading

Water – Nature's Magician

Water is the solvent, the medium and the participant in most of the chemical reactions in our environment. Water is at once simple and complex. A water molecule itself is simple, made up of three atoms: two hydrogen and one oxygen, H₂O. The configuration of these building blocks produces a molecule with almost magical properties. On earth, water is found as a liquid, as a solid (ice) or as a gas (water vapour).

- Canada has about 7% of the world's renewable freshwater supply, compared with 18% for Brazil, 9% for China, and 8% for the United States.

- The ice we skate on in winter is water in its solid form. Unlike most substances, which are the densest in their solid state, ice is less dense than water and thus floats. If this were not the case, lakes and rivers would freeze from the bottom up. Fish could not survive, and it is unlikely that rivers and lakes in northern countries would ever completely thaw.

- Water vapour forms a kind of global "blanket" which helps to keep the earth warm. Heat radiated from the sun-warmed surface of the earth is absorbed and held by the vapour.

Water molecules are attracted to each other, creating hydrogen bonds. These strong bonds determine almost every physical property of water and many of its chemical properties, too.

Water Balancing on the Earth

Water is continually moving around, through, and above the Earth as water vapour, liquid water, and ice. In fact, water is continually changing its form. The Earth is pretty much a "closed system," like a terrarium. That means that the Earth neither, as a whole, gains nor loses much matter, including water. Although some matter, such as meteors from outer space, are captured by the Earth, very little of the Earth's substances escape into outer space. This is certainly true about water. This means that the same water that existed on the Earth millions of years ago is still here. Thanks to the water cycle the same water is continually being recycled all around the globe. It is entirely possible that the water you drank for lunch was once used by Mama Alosaurus to give her baby a bath.

By the way, there is a theory that much of the Earth's water came from comets hitting the planet over billions of years.

Sediment in Water

Sediment plays a major role in the transport and fate of pollutants and so is clearly a concern in water quality management. Toxic chemicals can become attached, or adsorbed, to sediment particles and then transported to and deposited in other areas. These pollutants may later be released into the environment. By studying the quantity, quality, and characteristics of sediment in the stream, scientists and engineers can determine the sources and evaluate the impact of the pollutants on the aquatic environment. Once the sources and impact are known, action can be taken to reduce the pollutants. The association of toxic chemicals with sediment is an issue of prime importance.

Deposition of sediment in rivers or lakes can decrease water depth, making navigation difficult or impossible. To ensure access, some of the sediment may be dredged from the stream or harbour, but this may release toxic chemicals into the environment. To determine how much dredging needs to be done and how often, water levels must be monitored, and the rates of sediment transport and deposition estimated.

Stream borne sediment directly affects fish populations in several ways. Suspended sediment decreases the penetration of light into the water. This affects fish feeding and schooling practices, and can lead to reduced survival.

Suspended sediment in high concentrations irritates the gills of fish, and can cause death. Sediment can destroy the protective mucous covering the eyes and scales of fish, making them more susceptible to infection and disease. Sediment particles absorb warmth from the sun and thus increase water temperature. This can stress some species of fish. Suspended sediment in high concentrations can dislodge plants, invertebrates, and insects in the stream bed. This affects the food source of fish, and can result in smaller and fewer fish. Settling sediments can bury and suffocate fish eggs. Sediment particles can carry toxic agricultural and industrial compounds. If these are released in the habitat they can cause abnormalities or death in the fish.

Sediment can affect the delivery of water. When water is taken from streams and lakes for domestic, industrial, and agricultural uses, the presence of sediment in the water can wear out the pumps and turbines. As this increases maintenance costs, it is important to determine the amount of sediment in the stream so that the appropriate equipment can be chosen when designing a water supply plant.

The Sun-powered Cycle

The endless circulation of water from the atmosphere to the earth and its return to the atmosphere through condensation, precipitation, evaporation and transpiration is called the hydrologic cycle.

Heating the ocean water by the sun is the key process that keeps the hydrologic cycle in motion. Water evaporates, then falls as precipitation in the form of rain, hail, snow, sleet, drizzle or fog. On its way to the earth some precipitation may evaporate or, when it falls over land, be intercepted by vegetation before reaching the ground. The cycle continues in three different ways:

Evaporation/transpiration – On average, as much as 40% of precipitation in the world is evaporated or transpired.

Percolation into the ground – Water moves downward through cracks and pores in soil and rocks to the water table. Water can move back up by capillary action or it can move vertically or horizontally under the earth's surface until it re-enters a surface water system.

Surface runoff – Water runs overland into nearby streams and lakes; the steeper the land and the less porous the soil, the greater the runoff. Overland flow is particularly visible in urban

areas. Rivers join each other and eventually form one major river that carries all of the sub-basins' runoff into the ocean.

Although the hydrologic cycle balances what goes up with what comes down, one phase of the cycle is "frozen" in the colder regions during the winter season. During the Canadian winter, for example, most of the precipitation is simply stored as snow or ice on the ground. Later, during the spring melt, huge quantities of water are released quickly, which results in heavy spring runoff and flooding.

Evaporation:

As water is heated by the sun, its surface molecules become sufficiently energized to break free of the attractive force binding them together, and then evaporate and rise as invisible vapour in the atmosphere.

Transpiration:

Water vapour is also emitted from plant leaves by a process called transpiration. Every day an actively growing plant transpires 5 to 10 times as much water as it can hold at once.

Condensation:

As water vapour rises, it cools and eventually condenses, usually on tiny particles of dust in the air. When it condenses it becomes a liquid again or turns directly into a solid (ice, hail or snow). These water particles then collect and form clouds.

Precipitation:

Precipitation in the form of rain, snow and hail comes from clouds. Clouds move around the world, propelled by air currents. For instance, when they rise over mountain ranges, they cool, becoming so saturated with water that water begins to fall as rain, snow or hail, depending on the temperature of the surrounding air.

Runoff:

Excessive rain or snowmelt can produce overland flow to creeks and ditches. Runoff is a visible flow of water in rivers, creeks and lakes as the water stored in the basin drains out.

Percolation:

Some of the precipitation and snow melt moves downwards, percolates or infiltrates through cracks, joints and pores in soil and rocks until it reaches the water table where it becomes groundwater.

Groundwater:

Subterranean water is held in cracks and pore spaces. Depending on the geology, the groundwater can flow to support streams. It can also be tapped by wells. Some groundwater is very old and may have been there for thousands of years.

Water table:

The water table is the level at which water stands in a shallow well.

Runoff and Water Quality

A significant portion of rainfall in forested watersheds is absorbed into soils (infiltration), is stored as ground water, and is slowly discharged to streams through seeps and springs. Flooding is less significant in these conditions because some of the runoff during a storm is absorbed into the ground, thus lessening the amount of runoff into a stream during the storm.

As watersheds are urbanized, much of the vegetation is replaced by impervious surfaces, thus reducing the area where infiltration to ground water can occur. Thus, more stormwater runoff occurs – runoff that must be collected by extensive drainage systems that combine curbs, storm sewers, and ditches to carry stormwater runoff directly to streams. More simply, in

a developed watershed, much more water arrives into a stream much more quickly, resulting in an increased likelihood of more frequent and more severe flooding.

Drainage ditches to carry stormwater runoff to storage ponds are often built to hold runoff and collect excess sediment in order to keep it out of streams.

Runoff from agricultural land (and even our own yards) can carry excess nutrients, such as nitrogen and phosphorus into streams, lakes, and ground-water supplies. These excess nutrients have the potential to degrade water quality.

Groundwater quality

We often think of water quality as a matter of taste, clarity and odour, and in terms of other properties which determine whether water is fit for drinking. For other uses different properties may be important. Most of these properties depend on the kinds of substances that are dissolved or suspended in the water. Water for most industrial uses, for instance, must not be corrosive and must not contain dissolved solids that might precipitate on the surfaces of machinery and equipment.

Pure water is tasteless and odourless. A molecule of water contains only hydrogen and oxygen atoms. Water is never found in a pure state in nature. Both groundwater and surface water may contain many constituents, including microorganisms, gases, inorganic and organic materials.

The chemical nature of water continually evolves as it moves through the hydrologic cycle. The kinds of chemical constituents found in groundwater depend, in part, on the chemistry of the precipitation and recharge water. Near coastlines, precipitation contains higher concentrations of sodium chloride, and downwind of industrial areas, airborne sulphur and nitrogen compounds make precipitation acidic.

One of the most important natural changes in groundwater chemistry occurs in the soil. Soils contain high concentrations of carbon dioxide which dissolves in the groundwater, creating a weak acid capable of dissolving many silicate minerals. In its passage from recharge to discharge area, groundwater may dissolve substances it encounters or it may deposit some of its constituents along the way. The eventual quality of the groundwater depends on temperature and pressure conditions, on the kinds of rock and soil formations through which the groundwater flows, and possibly on the residence time. In general, faster flowing water dissolves less material. Groundwater, of course, carries with it any soluble contaminants which it encounters.

Scientists assess water quality by measuring the amounts of the various constituents contained in the water. These amounts are often expressed as milligrams per litre (mg/L), which is equivalent to the number of grams of a substance per million grams of water.

The suitability of water for a given use depends on many factors such as hardness, salinity and pH. Acceptable values for each of these parameters for any given use depend on the use, not on the source of the water, so that the considerations important for surface water are equally applicable to groundwater.

The natural quality of groundwater differs from surface water in that:

- for any given source, its quality, temperature and other parameters are less variable over the course of time and
- in nature, the range of groundwater parameters encountered is much larger than for surface water, e.g., total dissolved solids can range from 25 mg/L in some places in the Canadian Shield to 300 000 mg/L in some deep saline waters in the Interior Plains.

At any given location, groundwater tends to be harder and more saline than surface water, but this is by no means a universal rule. It is also generally the case that groundwater becomes more saline with increasing depth, but again, there are many exceptions.

As groundwater flows through an aquifer it is naturally filtered. This filtering, combined with the long residence time underground, means that groundwater is usually free from disease-causing microorganisms. A source of contamination close to a well, however, can defeat these natural safeguards. Natural filtering also means that groundwater usually contains less suspended material and undissolved solids than surface water.

Where do we Use Water?

The most obvious and immediate uses occur in its natural setting. They are called instream uses. Fish live in it, as do some birds and animals, at least part of the time. Hydroelectric power generation, shipping, and water-based recreation are other examples of human instream uses.

These instream uses are not always harmless. For example, oil leaking from outboard motors and freighters can cause pollution. Large reservoirs needed for hydroelectric power generation remove water by evaporation and completely change the river regime for downstream users.

The greatest number and variety of water uses occur on the land. These are called withdrawal uses. This term is appropriate because the water is withdrawn from its source (a river, lake or groundwater supply), piped or channeled to many different locations and users, and then is collected again for return to a lake, river or into the ground. Household and industrial uses, thermal and nuclear power generation, irrigation and livestock watering all fall into this category.

Most withdrawal uses "consume" some of the water, meaning less is returned to the source than was taken out. Furthermore, the water which is put back into its natural setting is often degraded. For example, water leaving our houses contains human and household wastes. The same is true of water used in many industrial processes. Often this liquid waste is only partially treated, if at all, before it is returned to nature.

Hydroelectric Power

Hydro power must be one of the oldest methods of producing power. No doubt, Jack the Caveman stuck some sturdy leaves on a pole and put it in a moving stream. The water would spin the pole that crushed grain to make their delicious, low-fat prehistoric bran muffins. People have used moving water to help them in their work throughout history, and modern people make great use of moving water to produce electricity.

Although much energy in the world is produced by fossil-fuel and nuclear power plants, hydroelectricity is still important as about 10 percent of total power is produced by hydroelectric plants. Nowadays, huge power generators are placed inside dams. Water flowing through the dams spin turbine blades (made out of metal instead of leaves) which are connected to generators. Power is produced and is sent to homes and businesses. Producing electricity using hydroelectric power has some advantages over other power-producing methods. Let's do a quick comparison.

Advantages to hydroelectric power:

- Fuel is not burned so there is minimal pollution
- Water to run the power plant is provided free by nature
- It's renewable - rainfall renews the water in the reservoir, so the fuel is almost always there

Disadvantages to power plants that use coal, oil, and gas fuel:

- They use up valuable and limited natural resources

- They can produce a lot of pollution
- Companies have to dig up the Earth or drill wells to get the coal, oil, and gas
- For nuclear power plants there are waste-disposal problems
- Reservoir construction is "drying up".

Gosh, hydroelectric power sounds great – so why don't we use it to produce all of our power? Mainly because you need lots of water and a lot of land where you can build a dam and reservoir, which all takes a LOT of money, time, and construction. In fact, most of the good spots to locate hydro plants have already been taken. In the early part of the century hydroelectric plants supplied a bit less than one-half of all the power, but the number is down to about 10 percent today. The trend for the future will probably be to build small-scale hydro plants that can generate electricity for a single community.

The construction of surface reservoirs has slowed considerably in recent years. In the middle of the 20th century, when urbanization was occurring at a rapid rate, many reservoirs were constructed to serve peoples' rising demand for water and power. Since about 1980, the rate of reservoir construction has slowed considerably.

So just how do we get electricity from water? Actually, hydroelectric and coal-fired power plants produce electricity in a similar way. In both cases a power source is used to turn a propeller-like piece called a turbine, which then turns a metal shaft in an electric generator, which is the motor that produces electricity. A coal-fired power plant uses steam to turn the turbine blades; whereas a hydroelectric plant uses falling water to turn the turbine. The results are the same.

The theory is to build a dam on a large river that has a large drop in elevation as the capacity to produce energy is dependent on both the available flow and the height from which it falls. The dam stores lots of water behind it in the reservoir to accumulate potential energy. This is transformed into mechanical energy when the water rushes down the sluice and strikes the rotary blades of turbine. Near the bottom of the dam wall there is the water intake. Gravity causes it to fall through the penstock inside the dam. At the end of the penstock there is a turbine propeller, which is turned by the moving water. The turbine's rotation spins electromagnets which generate current in stationary coils of wire. Finally, the current is put through a transformer where the voltage is increased for long distance transmission over power lines. The water continues past the propeller through the tailrace into the river past the dam.

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(водопотребление)

Пособие по английскому языку
для студентов специальности

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