

МИНИСТЕРСТВО СЕЛЬСКОГО ХОЗЯЙСТВА
И ПРОДОВОЛЬСТВИЯ РЕСПУБЛИКИ БЕЛАРУСЬ

ГЛАВНОЕ УПРАВЛЕНИЕ ОБРАЗОВАНИЯ,
НАУКИ И КАДРОВОЙ ПОЛИТИКИ

Учреждение образования
«БЕЛОРУССКАЯ ГОСУДАРСТВЕННАЯ
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И ТРУДОВОГО КРАСНОГО ЗНАМЕНИ
СЕЛЬСКОХОЗЯЙСТВЕННАЯ АКАДЕМИЯ»

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АНГЛИЙСКИЙ ЯЗЫК

IRRIGATION AND WATER SUPPLY

*Рекомендовано учебно-методическим объединением
в сфере высшего образования Республики Беларусь
по образованию в области сельского хозяйства
в качестве учебно-методического пособия
для студентов учреждений образования, обеспечивающих
получение общего высшего образования по специальности
6-05-0811-03 Мелиорация и водное хозяйство*

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В данном пособии приведены тексты для чтения по специальности, упражнения для работы с лексическим и грамматическим материалом. Упражнения охватывают достаточно широкий спектр специальных терминов, используемых в мелиоративной отрасли народного хозяйства, и способствуют значительному расширению активного словаря студентов.

Для студентов учреждений образования, обеспечивающих получение высшего образования по специальности 6-05-0811-03 Мелиорация и водное хозяйство.

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ВВЕДЕНИЕ

Данное учебно-методическое пособие представляет собой комплекс, состоящий из текстов, а также из лексических и грамматических упражнений, который позволит в значительной степени стимулировать процесс изучения английского языка студентами мелиоративно-строительного факультета.

Целью пособия является: 1) развитие навыков чтения и перевода текстов по специальности; 2) развитие навыков чтения и пересказа газетных текстов в соответствии с требованиями программы.

Пособие состоит из двенадцати уроков, куда входят тексты по специальности, упражнения для работы с лексическим и грамматическим материалом. Текстовая часть представлена двумя текстами (А и Б) в каждом уроке. Упражнения, предназначенные для работы с лексикой, охватывают достаточно широкий спектр специальных терминов, используемых в мелиоративной отрасли народного хозяйства. Схема упражнений включает в себя двусторонние переводные упражнения, соотношение ряда специальных терминов с их определениями, ответы на вопросы по тексту, поиск синонимов и антонимов, упражнения, предполагающие проведение ролевой игры для активизации пройденного материала, и многое другое.

Повторяемость структур в упражнениях направлена на консолидацию лексики. Упражнения содержат ключевые моменты статьи, необходимые для пересказа текста. Для развития навыков письменной речи предусмотрены письменные задания.

Пособие может использоваться как для аудиторной, так и для самостоятельной работы.

UNIT 1

Task 1

Ex. 1. Read and memorize the following words. You'll come across them in the text.

- 1) Irrigation – орошение
- 2) to improve – улучшать
- 3) to apply – применять
- 4) to increase – увеличить
- 5) available – доступный
- 6) source – источник
- 7) to eliminate – уничтожить, устранить
- 8) drought – засуха
- 9) arid – засушливый
- 10) humid – влажный
- 11) rate – норма, размер, степень
- 12) rainfall – осадки
- 13) moisture – влага
- 14) ample – обильный
- 15) to enable – позволять, давать возможность.

Ex. 2. Match the words with their definitions.

- | | |
|---------------|---|
| 1) irrigation | a) tiny drops of water in the air or on the surface |
| 2) humid | b) very dry |
| 3) moisture | c) the amount of rain that falls on a particular area during a certain period |
| 4) arid | d) the place where you get something from; the place where a river or stream begins |
| 5) drought | e) very damp |
| 6) rainfall | f) shortage of rainwater |
| 7) source | g) supplying soil with water |

Ex. 3. Translate the following sentences paying attention

a) to the use of modal verbs.

1. Thousands of acres can be added to cultivated land through irrigation.
2. Additional acres must be brought under irrigation.
3. New sources of water must be found.
4. If we are to determine how much water is needed we need to know three things.

b) to the degrees of comparison of the adjectives and the comparative conjunctions.

1. More efficient use must be made of both our land and water. 2. The problem of irrigation is among the most important ones. 3. This applies to old irrigated areas as well as humid areas.

Ex. 4. Before reading the text answer the questions.

1. What is irrigation? 2. Why is the problem of irrigation among the most important ones? 3. Which farming areas require much irrigation? Little irrigation?

Text A

Irrigation

The problem of irrigation is one of the most important in growing high crop yields. Much has been done to improve the land that was not suited for growing crops by applying irrigation. Thousands of acres can be added to cultivated land through irrigation.

More efficient use must be made of both our land and water if we are to increase crop production. Land under irrigation must get the maximum returns from the water available. And additional acres must be brought under irrigation.

New source of water for irrigation must be found. In short, every acre of land and every gallon of irrigation water must produce their most. Irrigation eliminates drought hazard.

Irrigation has long made it possible to produce high crops in arid climates. Good crops would not be possible without irrigation in these climates. Farmers find that by supplementary irrigation crop production can be greatly increased in most areas in humid regions.

If we are to determine when droughts begin and how much water is needed we need to know three things. First, we must know how much available water soils will hold – what their storage capacities are. Second, we must know at what rate plants use water at various stages of growth. Third we must know what our chances of getting enough rainfall are.

Adequate moisture, combined with ample plant food and good management, enables crops to produce top yields.

Ex. 5. Find the English equivalents for:

орошение, улучшать землю; применять; высокие урожаи; культивируемые земли; увеличить производство; источники воды; влажные площади; устранять опасность засухи; засушливый климат; способность запастись (хранить) воду; достаточно осадков; влага.

Ex. 6. Match the synonyms in two columns.

- | | |
|----------------|------------------|
| 1) Top | a) tillage |
| 2) various | b) high |
| 3) important | c) moist |
| 4) to improve | d) dry |
| 5) cultivation | e) to start |
| 6) humid | f) main |
| 7) arid | g) precipitation |
| 8) to begin | h) to perfect |
| 9) rainfall | i) different |

Ex. 7. Fill in the gaps with the best suited words.

1. It is necessary to find a new ____ of water for irrigation. 2. Irrigation eliminates ____ hazard. 3. Irrigation has made it possible to produce high ____ in ____ climates. 4. First, we must know what the ____ capacities of the soils are. 5. Second, we must know at what ____ plants use water. 6. Third, we must know what our chances of getting enough ____ are. 7. ____, ample ____ and good ____ enable crops to produce top yields.

Ex. 8. Answer the questions.

1. What can be done to improve the land which is not suited for farming? 2. Does irrigation eliminate drought hazard? 3. What has the irrigation made possible? 4. What three things do we need to know if we want to determine the quality of water for irrigation? 5. What enables crops to produce top yields?

Ex. 9. Find factual information in the text to prove the following.

1. The problem of irrigation is among the most important.
2. Irrigation eliminates drought hazard.
3. Good crops would not be possible without irrigation in arid climates.

Ex. 10. Write the summary of the text.

Task 2

Ex. 1. Learn the following words.

- 1) Output – выпуск продукции
- 2) ox (oxen) – бык (быки)
- 3) availability – доступность
- 4) monsoon – муссон
- 5) well – колодец
- 6) flood irrigation – орошение затоплением
- 7) labor – труд
- 8) bucket – ведро
- 9) to pivot – вращаться
- 10) wheat – пшеница
- 11) mustard – горчица
- 12) linseed – льняное семя
- 13) to soak – мочнуть, впитывать, просачиваться

Ex. 2. Translate the following attributive word combinations.

Water buffalo; water supplies; irrigation channels; flood irrigation; labor intensive operation; leather bucket; single cylinder; diesel engine; family workforce.

Ex. 3. Before reading the text answer the following questions.

1) What do you know about the climate in India? Is it favorable for agriculture? 2) What major agricultural crops are grown in India? 3) What animals are used on the farms? 4) What do you think is the main problem for farmers in India? 5) What is the title of the article? Why do you think the article is entitled so?

Text B

India: where water holds the key

Nicholas Waits, who farms at Deeping St Nicholas, Spaldings, Lincs, visited farms in Northern India and was struck by the similarity of many of their crops to those we know in Britain but the unfamiliarity of almost eve-

rything else. Water is the biggest constraint on crop output and on the country's ability to feed itself.

Many crops grown on the plains of northern India are the same as you might find in England. But that is where the similarity to English farming stops.

Most farms are too small to warrant a tractor. So two oxen, a camel and a water buffalo (depending on how big the farm is) may be the total horsepower on the farm.

The availability of water outside the monsoon period governs the value of land and the crops that are grown. In England we don't fully realize that without water there is no life. Once the monsoon stops in October farmers cannot rely on any rain until the next monsoon which starts in June.

November and December daytime temperatures are pleasant (20–25 °C) with night temperatures falling to 5–10 °C. After December the weather gradually gets hotter and temperatures in May and June exceed 40 °C.

Any cropping outside the monsoon is linked to water supplies. These are usually in the forms of wells and irrigation channels from rivers and flood irrigation is used to get it to the crops, a labor intensive operation.

In some places irrigation is carried out as it was 300 years ago. Two oxen lift a leather bucket full of water from a well, with the top pivoting around a wooden spoke wheel. When the bucket reaches the surface it is emptied into the channel which flows towards the area to be irrigated.

The small field is divided into sections which require two people to direct the flow of water. It takes four men to irrigate half an acre a day.

Farmers who irrigate from wells now have a single cylinder diesel engine to pump the water out of the wells, which is faster and only requires two people.

For those with irrigation it is quite normal to get three crops a year. A normal rotation would be sorghum, wheat or mustard and ground nuts and soya beans. For those without irrigation one crop is certainly but a second is not.

A typical farm might consist of 3–10 acres worked by a father and three or four brothers and their wives, and the families are usually busy all year round. Ploughing is done by oxen, but everything else is done by hand.

Despite the warm climate, milk is used quite generally. Most milking herds are of Indian buffalo which are milked by hand. Buffaloes produce more milk than cows and people prefer the taste of buffalo milk. There is one disadvantage of keeping the herd of buffalo. You need to be near a good water supply, as a buffalo has to soak its skin in water every day.

As well as general agricultural crops, a full range of subtropical and temperate vegetables and fruits are grown: coconuts, peanuts, mango and some others.

So what are the prospects for the future? India uses a lot of wheat and at times has to import it, and its population growth demand is likely to rise. But any increase in domestic wheat production depends on the supply of water, that's why wheat needs to be imported.

Ex. 4. Find the English for the following words and word combinations.

Равнина; доступность воды; ценность земли; без воды нет жизни, полагаться на дождь; запасы воды; колодцы; оросительные каналы; реки; орошение затоплением; достигнуть поверхности; поле делится на участки; контролировать поток воды; качать волю из колодца; нужно быть рядом с источником воды; прогноз на будущее.

Ex. 5. Fill in the blanks with the appropriate words.

1. Water supplies in India are usually in the form of _____ or _____ from rivers.

2. It's normal to get three _____ a year.

3. _____ is used to get water to the crops.

4. Usually two men direct the _____ of water.

5. Most farmers _____ water out of wells.

6. If farmers keep buffaloes they must be near a good _____ _____.

7. A buffalo has to _____ its skin in water every day.

Flow, crops, soak, flood irrigation, wells, pump, water supply, irrigation.

Ex. 6. Give Russian equivalents of the following crops.

Sorghum, wheat, mustard, linseed, potato, ground nuts, soya beans, sugar beet.

Ex. 7. Answer the questions.

1) What was Nicholas Watts struck by? 2) What is the main constraint on crop output in India? 3) Is Indian agriculture similar to British agriculture? 4) What farms are there in India? 5) What animals are kept on the farms? 6) What governs the value of land and the crops that are grown? 7) Can the farmers rely on the rainfall all over the year? 8) What are November and December daytime temperatures? 9) What is cropping outside

the monsoon linked to? 10) What forms is water supplied in? 11) What kind of irrigation is used? Is it a labor intensive operation? Why? 12) How is irrigation carried out in some places? 13) Do some farmers pump the water out of wells? Is it faster? Does it require fewer people? 14) How many crops a year do the farmers get? 15) What crops are grown by normal rotation? 16) What is a typical farm? 17) How is ploughing done? 18) Do people consume much milk? 19) What are the disadvantages and advantages of keeping buffaloes? 20) What vegetables and fruits are grown? 21) What does wheat production depend on? 22) What are the prospects for the future for the Indian agriculture?

Ex. 8. Say whether the following statements are true or false. Correct the false ones.

1. Indian agriculture is very efficient. 2. Indian agriculture is totally dependent on water. 3. Farmers usually get four crops a year. 4. A typical farm consists of four hectares. 5. Ploughing is usually done by tractors. 6. There are no disadvantages of keeping little herds of buffaloes. 7. India grows a lot of wheat and needn't import it.

Ex. 9. Tell about Indian agriculture using the plan.

1. The role of water for agriculture.
2. Irrigation
3. Typical farms.
4. Normal crops and rotation.
5. The animals used on the farms.
6. Indian agriculture in comparison to British agriculture.
7. The prospects for the future.

Ex. 10. You are Nicholas Watts. Interview an Indian farmer who has got a family farm. Ask him about the size of the farm, the availability of water on the farm, crops he grows, type of irrigation he uses, his prospects for the future.

UNIT 2

Task I

Ex. 1. Memorize the following words.

- 1) Wet – влажный

- 2) to wet – увлажнять
- 3) to permit – позволять
- 4) to affect – влиять
- 5) to combine – сочетать, объединять
- 6) surface – поверхность
- 7) subsurface – подпочвенный слой
- 8) removal – удаление
- 9) excess – излишек
- 10) to maintain – поддерживать
- 11) stream – поток, река
- 12) to replace – заменять
- 13) leak – просачивание, утечка
- 14) pipeline – труба
- 15) sprinkler – разбрызгиватель, дождевальная установка
- 16) to install – устанавливать
- 17) amount – количество
- 18) to supply – поставлять
- 19) permanent – постоянный
- 20) frequent – частый.

Ex. 2. State what part of speech the following words belong to and translate them.

The need; wet, difference; several; variety; grown, condition; increasingly; moisture; mechanically; sensors; frequency.

Ex. 3. Translate the following word combinations into Russian paying attention to the use of Participles I and II.

Recorded history; so-called wet regions; affected crops; accepted practice; maintaining conditions; changing control; highly developed projects, mechanically moved sprinkler system; installed sprinkler lines.

Ex. 4. Point out a common word for all:

- 1) potato, cotton, crops, wheat;
- 2) arid, wet, climate, mild;
- 3) rain, snow, hail, precipitation;
- 4) tools, stick, shovel, spade;
- 5) sprinkler, irrigation, channel, pipeline.

Text A

Irrigation Engineering

Irrigation of crops has been accepted as normal practice in the arid regions during most of the recorded history of man. However, it is only in recent years that man has felt the need to irrigate land in so-called “wet regions” areas where 40 inches or more rainfall may occur each year. Irrigation during the dry periods can mean the difference between one crop a year or several. Irrigation also permits the growing of a much greater variety of crops since yields and quality of many crops are adversely affected when grown only under frequent rainfall conditions.

So, in the high rainfall areas irrigation must be combined with good surface and subsurface drainage. Removal of excessive water during wet periods and application of water during dry periods will permit maintaining conditions most suitable to crop production.

Man first depended on his bare hands, then on a stick, or a shovel, to move earth and direct the stream to wet the land. These primitive controls are rapidly changing. On the more highly developed projects of the world, open earth conveyance channels are rapidly disappearing. Even lined, open channels are losing favor and are replaced by leak proof pipelines that are both safe and economical. Water application to the land is also changing. Mechanically moved sprinkler systems or permanently installed sprinkler lines are replacing surface irrigation. Water can be applied automatically with frequency and amounts controlled by moisture sensors in the field or by time clocks on the system. Nor is the irrigation system used only to supply moisture to the crops,

Ex. 5. Find the English equivalents for:

засушливый; влажный; потребность в орошении; осадки; один урожай в год; осушение; подпочвенный слой; удаление избытка воды; условия, подходящие для растений; направлять поток; увлажнять землю; передвижная дождевальная установка; частота и количество; датчики влажности; обеспечивать влагой растения.

Ex. 6. Match the antonyms.

- | | |
|---------------|-------------|
| 1) Irrigation | a) moist |
| 2) arid | b) modern |
| 3) dry | c) drainage |

- | | |
|--------------|---------------|
| 4) excess | d) subsurface |
| 5) primitive | e) same |
| 6) moving | f) wet |
| 7) surface | g) permanent |
| 8) different | h) shortage |

Ex. 7. Read the sentences and translate the words in brackets.

1. (Влажные) regions are areas where 40 inches or more (количество осадков) may occur every year. 2. It is necessary to remove (лишнее количество воды). 3. Mechanically moved (дождевальные установки) are used in this field. 4. Water can be applied automatically with (частотой и количеством) controlled by (датчиками влажности). 5. The irrigation system is used to (обеспечивать влагой) to the crops.

Ex. 8. Answer the questions.

1. Where has irrigation been accepted as normal practice? 2. Is it necessary to irrigate land in wet regions? Why? 3. What must irrigation be combined with in the high rainfall areas? 4. What did man first depend on? 5. Are open earth conveyance channels disappearing? 6. What are they replaced by? Why? 7. What replaces surface irrigation? 8. How can water be applied in sprinklers?

Ex. 9. Reproduce the situations where the following phrases are used.

1) normal practice; 2) the need to irrigate land; 3) frequent rainfall conditions; 4) an increasingly accepted practice; 5) to depend on hands; 6) open earth conveyance channels; 7) to be replaced by pipelines; 8) sprinkler systems; 9) moisture sensors.

Ex. 10. Write the summary of the text.

Task 2

Ex. 1. Learn the following words.

- 1) Precipitation – осадки
- 2) drop – капля
- 3) hail – град
- 4) sleet – дождь со снегом
- 5) coastal – прибрежный, береговой

- 6) temperate zone – умеренная зона
- 7) interior – внутренние земли; глубинные районы
- 8) polar circle – полярный круг
- 9) latitude – широта
- 10) air current – воздушный поток
- 11) elevation – возвышение, возвышенность.

Ex. 2. Before reading the text check your weather vocabulary.

1. Tomorrow it will be mild with the possibility of a few _____ in the evening.
2. Close to the Equator the weather is hot and _____ and there are often storms.
3. The ground was completely white. I thought it was snow at first, but it was just a heavy_____.

Text B

Rain

Rain is a form of precipitation that consists of drops of water. Raindrops form when water droplets in clouds combine or when precipitation in the form of ice – such as snow, hail or sleet melts. Rain falls throughout most of the world, in the tropics almost all precipitation is rain.

Rain is necessary for all forms of life that live on land – it provides water for human beings and other animals and for crops. Few forms of life exist in places where little or no rain falls. Rain also cleans the air by washing away dust and chemical pollutants.

Rain can also be harmful as well. Too much rain can cause flooding that destroys property and threatens life. Heavy rainfall damages crops and speeds up the loss of soil.

The earth receives an average of about 34 inches (86 centimeters) of rain and other forms of precipitation annually. Some regions of the world have a much heavier rainfall and others get much less rain.

Some regions near the equator have received as much as 400 inches (1,000 centimeters) of rain a year. Rain usually falls every day of the year in such areas as western Africa and the Amazon River Basin of South America.

The coastal regions of the tropics also have heavy rains. Other regions of the tropics receive little rain.

In the temperate zones, the regions between the tropics and the polar circles, cyclones bring heavy rains to the western coast of some continents. However, deserts lie in the interior of continents in this zone. Other regions of low precipitation occur around the polar circles

Factors affecting rainfall include latitude, large bodies of water, air currents and cities. These factors largely determine the variations of rainfall that occur throughout the world.

In general, rain falls more frequently in latitudes near the equator than in those close to the pole. At the equator, the intense heat of the sun causes large amount of moisture to evaporate in the warm air. Because the polar regions receive little sunlight, the air there is too cold to receive much moisture. Areas near large bodies of water get more rain than areas in the dry areas of a continent. The large amount of rainfall results from evaporation moisture from nearby sources of water, including oceans, lakes, irrigation systems. The lack of rain in the deserts of west central Asia is due mainly to their great distance from the sea.

Places on the windward slopes of mountains generally have more rain than areas at a lower elevation. The slopes help to produce rain by lifting warm, moist air to a higher altitude. There the air cools, forming clouds and then rain. Most of the slopes away from the wind are dry because the wind carries little moisture across the top of the mountains.

Meteorologists believe the presence of cities promotes rainfall, but they are not certain why. One idea is that clouds form more quickly in the heat generated by cars, heating systems, and sun-warmed concrete.

Acid rain forms when moisture reacts with nitrogen oxides and sulfur dioxide. These chemicals are released by motor vehicles, factories and certain power plants. Such rain pollutes lakes and streams, endangering wildlife. It also damages buildings and other structures and is suspected of damaging forests and soil.

Ex. 3. Find the English for:

осадки; капли воды; снег; град; дождь со снегом; таять; наводнение; прибрежные районы; получать мало дождя; умеренный пояс; полярный круг; пустыня; широта; большие водоемы; особенности земли; воздушные потоки; разнообразие осадков; количество влаги; испаряться; теплый воздух; отсутствие дождя в пустынях; воздух охлаждается; ветер приносит мало влаги; кислотный дождь; загрязнять.

Ex. 4. Give the Russian equivalents.

Raindrops; to clean the air; to wash away dust and chemical pollutant; to damage properly; heavy rainfall; to damage crops; to speed up the loss of soil; interior of continents; factors affecting rainfall; intense heat of the sun; to receive little sunlight; dry areas of a continent; nearby sources of water; great distance from the sea, windward slopes of mountains; lower elevation; lifting warm moist air to a higher latitude; to promote rainfall; heat generated by cars; sun-warmed concrete; to endanger wildlife.

Ex. 5. Answer the following questions.

1. What does rain consist of? 2. When do raindrops form? 3. Why is rain important? 4. Can rain be harmful? When? 5. How much rain does the earth receive? 6. Do the coastal regions have much rain? Polar circles? 7. What factors affect rainfall? 8. Which areas does rain fall more frequently in? 9. Do places on the windward slopes of mountains have more or less rain? 10. How do the slopes help to produce rain? 11. What do meteorologists believe? 12. How does acid rain form? 13. Is acid rain harmful? Why?

Ex. 6. There is very little in the world that is not affected by acid rain. Read the text, then work in pairs and ask each other questions about these things.

Rivers, fish, soil, animals, humans, trees, buildings.

Can you tell me from the text how ____ is/are affected by acid rain?

Some of the Most Striking Effects of the Acid Rains are:

- Water becomes acid and the concentration of toxic materials in rivers increases.
- Fish are poisoned and killed. Birds and animals which eat fish have no food, and this makes them leave their natural areas.
- Acid groundwater removes vital minerals essential for plant growth. Toxic substances become concentrated in land animals.
- People are directly affected by local pollution and by acid drinking.
- Air pollution causes direct damage to trees. Trees weakened by acid rain could easily be damaged by strong winds, disease, and cold weather. Buildings, statues and monuments are damaged due to gases and acid rain.

Ex. 7. Ask and answer the questions like this one.

– *What have you said about poisoned food?*

– *I've said that it makes birds and animals leave their natural areas.*

Use these verbs: make, cause, remove, increase, affect.

Ex. 8. Tell your partner about the rain using the plan.

- 1) Rain as a form of precipitation.
- 2) The importance of rain for all forms of life
- 3) Factors affecting rainfall.

Ex. 9. Role play. Unfortunately, acid rain doesn't always fall in the countries which produce air pollution. The wind carries poisonous substances from one country to another. But it was reported that Britain was not responsible for acid rain in Norway. You are members of the Scandinavian countries. Work in groups and decide on strong measures you will take to try to persuade Britain to change its mind. Choose from the following or add another measure of your own:

- 1) make it more difficult for British people to enter Scandinavia;
- 2) make it more difficult for British companies to export to Scandinavia;
- 3) withdraw British sportsmen from all international sports competitions;
- 4) get the United Nations to tell Britain to control pollution.

When you have decided exchange the information with other groups.

Ex. 10. Based upon your decisions in ex. 9. write a letter explaining your views to a national newspaper.

UNIT 3

Task 1

Ex. 1. Learn the following words.

- 1) Dependability – зависимость
- 2) artesian – подземный
- 3) gravity – тяжесть, тяготение
- 4) subterranean – подземный
- 5) rock-fill (dam) – каменная наброска
- 6) earth-fill (dam) – земляная насыпь
- 7) concrete – бетон
- 8) water intake – водозабор
- 9) gravity flow and pumping systems – самотечные оросительные системы и системы с механическим водоподъемом
- 10) head water intake – головное водозаборное сооружение

- 11) an escape drainage system – сбросная дренажная сеть
- 12) temporary – временный
- 13) flume – лоток, желоб
- 14) barrage – водоподъемная плотина
- 15) expedient – целесообразный.

Ex. 2. Give verbs corresponding to the following nouns.

Arrangement; classification; conveyance, dependability; delivery; distribution; diversion; installation; maintenance; storage; utilization.

Ex. 3. Before reading the text answer the following questions.

1. What does success of irrigation depend on? 2. Where may irrigation projects obtain water from? 3. What are the most common means of conveying irrigation water?

Text A

Irrigation Systems

The success of every irrigation project rests largely on the adequacy and dependability of its water supply. Irrigation projects may obtain water from artesian or pumped groundwater, lift from lakes and rivers, gravity flow diversion from rivers (without storage), diversion from rivers with storage, and springs and other subterranean sources.

Large scale storage capacity is provided by dams which may be of rock-fill, earth-fill, or concrete types.

As to water intake, the irrigation systems are classified as gravity flow and pumping. The biggest and most widespread are the gravity flow systems, where water is drawn from the source by gravity and supplied to the irrigated areas by means of canals. In the case with pumping irrigation systems, the intake is affected by means of pumping plants from a source, water level of which is below the irrigated area.

The gravity irrigation system consists of a head water intake arrangement, a network of canals (main, distributive, irrigation) with control (water dividing) installations on them, a farm distribution system and an escape drainage system to remove excess water from the irrigation network, from the surface of the watered fields and from the soil. The farm distribution system must be designed to carry enough water to meet the demands of the crop to each field without erosion and allow for efficient application.

Open ditches are the most common means of conveying irrigation water. In many areas the ditches to each field are permanently constructed and maintained. In areas where the seasonal requirements are low and only one or two irrigations are required, it is often useful to utilize temporary ditches.

In some irrigated areas of the world concrete flumes (troughs) raised above the ground are used to convey water to the fields. Sometimes water is delivered to the fields by underground, pipes interrupted at definite intervals by hydrants which release water to the surface.

If it is necessary to irrigate territories lying above the water source level and in cases when it is not expedient, for this or other reason, to build a barrage, the intake is effected by means of pumps. Sometimes pumping plants are used to raise water from sections of the main (trunk) canal or distributor lying below the irrigated fields. At present pumping from rivers, reservoirs, or from underground sources is more and more used in many countries of the world.

Ex. 4. Arrange the following words and word combinations in pairs of synonyms.

a) To convey, b) by means of, c) to supply, d) to allow, e) subterranean, f) trunk canals, g) lift irrigation, h) to meet the demands, i) necessary, j) ditch.

1) Main canals, 2) underground, 3) to transport, 4) with the help of, 5) trench, 6) pump irrigation, 7) to meet the needs, 8) needful, 9) to provide, 10) to permit.

Ex. 5. Arrange the following words in pairs of antonyms.

a) To raise, b) temporary, c) success, d) common, e) permeable, f) pervious, g) closed, h) efficient.

1) Failure, 2) uncommon, 3) impervious, 4) impermeable, 5) open, 6) inefficient, 7) to lower, 8) permanent.

Ex. 6. Give one word for the following.

An artificial watercourse; agricultural plants in the fields; to find use for; a wall built to keep back water; to arrange in classes; to take into another place; changing with the season; large pipe or waterway; lasting only for a time.

Ex. 7. Translate the following word combinations:

gravity flow; the success of an irrigation system; storage capacity; trunk, distributive and irrigation canals; to build a barrage, pumped groundwater, subterranean sources; permanently constructed; to convey irrigation water; seasonal requirements, temporary ditches.

Ex. 8. Answer the following questions.

1. How may irrigation project obtain water? 2. What is necessary to provide large scale storage capacity? 3. How are the irrigation systems classified? 4. What does the gravity irrigation system consist of? 5. How must the farm distribution system be designed? 6. When is the intake affected by means of pumps?

Ex. 9. Complete the sentences.

1. The success of irrigation depends on _____. 2. The irrigation projects may obtain water from _____. 3. Storage capacity is provided by _____. 4. Irrigation systems are classified as _____. 5. The biggest irrigation systems are _____. 6. The gravity irrigation system consists of _____. 7. Temporary ditches are used to _____. 8. Concrete flumes are used to _____.

Ex. 10. Write about irrigation systems.

Task 2

Ex. 1. Memorize the following words.

- 1) Unacceptably – неприемлемо
- 2) sample – образец, проба
- 3) to assume – предполагать, допускать
- 4) to infiltrate – проникать, пропитывать
- 5) spell – период
- 6) to recharge – попадать, проникать
- 7) to treat – обрабатывать, очищать
- 8) to exceed – превышать
- 9) nanogram – одна миллиардная часть грамма.

Ex. 2. Look at the title of the article. Make guesses what the article is about. What do you know about acid rains (pesticide rains)? Why are they harmful? What causes pesticide rains? Are there any ways to solve the problem?

Text B

Pesticide Rains on Europe

Environmental researchers in Switzerland believe much of the rain falling in Europe contains unacceptable levels of pesticides. The researchers

from the Swiss Federal Institute for Environmental Science and Technology said samples of rainwater they had studied contained high levels of chemicals that in some cases were above drinking water standards.

It appears the chemicals evaporate and are absorbed by clouds and then returned to the earth in the rainwater which runs off into streams and rivers. Until now scientists have assumed pesticides only infiltrated groundwater directly from fields where they were sprayed. The research also found that the highest concentration of pesticides occurred in the first rain after a long dry spell, especially when local fields have been treated.

"Drinking water standards are regularly exceeded in rain", Stephen Muller, a chemist with the Dubendorf-based Institute told New Scientist Magazine.

Under EU and Swiss regulations, a liter of drinking water should not contain more than 100 nanogram of any particular pesticide. However, Muller and his colleague Thomas Buchelli found one sample of rainwater that contained almost 4000 nanogram per liter of 2,4 dinitrophenol, a widely used pesticide.

Muller and Buchelli are concerned about the growing practice of using rainwater that falls onto roofs to recharge underground water. They say this water often contains dissolved herbicides that have been added to roofing materials to prevent vegetation growing. They suggest the first rains that fall during a storm should be diverted into sewers to minimize the pollution of drinking water, which is not usually treated to remove these herbicides and pesticides.

Ex. 3. Give the Russian for:

environmental researchers; unacceptably high level; drinking water standards; to evaporate; to infiltrate groundwater; to return to earth; streams and rivers; to prevent vegetation growing; to minimize the pollution; sample of rainwater; to divert into sewers; to treat the water; the highest concentration of pesticides; long dry spell; to remove herbicides.

Ex. 4. Translate into English.

Содержать недопустимо высокий уровень пестицидов, пробы дождевой воды; химикаты испаряются и поглощаются облаками; возвращаться на землю с дождем; попадать в ручьи и реки, просачиваться в грунтовые воды прямо с полей; самая высокая концентрация пестицидов; долгий засушливый период; обработанные местные поля; отводить воду; уменьшить загрязнение питьевой воды; очищать воду.

Ex. 5. Translate the sentences into English.

1. Проведенные исследования выявили недопустимо высокий уровень пестицидов в дождевой воде. 2. Питьевая вода содержит больше химикатов, чем положено по стандартам. 3. В природе химикаты испаряются и поглощаются облаками. 4. Затем они возвращаются на землю в виде осадков. 5. Пестициды проникают в подземные воды прямо с полей. 6. Самое высокое содержание пестицидов – в первом дожде после долгого засушливого периода. 7. По европейским стандартам, литр питьевой воды может содержать не более 100 нанограммов пестицидов. 8. Ученые очень обеспокоены загрязнением питьевой воды.

Ex. 6. Complete the sentences.

1. Environmental researchers in Switzerland believe _____. 2. The samples of rainwater contain _____. 3. It appears that _____. 4. The research also found that _____. 5. Drinking water standards are _____. 6. Drinking water should not contain _____. 7. Scientists are concerned about _____. 8. Scientists suggest _____.

Ex. 7. Answer the questions.

1. What do environmental researchers in Switzerland discover? 2. What did their studies show? 3. What happens when the chemicals evaporate? 4. What did the research also find? 5. What did Stephen Muller tell New Scientist magazine? 6. What are the standards for drinking water under European regulations? 7. What did Muller and his colleagues find? 8. What are the scientists concerned about? 9. What do they suggest?

Ex. 8. You are Stephen Muller. Speak about the problems of pesticide rains in Europe and the ways to eliminate this hazard to the readers of New Scientist magazine.

Ex. 9. You are a reporter from New Scientist magazine. Interview Stephen Muller on the topic of pesticide rains.

Ex. 10. Every day we hear about the disasters that face our planet. Animals and plants are dying. Seas and rivers are being filled with rubbish. The air is becoming poisoned with chemicals and smoke. And these are only a few examples of the ways people have lived until now damaging the world.

But lifestyles are already beginning to change as people become

aware of what is going on and make choices to live in way that less damaging the planet. Group campaigns are saving seas, rainforests, countryside. Many people call themselves “green” and the lifestyles “green living”. “Green” is becoming a household word. It is exciting time to be green.

Here is a quiz to see how green you are and how well-informed you are about the environment.

Score one point for every “yes” answer.

1. Do you read the list of ingredients on the food you buy?
2. Do you take a shower instead of bath?
3. Have you planted at least one tree?
4. Do you feed birds or squirrels in winter?
5. Do you insulate your house in winter to save heat?
6. Do you switch off lights if nobody needs them on?
7. Do you use recycled paper?
8. If you ever organized a campaign on environmental issues, score 5.
9. For short journeys, do you regularly walk if you can?
10. For long journeys, do you regularly use a hike or public transport?
11. If your family has a car, does it run on unleaded petrol?
12. If your family doesn't have a car, score 2.
13. Do you buy ozone friendly aerosols?
14. If you don't buy aerosols at all, score 5.
15. If you have ever written a manufacture to complain about their products, score 5.
16. Do you belong to any environmental organization?
17. Can you name at least one endangered species?
18. Do you take bottles to the bottle bank?
19. Do you collect aluminum cans for recycling?
20. Do you collect paper for recycling?
21. If you are a non-smoker, score 3.
22. Coming back from the forest or home from the beach, do you always take your litter with you?

How do you score?

Very pale green – score under 5.

Light green – 6–16.

Mid-green – 17–27.

Dark-green – 28–38.

There is a whole green world waiting for you. Read on, read on.

Light green (6–16).

You have already begun to notice that some parts of your lifestyle aren't very environmental friendly, but you wouldn't think twice about throwing away paper, cans and bottles. You are a bit curious about all the fuss over environmental problems and definitely want to find out more as long as it is not too difficult. You realize that it is a good move to be green.

Mid-green (17–27).

You are really thinking about the way that planets operate and you know that everything you do good or bad – will return to us sooner or later. You have made some changes to your lifestyle already. You are aware of the most common environmental problems and you feel strongly about some endangered species. Sometimes you eat fast food, but wonder what's in it. You often watch environmental programs on television. You may be thinking about joining an environmental group. Now it's time to take the leap and become an active green!

Dark-green (28–38).

You try to live in a way that does not damage the environment. You like to plant trees and take care of birds. You use recycled paper but are constantly frustrated with the lack of recycling facilities in your area. You might be a member of an environmental organization, and you have already taken part in some actions. Your friends think you are a bit obsessive but you have noticed that recently they have been coming around to your way of thinking. Be cheerful by the fact, that people are becoming more aware and there will be changes.

UNIT 4**Task 1****Ex. 1. Memorize the following words.**

- 1) To pond – запруживать
- 2) to flow – течь
- 3) duration – продолжительность
- 4) to convey – подавать, транспортировать
- 5) pipe – труба, трубопровод
- 6) reservoir – водохранилище, резервуар
- 7) sub-irrigation – подпочвенное орошение
- 8) underground – подземный, под землей
- 9) upward – вверх

- 10) furrow irrigation – полив по бороздам
- 11) corrugation irrigation – орошение по мелким бороздам
- 12) border strip irrigation – орошение методом чеков
- 13) contour irrigation – орошение с учетом рельефа
- 14) wild flooding – затопление большими нормами

Ex. 2. Translate the following word combinations.

a) Surface irrigation, sprinkler irrigation, sub-irrigation, flood irrigation, furrow irrigation, corrugation irrigation, basin irrigation, border strip irrigation; b) flooding system, flooding pipe; c) flooded crop, flooded condition; d) irrigation water, capillary water, a sheet of water, the flow of water, underground water.

Ex. 3. Translate the following sentences paying attention to the different meanings of the verb *to flow*.

1. The Don flows into the Black Sea. 2. Rivers flow from springs and lakes. 3. Tears flowed from her eyes. 4. The tide flows twice in twenty four hours. 5. Many excellent results flowed from his actions. 6. Money flows like water.

Text A

Surface Irrigation Methods

There are three general methods of applying irrigation water to the land.

In surface irrigation the water either is ponded on the soil or allowed to flow continuously over the soil surface for the duration of the irrigation.

In sprinkler irrigation the water is conveyed above the field in pipes.

In sub-irrigation the water flows underground, and the capillary water moves upward toward the surface of the land.

Surface irrigation includes the general methods of flood, furrow and corrugation irrigation.

In flood irrigation the water is permitted to cover the surface of the land in a continuous sheet.

Flood irrigation includes several methods: border strip, basin, contour or bench border irrigation, wild flooding and others.

The object of border strip irrigation is to advance a sheet of water down a narrow strip between low ridges or borders and to get the water into the soil as the sheet advances. The ridges should be low and rounded so they can be planted with the stripe.

Border strip irrigation is well adapted for all close-growing crops and is used for some row crops, such as cotton.

Basin irrigation is adapted especially to flat lands. It consists of quick filling a diked area with water to the desired depth and allowing the water to percolate into the soil. It is desirable for close-growing crops, arid orchards and rice.

Contour, or bench border irrigation is adapted to fairly uniform, moderate slopes. Border strips are laid out across the slope and the ridges are constructed parallel to each other.

In wild flooding the stream of water is diverted from its course and allowed to spread out over the field at random. It is not recommended, because the low spots in the field will get too much water and the high spots will receive none.

Furrow irrigation is the most common method of applying water to row crops. Water is applied in the furrows between the rows of plants. As water runs down the row, part of it is being absorbed all along the furrow. It is adapted to all row crops, truck crops, orchards, vineyards, and berry patches on gentle slopes.

Corrugation irrigation is well adapted to close-growing crops on sloping lands and to soil slow to take water. The water is applied in small furrows running down the slope from the head ditch. Corrugation irrigation provides uniform wetting and prevents erosive water accumulation on land too steep for borders or basins and make use of small irrigation streams.

Ex. 4. Read and translate the following words.

Ditch, to ditch, ditching, ditcher; to convey, conveyance, conveyer; to percolate, percolation, percolating; to continue, continuous, continuously, continuity, continuer; care, careful, carefully, careless; fill, to fill, filling, unfilled; to border, bordered, border, bordering; to apply, application, applicable, applied, unapplied.

Ex. 5. Give English equivalents of:

орошение по бороздам; подавать воду; орошение сплошным заливом (затоплением); узкая полоса; слой воды; низкие гребни или валики; орошение по мелким бороздам; пропашные культуры; равномерное распределение воды; вниз по склону; вызывающие эрозию; уменьшение уклона; быстрое наполнение; равномерный уклон; головная часть канала; равномерное увлажнение: лиманное орошение; полив напуском по полосам; подача воды; запруживать; течь по поверхности; продолжительность орошения; транспортировать воду в трубах; водохра-

нилице; подпочвенное орошение; орошение затоплением; полив по бороздам; покрывать поверхность; струя воды; орошение методом чеков; орошение с учетом рельефа; низкие гребни борозд; равнина; перегораживать; желательная глубина; просачиваться в почву.

Ex. 6. Match the types of irrigation with their definitions.

1) surface irrigation	a) the water flows underground
2) sprinkler irrigation	b) the water is permitted to cover the surface in a continuous sheet
3) sub-irrigation	c) the water is conveyed above the fields in pipes
4) flood irrigation	d) quick filling of a diked area with water to the desired depth
5) border strip irrigation	e) the water is either ponded on the soil or allowed to flow over the surface
6) basin irrigation	f) advancing a sheet of water down a narrow strip between low borders

Ex. 7. Complete the following sentences with the right words given below.

1. The method selected must be capable of meeting crop requirements with a minimum potential of producing drainage and salinity... . 2. The border system is a modification of flooding, in which the land is divided into strips with small borders (небольшие земляные валики) along the
3. The furrow system of irrigation is suitable for land too uneven for the border 4. They know that the supply of water should be started there
5. The introduction of the system of portable flexible pipes in surface irrigation represents a substantial contribution to the technical improvement of watering by... .

Furrows, the next week, problems, method, sides.

Ex. 8. Translate and state the meaning of *should* and *would*.

1. Adequate quantities of water should be ensured for irrigation purpose.
2. He said that this would be a multiple-purpose project providing irrigation, hydroelectric power and flood control.
3. The size of strips should be adjusted to the head of stream and soil characteristics.
4. Projects now under consideration would greatly enlarge the area of irrigated land
5. There should be proper maintenance of completed minor irrigation works.
6. They knew that the main method of irrigation in that area would be sprinkling

irrigation. 7. The engineer proposed that the scheme should be divided into small projects. 8. In this long term study, it would be useful to emphasize the importance of proper irrigation planning. 9. It is suggested that the new equipment should be used for both field and laboratory work.

Ex. 9. Translate the following sentences into English.

1. Метод полива по бороздам можно применять при различных размерах источника (for variable streams) воды. 2. Когда вода протекает по бороздкам, она всегда уносит с собой некоторое количество почвы. 3. Наиболее частой проблемой при бороздовом поливе является проблема эрозии. 4. Метод полива по бороздкам особенно удобен, когда источники воды слишком малы для орошения методом напуска по полосам или затопления по чекам. 5. Хлопчатник обычно высевается на заранее подготовленные гряды, которые перед самым посевом обильно (heavily) поливаются. 6. Для пастбищ рекомендуются поливы по полосам или по чекам.

Ex. 10. Mark the following sentences as true or false.

1. There are two general methods of applying irrigation water to the land. 2. In sprinkler irrigation the water is allowed to flow over the surface. 3. In sub-irrigation the water flows underground. 4. The object of flood irrigation is to cover the surface of the land in a continuous sheet of water. 6. Border strip irrigation is desirable for orchards.

Ex. 11. Make up short sentences using the following words and word combinations.

General methods, surface irrigation, across the slope, to make use, the stream of water, in this method, between field ditches, carefully selected grade, erosion by irrigation water, land too steep, close-growing crops, at random, to percolate into the soil, to be under way, arid areas.

Ex. 12. Answer the questions.

1. What are the general methods of applying irrigation water to the land? 2. How is water applied to the land in surface irrigation? 3. How is water conveyed in sprinkler irrigation? 4. What are the general methods of surface irrigation? 5. What methods does flood irrigation include? 6. What is the object of border strip irrigation? 7. What does basin irrigation consist of? 8. How is the water applied in wild flooding? 9. How is the water applied in furrow irrigation? 10 How is the water applied in corrugation irrigation?

Ex. 13. Write about different methods of irrigation.

Task 2

Ex. 1. Memorize the following words.

- 1) To shrink – уменьшаться
- 2) to siphon off – откачивать
- 3) to stretch – простираться
- 4) edge – кромка, край
- 5) shoreline – линия берега
- 6) diversion – забор (воды)
- 7) to divert – убирать, отводить (воду)
- 8) to vaporize – выпаривать
- 9) to extract – добывать

Ex. 2. Look at the title of the article. Why do you think the Dead Sea is in danger? Who is to blame? Invent a possible story line.

Text B

Dead Sea in Danger

The Dead Sea, the saltiest body of water on the Earth and natural treasure, is shrinking dramatically due to human decisions to siphon off its waters.

Located at the lowest point on the Earth, almost 400 meters below the sea level, in the Jordan valley, the Dead Sea is 50 kilometers long. Just 40 years ago it stretched 80 kilometers in length.

British explorers in 1917 made a mark on the stone which originally lays at the water's edge. That mark is now more than 15 metres up a cliff and water runs between the cliff and the new shoreline.

One of the main reasons of the sea's shrinkage is the diversion of water. Ninety percent of the waters that flow from the Jordan River, which traditionally supplies the Dead Sea, is diverted for drinking and agriculture in Israel and Jordan.

The region is suffering its worst water shortage in 60 years. Most Israeli agricultural produce is exported. Environmentalists argue that, if the water is not diverted and the Dead Sea was left to flourish, tourism would grow,

making up revenues lost from agriculture. Industrial activities also contribute to the Dead Sea's problems. Massive evaporation pools vaporize the water to extract minerals, which are used for industrial activities and for making beauty products. The evaporation pools account for a quarter of the Dead Sea's problems.

Currently, hundreds of thousands of tourists flock to the Dead Sea every year to float on its waters – so salty that even a well-built man can float unaided, reading a newspaper comfortably while lying on his back. The water contains a high level of sulfur, and the thick black mud that is found at the sea's edge contains healing qualities that are said to be effective in the treatment of skin diseases. Tourists smoothen themselves in the black mud, unaware of the Dead Sea's troubles.

Ex. 3. Find the English equivalents for:

самое соленое море; решения человека; откачивать воду; уровень моря; пустыня; морской берег; забор воды; испарение; добывать минералы; содержать; простирается; одна из главных причин, использовать для промышленной деятельности; сохранить.

Ex. 4. Use one of the words or word combination to fill each gap.

Shoreline, vaporize, sea's edge, extract minerals, to siphon off, float, water shortage, diversion of water, sulfur.

1. The Dead Sea is shrinking due to the human decision ____ its waters.
2. Now a road runs between the cliff and the new ____.
3. One of the main reasons of the sea's shrinkage is the ____.
4. The region is suffering its worst ____ in 60 years.
5. Massive evaporation pools ____ the water in order to ____.
6. Thousands of tourists like to ____ on the Dead Sea's waters.
7. The water contains a high level of ____.
8. The thick black mud that is found at the ____ has healing qualities.

Ex. 5. Open the brackets using the appropriate tense forms.

1. The Dead Sea (to shrink) due to human decisions to siphon off its waters.
2. 40 years ago the sea (to stretch) 80 km in length.
3. British explorers in 1917 (to make) a mark on the stone at the water's edge.
4. Water (to divert) for drinking and agriculture.
5. Most Israeli agricultural produce (to export).
6. Industrial activities also (to contribute) to the Dead Sea's problems.
7. Minerals (to use) for industrial activities.
8. Tourists (to smoothen) themselves in the black mud unaware of the Dead Sea's problems.

Ex. 6. Mark the following sentences as true or false.

1. The Dead Sea is not the saltiest body of water in the world.
2. The Dead Sea flourishes, because there are a lot of tourists.
3. People siphon off water for drinking and agriculture.
4. The Dead Sea is located at the highest point on the Earth.
5. One of the main reasons for the Sea's shrinkage is evaporation.
6. Industrial activities don't contribute to the Dead Sea's problems.

Ex. 7. Answer the questions.

1. What is the saltiest body of water on the Earth?
2. What is happening to the Dead Sea?
3. What are the reasons for the sea's shrinkage?
4. Why is the Dead Sea so attractive for tourists?
5. Can the situation be improved?

Ex. 8. Tell your partner about the Dead Sea and its problems.

Ex. 9. Role-play. One of the students is an environmentalist, the other one is a farmer, the third one is the head of the industrial enterprise located near the Dead Sea, the fourth one is a manager from the Tourist Agency. Discuss the problems of the Dead Sea and try to find the ways out.

Ex. 10. Based upon your decisions in exercise 9 write a letter explaining your views to a national newspaper.

UNIT 5

Task 1

Ex. 1. Learn the following words.

- 1) To run – прокладывать
- 2) slope – склон, уклон
- 3) contour – контур, рельеф
- 4) rectangular – прямоугольный
- 5) length – длина
- 6) spacing – промежуток
- 7) loose – свободный
- 8) to cause – быть причиной
- 9) loss – потеря
- 10) deep – глубокий

- 11) percolation – просачивание
- 12) initial – первичный
- 13) to reduce – уменьшать
- 14) runoff – сток
- 15) remainder – остаток
- 16) bed – грядка
- 17) level – уровень

Ex. 2. Odd one out.

1. Furrow, water, ridge, soil.
2. Land, soil, erosion, ground.
3. Spring, stream, sheet, field.
4. To occur, to happen, to take place, to reduce.
5. Slope, incline, declivity, plain.

Ex. 3. Translate the sentences paying attention to the different meanings of the words.

To run: 1. Water ran into the bucket. 2. She was running hot water into the tub. 3. The river was running clear. 4. Tears ran down her cheeks. 5. The ice-cream is beginning to run. 6. The road runs across the plain. 7. A deep ravine ran under the hill. 8. He runs a fence round.

Bed: 1. You should water the flowers on the bed. 2. There is much shell-fish on the seabed in some places. 3. It is necessary to prepare the bed before sowing.

Field: 1. We saw people working together in the field. 2. Water reclamation is my particular field of study. 3. We'll study this subject in the field.

Ex. 4. Before reading the text answer the questions.

1. What do you know about furrow irrigation? 2. When is it used?
3. What crops can be irrigated by the furrow method? 4. How is water applied?

Text A

Furrow Irrigation

How can crops such as potatoes, corn, fruit and vegetables be irrigated by the furrow method? Water is applied in the furrows which are generally made by cultivating between the plant rows. Furrows are most commonly

run directly down the slope, but sometimes can be run on the contour to control erosion from rainfall or irrigation water. You may also rim furrows across the slope to keep the farm field rectangular, and to keep row lengths uniform. When this is done care must be taken to prevent the water overtopping the furrows and breaking them. The spacing of the furrows is ordinarily determined by the spacing of the row crop. Furrow irrigation is adaptable to a great variation in land slopes and soil textures. You can use furrows with either large or small streams of irrigation water because you can divide the available water in any number of furrows you wish. The soil in the furrows is generally loose from cultivation, so care should be exercised to limit the stream of water in the furrow not to cause erosion. Unnecessary water losses will occur from deep percolation if furrows are too long. With furrow irrigation the initial stream should be large enough to get through the furrow rapidly without erosion. The stream should then be reduced so that excessive runoff will not occur during the remainder of irrigation.

This system of irrigation is also used extensively by farmers to irrigate crops planted on beds ridges on nearly level land.

Ex. 5. Find the English for:

прокладывать борозды; ряды растений; вниз по склону; бороться с эрозией; предотвратить чрезмерный полив; промежуток между бороздами; ограничить поток воды в борозде; уменьшить нежелательные потери воды; глубокое просачивание; первый поток.

Ex. 6. Match the synonyms and use them in your own sentences.

1) Soil, 2) rapidly, 3) to reduce, 4) to care, 5) initial, 6) ordinarily, 7) to wish, 8) to occur.

a) to look after, b) to decrease, c) land, d) commonly, e) to want, f) to happen, g) the first, h) quickly.

Ex. 7. Read the sentences translating the modal verbs in brackets.

1. Potatoes, corn, fruit and vegetables (могут) be irrigated by the furrow method. 2. You (можете) also run furrows across the slope. 3. Care (следует) be taken to prevent the water overtopping the furrows. 4. You (можете) use furrows with either large or small streams of water. 5. Care (следует) be exercised to limit the stream of water. 6. The initial stream (должен) be large.

Ex. 8. Answer the questions.

1. How can crops be irrigated by furrow method? 2. How are furrows run? 3. Why must care be taken? 4. What is the spacing of the furrows determined by? 5. What soil texture is furrow irrigation adaptable to? 6. Can farmers use furrows with large or small streams of irrigation water? 7. What is done to prevent unnecessary water losses? 8. Where is this system of irrigation also used?

Ex. 9. Write about furrow irrigation.

Task 2

Ex. 1. Before reading the text look through the following words.

- 1) Steam – пар
- 2) to estimate – подсчитывать
- 3) to evaporate – испаряться
- 4) capacity – мощность, емкость
- 5) artificially – искусственно
- 6) to turn out – оказаться
- 7) tantamount – равносильный
- 8) sizeable – значительный
- 9) bulk – объем
- 10) annually – ежегодно
- 11) obvious – очевидный
- 12) uneven – неравномерный

Ex. 2. Translate the following words and word combinations.

1) Water, to water, water table, water crisis, water balance, water resources, water problem, water conditions; 2) evaporation, evaporation process, to evaporate; 3) land, from the ocean to the land and back, to land, mainland; 4) pure, pure water, to purify; 5) to distribute, distribution.

Ex. 3. Before reading the text answer the questions.

1) What is the article about judging by the words from ex.1? 2) Do you know anything about world water balance and the water resources of the Earth? 3) Where are the largest reservoirs of water on the Earth? 4) What do you know about the problem of the fresh water? 5) Do we drink pure water? Where is it taken from? 6) Why is there water crisis obvious in some countries? 7) What can be done to solve the problem of freshwater?

Text B

The Water of the Earth

How much moisture is involved in the giant cyclical process of ocean-atmosphere-land-ocean? What is the mechanism of this conveyor thanks to which moisture gets from the ocean to the land and back?

It has been estimated that a total of 577,000 cu km of water annually evaporates on our planet, chiefly from the surface of the ocean. This is a process of tremendous energy. It would take 44 million power stations, each with a capacity of 1,000 million kW, to artificially produce the amount of energy involved in the evaporation process.

Hydrologists made several interesting discoveries, for instance, they established that there is another important link in the external rotation of moisture – the flow of moisture from the mainland to the ocean through the atmosphere. Prior to this it was believed that all moisture coming from the ocean falls to the ground as rain or snow and then is carried back to the ocean by the rivers. It turns out that the sky is literally furrowed by powerful and deep rivers. Every year, for example, 4,000 cu km of water “flows” above the Volga area – this is tantamount to twenty rivers such as the Volga.

The data on the transfer to steam in the atmosphere can be used for calculating the water balance of the mainland, large river basins, and for analyzing how water conditions are shaped over large territories.

According to the calculations, the reserves of water on the planet total 1.386 million cu km, of which only 2.5 per cent is freshwater. The most sizeable part of it is conserved in the ice covers of the Atlantic and the Arctic. Only 0.25 per cent of the reserves is to be found in lakes and only 0.006 per cent in rivers. Scientists maintain that the bulk of water resources are within the “secular” category, that is they replenish their reserves at an extremely slow rate and cannot be used without running the risk of upsetting the balance of nature. For many years water reserves on the planet were considered to be unlimited, but it's not so. A water crisis is becoming obvious. The reason lies not in the uneven distribution of water resources, but also in growing pollution of water.

The most realistic way to solution of the water problem is the rationalization of the use of water.

Ex. 4. Give the English equivalents for:

гигантский циклический процесс; влага; с океана на землю и обратно; огромная энергия; мощность; процесс испарения; искусственно; интересное открытие; важная связь; материк; выпадать на землю; мощные реки; передвижение пара; водный баланс; большие речные бассейны; запасы воды; пресная вода; лед; крайне низкий уровень.

Ex. 5. a) Find the synonyms to the following words in the text:

humidity, huge, transpiration, mainly, evaluation, to purify.

b) Find the antonyms to the following words in the text:

drought, small, rapid, shallow, unreal.

Ex. 6. Choose the right word.

1. A total of 577,000 cu km of water annually (evaporates, penetrates, percolates) on our planet 2. All moisture coming from the ocean (evaporates, repures, falls) to the ground as rain or snow. 3. The reserves of (polluted water, ocean water, freshwater) is 2.5 per cent. 4. The most sizeable part of water is conserved in the (ice covers, icebergs, ice caps) of the Antarctic and the Arctic. 5. The reason for a water crisis is in growing (population, pollution, distribution). 6. The water on the planet can and must (restore, repure, replenish).

Ex. 7. Complete the sentences.

1. It has been estimated that... .
2. Hydrologists estimated that... .
3. It turned out that the sky... .
4. The reserves of water on the planet... .
5. Fresh water is... .
6. The most sizeable part is... .
7. Unfortunately the water crisis is... .
8. The most realistic way to solve the problem is... .

Ex. 8. Answer the questions.

1. What is the article about? 2. How much water evaporates on our planet annually? 3. Is it the process of tremendous energy? 4. What interesting discoveries did hydrologists make? 5. How much water is there on the planet? What about freshwater? 6. Where is the most sizeable part of water? 7. Why is water crisis becoming obvious? 8. What is the most realistic way to the solution of the problem?

Ex. 9. You are going to participate in the conference “World Water Balance and the Water Resources on the Earth”. Be ready to make a speech on the topic.

Ex. 10. Role-play. The Chairman of the State Committee for Hydrometeorology and Environmental Control holds a press conference for the reporters. The theme of the conference is “The water of the Earth”.

UNIT 6

Task 1

Ex. 1. Memorize the following words.

- 1) Beneath – под, внизу, ниже
- 2) to create – создать
- 3) artificial – искусственный
- 4) water table – уровень грунтовых вод
- 5) depth – глубина
- 6) permeable – проницаемый
- 7) salinity – соленость
- 8) smooth – гладкий, ровный
- 9) percolation – просачивание
- 10) impervious – непроницаемый
- 11) layer – слой
- 12) substratum – подпочвенный слой
- 13) ditch – канава, ров, малый распределительный канал
- 14) lateral – поперечная отводная канава
- 15) ditch – канава, ров, малый распределительный канал
- 16) tile drain – трубчатый дренаж
- 17) application efficiency – коэффициент полезного действия

Ex. 2. Translate the words and word combinations.

- 1) To apply, application, applied, applying; 2) artificial, artificially;
- 3) root, rooting zone; 4) permeable, permeability, permeate, permeation;
- 5) percolation, percolate, percolated.

Ex. 3. Before reading the text answer the questions.

1. What irrigation methods do you know? 2. How is water applied in different irrigation methods? 3. What is sub-irrigation? 4. How is water applied in this method? 5. What crops can be irrigated by this method?

Text A

Sub-irrigation

Sub-irrigation is a method of applying water beneath the ground surface. It is usually done by creating an artificial water table and maintaining at some predetermined depth, usually 12 to 30 inches below the ground surface for farm crops. Moisture reaches the plant roots through capillary movement. Application efficiencies vary from 30–50 % in some areas up to 70–80 under favorable conditions.

Sub-irrigation requires permeable soils provided that the soil permeability in the rooting zone is homogeneous, and salinity is not a potential hazard. For successful sub-irrigation, an adequate supply of water of good quality must be available throughout the growing season. The topography must be nearly level and smooth.

A barrier against excessive losses through deep percolation must exist in the soil profile. The barrier may be a relatively impervious layer in the substratum. The distribution system must consist of a well planned system of main ditches, field laterals, and structures, which will permit the water table to be raised to a uniform depth below the ground surface over the entire area. An adequate outlet for the drainage of the irrigated area must be provided for particularly in humid areas.

The principles involved in sub-irrigation are the same in all areas, although the means of introducing water into the soil profile may differ. An artificial water table is created over a natural barrier that prevents deep percolation of the water.

Water may be introduced into the soil profile through open ditches, through mole drains, or through tile drains. The first way is most widely used because it is relatively inexpensive and is adaptable to all the soil types that can be sub-irrigated. Mole and tile drains can be used in organic soils.

The main crops so irrigated are potatoes, beets, onion and corn.

An effective drainage system has to be provided so that the water table can be lowered rapidly when necessary and harmful salts can be leached out of the profile.

The entire system, when adequately planned, installed and maintained, provides excellent drainage during the rainy season.

Under limited situations, subsoil irrigation may be a very desirable system of irrigation. In general, however, it must be used with great caution. Danger from waterlogging and salt accumulation is great.

Ex. 4. Translate the following nouns. Mind their plural forms.

Axis – axes, basis – bases, datum – data, phenomenon – phenomena, stratum – strata, substratum – substrata.

Ex. 5. Form nouns from the following verbs.

Apply, drain, measure, moisten, create, perform, indicate, reclaim, consider, know, mean, improve, fulfill.

Ex. 6. Translate and memorize the following words.

1) Deep, depth, deepen; 2) wide, width, widen; 3) long, length, lengthen; 4) strong, strength, strengthen; 5) high, height, heighten.

Ex. 7. Arrange the following words in pairs of synonyms:

- | | |
|------------------|---------------|
| a) to maintain | 1) to change |
| b) to produce | 2) cheap |
| c) to vary | 3) hazard |
| d) risk | 4) relatively |
| e) entire | 5) beneath |
| f) below | 6) to support |
| g) comparatively | 7) to create |
| h) inexpensively | 8) whole |

Ex. 8. Give one word for the following.

Slight wetness, in general, of the same sort, not natural, very good, too much, to filter through, way for the water.

Ex. 9. Find the Russian equivalents for the following English words and word combinations:

- | | |
|-------------------------------|-------------------------------|
| a) the plant roots | 1) глубокое просачивание |
| b) under favorable conditions | 2) водопроницаемая почва |
| c) to adapt | 3) относительно недорогой |
| d) deep percolation | 4) покрывать, охватывать |
| e) permeable soil | 5) это делается посредством |
| f) over the entire area | 6) корни растения |
| g) it is done by | 7) при благоприятных условиях |
| h) relatively inexpensive | 8) на всей площади |
| i) to cover | 9) водопроницаемость почвы |
| j) soil permeability | 10) приспособлять |

Ex. 10. Find the English for:

подпочвенное орошение; под поверхностью земли; уровень грунтовых вод; поддерживать; хорошо пропускать жидкость; запас воды хорошего качества; вегетативный период; непроницаемый слой; система распределения; боковые поперечные отводные каналы; способы подачи воды в почву; кротовая дрена, трубчатый дренаж.

Ex. 11. Translate the Russian word combinations into English.

1. Sub-irrigation is usually done by (создание искусственного уровня грунтовых вод) and maintaining at (определенной глубине). 2. (Влага достигает корней растений) through capillary movement. 3. Sub-irrigation requires (проницаемые почвы). 4. (Соленость) is not a potential hazard. 5. A barrier against (избыточных потерь) through (глубокое просачивание) must exist in soil profile. The burner must be an (непроницаемый слой). 6. (Система распределения) must consist of well planned system of (главных каналов и поперечных отводных каналов). 7. Water may be introduced into the soil profile through (открытые каналы, кротовые дрены, трубчатый дренаж).

Ex. 12. Translate the following word combinations and use them in sentences.

Beneath the ground surface; open ditches; some predetermined depth; the rooting zone; a potential hazard; an adequate supply of water; an adequate outlet; level and smooth; of good quality; impervious layer; a uniform depth; organic soils; the main crops; harmful salts.

Ex. 13. Answer the following questions.

1. How do we apply water in sub-irrigation? 2. What soils does sub-irrigation require? 3. How does moisture reach the plant roots? 4. State the main conditions necessary for successful sub-irrigation. 5. How may water be introduced into the soil profile in sub-irrigation? 6. What are the main crops irrigated in such a way? 7. What must the distribution system consist of? 8. Why must sub-irrigation be used with great caution? 9. What must be provided in humid areas? 10. Are the principles involved in sub-irrigation the same in all areas? 11. Are the means of introducing water into the soil different? 12. What prevents deep percolation of water? 13. How may water be introduced into the soil profile? 14. What way is most widely used? Why?

Ex. 14. Translate into English in writing.

1. Система подпочвенного орошения должна быть тщательно спроектирована, а поверхность выровнена так, чтобы глубина контролируемого уровня воды под поверхностью почвы была одинакова на всей площади. 2. На почвах с весьма высокой водопроницаемостью распределение воды посредством открытых каналов является достаточным, на почвах с пониженной водопроницаемостью следует использовать кротовые или гончарные дренажные линии. 3. При кротовом подпочвенном поливе вода протекает по кротовинам (through the mole-passages), проделанным кротовым плутом или дренажно-кротовой машиной. 4. При поверхностных методах полива вода на орошаемой площади используется менее равномерно (less evenly) по сравнению с дождеванием или подпочвенным орошением. 5. Но различие методов полива становится более очевидным (more apparent), когда необходимы небольшие поливы.

Task 2

Ex. 1. Look through the following words.

- 1) Dam – дамба, плотина, запруда, водохранилище
- 2) concrete – бетон
- 3) concern – проблема
- 4) community – общество
- 5) to harness – обуздать, покорить
- 6) to collapse – рушиться
- 7) faulty – ошибочный
- 8) earthquake – землетрясение
- 9) embankment – насыпь
- 10) spillway – водослив, водосброс
- 11) to erect – воздвигать, сооружать
- 12) to map – наносить на карту
- 13) to relocate – перемещать, перебазировать
- 14) outlet – выходное, выпускное отверстие
- 15) valve – клапан.

Ex. 2. Before reading the text answer the questions.

1. What is a dam? 2. How do dams help farmers? 3. What are dams usually built of? 4. What hazards can dams cause?

Text B

Dams

Dams have influenced civilization for thousands of years, especially cultures that depended on irrigation. The Egyptians built the earliest known dam on the Nile River about 2800 BC. But dams probably were built much earlier. The ancient Romans built dams of cut stone throughout the Roman Empire. Some of these dams are still in use today.

Dam is a barrier that is placed across the river to stop the flow of water. Dams vary in size from small earth or rock barriers to concrete structures that rise as high as a skyscraper. People have always had to gather water during wet seasons to have enough for themselves, their animals, and their crops in dry spell.

Throughout the history, whenever people settled, an important first concern was to locate near an adequate water supply. In many regions streams full of water during certain seasons of the year become dry at other times, perhaps when water is most needed. At first, people built small dams of earth and rock that would store enough for immediate needs. But floods often washed these dams away. As communities grew and population increased, people learned to construct larger dams that would provide a more permanent and abundant water supply. These dams could store enough water to meet people's needs during seasonal drops in the water supply and during drought periods covering several years. Later people learned how to harness the energy of falling water and use to produce electric power for homes and industries.

In order to construct a dam, the builders must first gather and study much information. The site where the dam is to be erected must be examined for its formation, quality of foundation, and the availability of suitable construction materials. The careful analyses must be made on the stream-flow characteristics. The area to be covered by the reservoir that the dam creates must be outlined when determining the height of the dam at any given site. This requires detailed topographic mapping and the geologic studies. Subsurface drilling is necessary to determine the condition, quality, and location of the rock formation under the damsite.

All property in the reservoir areas must be relocated. This occasionally requires the relocation of entire towns, highways, railroads. Engineers must also determine the amount of mud, silt and debris which the dam will stop. This will determine the useful life of the reservoir, because when the reser-

voir becomes filled with this material it can no longer store water. If the dam is to be used for generating power, outlets must be provided which will connect to generating equipment. If the water is to be used for irrigation or municipal supply, outlets to control its release to canals or aqueducts must be built.

In designing a dam some provision must be made to bypass water when the reservoir is full, without overtopping the dam. For this purpose, a spillway is constructed. Spillways act as safety valves by releasing excess waters that the reservoirs cannot contain. A spillway may be a channel apart from the dam or a section of the dam over which water can flow freely. The excess water flows from the reservoir through the spillway and back to the downstream river or drainage channel. A spillway must be large enough to handle the water from a major flood.

However, dams can create serious safety hazards. If a dam collapses it can cause enormous property damage, injury, and sometimes death. A dam can collapse because of faulty construction or an earthquake. Erosion can also lead to a dam's collapse. A dam can be eroded from the inside by water leaking into the embankment, the foundation, or structures attached to the dam. If the spillway is too small, water may flow over the top of the dam and cause erosion.

Ex. 3. Translate the word combinations into Russian.

To erect the dam; stream-flow characteristics; to determine the height of the dam; the given site; detailed topographic mapping; subsurface drilling; location of the rock formation under the damsite; the amount of mud and silt; useful life of the reservoir; generating power; equipment; outlets to control water release; to bypass water; overtopping the dam; to release excess water; downstream river; drainage channel; to handle the water from a major flood.

Ex. 4. Give the English equivalents.

Остановить поток воды; различаться по размеру; бетонные сооружения; влажный период; зависеть от орошения, селиться недалеко от запаса воды; наводнения часто смывали дамбы; строить (сооружать) большие дамбы; обеспечить постоянный запас воды; периоды засухи; энергия падающей воды; производить электроэнергию; создавать; проблемы безопасности; разрушиться; просачивание воды; насыпь; вызывать эрозию; водослив.

Ex. 5. Find the right meaning of the underlined words.

1. Dams vary in size.

a) exceed; b) differ; c) leak.

2. People gather water to have enough in the dry spells.

a) time; b) period; c) mouths.

3. The first concern was to locate near an adequate water supply.

a) to settle; b) to leave; c) to build.

4. If a dam collapses it can cause enormous damage.

a) destroys; b) breaks out; c) restores.

5. A dam can collapse because of a faulty construction.

a) wrong; b) false; c) reliable.

Ex. 6. Complete the sentences.

1. People gather water to ____.
2. First, people built dams of ____.
3. Floods often ____.
4. Modern dams are built of ____.
5. In order to construct a dam the builders must ____.
6. Engineers must also determine ____.
7. Spillway is constructed ____.
8. Dams can create ____.
9. A dam can be eroded from ____.

Ex. 7. Answer the questions.

1. Which nation built the earliest known dams? Where? When?
2. What is a dam?
3. What are dams built of?
4. Why have people had to gather water?
5. What was an important first concern throughout human history?
6. What dams did people build at first?
7. What are dams built of now?
8. What must builders do before the construction of a dam?
9. What must engineers also determine?
10. What must outlets be provided for?
11. What is spillway constructed for?
12. What safety hazard can dams create?
13. What are the reasons for a dam's collapse?

Ex. 8. Tell about the dams using the plan.

1. The history of the dams.
2. Their importance for civilization.
3. Construction of dams.
4. Safety hazards.

Ex. 9. Discuss with your partner advantages and disadvantages of building dams, ways out to eliminate safety hazards.

Ex. 10. Role-play. Local people are opposing a hydro-electric scheme involving building a dam across the valley.

The characters:

- a) a farmer;
- b) a conservationist;
- c) an old lady or man.

The representatives of the proposers of hydro-electric scheme:

- a) an expert on energy;
- b) an engineer;
- c) a recruitment officer from the company who will build the dam.

UNIT 7

Task 1

Ex. 1. Read and memorize the following words.

- 1) Uniform – постоянный
- 2) steep – крутой
- 3) ditch – канава, ров
- 4) corrugation – мелкая борозда
- 5) dike – канава, ров, малый распределительный канал
- 6) debris – наносы, примеси
- 7) tight – плотный, непроницаемый
- 8) rotating sprinkler heads – дождевальная аппаратура с вращающимися насадками
- 9) fixed jet – неподвижный аппарат
- 10) perforated pipe – перфорированная труба
- 11) nozzle – насадка, сопло
- 12) intake rates – скорость поглощения
- 13) sprinkler in the low-pressure range – низконапорная дождевальная система
- 14) medium pressure sprinkler – средненапорный дождевальная аппаратура
- 15) precipitation rates – интенсивность дождя

Text A

Sprinkler Irrigation

In sprinkler irrigation the water is sprayed into the air and allowed to fall on the land surface in a uniform pattern. This method came into widespread use because it could be adapted to most sites and crops.

The advantages of sprinkler irrigation, properly installed and operated, are:

1) Erosion can be controlled. Safe irrigation is possible on land too steep for the efficient use of other methods.

2) Uniform application is possible on all kinds of soil. On sandy soils that have high intake rates sprinkler irrigation distributes water better than other methods do.

3) Land preparation is not required. More land is available for cropping. Field ditches, corrugations and dikes are not needed.

4) Small streams of irrigation water can be used efficiently.

The limitations are:

1) Rather high initial cost of installation. Much water may be lost due to evaporation and wind.

2) A constant water supply is needed for the most economical use of equipment. The water must be clean and free of sand and debris.

3) Tight soils, which have slow intake rates, cannot be irrigated efficiently.

Three types of sprinkler systems are used to irrigate farm crops: rotating sprinkler heads, fixed jets, perforated pipes. Rotating sprinkler-head systems are the more widely used type.

Each rotating sprinkler head applies water to a given area. This area is governed by the nozzle size and the water pressure. Sprinklers in the low-pressure range have small area of coverage. Medium-pressure sprinklers cover larger areas and have a wide range of precipitation rates.

High-pressure sprinklers cover large areas, and precipitation rates are higher than for the moderate or medium pressures.

The sprinkler system includes the pumping plant to provide needed pressure, the sprinkler, the riser pipe, the main pipeline, and the lateral distribution pipe. Sprinkler systems are classified as (1) permanent installations, with buried main and lateral lines, (2) semi-permanent, with fixed main lines and portable laterals, and (3) fully portable systems.

Sprinklers with perforated pipes deliver water through very small holes, drilled at close intervals along a segment of the circumference of a pipe.

Electric motors and internal-combustion engines are used to drive the pumps.

Ex. 2. Read and translate the following words paying attention to the suffixes and prefixes.

1) To operate, operated, operating, operation, operational; 2) limit, limitation, limited, unlimited, limitless; 3) erosion, to erode, eroded, erosive; 4) efficiency, efficient, efficiently, inefficient, inefficiency; 5) to cover, covered, coverage, covering; 6) to discover, discovery; 7) to fix, fixation, fixed, fixable, unfixed; 8) to impress, impression, impressive; 9) to reduce, reduced, reduction, reductive; 10) to govern, governing, government, governmental, governor.

Ex. 3 Arrange the following words in pairs of synonyms:

soil, to operate, rightly, to carry out, to let, to obtain, properly, to work, over, earth, to fulfill, more, to collect, to get, to allow, to store.

Ex. 4. Arrange the following words in pairs of antonyms:

slow, to include, internal, to fall, wide, initial, high, upward, external, westward, to rise, quick, to exclude, narrow, final, low, downward, eastward.

Ex. 5. Translate the following word combinations and use them in sentences.

To irrigate farm crops; on the land surface; land preparation; permanent installation; most sites and crops; to deliver water; apply water to a given area; a constant water supply; initial cost of installation; buried lateral pipe lines; riser pipes; small area of coverage; internal-combustion engines; to provide needed pressure; portable systems; to drive the pumps; small streams of irrigation water.

Ex. 6. Answer the following questions.

1. Why did the method of sprinkler irrigation come into wide-spread use? 2. What are the advantages of sprinkler irrigation? 3. What are the limitations of sprinkler irrigation method? 4. What types of sprinkler systems are used to irrigate farm crops? 5. What does the sprinkler system include? 6. How are sprinkler systems classified?

Ex. 7. Give English equivalents of:

преимущества метода дождевания, на всех типах почв, равномерная подача воды, распределять воду лучше, земли со значительным уклоном, недостатки метода, потери на испарение, довольно большие расходы, при орошении дождеванием, виды систем дождевания, главный трубопровод, боковые трубопроводы, неподвижный главный трубопровод, полустационарная установка, передвижные боковые трубопроводы.

Ex. 8. Complete the following sentences with the right words given below.

1. The uniformity of distribution with sprinkler method is directly affected by 2. Portable mains are more economical when a sprinkler system is to be used on any of a number of 3. The permanent lines should be buried so as to be out of the way of farming 4. Water supplies, including source, quantity and quality, should be investigated as an early step in the design of a ...

Sprinkler system, operations, fields, wind.

Ex. 9. Translate the sentences paying attention to different types of conditionals.

1. If all the above projects are carried out, the present course of this river will be changed. 2. If suitable steps were not taken, the hydro-engineering structures would be silted up in a short time. 3. Had adequate basic data been collected before initiating construction, it is quite possible the project could have been brought into operation earlier. 4. If this factor had been taken into account, it is apparent that the scheme would not have been initiated. 5. If this country was to ensure an increase in its exportable surplus of rice, a much more comprehensive scheme would be required.

Ex. 10. Translate the following sentences into English.

1. Дождевальную систему следует проектировать так, чтобы полив производился с наименьшим расходом средств в течение года. 2. Ширина полосы, орошаемой перфорированной трубой, зависит от размера отверстий и напора воды. 3. Им надо будет использовать средненапорные дождевальные системы на тех полях. 4. Орошение дождеванием можно использовать почти для всех сельскохозяйственных культур (за исключением риса и джута) и почти на всех видах почв.

Ex. 11. Complete the table.

Types of sprinkler systems			
Classification of sprinkler systems pressure			
Parts of sprinkler systems			

Task 2

Ex. 1. Read and memorize the following words.

- 1) Indispensable – незаменимый
- 2) endemic – местный, присущий данному месту
- 3) indefinitely – навечно
- 4) to intend – предназначать
- 5) draft – проект
- 6) predicament – опасное, неприятное положение
- 7) pertinent – соответствующий
- 8) crucial – критический
- 9) imperative – крайне необходимо
- 10) lakefront – расположенный вблизи озера
- 11) inadvertently – неумышленно
- 12) smokestack – труба
- 13) to spare – щадить
- 14) to entrust – вверять, поручать
- 15) to persist – оставаться

Ex. 2. Read the words and translate them into Russian paying attention to the prefixes.

Dispensable – indispensable; like – unlike; definitely – indefinitely; fortunately – unfortunately.

Text B

People and Lakes

Lakes are indispensable source of fresh water for humans, animals, plants and many species of fish. Some of these species can live only in lakes, or are endemic to one particular lake. There are lakes rich in therapeutic mud or table salt, but the real shared wealth of lakes is the Beauty that we and our planet would be so much poorer without.

Unlike dynamic rivers, lakes, for the most part, are settling tanks: once contaminated they stay so indefinitely. Though outflowing rivers may drain lakes by some of their contaminants, about 60 per cent of the pollution is retained. In deep lakes toxic substances may settle into the silt, whereas shallow waters are warmed by the sun to the bottom and thoroughly agitated in summer. A poisoned lake ages quickly. From a historical standpoint, this is a split-second process.

The natural life span of a lake is hundreds of thousands, maybe millions of years. In a healthy lake silt accumulates by a few millimeters a year till it becomes a swamp. People and industrial wastes, harmful farming practices and lakefront highways pollute either the lakes or its inflowing rivers. It takes just a few years for a bog to take over a small polluted lake; a larger one may resist for a little longer and die after a few decades instead of the millions of years intended by Nature.

For example, Lake Baikal, along with some smaller lakes, is in predicament. A lot is being said and written on the issue. But emotions remain emotions. It is time for real technical solutions: wasteless technology, water circulation and lakefront farming.

Some of the Great Lakes, located between the United States and Canada, are not just dead, but even dangerous to swim in. It has become clear that human activity, such as industry, agriculture, tourism and road construction, is not all that should be taken into consideration. The state of the atmosphere, solar activity and tectonics are just a few pertinent factors. All these comprise a chain in which every link may become crucial. Scientists therefore are looking for ways to exclude even a possibility of a disaster. It is imperative that everyone be aware of the consequences of today's decisions. All this calls for education about ecology.

When a factory manager is not concerned with the minute quantities of heavy metals and poorly treated wastes of his plant release into a nearby river, it means he doesn't realize that lake fish will be poisoned, and fairly soon. When a farmer (to water his vegetables more conveniently) digs his or her garden to the lakefront, he or she is contributing to the lake's fast decay. In one way or another, we are all shaping the destiny of the lakes.

Everyone is responsible. And the rivers that transport their contaminated waters to lakes hundreds of kilometers away are not alone to blame. For decades the highest smokestacks had been built to take sulphur dioxide or other byproducts of coal and fuel-oil burning away and to the atmosphere. But then the Swedes traced the deaths of many Swedish lakes to the sulphur-dioxide-rich winds from Great Britain. The deathly gas interacted with atmospheric moisture to produce sulphuric acid. Neither algae, nor fish were spared by the acid rains that followed.

It is time to realize that History has entrusted our generation with the responsibility for the planet our children will inherit. Fortunately, there is a growing public awareness of our responsibility, although a prehistoric mentality still persists.

Ex. 3. Give Russian equivalents of the following words and word combinations.

Lake, source, unlike, tank, resist, a little longer, bog, predicament, shut down, pertinent factors, human activity, consequences, the lake's fast decay, dig, sulphur-dioxide-rich, for decades, will inherit, table salt, toxic substances, take over, to threaten.

Ex. 4. Say whether the following statements are true or false. Correct the false ones.

1. Lakes are an important source of fresh water.
2. Lakes are dynamic.
3. The natural life span of a lake is a few decades.
4. Every person is responsible for the consequences of lakes pollution.
5. Factory managers have to be concerned with the problem of wastes their plants dump into rivers and lakes.
6. Rains are dangerous to fish.

Ex. 5. Find words which mean:

- 1) people; 2) kinds; 3) not having; 4) moving; 5) polluted; 6) forever; 7) bog; 8) not ill; 9) plants; 10) desperation; 11) situated; 12) catastrophe; 13) everybody; 14) to understand; 15) having responsibility.

Ex. 6. Fill in the gaps with the appropriate words from the list below.

1. There are lakes rich in ... or 2. Outflowing rivers may drain lakes by 3. Industrial wastes, harmful farming practices and highways ... lakes and rivers. 4. Lake Baikal, along with some smaller lakes, is in 5. All these factors comprise a chain in which every link may become 6. When a farmer digs his garden close to the lakefront, he is contributing to the lake's fast 7. The deathly gas interacted with atmospheric moisture produces 8. It is time to realize that history has entrusted our generation with the ... for our planet.

Table salt, pollute, crucial, sulphuric acid, therapeutic mud, their contaminants, predicament, decay, responsibility.

Ex. 7. Answer the following questions.

1. Why are lakes important to people?
2. What pollutes lakes and rivers?
3. Can lakes stay contaminated forever?
4. What threatens the Great Lakes?
5. Are the Great Lakes dangerous to swim in?
6. What factors of water pollution should be taken into consideration?
7. Why are fish poisoned in lakes?
8. How do smokestacks pollute lakes and rivers?
9. What do we have to realize not to poison all the lakes on the Earth?

UNIT 8

Task 1

Ex. 1. Read and memorize the following words.

- 1) Sprinkler – опрыскиватель
- 2) infiltration – просачивание
- 3) to save – сберегать, экономить
- 4) to apply – применять
- 5) capacity – способность
- 6) the above – вышеупомянутый
- 7) essential – существенный, необходимый
- 8) supplemental – дополнительный
- 9) psi – паскаль на квадратный дюйм
- 10) pressure – давление
- 11) hydraulic – гидравлический.

Text A

Sprinkler Systems

Sprinklers have been used on all soil types, on land of widely different topography and slopes, and for many crops. Sprinklers are especially desirable to irrigate soils having high infiltration rates, shallow soils and areas having steep slopes and erosive soils. Under these conditions sprinklers save water, labor, and soil and usually increase crop production over any method.

Sprinkler irrigation systems may be divided into three groups according to the purpose for which they are used: 1) the main irrigation system, 2) the supplemental irrigation system, and 3) the protective irrigation system.

In arid regions, where all the crops depend on irrigation, sprinkler systems are used to apply all the water used by the crops. The design of such a system must be based on the available water-holding capacity of the crop. Sufficient equipment must be available to cover the given area in the time calculated from the above two factors.

In some areas where the natural rainfall is usually adequate to supply crop needs, there are times when additional water during short periods is essential to obtain normal crop. Perhaps but one water application is needed. This is called supplemental irrigation.

Sprinkler systems operate under a wide range of pressure from 5 psi to over 100 psi. The pressure depends upon power costs, area, type of sprinkler used with systems, and crop.

Low pressure ranges from 5 to 20 psi; medium one – from 21 to 50; and high pressure – from 51 to 100 psi. Pressures above 100 psi are called hydraulic.

Ex. 2. Choose the right answer to the question.

1. What soil types have sprinklers been used on?
a) all soil types; b) only on level lands and slopes?
2. How many groups may sprinkler irrigation systems be divided into?
a) two; b) three.
3. What do all crops in arid regions depend on?
a) irrigation; b) topography.
3. Is additional water essential to crops in areas with adequate natural rainfall?
a) no; b) yes.
4. How do low pressures range?
a) from 5 to 20 psi; b) from 21 to 50 psi.

Ex. 3. Match the synonyms:

- | | |
|------------------|-----------------|
| 1) purpose | a) to vary |
| 2) to range | b) to get |
| 3) to divide | c) to construct |
| 4) to obtain | d) sufficient |
| 5) to calculate | e) rainfall |
| 7) to operate | f) to split |
| 8) to design | g) aim |
| 9) precipitation | h) to estimate |
| 10) essential | i) to work |

Ex. 4. Match the words with the opposite meanings:

- | | |
|------------------|----------------|
| 1) different | a) low |
| 2) high | b) to waste |
| 3) steep | c) artificial |
| 4) to save | d) same |
| 5) to increase | e) unnecessary |
| 6) natural | f) to misuse |
| 7) essential | g) main |
| 8) wide | h) narrow |
| 9) to use | i) to decrease |
| 10) supplemental | j) flat |

Ex. 5. Put the sentences into the correct order as they follow in the text.

1. Sprinkler irrigation systems may be divided into three groups. 2. In some areas where the natural rainfall is adequate to supply crop needs, there are times when additional water is essential to obtain to increase crop production. 3. Sprinklers are desirable to irrigate erosive soils. 4. The design of a sprinkler system must be based on water holding capacity of the crop. 5. Sprinkler systems operate under a wide range of pressures from 5 psi to over 100 psi. 6. In arid regions sprinkler systems are used to apply all the water used by the crops. 7. The pressure depends upon power costs, area, type of sprinkler used with systems, and crop.

Ex. 6. Translate the sentences paying attention to different functions of the verb “to have”.

1. Sprinklers have been used on all soil types. 2. You have to irrigate soil even in some arid regions. 3. Sprinklers are especially desirable to irrigate soils having high infiltration rates. 4. If you want to get high yields you'll have to make your farm bigger. 5. Areas which have steep slopes and erosive soils have to be irrigated. 6. You have to get many crop yields from every hectare. 7. The new program has already stimulated growth in vegetables and fruit crops in rural areas.

Ex. 7. Answer the questions to the text.

1. What soil types have sprinklers been used on? 2. Where are they especially desirable? 3. What groups may sprinkler irrigation systems be divided into? 4. What do all crops in arid regions depend on? 5. Is water application needed in the areas where the natural rainfall is adequate to supply crop needs? 6. What does the sprinkler system pressure depend on? 7. How do pressures range?

Ex. 8. Write the summary of the text.

Task 2

Ex. 1. Read and memorize the following words.

- 1) Perennial – не высыхающий летом
- 2) fringe – край
- 3) catchment – водосборный бассейн
- 4) interior – внутренняя часть

- 5) water management – рациональное использование воды
- 6) evapotranspiration – суммарное испарение
- 7) erratic – неустойчивый
- 8) to pool – собирать
- 9) event – процесс
- 10) runoff – поверхностный сток
- 11) to divert – отводить
- 12) bund – дамба, плотина
- 13) impermeable – не пропускающий жидкость
- 14) ingenious – искусный, оригинальный
- 15) canopy – полог
- 16) to bound – ограничивать, сдерживать
- 17) sluice – затвор, шлюз

Text B

Every Drop Counts

Population growth and tourism have placed great strain on Tunisia's water resources. The key to sustainable water supply will be a mix of traditional and modern methods.

Agriculture remains an important sector in Tunisia's economy, despite the recent drive towards industrialization and tourism. Tunisian agriculture is influenced strongly by water availability and this depends on the prevailing climate in different parts of the country. Northern Tunisia has a Mediterranean climate, characterized by cool wet winters and hot dry summers. Here, a water surplus feeds Tunisia's only perennial river, the Mejerda, and numerous reservoirs. These reservoirs support extensive irrigation systems for a mixture of arable and pastoral agriculture.

Further to the south, the climate changes to semi-arid and then to arid on the northern fringe of the Sahara desert. Under average summer temperature of 40 °C water evaporates quickly, so long-term storage in large reservoirs is not possible. In the semi-arid regions traditional methods of rainwater harvesting within small hillsides catchments overcome water deficits and ensure a reasonable water supply to the local communities. In the arid interior artesian wells irrigate oases.

Two common methods of traditional water management are catchment rainwater harvesting and oases irrigation. These methods maximize water supply with minimal environmental degradation.

Catchment Rainwater Harvesting

In semi-arid areas of Tunisia, evapotranspiration by plants is only just balanced by precipitation, and this places crops at risk from drought. Precipitation is erratic, occurring mainly in high-intensity events, so rainwater must be collected, pooled and supplied to cropped areas quickly to avoid losses via evaporation and catchment runoff. This is known as rainwater harvesting. Rainwater harvesting is commonly practiced in hilly areas where the local landscape diverts the maximum amount of runoff into fields. The ratio of catchment size to field size is high (typically 4:1).

The topography quickly channels runoff into individual fields where it collects in level terraces bounded by earth bunds and stone dams. Frequent tillage of the soil prevents the formation of a permeable crust and maximizes infiltration; it also ensures that the soil in the cropped field is deep enough to store water.

Oases Irrigation

Catchment rainwater harvesting is a good example of managing surface water. On the arid fringes of the Sahara desert, management of groundwater resources is seen at oases, where artesian water reaches the surface. Palm trees flourish and the area is always green. These sites are the mostly cultivated areas in southern Tunisia, and ingenious use of limited irrigated space maximizes agricultural production. A three-tier system of cultivation is common, consisting of canopy of date palms, a middle layer of fruit trees (apricots, peaches, grapes and pomegranates), a ground cover of vegetables (carrots, onions, and salad crops), cereals and fodder plants.

Although it is a labor-intensive, this system provides a mix of cash crops for overseas markets and subsistence crops for local consumption (fruit, vegetables, fodder and cereals).

Sustainable use of groundwater supplies is essential to oases agriculture. Land within an oasis is divided into small (0.5 hectare) plots, which are bounded by earth bunds to retain water. Artesian water is pumped through concrete surface channels into individual plots; the amount of water entering each plot is controlled by slices.

Ex. 2. Are the following statements true or false?

1. Tunisian agriculture depends strongly on water availability. 2. The climate in Tunisia ranges from semi-arid and arid to Mediterranean. 3. Only one common method of water management exists in Tunisia. 4. Crops are

not at risk from drought. 5. Rainwater harvesting is used in semi-arid areas of Tunisia. 6. Rainwater harvesting is practiced in oases. 7. Frequent tillage of the soil prevents the formation of soil crust. 8. Catchment rainwater harvesting is a good example of managing groundwater. 9. Ingenious use of limited irrigated space maximizes agricultural production. 10. Rainwater harvesting system is labor-intensive.

Ex. 3. Choose the answer that fits best.

1. The recent drive in Tunisia was towards ...
a) economy; b) tourism and industrialization; c) agriculture.
2. In the arid interior artesian wells irrigate ...
a) cropped areas; b) fields; c) oases.
3. Two common methods of water management maximize ...
a) environmental degradation; b) water supply;
c) evapotranspiration by plants.
4. In semi-arid areas people use the method of ...
a) stone dams construction; b) rainwater harvesting; c) frequent tillage.
5. In oases the most flourishing plants are ...
a) palm trees; b) grapevines; c) fodder plants.
6. Artesian water is pumped into ...
a) oases; b) fields; c) individual plots.

Ex. 4. Find the English equivalents for the following words and phrases:

1) наличие воды, 2) средиземноморский, 3) избыток воды, 4) вода быстро испаряется, 5) полузасушливые районы, 6) артезианские колодцы, 7) система обработки, 8) зарубежные рынки, 9) бетонные тоннели.

Ex. 5. Match the antonyms:

- | | |
|----------------|-----------------|
| 1) available | a) level |
| 2) northern | b) southern |
| 3) surplus | c) moist |
| 4) quickly | d) deficit |
| 5) arid | e) slowly |
| 6) hilly | f) maximum |
| 7) rain | g) drought |
| 8) minimum | h) disadvantage |
| 9) to maximize | i) increase |
| 10) to reduce | j) unavailable |
| 11) advantage | k) to minimize |

Ex. 6. What do these words mean? Explain it in English.

1) “The recent drive towards industrialization and tourism”. 2) “With minimal environmental degradation”. 3) “The area is always green”.

Ex. 7. Complete the following sentences on the basis of the information given in the text.

1. Agriculture is an important sector in Tunisia’s economy, despite the recent development of ____.

2. In the arid interior, artesian wells irrigate ____.

3. Two common methods of traditional water management are ____ and ____.

4. In semi-arid areas of Tunisia evapotranspiration by plants is balanced by ____.

5. The irrigation system by which rainwater is collected is known as ____.

6. The ratio of catchment size to field size is ____.

7. Frequent tillage of the soil maximizes ____.

8. The soil in the cropped field is deep enough to ____.

9. Catchment rainwater harvesting is a good example of managing ____.

10. A three-tier system of cultivation includes cultivation of ____ trees.

11. Oases irrigation system is labor-____.

12. The amount of artesian water entering each plot is controlled by ____.

Ex. 8. Answer the following questions.

1. Is agriculture important in Tunisia’s economy? 2. How do Tunisia’s farmers irrigate oases? 3. What two common methods of water management are used? 4. Why are crops at risk from drought? 5. Is catchment rainwater harvesting widely used? 6. Frequent tillage of the soil maximizes infiltration, doesn’t it? 7. What are the advantages of catchment rainwater harvesting? 8. What areas are the most intensively cultivated ones in Tunisia? 9. Which crops are irrigated by artesian water? 10. What crops does the system of oases irrigation provide for local consumption? 11. Are oases irrigated by groundwater or by surface water?

Ex. 9. Project work. Using the information from the text prepare the report on the two basic methods of water management in Tunisia. Use the following words and word combinations.

An important sector; water is available; extensive irrigation systems; the climate ranges; rainwater harvesting; reasonable water supply; two common methods; oases irrigation; to be at risk from drought.

UNIT 9

Task 1

Ex. 1. Read and memorize the following words.

- 1) To supply – снабжать
- 2) toe of slope – пята откоса
- 3) turnout – выпуск воды
- 4) conveyance – пропускная способность русла
- 5) free-flow irrigation – самотечное орошение
- 6) to adhere – придерживаться
- 7) to endeavor – пытаться, стараться
- 8) waste canals – сбросная сеть каналов
- 9) downstream – вниз по течению
- 10) anew – снова, опять
- 11) mulberry – шелковица
- 12) poplar – тополь
- 13) willow – ива.

Text A

Canals

Canals may be defined as artificial channels filled with water, which may be used for navigation, irrigation and drainage. In recent years, some of the irrigation canals also supply water to industries. Hydro-power is being generated on some of the irrigation canals.

Canal locations may follow ridges, if lands lie to either side, or the toe of slopes on either side of valley areas. The spacing and location further depend on topography, type of system and number of turnouts. There is no limitation in size but in most systems lateral capacities are between 1 and 2 meters per second at canal turnouts.

Capacities for which irrigation canals must be designed depend on conveyance losses, irrigable areas served, and maximum quantities of water needed during the growing season.

Classical theory of free-flow irrigation states that the most convenient water level in a distributing canal is 25 cm above the ground level. It is obvious that this rule cannot be strictly adhered to throughout all the length of

every canal but the designer should endeavor to maintain the water level as near as possible at the standard 25 cm above the land surface.

Cross sections of unlined earth canals should ordinarily be provided with side slopes of 1, 5: 1 to 2 : 1, depending on earth materials. Extremes of 1:1 and 2, 5:1 have been used. Rock sections and lined earth sections may be provided with steeper slopes.

Waste canals are cut to rid irrigation areas of excess water, appearing during irrigation or as a result of heavy rainfall. Downstream distributors are often used as waste ways.

Farm irrigation distribution systems can be classified into two groups: surface canals and underground pipelines. Facilities for the conveyance and control of irrigation water are different for each type.

Temporary irrigating canals distribute the water within the irrigated plots through irrigation furrows and strips. The irrigation network within the watered plot is only temporary, either open or closed. The temporary irrigation canals and field ridges are ploughed up every year and made anew.

It has been noted that trees planted along irrigation canals cause a drop of more than 1 meter in the groundwater level during the growing season, thus changing the groundwater slope towards the canal. That is why it is recommended, as a useful reclamation measure, to plant two or three rows of trees along the permanent sections of irrigation systems. Trees suitable for this purpose include the mulberry, poplar, willow or fruit trees, such as apricot, mango, banana.

Ex. 2. Give verbs corresponding to the following nouns:

definition, generation, inoculation, limitation, location, movement, opening, requirement, statement, strength, suggestion, usage.

Ex. 3. Arrange the following words and word combinations in pairs of synonyms:

- | | |
|-------------------------|-------------------------|
| a) to generate | 1) escape canals |
| b) within | 2) gravity irrigation |
| c) further | 3) too, as well |
| d) waste canals | 4) to produce |
| e) free-flow irrigation | 5) to try |
| f) convenient | 6) usually |
| g) also | 7) suitable |
| h) obvious | 8) besides, in addition |
| i) to endeavor | 9) inside |
| k) ordinarily | 10) clear. |

Ex. 4. Find in the text one word for the following:

to explain the meaning, the distance between two or more objects, ability to hold, contain, to go after, to make free, from end to end, reaching the highest degree, to employ for a purpose, long deep cut made in ground by plough.

Ex. 5. Translate the following words and word combinations into Russian. Use some of them in sentences.

Canal locations, to follow ridges, either side, turnout, limitation in size, irrigable area served, maximum quantities of water, the most convenient water level, throughout all the length, should endeavor, unlined canals, side slopes, steeper slopes, facilities for the conveyance, through irrigation furrows, trees planted along, useful reclamation measure.

Ex. 6. Answer the following questions.

1. How would you define canals? 2. What do the spacing and location of canals depend on? 3. What do canal capacities depend on? 4. What is the most convenient water level in a distributing canal? 5. How should cross sections of unlined canals be provided? 6. How are downstream distributors often used? 7. Why is planting trees along irrigation canals considered as a useful reclamation measure?

Ex. 7. Find in the text English equivalents of the following words and word combinations. Use some of them in sentences:

Можно определить, наполнить водой, пропускная способность, в последние годы, распределители, в секунду, потери при транспортировке, в течение вегетационного периода, над поверхностью земли, очевидно, поперечное сечение, использовать в качестве сбросных каналов, строго придерживаться.

Ex. 8. Complete the table using facts from the text and your knowledge of the irrigation canals.

1) Using the canals.	
2) Canal locations.	
3) Factors on which the design of irrigation canals depend.	
4) Groups of farm irrigation distribution systems.	
5) Trees planted along irrigation canals.	
6) Irrigation network.	

Task 2

Ex. 1. Read and memorize the following words.

- 1) Doctrine – догма, доктрина
- 2) to treat – относиться, иметь дело, улаживать
- 3) property – имущество
- 4) purpose – задача, цель
- 5) elsewhere – где-нибудь еще, в другом месте
- 6) correlative – относительный
- 7) to own – иметь, владеть
- 8) appropriation – присвоение
- 9) to lose – терять, утратить

Ex. 2. Complete the table.

Noun	Adjective	Verb	Meaning
activity			
	reliable		
	basic		
		to reason	
correlation			
	dependent		
appropriation			
		to recreate	

Ex. 3. Translate the following words. Pay attention to the translation of different parts of speech.

Differently; relying; following; owner; reasonable; property; came; comparison.

Text B

Groundwater Law

Over time, four doctrines of groundwater rights have evolved in the United States. Each state treats groundwater conflicts differently, relying on one or more of the following doctrines as the basis for its groundwater use law.

1. *English Rule.*

Groundwater use is a property right under this doctrine. A land owner has the right to use the water under his/her land at any time and for any purpose. He/she may also sell or allow others to use her water.

2. Reasonable Use Rule.

Groundwater use is a property right, but water may only be used for "reasonable" purposes. A property owner may use the water on the land from which it came or elsewhere, as long as his use is reasonable in comparison with neighbors needs and uses.

3. Correlative Rights Rule.

All land owners in an area have a right to use groundwater. The amount of water each land owner can use depends on the amount of land he/she owns. He/she cannot pump more than his/her share of water, even for use on his/her own land if neighbors don't have enough water to meet their needs.

4. Appropriation Rule.

This is the rule of "first in time, first in right." Groundwater rights under this doctrine are not connected to land ownership. A person has a right to use groundwater if he has obtained it and put it to a beneficial use such as irrigation, mining, manufacturing, power generation, raising fish, watering farm animals, household or recreational uses. Water may be used on the land from which it came, or elsewhere. Appropriation rights may be sold or given to others.

Under the Appropriation Doctrine, in times of water shortage, those who have used the water longest may use all the water they have used in the past and newcomers may be left with little or no water. If a person stops using his share of water for a beneficial purpose, he may lose his right to use the water at all.

Ex. 4. Find the missing words from the list given below.

1. Four doctrines of groundwater rights ... in the United States.
2. Groundwater use is a property right under the
3. Water may only be used for ... purposes.
4. All land owners in an area have a right to use
5. Water may be used on the land from which it came, or
6. Those who have used the water longest may use all the water they have used
7. The amount of water each land owner can use depends on the ... of land he owns.

Elsewhere; have evolved; in the past; reasonable; amount; doctrine; groundwater.

Ex. 5. Choose the right word in brackets. Translate the sentences into Russian.

1. Each state treats groundwater conflicts (differently; in the same way).
2. A land owner has the right (to sell; to buy) water. 3. Water may only be

used for (any; reasonable) purposes. 4. The amount of water each land owner can use depends on the amount of (land; money) he owns. 5. (Correlative rights; appropriation) rule is of “first in time, first in right”. 6. Those who have used the water longest may use (a part of; all) the water they have used in the past.

Ex. 6. Translate into Russian.

1) Over time; 2) groundwater use law; 3) a property right; 4) for any purpose; 5) allow others to use water; 6) “reasonable” purposes; 7) in comparison; 8) land owners; 9) the amount of water; 10) enough water; 11) first in time; 12) not connected; 13) beneficial use; 14) may be used; 15) appropriation rights; 16) in the past; 17) his share.

Ex. 7. Ask your own questions to get the following answers.

1. Each state treats groundwater conflicts differently. 2. A land owner may allow others to use his water. 3. A property owner may use the water as long as his use is reasonable. 4. A land owner cannot pump more than his share of water. 5. Appropriation rule is “first in time, first in right”. 6. If a person stops using his share of water for a beneficial purpose, he may lose his right to use the water.

Ex. 8. Answer the questions.

1. How many doctrines of groundwater rights have evolved in the United States? 2. How does each state treat groundwater conflicts? 3. What is the essence of English Rule (Reasonable Use Rule, Correlative Rights Rule, Appropriation Rule)?

Ex. 9. Match the following proverbs with their Russian equivalents. Explain your ideas.

1. Who has been scalded with hot soup blows on cold water.	1. Правда глаза колет.
2. The devil loves no holy water	2. В мутной воде хорошо рыбу ловить.
3. It is good fishing in troubled waters.	3. Обжегшись на молоке, дуют на воду.
4. It is hard to sail over the water in an eggshell.	4. Против воды тяжело плыть.

UNIT 10

Task 1

Ex. 1. Read and memorize the following words.

- 1) Terrain – местность
- 2) interconnecting structures – сопрягающие сооружения
- 3) crossing structures – сооружения на пересечениях
- 4) flume – лоток, желоб
- 5) sluice – затвор, шлюз; выпускать
- 6) chute – быстроток, скат
- 7) discharge – расход
- 8) besides interconnecting the head water and the after bay – кроме сопряжения бьефов
- 9) to dissipate – рассеивать
- 10) gully – овраг, лощина
- 11) dive culvert – дюкер, сифон
- 12) depression – впадина, лощина
- 13) outlet – выпускное отверстие
- 14) telemetry – телеметрия
- 15) valve – клапан.

Text A

Canal Structures

Standardization of canal structures is limited because of the wide range of climate, terrain, geology, and water delivery requirements. Therefore control structures in current use in distribution systems throughout the world are of many forms.

Hydrotechnical installations on irrigation canals can be divided into three groups:

- a) interconnecting structures: chutes of different types and drops;
- b) crossing structures: aqueducts, runoffs, dive culverts, pipes beneath embankments, tunnels and flumes;
- c) regulating structures, water dividers, cheek structures, water outlets, flood gates, sluicing locks, etc.

Interconnecting structures. Chutes and regulator-chutes are intended for linking different sections of the canal, having different levels and built on sharply inclined terrain.

Regulator-chutes, moreover, are designed to regulate the water level and discharge in the canal.

The function of drops is to dissipate the energy of the flowing stream without causing erosion. Regulator drops besides interconnecting the head water and afterbays serve as a regulator of discharges into the minor canals.

Installations at crossings. Aqueducts, dive culverts, flumes, pipes, run-offs and tunnels are provided in places where the canals intersect other waterways, gullies and roads. They are also designed to provide a passage for rain water and mud streams.

Aqueducts are built of asbestos cement, cast-in-site and precast reinforced concrete. Sometimes they are put up of metal.

Dive culverts are built for the passage of the canals water under river beds, roads, gorges and other barriers.

For crossing natural depressions of narrow canyons, and for conveyance of irrigation water along very steep side hills, flumes are constructed either of wood or metal, or of concrete.

Regulating structures (control structures) on an irrigation distribution system are those needed to regulate the flow of water and to control the water surface in the conveyance. These structures include turnouts (water outlets) which are needed to control the rate of flow into laterals and farm ditches, check structures used for controlling the water surface elevations, division structures for dividing flow into two or more laterals, and waste-ways for removing unwanted water from the system.

Automatic flow control is also possible using both upstream and downstream regulating systems. Telemetering equipment feeds in information on flow rates and from water levels to a control center from which remote controlled telemechanical devices can be operated to adjust control structures in the distribution network.

In all cases, canals should be fitted with safety structures at intervals so as to make it possible to spill off the surplus discharges in the event of valves not operating properly or being wrongly maneuvered.

Ex. 2. Give nouns corresponding to the following verbs:

to divide, to link, to regulate, to serve, to dissipate, to pass, to intersect, to equip, to build, to provide, to transform, to widen, to cross, to move, to deliver.

Ex. 3. Arrange the following words in pairs of synonyms:

- | | |
|-----------------|------------------|
| a) requirements | 1) to intersect |
| b) wide | 2) to check |
| c) structures | 3) broad |
| d) to cross | 4) needs |
| e) to control | 5) to build |
| f) to put up | 6) installations |
| g) to adjust | 7) to connect |
| h) to link | 8) to arrange |

Ex. 4. Find in the text one word for the following:

in the event; for that reason; to be in action; to put into place; a tract of land looked at from the point of view of its physical features; of the present time; things needed for a purpose; deep gorge; narrow opening between hills or mountains.

Ex. 5. Translate into Russian the following words and word combinations. Use some of them in sentences.

The wide range of climate, water delivery requirements, drops, pipes beneath embankments, tunnels and flumes, water dividers, chutes and regulator-chutes, sharply inclined terrain, to dissipate the energy, upstream and downstream regulating systems, remote controlled telemechanical devices, to adjust control structures, to fit with safety structures, the surplus discharge.

Ex. 6. Find in the text English equivalents of the following words and word combinations:

быстротоки различных типов, сооружения на пересечениях, регулирующие сооружения, дюкеры, лотки и ливнеспуски, ложбина, глубокое ущелье, скорость течения, сделать возможным, равные уровни, во всех случаях, монолитный бетон, уложенный на месте.

Ex. 7. Answer the following questions.

1. How can hydrotechnical installations on irrigation canals be divided?
2. What interconnecting structures do you know?
3. Name various types of crossing structures.
4. Name the types of regulating structures.
5. What purposes may interconnecting structures serve?
6. What do you know about installations at crossings?
7. What are regulating structures needed to?

Ex. 8. Translate into English.

1. При отводе воды из большого распределителя или магистрального канала желательнее обеспечить возможно наиболее равномерное течение воды. 2. Расход воды в потоке может быть непосредственно определен путем измерения скорости потока и площади его поперечного сечения. 3. Лучшим способом определения скорости потока является измерение её при помощи гидрометрической вертушки. 4. Регуляторы со щитами (cheek gates) устанавливаются поперек оросительных каналов для полного или частичного отвода воды из них. 5. Для регулирования воды в оросителях устраиваются переносные перемычки (portable check dams).

Ex. 9. Using the information from the text prepare a report under the headline “Canal Structures”. In work-groups debate on the problem of canal building.

Task 2**Ex. 1. Read and memorize the following words.**

- 1) Supreme – верховный
- 2) to cap – закрыть, перекрыть
- 3) maliciously – злонамеренно
- 4) vs (versus) – против
- 5) Inc. (incorporated) – зарегистрированный как корпорация
- 6) sewer – коллектор, канализационная труба
- 7) foundation – фундамент
- 8) nuisance – помеха, неудобство
- 9) to deplete – исчерпывать, опорожнять
- 10) to modify – видоизменять
- 11) substantial – существенный, значительный

Ex. 2. Practice the pronunciation of the following words and geographical names. Consult the dictionary.

Wisconsin, Milwaukee, sewerage, quality, damage, appropriate, purpose, reasonable, substantial.

Text B

Groundwater Law in Wisconsin

There have been several key cases establishing Wisconsin's groundwater use law. Two of them are described here for you:

A. Huber vs. Merkel-Wisconsin Supreme Court 1903:

In 1903 a decision was made in the Wisconsin Supreme Court that influenced groundwater law for more than 70 years. This case involved two farmers, Mr. Huber and Mr. Merkel, who lived about 1/2 mile from each other. Both farmers owned flowing artesian wells.

Mr. Merkel had two wells on his property, one dug in 1899 and the other in 1900. Mr. Merkel used some of his water for a fish pond and some he sold to neighbors. Mr. Huber, like other land owners in the area, capped his well so that the water would not flow out when he was not using it. Mr. Huber's well was dug in 1899 and his farm is 20 feet higher than Mr. Merkel's.

There was enough water for both farms and neighboring homes until Mr. Merkel began letting his wells flow freely, maliciously wasting water to harm his neighbors. When Mr. Merkel's wells were allowed to flow, water levels dropped in all neighboring wells and some of the wells stopped flowing. Mr. Huber took Mr. Merkel to court to try to stop him from wasting water from his artesian wells.

The case was fought all the way to the Wisconsin Supreme Court. In 1903, the Supreme Court decided that the English Rule used in Wisconsin at the time meant that a land owner had an absolute property right to use water under his/her property. Since Mr. Merkel had an absolute right to use groundwater under his property, he could consume, sell or even waste water from his wells if he wanted. So Mr. Merkel won the case and Mr. Huber probably had to find a way to pump water from his once-flowing artesian well.

2. State of Wisconsin vs. Michel's Pipeline Construction, Inc. – Wisconsin Supreme Court, 1974.

In 1972, Michel's Pipeline Construction, Inc. was hired by the Metropolitan Sewerage Commission of Milwaukee to install a sewer line for the city. To bury the sewer pipe, Michel's Pipeline had to lower the water table to 40 feet depth. The company dewatered the soil by pumping a lot of water (5,500 gallons per minute) in a nearby city.

When the water table was lowered some wells in the area dried up, others yielded less water, some began having water quality problems, and some foundations, basement walls and driveways began to crack because the land under them sank as the groundwater was drawn out.

The State of Wisconsin took Michel's Pipeline to court because of the problems caused by dewatering the soil. The State wanted the Court to make the company construct the sewer line in a different way so the neighbors' water supply and property wouldn't be affected. They also wanted Michel's Pipeline to fix the damage that had already been done.

The Court determined that pumping so much groundwater created a "public nuisance" and that by depleting neighboring wells, Michel's Pipeline was actually taking property from people who lived in the area. The Court changed the course of Wisconsin's groundwater law by overruling the Huber vs. Merkel decision. They felt that the old Common Law Doctrine was no longer appropriate for Wisconsin's needs. The case was decided instead on a modified Reasonable Use Rule. Our present groundwater laws are based on this rule.

Under the modified Reasonable Use Rule a landowner may pump water from his/her land and use it for any beneficial purpose unless pumping the water causes unreasonable harm to someone else by lowering the water table or pumping has a direct and substantial effect on a lake, stream or wetland.

It is still up to the courts to determine what is "unreasonable harm" and what is a "direct and substantial effect" on a lake or stream.

Ex. 3. From the sentences given below choose the one which contains the main idea of the first part of the text.

1) Mr. Merkel used some of his water for a fish pond and some he sold to neighbours. 2) Both farmers own flowing artesian wells. 3) Any landowner has an absolute right to use groundwater under his property.

Ex. 4. What is missing?

A) 1. In 1903 a decision was made that influenced ____law for more than 70 years. 2. Mr. Huber kept his well so that the water would not flow out when he wasn't using it. 3. Mr. Huber took Mr. Merkel to court to try to stop him from wasting water from his _____. 4. The English Rule meant that a land owner had a property right to use under his property.

B) 1. The company dewatered the soil by __ a lot of water in a nearby city. 2. The state wanted the court to make the company construct ____ in a different way.

Ex. 5. Are the statements true or false? Begin your answer with “It’s true, I guess ...”; “I don’t think it’s true”; “I’m afraid it’s wrong”.

A) 1. A decision was made in the Wisconsin Supreme Court that influenced groundwater law for more than 70 years. 2. Mr. Merkel used all his water for a fish pond. 3. When Mr. Merkel’s wells were allowed to flow, some of the wells stopped flowing. 4. Mr. Merkel had right to consume and sell water from his wells. 5. Mr. Huber and Mr. Merkel had flowing artesian wells.

B) 1. The company dewatered the well by pumping a lot of water. 2. The state wanted to fix the damage that had already been done. 3. The case in Wisconsin was decided. 4. Pumping doesn’t have substantial effect on wetland.

Ex. 6. Give the English equivalents to the following words and phrases:

артезианский колодец; достаточно воды; Верховный суд; выиграл дело; коллектор; грунтовые воды; выкачивание; основаны на этом праве; прямое и косвенное влияние; владел двумя колодцами; принести вред своим соседям; в то время.

Ex. 7. Open the brackets and put the verbs into the correct form.

1. In 1903 a decision (to make) in the Wisconsin Supreme Court that (to influence) groundwater law. 2. Mr. Huber (to cap) his wells. 3. Mr. Huber (to take) Mr. Merkel to court. 4. Since Mr. Merkel (to have) right to use groundwater, he (can) consume water from his wells if he (to want). 5. In 1972 Michael’s Pipeline Construction, Inc. (to hire) by the Metropolitan Sewerage Commission. 6. Some foundations (to begin) to crack because the land under them (to sink) as the groundwater (to draw out). 7. By depleting neighbouring wells, Michaels Pipeline (to take) property from people who (to live) in the area. 8. A landowner may (to use) water for any beneficial purpose. 9. It is still up to the courts (to determine) what is “direct and substantial effect” on a lake or stream.

Ex. 8. Match the two halves of the sentences:

1) Both farmers	a) were allowed to flow
2) Water levels	b) to pump water from his once-flowering artesian well.
3) Mr. Huber had to find a way	c) taking property from people.
4) The land under drive ways	d) owned flowing artesian wells.
5) Mr. Huber and Mr. Merkel	e) unreasonable harm.
6) Mr. Merkel's wells	f) some basement walls began to crack.
7) Michael's Pipeline was actually	g) sank.
8) Pumping has	h) dropped in all neighboring wells.
9) When the water table was lowered	i) lived about 1/2 mile from each other.
10) Pumping water causes	j) direct and substantial effect on a lake, stream, or wetland.

Ex. 9. Answer the questions.

A) What did two farmers own? When was Mr. Huber's well dug?

B) Why did Mr. Huber take Mr. Merkel to court? What did the Supreme Court decided in 1903?

C) What did Michaels Pipeline have to do to buy the sewer pipe? What happened when the water table was lowered? Was the damage fixed by Michaels Pipeline? Was the old Common Law Doctrine appropriate for Wisconsin's needs? Does pumping have effect on streams and wetland?

Ex. 10. Let's go back to 1903. Imagine that you're on the Supreme Court and you are responsible for deciding the Huber vs. Merkel case. Write a short paragraph explaining how you would decide the case using Wisconsin's modified Reasonable Use doctrine.

UNIT 11

Task 1

Ex. 1. Read and memorize the following words.

1) To confine – ограничивать

2) complement – дополнение

- 3) alkali – щелочь
- 4) by developing the slope of the land – увеличивая уклон
- 5) drain – дрена
- 6) mole drain – кротовая дрена
- 7) tile – гончарная труба
- 8) grade – уклон
- 9) joint – место соединения
- 10) uncased – необлицованный
- 11) aquifer – водоносный слой

Ex. 2. Translate the following words without the dictionary:

drainage, profile, region, civilization, period, system, malaria, problem, basic, type, parallel, asbestos, line, zone, special, interval, meter, normal, vertical.

Text A

Drainage

Drainage is the removal of excess water from the soil profile. Draining is done both for the purpose of reclaiming swampy areas and lowering the water table and desalinizing soils in arid regions.

Drainage is a reclamation measure probably started in the Greek civilization period, when some areas were reclaimed by a system of ditches. The drainage of semi-humid and humid areas around the North Sea started in about the tenth century and spread from there to other parts of Europe. These efforts were confined to the reclamation of marshes or swamps, largely around lakes, or to low-lying areas near the sea.

But for drainage, large parts of the Netherlands and the coastal areas of many other countries would be always under water. There are many inland areas in various countries where, without drainage, land would be unfit for cultivation and instead of crops and gardens, there would be swamps and malaria.

The rapid development of irrigation during the past one hundred years has brought acute problems of water-logging and salinity, particularly in south Asia and the Middle East. Drainage is one of the basic requirements for the solution of these problems.

The development of drainage, as an essential complement to irrigation for the successful reclamation of saline and alkali soils, has its beginning only in the present century.

In general, drainage can be divided into two basic types: a) surface drainage and b) subsurface drainage.

Surface drainage systems are designed primarily to remove water that is on the surface and has not entered the soil profile. That is done by developing the slope of the land so that the excess water will flow by gravity to a system of shallow field ditches.

The removal of water that has already entered the soil profile is considered subsurface drainage.

The most common types of drain are ditches (open drains) and tile lines (subsurface or covered drains), placed more or less parallel to the soil surface. Tile drains are normally constructed of burned clay, asbestos or concrete.

Tile drainage removes excess water from the soil through a continuous line of tile laid at a specified depth and grade. Free water enters through the tile joints and flows out by gravity, so that the water table is lowered below the root zone of the plants.

A special type of subsurface drains is the mole drain. It consists of an uncased hole formed by a mole plow at a depth of about 60 cm and at intervals of 2-3 meters. Mole drains are mostly installed in the heaviest soil layers. They are generally used as a drainage system, supplemental to the normal system.

Shallow horizontal drainage (about 1 m) has been widely used, but has not always been entirely successful. On the other hand, deep horizontal drainage lowers the water table to such a depth that it is no longer harmful.

Under certain conditions vertical wells are used as drains. Vertical drainage has given good results in areas underlain by free aquifers. Where the quality of water pumped from wells is satisfactory, it can be used for irrigation or other uses. Where the pumped water is saline it has to be removed from the area.

The initial cost of vertical or pump drainage is usually less than that of open or tile drain systems; but the operation and maintenance expenses are higher, and over a period of years gravity drainage systems are in most cases more economical.

Ex. 3. Give the derivatives of the following words:

to use, to move, saline, to reclaim, to improve, to apply, fertile, to indicate, nature, to observe, to measure, product.

Ex. 4. Arrange the following words in pairs of synonyms.

Grade, development, common, purpose, expenses, to require, rapid, particularly, supplemental, usual, aim, cost, additional, to call for, especially, quick, slope, growth.

Ex. 5. Find in the text one word for the following:

1) to bring into cultivation; 2) the earth in which plants grow; 3) measurement from top down; 4) containing salt; 5) of little depth; 6) area of low-lying wet land; 7) at the beginning; 8) way in which something works.

Ex. 6. Translate into Russian the following words and word combinations. Use some of them in sentences.

1) The removal of excess water; 2) for the purpose of, reclamation measure; 3) by a system of ditches; 4) inland areas; 5) land would be unfit for; 6) instead of; 7) acute problems of waterlogging and salinity; 8) one of the basic requirements; 9) successful reclamation; 10) saline and alkali soils; 11) tile line; 12) to flow by gravity, pump drainage.

Ex. 7. Find in the text English equivalents of the following words and word combinations:

1) дренирование проводится; 2) понижение уровня грунтовых вод; 3) увлажненные земли; 4) если бы не дренаж; 5) быстрое развитие; 6) решение этих проблем; 7) существенное дополнение; 8) поверхностные или закрытые дрены; 9) каналы; 10) кротовый дренаж; 11) необлицованные отверстия; 12) глубокий горизонтальный дренаж; 13) вертикальные скважины.

Ex. 8. Translate the sentences paying attention to the functions of the verbals.

1. The engineer who has to design structures to be built in the paths of floods is faced with a most difficult problem. 2. Besides irrigation, this scheme will also provide greatly improved waterway communication. 3. They began to be alarmed by dropping water table. 4. Water resources development cannot be successfully carried out without adequate hydrologic data supported by observation over a period of many years. 5. The scheme was accepted to be recommended and to be drawn up in detail. 6. A survey party sent by the engineers carried out ground surveys. 7. For various reasons, the most widely adopted method of reclamation, particularly in Wales, has been ploughing and reseeding with rye-grass. 8. The system seems to

have proved very successful. 9. As the capacity of flowing water to carry silt in suspension depends largely on its velocity, it appears desirable to suitably reduce the width and increase the depth of the proposed channel after making model tests.

Ex. 9. Ask questions to the following answers.

1. The drainage started in about the tenth century. 2. Large parts of the Netherlands would be always under water. 3. The development of drainage has its beginning only in the present century. 4. The removal of water is considered subsurface drainage. 5. The most common types of drain are ditches and tile lines. 6. A special type of subsurface drains is the mole drain. 7. Under certain conditions vertical wells are used as drains. 8. The initial cost of vertical or pump drainage is usually less than that of open or tile drain systems.

Ex. 10. Translate the following sentences into English.

1. Развитие дренажа как существенного дополнения к орошению началось только в текущем столетии. 2. Хороший дренаж улучшает структуру почв и увеличивает их плодородие. 3. Один из главных факторов в выборе дренажной системы – это пропускная способность. 4. Прежде чем приступить к проектированию дренажной системы, следует тщательно изучить территорию.

Task 2

Ex. 1. Read and memorize the following words.

- 1) Township – городок, местечко
- 2) downtown – деловой центр города
- 3) suburban – пригородный
- 4) neighborhood – округ, район
- 5) dizziness – головокружение
- 6) benzene – бензол
- 7) toluene – толуол
- 8) fan – вентилятор
- 9) level – уровень
- 10) to petition – обращаться с петицией, ходатайствовать
- 11) volatile – летучий, быстро испаряющийся.

Text B

Trouble in Paradise

The mythical town of Paradise is a rural township of about 5,000 people. Most residents run small farms or local services and businesses. The rolling countryside of the township has attracted urban workers in recent years from the nearby city of Crystal Springs and the town is experiencing its first major growth period in 20 years.

A small industrial area lies just west of downtown Paradise. This area includes a paint manufacturing company and a chemical plant. Both of these industries use water in their manufacturing processes and both produce chemical wastes. The paint and chemical companies were built in the late 1960's. In 1970, a municipal landfill was built west of the industrial site. The landfill accepted 500,000 cubic yards of municipal and industrial waste from 1971 until the landfill was covered in 1980.

The landfill site was sold to Jean Johnson for farming in 1982, the farm house was destroyed by fire in 1998, and the land was sold for suburban development in 1999. A gas station was opened near the farm site in 2000.

Through the late 1970's, all Paradise residents drew their drinking water from private wells. As more and more people moved into Paradise, residential neighborhoods expanded to the west and what had been farmland became suburban neighborhoods. In 1983 Paradise incorporated as a city. A new subdivision Tranquil Acres, was developed between the industrial area and the Johnson farm during the early 2000. Subdivision plans called for one high capacity well to serve the new homes. The well was installed in 2003 and began pumping water in March 2004.

In February 2003, members of the Hansen family began experiencing dizziness and headaches. The Hansen home is one of three remaining farms in Paradise and is located about 1/2 mile west of Tranquil Acres. Their home was built in 1930 and has its own private well. The Hansens suspected that their well water was causing their symptoms and in March 2003 they contacted the city health department. The city health department did not have the means to detect many contaminants, so they called in county health officials.

In May 2003, lab samples drawn by the county showed that the Hansen's well contained volatile organic compounds (VOC's), including benzene and toluene. The well samples contained 350 ug/L toluene and 4 ug/L benzene. County health officials advised the Hansen family to use bottled water for

drinking and to minimize contact with water by taking shorter, cooler showers, running the exhaust fan during showers, ventilating the bathroom after showering, and opening kitchen windows when running the dishwasher.

The Hansen's well showed high levels of VOC's in June 2003, but only traces of VOC's in February 2004. By April 2004 the contaminants seemed to have disappeared from the Hansen well. In June 2004, the Smiths began to experience the same symptoms that the Hansens had experienced in 2003. The Smiths called the county health department to report the problem. Paradise officials decided a full scale investigation was in order. They feared that the contamination might be drawn toward the new high capacity well in the subdivision.

The area wells were sampled again in May and July 2004 with the following results.

Public health officials advised the Thompsons and the Smiths to use bottled drinking water and minimize contact with their well water. In addition to benzene and toluene, water tests revealed that the Thompson's well was also contaminated with methane gas produced by decaying organic material. Methane gas can be carried underneath homes by groundwater where, in high enough concentrations, it can cause explosions.

After hearing the results of the health department tests, residents of Tranquil Acres formed a citizen action group. They feared that the high capacity well was in danger of being contaminated. After several meetings citizens petitioned the city to:

1. Guarantee that the VOC problem will be solved before the contamination spread to the new community well.
2. Guarantee alternate sources of water for contaminated wells.
3. Guarantee purchase of affected properties to maintain property values if the contamination problem cannot be solved.

Ex. 2. Correct the following statements.

1. A chemical plant alone produces chemical waste. 2. Through the late 1970s, all Paradise residents drew drinking water from one high capacity well. 3. The city health department had all the means to detect many contaminants. 4. In June, 2004, the Smiths began to experience symptoms different from those the Hansens had experienced in 2003. 5. Water tests revealed that the Thompson's well was contaminated only with methane gas. 6. Citizens petitioned the city to guarantee them water from contaminated wells.

Ex. 3. Use these words to make sentences.

1. The town/ experience/ first/ major/ growth/ period. 2. Gas station/ open/ near/ farm site/2000. 3. Subdivision plants/ call for/ capacity well/ serve new homes. 4. County health officials/ advice/ Hansen family/ open kitchen windows. 5. They/ fear/ contamination/ may/ draw/ toward/ new high capacity well.

Ex. 4. Give antonyms to the following words:

real, village, urban, large, decrease, east, that, neither, yearly, bought, closed, collective, less, old, finished, to maximize, longer, low, appear, different, in trouble.

Ex. 5. Translate into Russian:

lab samples, volatile organic compounds, county health officials, running the exhaust fan, running the dishwasher, seemed to have disappeared, the same symptoms, a full scale investigation, the new high capacity well, bottled drinking water, decaying organic material, can cause explosions.

Ex. 6. Complete the sentences using the words from the text.

1. Most residents run 2. The landfill accepted 3. A gas station was opened 4. The well was installed in 1983 and 5. The city health department didn't have the means 6. County health officials advised the Hansen family 7. Paradise officials feared that 8. Methane gas can be carried 9. After several meetings citizens

Ex. 7. Answer the following questions.

1. Where did urban workers come to the township from? 2. When was a gas station opened near the farm? 3. When did the high capacity well begin pumping water? 4. Why did the city health department call in county health officials? 5. What did lab samples drawn by the county in May 2003 show? 6. Why did the Smiths call the county health department? 7. What were the samples of the area wells in May and July 2004? 8. What did public health officials advise the Thompsons and the Smith? 9. What did residents of Tranquil Acres do after hearing the results of the health department test? 10. What did citizens petition the city after several meetings?

Ex. 8. Role-play. You are the members of the families which suffered from contaminated wells. You are having a meeting with the public health officials. Report your problems and ask the officials to take measures.

Ex. 9. Writing task. You are a member of the citizen action group. Write a petition to the city officials to tackle the problem of contaminated wells.

UNIT 12

Task 1

Ex. 1. Read and memorize the following words.

- 1) Range – выгон
- 2) feasible – возможный
- 3) gravity – тяжесть, тяготение
- 4) water logging – заболачивание
- 5) to tackle – заниматься
- 6) to confront – столкнуться
- 7) adverse – неблагоприятный
- 8) transit – транспортировка

Ex. 2. Read the text and answer the following questions.

- 1) What are the problems in water supply for agriculture?
- 2) Why must underground water resources be exploited more and more?

Text A

Some Problems of the Past and Present

The problems of water in agriculture include not only these of getting and making best use of water on farms, they also include the problems of managing our croplands and pastures, forests and ranges so that damage from runoff and floods is held at the lowest point practical, and that the sources of water underground or in streams are improved to the greatest extent feasible.

Irrigation provides opportunity for keeping soil moisture at about the levels that crops may need. Studies are under way to find out how best to apply the water, how much to use, and when to apply it.

The method of applying water in irrigation is also under experimental study. Comparisons of sprinkler and gravity irrigation are made to see which is the more advantageous under specified conditions. Research seeks to find the circumstances under which a method is best.

How to keep irrigated lands from becoming waterlogged is another objective of research. The design of the water distribution system to avoid undue seepage is part of it. Provision of an adequate drainage system is another.

The problem of salt and alkali is acute in many parts of the world. Irrigated lands have been abandoned in some places because of salt and alkali accumulation. The remedy is not a simple matter. It requires a great deal of further research.

More and more irrigation is coming into the humid regions. The benefits of using it to provide moisture in droughts are well known. But it presents a few problems not common in arid regions. One is how to prevent waterlogging of soil or serious erosion, when a heavy rain follows soon after irrigation. Research is tackling this problem as well as that of how to manage and fertilize crops so as to get the most advantage from the added water.

Can we now predict what new kind of problems, or what new emphasis on present problems, will confront the irrigation engineers who are now beginning their active careers?

Unquestionably they will meet with increasingly adverse conditions when lift irrigation is to be more practiced. In the future it is certain that greater dependence must be placed on subterranean waters in some parts of the world. New methods of hydrological and geophysical surveying will make it easier to find out where these supplies are located. On the other hand, there is no doubt that the present use of water for agriculture is, to some extent, wasteful. There is considerable room for economy in water use and efforts must increasingly be made to save water in transit losses, in irrigation doses, in transpiration by wild grass and useless vegetation and in several other ways. Measures to conserve water resources and to economize in their use will be a constant task to irrigation engineers and agronomists for a long time to come.

Ex. 3. Give the derivatives of the following words:

to depend, to distribute, to erode, to cultivate, to differ, care, to operate, to consider, moist, special, to appear, direct, to cover.

Ex. 4. Arrange the following words in pairs of synonyms:

- | | |
|-------------------|-----------------|
| a) feasible | 1) to offer |
| b) benefit | 2) to deal with |
| c) to present | 3) possible |
| d) to tackle | 4) advantage |
| e) transit | 5) harm |
| f) constant | 6) conveying |
| g) to include | 7) unchanging |
| h) damage | 8) to contain |
| i) extend | 9) undoubtedly |
| j) unquestionably | 10) degree |

Ex. 5. Translate into Russian the following words and word combinations. Use some of them in sentences:

making best use of water on farms, damage from runoff, sources of water underground, to provide opportunity, at about the level, experimental study, under specified conditions, circumstances, the problem of saline and alkali soils, humid regions, to tackle this problem, wasteful use.

Ex. 6. Find in the text English equivalents of the following words and word combinations:

пахотная земля, пастбища и леса, ущерб от паводков, улучшить, влажность почвы, как лучше всего применять воду, сравнение метода дождевания с самотечным орошением, более выгодный, дальнейшие исследования, предохранять орошаемые земли от заболачивания, засуха, засушливые районы, подземные воды, до некоторой степени, сохранить водные ресурсы.

Ex. 7. Give one word for the following:

1) to put into use; 2) very wet; 3) to make better; 4) grassland for cattle; 5) continuous dry weather; 6) to use or spend less than before; 7) using more than needed; 8) surface parallel with the horizon; 9) to try to find.

Ex. 8. Answer the following questions.

1. What are the problems of water in agriculture? 2. What opportunity does irrigation provide for keeping soil moisture? 3. What methods of applying water in irrigation are under experimental study? 4. What is done to keep irrigated lands from becoming waterlogged? 5. Why have irrigated lands been abandoned in some places? 6. What are the problems of irrigation in humid regions? 7. What can you say about the problems which will confront the irrigation engineers in future?

Ex. 9. Translate into English.

1. Орошение и дренаж превращают пески пустыни, заброшенные засоленные земли и болота в плодородные сельскохозяйственные земли, изменяют флору, фауну и ландшафт. 2. Все правильно орошаемые земли нуждаются в дренаже. 3. Это может быть естественный или искусственный дренаж или комбинация того и другого. 4. Орошение и дренаж – это процессы, которые направлены на поддержание почвенной влаги в пределах, требуемых для оптимального роста растения.

Task 2

Ex. 1. Read and memorize the following words.

- 1) Desalination – опреснение
- 2) drought – засуха
- 3) membrane – мембрана, диафрагма
- 4) to split – расщеплять, разделять
- 5) intermittent – с перебойми
- 6) to abide – ослабевать, утихать
- 7) free-for-all – общедоступный

Ex. 2. Practice the pronunciation of the following words:

scientist, desalination, drought, require, technological, supply, turbine, excess, huge, commercially, urban, precious.

Text B

Sow the Wind and Reap Clean Water

Scientists have found a way to power water desalination plants using wind energy.

Wind power has not been suitable for desalination plants because they require a constant supply of energy. If the wind falls and the supply is interrupted, the membrane through which the water is filtered gets damaged, and the repairs are very expensive.

The group of scientists from the Tenerife-based technological Institute for Renewable Energy (Iter), the University of Las-Palmas, the University of Athens and three energy companies in Germany, have developed a way of keeping the plant running by splitting the membrane units into three sections.

They are developing software to control the input and storage of energy. Guillermo Galvano from Iter says: “This has not been done before because of the problems of intermittent power supply and storage. But we have worked out a way of building the plants using separate modules that could be activated steep by steep, depending on the energy supply.”

The wind turbines will be built to produce power at higher rates than required in the plant, and the excess stored when winds abate.

The Canary Islands, which has been one of the worst-hit drought areas, is planned as the first site for a new plant. Galvano explains: “Seventy per-

cent of the water used on the Canary Islands comes from the sea. But desalination uses up more than 35 per cent of all the energy produced from oil-fired power stations here. It is a very expensive process.”

A huge demand for the new technology is expected, as most of those countries suffering the worst water shortages also have regular winds.

Mediterranean countries that could benefit from such plants include Spain, Italy, Greece, Cyprus, Morocco, Lebanon, and Israel – which all have good potential for wind energy.

It is hoped that the technology will be commercially available in time for a new desalination plant planned for Mallorca. The island has so little fresh water that it has to ship it in from mainland Spain.

In places such as the Canary Islands, where tourism is increasing and industry developing, the plan is for every urban center to have its own desalination plant.

“Water will become a free-for-all commodity, with each community independent of the central supplies”, says Galvano. “Even in periods of drought, water will no longer be a precious resource that communities fight over.”

Ex. 3. Are the statements true or false?

1) Scientists have found a way to power water desalination plants using water energy. 2) Wind power has always been suitable for desalination plants. 3) Scientists have developed a way of keeping the plant running. 4) The scientists are now developing new software to control the storage of energy. 5) The wind turbine will produce power at lower rates than required in the plant. 6) 35 % of the water used in the Canary Islands comes from the sea.

Ex. 4. Find the English equivalents:

страдают от, очень дорого, не было сделано раньше, турбины, огромный спрос, огромная нехватка воды, коммерческий, в таких местах как, общедоступный товар, Ливан.

Ex. 5. Translate into Russian:

wind energy, a constant supply of energy, energy companies, they are developing, at higher rates, a new plant, is expected, regular winds, wind energy, little fresh water, tourism is increasing, periods of drought.

Ex. 6. Fill in the blanks with an appropriate word or phrase.

1. Parts of southern Europe are suffering from one of the worst ... this century.
a) droughts; b) floods; c) hurricanes.
2. Wind power hasn't been suitable for desalination plants because they require a constant supply of ...
a) water; b) air; c) energy.
3. New software controls the input and ... of energy.
a) supply; b) storage; c) excess.
4. The wind turbines will be built to produce ____ ... at higher rates than required.
a) sites; b) demand; c) rates.
5. Seventy per cent of the water used in the Canary Islands comes from
a) the sea; b) different countries; c) power stations
6. A new ... plant is planned for Mallorca.
a) desalination; b) independent; c) water
7. Even in periods of drought, water will no longer be ... resource.
a) suitable; b) natural; c) precious.

Ex. 7. Answer the questions.

1. What way have scientists developed to power water desalination plants.
2. Why hasn't wind power been suitable for desalination plants?
3. Which way of keeping the plant running have the scientists found?
4. What are scientists developing now?
5. Will the wind turbines produce power at higher rates than required in the plant?
6. What area has been one of the worst-hit drought areas?
7. Why is a huge demand for the new technology expected?
8. What countries could benefit from such plants?
9. Water will become a free-for-all commodity, won't it?

Ex. 8. Write down the main idea of each paragraph. Look at number 1 as an example.

The main idea of par. 1 is that scientists have found a way to power water desalination plants using wind energy.

Ex. 9. Prepare a report under the headline "Turbines could put an end to water shortages".

VOCABULARY

A

adverse – неблагоприятный
air current – воздушный поток
alkali – щелочь
amount – количество
ample – обильный
anew – снова, опять
annually – ежегодно
appropriation – присвоение
application efficiency – коэффициент полезного действия
aquifer – водоносный слой
arid – засушливый
artesian – подземный
artificial – искусственный
artificially – искусственно
availability – доступность
available – доступный

B

barrage – водоподъемная плотина
bed – грядка
beneath – под, внизу, ниже
benzene – бензол
besides interconnecting the head water and the after bay – кроме сопряжения бьефов
border strip irrigation – орошение методом чеков
bound – ограничивать, сдерживать
bucket – ведро
bulk – объем
bund – дамба, плотина
by developing the slope of the land – увеличивая уклон

C

canopy – полог
cap – закрыть, перекрыть
capacity – способность, мощность, емкость
catchment – водосборный бассейн

chute – быстрое течение, скат
coastal – прибрежный, береговой
community – общество
complement – дополнение
concern – проблема
concrete – бетон
conveyance – пропускная способность русла
confine – ограничивать
confront – столкнуться
contour – контур, рельеф
contour irrigation – орошение с учетом рельефа
correlative – относительный
corrugation – мелкая борозда
corrugation irrigation – орошение по мелким бороздам
crossing structures – сооружения на пересечениях
crucial – критический

D

dam – дамба, плотина, запруда, водохранилище
debris – наносы, примеси
deep – глубокий
dependability – зависимость
deplete – исчерпывать, опорожнять
depth – глубина
desalination – опреснение
dike – канава, ров, малый распределительный канал
discharge – расход
dissipate – рассеивать
ditch – канава, ров, малый распределительный канал
dive culvert – дюкер
diversion – забор (воды)
divert – отводить
doctrine – догма, доктрина
downtown – деловой центр города
drain – дрена
drop – капля
drought – засуха
duration – продолжительность

Е

earth-fill (dam) – земляная насыпь
earthquake – землетрясение
edge – кромка, край
elevation – возвышение, возвышенность
elsewhere – где-нибудь еще, в другом месте
embankment – насыпь
endeavor – пытаться, стараться
endemic – местный, присущий данному месту
entrust – верить, поручать
erratic – неустойчивый
essential – существенный, необходимый
evapotranspiration – суммарное испарение
event – процесс
excess – излишек
expedient – целесообразный

Ф

fan – вентилятор
faulty – ошибочный
feasible – возможный
fixed jet – неподвижный аппарат
flood irrigation – орошение затопление
flume – лоток, желоб
foundation – фундамент
free-flow irrigation – самотечное орошение
free-for-all – общедоступный
frequent – частый
furrow irrigation – полив по бороздам

Г

gravity – тяжесть, тяготение
great – уклон
gully – овраг, лощина

Н

hail – град
head water intake – головное водозаборное сооружение
humid – влажный
hydraulic – гидравлический

I

imperative – крайне необходимо
impermeable – не пропускающий жидкость
impervious – непроницаемый
inadvertently – неумышленно
Inc. (incorporated) – зарегистрированный как корпорация
indefinitely – навечно
indispensable – незаменимый
infiltration – просачивание
ingenious – искусный, оригинальный
initial – первичный
intake rates – скорость поглощения
intend – предназначать
interconnecting structures – сопрягающие сооружения
interior – внутренняя часть
intermittent – с перебоями
irrigation – орошение

J

joint – место соединения

L

labor – труд
lakefront – расположенный вблизи озера
lateral – поперечная отводная канава
layer – слой
leak – просачивание, утечка
length – длина
level – уровень
linseed – льняное семя
loose – свободный
lose – терять, утратить
loss – потеря

M

maliciously – злонамеренно
mediterranean – удаленный от берегов моря
medium pressure sprinkler – средненапорный дождевальная аппарат
membrane – мембрана, диафрагма
milberry – шелковица

modify – видоизменять
moisture – влага
mole drain – кротовая дрена
monsoon – муссон
mustard – горчица

N

nanogram – одна миллиардная часть грамма
neighborhood – округ, район
nozzle – насадка, сопло
nuisance – помеха, неудобство

O

obvious – очевидный
outlet – выпускное отверстие
output – выпуск продукции
own – иметь, владеть
ox (oxen) – бык (быки)

P

percolation – просачивание
perennial – не высыхающий летом
perforated pipe – перфорированная труба
permanent – постоянный
permeable – проницаемый
persist – оставаться
pertinent – соответствующий
petition – обращаться с петицией, ходатайствовать
pipe – труба, трубопровод
pipeline – труба
polar circle – полярный круг
pool – собирать
poplar – тополь
precipitation – осадки
precipitation rates – интенсивность дождя
predicament – опасное, неприятное положение
pressure – давление
property – имущество
psi – паскаль на квадратный дюйм
purpose – задача, цель

R

rainfall – осадки

range – выгон

rate – норма, размер, степень

rectangular – прямоугольный

reminder – остаток

removal – удаление

reservoir – водохранилище, резервуар

rock-fill (dam) – каменная наброска

rotating sprinkler heads – дождевальная установка с вращающимися насадками

runoff – сток

S

salinity – соленость

sample – образец, проба

save – сберегать, экономить

sewer – коллектор, канализационная труба

shoreline – линия берега

sizeable – значительный

sleet – дождь со снегом

slope – склон, уклон

sluice – затвор, шлюз; выпускать

smokestack – труба

smooth – гладкий, ровный

source – источник

spacing – промежуток

spare – щадить

spell – период

spillway – водослив, водосброс

split – расщеплять, разделять

sprinkler – разбрызгиватель, дождевальная установка

sprinkler in the low-pressure range – низконапорная дождевальная система

steam – пар

steep – крутой

stream – поток, река

subirrigation – подпочвенное орошение

substratum – подпочвенный слой

suburban – пригородный
subsurface – подпочвенный
subterranean – подземный
suburban – пригородный
supply – снабжать
surface – поверхность

T

tackle – заниматься
tantamount – равносильный
telemetry – телеметрия
temperate zone – умеренный пояс
temporary – временный
terrain – местность
tight – плотный, непроницаемый
tile – гончарная труба
tile drain – трубчатый дренаж
toe of slope – пята откоса
toluene – толуол
township – городок, местечко
transit – транспортировка
treat – относиться, иметь дело, улаживать, обрабатывать, очищать
turnout – выпуск воды
turn out – оказаться

U

unacceptably – неприемлемо
uncased – необлицованный
underground – подземный, под землей
uneven – неравномерный
uniform – постоянный
upward – вверх

V

valve – клапан
volatile – летучий, быстро испаряющийся
vs (versus) – против

W

waste canals- сбросная сеть каналов

water intake – водозабор

water logging – заболачивание

water management – рациональное использование воды

water table – уровень грунтовых вод

well – колодец

wet – влажный

wheat – пшеница

wild flooding – затопление большими нормами

willow – ива

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