МИНИСТЕРСТВО ОБРАЗОВАНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ

Белорусский национальный технический университет

Кафедра «Английский язык № 2»

А.Н. Пучко
Н.А. Зозон

WATER-SUPPLY ENGINEERING AND SEWAGE DISPOSAL

ВОДОСНАБЖЕНИЕ И ВОДООТВЕДЕНИЕ

Пособие

Часть 1

Минск
БНТУ
2017

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Пособие
по английскому языку для студентов специальности 1-70 04 03
«Водоснабжение, водоотведение и охрана водных ресурсов»

В 2 частях

Часть 1

Рекомендовано учебно-методическим объединением по образованию в области строительства и архитектуры

Минск
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Настоящее пособие является частью учебно-методического комплекса по английскому языку. Основу пособия составляют три раздела, построенных по единому принципу. Особое внимание уделяется изучению профессиональной лексики. Цель пособия – развить навыки устной речи по предложенным темам. Комплекс упражнений расширяет направленный вокабулярий.

Пособие может использоваться всеми, кто интересуется данной тематикой и желает самостоятельно повысить уровень владения английским языком в области водоснабжения и канализации.

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Contents

UNIT 1

Introduction to Water-Supply Engineering

"Water is the driver of Nature."
leonardo da vinci (1452–1519)

WARMING-UP

1. Water is a chemical you encounter every day that is essential for life. How much do you know about water? Test your knowledge with this water facts quiz.

Q 1: Is water a chemical element or not?

○ yes ○ no

Q 2: So... how about fire? Is it a chemical element?

○ yes ○ no

Q 3: How about air? You breathe it all the time. Is it a chemical element?

○ yes ○ no

Q 4: How much of the human body and the human brain is water?

○ about 5% and 15% correspondingly

about 25% and 35% correspondingly

about 50% and 60% correspondingly

about 65% and 75% correspondingly

Q 5: The scientific study of water is:

aqueology hydrology archaeology selenology

Q 6: Only about 1% of the world's water is in a form that is drinkable by people.

true false

Q 7: The longest river in the world is:

Nile Amazon Mississippi Volga

Q 8: The largest lake in the world is:

Lake Baikal Lake Victoria

the Caspian Sea the Aral Sea

Q 9: The largest ocean in the world is:

the Arctic Ocean the Indian

the Atlantic the Pacific

Q 10: Water has been found on Mars, Earth, and Venus.

true false

Q 11: If you expose a glass of water to space it will:

freeze boil glow burst into flame

Q 12: A mole of water molecules has a mass of about 18 grams.

true false

Q 13: Rain is liquid water precipitation. All raindrops are shaped like teardrops.

true false

Q 14: There is enough salt in the world's oceans to cover the land on the continents *(1 foot equals to 30.48 cm)*:

0.5 feet 5 feet 50 feet 500 feet

Q 15: Saltwater fish drink water; freshwater fish do not.

true false

Q 16: Dissolving a spoonful of table salt in a cup of water will *lower* the level of the liquid.

true false

Q 17: Icebergs are made of:

fresh water salt water

either fresh or salt water

Q 18: Ice is:

more dense than liquid water

the same density as liquid water

less dense than liquid water

Q 19: Melting ice into water is an example of a:

chemical change nuclear change **Ошибка! Ошибка внедренного объекта.**physical change

Q 20: Dry ice is the solid form of:

air carbon dioxide nitrogen oxygen water

Q 21: Water boils at a lower temperature on a mountaintop than it does at sea level. In fact, you could drink boiling tea on the highest peaks and not get burned!

true false

Q 22: You can superheat water in a microwave so that it suddenly boils or explodes when disturbed.

true false

Q 23: Which is hotter?

100 degrees Celsius 100 Kelvin 100 degrees Fahrenheit

Q 24: Sound moves slower in water than in air.

true false

Q 25: All of the following common chemicals are acidic or have a low pH *except*:

seawater gastric juice lemon juice coffee

Q 26: Lithium metal is light enough it could float on water.

true **Ошибка! Ошибка внедренного объекта.**false

Now check your answers!

Q 1 – no; Q 2 – no; Q 3 – no; Q 4 – about 65% and 75% correspondingly; Q 5 – hydrology; Q 6 – true; Q 7 – Nile; Q 8 – the Caspian Sea; Q 9 – the Pacific; Q 10 – true; Q 11 – boil; Q 12 – true; Q 13 – true; Q 14 – 500 feet; Q 15 – true; Q 16 – true; Q 17 – fresh water; Q 18 – less dense than liquid water; Q 19 – physical change; Q 20 – carbon dioxide; Q 21 – true; Q 22 – true; Q 23 – 100 degrees Celcius; Q 24 – false; Q 25 – seawater; Q 26 - true.

TEXT A

VOCABULARY WORK

2. Read the following international words and guess their meaning. Mind the stressed syllables. Prove that these words are international ones.

Model: management [ˈmænɪʤmənt] – управление; организация; заведование, руководство, **менеджмент**; осторожное, бережное отношение

adequate [ˈædkwət]	organism [ˈɔ:g(ə)nɪz(ə)m]
biological [ˌbaɪəuˈlɔʤk(əl)]	percent [pəˈsent]
central [ˈsentr(ə)l]	philosophical [fɪləˈsɔfɪk(əl)]
chemical [ˈkemɪk(ə)l]	planet [ˈplænɪt]
civilization [ˌsɪv(ə)laɪˈzeɪʃ(ə)n]	population [ˌpɔpjuˈleɪʃ(ə)n]
colour [ˈkʌlə]	problem [ˈprɔbləm]
element [ˈelɪmənt], [ˈelə-]	process [ˈprəuses]
experiment 1. *n* [ɪkˈsperɪmənt], [ek-]	protection [prəˈtekʃ(ə)n]
2. *v* [ɪkˈsperɪˌment], [ek-]	religious [rɪˈlɪʤəs]
fundamental [ˌfʌndəˈment(ə)l]	resource [rɪˈsɔ:s]
history [ˈhɪst(ə)rɪ]	result [rɪˈzʌlt]
human [ˈhju:mən]	role [rəul]
major [ˈmeɪʤə]	safe [seɪf]
medium [ˈmi:dɪəm]	substance [ˈsʌbst(ə)ns]
(pl. media [ˈmi:dɪə])	system [ˈsɪstəm]
metal [ˈmet(ə)l]	
microorganism [maɪkrəuˈɔ:g(ə)nɪz(ə)m]	
ocean [ˈəuʃ(ə)n]	

3. Translate the following words and phrases and memorize them.

Nouns and noun phrases	
chemical	resource
compound	solution
consequence	solvent
demand	substance
development	supply
drinking water	surface
element	tap
fresh water	water
health	water purification
hydrogen	water quality
medium (*pl*. media)	water recycling
microorganism	water supply
oxygen	water treatment
property	waterway
Verbs and verbal phrases	
to be	to make up
to carry out	to manage
to cause	to occur
to contaminate	to participate
to cover	to protect
to depend on	to result in
to develop	to safeguard
to ensure	to use
to exist	to waste
Adjectives	
adequate	ill
aqueous	important
biological	living
clean	pleasant-tasting
disease-causing	precious
elaborate	safe
essential	vital
fundamental	

Adverbs	
at least	increasingly
carefully	wisely
Prepositions	
along with	because of
Abbreviations	
e.g.	etc.
esp.	i.e.

4. Match the English and Russian equivalents.

1. adequate supply
2. aqueous solutions
3. disease-causing microorganisms
4. drinking water quality
5. in place
6. major consequence
7. stomach upset
8. to be a threat to health
9. to carry out a process
10. to cover the area
11. to flourish around major waterways
12. to take *smth.* for granted
13. to turn on the tap
14. to use *smth.* as a medium
15. wasted and contaminated water
16. water purification and recycling

a. водный раствор
b. водоочистка и оборотное водоснабжение
c. достаточный запас
d. загрязненная и зараженная вода
e. занимать площадь
f. использовать *что-л.* как среду *(вещество, в котором существует что-л.)*
g. качество питьевой воды
h. осуществлять процесс
i. открывать водопроводный кран
j. патогенные [болезнетворные] микроорганизмы
k. представлять угрозу [опасность] для здоровья
l. процветать вокруг главных водных путей
m. работающий, рабочий, готовый к работе
n. расстройство желудка
o. серьезное последствие
p. считать *что-л.* в порядке вещей, само собой разумеющимся

5. Match the terms and their definitions.

drinking water, microorganism, occur, resources, solvent, substance, tap, water, water supply, waterway

a. a colorless, transparent, odorless, tasteless liquid that forms the seas, lakes, rivers, and rain and is the basis of the fluids of living organisms

b. a country's collective means of supporting itself or becoming wealthier (reserves of minerals, land, water, etc.)

c. a device by which a flow of liquid or gas from a pipe can be controlled

d. a liquid capable of dissolving another substance

e. a particular kind of matter with uniform properties

f. a river, canal, or other navigable channel used as a means of travel or transport

g. an organism too small to be seen without the aid of a microscope

h. happen; takes place; exist

i. the water available for a community or region; the supply of treated and purified water for a community; water resources

j. water intended primarily for human consumption (also known as potable water)

6. Make sure you know the words and word combinations from the box and insert them into the sentences.

water, resources, drinking, substance, properties, systems, management, use, makes up, covers, essential

1. Water is the most important liquid _____ on Earth. It _____ almost 75 percent of Earth's surface in the form of oceans, rivers, and lakes. All plants and animals need _____ to live.

2. Everyone should drink water every day. Water _____ about 60 percent of an adult's body by weight. Children's bodies have an even higher percentage of water.

3. People have many uses for water besides _____ . They use it for washing and cooking. They use it to irrigate crops and lawns, to clean

streets, and to operate air-conditioning units and heating _____ . They also _____ the power of flowing water to produce electricity.

4. Water's physical and chemical _____ make it _____ to life and civilization.

5. Water conservation is the protection, development, and efficient _____ of water _____ for beneficial purposes.

7. Translate the following sentences into Russian paying attention to the underlined words that can be verbs, nouns or adjectives without changing their form and adding suffixes.

1. Don't leave the tap running.
2. Tap water is a principal component of indoor plumbing.
3. It is necessary to water these flowers several times during the day.
4. Reducing the water demand can delay the need to find new water supplies.
5. The plumbing in this building needs repairing.
6. Water scarcity occurs when the demand for water outpaces the supply and causes water shortages.
7. The cause of the failure of the water supply system is not clear.
8. The implementation of the plan demands profound knowledge.
9. Ancient Rome's elaborate aqueduct system supplied water to the city.
10. The two reservoirs supply about 1% of the city's needs.
11. A group of architects and engineers elaborated the plan of a complex of buildings.
12. Anyone who plans on building their own house, should be ready for the challenges that go along with this complex process.
13. The computers will process the data obtained.
14. Over 1 billion people lack access to safe drinking water worldwide.
15. Water for drinking either comes from surface water sources such as rivers and lakes, or from underground wells or springs.

Now fill in the table with Russian equivalents to the words from the sentences above.

complex, demand, drinking, elaborate, need, plan, process, supply, tap, water

	NOUN	VERB	ADJECTIVE
cause	причина	вызывать, быть причиной	---

READING PRACTICE

8. Answer the following question and read the text carefully to check your answer.

Why is water considered to be the most precious resource on the Earth?

Text A Water as the Most Precious Resource

"Water has become a highly precious resource. There are some places where a barrel of water costs more than a barrel of oil."
LLOYD AXWORTHY, Foreign Minister of Canada

It is easy for us to take the quality of our drinking water for granted — when we turn on the tap, we expect safe, pleasant-tasting water to flow out. Long before water reaches our tap, elaborate and carefully managed systems are in place protecting our water and making it safe to drink, from the water falling as rain to the point when it reaches our tap.

Let's look at why drinking water quality is so important, the journey our water makes to our taps and back, systems to ensure good water quality and how everyone can help safeguard this most precious of resources.

Significance of Water for Life

Water is vital to life and is essential to all living organisms. Life is believed to have originated in the world's oceans, so water has played a central role in the development of life on Earth. One of water's most important properties is its ability to be a solvent for many other substances, which is essential to living organisms. They use aqueous solutions as

mediums for carrying out biological processes. In fact, water participates in every process that occurs in plants and animals.

Water is essential to life. Our health depends on having an adequate supply of safe water for drinking, cooking, laundry and bathing — every day. The link between our water supply and disease has been recognized for thousands of years — at least since Egyptian times. If our water becomes contaminated with microorganisms or chemicals, illness can result. Disease-causing microorganisms carried by water are the biggest threat to health, causing stomach upset or even death. In some cases, people can become ill after drinking contaminated water just once. As we all depend on clean water every day, any problem with the water supply can very quickly have major consequences for an entire community. Water is too easily wasted or contaminated. We need to use it wisely and protect it.

The Earth is often called the "blue planet" because it appears blue from space. This blue colour is caused by reflection from the oceans which cover about 70 percent of the area of the Earth. Water is one of the five elements that make up this planet, along with fire, earth, air, and metal. Because of its prominence, water has long played an important religious and philosophical role in human history. The belief that water was a fundamental substance existed for more than 2,000 years until experiments in the second half of the 18th century showed that water is a compound made up of the elements hydrogen and oxygen. Civilization has historically developed and flourished around rivers and major waterways. As the Earth's population grows and the demand for fresh water increases, water purification and recycling become increasingly important.

COMPREHENSION CHECK

9. Decide whether the following statements are true (T) or false (F) according to the text. Correct the false statements.

1. Carefully managed systems protect our water and make it safe to drink, from the water falling as rain to the point when it reaches our tap.
2. Water is essential to life and all living things.
3. Scientists believe that life originated in the world's oceans.
4. Water has the ability to solve any substance easily.
5. Water takes part in most processes that occur in plants and animals.
6. There isn't any link between the contamination of our water supply and human diseases.
7. Disease-causing microorganisms carried by water can cause death.
8. Water should be protected from contamination.
9. The land covers about 70% of the area of the Earth.
10. It wasn't until the second half of the 18th century that experiments showed that water is a compound made up of the elements hydrogen and oxygen.
11. Today water purification and recycling are increasingly important because of the Earth's population growth.

10. Answer the following questions.

1. Is it easy for us to take the quality of our drinking water for granted?
2. What do elaborate and carefully managed systems do long before safe pleasant-tasting water reaches our tap?
3. Life is believed to have originated in the air, isn't it?
4. What is one of water's most important properties?
5. Is water a solvent for all other substances?
6. What do living organisms use aqueous solutions for?
7. What does our health depend on?
8. Since what time has the link between our water supply and disease been recognized?
9. Why do we need to use water wisely and protect it?
10. Why is the Earth often called the "blue planet"?
11. Where has civilization developed historically?
12. Why do water purification and recycling become increasingly important?

11. Find key words and phrases which best express the general meaning of each paragraph.

12. What parts of the text can you define? Do they correspond to the paragraph? Entitle each part.

1. _____
2. _____
3. _____
… _____

13. Write a summary of the text.[1]

LANGUAGE FOCUS

14. Match the synonyms.

1. aqueous	a. dissolvent
2. because of	b. due to / owing to
3. contamination	c. faucet
4. disease-causing	d. organized
5. essential	e. pathogenic
6. managed	f. pollution
7. precious	g. to dissolve
8. purification	h. to exist
9. solvent	i. to protect
10. tap	j. to reuse
11. to be	k. to take part
12. to participate	l. treatment
13. to recycle	m. valuable
14. to safeguard	n. vital
15. to solve	o. watery

[1] SUMMARY is a brief statement (in approximately 150 words) of the main points of a text.

15. Match the antonyms.

1. ability	a. careless
2. adequate	b. dangerous / harmful
3. careful	c. dead
4. death	d. harm
5. easy	e. inability
6. essential	f. inadequate
7. important	g. inessential
8. living	h. insignificant
9. protection	i. life
10. safe / harmless	j. to decrease
11. significant	k. to demand
12. to contaminate / to pollute	l. to treat / to purify
13. to increase	m. uneasy
14. to supply	n. unimportant

16. Fill in the correct prepositions.

1. the quality … drinking water 2. to take … granted 3. to be vital … life and essential … all living organisms 4. to play a central role … the development … life … Earth 5. to use aqueous solutions … mediums … carrying … biological processes 6. to depend … an adequate supply … safe water 7. to become contaminated … microorganisms or chemicals 8. a compound made … … the elements hydrogen and oxygen 9. to develop and flourish … rivers and major waterways 10. the demand … fresh water

17. Choose the word or phrase the translation of which is given at the beginning of each line.

1. вследствие, из-за: A. because of B. however C. therefore D. because
2. вещество: A. property B. substance C. medium D. compound
3. ресурсы: A. sources B. properties C. solvents D. resources
4. снабжение: A. demand B. development C. supply D. solution
5. очистка: A. protection B. process C. recycling D. purification
6. пресная вода: A. tap water B. drinking water C. potable water D. fresh water

7. водоснабжение: A. water supply B. waterway C. water treatment D. water resources

8. происходить: A. to cover B. to carry C. to occur D. to use

9. существовать: A. to reach B. to develop C. to flourish D. to exist

10. приятный на вкус: A. pleasant-tasting B, disease-causing C. drinking D. elaborate

18. Find the odd word.

1. compound, mixture, quality, mix, combination, composite, blend
2. substance, matter, material, element
3. treatment, protection, purification, cleaning, cleansing, purifying
4. to clean, to treat, to dirty, to purify
5. contamination, pollution, solution
6. to solve, to pollute, to contaminate, to foul
7. drinking, drinkable, palatable, potable

19. Translate the following words and phrases into English using the vocabulary of the text.

Питьевая вода, пресная вода, соленая вода, водоснабжение, водные ресурсы, водные пути, качество воды, свойства воды, водопроводная вода, болезнетворные микроорганизмы, очистка воды, оборотное водоснабжение, самое распространенное вещество, самый ценный ресурс, достаточный запас, водный раствор, тщательно разработанный, химические элементы водород и кислород, химическое соединение, занимать 70 % поверхности Земли, загрязненная и зараженная вода, участвовать по всех процессах, существовать, происходить, развиваться, использовать.

20. Translate the following text into English using the active vocabulary.

Давайте взглянем на карту мира. На ней преобладает синий цвет, которым изображают воду. Ее в два с половиной раза больше, чем суши, на нашей планете, которую назвали Землей. Не справедливо ли было дать ей имя Вода?..

В сокровищнице природы нет второго такого же чудесного вещества. Вода – единственное из всех веществ, существующее одно-

временно в трех агрегатных состояниях – твердом, жидком и газообразном. В холодных полярных морях на поверхности жидкой воды плавают огромные ледяные глыбы – твердая вода. А воздух над морем и сушей содержит газообразную воду – пар.

Вода обладает огромной силой: она прорывает плотины, сметает все на своем пути. Наводнения заливают и разрушают города и поселки. Неожиданно налетают гигантские волны – цунами.

В то же время вода – добрый друг и помощник человека. Она – удобный путь, а водный транспорт самый дешевый. Она побеждает засуху, оживляет пустыни, повышает урожай садов и полей. Она послушно вращает турбины на гидроэлектростанциях.

Вода – одно из самых важных для человека, для жизни веществ. Без еды человек может существовать около полутора месяцев. А без воды не проживет и недели. Организм человека, его кровь, мозг, ткани тела, на три четверти состоит из воды. Да и сама жизнь на Земле зародилась именно в водах океана. Вот какое необыкновенное вещество обыкновенная вода!

LANGUAGE DEVELOPMENT

WORD FORMATION

Word formation (word-building) is the creation of a new word. There are various mechanisms of word formation:

*Agglutination (the process of forming new words from existing ones by adding affixes (suffixes and prefixes) to them, like "develop" + "ment" → "development")

*Back-formation (removing seeming affixes from existing words, like forming "engine" from "engineer")

*Blending (a word formed by joining parts of two or more older words, like "smog", which comes from "smoke" and "fog")

**Acronym (a word formed from initial letters of the words in a phrase, like English "laser" from "light amplified by stimulated emission of radiation")

**Clipping (taking part of an existing word, like forming "ad" from "advertisement")

*Compound (a word formed by stringing together older words, like "earthquake")

**Incorporation (a compound of a verb and an object or particle, like "intake")

*Conversion (forming a new word from an existing identical one, like forming the verb "green" from the existing adjective)

*Loanword (a word borrowed from another language, like "cliché", which comes from French)

*Neologism (a completely new word, like "quark")

Let's consider some examples of word formation by means of adding suffixes and prefixes.

1) In order to form adjectives from verbs and nouns, we add the following suffixes:

-(ic)al (*e.g.* biology – biological, physics – physical, chemistry – chemical, philosophy – philosophical, nature - natural)

-able/ -ible (*e.g.* to avail – available, to value – valuable, to drink – drinkable, to desire – desirable)

-ant/ -ent (*e.g.* to please – pleasant, to depend – dependent)

-ar (*e.g.* molecule – molecular, pole – polar)

-ate (*e.g.* adequacy – adequate)

-ful (*e.g.* colour – colourful, to harm – harmful, to care – careful, plenty - plentiful)

-ial (*e.g.* essence – essential)

-ic (*e.g.* aqua – aquatic, science – scientific)

-ing (*e.g.* interest – interesting)

-ive (*e.g.* to protect – protective, to act – active, effect - effective)

-less (*e.g.* colour – colourless, taste – tasteless, odour – odourless)

-ous/ -eous/ -ious (*e.g.* aqua – aqueous, gas – gaseous, preciosity – precious, religion – religious, to vary – various, danger – dangerous)

-y (*e.g.* water – watery)

2) In order to form nouns from verbs and adjectives, we add the following suffixes:

-ability/ -ibility (*e.g.* suitable – suitability, variable – variability, responsible – responsibility)

-age (*e.g.* to drain – drainage)

-al (*e.g.* to survive – survival, to remove – removal, chemistry – chemical)

-ance/ -ence/ -ancy/ -ency (*e.g.* to appear – appearance, important – importance, to exist – existence, consequent – consequence, frequent – frequency, efficient – efficiency)

-ant/ -ent (*e.g.* to participate – participant, to pollute – pollutant, to contaminate – contaminant, to solve – solvent)

-ate (*e.g.* to condense - condensate)

-er/ -or/ -ar (*e.g.* to plumb – plumber, engine – engineer, to build – builder, to contain – container, to invent – inventor, to lie – liar)

-gen (*e.g.* allergen, oxygen, hydrogen)

-ics (*e.g.* physics, hydraulics)

-ing (*e.g.* to drink – drinking, to bathe – bathing, to recycle – recycling, to build – a building, engineer – engineering, to draw – a drawing)

-ion/ -tion/ -ation/ -ution/ - sion (*e.g.* to pollute – pollution, to purify – purification, to vary – variation, to civilize – civilization, to permit – permission)

-ism (*e.g.* Darwin – Darwinism, organ – organism)

-ity (*e.g.* stable – stability, major – majority, pure – purity)

-ment (*e.g.* to develop – development, to treat – treatment)

-ness (*e.g.* busy – business, ready – readiness, damp – dampness)

-th (*e.g.* long – length, warm – warmth, wide – width, strong – strength)

-ty/ -ety/ -ity (*e.g.* to save – safety, human – humanity, proper – property)

-ure/ -ture (*e.g.* to mix – mixture, to create – creature)

-y (*e.g.* to discover – discovery, health – healthy)

3) In order to form <u>verbs</u> from <u>nouns</u> and <u>adjectives</u>, we add the following suffixes and prefixes:

-ate (*e.g.* origin – to originate)

-ify/ -fy (*e.g.* pure – to purify)

-en (*e.g.* length – to lengthen, wide – to widen, broad – to broaden, strength – to strengthen)

-ish (*e.g.* to establish, to demolish)

-ize/ -yze (*e.g.* civil – to civilize, analysis – to analyze)

-en- (*e.g.* large – to enlarge, danger – to endanger)

4) We add the suffixes –ly and –ward/ -wards to form adverbs (*e.g.* natural – naturally, usual – usually, increasing – increasingly, outward – outwardly, down – downward, up – upward, south – southwards, sea – seaward)

5) In order to make the word negative, we use the following prefixes:

ab- (*e.g.* normal – abnormal)
dis- (*e.g.* infection – disinfection, order – disorder, to charge – to discharge, to like – to dislike, honest – dishonest)
il- (*e.g.* legal – illegal)
im- (*e.g.* possible – impossible, mature – immature)
in- (*e.g.* significant – insignificant)
ir- (*e.g.* rational – irrational)
mal- (*e.g.* practice – malpractice)
mis- (*e.g.* understanding – misunderstanding)
non- (*e.g.* renewable – nonrenewable)
un- (*e.g.* important – unimportant)

The suffix –less also has the negative meaning (*e.g.* harm – harmless).

6) There are many other prefixes including:

after- (*e.g.* after-treatment, after-effect)	micro- (*e.g.* microorganism, microscope)
agri- / agro- (*e.g.* agriculture, agrotourism)	milli- *e.g.* (milliliter, millimeter)
bi- (*e.g.* bicarbonate)	mono- (*e.g.* monoxide)
bio- (*e.g.* biodegradable, biochemical)	multi- (*e.g.* multi-purpose)
by- (*e.g.* by-product)	nano- (*e.g.* nanotechnology)
chemi- / chemico- (chemicophysical)	off- (*e.g.* offshore)
co- (*e.g.* coexistence, cooperation)	over- (*e.g.* overestimate)
counter- (*e.g.* counteract)	peri- (*e.g.* perimeter)
de- (*e.g.* deactivate, de-ice)	poly- (*e.g.* polytechnic, polyethylene)
di- (*e.g.* dioxide)	pre- (*e.g.* pretreatment, prehistoric)
down- (*e.g.* downstream)	re- (*e.g.* reconstruction, removal, rebuild)
	self- (*e.g.* self-purification)
	semi- (*e.g.*semiliquid)

eco- (*e.g.* eco-friendly, ecosystem)	sub- (*e.g.* subsurface, substructure)
extra- (*e.g.* extracellular)	super- (*e.g.* superstructure)
fore- (*e.g.* foreseeable)	sur- (*e.g.* surface)
half- (*e.g.* half-period)	techno- (*e.g.* technomania)
hemi- (*e.g.* hemisphere)	trans- (*e.g.* transport, transportation)
hetero- (*e.g.* heterogeneous)	tri- (*e.g.* triangle, triangular)
homo- (*e.g.* homogeneous)	ultra- (*e.g.* ultraviolet, ultrahazardous)
hydro- (*e.g.* hydropower)	under- (*e.g.* underestimate)
infra- (*e.g.* infrared, infrastructure)	uni- (*e.g.* uniform)
inter- (*e.g.* international)	up- (*e.g.* upstream)
meta- (*e.g.* metabolism)	with- (*e.g.* withstand, withdrawal)

21. Arrange the following words according to the parts of speech paying attention to their suffixes and prefixes.

NOUN	VERB	ADJECTIVE	ADVERB
engineering	to characterize	mechanical	easily
…	…	…	…

aerify	constantly	hardness	oxidize
basic	consumer	harmfully	pollutant
beautiful	contaminate	healthless	property
biologically	density	hydrologic	protection
central	downwards	inexhaustible	quality
characteristic	fertilizer	microorganism	structure
condensate	flourish	occurrence	unavailable

22. Form the nouns from the following verbs using suffixes –ion (-tion/ -ation/ -ution/ - sion).

to civilize ➔ civilization
to combine ➔…
to contaminate ➔…
to originate ➔…
to participate ➔…
to pollute ➔…
to populate ➔…
to protect ➔…
to purify ➔…
to solve ➔…

23. Form the nouns from the following verbs and adjectives using suffixes –ence/ -ance.

consequent ➔consequence
important ➔…
prominent ➔…
significant ➔…
transparent ➔…

to appear ➔appearance
to exist ➔…
to occur ➔…

SPEAKING PRACTICE

24. Get ready to speak about significance of water for life on the Earth.

TEXT B

VOCABULARY WORK

25. Read the following international words and guess their meaning. Mind the stressed syllables. Prove that these words are international ones.

Model: substance [ˈsʌbst(ə)ns]– **субстанция**, материя; вещество

aquatic [əˈkwætɪk]	myriad [ˈmɪrɪəd]
atmosphere [ˈætməsfɪə]	natural [ˈnætʃ(ə)r(ə)l]
bacterium [bækˈtɪərɪəm]	normal [ˈnɔ:m(ə)l]
(pl. bacteria [bækˈtɪərɪə])	person [ˈpɜ:s(ə)n]
chance [tʃʌns]	physical [ˈfɪzɪk(ə)l]
characteristic [ˌkærəktəˈrɪstɪk]	phytoplankton [faɪtəʊˈplæŋktən]
circulate [ˈsɜ:kjəleɪt]	polar [ˈpəulə]
complex [ˈkɔmpleks]	portion [ˈpɔ:ʃ(ə)n]

condense [kən´dens]	recreation [ˌrɪekrɪ´eɪ(ə)n]
cycle [´saɪkl]	saturate [´sætʃ(ə)reɪt]
determine [dɪ´tɜ:mɪn]	structure [´strʌktʃə]
drainage [´dreɪnɪʤ]	temperature [´temp(ə)rətʃə]
form [fɔ:m]	transpiration [trænspɪ´reɪʃ(ə)n]
formula [´fɔ:mjələ]	transport 1. *v* [træn´spɔ:t]
(pl. formulae [´fɔ:mjuli:]/	2. *n* [´trænspɔ:t]
formulas)	transportation [ˌtrænspɔ:´teɪʃ(ə)n]
gas [gæs]	typical [´tɪpɪk(ə)l]
generation [ˌʤenə´reɪʃ(ə)n]	unique [ju:´ni:k]
glacier [´glæsɪə]	variety [və´raɪətɪ]
ground [graund]	virus [´vaɪ(ə)rəs]
hydrologic [ˌhaɪdrə´lədʌʤɪk]	zooplankton [ˌzu:ə´plæŋktən]
microscopic [ˌmaɪkrə´skɔpɪk]	
molecule [´mɔlɪkju:l]	

26. Translate the following words and phrases and memorize them.

Nouns and noun phrases

acid	melting point
acidity	moisture
alga	molecule
alkali	odour
alkalinity	physical state
aquifer	phytoplankton
boiling point	precipitation
characteristic	protozoan (*pl*. protozoa /
cleansing	protozoans)
colour	saline water
corrosiveness	salt water
corrosivity	soil
drainage	solid
evaporation	surface water
evapotranspiration	taste
foamability	transpiration
gas	turbidity

glacier	vapour
groundwater / ground water	water [hydrologic] cycle
hardness	water body / body of water
icecap	zooplankton
liquid	

Verbs and verbal phrases

to assess	to determine
to be composed of	to evaporate
to be locked up	to nourish
to be saturated with	to refer to
to circulate	to release
to condense	to transport
to contain	

Adjectives

aquatic	liquid
available	odourless
chemical	physical
colourless	plentiful
gaseous	solid
invaluable	tasteless

Abbreviations and symbols

^{o} C (degree(s) Celsius)	H_2O
^{o} F (degree(s) Fahrenheit)	pH (hydrogen ion exponent)
% (per cent / percent)	

27. Match the English and Russian equivalents.

1. aquatic life	a. быть насыщенным водой
2. complex property	b. вести себя либо как кислота, либо как щелочь
3. natural cleansing	c. взять на себя ответственность за *что-л.*
4. polar icecap	d. водная поверхность, поверхность воды
5. salt [saline] and fresh water	e. водная флора и фауна, гидробионты *(организмы, обитающие в воде)*
6. surface water and groundwater	
7. to act as an acid or as an alkaline	
8. to be saturated with water	

9. to be transported through the atmosphere 10. to exist in three physical states 11. to take responsibility for *smth* 12. under normal conditions 13. water [hydrologic] cycle 14. water body [a body of water] 15. water supply [supplies] 16. water surface	f. водные ресурсы; водные запасы g. водоем; водный объект h. круговорот воды, влагооборот i. ледниковый покров *(в горах)*; полярный лёд j. перемещаться в атмосфере k. поверхностная вода и подпочвенные воды [почвенная/ грунтовая вода] l. при нормальных условиях m. самоочищение *(природной среды)* n. сложное свойство o. соленая и пресная вода p. существовать в трех физических (агрегатных) состояниях

28. Match the terms and their definitions.

alga (*pl*. algae), aquifer, fresh water, glacier, groundwater, icecap, property, solid, surface water

a. a simple nonflowering (нецветковый) plant growing in water

b. a slowly moving mass of ice formed by the accumulation and compaction of snow on mountains or near the poles

c. a thick mass of glacial ice and snow that permanently covers an area of land, such as either of the polar regions or the peak of a mountain

d. all water naturally open to the atmosphere (*e.g.* rivers, streams, lakes or reservoirs); water that collects on the surface of the ground

e. an attribute, quality or characteristic of something

f. an underground layer of permeable rock, sand or gravel that carries water, allowing it free passage through pore space

g. firm and stable in shape; not liquid or fluid

h. the water with the total dissolved substances content of less than 1,000 mg/l

i. water contained underground in the soil or in pores and crevices in rock

29. Make sure you know the words and word combinations from the box and insert them into the sentences.

surface, temperatures, physical states, molecules, atoms, vapour, formula, determines, to melt, evaporates

Water is made of _____ which are combinations of atoms. A molecule of water is made of two hydrogen _____ and one oxygen atom. The scientific _____ for water is H_2O.

Water can be found in three _____ : liquid, solid (ice), or gas (steam or vapour). The molecules in all three states are constantly moving. The speed of this movement _____ water's physical state. In ice, the water molecules vibrate but basically stay in place. In liquid water, the molecules move more quickly but stay near each other. In _____ , the molecules move so quickly that they fly away in all directions.

Heat causes water to change from one physical state to another. When ice is heated, the water molecules move faster and farther apart. This causes the ice _____ into liquid. When liquid water is heated, the molecules speed up even more. Molecules at the _____ of the liquid begin to break loose and fly into the air. In this way the liquid _____ , or becomes vapour. This process also works in reverse. Cooling _____ slow down the molecules so that vapour turns back into liquid. Very cold temperatures turn liquid into ice.

30. Translate the following phrases and sentences into Russian paying attention to the underlined words that can be verbs, nouns or adjectives without changing their form and adding suffixes.

1. acid medium, acid rain; rainwater is a very weak acid
2. the chemical composition of the atmosphere, chemical reaction; never mix disinfectant with other chemicals; controversy arose over treatment of fruit with this chemical
3. rivers and lakes are often coloured green by algae; colour of water
4. ice melts; ice is a solid form of water; water occurs as a solid called ice; lakes and rivers ice over in winter
5. water can occur as a gas called steam or water vapour; vapour forms clouds; heating makes moisture vapour
6. liquid water; a liquid substance; clear liquid; cloudy liquid

7. to grow plants; to water a plant; to plant a tree
8. mineral salt; salt water
9. pleasant taste; strong taste; the water tastes good; to taste water

Now fill in the table with Russian equivalents to the words from the sentences above.

chemical, colour, form, ice, liquid, plant, salt, solid, taste, vapour

	NOUN	VERB	ADJECTIVE
acid	кислота	---	кислотный *(о химическом составе)*

READING PRACTICE

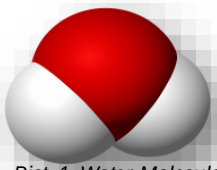
31. Answer the following questions and read the text carefully to check your answers.

Is water a unique substance with complex properties? Why? Why not?
How much water on the Earth is fresh water?
What do you know about the water cycle?

Text B Water. General Information

"Water is H_2O, hydrogen two parts, oxygen one,
but there is also a third thing that makes water
and nobody knows what that is."
D.H. Lawrence (1885–1930)

Water is a substance composed of the chemical elements hydrogen and oxygen and existing on the Earth in all *three physical states*: *solid*, *liquid*, and *gas*. Water is a colourless, tasteless, and odourless liquid at room temperature. Its melting point is 0^o C (32^o F), and its boiling point is 100^o C (212^o F). Water is undoubtedly the most common, plentiful and essential of all chemical compounds.



Pict. 1. Water Molecule

Water Properties

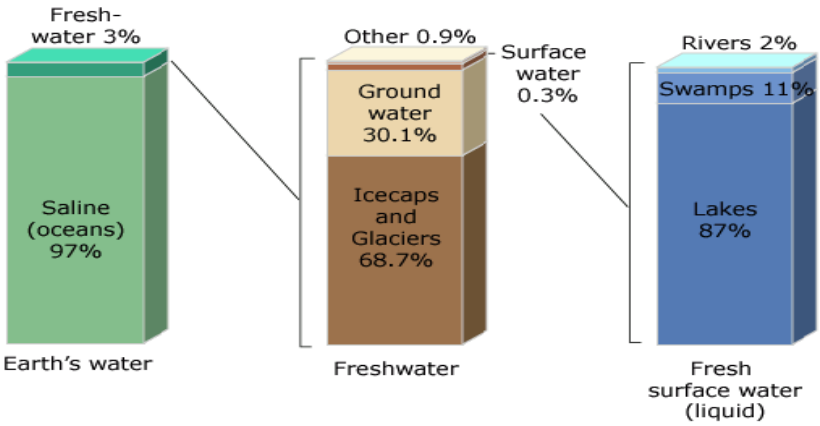
Although the water molecule formula seems simple in structure (H_2O), the physical and chemical properties of the compound are extremely complex. These properties are incompletely understood and are not typical of most substances. For example, water can sometimes act as an acid or as an alkali (a base). Another unusual property is that in its solid form, ice, water is less dense than when it is liquid. Ice therefore floats on water and protects the aquatic life below water surface of water bodies in cold areas of the world. Water occurs as a liquid on the surface of the Earth under normal conditions, which makes it invaluable for transportation, for recreation, and as a habitat for a myriad of plants and animals. The fact that water is readily changed to a vapour (gas) allows it to be transported through the atmosphere from the oceans to inland areas where it condenses and, as rain, nourishes plant and animal life. The process is called the ***"water cycle"***, or the ***"hydrologic cycle"***.

Water Characteristics

Water quality is determined by assessing three classes of characteristics: physical, chemical, and biological. *The physical characteristics* include turbidity, colour, taste, odour, temperature, and foamability. *The chemical characteristics* of water are its acidity, alkalinity, pH, hardness, and corrosiveness (corrosivity). *The biological characteristics* of a water body refer to a variety of living organisms that can be found in water, including microscopic viruses, bacteria and protozoans; as well as phytoplankton (microscopic algae), zooplankton (tiny water animals), insects, worms, large plants and fish.

Earth's Water Supply

About 97% of all water is *salt (saline) water* of the oceans, and the remaining 3% is *fresh water*. The majority of fresh water, about 69%, is locked up in polar *glaciers* and *icecaps*, mainly of Greenland and Antarctica; and the rest is *ground water*. No matter where on Earth we stand, chances are that, at some depth, the ground below is saturated with water. Of all the fresh water on Earth, only about 0.3% is contained in rivers and lakes, known as *surface water*. Considering that most of the water we use in everyday life comes from rivers, we make use of a tiny portion of the available water supplies.



Pict. 2. Distribution of Earth's Water

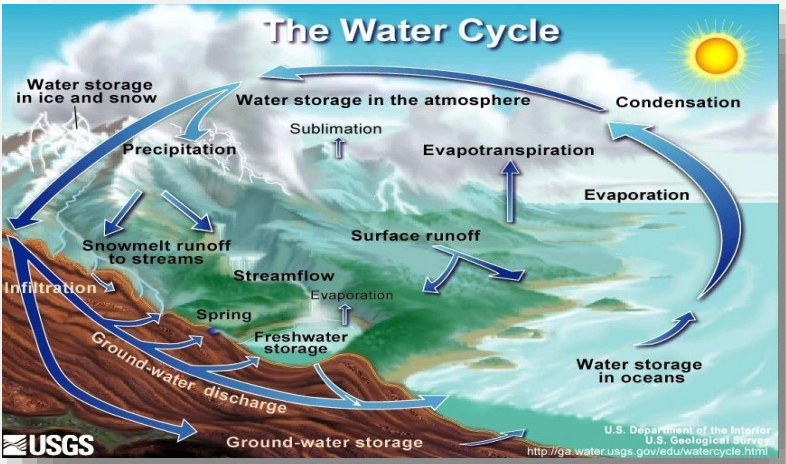
The Water (Hydrologic) Cycle

The water we drink has been around for hundreds of millions of years. It travels in a continuous cycle between the oceans, the air, the earth's surface and aquifers, undergoing natural cleansing as it makes this journey, but also potentially becoming contaminated.

The water (hydrologic) cycle is the cycle of processes by which water circulates between the earth's oceans, atmosphere, and land, involving precipitation as rain and snow, drainage in streams and rivers, and return to the atmosphere by evaporation and transpiration.

Water vapour condenses to form clouds, which release water as *precipitation* (rain, hail or snow) when conditions are suitable. As the water falls to earth it either moves into the soil or runs into rivers and the ocean. Surface water in lakes, streams and oceans evaporates, returning moisture to the atmosphere, in a process called *evaporation*. Plants also return water to the atmosphere by taking water from the ground through their roots and releasing it from their leaves in a process known as *transpiration*.

Water on the Earth is constantly on the move, recycling over and over again. This process proves the necessity of every person to take responsibility for saving the most precious resource - water - for the future generations.



Pict. 3. The Mechanism of Water (Hydrologic) Cycle

COMPREHENSION CHECK

32. Decide whether the following statements are true (T) or false (F) according to the text. Correct the false statements.

1. Water is composed of the physical elements hydrogen and oxygen.
2. Solid, liquid, and gas are the three physical states in which water exists on the Earth.
3. Water is a colourful, tasteful and odourless liquid at room temperature.
4. The formula of a water molecule seems complex in structure, but the physical and chemical properties of the compound are simple.
5. Water in its solid state is denser than water in its liquid state.
6. Water is valueless for transportation, for recreation, and as a habitat for a myriad of plants and animals.
7. The "water cycle" is a synonym for the "hydrologic cycle".
8. There are three classes of characteristics of water: physical, chemical, and biological.

9. The chemical characteristics of water include its acidity, alkalinity, pH, turbidity, and hardness.
10. Salt water constitutes about 3% of all the Earth's water supply.
11. Both groundwater and surface water are fresh water.

33. Answer the following questions.

1. What is water?
2. In what physical states does water exist on the Earth?
3. What are the examples of unusual and complex properties of water?
4. What are three classes of water characteristics?
5. What do the physical, the chemical and the biological characteristics of water include?
6. Is 97% of all water on the Earth salt or fresh water?
7. Ground water is fresh water, isn't it?
8. Is fresh surface water contained in rivers, lakes and seas?
9. What is the water (hydrologic) cycle?
10. What is precipitation, evaporation and transpiration?
11. What proves the necessity of saving the most precious resource – water – for the future generations?

34. Choose the right variant according to the text.

1. **Water consists of the chemical elements … .**
A. carbon and hydrogen
B. oxygen and hydrogen
C. oxygen and nitrogen
D. carbon oxide and carbon dioxide
2. **About 97% of all water on the Earth is … .**
A. ground water
B. salt water
C. surface water
D. fresh water
3. **Fresh surface water is found in … .**
A. oceans, seas, rivers, lakes and swamps
B. rivers, lakes and marshes
C. rain, oceans, rivers, lakes, etc.
D. glaciers and icecaps

4. Since rivers are the main source of the water we use in our **everyday life, the humanity … .**

A. uses the vast majority of the available fresh water
B. makes use of all the Earth's surface water
C. uses only a small part of the available water supplies
D. can't make use of available water supplies at all

5. **In the process called the "hydrologic cycle", water is transported** through the atmosphere from the oceans to inland areas **where it … and, as rain, nourishes plant** and animal life.

A. recycles
B. condenses
C. vapours (vaporizes)
D. saturates

35. Write a summary of the text.

LANGUAGE FOCUS

36. Match the synonyms.

1. cleansing	a. abundant
2. common	b. characteristic/quality
3. cycle	c. cleaning
4. element	d. component
5. gas	e. evaporation
6. moisture	f. gaseous
7. plentiful	g. general
8. property	h. humidity
9. to compose	i. hydrologic cycle
10. vapour	j. reservoir
11. water body	k. rotation
12. water cycle	l. to constitute

37. Match the antonyms.

1. acidity	a. alkalinity
2. contaminated	b. artificial / man-made
3. dense	c. complex
4. groundwater	d. fresh water
5. microscopic	e. sparse
6. natural	f. surface water
7. saline water	g. to exclude
8. simple	h. to waste
9. suitable	i. treated
10. to include	j. tremendous
11. to save	k. unsuitable
12. valuable	l. valueless

38. Fill in the correct prepositions.

1. to be composed … the chemical elements hydrogen and oxygen 2. to exist … the Earth … all three physical states 3. … room temperature 4. to seem simple … structure 5. the chemical properties … the compound 6. to be typical … most substances 7. to act … an acid or … an alkali 8. … solid form 9. … water surface … the water bodies … cold areas … the world 10. to occur … a liquid … the surface … the Earth 11. to be transported … the atmosphere … the oceans … inland areas 12. to be determined … assessing three classes … characteristics 13. … 97% … all water 14. to make use … a tiny portion … the available water supplies 15. to return water … the atmosphere … taking water … the ground … the roots

39. Insert the appropriate word or word combination.

pH, hydrologic cycle, desalination, survive, evaporation, dependent, quality, factors, circulates, precipitation, salts, fluid, consumption

1. The human being can ___ only a few days without clean, safe drinking water, and every part of the human body is ___ on water.

2. Whether the ___ of drinking water is acceptable or not depends on several ___: how it looks, how it tastes, how it smells, and how clean and safe it is.

3. ___ is a measure of the acidity or alkalinity of a solution, as well as a measure of the hydrogen ion concentration in water.

4. A gas and especially a liquid are called a ___ .

5. The ___ describes the cycle by which water is transferred over the Earth. It is the cycle of processes by which water ___ between the earth's oceans, atmosphere, and land, involving ___ as rain and snow, drainage in streams and rivers, and return to the atmosphere by ___ and transpiration.

6. Because seawater contains large quantities of dissolved ___, it must be desalinated for most uses, including human consumption. The most common ___ methods are distillation, ion exchange, and reverse osmosis.

7. Interestingly, the purity requirements of water for industrial use often exceed those for human ___ .

40. Translate the words and word combinations in brackets.

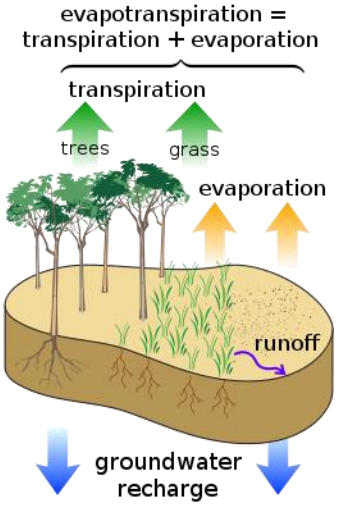
The Water Cycle

(1) Water on Earth is always moving. It moves from Earth's surface into the *(атмосфера)* and then returns to the surface. This movement is called the water cycle. The sun, *(воздух)*, and gravity work together to create the water cycle. Heat from the sun causes water to *(испаряться)* from the surface of lakes, streams, oceans, and *(растения)*. The water vapour moves into the atmosphere. In the cool air high above the ground, the *(водяной пар)* changes into droplets of water. Large groups of these droplets are called *(облака)*. Gravity pulls the droplets back to Earth as rain. The rain falls into *(океаны)* and lakes, enters rivers, and seeps into the *(почва)*.

Most of Earth's water is in the oceans. But water is *(непрерывно / постоянно)* being recycled. Through a process called evaporation, water moves from *(поверхность Земли)* into the air as water vapour. The vapour can *(образовывать)* clouds, which make rain and snow. Rain and snow bring water back to the ground again and into lakes, streams, and oceans. Some of the water *(просачивается)* underground, where it is called groundwater.

(2) Rain is the prime (*источник*) of all water. A part of the rain water sinks into the ground to form (*грунтовые воды*); part of it evaporates

back into the atmosphere, and some runs off to form streams and rivers which ultimately *(впадают в)* the sea. Some of the water in the soil is taken up by the plants and is evaporated in turn by the (*листья*). This (*процесс*) is called the *"water cycle"*, or *the "hydrologic cycle"*. So the (*круговорот воды / влагооборот*) is the (*циркуляция*) of the earth's water, in which water (*испаряется*) from the sea into the atmosphere, where it condenses and falls as (*дождь*) or (*снег*), returning to the sea by rivers or returning to the atmosphere by evapotranspiration.



Pict. 4. Water cycle of the Earth's surface, showing the individual components of transpiration and evaporation that make up evapotranspiration

(Суммарное испарение) is the process by which water is transferred from the land to the atmosphere by (*испарение*) from the soil and other surfaces and by *(транспирация)* from plants. So, water on Earth moves continually through a cycle of evaporation or transpiration (evapotranspiration), precipitation, and runoff, usually reaching the (*море*).

41. Translate the following words and phrases into English using the vocabulary of the text.

Вещество; химическая формула H_2O; молекула воды; существовать в трех агрегатных состояниях; твердое вещество; жидкость; газообразное состояние; не иметь цвета, вкуса и запаха; температура кипения; температура таяния; физические, химические и биологические свойства воды; щелочь; кислота; мутность воды; пенообразование; щелочность и кислотность; жесткость воды; водородный показатель; поверхностные воды; грунтовые воды; насыщать водой; водные запасы; глетчер (ледник); круговорот воды в природе; поверхность земли; самоочищение природной среды; процесс; циркулировать; атмосферные осадки; сток; испарение; транспирация; суммарное испарение; взять на себя ответственность.

LANGUAGE DEVELOPMENT

The "Stone Wall" Construction ("Noun + Noun" Combination) includes two and more nouns not separated by a preposition, a conjunction, an article or a punctuation mark (a comma, a hyphen, etc.). Begin to translate such constructions from the last noun. The previous noun (or nouns) can be translated into Russian by:

1. an adjective (*e.g.* water supplies/ water resources – ***водные*** ресурсы)
2. a noun in an oblique case with or without a preposition (*e.g.* water supply – снабжение ***водой***, подача ***воды***, запас ***воды***)
3. one word (term) (*e.g.* water supply – ***водоснабжение***, ***водоподача***, ***водообеспеченность; водопровод***)

42. Transform as in the models.

Model 1 "Verb → Noun": to purify water → purification of water

To use a solution, to carry out a process, to recycle water, to compose a substance, to solve substances, to saturate with water, to use water supplies.

Model 2 "Noun → Noun": purification of water → water purification

A molecule of water, the formula of a water molecule, quality of water, a body of water, the surface of water, water on the surface, water under the ground, supply of water, recycling of water, growth of population, temperature in a room, tiny animals in water, saturation with water, use of water supplies, a solvent for substances and compounds, development of civilization.

SPEAKING PRACTICE

43. Get ready to speak about water properties, characteristics, and the circulation of water on the Earth.

TEXT C

VOCABULARY WORK

44. Read the following international words and guess their meaning. Mind the stressed syllables. Prove that these words are international ones.

Model: engineering [ˌendʒɪˈnɪərɪŋ] – прикладной *(о науке)*; технический, **инженерный**; инженерное искусство; машиностроение; **инженерия**; **инжиниринг**; строительство; техника, аппаратура; проектирование; конструирование; разработка

activity [æk´tɪvətɪ]	metallurgical [ˌmet(ə)´lɜ:dʒɪk(ə)l]
airport [´ɛəpɔ:t]	method [´meθəd]
application [ˌæplɪ´keɪʃ(ə)n]	military [´mɪlɪt(ə)rɪ]
art [a:t]	modern [´mɔd(ə)n]
automobile [´ɔ:təmə(u)bi:l]	myth [mɪθ]
biomedical [baɪəu'medɪk(ə)l]	number [´nʌmbə]
bulldozer [´bulˌdəuzə]	occupation [ˌɔkju´peɪʃ(ə)n]
canal [kə´næl]	occupy [´ɔkjupaɪ]
civil [´sɪv(ə)l]	parallel [´pærəlel]
code [kəud]	phenomenon [fɪ´nɔmɪnən]
concentrate [´kɔns(ə)ntreɪt]	(pl. phenomena [fi´nominə])
control [kən´trəul]	position [pə´zɪʃ(ə)n]
conveyor [kən´veɪə]	practical [´præktɪk(ə)l]
crane [kreɪn]	practice [´præktɪs]
dam [dæm]	principle [´prɪnsəpl]

definition [ˌdefɪˈnɪʃ(ə)n]	profession [prəˈfeʃ(ə)n]
elevator [ˈeləveɪtə]	programme [ˈprəugræm]
empire [ˈempaɪə]	project [ˈprɔʤekt]
equivalent [ɪˈkwɪv(ə)lənt]	range [reɪnʤ]
escalator [ˈeskəleɪtə]	refrigeration [rɪfrɪʤ(ə)ˈreɪʃ(ə)n]
etymology [ˌetɪˈmɔləʤɪ]	regulation [ˌregjəˈleɪʃ(ə)n]
focus [ˈfəukəs]	rock [rɔk]
foundation [faunˈdeɪʃ(ə)n]	sanitary [ˈsænɪt(ə)rɪ]
geometry [ˈʤɔmɪtrɪ]	term [tɜ:m]
hydroelectric [ˌhaɪdrəuɪˈlektrɪk]	territory [ˈterɪt(ə)rɪ]
legion [ˈli:ʤən]	traffic [ˈtræfɪk]
manufacture [ˌmænjuˈfæktʃə]	tunnel [ˈtʌn(ə)l]
marine [məˈri:n]	turbine [ˈtɜ:baɪn]
material [məˈtɪərɪəl]	urban [ˈɜ:b(ə)n]

45. Read and translate the following groups of international words.

architecture (n) – architect (n) – architectural (adj)

construction (n) – constructor (n) – to construct (v) – constructional (adj) – constructed (part II)

design (n) – designing (n) – designer (n) – to design (v)

electricity (n) - electrician (n) – to electrify (v) – electric(al) (adj) – electrified (part II)

electronics (n) – electronic (adj)

engineering (n) – engineer (n) – engine (n) – to engineer (v) – engineering (adj) – engineered (part II)

industry (n) – industrialization (n) – to industrialize (v) – industrial (adj) – industrialized (part II)

irrigation (n) – to irrigate (v) – irrigational (adj)

machine (n) – machinist (n) – machinery (n)

mechanism (n) – mechanization (n) – mechanic (n) - to mechanize (v) – mechanical (adj)

operation (n) – operator (n) – to operate (v) – operational (n)

plan (n) – planning (n) – planner (n) – to plan (v) – planned (part II)

product (n) - production (n) – productivity (n) – producer (n) – to produce (v) – productive (adj)

specialty (n) – specialization (n) – specialist (n) – to specialize (v) – specialized (part II)

structure (n) – to structure (v) - structural (adj)

technique (n) – technician (n) – technical (adj) – polytechnical (adj)

technology (n) – technologist (n) – technological (adj)

46. Arrange the following words according to the pronunciation **of the combination of letters "ch". Pronounce the words carefully.**

[ʧ]	[k]	[ʃ]
arch …	architect …	machine …

technology	mechanism	technological	schedule
characteristic	architecture	technical	chemistry
chemist	change	chance	chronology
school	mechanic	channel	scheme
polytechnic	chlorination	character	choose
challenge	chemical	cliché	machine-tool
choice	mechanical	scholar	characterize
technique	stomach	chlorine	architectural

47. Put these headings in the coloured boxes. Underline the stressed syllables in the words in the white boxes.

adjective, subject / science, equipment, person, scientific concept

noun				
en·gin·eer	en·gine	en·gin·eer·ing		
el·ec·tri·cian			el·ec·tri·ci·ty	el·ec·tric·al
		el·ec·tron·ics	el·ec·tron	el·ec·tron·ic
mech·an·ic	mech·an·ism	mech·an·ics		mech·an·ic·al
tech·ni·cian				tech·ni·cal

tech·no·lo·gis t		tech·no·lo·g y		tech·no·lo·gic·a l
chem·ist		chem·is·try		chem·i·cal
hy·dro·lo·gist		hy·dro·lo·gy		hy·dro·lo·gic·al
		hy·drau·lics		hy·drau·lic

48. Fill in the gaps.

1. The _____ is responsible for every _____ in the factory. (engineering / engineer / engine)
2. I'm a _____, but I want to become a _____ engineer. (mechanical / mechanic / mechanics)
3. The laboratory _____ maintains all the _____ equipment. (technician / technical / technology)
4. The _____ repairs all the _____ equipment on the rig. (electrical / electrician / electricity)

49. Give Russian equivalents to the following words and phrases and memorize them.

Nouns and noun phrases

application	machine
area	machine-tool
branch	operation
building	planning
construction	project
construction [building] material	sewage system
creation	sewerage system
design	site
designing	specialty
device	steam engine
engine	structure
engineer	supervision
engineering	surveying
equipment	technique
	technology

field	tool
hydroelectric power plant	water supply system
invention	
Verbs and verbal phrases	
to appear	to evolve
to apply	to explore
to attempt	to include
to be divided into	to increase
to branch off	to influence
to build	to involve
to call	to look for
to come from	to mean
to cooperate with	to originate
to create	to overlap
to deal with	to plan
to design	to produce
to develop	to range from … to ..
to emerge	to reduce
to erect	to specialize
Adjectives and participles	
civil	proper
engineering	responsible (for)
environmental	scientific
mechanical	skilled
nuclear	specialized
Conjunctions	
as	whereas

50. Match the English and Russian equivalents.

(1)

1. a wide variety of activities	a. в то или иное время
2. at one time or another	b. защита от наводнений; предупреждение наводнений; борьба с наводнениями
3. building site	c. научно-технический прогресс
4. complex scientific equipment	d. одни … другие … а третьи …
5. construction project	e. первый … последний … *(из двух*

6. design, construction and operation	*названных)*
7. electronic circuit	f. применять научные знания на практике
8. flood control	g. проводить [выполнять] исследование
9. scientific and technological breakthroughs	h. проект строительства; строительный объект
10. solutions to problems	i. проектирование, строительство и эксплуатация
11. some … others ... still others …	j. происходить от латинского слова
12. strong and safe structures	k. прочные и безопасные сооружения
13. the former … the latter …	l. развиваться параллельно
14. to carry out research	m. решение задач
15. to come from the Latin word	n. сложное научное оборудование
16. to develop in parallel	o. создавать новые материалы
17. to develop new materials	p. соответствовать строительным нормам и правилам (СНиП)
18. to have a direct role	q. строительная площадка [стройплощадка]; строительный участок
19. to meet building codes and regulations	r. сыграть непосредственную роль
20. to put scientific knowledge to practical use	s. широкое разнообразие видов деятельности
	t. электронная схема

(2)

1. aerospace engineering	a. авиационно-космическая техника
2. biomedical engineering	b. биомедицинская техника
3. chemical engineering	c. военно-инженерное дело
4. civil engineering	d. вычислительная техника
5. computer engineering	e. гражданское строительство
6. electrical engineering	f. кораблестроение
7. environmental engineering	g. материаловедение
8. industrial engineering	h. машиностроение
9. marine engineering	i. металлургия
10. materials engineering	j. промышленное строительство
11. mechanical engineering	

12. metallurgical engineering 13. military engineering 14. nuclear engineering 15. sanitary engineering	k. санитарная техника l. технические средства и методы охраны окружающей среды m. химическое машиностроение n. электротехника o. ядерная техника

51. Match the terms and their definitions.

civil engineer, construction, design, equipment, operation, science, structure, technique, technology

a. a building or other object constructed from several parts

b. a way of carrying out a particular task

c. an engineer who plans, designs, constructs and maintains various structures, such as roads, bridges, canals, dams, pipelines, electric power plants, water supply and waste disposal systems, and similar structures

d. the application of scientific knowledge for practical purposes, *esp*. in industry

e. the building of something, typically a large structure

f. the creation of a plan or drawing which shows the look and function of a building before it is built

g. the fact or condition of functioning or being active

h. the intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment

i. the necessary items for a particular purpose; installations; fitments; machinery

52. Translate the following phrases and sentences into Russian paying attention to the underlined words that can be verbs, nouns or adjectives without changing their form and adding suffixes.

1. to begin work; hard work; a works is an architectural or engineering structure such as a bridge or dam; work surface; to work hard; the engineer works on a design

2. engineering projects; engineering brain; gene engineering; safety engineering; civil and industrial engineering

3. civil engineer; an engineer is a person qualified in a branch of engineering; to engineer a tunnel

4. a branch of science; a branch of knowledge; branches of industry; the road branched off at the town

5. to do a detailed study; to complete one's studies; scientific study; the study of a foreign language; to study mathematics under a well-known professor

6. flood control; traffic control; the whole operation is under the control of the engineers; to control the operation

7. positive influence; negative influence; to influence profoundly

8. school of design; design of structures; to design a building; a number of architectural students were designing a factory

9. practical use; to make use of; to use widely

10. mountain range; range of interests; a wide range of activities; the cost of the project ranges from $1.5 million to $2 million

READING PRACTICE

53. The following plan is in the jumbled order. Read the text and number the points of the plan in the correct order.

- ☐ From the History of Engineering
- ☐ Etymology of the Words “Engineering” and “Engineer”
- ☐ Definition of Engineering
- ☐ The Work or Occupation of an Engineer
- ☐ Branches of Engineering

Text C Engineering

1. Engineering is a science which deals with design, construction and operation of structures, machines, engines and other devices used in industry and everyday life. Engineering is the profession that puts scientific knowledge to practical use. Engineering applies scientific and technical knowledge to solve human problems.

2. The word “*engineering*” comes from the Latin word “*ingeniare*” which means “to design” or “to create”. The proper Russian equivalents for "engineering" are «инженерия, инжиниринг, инженерное искусство, техника, технология, строительство, разработка, проектирование, конструирование, машиностроение».

A person who practises engineering is called an *engineer*. It is a myth that the word “*engineer*” originated to describe those who built engines. In fact, the words “*engine*” and “*engineer*” (as well as “*ingenious*”) developed in parallel from the Latin root “*ingeniosus*”, meaning "skilled". An engineer is thus a clever, practical, problem solver. The spelling of “engineer” was later influenced by back-formation from “engine”. The term later evolved to include all fields where the skills of application of the scientific method are used. In some other languages, such as Arabic, the word for "engineering" also means "geometry".

3. Engineering is divided into many branches. The most important of them are civil engineering, industrial engineering, mechanical engineering, chemical engineering, metallurgical engineering, electrical engineering, computer engineering, nuclear engineering, military engineering, marine engineering, aerospace engineering, biomedical engineering, environmental engineering, sanitary engineering, and materials engineering.

At present there are hundreds of subdivisions of engineering but they all, at one time or another, branched off from civil, mechanical, electrical or chemical engineering.

4. Engineers use principles of science to design structures, machines, and products of all kinds. They look for better ways to use existing resources and often develop new materials. Engineers have had a direct role in the creation of most of modern technology – the tools, materials, techniques, and power sources that make our lives easier. Scientists attempt to explain phenomena, whereas engineers construct solutions to problems.

The field of engineering includes a wide variety of activities. For example, engineering projects range from the construction of

huge dams to the design of tiny electronic circuits. Engineers may help produce guided missiles, industrial robots, or artificial limbs for the physically handicapped. They develop complex scientific equipment to explore far reaches of outer space and the depths of the oceans. Engineers also plan our electric power and water supply systems, and carry out research to improve automobiles, television sets, and other consumer products. They work to reduce environmental pollution, increase the world's food supply, and make transportation faster and safer.

Civil engineering, the oldest of the main branches of engineering, involves the planning and supervision of large construction projects as bridges, canals, dams, tunnels and water supply systems. Civil engineers also cooperate with architects to design and erect all types of buildings. Other civil engineering projects include airports, highways, levees, irrigation and sewerage systems, pipelines and railways. Civil engineers work to build strong, safe structures that meet building codes and regulations and are well-suited to their surroundings. They are responsible for surveying and preparing building sites and for selecting appropriate materials. Civil engineers must understand the use of bulldozers, cranes, power shovels and other construction equipment.

Some civil engineers work in the specialized study of the physical characteristics of soils, rocks and the design of foundations. Others concentrate on the management of water resources, including the construction of flood control and irrigation systems, hydroelectric power plants, water supply and sewage systems. Still others focus on designing transportation systems and methods of traffic control. A number of civil engineers are involved in city planning and urban renewal programmes.

At present mechanical engineering occupies a prominent position among modern production processes. It is mechanical engineering that deals with the design and construction of steam engines, turbines, air-conditioning and refrigeration devices. Conveyors, escalators and elevators are also designed by mechanical engineers. And again, it is the mechanical engineer who designs machine-tools for various operations and it is he who applies these machine-tools in various production processes.

5. The art of building houses was known many thousand years ago. Now we call it "civil engineering". It may be of interest to know that at the time of the Roman Empire there were already two branches of engineering: civil engineering and military engineering. The former included

building of houses, roads, bridges, etc., the latter building of fortifications and military devices. It is still possible to find the remains of Roman structures not only in Italy but also in some other countries, the ones that were occupied by the Roman legions. Among those countries one may mention the territory of modern England which remained under Roman rule for about four centuries.

Most of the specialized fields of engineering have been developed since about 1750. Before that time, engineering dealt mostly with the construction of buildings, roads, bridges, canals, or weapons. As people gained more knowledge of science and technology in the 18th and the 19th centuries, engineers began to specialize in certain kinds of work.

It is well known that with the invention of steam engine and the growth of factories there appeared a new branch of engineering, mechanical engineering. In the 19th century with the development of the science of electricity there appeared another branch of engineering - electrical engineering. It is impossible to speak of present-day engineering without mentioning chemical engineering.

Today, new fields of engineering are continually emerging as a result of scientific and technological breakthroughs. At the same time, the boundaries between the various fields are becoming less and less clear-cut. Numerous areas of engineering overlap, and engineers from different specialties often work closely together on projects.

COMPREHENSION CHECK

54. Decide whether the following statements are true (T) or false (F) according to the text. Correct the false statements.

1. Engineering the branch of science and technology concerned with the design, building, and operation of engines, machines, and structures.
2. Engineering is the art of building houses.
3. The word "*engineering*" comes from the Greek word "*ingeniare*" which means "to design" or "to create".
4. An engineer is a person who practises engineering, *i.e.* designs, builds, or maintains engines, machines and structures.

5. There are thousands of subdivisions of engineering.

6. At present there are hundreds of subdivisions of engineering, besides civil, mechanical, electrical or chemical engineering.

7. Engineers attempt to explain phenomena, whereas scientists construct solutions to problems.

8. Construction projects range from the building of huge dams to the design of tiny electronic circuits.

9. Civil engineers cooperate with architects in designing and erecting all types of buildings.

10. It is the mechanic who designs and constructs steam engines, turbines, air conditioning and refrigeration devices, as well as conveyors, escalators and elevators.

11. It is still possible to find only two branches of engineering not only in Italy, but also in some other countries, the ones that were occupied by the Roman legions.

12. Most of the specialized fields of engineering have been developed since the early 18th century.

13. Mechanical engineering appeared with the invention of diesel engine.

14. Electrical engineering appeared with the development of the science of electricity in the 19th century.

15. Today, new fields of engineering are continually appearing as a result of scientific and technological advance.

55. Answer the following questions.

1. What is engineering?
2. What is the etymology of the words “engineer” and “engineering”?
3. What are the proper Russian equivalents for “engineering”?
4. What are the most important branches of engineering?
5. What is the main difference between the work of engineers and architects?
6. The field of engineering includes a wide variety of activities, doesn’t it? What are the examples of such activities?
7. What does civil engineering deal with? What does the work of civil engineers include?
8. Who do civil engineers cooperate with to design and erect all types of buildings?
9. Is the art of building houses considered to be an ancient one?

10. At the time of the Roman Empire there existed two branches of engineering - civil and industrial engineering, didn't there?

11. Have most of the specialized fields of engineering been developed since the middle of the 18th century?

12. When did mechanical and electrical engineering appear?

13. As a result of what are new fields of engineering emerging nowadays?

56. Find key words and phrases which best express the general meaning of each paragraph.

57. Write a summary of the text.

LANGUAGE FOCUS

58. Match the synonyms.

1. branch	a. building
2. canal	b. channel
3. construction	c. energy
4. dam	d. erection
5. irrigation	e. field / area / subdivision
6. machine-tool	f. levee
7. operation	g. machine
8. power	h. maintenance
9. production	i. manufacturing
10. railway	j. method
11. renewal	k. reconstruction
12. sewage system	l. railroad
13. structure	m. sewerage system
14. technique	n. to create
15. to design	o. to plan
16. to develop	p. to search for
17. to look for	watering

59. Match the antonyms.

1. appropriate	a. improper
2. artificial	b. inappropriate
3. early	c. late
4. huge	d. misunderstanding
5. modern	e. natural
6. proper	f. outdated / ancient
7. safe	g. rural
8. skilled	h. the latter
9. strong	i. tiny
10. the former	j. to destroy / to demolish
11. to appear / to emerge	k. to disappear
12. to construct / to build	l. to reduce / to decrease
13. to increase	m. unsafe
14. understanding	n. unskilled
15. urban	o. weak

60. Insert the appropriate word.

operation, result, to draw, equipment, safety, science, specifications, use, properties

An Engineer's Duties

1. An engineer must have a good understanding of documents (standards, _____ , etc.).
2. Engineers must know how _____ the parts of mechanisms.
3. Engineers must study the structure of materials and their _____.
4. Engineers should be able to remove machine and _____ breaking downs.
5. Engineers must follow _____ rules.
6. An engineer must _____ other countries' experience.
7. Engineers should use imagination, judgment, reasoning and experience to apply _____ , technology, mathematics, and practical experience. The _____ is the design, production, and _____ of useful objects or processes.

61. **Write down "stone wall" constructions from the text and** translate them into Russian.

Model:

water resources – водные ресурсы

water supply – водообеспеченность, запас воды; водоснабжение, снабжение водой, подача воды, водоподача; водопровод; *pl*. водные ресурсы

water supply system – водопровод, система водоснабжения

sewage system – канализация, система канализации, канализационная система

sewerage system – система канализации, канализационная система

62. Choose the right variant.

1. The former included the building of houses, roads, bridges, etc., the latter the building of fortifications and military devices.

A. Первое включало в себя строительство домов, дорог, мостов и т.д., последнее – строительство укреплений и военных механизмов.

B. Сначала оно включало в себя строительство домов, дорог, мостов и т.д., затем – строительство укреплений и военных механизмов.

C. Во-первых, оно включало в себя строительство домов, дорог, мостов и т.д., во-вторых – строительство укреплений и военных механизмов.

2. It is the mechanical engineer who designs machine-tools for various operations and it is he who applies these machine-tools in various production processes.

A. Инженер-механик проектирует станки для выполнения различных операций и применяет это станочное оборудование в различных производственных процессах.

B. Инженер-механик не только проектирует станки для выполнения различных операций, но и применяет их в различных производственных процессах.

C. Именно инженер-механик проектирует станки для выполнения различных операций и именно он применяет это станочное оборудование в различных производственных процессах.

3. It is impossible to speak of present-day engineering without mentioning chemical engineering.

A. Не стоит упоминать химическое машиностроение, говоря о современном инженерном искусстве.

B. Невозможно говорить о современном строительстве, не раскрыв значения химического машиностроения.

C. Невозможно говорить о современном инженерном искусстве, не упомянув химическое машиностроение.

63. Translate the following words and word combinations into English.

Инженерное искусство (инженерия); отрасли инженерии; специализированные отрасли; промышленное и гражданское строительство; материаловедение; проектирование, строительство и эксплуатация; инженер-строитель; научные знания; научные принципы; сооружение; наука и техника; технология; научно-технический прогресс; строительная площадка; чертеж; СНиП; навыки/умение; строительный материал; строительный объект; решение задач; управление водными ресурсами; современные производственные процессы; гидроэлектростанция; электроэнергия; градостроительство/городское планирование; реконструкция города; загрязнение окружающей среды; двигатель/мотор; станок; паровой двигатель; устройство; оборудование; строительство домов, дорог и мостов; плотина; туннель; шоссе; трубопровод; канализационная система; система водоснабжения (водопровод); канал *(искусственный)*; заниматься *(чем-л.)*; сосредоточить свое внимание на; подразделяться на; означать / иметь значение; происходить от; проектировать; строить; возводить; создавать; усовершенствовать; появляться; применять знания на практике; сотрудничать с архитекторами; тесно сотрудничать; специализироваться в; четкие границы.

SPEAKING PRACTICE

64. Get ready to speak about engineering and the work of an engineer.

TEXT D

VOCABULARY WORK

65. Read the following international words and guess their meaning. Mind the stressed syllables. Prove that these words are international ones.

Model: problem [ˊprɔbləm] **проблема**; вопрос; задача; сложная ситуация; трудность, затруднение

base [beɪs]	hydraulic [haɪˊdrɔ:lɪk]
character [ˊkærəktə]	hydraulics [haɪˊdrɔ:lɪks]
chemistry [ˊkemɪstrɪ]	hydrobiology
collection [kəˊlekʃ(ə)n]	hydrogeology
concern [kənˊsɜ:n]	hydrology [haɪˊdrɔlədʒɪ]
course [kɔ:s]	hydrotechnics
discipline [ˊdɪsəplɪn]	instrument [ˊɪnstrəmənt]
disinfection [ˌdɪsɪnˊfekʃ(ə)n]	limit [ˊlɪmɪt]
general [ˊdʒen(ə)r(ə)l]	sphere [sfɪə]

66. Translate the following words and phrases and memorize them.

Nouns and noun phrases	
disinfection	sewage disposal
facilities	waste disposal
pump	wastewater / waste water
quantity	water acquisition
recycling	water consumer
sanitation	water delivery
sewage	water facilities
sewage [wastewater] collection	water supply system
sewage [wastewater] discharge	water treatment
sewage [wastewater] disinfection	water-supply engineer
sewage [wastewater] sanitation	water-supply engineering
sewage [wastewater] treatment	water-supply network
sewage [wastewater] treatment plant	waterworks
Verbs and verbal phrases	
to be based on	to be determined by
to be concerned with	to be intended for
to be connected with	to require
Adjectives	
complicated	sufficient
sanitary	

67. Match the English and Russian equivalents.

(1)

1. control and measuring instruments	a. буровая техника
2. drilling technology	b. гидрогеология
3. engineering structure	c. гидротехника; строительство гидротехнических сооружений, гидротехническое строительство
4. engineering task	d. глубокие знания
5. hydraulic engineering	e. добывание воды из природных источников
6. groundwater hydrology	f. инженерная задача
7. industrial enterprise	
8. acquisition of water	

from natural water sources 9. profound knowledge 10. technical sciences 11. to solve (a task / a problem)	g. инженерное сооружение h. промышленное предприятие i. регулирующие и измерительные приборы j. решать (задачу / проблему) k. технические науки

(2)

1. a complex of activities 2. a complex of complicated engineering tasks 3. a complex of engineering structures and facilities 4. a complex of sanitary activities 5. to have a complex character	a. комплекс инженерных сооружений и оборудования b. комплекс санитарных мероприятий c. комплекс сложных инженерных задач d. носить комплексный характер e. совокупность мероприятий

68. Match the terms and their definitions.

delivery, disposal, engineering, facility, hydrology, maintenance, sanitation, sewage, treatment

a. an establishment that fulfills a particular function or provides a particular service, typically an industrial one

b. conditions relating to public health, esp. the provision of clean drinking water and adequate sewage disposal

c. the action or process of throwing away or getting rid of something

d. the branch of science and technology concerned with the design, building, and use of engines, machines, and structures

e. the branch of science concerned with the properties of the earth's water, esp. its movement in relation to land

f. the process of keeping something in good condition

g. the supply or provision of something

h. the use of a chemical, physical, or biological agent to preserve or give particular properties to something

i. waste water and excrement conveyed in sewers

69. Make sure you know the words and word combinations from the box and insert them into the sentences.

supply , treatment, branch, term

Water-supply engineering is a _____ of civil engineering concerned with the development of sources of supply, transmission, distribution, and _____ of water. The _____ is used most frequently for municipal water works, but applies also to water _____ systems for industry, irrigation, water reuse, and other purposes.

70. Translate the following phrases and sentences into Russian paying attention to the underlined words that can be verbs, nouns or adjectives without changing their form and adding suffixes.

1. the new discovery became the base for further research; to base one's conclusions upon knowledge; to base one's opinion on facts
2. to exceed a limit; time limit; service limit; to limit the amount of materials
3. the outside of the building; outside walls
4. to pump water; to pump in; to pump off; water pump
5. structure in service; to design a structure; water purification structure; to structure means to construct or arrange according to a plan

Now fill in the table with Russian equivalents to the words from the sentences above.

base, limit, outside, structure

	NOUN	VERB	ADJECTIVE
pump	насос; помпа	работать насосом; закачивать; накачивать; выкачивать	---

READING PRACTICE

71. Answer the following question and read the text carefully to check your answer.

What does water-supply engineering deal with?

Text D Water-Supply Engineering and Sewage Disposal

"Water is fundamental to life and health"
United Nations Committee on Economic, Cultural and Social Rights (2002)

Water-supply engineering is a branch of civil engineering. It is a complex of activities concerned with the supply of water to its various consumers – community, industrial enterprises, transport, etc.

This discipline based on various branches of technical sciences has a complex character. The complex character is determined by the necessity of solving a complex of complicated engineering tasks connected with design, construction and operation of water supply systems. These systems include various facilities providing acquisition, treatment and delivery of water in demanded quantities and of adequate quality to water consumers.

The study of the course in water-supply engineering is based on the knowledge of a number of general technical and specialized disciplines:

1. For solving the tasks of acquisition of water from natural water sources the knowledge of hydrology, hydrogeology (groundwater hydrology), hydrotechnics (hydraulic engineering) and drilling technology is needed.

2. The solution for problems of water treatment technology is possible with sufficient knowledge of water chemistry and hydrobiology.

3. Planning and designing of water-supply networks and water facilities based on the laws of hydraulics require profound knowledge of this discipline.

4. Design, construction and operation of water delivery structures require the knowledge of technical equipment: pumps, engines, electrical equipment, as well as control and measuring instruments.

5. For the work in design and construction of waterworks a water-supply engineer must have good training in the sphere of building disciplines.

Sewage disposal [waste disposal] is a complex of sanitary activities as well as a complex of engineering structures and facilities intended for the collection of wastewater, its disposal outside the city limits or industrial enterprises, its delivery to wastewater treatment plants, as well as its treatment, sanitation and disinfection before recycling or discharge into a body of water.

COMPREHENSION CHECK

72. Complete the following sentences according to the text.

1. Water-supply engineering is … .
2. This discipline based on various branches of technical sciences has … .
3. A water-supply engineer solves a complex of complicated engineering tasks connected with … .
4. Water supply systems include various facilities providing … .
5. The study of the course in water-supply engineering is based on the knowledge of … .
6. Sewage disposal [waste disposal] is a complex of sanitary activities as well as a complex of engineering structures and facilities intended for … .

73. Answer the following questions.

1. What is water-supply engineering?
2. Does this discipline have a complex character? What is it determined by?
3. What facilities do water supply systems include?
4. What is a water supply system?
5. What does a water supply system include?

6. What general technical and specialized disciplines is the study of the course in water-supply engineering based on?

7. What is sewage disposal?

74. Choose the right variant according to the text.

1. Water-**supply engineering is … .**

a. a complex of complicated engineering tasks connected with design, construction and operation of water supply systems

b. a complex of activities concerned with the supply of water to its various consumers

c. a complex of sanitary activities intended for the collection and treatment of sewage

d. a complex of engineering structures and facilities intended for the collection and treatment of wastewater

2. Water supply systems include various facilities providi**ng …. .** *(several answers possible)*

a. acquisition of water from a variety of natural water sources

b. treatment of water

c. design, construction and operation of water supply systems

d. delivery of water to water consumers

3. The study of the course in water-supply engineering is based on the knowledge of the following general technical and specialized dis**ciplines: … .** *(several answers possible)*

a. hydrology, hydrogeology (groundwater hydrology), hydrotechnics (hydraulic engineering) and drilling technology

b. water treatment technology

c. water chemistry, hydrobiology and hydraulics

d. building disciplines

4. Sewage disposal [waste disposal] is a complex of sanitary activities as well as a complex of engineering structures and facilities **intended for … .** *(several answers possible)*

a. water treatment and purification

b. wastewater collection

c. disposal of wastewater outside the city limits or industrial enterprises, its delivery to wastewater treatment plants and its treatment

d. sewage sanitation and disinfection

75. Write a summary of the text.

LANGUAGE FOCUS

76. Match the synonyms.

1. acquisition	a. building
2. branch	b. collection
3. complex	c. complicated / difficult
4. construction	d. deep
5. hydrogeology	e. delivery
6. hydrotechnics	f. designed
7. intended	g. groundwater hydrology
8. network	h. hydraulic engineering
9. problem	i. sewage disposal
10. profound	j. solving
11. sewage	k. sphere/field/area/subdivision
12. solution	l. system
13. supply	m. task
14. waste disposal	n. wastewater
15. water consumer	o. water user

77. Match the antonyms.

1. adequate	a. impossible
2. complicated	b. inadequate
3. demand	c. inside
4. high-quality	d. insufficient
5. natural	e. low-quality
6. outside	f. simple
7. possible	g. supply
8. sufficient	h. to admit
9. to discharge	i. to exclude
10. to include	j. Unnatural

78. Fill in the correct prepositions.

1. a branch … civil engineering 2. a complex … activities concerned … the supply … water … its various consumers 3. to be based … various branches … technical sciences 4.to be determined … the necessity … solving a complex … complicated engineering tasks 5. to be connected … design, construction and operation … water supply systems 6. the course … water-supply engineering 7. acquisition … water … natural water sources 8. the solution … problems … water treatment technology 9. design, construction and operation … water delivery structures 10. … the sphere … building disciplines 11. a complex … engineering structures and facilities 12. to be intended … the collection … wastewater 13. … the city limits 14. … recycling or discharge … a body … water

79. Form the nouns denoting the doer from the following words using suffixes –er / -or, -ist, -ian.

-er / -or	-ist	-ian
engineer	hydrologist	technician
…	…	…

chemistry ➔
electricity ➔
geology ➔
machine ➔
science ➔
technology ➔

to build ➔
to collect ➔
to construct ➔
to consume ➔
to design ➔
to distribute ➔

to operate ➔
to purify ➔
to supply ➔
to train ➔
to treat ➔
to work ➔

80. Choose the contextual meaning of the words underlined in the text.

1. engineering
a. инженерное искусство
b. инженерный
c. технический
d. инженерия
e. строительство

2. complex
a. комплексный
b. комплекс
c. совокупность
d. сложный
e. составной

3. design
a. дизайн
b. проектирование, разработка
c. чертеж
d. проектировать
e. замысел

4. construction
a. строительство
b. здание, сооружение
c. стройка
d. строительный
e. конструкция, устройство

5. operation
a. деятельность, работа
b. эффективность
c. операция
d. эксплуатация
e. процесс

6. structure
a. сооружение
b. структура
c. конструкция
d. здание
e. структурировать

7. plant
a. растение
b. размещать
c. завод
d. фабрика
e. станция

8. treatment
a. обращение
b. лечение
c. обработка, очистка
d. уход
e. переработка

81. Match the English and Russian equivalents.

1. water-supply engineering
2. sewage [wastewater / waste] disposal
3. water supply [delivery]
4. water supply system [network]; water distribution system
5. water consumer [user]
6. water acquisition [collection]
7. water treatment [purification]
8. water facilities
9. sewage / wastewater
10. sewage [wastewater] collection
11. sewage [wastewater] treatment
12. sewage treatment plant [works], wastewater treatment plant [works]
13. sewage [wastewater] sanitation
14. sewage [wastewater] disinfection

a. водоотведение, отведение сточных вод, отвод сточных вод, удаление сточных вод

b. водоочистная станция, станция водоочистки, станция очистки сточных вод, сооружения по очистке сточных вод

c. водопользователь, водопотребитель

d. водоснабжение *(отрасль инженерии)*

e. водоснабжение, снабжение водой, доставка воды, подача воды, водоподача, обеспечение водой

f. водохозяйственные сооружения

g. обезвреживание сточных вод

h. обеззараживание сточных вод

i. обработка воды, очистка воды

j. очистка сточных вод

k. сбор воды, водосбор, добывание воды

l. сбор сточных вод, прием сточных вод

m. система водоснабжения

n. сточные воды

82. Translate the following texts into English using the active vocabulary.

1. Среди многих отраслей современной техники, направленных на повышение уровня жизни людей, благоустройства населенных мест и развития промышленности, водоснабжение занимает большое и почетное место.

2. Обеспечение населения чистой, доброкачественной водой имеет большое гигиеническое значение, так как предохраняет людей от различных эпидемических заболеваний, передаваемых через воду. Подача достаточного количества воды в населенное место позволяет поднять общий уровень его благоустройства. Выполнение этой задачи, а также обеспечение высоких санитарных качеств питьевой воды требуют тщательного выбора природных источников, их защиты от загрязнения и надлежащей очистки воды на водопроводных сооружениях.

3. Производственные процессы на предприятиях большинства отраслей промышленности также сопровождаются расходованием воды.

4. Кроме обеспечения водой населения и промышленности, осуществляемого системами водоснабжения, огромное экономическое значение имеет обеспечение водой сельского хозяйства для искусственного орошения земель в целях успешного выращивания сельскохозяйственных культур и получения высоких урожаев.

5. ***Водоснабжение*** представляет собой комплекс мероприятий по обеспечению водой различных ее потребителей.

6. ***Водоотведение*** – совокупность санитарных мероприятий и технических устройств, обеспечивающих удаление сточных вод за пределы населённого пункта или промышленного предприятия.

7. ***Канализация*** – комплекс инженерных сооружений, оборудования и санитарных мероприятий, обеспечивающих сбор (прием) сточных вод в местах образования, их отведение за пределы населённых мест и промышленных предприятий.

SPEAKING PRACTICE

83. Get ready to speak about water-supply engineering as a branch of civil engineering.

FOLLOW-UP ACTIVITIES

84. Read the texts of UNIT 1 again and make notes under the following headings. Then use your notes to talk about *Water as the Most Precious Resource, Engineering* and *Water-Supply Engineering.*

1. Significance of water for life.
2. Water properties and characteristics.
3. The water (hydrologic) cycle.
4. Engineering.
5. Water-supply engineering and waste (sewage) disposal.
6. The work of a water-supply engineer.

SUPPLEMENTARY READING

Text 1. ENGINEERING

Engineering is the application of science to the optimum conversion of the resources of nature to the uses of humankind. The field has been defined by the Engineers Council for Professional Development, in the United States, as the creative application of "scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design; or to forecast their behaviour under specific operating conditions; all as respects an intended function, economics of operation and safety to life and property." The term "engineering" is sometimes more loosely defined, especially in Great Britain, as the manufacture or assembly of engines, machine tools, and machine parts.

The words "engine" and "ingenious" are derived from the same Latin root, "*ingenerare"*, which means "to create." The early English verb *engine* meant "to contrive." Thus the engines of war were devices such as catapults, floating bridges, and assault towers; their designer was the "engine-er," or military engineer. The counterpart of the military engineer was the civil engineer, who applied essentially the same knowledge and skills to designing buildings, streets, water supplies, sewage systems, and other projects.

Associated with engineering is a great body of special knowledge; preparation for professional practice involves extensive training in the application of that knowledge. Standards of engineering practice are maintained through the efforts of professional societies, usually organized on a national or regional basis, with each member acknowledging a responsibility to the public over and above responsibilities to his employer or to other members of his society.

The function of the scientist is to know, while that of the engineer is to do. The scientist adds to the store of verified, systematized knowledge of the physical world; the engineer brings this knowledge to bear on practical problems. Engineering is based principally on physics, chemis-

try, and mathematics and their extensions into materials science, solid and fluid mechanics, thermodynamics, transfer and rate processes, and systems analysis.

Unlike the scientist, the engineer is not free to select the problem that interests him; he must solve problems as they arise; his solution must satisfy conflicting requirements. Usually efficiency costs money; safety adds to complexity; improved performance increases weight. The engineering solution is the optimum solution, the end result that, taking many factors into account, is most desirable. It may be the most reliable within a given weight limit, the simplest that will satisfy certain safety requirements, or the most efficient for a given cost. In many engineering problems the social costs are significant.

Engineers employ two types of natural resources--materials and energy. Materials are useful because of their properties: their strength, ease of fabrication, lightness, or durability; their ability to insulate or conduct; their chemical, electrical, or acoustical properties. Important sources of energy include fossil fuels (coal, petroleum, and gas), wind, sunlight, falling water, and nuclear fission. Since most resources are limited, the engineer must concern himself with the continual development of new resources as well as the efficient utilization of existing ones.

Text 2. WATER CHARACTERISTICS

Water quality is determined by assessing three classes of attributes: *biological*, *chemical*, and *physical.*

1. PHYSICAL CHARACTERISTICS

The physical characteristics of water include turbidity, color, taste and odor, temperature, and foamability (detergents).

Turbidity

The presence of suspended material such as finely divided organic material, clay, silt, and other inorganic material in water is known as turbidity. Turbidity is tested by measuring the amount of light scattered by particles in the water. As the number of particles increases, more light is scattered and a higher turbidity reading is obtained. The measuring in-

strument is called a nephelometer, and the readings are expressed as nephelometric turbidity units (NTU) or turbidity units. Excessive turbidity is a problem for several reasons:

1. It protects microorganisms from chlorine and other disinfectants;
2. It acts as a food source for microorganisms, allowing them to survive and multiply;
3. It interferes with the maintenance of a chlorine residual;
4. It interferes with the test for coliform bacteria.

Clay or other inert suspended particles in drinking water drawn from groundwater sources may not adversely affect health, but water containing such particles may require treatment to make it aesthetically suitable for its intended use. Following a rainfall, variations in groundwater turbidity may be considered an indication of surface or other introduced pollution. Excessive turbidity must be removed by filtration.

Color

Dissolved organic material from decaying vegetation and certain inorganic matter can cause color in water. Although color itself is not usually objectionable from a health standpoint, its presence is aesthetically objectionable and suggests that the water needs appropriate treatment.

Taste and Odor

Taste and odor in water can be caused by foreign matter such as organic compounds, inorganic salts, or dissolved gases. These contaminants may come from domestic, agricultural, or natural sources. Water should be free from any objectionable taste or odor at the point of use.

Foamability

Many natural and man-made substances will cause foam when water is agitated. The major cause of foaming is surfactants, which are synthetic organic chemicals used as the principal ingredient in modern detergents. Foaming is an undesirable property of drinking water because foaming agents may impart an unpleasant taste, cause frothing, and usually can be associated with contamination of groundwater.

Although foam itself is not generally hazardous, other possible hazardous materials may be present along with the foam. Water with high foamability should be analyzed to determine what treatment may be required and to help determine the origin of contamination.

Foaming substances can be removed by conventional treatment consisting of coagulation/flocculation, sedimentation, and filtration, or by activated carbon.

Temperature

Temperature is related to the taste of water in several ways. Taste acuity depends on temperature. An optimum response is obtained with water at or near body temperature. The degree to which taste is influenced by temperature is a function of the specific taste-causing substance, however. Temperature will also affect the taste of water to the degree with which it influences chemical equilibria in favour of taste constituents. The growth rate of micro-organisms, which may produce bad-tasting metabolites, is enhanced by higher temperature, as is the rate of formation of offensive-tasting corrosion products.

2. CHEMICAL CHARACTERISTICS

The chemical characteristics of water are numerous. Every substance that dissolves in water can be called a chemical water quality characteristic. The chemical characteristics of water include natural substances such as dissolved minerals and man-made toxic metals and organic chemicals.

Alkalinity

The alkalinity of water is a measure of its capacity to neutralize acids. Alkalinity is imparted to water by bicarbonate, carbonate and hydroxide components. Bicarbonates represent the major form of alkalinity, since they are formed in considerable amounts from the action of carbon dioxide upon minerals in the soil. Although there is no MCL (Maximum Contaminant Level) for alkalinity, a range of 30 to 100 mg/l of Calcium Carbonate is desirable for finished drinking water in order not to adversely affect taste and corrosivity. Alkalinity itself is not considered a health hazard.

pH

pH is a measure of the hydrogen ion concentration in water. It is also an indication of acid or alkaline content. The pH scale ranges from 0 to 14, with 7 indicating neutral water. Values less than 7 indicate sharply increasing acidity, and values greater than 7 indicate sharply increasing alkalinity. The pH of water in its natural state varies from 5.5 to 9.0. Determination of the pH value assists in the control of corrosion, the determination of proper chemical dosages, and adequate control of disinfection.

Hardness

Hard water retards the cleaning action of soaps and detergents, causing an expense in the form of extra work and cleaning agents. Furthermore,

when hard water is heated it deposits a hard scale on heating coils, cooking utensils, and other equipment with a consequent waste of fuel. The scale formed by hard water coats the inside of distribution system piping, which can eventually cause significant reductions in its water carrying capacity. Soft water, on the other hand, tends to be more corrosive.

A hardness of 75 to 100 mg/l as CaCO3 is usually considered optimal for domestic water. Water harder than 300 mg/l as CaCO3 is generally unacceptable. Lime and soda ash or ion exchange softening processes can be used to produce acceptably soft water.

Calcium and magnesium salts, the most common cause of hardness in water supplies, are divided into two general classifications: *carbonate*, or temporary, hardness and *noncarbonate*, or permanent, hardness. *Carbonate hardness* is called temporary hardness because heating the water will usually remove it. Noncarbonate hardness is called permanent hardness because it is not removed when water is heated. Noncarbonate hardness is due largely to the presence of the sulfates and chlorides of calcium and magnesium in the water.

Corrosivity

The tendency of a water to corrode pipes and fittings is health related as well as being of economic importance, since the materials released into water by corrosion may include lead, cadmium, and other toxic metals. The corrosivity of water is not easily measured. However, equations have been developed that reasonably predict the tendency of water to corrode on the basis of temperature, total dissolved solids, calcium content, hardness, pH, and alkalinity. Water that is excessively corrosive can be stabilized made noncorrosive by the addition of lime and soda ash to increase the pH and alkalinity, or by the addition of polyphosphates or silicates to form protective coatings on the pipe walls.

Chlorides

Most waters contain some chloride. It can be caused by the leaching of marine sedimentary deposits and by pollution from sea water, brine or industrial and domestic wastes. Chloride concentrations in excess of about 250 mg/l usually produce a noticeable taste in drinking water. An increase in chloride content may indicate possible pollution from sewage sources, particularly if the normal chloride content is known to be low.

N.B. Chlorine has long been known to be a leading cause of cancer.

Copper

Copper is found in some natural waters, particularly in areas where copper has been mined. Excessive amounts of copper can occur in corrosive water that passes through unprotected copper pipes. Copper in small amounts is not considered detrimental to health, but will impart an undesirable taste to the drinking water. For this reason, the limit for copper is 1.0 mg/l (1.3 mg/l by the copper/lead rule).

Fluoride

In some areas of the country, water sources contain natural fluorides. It has been established that the presence of about 1 mg/l of fluoride in a water supply will help to prevent tooth decay in children. The effect is the same whether the fluoride occurs naturally or is added to the water during treatment. Optimal concentrations from 0.7-1.2 mg/l are recommended. Excessive fluorides in drinking water supplies may produce fluorosis (mottling) of teeth, which increases as the optimum fluoride level is exceeded. Higher levels adversely affect bone structure.

Iron

Small amounts of iron are frequently present in water because iron is present in the soil and because corrosive water will pick up iron from unprotected pipes. The presence of iron in water is considered objectionable because it imparts a brownish color to laundered goods and affects the taste of beverages such as tea and coffee.

Zinc

Zinc is found in some natural waters, particularly in areas where zinc has been mined. Zinc is not considered detrimental to health at or near 5 mg/l but it will impart an undesirable taste to drinking water.

Toxic Metals

Arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver can all cause serious health problems. Lime soda softening and reverse osmosis can both be used to reduce the concentrations of toxic metals. Precipitation with alum is also effective for certain metals. Lead can be a serious problem even if not found in raw water. Corrosive waters may leach lead from pipes and fixtures, often exceeding the 0.015 mg/l maximum safe limit.

(Total) Dissolved Solids

Total dissolved solids (TDS, also called total filterable residue or total dissolved residue) are a measure of the water's content of various dissolved materials. Water with no dissolved solids usually has a flat taste,

whereas water with more than 500 mg/l TDS usually has a disagreeably strong taste.

Dissolved Oxygen

The amount of dissolved oxygen (DO) available in water is a very important factor in determining the types of organisms that can survive. Dissolved oxygen analysis measures the amount of gaseous oxygen (O2) dissolved in an aqueous solution. Total dissolved gas concentrations in water should not exceed 110 percent. Concentrations above this level can be harmful to aquatic life. Adequate dissolved oxygen is necessary for good water quality. When saturated with DO, waters have a pleasant taste whereas water with no DO, *e.g.* boiled water, tastes flat and insipid.

N.B. High DO levels speed up corrosion in water pipes. For this reason, industries use water with the least possible amount of dissolved oxygen.

Chemical Oxygen Demand (COD)

The chemical oxygen demand (COD) is the amount of oxygen consumed to completely chemically oxidize the organic water constituents to inorganic end products. COD is an important, rapidly measured variable for the approximate determination of the organic matter content of water samples. Most applications of COD determine the amount of organic pollutants found in surface water (*e.g.* lakes and rivers), making COD a useful measure of water quality.

Biochemical Oxygen Demand (BOD)

Biochemical oxygen demand, or BOD, is a measure of the quantity of oxygen consumed by microorganisms during the decomposition of organic matter. BOD is the most commonly used parameter for determining the oxygen demand on the receiving water of a municipal or industrial discharge. BOD can also be used to evaluate the efficiency of treatment processes, and is an indirect measure of biodegradable organic compounds in water.

3. BIOLOGICAL CHARACTERISTICS

Water for drinking and cooking purposes must be free from disease causing organisms. These organisms include bacteria, protozoa, viruses, and worms.

Bacteriological Quality

The specific disease causing organisms present in water are not easily identified, and the techniques for comprehensive bacteriological examination are complex and time consuming. It has been necessary, therefore, to develop tests that indicate the relative degree of contamination in terms of a single, easily performed test.

Because many of the microorganisms that cause disease in man are transmitted through the fecal wastes of infected individuals, the most widely used method of testing the bacteriological quality of water involves testing for a single group of bacteria that are always present when fecal contamination is present. This group of bacteria, the coliform group, inhabits the intestinal tract of man, but is also found in most domestic animals, birds, and certain wild species. The methods used to test specifically for coliform are the membrane filter test and the multiple tube fermentation test. A third test, the heterotrophic (standard) plate count, determines the total number of bacteria in a sample that will grow under certain conditions.

Some groundwater sources, if properly protected and developed, can meet bacteriological drinking water standards without treatment. However, disinfection is a recommended safeguard for non-community systems and required treatment for community systems. Chlorination of ground water also introduces a disinfectant residual that helps maintain bacteriological quality of the water in the distribution system.

Water from surface sources should always be disinfected, usually by chlorination, before it is supplied to the public. For both ground and surface water, protection of the source from contamination should be an ongoing priority. In ground water sources, iron bacteria can cause problems with staining and tastes and odors. Proper well drilling procedures will prevent the entrance of iron bacteria into a new well, and iron bacteria in an existing well can usually be eliminated by temporarily introducing a high chlorine concentration.

UNIT 2

Water Demands.
Sources to Meet Water Demands

"When the well is dry, we know the worth of water."
Benjamin Franklin, (1706–1790),
Poor Richard's Almanac, 1746

WARMING-UP

1. Fill in the omitted words and word combinations.

drinking water, resource, water quality, safe, to maintain, inexhaustible, community, consumer, delivered

It is apparent that our supply of water is not ___ and our freshwater supplies are indeed a precious ___. It is now clear that the ___ also has an important role to play in the management of our ___. Every ___ should be encouraged to become more active in this process.

It is important to highlight the many steps that water must go through before it is ___ safely to your tap, and the things that we can all do to ensure that we continue to receive the highest quality ___.

___ water is essential to sustain life — we all have a responsibility to make every effort to ensure the quality of our drinking water. Water is important; let's work together ___ this precious resource.

TEXT A

VOCABULARY WORK

2. Read the following international words and guess their meaning. Mind the stressed syllables. Prove that these words are international ones.

Model: commercial [kə′mɜ:ʃ(ə)l] **коммерческий**, торговый; промышленный; технический; рентабельный, прибыльный

basis [′beɪsɪs]	local [′ləuk(ə)l]
(pl. bases [′beɪsi:s])	mineral [′min(ə)r(ə)l]
characterize [′kærəkt(ə)raɪz]	minimum [′mɪnɪməm]
chlorine [′klɔ:ri:n]	monitor [′mɔnɪtə]
climate [′klaɪmət]	municipal [mju:′nɪsɪp(ə)l]
conversion [kən′vɜ:ʃ(ə)n]	peak [pi:k]
distillation [ˌdɪstɪ′leɪʃ(ə)n]	potential [pə′tenʃ(ə)l]
economic [ˌi:kə′nɔmɪk], [ˌekə-]	public [′pʌblɪk]
electric [ɪ′lektrɪk]	restaurant [′restərɔnt]
express [ɪk′spres], [ek-]	school [sku:l]
extravagant [ɪkˌstrævəgənt], [ek-]	seasonal [′si:z(ə)n(ə)l]
figure [′fɪgə]	state [steɪt]
function [′fʌŋkʃ(ə)n]	total [′təut(ə)l]
gallon [′gælən]	type [taɪp]
geographic [ʤɪə′græfɪk]	uniform [′ju:nɪfɔ:m]
hospital [′hɔspɪt(ə)l]	variation [ˌvɛərɪ′eɪʃ(ə)n]
hotel [həu′tel], [əu′tel]	

3. Translate the following words and phrases and memorize them.

Nouns and noun phrases	
advantage	municipal water consumption
bathing	pattern
commercial (water) demand	public (water) demand
commercial (water) use	public (water) use
community	purpose
construction material	raw material
domestic (water) demand	street cleaning
domestic (water) use	urban water use
drinking [potable] water	volume
fire fighting	wastes
fire protection	water consumption
hydropower	[dmand/requirement/usage/
impurity	use]
industrial (water) demand	watering
industrial (water) use	waterwheel
mineral ore	withdrawal
Verbs and verbal phrases	
to average	to meet (a requirement/
to capture	a need /a demand)
to carry away	to monitor
to consume	to satisfy (a requirement /
to estimate	a need /a demand)
to fall	to serve
to locate	to take into account
Adjectives	
average	paramount
efficient	potable
extravagant	residential
fit (for)	scarce
municipal	wasteful
Adverbs	
approximately	per day
nevertheless	per person
numerically	relatively
per capita	though

Conjunctions	
both … and …	in order to
Prepositions	
despite	throughout
through	without

4. Match the English and Russian equivalents.

(1)

1. civil and environmental engineers 2. drinking [potable] water 3. electric power generation 4. municipal water consumption / urban water use 5. potential water consumers [users] 6. power engineering 7. public building 8. pumping system 9. residential area 10. water consumption [demand/requirement/usage/use] 11. water supplied [delivered] 12. water withdrawal	a. водопотребление; водопользование; водопотребность, потребность в воде; расход воды b. возможные потребители воды [водопотребители] c. выработка электроэнергии d. городское водопотребление e. жилой район f. инженеры-строители и специалисты в области охраны окружающей среды g. общественное здание h. отбор воды из природного источника i. питьевая [годная для питья] вода j. подаваемая вода k. система накачки [накачивания] l. энергетика

(2)

1. as indicated by the fact that … 2. chemical or heat treatment 3. cooling fluid 4. despite recent advances 5. finished products 6. fossil and nuclear fuels	a. более низкий порог качества b. быть в недостаточном количестве c. быть основой для выживания d. готовая продукция e. иметь относительно низкую стоимость на единицу веса или объема

7. lower quality threshold 8. navigable waterway 9. steel and pulp mills 10. the conversion of raw materials into finished product 11. to be essential for survival 12. to be scarce 13. to have a relatively low value per unit of weight or volume 14. with the latter consuming far greater volumes	f. ископаемое и ядерное топливо g. на что указывает тот факт, что … h. несмотря на недавние достиже-ния [прогресс] i. охлаждающая жидкость j. превращение сырья в готовую продукцию k. причем последнее потребляет гораздо большие объемы l. сталелитейные и целлюлозные заводы m. судоходный водный путь; судоходная река n. химическая или термическая обработка

(3)

1. commercial (water) demand 2. domestic (water) demand 3. industrial (water) demand 4. public (water) demand	a. потребность в воде для коммунально-бытовых нужд b. потребность в воде для коммунальных нужд c. потребность промышленности в воде; потребность промышленных предприятий в воде d. потребность торговли в воде; потребность торговых предприятий в воде

(4)

1. commercial (water) use 2. domestic (water) use 3. industrial (water) use 4. public (water) use	a. водоснабжение на коммерческой основе b. коммунально-бытовое водопотребление, водопотребление коммунально-бытового водоснабжения c. муниципальное водопотребление, водопотребление для общегородских нужд d. промышленное водопотребление

5. Match the terms and their definitions.

bacterium, chlorine, consumption, impurity, per capita, potable, residential, wasteful, waterwheel

a. a constituent that impairs the purity of something

b. a large wheel driven by flowing water, used to work machinery or to raise water to a higher level

c. a microscopic unicellular living organism found almost everywhere that causes decay and human diseases; most are harmless

d. designed for people to live in

e. for each person

f. safe to drink; drinkable

g. the chemical element of atomic number 17, a toxic, irritant, pale green gas

h. the using up of a resource

i. using something of value carelessly, extravagantly, or to no purpose

6. Translate the following phrases and sentences into Russian paying attention to the underlined words that can be verbs, nouns or adjectives without changing their form and adding suffixes.

1. metallic minerals; nonmetallic minerals; mineral water; mineral spring

2. we all need several glasses of fluid a day; a cleaning fluid; a cooling fluid; a fluid medium

3. to put much / little value upon *smth*.; a total value of $500; the equipment was valued at $5,000

4. magnetic force; centrifugal force; force of gravity; to exert force; to force out; to force particle settling

5. the human body; a human being; the survival of the human race; water for human consumption; human water consumption requirements; the human; to be harmful for humans

6. a total cost of $4,000; total sum; sum total; to add up / calculate a total; the sum was totalled

7. water demand varies on a seasonal, daily and hourly basis; to change daily; to vary hourly

8. an average person; average daily consumption; above the average; below the average; on average; the world average; daily water consumption averages 20 gallons per capita per day

9. atomic / nuclear power; solar power; electric power; power industry; to power devices

10. to fulfill / perform a function; to function properly / improperly

Now fill in the table with Russian equivalents to the words from the sentences above.

daily, fluid, force, function, hourly, human, mineral, power, total, value

	NOUN	VERB	ADJECTIVE	ADVERB
average	среднее число; средняя величина; среднее	выводить среднее число; в среднем равняться, составлять	обычный, средний	---

READING PRACTICE

7. Answer the following questions and read the text carefully to check your answers.

What purposes do water consumers use water for?

What quantity of water does a person use every day and for what purposes?

Does water consumption vary in different countries?

Text A Water Consumption and Its Types

Part 1.

In designing any water supply system specialists determine the required quantity and quality of water supplied. For solving this problem it

is necessary to take into account all the potential water consumers and find out their requirements for the quantity and quality of the water delivered.

Water is used by various consumers and is required for a wide variety of purposes.

Water consumption (also called "*water requirement/water demand / water use*") is the use of water delivered to satisfy particular needs of a community. Water consumption is characterized by several *types (categories) of demands*, including domestic, public, commercial, and industrial uses.

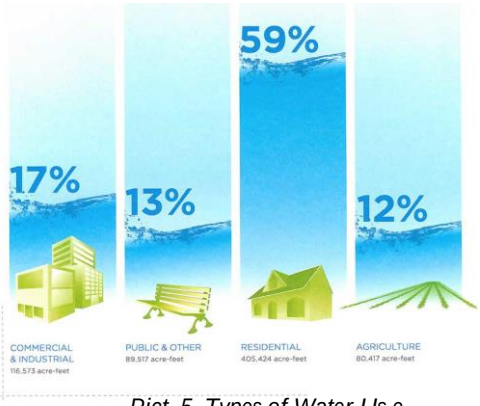
Domestic demand includes water for drinking, cooking, washing up dishes, cleaning, laundering (washing), bathing, car washing, yard and garden watering, carrying away wastes, and other household functions.

Public demand includes water for fire protection, street cleaning, and use in schools, hospitals and other public buildings.

Commercial and *industrial demands* include water for shops, warehouses, offices, hotels, laundries, restaurants, and most manufacturing plants, for various technological purposes in industry, power engineering, transport, etc.

There is usually a wide variation in total water demand among different communities. This variation depends on population, geographic location, climate, the extent of local commercial and industrial activity, and the cost of water.

Water use or demand is expressed numerically by average daily consumption per capita (per person). In the United States the average demand is approximately 100 gallons (380 litres) per capita per day for domestic and public needs. Overall, the average total demand is about 180 gallons per capita per day, when commercial and industrial water uses are included. (These figures do not include withdrawals from freshwater sources for such purposes as crop irrigation or cooling operations at electric power generation



Pict. 5. Types of Water Use

facilities.) Water consumption in some developing countries may average as little as 4 gallons per capita per day; the world average is estimated to be approximately 16 gallons per person per day.

In any community, water demand varies on a seasonal, daily, and hourly basis. On a hot summer day, for example, it is not unusual for total water consumption to be as much as 200 percent of the average demand. Water consumption also varies hourly throughout the day. The peak demands in residential areas usually occur in the morning as well as early evening hours (just before and after the normal workday). Water demands in commercial and industrial districts, though, are usually uniform during the working day. Minimum water demands typically occur in the very early morning and predawn hours when very few people use water.

Civil and environmental engineers must carefully study each community's water use patterns in order to design efficient pumping and distribution systems.

Part 2.

Let's consider some of the main types of water use.

1. Water for drinking and other municipal (urban) uses

Water for drinking is still paramount, and such water must be relatively pure. Water for urban use other than drinking serves a multitude of purposes, such as fire fighting, street cleaning, sanitation, and sewage disposal.

Water fit for human consumption is called *drinking,* or *potable water*. Water that is not potable can be made potable by distillation (heating it until it becomes water vapour, and then capturing the vapour without any of the impurities it leaves behind), or by other methods (chemical or heat treatment that kills bacteria). Sometimes the term "safe water" is applied to potable water of a lower quality threshold. Water that is not fit for drinking but is not harmful for humans when used for swimming or bathing is called by various names other than potable or drinking water, and is sometimes called "safe water", or "safe for bathing". Chlorine is a substance used to make water safe for bathing or drinking. Its use is highly technical and is usually monitored by various regulations.

2. Water for industrial use

Steel mills, pulp mills, chemical factories, and most other industrial processes that involve the conversion of raw materials into finished

products require water. Next to agriculture, one of the most extravagant uses of water is as a cooling fluid in the generation of power from fossil and nuclear fuels, with the latter consuming far greater volumes. Water has been used directly as a source of power since the time of the first boat and the first waterwheel. A small but important part of the world's electrical supply now is generated by hydropower, in which the force of falling water is used to turn turbines that produce electricity.

3. Water for transportation

Water for transportation has always been important, as indicated by the fact that most major cities are located on the shores of oceans and other large bodies of water or along rivers and other types of navigable waterways. Despite recent advances in ground and air transportation, water transportation has an economic advantage for the movement of goods that have a relatively low value per unit of weight or volume, such as raw mineral ores, fuels, and various types of construction materials.

4. Water for irrigation

Irrigation is one of the most wasteful uses of water in areas in which it is scarce, because great quantities are lost through evaporation in both storage areas and transport. In many regions irrigation is, nevertheless, essential for human survival.

COMPREHENSION CHECK

8. Decide whether the following statements are true (T) or false (F) according to the text. Correct the false statements.

1. In designing a water supply system it is necessary to find out the water consumers' requirements for the quantity and quality of water delivered.
2. There are several types of water demands, including domestic, public and industrial uses.
3. Domestic demand includes water for drinking, laundering, bathing, carrying away wastes, garden watering, street cleaning, etc.
4. Industrial demand includes water for various technological purposes in industry and power engineering.
5. Water demand is expressed numerically by average hourly consumption per capita.

6. Water consumption in the USA is approximately 100 gallons per capita per day, whereas water use in some developing countries may average 4 gallons per person per day.

7. Water demand varies on a seasonal, daily and hourly basis.

8. On a hot summer day it is quite usual for total water consumption to be as much as 200% of the average demand.

9. In residential areas minimum water demands usually occur in the morning and early evening hours, whereas the peak water demands typically occur in early morning and predawn hours.

10. Water for urban use serves a multitude of purposes, such as drinking, fire fighting, street cleaning, sanitation, and sewage disposal.

11. Water can be made potable by various methods, including distillation or chemical or heat treatment that kills bacteria.

12. The term "safe water" is sometimes applied to water fit not only for drinking, but also for bathing or swimming.

13. The most extravagant and wasteful uses of water are for industrial and agricultural purposes.

14. The force of falling water to produce electricity has been used since the time of the first waterwheel.

15. Water transportation has a certain economic advantage over ground and air transportation.

9. Answer the following questions.

1. What factors must be taken into account for solving the problem of designing any water supply system?

2. What is water consumption?

3. What are the synonyms of "water consumption"?

4. What types (categories) of demands is water consumption characterized by?

5. What do domestic, public, commercial and industrial demands include?

6. What does the variation in total water demand among different countries depend on?

7. How is water use expressed?

8. Does water consumption in the developed countries differ from the one in developing countries, as a rule?

9. On what basis does water demand vary in any country?

10. For what purpose must engineers study carefully each community's water use patterns?
11. What purposes does water for urban use serve?
12. What is drinking (potable) water?
13. By what methods can water be made potable?
14. What are the most extravagant uses of water?
15. How is water used in industry?
16. Why has water for transportation always been important?
17. What is an economic advantage of water transportation over ground and air transportation?
18. In many regions irrigation is essential for human survival, isn't it?

10. What parts of the text can you define in Part 1? Do they correspond to the paragraph? Entitle each part.

1. _____
2. _____
3. _____
... _____

11. Find key words and phrases which best express the general meaning of each paragraph in Part 2.

12. Write a summary of the text.

LANGUAGE FOCUS

13. Match the synonyms.

1. approximately	a. amount
2. carefully	b. energy
3. delivered	c. household
4. despite	d. in spite of
5. domestic	e. municipal
6. drinking	f. overall
7. extravagant	g. per person
8. laundering	h. potable

9. manufacturing	i. power industry
10. per capita	j. production
11. power	k. roughly
12. power engineering	l. supplied
13. quantity	m. thoroughly
14. to find out	n. to discover
15. to include	o. to generate
16. to produce	p. to involve
17. to require	q. to need/to demand
18. total	r. washing
19. urban	s. wasteful
20. water consumption	t. water use

14. Match the antonyms.

1. approximately	a. cooling
2. demand	b. developed country
3. developing country	c. exactly
4. efficient	d. inefficient
5. evening hours	e. land reclamation
6. fresh water	f. low
7. heating	g. maximum
8. highly	h. morning hours
9. impurity	i. purity
10. land irrigation	j. rural
11. minimum	k. salt water
12. scarce	l. sufficient
13. to include	m. supply
14. unusual	n. to exclude
15. urban	o. usual

15. Fill in the table with the derivatives.

Noun	Verb	Adjective /Participle
		average
	to bathe	
	to consume	
		developing/ developed

Noun	Verb	Adjective /Participle
	to drink	
electricity		
		industrial
		powerful
		productive
	to purify	
requirement		
transportation		
usage		
		wasteful

16. Translate the following text into English using the active vocabulary.

Основные категории водопотребления

Вода расходуется различными потребителями на самые разнообразные нужды. Однако подавляющее большинство этих расходов может быть сведено к трем основным категориям.

1. **Расход воды на хозяйственно-питьевые (бытовые) нужды населения**. Сюда входят все расходы воды, связанные с бытом людей: питье, приготовление пищи, умывание, стирка, поддержание чистоты жилищ и т. п. К этой же категории могут быть отнесены все расходы воды, необходимые для обеспечения благоустройства города или поселка: поливка улиц, зеленых насаждений и т. п.

2. **Расход воды для производственных (технических) целей** на предприятиях промышленности, транспорта, энергетики, сельского хозяйства и т.п. Примерами использования воды для производственных (технических) целей служат парообразование, охлаждение, конденсация пара, изготовление различных фабрикатов, промывка продукции и пр.

3. **Расход воды для пожаротушения.** Кроме того, вода расходуется на собственные нужды водопровода (промывка фильтров, водоприемных устройств, сети и др.).

Требования, предъявляемые к качеству воды, различны в зависимости от характера ее использования.

Так, к воде, идущей на **удовлетворение питьевых нужд населения**, в первую очередь предъявляют требования санитарно-гигиенического порядка. Вода должна быть прозрачной и безвредной для здоровья. Она не должна содержать болезнетворных бактерий и иметь запаха и дурных привкусов.

SPEAKING PRACTICE

17. Get ready to speak about types of water consumption.

TEXT B

VOCABULARY WORK

18. Read the following international words and guess their meaning. Mind the stressed syllables. Prove that these words are international ones.

Model: natural [ˊnætʃ(ə)r(ə)l] естественный, природный; настоящий, **натуральный**; обычный, нормальный

aesthetically [iːsˊthetɪk(ə)lɪ]	ideally [aɪˊdɪəli]
artesian [ɑːˊtiːzlən]	matter [ˊmætə]
collect [kəˊlekt]	organic [ɔːˊgænɪk]
concentration [ˌkɔn(t)s(ə)nˊtreɪʃ(ə)n]	pathogenic [ˌpæθəˊʤenɪk]
degradation [ˌdegrəˊdeɪʃ(ə)n]	porous [ˊpɔːrəs]
ecological [ˌiːkəˊlɔʤk(ə)l]	reservoir [ˊrezəvwaː]
globe [ˊgləub]	stratum [ˊstrtəm]
gravel [ˊgræv(ə)l]	(pl. strata [ˊstrɑːtə])
guarantee [ˌgær(ə)nˊtiː]	tank [tæŋk]
	transmission [trænzˊmɪʃ(ə)n], [trænsˊmɪʃ(ə)n]

19. Translate the following words and phrases and memorize them.

Nouns and noun phrases	
artesian [confined] water	subsurface source
bore	surface source
intake	tank
maintenance	underground source
pond	water transmission
reservoir	water-bearing stratum
spring	(*pl*. strata)
stream	well
Verbs and verbal phrases	
to access	to find
to come from	to guarantee
to distribute	to obtain
to enable	to take place
to experience	to treat
to face *smth*	to withdraw
Adjectives / Participles	
deep	pathogenic
dissolved	shallow
harmful	suitable
organic	suspended

20. Match the English and Russian equivalents.

1. continuity of water supply	a. бесперебойность снабжения водой
2. deep water	b. взвешенное вещество (взвесь) и растворенные минералы и газы
3. impounding reservoir	c. владелец *или* сотрудник системы коммунальнго водоснабжения
4. in designing a water supply system	d. водохранилище
5. natural water sources	e. глубинная вода; донная вода; глубоководный участок (*водоема*)
6. porous or fractured rock	
7. reasonably priced	
8. shallow and deep wells	
9. suspended matter and dis-	

solved minerals and gases 10. through a bore 11. through intakes 12. to determine to a considerable degree 13. to experience water shortage [scarcity, deficit] 14. to pose a threat 15. to satisfy requirements 16. water supplier 17. with a glance of an increase 18. without ecological disturbance	f. испытывать недостаток [дефицит, нехватку] воды g. не нарушая экологического баланса h. неглубокие и глубокие скважины i. недорогой j. обуславливать в значительной степени k. пористая или раздробленная порода l. представлять угрозу (ставить под угрозу, являться угрозой, угрожать) m. при проектировании системы водоснабжения n. природные источники воды o. с помощью водозаборных сооружений [водозаборов] p. с учетом роста q. отвечать требованиям r. через скважину

21. Match the terms and their definitions.

aquifer, drinking water supplier, inorganic, organic, pathogen, reservoir, spring, well, withdraw

a. a body of permeable rock that can contain or transmit groundwater

b. a disease-causing organism (*e.g.* bacteria, viruses and protozoa)

c. a place where water or oil wells up from an underground source, or the basin or flow formed in such a way

d. a shaft sunk into the ground to obtain water, oil, or gas

e. an organization, agency or company that has responsibility and authority for treating and/or supplying drinking water

f. any natural or artificial holding area used to store, regulate or control water

g. of, relating to, or denoting compounds that are not organic (broadly, compounds not containing carbon)

h. of, relating to, or denoting compounds containing carbon (other than simple binary compounds and salts) and chiefly or ultimately of biological origin

i. remove or take away *smth* from a particular place or position

22. Translate the following phrases and sentences into Russian paying attention to the underlined words that can be verbs, nouns or adjectives without changing their form and adding suffixes.

1. to have access to smth.; access for repair; easy / free access; access to water; unlimited access; this article can be accessed via the Internet
2. practical experience; to acquire / get experience from smth.; to experience water shortage; the company is experiencing difficulties
3. to get face to face with a problem; to face the challenge; the building faces eastwards; the external basement walls were faced with granite slabs
4. we offer a 10-year guarantee against rusting; to give / offer a firm guarantee of quality; valid guarantee; to guarantee fully
5. high / low price; a wide selection of tools varying in price; the equipment is priced at $20,000
6. firm / hard / solid ground; soft ground; to lie on the ground; ground water; shore dumping can pollute fishing grounds and beaches; the conclusions must be grounded on facts
7. working / operating / maintenance costs; to cover the cost of smth.; at all costs; to cost much / little
8. hot / thermal spring; mineral spring; subterranean spring; spring water; the water springs out of the ground
9. subsurface water; subsurface irrigation; subsurface is the stratum or strata below the earth's surface
10. water tank; fresh water tank; auxiliary / service tank; to tank water

Now fill in the table with Russian equivalents to the words from the sentences above.

cost, experience, face, ground, guarantee, price, spring, subsurface, tank

	NOUN	VERB	ADJECTIVE
access	доступ	иметь доступ, получить доступ	---

READING PRACTICE

23. Answer the following questions and read the text carefully to check your answers.

Where does our drinking water come from?
Why is there a limited supply of fresh water on the Earth?

Text B Natural Water Sources and Their Use for water Supply Purposes

The choice of a water source is one of the most responsible tasks in designing a water supply system. The source determines to a considerable degree the type of the water supply system itself, the necessity of certain facilities and, therefore, the cost of its construction and maintenance.

A water supply source should satisfy the following requirements:

a. it should provide the acquisition of adequate quantities of water with a glance of a prospective increase in water consumption;

b. it should provide continuity of water supply;

c. it should provide the water of such quality that meets the demands of water consumers by means of reasonably priced treatment;

d. it should enable water transmission at the lowest cost;

e. it should guarantee water acquisition without ecological disturbance.

Natural sources of water include:

- *surface sources* (oceans, seas, lakes, reservoirs, rivers, streams, tanks and ponds);
- *underground sources* (ground water, artesian [confined] water, shallow wells, deep wells, springs).

Natural sources, such as rivers and lakes, and impounding reservoirs are *sources of surface water*. So, surface water can come from oceans and seas, lakes and reservoirs, rivers and streams, tanks and ponds. Water is withdrawn from rivers, lakes, and reservoirs through *intakes*. The simplest intakes are pipes extending from the shore into deep water.

Water obtained from subsurface sources, such as sands and gravels and porous or fractured rocks, is called *ground water*. The flow of ground water takes place in river valleys and, in some areas, along the

seacoast in water-bearing strata known as *aquifers*. Groundwater is accessed through a bore.

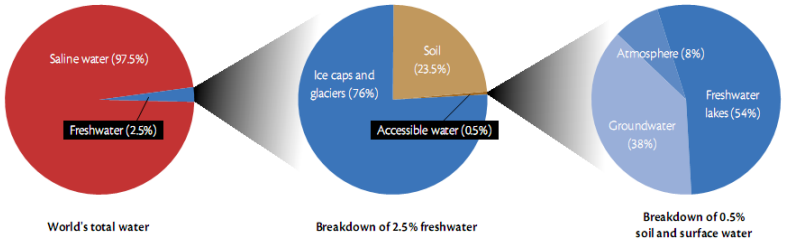
For the community's needs groundwater is more suitable. However, for the supply of water to large inhabited localities groundwater sources are often insufficient, and acquisition of a considerable quantity of water from them is unprofitable.

For the supplying of big cities and industrial enterprises with water, therefore, surface sources of fresh water are mainly used.

Sources of Drinking Water

Drinking water is water intended primarily for human consumption, either directly, as supplied from the tap, or indirectly, in beverages or foods prepared with water. It should contain no harmful concentrations of chemicals or pathogenic microorganisms, and ideally it should be aesthetically pleasing in regard to appearance, taste and odour.

Drinking water comes from *both surface and groundwater sources*. Surface water (rainfall and its runoff into streams and rivers) normally contains suspended matter, pathogenic organisms, and organic substances. Groundwater (water that has collected in aquifers) normally contains dissolved minerals and gases. Both require treatment. Water suppliers access this water, treat it and distribute it to consumers.



Pict. 6. The Distribution of Water Resources on the Earth

A Limited Supply of Fresh Water on the Earth

The amount of water on our planet that is suitable and available for drinking is very small. Only 2.5% of the total water on earth is fresh water. Most of this is not available for drinking, because it is frozen in glaciers or the polar icecaps, or is unavailable in the soil. Accessible fresh water is found in the atmosphere, lakes, rivers, streams, wetlands and under the surface in aquifers (groundwater).

Across the globe, population growth, urban development and environmental degradation pose an ever-increasing threat to freshwater supplies. Today, 4 out of every 10 people live in areas that are experiencing water scarcity, and nearly 50% of the world's population is likely to face severe water shortages by 2025.

COMPREHENSION CHECK

24. Decide whether the following statements are true (T) or false (F) according to the text. Correct the false statements.

1. The choice of a water source is one of the most responsible tasks in water supply system design.
2. A water supply source should satisfy a number of requirements.
3. Natural sources of water include surface, subsurface, underground and groundwater sources.
4. An aquifer is a water-bearing stratum.
5. For the supplying of big cities groundwater sources are sufficient.
6. Drinking water should not contain any harmful concentrations of chemicals or pathogenic microorganisms.
7. Drinking water comes from both surface and underground sources.
8. Surface water usually contains dissolved minerals, pathogenic organisms, and organic substances.
9. Groundwater normally contains suspended matter and gases.
10. Most of fresh water on the Earth is not available for drinking.
11. Population growth, urban development and environmental degradation threaten freshwater supplies across the globe.

25. Answer the following questions.

1. Why is the choice of a water source considered one of the most responsible tasks in designing a water supply system?
2. What requirements should a water supply source satisfy?
3. What do natural sources of water include?
4. What is ground water?

5. An aquifer is a water-bearing stratum, isn't it?
6. Are surface or underground sources of water used for the community's needs?
7. Does drinking water come only from groundwater sources?
8. Why do both surface and ground water require treatment?
9. There is a large amount of water on the Earth that suitable and available for drinking, isn't there?
10. Why is most of the Earth's fresh water not available for drinking?
11. Is fresh water found not only on and under the Earth's surface, but also in the atmosphere?
12. What factors pose an ever-increasing threat to freshwater supplies?
13. Nearly half of the world's population will probably face severe water shortages soon.

26. Find key words and phrases which best express the general meaning of each paragraph.

27. What parts of the text can you define? Do they correspond to the paragraph? Entitle each part.

1. _____
2. _____
3. _____
... _____

28. Write a summary of the text.

LANGUAGE FOCUS

29. Match the synonyms.

1. access	a. approach
2. cost	b. bore
3. ground	c. layer
4. in regard to	d. price
5. reservoir	e. shortage
6. river	f. soil / earth
7. scarcity	g. stream

8. stratum
9. subsurface source
10. to guarantee
11. well

h. to ensure
i. underground source
j. water storage reservoir
k. with respect to

30. Form the opposites using the negative prefixes and arrange the derivatives in the table below.

ab-	dis-	in-	ir-	non-	un-
…	…	…	…	…	…

accessible	confined	limited	reasonable
adequate	considerable	natural	renewable
advantage	directly	normal	responsible
appearance	ease	organic	sufficient
available	exhaustible	profitable	suitable
certain	likely	rational	to solve

31. **Find the words in the text that mean …**

1. existing in nature; not made or caused by humankind; not artificial
2. a structure through which water is taken in from a river into a channel or pipe
3. a distinctive smell, esp. an unpleasant one
4. a layer or a series of layers of rock in the ground
5. land consisting of marshes or swamps
6. disease-producing, disease-causing
7. subterranean, subsurface

32. Use the words and word combinations from the box to change the underlined words.

regions, amount, designs, desalination, besides, sea water, increasing, densely, contaminated, predictable, recycling, nevertheless, to satisfy, demands, solar energy, shortage, use

"New" Sources of Water

Lack of water of proper quality and quantity has been a major factor affecting urban and industrial growth. To overcome this problem, *water has been transported great distances* (e.g., the channeling of Rocky Mountain water from the Colorado River to Tucson, Ariz.) During the 1970s and 1980s the Soviet Union proposed several projects to reverse or divert the waters of northward-flowing rivers of Siberia and the Russian S.F.S.R. to meet the demands of the more heavily populated and water-short regions of the Volga Basin, Central Asia, and Kazakstan. The predicted environmental and climatic consequences of such undertakings, however, combined with their engineering logistics, prevented the practical application of most of these plans.

The use of the oceans as sources of fresh water is being developed in many areas. Kuwait, a desert nation in Arabia, now receives much of its water supply through the desalinization of seawater, as do a number of small communities and several large urban centres elsewhere in the world. Seawater may be used as a source of fresh water on a more widespread basis if an additional power source (*e.g.,* solar power) can be developed for the desalinization process. Moreover, the materials reclaimed from seawater could, if power is available for their separation and concentration, help in meeting many of the world's mineral needs. It seems unlikely, however, at least with foreseeable sources of power, that desalinized ocean water will be extensively pumped to inland regions. Meeting the growing needs of such areas will require the purification of waters polluted by urban or industrial use or of waters that have become salinized through their use in irrigation. The reuse of such waters could go far toward reducing the need for new water by inland communities.

33. Translate the following texts into English using the active vocabulary.

1. Выбор источника является одной из наиболее ответственных задач при проектировании системы водоснабжения, так как он определяет в значительной степени характер самой системы, наличие в ее составе тех или иных сооружений, а следовательно, стоимость и строительства, и эксплуатации.

2. Практически все используемые для целей водоснабжения природные источники воды могут быть отнесены к двум основным группам:

а) **поверхностные источники** — реки (в естественном состоянии или зарегулированные) и озера;

б) **подземные источники** — грунтовые и артезианские воды и родники.

3. **Поверхностные источники** характеризуются значительными колебаниями качества воды и количества загрязнений в отдельные периоды года. Качество воды рек и озер в большой степени зависит от интенсивности выпадения атмосферных осадков, таяния снегов, а также от загрязнения ее поверхностными стоками и сточными водами городов и промышленных предприятий.

Характерными качествами **речной воды** являются относительно большая мутность (особенно в период паводков), высокое содержание органических веществ, бактерий, цветность. Наряду с этим речная вода характеризуется обычно относительно малым содержанием минеральных солей и относительно небольшой жесткостью (особенно в период паводков).

Вода озер обычно отличается малым содержанием взвешенных веществ (т. е. малой мутностью или, иначе, большой прозрачностью), кроме прибрежной зоны, где мутность воды увеличивается в результате волнения. Степень минерализации озерной воды различна.

4. **Подземные воды**, как правило, не содержат взвешенных веществ (т. е. весьма прозрачны) и обычно бесцветны.

Артезианские воды, перекрытые сверху водонепроницаемыми породами, защищены от поступления проникающих с поверхности земли загрязненных стоков и потому обладают высокими санитарными качествами. Такими же качествами часто обладают и **родниковые воды**.

Наряду с этими положительными качествами подземные воды часто сильно минерализованы. В зависимости от характера растворенных в них солей они могут обладать теми или иными отрицательными свойствами (повышенная жесткость, наличие неприятного привкуса, содержание веществ, вредно влияющих на организм человека).

5. Окончательный выбор источника водоснабжения для данного объекта производится в зависимости не только от качества воды в

нем, но также от его мощности, удаленности от объекта, стоимости подачи и очистки воды.

6. Для водоснабжения населенных мест наиболее подходящим источником являются подземные (особенно артезианские и родниковые) воды, если они не сильно минерализованы.

7. Для крупных населенных мест подземных источников часто оказывается недостаточно. В этих случаях, несмотря на отрицательные качества поверхностных вод, приходится использовать их, производя соответствующую очистку.

8. Водоснабжение большинства малых и средних населенных мест основано на использовании подземных источников. Для водоснабжения большинства крупных городов приходится полностью или в значительной степени пользоваться поверхностными водами (с соответствующей их очисткой).

SPEAKING PRACTICE

34. Get ready to speak about natural sources of water and their use for water supply purposes.

TEXT C

VOCABULARY WORK

35. Read the following international words and guess their meaning. Mind the stressed syllables. Prove that these words are international ones.

Model: utilization [ˌjuːtɪlaɪˈzeɪʃ(ə)n] использование, пользование, употребление; **утилизация**

billion [ˈbɪliən]	permanent [ˈpɜːm(ə)nənt]
biosphere [ˈbaɪəsfɪə]	pesticide [ˈpestisaɪd]
cholera [ˈkɔl(ə)rə]	phosphate [ˈfɔsfeɪt]
constant [ˈkɔnstənt]	plane [pleɪn]

diarrhea [ˌdaɪəˈrɪə]	pore [pɔ:]
drained [dreɪnd]	progressive [prəˈgresɪv]
ecosystem [ˌi:kəuˈsɪstəm]	recreational [ˌrekrɪˈeɪʃ(ə)n(ə)l]
extensively [ɪkˈsten(t)sɪvlɪ], [ek-]	region [ˈri:ʃ(ə)n]
herbicide [ˈhɜ:bɪsaɪd]	situation [ˌsɪtʃuˈeɪʃ(ə)n]
kilometer [kɪˈlɔmɪtə]	summarize [ˈsʌm(ə)raɪz]
malaria [məˈlɜərɪə]	thermal [ˈθɜ:m(ə)l]
maximum [ˈmæksɪməm]	thermoelectric [ˌθɜ:məuɪˈlektrɪk]
(*pl*. maxima [ˈmæksɪmə])	top [tɔp]
mercury [ˈmɜ:kjurɪ]	trend [trend]
nitrate [ˈnaɪtreɪt]	typhoid [ˈtaɪfɔɪd]
nuclear [ˈnju:klɪə]	

36. Translate the following words and phrases and memorize them.

Nouns and noun phrases

(non-)renewable resource	pesticide
algal bloom	recharge
availability	release
depth	river flow
desalinization	salinity
deterioration	seepage
disease	snowfield
drinking water supply	water distribution
estuary	water resources
fertilizer	water reuse
herbicide	water table
overfertilization	water utilization
overuse	

Verbs and verbal phrases

to be filled with	to recover
to disappear	to remain
to disrupt	to replace
to fill with	to store
to give rise to	to trickle down
to increase	

Adjectives	
dry	nonpolluting
freshwater	uneven
glacial	unfit (for)
improper	untreated
inaccessible	
Adverbs	
continually	primarily
currently	roughly
evenly	steadily
permanently	
Prepositions	
due to	regardless of
Conjunctions	
although while	while

37. Match the English and Russian equivalents.

1. bottom water	a. атомная электростанция, АЭС
2. evenly distributed	b. влажность грунта, почвенная влага
3. ever-widening	c. воды, залегающие в верхних слоях почвы
4. flood prevention	d. гидроэлектростанция, ГЭС
5. ground water recharge	e. донная [глубинная] вода
6. groundwater plane	f. ледниковый щит
7. hydropower plant	g. максимальная мощность [производительность]
8. ice sheet	h. маловероятно, что …
9. it is unlikely that …	i. покрывающая порода
10. maximum capacity	j. пополнение запасов подземных вод
11. nuclear power plant	k. поровое пространство *(в почве)*; объём пор
12. overlying rock	l. постоянно расширяющийся
13. pore space	m. противопаводочные мероприятия
14. shallow groundwater	n. равномерно распределённый
15. soil moisture	o. сделать *что-л.* непригодным для
16. thermoelectric power	
17. to render *smth*. unfit for	

	p. термоэлектродвижущая сила, термоэдс q. уровень подземных вод

38. Match the terms and their definitions.

ecosystem, lake, lead, ocean, recharge, reservoir, river, snowfield, water table

a. a biological community of interacting organisms and their physical environment

b. a heavy, bluish-gray, soft, ductile metal, the chemical element of atomic number 82 (Symbol: Pb). It has been used in roofing, plumbing, ammunition, etc.

c. a large body of water surrounded by land

d. a large natural or artificial lake used as a source of water supply

e. a large natural stream of water flowing in a channel to the sea, a lake, or another such stream

f. a permanent layer of ice covering an extensive tract of land, esp. a polar region

g. a very large expanse of sea, in particular, each of the main areas into which the sea is divided geographically

h. the level below which the ground is saturated with water

i. the replenishment of an aquifer by the absorption of water

39. Translate the following phrases and sentences into Russian paying attention to the underlined words that can be verbs, nouns or adjectives without changing their form and adding suffixes.

1. the problem concerns us all; the new techniques raise some safety concerns; to give cause for concern; to express concern about a water shortage; the concern of the urban community

2. to drain marshes; to drain the swimming pool; to drain the tank of all water; the land was drained and the boggy ground reclaimed; it is impossible to pass there until the water drains; the river drains into the Pacific; springs and rivers that drain into lakes carry dissolved nitrates and phosphates; the water slowly drained down through the porous soil; to

block/clog a drain; to clean out/clear/unblock/unclog a drain; to lay drains in a new house

3. to flow from/out of; to flow (in)to; to flow from *smth*. to *smth*.; the river flows from east to west; water flowed from the pipe; rivers flow into the sea; to regulate the water flow; the flow of water into the pond

4. maximum utilization; annual maximum

5. to overuse water resources; overuse of natural resources; water supplies are under increasing threat from overuse and pollution

6. the rate at which the aquifer recharges naturally; recharge of an aquifer is the replenishment of the aquifer by the absorption of water

7. to release water from the drain; release of stored water; release of impounded water

8. to evaluate/measure results; to achieve results; measurement result; results of test; as a result of; to result in; to result from

9. water reuse; waste reuse; public pressure to reuse paper

10. water table rise; pressure rise; the water often rises above the normal level

11. to store water in cisterns; to store up water; water stores

Now fill in the table with Russian equivalents to the words from the sentences above.

concern, drain, flow, overuse, recharge, release, result, reuse, rise, store

	NOUN	VERB	ADJECTIVE
maximum	максимум; максимальное значение; высшая степень	---	максимальный, наибольший, предельный

READING PRACTICE

40. Read the text using a dictionary.

Text C Natural Water Resources and Their Use for Water Supply Purposes

Part 1. The Earth's Water Supply and Its Natural Distribution

A water resource is any natural waters that occur on the Earth, regardless of their state (*i.e.,* vapour, liquid, or solid) and that are of potential use to humans. Of these, the resources most available for use are the waters of the oceans, rivers, and lakes; other available water resources include groundwater and deep subsurface waters and glaciers and permanent snowfields.

Water is stored on the Earth's surface in a number of places called *reservoirs*.

Oceans. By far the largest reservoir is the ocean, which contains 96% of the Earth's water and occupies more than two-thirds of the Earth's surface. Ocean water, [1]being saline, is not generally available for human consumption, although it can be used for some purposes, mainly thermoelectric power.

Glaciers. Fresh water makes up only about 4% of the Earth's water. The largest freshwater reservoir is glacial ice, at 3%. Most of this ice (about 85%) occurs as continental glaciers in Antarctica and less than 10% in the Greenland ice sheet. Alpine or mountain glaciers which occur in mountain valleys on the continents contain a small part of the total ice.

Ground water. The largest reservoir of available fresh water is groundwater (1.05% of total water) which is stored in the pores and spaces in rocks, sand, gravel, and soil under the Earth's surface. The top plane of the ground water is referred to as the water table, below which all the spaces are filled with water. About half of the ground water occurs quite near the Earth's surface and this is an important source of water for human consumption. Although shallow ground water is continually being refilled by precipitation [2]trickling down to the water table,

the rate of recharge is very slow and often takes hundreds or thousands of years. This makes many ground-water aquifers a nonrenewable resource. The rest of the ground water, while at greater depths, does not occur much deeper than a few kilometers, where the pressure of the [3]overlying rock becomes so great that pore space disappears. Deep groundwater is harder to recover and is more likely to be saline. A smaller amount of water occurs in the soil above the water table, where both air and water fill the pore spaces; this water is referred to as soil moisture and is tightly held in the pores.

Lakes, rivers, and other reservoirs. Fresh-water lakes and rivers on the Earth's surface contain only 0.01% of the Earth's water. This water is generally available for human consumption. There is also an even smaller reservoir of water in the atmosphere (0.001%), where the water occurs as water vapour gas. The smallest reservoir of water occurs in the biosphere, within plants and animals (0.0006%). To summarize, the main fresh-water resources available for humans on the Earth's surface are ground water and lake and river water, which together only constitute about 1.1% of the Earth's total water.

Hydrologic cycle. Water does not permanently remain in any one reservoir on the Earth but is continually in motion through the hydrologic, or water cycle.

The total amount of water on the Earth's surface in the various reservoirs remains roughly constant over time. The general belief is that the amount of water on or near the Earth's surface has not changed greatly since 3.8 billion years ago.

Part 2. Worldwide Water Use and Water Usage Problems

Although water is a renewable resource which is continually being replaced by precipitation it is not evenly distributed and is scarce in many areas. The distribution of both surface and ground water resources is uneven on the Earth. Groundwater is of special importance for [4]drinking water supply throughout the world, every region having different groundwater resources.

Human use of natural waters, particularly of freshwater resources, has increased steadily over the centuries. It is unlikely that this trend will change given the continued growth of population and the [5]ever-widening utilization of water for agricultural, industrial, and recreational purposes.

This situation has given rise to [6]growing concern over the availability of adequate water supplies to accommodate the future needs of society. Surface water resources are already being used to their maximum capacity in various regions of the world.

Quantity of water is not the only concern. Overuse has resulted in the progressive deterioration of water quality. Seepage of mineral fertilizers (phosphates and nitrates), pesticides, and herbicides into surface and subsurface waters has not only rendered them unfit for human consumption but also disrupted aquatic ecosystems. Lakes and rivers also have been contaminated by the improper disposal of sewage, the discharge of untreated industrial wastes, and the release of heated wastewater from nuclear power plants and other industrial facilities, which results in thermal pollution and its attendant problems.

The result of the uneven distribution of precipitation and world's rivers is that many areas do not have adequate water resources. In total, about 20% of world river flow (the remote northern rivers of North America and Eurasia, as well as large parts of the flow of the Amazon and Congo rivers) is geographically inaccessible to populated areas and thus not available for human use. Rivers in other dry parts of the world, such as the Nile in Egypt, have had their flow greatly reduced due to dams and irrigation. At times, the Nile is reduced to zero flow. Freshwater lakes only make up 0.009% of the world's water by volume, but they are important water resources. There are several very large saline lakes. In fact, the world's largest lake, the Caspian Sea at the border between Asia and Europe, is saline. It was named a "sea" because of its salinity. The Aral Sea is another large saline lake, although it has been shrunk extensively by the use of its water for irrigation.

The uses of water worldwide are 70% for agriculture, 10% for domestic purposes such as drinking water, and 20% for industry (more than half of which is used for hydropower). Countries that have scarce water include a number in the belt of low precipitation such as the northern tier of Africa (Mauritania, Algeria, Morocco, Libya, Niger, and Egypt) and the Middle East (Saudi Arabia, Palestine, Syria, and Jordan). Worldwide there are 500 million people in countries with scarce water.

Water for human consumption is unsafe in many places, particularly in the [7]developing countries. It is estimated that as much as 80% of diseases in developing countries are water-related, and 1.7 million people, often children, die from these diseases mainly in Africa and south-east

Asia. Typical diseases are diarrhea, cholera, typhoid, and malaria. The main problem is that unsafe disposal of human and animal waste contaminates water for domestic use and irrigation.

More than 50% of the water used by industry (20% of the total) is used for hydropower plants. These plants provide one-fifth of the world's electricity. Hydropower is relatively clean and [8]nonpolluting and is renewable. Dams used for hydropower generation also store water resources for agricultural irrigation, flood prevention, and domestic use. Industrial uses of water can lead to pollution of rivers and aquifers by heavy metals (such as mercury and lead) and persistent organic pollutants.

Agriculture uses 70% of water worldwide, primarily for irrigation. About 65% of irrigation water is "consumed" in distribution and application and by crops and not available for reuse. Irrigation can be wasteful of water and can lead to salt buildup in soils if the soil is poorly drained. Agricultural and lawn runoff often cause over-fertilization of water from nitrate and phosphate, causing algal blooms and loss of oxygen in bottom water of rivers, lakes, and estuaries. There have also been problems with agricultural pesticides [9]polluting ground and surface water.

Desalinization of saltwater currently supplies only about 0.1% of fresh water. It is expensive since it requires a lot of energy. Thus, it is used primarily for drinking water in water-poor areas.

COMPREHENSION CHECK

41. Decide whether the following statements are true (T) or false (F) according to the text. Correct the false statements.

1. A water resource is any natural waters that occur on the Earth in liquid state and that are of potential use to humans.
2. The resources most available for use are groundwater and deep subsurface waters and glaciers and permanent snowfields.
3. Reservoirs are places where water is stored on or under the Earth's surface.
4. The largest saline water reservoir is the ocean.
5. Freshwater reservoirs include glaciers, rivers, lakes, and groundwater.

6. Deep groundwater is more likely to be saline.

7. The largest reservoir of water occurs in the biosphere, within plants and animals.

8. The total amount of water on the Earth's surface in the various reservoirs remains approximately constant over time.

9. Although water is a renewable resource which is continually being replaced by precipitation it is distributed unevenly and is scarce in many areas.

10. It is likely that human use of natural waters, particularly of fresh-water resources, will decrease steadily.

11. Surface water resources are being used to their minimum capacity in most regions of the world.

12. Both quality and quantity of water are of concern.

13. About 20% of world river flow is not available for human use.

14. The world's largest lake, the Caspian Sea, is named a "sea" because of its salinity.

15. The worldwide water uses are 70% for agriculture, 10% for domestic purposes such as drinking water, and 20% for industry.

16. It is estimated that as much as 80% of diseases in developed countries are water-related.

17. Though desalinization of saltwater is expensive since it requires a lot of energy, it is used primarily for drinking water in water-poor areas.

42. Answer the following questions to Part 1 of the text.

1. What is a water resource?
2. What is a reservoir?
3. How much Earth's water does the ocean contain?
4. Is ocean water generally available for human consumption?
5. Fresh water makes up about 96% of the Earth's water, doesn't it?
6. Where does glacial ice occur?
7. What is groundwater?
8. What is the water table?
9. What is the difference between shallow and deep groundwater?
10. What is soil moisture?
11. Is the water of lakes, rivers and other fresh-water reservoirs available for human consumption?

12. Are there reservoirs of freshwater water in the atmosphere and the biosphere?

13. Through what process doesn't water on the Earth remain permanently in any one reservoir?

43. Find key words and phrases which best express the general meaning of each paragraph.

44. What parts of the text can you define? Do they correspond to the paragraph? Entitle each part.

1. _____
2. _____
3. _____
... _____

45. Write a summary of the text.

LANGUAGE FOCUS

46. Match the synonyms.

1. billion	a. arid
2. desalinization	b. called
3. dry	c. constant/continual
4. mainly	d. desalination
5. moisture	e. distant/far
6. named	f. global/world
7. permanent	g. humidity/dampness
8. remote	h. leakage
9. saline water	i. milliard
10. seepage	j. primarily
11. subsurface	k. salt water
12. to drain	l. to dewater
13. to store	m. to keep
14. utilization	n. underground/subterranean
15. world-wide	o. use

47. Match the antonyms.

1. below	a. above
2. deep	b. bottom
3. dry	c. cheap
4. even	d. evenly
5. expensive	e. improper
6. likely	f. minimum
7. maximum	g. polluting
8. nonpolluting	h. renewable
9. non-renewable	i. shallow
10. overuse	j. temporary
11. permanent	k. underuse
12. proper	l. uneven
13. top	m. unlikely
14. unevenly	n. wet

48. Form the nouns from the following verbs.

to access ➔	to deteriorate ➔	to moisten ➔
to accommodate ➔	to dispose ➔	to precipitate ➔
to apply ➔	to disrupt ➔	to recover ➔
to avail ➔	to distribute ➔	to refer ➔
to constitute ➔	to drain ➔	to renew ➔
to consume ➔	to estimate ➔	to require ➔
to desalinate ➔	to fertilize ➔	to utilize ➔
to desalinize ➔	to lead ➔	to waste ➔

49. Choose the right translation of the words underlined in the text, paying attention to the meaning of the suffix -ing.

[1]being
a. являясь
b. существующий
c. существование

[2]trickling
a. просачиваясь
b. просачивающийся
c. просачивание

[3]overlying
a. покрывающий
b. покрывая
c. покрывающийся

[4]drinking
a. питьевой
b. питье
c. питьевого назначения

[5]ever-widening
a. постоянно расширяясь
b. постоянно расширяя
c. постоянно расширяющийся

[6]growing
a. растущий
b. рост
c. способствующий росту

[7]developing
a. развитый
b. развивающийся
c. разработка

[8]nonpolluting
a. незагрязняющий
b. защита от загрязнения
c. не загрязняя окружающей среды

50. Choose the correct word.

Water: a Renewable or Nonrenewable Resource?

Water may be considered an inexhaustible resource because the total supply of water in the biosphere is not affected/effected by human activities. Water is not destroyed by human uses, although/despite it may be held for a time in combination with other chemicals. To be useless/useful, however, water must be in a particular place and of a certain quality, and so it must be regarded as a renewable, and often scarce, resource, with water recycling times that dependent/depend on its location and use.

Water that falls from the atmosphere/biosphere as various types of precipitation and than/then runs off the land surface to form streams and rivers that eventually reach the ocean generally operates on a one-year-renewable cycle known as the hydrologic/hydraulic cycle. From the ocean the water is evaporated by solar energy and returned to the atmosphere, from which it again falls as/like rain or some other form of precipitation. In certain locations, however, water has a much longer/longest cycling time; after entering the ground from rainfall, it may percolate slowly through/though underground channels/canals until it reaches underground reservoirs. In certain arid regions the total water supply may be underground water that accumulated during past ages, when the climate of the region was less/more humid. Since/science that time there may have been little or no addition to this supply because of the existing/exciting climatic conditions. Because its cycling time may be extremely long and dependent upon/from the frequency with which wet and dry climates alternate in a particular region, such a water resource can/should be virtually nonrenewable.

51. Read the text and answer the following questions in written form.

Water Resources in Europe

The mountainous and upland areas of Europe collect great quantities of surface water which supply the rivers and lakes. In the Mediterranean lands, surface water is minimal in summer, with the exception of Alpine rivers, lakes, and springs, and the Apennine zone of Italy. In the east, surface water is relatively abundant in Belarus and central and northern Russia, but it decreases to the south; dams on the Volga and Dnieper (Dnepr), however, have created enormous reservoirs. There are large artesian and ground water basins in Belarus and the Baltic countries.

The increasing water requirements of thermal power stations, industry and domestic needs make the little-populated and little-industrialized European highlands, which offer surplus water, vital to the lowlands. The pollution of water by effluents from urban areas, oil refineries and chemical and metallurgical plants presents serious problems in, for example, the Rhine and the Ruhr regions, and Lakes Geneva. In reaction to water shortages, for example, in the Thames, water is recycled many times, a practice that improves river water quality.

Europe is relatively well supplied with water, for the water table is normally not far below the surface in the lowlands, and wells and springs are widely available there; groundwater supplies that are held particularly in porous rocks are sporadically utilized through the process of pumping. A growing trend is to artificially integrate surface and underground water; nearly half of Sweden's urban water requirements are thus supplied. High capital costs, rather than an actual lack of water, leave some areas of the continent (in particular, southwestern Russia near the Caspian Sea and parts of interior Spain and Turkey) in an arid state.

The needs of the major European cities and of the industrial regions involve continuing efforts to collect enough water by impounding surface water, by pumping groundwater, and by encouraging the economy, reuse, and reclamation of water.

1. Where are the areas of abundance and shortage of water in Europe?
2. What are some of the water-related problems in Europe?
3. What natural sources of water are mainly used in Europe?
4. How is the problem of collecting enough water solved in European countries?

52. Translate the following sentences into English using the vocabulary of the text.

1. Водные ресурсы – это пригодные для использования в хозяйстве воды рек, озер, каналов, водохранилищ, морей и океанов, подземные воды, почвенная влага, вода (льды) ледников и снежного покрова.

2. Ледники (глетчеры) – это движущиеся естественные скопления льда атмосферного происхождения на земной поверхности; которые образуются в тех районах, где твердых атмосферных осадков отлагается больше, чем испаряется.

3. Грунтовые воды – это подземные воды первого от поверхности Земли постоянного водоносного горизонта, которые образуются главным образом за счёт инфильтрации (просачивания) атмосферных осадков и вод рек, озёр, водохранилищ, оросительных каналов. Местами запасы грунтовых вод пополняются восходящими водами более глубоких горизонтов (например, водами артезианских бассейнов).

4. Грунтовые воды благодаря относительно лёгкой доступности имеют большое значение для национальной экономики как источники водоснабжения промышленных предприятий, городов, посёлков, населенных пунктов в сельской местности и т. д.

5. Круговорот воды на Земле (влагооборот) - непрерывное перемещение воды на Земле (в её атмосфере, гидросфере и земной коре), состоящий из испарения, переноса водяного пара в атмосфере, конденсации пара, выпадения осадков и стока.. Различают малый круговорот: море (океан) → атмосфера → море (океан) и большой круговорот: океан → атмосфера → суша → океан.

SPEAKING PRACTICE

53. Get ready to speak about natural water resources and their use for water supply purposes.

TEXT D

VOCABULARY WORK

54. Read the following international words and guess their meaning. Mind the stressed syllables. Prove that these words are international ones.

Model: crisis [ˊkraɪsɪs] (*pl*. crises [ˊkraɪsi:z]) **кризис**; критическая ситуация; критический момент, решительный момент, перелом

chief [ʧi:f]	ignore [ɪgˊnɔ:]
conflict 1. *n* [ˊkɔnflɪkt];	million [ˊmɪljən]
2. *v* [kənˊflɪkt]	observation [ˌɔbzəˊveɪʃ(ə)n]
consensus [kənˊsensəs]	quarter [ˊkwɔ:tə]
conservation [ˌkɔnsəˊveɪʃ(ə)n]	remark [rɪˊmɑ:k]
economically [ˌi:kəˊnɔmɪk(ə)lɪ]	reserve [rɪˊz3:v]
economist [ɪˊkɔnəmɪst]	shock [ʃɔk]
erosion [ɪˊrəuʒ(ə)n]	stability [stəˊbɪlətɪ]
extreme [ɪksˊtri:m], [ek-]	strategy [ˊstrætəʤɪ]
formation [fɔ:ˊmeɪʃ(ə)n]	
global [ˊgləub(ə)l]	

55. Translate the following words and phrases and memorize them.

Nouns and noun phrases	
benefit	jeopardy
diamond	practice
environmentalist	threat
flush	water shortage
Verbs and verbal phrases	
to cost	to pour
to lack	to save
to look for	to threaten
to matter	
Adjectives / Participles	
conscious (of)	shared
sensible	
Adverbs	
approximately	immediately
considerably	moreover
economically	rapidly
fiercely	undoubtedly
however	unfortunately
Prepositions	
according to	like

56. Match the English and Russian equivalents.

1. energy conservation 2. no longer 3. oil crisis 4. to put in jeopardy 5. water conservation 6. World Health Organization (WHO)	a. Всемирная организация здравоохранения, ВОЗ *(специализированное учреждение ООН, ставящее целью достижение всеми народами более высокого уровня здоровья; создано в 1948 г.)* b. нефтяной кризис c. сохранение воды; накопление воды; охрана водных ресурсов d. сохранение энергии; рациональное использование энергии; экономия энергии e. ставить под угрозу, подвергать опасности f. уже не, больше не

57. Match the terms and their definitions.

consensus, crisis, economically, jeopardy, lack, save, sensible, shortage

a. a state or situation in which something needed cannot be obtained in sufficient amounts

b. a time of intense difficulty, trouble, or danger

c. an agency of the United Nations, established in 1948 to promote health and control communicable diseases

d. be without or deficient in

e. chosen in accordance with wisdom or prudence; likely to be of benefit

f. danger of loss, harm, or failure

g. general agreement

h. in a way that involves careful use of money or resources

i. keep safe or rescue (*smb. or smth.*) from harm or danger

58. Make sure you know the words and word combinations from the box and insert them into the sentences.

providing, urban, dense, maintaining, sanitation, groundwater, quality

Where the Water Goes

What exactly constitutes a water crisis varies greatly, according to type of environment: rural or _____ community, developing or industrial nation.

In rural areas, the conflict is one of agricultural overuse, _____ contamination, and, in some parts of the world, lack of infrastructure and _____ .

In urban areas, the crisis is primarily one of insufficient water to support the _____ population.

In developing nations, the primary concern is simply _____ water to people, while water quality may take a backseat.

In industrial nations, where the infrastructure for providing drinking water to the majority of the population is already in place, the concern turns to _____ the level of service and the _____ of the water supply.

READING PRACTICE

59. Read the text using a dictionary.

Text D The Threat of a Worldwide Water Shortage

"High quality water is more than the dream of the conservationists, more than a political slogan;
high quality water, in the right quantity at the right place at the right time,
is essential to health, recreation, and economic growth."
EDMUND S. MUSKIE, U.S. Senator, speech, 1 March 1966

"Water, which is essential for life, costs nothing. *On the other hand*, diamonds, which are essential for nothing, cost a lot." *Unfortunately*, the world has changed considerably since an eighteenth century economist made this remark. What was true over two hundred years ago is certainly no longer true now. In a number of countries people pay as much for water in their homes as they do for electricity.

What is still true, *however*, is the remark made by Benjamin Franklin at the same time as the previous observation was made. "When the well's dry, we know the worth of water," he observed. Like health, we ignore water when we have it — unless there are floods, of course. Once there is a threat to our water supply, however, water can quickly become the only thing that matters. We know only too well that, without water, there can be no life.

The situation is now becoming so bad that environmentalists feel it may be necessary to shock the world into saving water in a similar way to the shock caused by the oil crisis in the 1970s. At that time, the oil crisis became such a serious threat to the lives of everyone in the developed countries that it made people conscious of the importance of saving

oil and provided powerful encouragement for governments to look for other forms of energy. The result *undoubtedly* was of major benefit to energy conservation.

There is now no longer an unlimited supply of fresh water. If all the earth's water could be poured into a gallon jug, the fresh water which would be available for everyone would amount to slightly more than one tablespoon — less than half of one per cent of the total water in the jug. About 97 percent of the planet's water is seawater. Another 2 percent is locked in icecaps and glaciers. There are also reserves of fresh water under the earth's surface but these are too deep for us to use economically. Unfortunately, competition is growing fiercely for what little water is available. It may be a matter of time before that competition becomes a conflict. *To make matters worse*, the world's population is increasing so rapidly that it is expected to grow in thirty years to approximately 8,000 million — an increase of 60%. *Moreover*, in many developed countries throughout the world, flush lavatories and washing machines mean the average person now uses 300 liters of water a day compared with 50 at the beginning of the century.

At the other extreme, according to the World Health Organization, one quarter of the world's present population still lacks safe drinking water and proper sanitation. Most live in the southern hemisphere, where supplies of fresh water are put in jeopardy through dirty industrial practices, poor irrigation and erosion It is estimated that diarrhea caused by polluted water will kill 15 out of every 1,000 children born in developing countries before they reach the age of five. Cases of cholera have risen to levels unheard of in the past. Contamination is responsible for 80 percent of diseases and 33 percent of deaths in these countries.

The social stability of the world is no longer threatened by global wars, the Cold War, etc. However, the supply of water could soon become the chief threat to such stability. There is already evidence of this happening, especially in Africa. Recently the Egyptian government threatened to destroy any dams built on the Nile if they considered the

dams would affect their supply of fresh water. What is required *immediately* is an awareness of the true value of water and the formation of sensible water conservation strategies. It is also of vital importance to have a consensus on how best to use shared water resources for the benefit of all the countries in the world as well as an examination of the best methods of the distribution of the world's water.

COMPREHENSION CHECK

60. Complete the sentences according to the text.

1. Water, which is essential for life, … . On the other hand, diamonds, which are essential for nothing, … .
2. In a number of countries people pay as much for water in their homes … .
3. When the well's dry, we know … .
4. Once there is a threat to our water supply, however, … .
5. Without water, there can be … .
6. There is now no longer an unlimited supply of … .
7. About 97 percent of the planet's water is … . Another 2 percent is locked in … .
8. To make matters worse, the world's population is increasing so rapidly that … .
9. Moreover, in many developed countries throughout the world, flush lavatories and washing machines mean … .
10. At the other extreme, one quarter of the world's present population still lacks … .
11. Most live in the southern hemisphere, where … .
12. The supply of water could soon become … .
13. What is required immediately is … .
14. It is also of vital importance to have a consensus on … .

61. Write a summary of the text.

LANGUAGE FOCUS

62. Translate the words and phrases printed in italics in the text.

1. on the other hand
a. с другой стороны
b. с одной стороны
c. на другой стороне

2. unfortunately
a. к счастью
b. к сожалению
c. неудачно

3. however
a. несмотря на это
b. однако/тем не менее
c. следовательно

4. *undoubtedly*
a. несомненный
b. сомнительно
c. несомненно/бесспорно

5. to make matters worse
a. для того чтобы сделать ситуацию еще хуже
b. для того чтобы дела стали еще хуже
c. хуже того

6. *moreover*
a. кроме того
b. однако
c. возможно

7. *immediately*
a. сразу
b. непосредственно
c. незамедлительно

63. Match 1-10 to a-j to form complete sentences.

1. We only appreciate the importance of water...	a ... for what little water is available.
2. The water crisis is now so bad ...	b ... while another 2 percent is ice.
3. The amount of fresh water available for everyone now ...	c ... the social stability of the world will be threatened.
4. About 97 percent is sea water...	d ... that the world must be shocked into taking action.
5. The fresh water below the surface of the earth ...	e ... is responsible for large numbers of deaths and illnesses.
6. The water shortage is made more serious ...	f ... how to use and distribute the world's water.
7. Polluted water in developing countries ...	g ... when we do not have any.
8. There will soon be keen	h ... is too deep to obtain at a reasonable cost.

competition ... 9. Countries must reach an agreement on ... 10. If there is no such an agreement...	i ... because the world's population is increasing at a rapid rate. j ... is less than one percent of the total water in the world.

64. Choose the right variant. Comment on your choice.

Water is essential for life. However, (like/as/such as) the air we breathe, water is something that we often take for granted. It is (easy/ uneasy/easily) to take something for granted when it is always there. In places rich with clean water resources, (these/there/their) are watered lawns, clean cars and long showers. Comprehending the global need for water (are/is/it is) difficult when wells are abundant and public waterworks are aptly funded – the tap turns and the water comes out. It is unimaginable to even think of walking great distances (everyday/every day/per day) to throw a bucket into a swamp and call what comes out drinking water.

The need is so vast that (some/any/no) single solution will work in every case; therefore, there is room for various creative solutions. The need (of/to/for) clean water will continue to grow (as/however/but) the global population increases. In the developing world, wells are (enough/ too/such) expensive for impoverished villages to afford (because of/ because/due to) they require skilled workers and specialized heavy equipment. To top it all off, subterranean water (is not/are not/is no) always available, and surface water is generally not safe to (drink/ drinking/drank). (Another/ Other/Others) innovations are necessary, and tremendous steps are being taken to bring water to (this/that/these) communities.

65. Insert the appropriate word.

lack, protect, flush, misused, management, worse, increase, stress, purposes, droughts, precious, ecosystems

1. The world is currently in a water crisis. A _____ of water to meet daily needs is a reality today for one in three people around the world.

2. Globally, the problem is getting _____ as cities and populations grow, and the needs for water _____ in agriculture, industry and households.

3. Water is an essential resource for life and good health. The WHO urges everyone to be part of efforts to conserve and _____ this resource.

4. Water conservation is the protection, development, and efficient _____ of water resources for beneficial _____.

5. Regions throughout the world are experiencing water shortages, due to both _____ and overuse of water.

6. According to the Washington Post in 2005, "Just one _____ of a toilet in the West uses more water than most Africans have to perform an entire day's washing, cleaning, cooking and drinking."

7. There is no resource more _____ than water. There is also no resource that is _____, abused, misallocated, and misunderstood the way water is.

8. Safe drinking water, healthy and intact natural _____, and a stable food supply are a few of the things at risk as our water supply is put under greater and greater _____.

READING PRACTICE

66. The following newspaper report contains much of the same information as that in Text D. However, one additional important problem has been included. Scan the text to find out what this problem is.

Possible Water Shortage

a The world needs to be shocked into saving water, a United Nations conference was told yesterday.

b A disaster like the

h "With no clear consensus on how best to use shared water resources for the benefit of all states, that competition will

o "Water is going to be the dominant world issue into the next century," said Mr. Clive Wicks, a senior conservationist at the

oil crisis of the 1970s would help to spur conservation in the face of growing demand and pollution problems, delegates were told.

c If not, conflict would result as countries fought for dwindling supplies, the International Conference on Wter and the Environment heard in Dublin.

d "The oil shock of the early 1970s has had a major impact on energy conservation," said Dr.

Ramachandran, director of the week-long conference, "Perhaps what is needed to stimulate more sensible water conservation strategies is an equivalent water shock."

e The Dublin summit, he said, had the authority and the ammunition to administer that shock.

f He was addressing delegates from 156 countries and members of 24 U.N. organizations considering a strategy for drinking water.

become conflict."

i One quarter of the world's population still lacks safe water and sanitation, according to the World Health Organization.

j And the earth's population is expected to grow by 60 percent within 30 years to 8,000 million,

k Most of the extra mouths will be in the southern hemisphere where supplies are already jeopardized by poor irrigation. dirty industrial practices and erosion,

l Dr. Hiroshi Nakajima, Director General of the WHO, said cases of cholera had risen to levels unheard of in modern times.

m "Safe water and sanitation are the foundation for health, and health is the foundation for global development." he said.

n Fifteen out of every 1,000 children born in developing countries will die before they reach the age

World Wide Fund for Nature.

p "It is the supply of water that threatens the social stability of the world. There is already evidence.

The Egyptian government has said that it will destroy any dams built on the Nile which affect their water supply."

q In developing countries, contamination is responsible for 80 percent of diseases and 33 percent of deaths. Concern over nitrate and pesticide pollution is growing in Europe, especially as large sums of money are now being spent on treating pesticide residues.

r Throughout Europe, flush lavatories and washing machines mean the average person now uses 70 gallons of water a day compared with 11 at the turn of the century.

s The summit is likely to call for cleaner technology and cuts in intensive farming to

g "There is now no longer an unlimited supply of fresh water, and international competition for it is growing. As demand grows, the competition will grow fiercer, more violent," he said.	of five from diarrhea caused by polluted water.	reduce fertilizers and pesticides.

COMPREHENSION CHECK

67. Read the newspaper report once again and answer the following questions.

1. What are the two chief reasons for the water crisis?
2. What could the result be if the crisis is ignored?
3. What conference did Dr. Ramachandran preside over?
4. How many people are without safe water and sanitation?
5. In what part of the world will most of the increase in the world's population occur?
6. What happens to 1.5 percent of children in developing countries?
7. Why may there be a demand to reduce intensive farming?
8. What evidence is there that serious water shortage has recently affected health?

LANGUAGE FOCUS

68. Express in your own words the meaning of each of the following sentences from the newspaper report. Write one sentence for each.

1. A disaster like the oil crisis of the 1970s would help to spur conservation in the face of growing demand and pollution problems.

_____

2. With no clear consensus on how best to use shared water resources for the benefit of all states, that competition will become conflict.

_____

3. The Dublin summit had the authority and the ammunition to administer that shock.

_____

4. Safe water and sanitation are the foundation for health.

_____

5. Water is going to become the dominant issue into the next century.

_____

6. The summit is likely to call for cleaner technology and cuts in intensive farming.

_____

69. Complete the following notes about the newspaper report by answering the questions in parentheses.

1. U.N. Conference.
(What conference is being held, for whom and for what purpose?)

_____

2. Need to shock world into saving water.
(What comparison is made?)

_____

(What may happen between countries if there is not enough water?)

_____

3. Problem will be made worse.
(What about the world's population?)

_____

(What about the present situation in developing countries?)

_____

4. Problem also made worse by developed countries.
(What about pollution there, etc.?)

_____

5. Likely action to be taken.
(What three recommendations may be made by the Conference?)

_____

70. Write the summary of the newspaper report, using the points listed in Exercise 69, together with the notes you have made.

Global Water Crisis
Did you know that ...

✓ Although a person can live without food for more than a month, he or she can only live without water for approximately one week.

✓ Worldwide, more than 884 million people lack access to clean water.

✓ More than a billion people in the world are currently in need of safe drinking water and more than two billion people lack adequate sanitation.

✓ Water-related diseases are the leading cause of death in the world, taking the lives of 6,000 people a day.

✓ More than a million people die each year from preventable diseases caused by contaminated water.

✓ Every 15 seconds, a child dies from a preventable disease related to unsafe water, inadequate sanitation and poor hygiene.

✓ 2 million children die each year due to a lack of clean water and inadequate sanitation.

✓ 443 million school days are lost each year due to water-related illnesses that keep children out of school and compromise their ability to learn when they do attend.

✓ When you flush the toilet, you are using the same water amount that one person in a developing country uses all day to wash, clean, cook and drink.

✓ 40 billion hours are lost annually to hauling water, a chore primarily undertaken by women and girls, in sub-Saharan Africa.

✓ In many areas of sub-Saharan Africa women and girls often walk an average of five miles to the nearest water source every day. If a woman only had to carry water for one hour a day, she could earn an additional US $100 a year.

✓ The weight of the water container that women in Asia and Africa carry on their heads is equivalent to the baggage weight allowed by airlines (20 kg/44 lbs).

✓ It takes 630 gallons of water to produce one hamburger and 2,900 gallons of water go into producing a single pair of blue jeans!

LANGUAGE DEVELOPMENT

71. The following prefixes are concerned with water and with earth. Read and translate them.

aqu- (water): aqueduct, aqualung, aquamarine, aquaplane, aquarium, aquatic

hydr- (water): hydrant, hydraulic, hydroelectric, hydrofoil, hydroplane

mar- (sea): marina, marine, mariner, maritime, submarine

geo- (earth): geocentric, geography, geology, geometry, geophysics

terr- (earth): terra firma, terra incognita, terrace, terrain, terrestrial, territorial, territory

72. Using a dictionary to help you, complete each blank in the following sentences with the most appropriate word from the list above.

1. A long bridge carrying a road or railway is called a viaduct. A long bridge carrying water is called an _____.
2. Swimming, skin-diving, sailing and water skiing are all _____ sports.
3. Electricity produced by the force of water is called _____ power.
4. _____ brakes work by using compressed fluid to supply the braking force.
5. The _____ is very mountainous, making it difficult to build roads.
6. Countries which had powerful navies were often referred to as great _____ powers.
7. _____ refers to the study of the movements of parts of the Earth.
8. A fire _____ is a water pipe in the street from which water may be taken for public use in times of emergencies — for example, for fighting fires or for distributing water during severe water shortages.

73. Using the information from Exercise 71, choose the best ending for the following sentences.

1. **An aquamarine jewel is … .**
A. reddish-brown
B. light yellow
C. dark purple
D. bluish-green
2. **A hydrofoil can travel at high speed … .**
A. through the air
B. over the water
C. by both land and sea
D. on land
3. A mar**ina is … .**
A. a tank for keeping fresh fish
B. an aircraft with two sets of wings
C. an area of mountainous country
D. a harbor for pleasure boats

4. Extra-**terrestrial beings are creatures who … .**
A. come from the sea
B. live on other planets
C. take the form of ghosts
D. lead very lonely lives
5. **"Terra firma" is a Latin phrase used to refer to … .**
A. water as contrasted with land and air
B. fresh air as compared with polluted air
C. dry land as contrasted with air and water
D. fresh water as compared with sea water
6. Geocentric refers to regar**ding … .**
A. the Earth as the central point for measurements, etc.
B. the sun as the center of the solar system
C. the sea as forming the largest and most important part of the Earth
D. the atmosphere as the most important of all subjects for study

74. The following i**dioms all contain the word "water."**

in deep water	in serious trouble, in difficulties
to hold water	to seem true or reasonable
to keep one's head above water	to stay out of difficulties, keep out of debt
(like) water off a duck's back	to have no effect on someone (used about criticism, advice, warnings, etc.)
to pour cold water on	to try to prevent or discourage by criticizing and pointing out problems, etc.
water under the bridge	past events which cannot be changed or influenced in any way

75. Complete each blank in the following sentences with the most appropriate idiom from the list above. Make sure that you use the correct form of the verb in the idiom.

1. Mrs. Ford was very enthusiastic about her plans to open a dress shop until you began to … it. Now she thinks that there will be too many problems.

2. The lecturer warned Vincent that he would fail if he continued to miss lectures, but I'm afraid his warning was … . The trouble with Vincent is that he will never listen to advice.

3. Be careful! You'll get … if you borrow money from people like that. You'll have to pay a huge amount of interest and they'll keep on threatening you if you don't repay the loan at the time you've promised.

4. "How's your new business?" "I'm managing quite well. At least. I'm … ."

5. "I wish I'd learned Japanese at school. I wish I hadn't taken my uncle's advice."

"Stop thinking about the past and start to live in the present. That's all … . Have you ever thought of taking private lessons in Japanese or even of learning another language?"

6. What Mr. Jones has just said doesn't seem to … . I can't see anything unfair or deliberately misleading about it.

SPEAKING PRACTICE

76. Find additional information on the problem of water shortage. Make a presentation.

77. Get ready to speak about the threat of a worldwide water shortage.

FOLLOW-UP ACTIVITIES

78. Read the texts of UNIT 2 again and make notes under the following headings. Then use your notes to talk about *Types of Water Demands* and *The Threat of a Worldwide Water Shortage*.

1. Water consumption and its types.
2. The main types of water use.
3. Natural water sources and their use for water supply purposes.
4. Natural water resources and their use for water supply purposes.
5. The threat of a worldwide water shortage.

SUPPLEMENTARY READING

Text 1. CATEGORIES OF WATER USE

The use of water can be classified into four categories: (1) domestic use, (2) agricultural use, (3) in-stream use, and (4) industrial use.

Domestic Use of Water

Many rural residents still obtain safe water from untreated private wells, but urban residents are usually supplied with water from complex and costly water purification facilities. Extending and merging of urban communities have created problems in the development, transportation, and maintenance of quality water applies. A relatively small amount of freshwater—roughly 8 percent of the global total—is withdrawn for domestic and municipal requirements. Domestic activities in highly developed nations require a great deal of water. This domestic use includes drinking, air conditioning, bathing, washing clothes, washing dishes, flushing toilets, watering lawns and gardens. On average, each person in a North American home uses 300-400 liters of water each day. Most of this domestic water is used as a solvent to carry away wastes, with only a small amount used for drinking. Yet all water that enters the house has been purified and treated to make it safe for consumption. Until recently, the cost of water in almost every community has been so low that there was very little incentive to conserve, but increasing purification costs have raised the price of domestic water and it is becoming evident that increased costs do tend to reduce use. Natural processes cannot cope with the highly concentrated wastes typical of a large urban area. The unsightly and smelly results present a potential health problem for the municipality. Cities and towns must provide for both the domestic water supplies and the treatment of the wastewater following its use, and both processes are expensive and require trained personnel.

The major problem associated with domestic use of water is maintaining an adequate, suitable supply for growing metropolitan areas. Demand for water in urban areas sometimes exceeds the immediate supply.

During the summer, water demand is high, and precipitation is often

low. More domestic water is wasted than consumed. This loss, nearly 20 percent of the water withdrawn from public supplies (mainly through leaking water pipes and water mains), is amazingly large. Another major cause of water loss has been that of public attitudes. As long as water is considered a limitless, inexpensive resource, there will be little effort to conserve. As the cost of water rises and attitudes toward water change, so will usage and efforts to conserve.

Agricultural Use of Water

The major consumptive use of water in most parts of the world is for agricultural purposes and principally for irrigation.

In the 1980s, for example, irrigation accounted for nearly 80 percent of all the water consumed in North America. The amount of water used for irrigation and livestock continues to increase throughout the world. Future agricultural demand for water will depend on the cost of water for irrigation; the demand for agricultural products, food, and fiber; governmental policies; and the development of new technology.

In some areas, irrigation is a problem because there is not a supply of water nearby. This is particularly true in the western United States, where about 14 million hectares of land are irrigated. In some places, water must be piped hundreds of kilometers for irrigation.

Because most of the world's consumptive use of water results from irrigation, it is becoming increasingly important to modify irrigation practices to less water. Water loss from irrigation may be reduced in many ways. Increasing cost of water will stimulate conservation of water by farmers just as it does the owners. Another method is to reduce amount of water-demanding crops grown in dry areas, or change from high water-demanding to lower water-demand crops. Planting wheat or soybeans instead of potatoes or sugar beets reduces amount of water required. Switching trickle irrigation also reduces water consumption. With trickle irrigation, a series of pipes are placed on the ground with openings strategically placed so that when water flows through the pipe, it delivers a particular quantity of water to the individual plants. This method delivers the water directly to the roots of the plants, rather than flooding entire fields. Although used extensively in greenhouses, trickle irrigation is generally too costly for large agricultural operations. Methods that do not use as much water as flooding irrigation and that are not as expensive in terms of labor and equipment as the trick method include furrow irrigation, corrugation irrigation, overhead irrigation, and subirrigation. Each

of these methods has its drawbacks and advantages as well, conditions under which it works well.

Irrigation requires a great deal of energy. Estimates indicate that 40 per cent of the energy devoted to agriculture in Nebraska is used for irrigation. Increasing energy costs may force some farmers to reduce or discontinue irrigation. In addition, much of western Nebraska relies on groundwater for irrigation, and the water table is dropping rapidly. If a water shortage develops land values will decline. Land use and water use are interrelated and cannot be viewed independently.

In-Stream Use of Water

When the flow of water in streams is interrupted or altered, the value of the stream is changed. Major in-stream uses of water are for hydroelectric power, recreation, and navigation. Electricity from hydroelectric power plants is an important energy resource. Presently, hydroelectric power plants produce about 13 percent of the total electricity generated in the United States. Hydroelectric power plants do not consume water and do not add waste products to it. However, the dams needed for hydroelectric power plants have definite disadvantages, including the high cost of construction and the resultant destruction of the natural habitat in streams and surrounding lands. While dams reduce the amount of flooding, they do not eliminate it. In fact, the building of a dam often encourages people to develop the flood-plain. As a result, when flooding occurs, the potential loss of property and lives is greater.

The sudden discharge from a dam of the impounded water also can seriously alter the downstream environment. If the discharge is from the top of the reservoir, the stream temperature rapidly increases. Discharging the colder water at the bottom of the reservoir causes a sudden decrease in the stream's water temperature. Either of these changes is harmful to aquatic life in the stream.

The impoundment of water also reduces the natural scouring action of a flowing stream. If water is allowed to flow freely, the silt accumulated in the river is carried downstream during times of high water. This maintains the river channel and carries nutrient materials to the river's mouth. But if a dam is constructed, the silt deposits behind the dam, eventually filling the reservoir with silt.

In addition, impounded water has a greater surface area, which increases the amount of evaporation. In areas where water is scarce, the amount of water lost through such evaporation can be serious. This is particularly

evident in hot climates. Furthermore, flow is often intermittent below the dam, which alters the water's oxygen content and interrupts fish migration. The populations of algae and other small organisms are also altered. Therefore, dam construction requires careful prior planning.

Water tends to be a focal point for recreational activities. Sailing, waterskiing, swimming, fishing, and camping all require water of reasonably good quality. Water is used for recreation in its natural setting and often is not physically affected. Even so, it is necessary to plan for recreational use, because overuse or inconsiderate use can degrade water quality. For example, waves generated by powerboats can accelerate shoreline erosion and cause siltation.

Dam construction creates new recreational opportunities because reservoirs provide new sites for boating, camping, and related recreation. However, this is at the expense of a previously free-flowing river. Some recreational opportunities, such as river fishing, have been lost.

Most major rivers are used for navigation. North America currently has more than 40,000 kilometers of commercially navigable waterways. Waterways used for navigation must have sufficient water to ensure passage of transport vessels.

Canals, locks, and dams are employed to guarantee this. Often, dredging is necessary to maintain the proper channel depth. Dredging can resuspend in the water contaminated sediments that had previously been covered over. In addition, the flow within the hydrologic system is changed, which, in turn, affects the water's value for other uses.

Most large urban areas rely on water to transport needed resources. During recent years, the inland waterway system has carried about 10 percent of the goods, such as grain, coal, ore, and oil. In North America expenditures for the improvement of the inland waterway system have totaled billions of dollars.

In the past, almost any navigation project was quickly approved and funded, regardless of the impact on other uses. Today, however, such decisions are not made until the impacts on various other uses are carefully analyzed.

Industrial Use of Water

Water for industrial use accounts for more than half of total water withdrawals. 90 percent of the water used by industry is for cooling. Most industrial processes involve heat exchanges. Water is a very effective liquid for carrying heat away from these processes. For example,

electric power generating plants use water to cool steam so that it changes back into water. If the water heated in an industrial process is dumped directly into a watercourse, it significantly changes the stream's water temperature. This affects the aquatic ecosystem by increasing the metabolism of the organisms and reducing the water's ability to hold dissolved oxygen.

Industry also uses water to dissipate and transport waste materials. In fact, many streams are now overused for this purpose, especially watercourses in urban centers. The use of watercourses for waste dispersal degrades the quality of the water and may reduce its usefulness for other purposes. This is especially true if the industrial wastes are toxic.

During the past thirty years, many nations have passed laws that severely restrict industrial discharges of wastes into watercourses. In the United States, the federal role in maintaining water quality began in 1948 with the passage of the Federal Water Pollution Control Act. This act provided federal funds and technical assistance to strengthen local, state, and interstate water-quality programs. Through amendments to the act in 1956, 1965, 1972, and 1987, the federal role in water-pollution control was increased to include establishing water-quality standards, financing area-wide waste-treatment management plans, and establishing the framework for a national program of water-quality regulation.

Text 2. SOLVING PROBLEMS

There are no easy solutions to the world's water crises, but there are some promising technologies. *Desalination*, in particular, has been identified as a promising technology for creating new sources of potable water.

"Desalination is an area of major interest in Southern California coastal areas, which are currently very Colorado River water dependent", Deister said. "The technology has become so much more affordable that it's a viable solution for coastal areas that need a new source of water."

Five large municipal water agencies, all based in California, have joined together to form the United States Desalination Coalition. Its goal is to ask congress to approve legislation aimed at providing financial incentives and grants for the development of desalination treatment facilities.

Desalination is also gaining traction in Florida, where North America's largest seawater desalination plant is under construction for Tampa

Bay Water. The Brazos River Authority in Waco, Texas, also expects to begin work on a seawater desalination facility soon.

Aquifer storage and recovery offers another alternative for drought-plagued communities. The method uses aquifer formations to collect water when it is plentiful and to store it in an environmentally friendly way. It doesn't create a new supply of water, but rather stores available water efficiently. The Metropolitan Water District of Southern California has undertaken some major projects in this arena. (The Metropolitan Water District program was the subject of an article, "Putting water Back," in the February 2003 issue.)

Water recycling and reuse are perhaps the cornerstone techniques for helping to drought-proof communities, according to Deister. "Recycling provides a safe and reliable source of water, and a good way to keep wastewater from entering the environment," she said.

Deister's own El Dorado Irrigation District, which lies midway between Sacramento and South Lake Tahoe, currently uses recycled wastewater to irrigate golf courses and public grass plots. The district also recently received approval to use the water in residential gardens.

While recycled wastewater in the United States is carefully treated and used only for non-consumable and non-hygiene-related purposes, this isn't always the case in developing countries. According to Turral in Sri Lanka, many cities of Asia and Africa are reusing wastewater for irrigation, but they're not necessarily treating it. This exposes irrigation workers and even consumers to parasites, as well as to organic, chemical, and heavy metal contaminants. According to the World water Report.

A better alternative in agricultural developing countries is *improved irrigation technology* to use less water. Remote sensing, sprinkler irrigation, hydrodynamic gates on irrigation canals, and micro-irrigation kits for small farms could all go a long way to improve the efficiency of irrigation, Turral said. Automatic controls for canal gates are already in place in Morocco, Iran, Iraq, and Pakistan. But there is still potential for improvement.

Averting a water crisis is a massive undertaking that will require *a combination of conservation, new technology, and cooperation* among competing interests. Contaminated water will have to be cleaned up, while further pollution is reduced. And, new sources of water will need to be found if the constantly growing demand for suitable water for drinking, farming, and industry is to be met.

Text 3. WATER(LESS) WORLD: H_2O USE AROUND THE WORLD

Approximately 71 percent of the Earth's surface is covered with water. Yet, by all accounts, the world is on the verge of a water crisis. What exactly that water crisis entails, or when it will hit, depends on what part of the world you're looking at. In drought-plagued regions, such as Zimbabwe, Mauritania, and the western United States, the water crisis has already begun.

"At this point in time, the water crisis isn't global, but there are pockets of crisis," said Hugh Turral, a theme leader and principal researcher for the International Water Management Institute in Colombo, Sri-Lanka. "Right now, in most parts of the world, the crisis is one of governance.

Long-term, there will be problems with scarcity around the world.

In its first World Water Development Report, Water for People, Water for Life, the United Nations concurred, stating: "Attitude and behavior problems lie at the heart of the crisis. Inertia at leadership level and a world population not fully aware of the scald of the problem means we fail to take the needed timely corrective actions." The World Water Development Report was produced by the World Water Assessment Programme, whose secretariat is hosted by UNESCO.

"Of all the social and natural crises we humans face, the water crisis is the one that lies at the heart of our survival and that of our planet Earth," said UNESCO's director-general, Koichiro Matsuura, in a prepared statement. "No region will be spared from the impact of this crisis, which touches every facet of life, from the health of children to the ability of nations to secure food for their citizens."

Though water is indeed a renewable resource, to a certain extent it is also a finite one. Only 2.53 percent of the Earth's water is fresh, and some two-thirds of that is locked up in glaciers and permanent snow cover. Regionally, the distribution of that water is far from equitable. Asia is particularly hard hit, with just 36 percent of the world's water resources supporting 60 percent of the world's population, according to the UN's World Water Report. Africa, though it has just 11 percent of the world's available fresh water, has a better balance since it has 13 percent of the world's population.

Freshwater resources are reduced by pollution. The UN report estimates that some 2 million tons of waste per day are disposed of within waters. This

waste includes industrial trash and chemicals, human waste, and agricultural runoff, such as fertilizers, pesticides, and pesticide residue.

The World Water Report estimates that global wastewater production is roughly 1,500 cubic kilometers per year. Assuming that I liter of wastewater pollutes about 8 liters of freshwater, the present burden of water pollution may be as high as 12,000 km^3. The UNO estimates that 50 percent of the population of developing countries depends on polluted water sources.

Factoring in the availability of fresh water, current rates of pollution, and the potential for climate change — including a trend toward more frequent extreme weather conditions, such as floods and droughts — the World Water Report predicts that by the middle of this century, at worst, 7 billion people in 60 countries will be short of water; at best, 2 billion people in 48 countries will suffer shortages.

While water shortages are not widespread at the present time, a large percentage of the world's population lacks access to safe drinking water. Currently, 1.1 billion people lack access to an "improved" water supply (defined as water that has been at least marginally treated to remove chemical or biological contaminants). Some 2.4 billion people lack access to adequate sanitation.

UNIT 3

Water Supply Systems

''If there is magic on this planet, it is contained in water.''
Loran Eisely, The Immense Journey, 1957

WARMING-UP

1. Study the following table paying attention to the meanings of **the term "water supply". Use the tips below.** Make up sentences of **your own using the term "water supply" in its various meanings.**

In the English language, ***"water supply"*** is a broad term which may have the following definitions:

WATER SUPPLY

1. water storage or sufficiency [availability] of water for a community or region; the water available for a community

2. the supply [delivery] of treated and purified water for a community

3. the delivery system of such water (a complex of reservoirs, purification plants, distribution pipes, etc., for providing water to a community)

4. water resources (water of rivers, lakes, reservoirs, seas and oceans, as well as groundwater, soil moisture, water (ice) of glaciers, icecap and snow cover which is suitable for use in economy)

The proper Russian equivalents for the term ***"water supply"*** are:

- ► водообеспеченность
- ► запас воды
- ► водоснабжение, снабжение водой
- ► водоподача, подача воды
- ► водопровод
- ► водные ресурсы

TEXT A

VOCABULARY WORK

2. Read the following international words and guess their meaning. Mind the stressed syllables. Prove that these words are international ones.

Model: sedimentation [ˌsedɪmenˊteɪʃ(ə)n] **седиментация**, образование осадка, выпадение осадка, оседание; отстаивание; осаждение, осаждение отстаиванием

accumulation [əˌkju:mjəˊleɪʃ(ə)n]	flocculation [flɔkjəˊleɪ ʃ(ə)n]
adsorption [ædˊsɔ:pʃ(ə)n]	flotation [fləuˊteɪʃ(ə)n]
aeration [eəˊreɪʃ(ə)n]	gravity [ˊgrævɪtɪ]
apparatus [ˌæp(ə)ˊreɪtəs]	individual [ˌɪndɪˊvɪʤuəl], [ˌɪndɪˊvɪdjuəl]
break [breɪk]	landscape [ˊlæn(d)skeɪp]
chlorination [klɔ:rɪˊneɪʃ(ə)n]	line [laɪn]
coagulation [kəuˌægjəˊleɪʃ(ə)n]	neutralize [ˊnju:tr(ə)laɪz]
combination [ˌkɔmbɪˊneɪʃ(ə)n]	osmosis [ɔzˊməusɪs]
company [ˊkʌmpənɪ]	pressure [ˊpreʃə]
component [kəmˊpəunənt]	provision [prəˊvɪʒ(ə)n]
convert [kənˊvɜ:t]	

distance [ˊdɪst(ə)ns]	realize [ˊrɪəlaɪz]
factor [ˊfæktə]	scheme [skiːm]
filtration [fɪlˊtreɪʃ(ə)n]	standard [ˊstændəd]
fittings [ˊfɪtɪŋz]	topography [tɔˊpɔgrəfɪ]

3. Translate the following words and phrases and memorize them.

Nouns and noun phrases

abundance	heating
apparatus	layout
appurtenance	mismatch
arrangement	undertaking
elimination	water source
fittings	water supply
fixture	

Verbs and verbal phrases

to be aimed at	to obtain
to be designed for	to pump
to be situated	to represent
to carry out	to serve

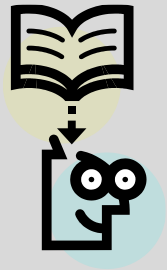
Adjectives and Participles

available	sufficient
elevated	treated
palatable	undesirable
pure	wholesome

4. Study your topical vocabulary and memorize the new terms.

- availability [sufficiency] of water водообеспеченность
- collecting system канализационная система
- drainage system канализационная сеть; система сбора сточных вод; дренажная система [сеть]
- drainage дренаж; дренажная система; дренирование, осушение; слив, сток; канализация
- main line главный [магистральный] трубопровод
- pipeline трубопровод
- piping трубопровод; система труб; система [сеть] трубо-

проводов; прокладка трубопровода; подача по трубопроводу; *pl*. трубы



- plumbing fixture водопроводная арматура; санитарно-техническое оборудование
- plumbing system внутридомовая система водоснабжения, газоснабжения и канализации; водопроводно-канализационная сеть здания; инженерное оборудование зданий, сантехника
- plumbing водопровод, водопроводная система; водопроводно-канализационная сеть *(здания)*; сантехническое оборудование
- sanitary piping канализация
- sanitation канализация; ассенизация; санитария; улучшение санитарных условий
- secondary main трубопровод второго подъема
- service main служебный трубопровод
- service reservoir буферное наливное водохранилище
- sewage system система канализации, канализационная система
- sewage treatment plant завод [установка] по переработке сточных вод, станция аэрации
- sewage treatment works сооружения по очистке сточных вод
- sewer system канализационная система
- sewer(age) network канализационная сеть
- sewerage system система канализации, канализационная система; система трубопроводов и туннелей для сбора и транспортировки сточных вод до станций аэрации
- sewerage канализация, канализационная система; наружная канализационная система; система сбора, обработки и сброса сточных вод
- storage tank бак-хранилище, резервуар-хранилище
- sufficiency of water водообеспеченность
- trunk main главная, основная магистраль
- wastewater treatment plant водоочистная станция, станция водоочистки
- wastewater treatment works станция очистки сточных вод, водоочистная станция, станция водоочистки
- water accumulation накопление воды

- water acquisition [collection] сбор [добывание, получение] воды, водосбор
- water conservation сохранение воды; накопление воды; охрана водных ресурсов
- water distribution system система водораспределения [распределения воды]; система водоснабжения
- water distribution распределение воды
- water main водопроводная магистраль; магистральный водопровод
- water purification [treatment] обработка воды, очистка воды
- water storage хранение воды; запас воды, аккумулирование воды; водные запасы; водные ресурсы
- water storage facility водохранилище
- water supply network [system] система водоснабжения; водопровод
- water tower водонапорная башня
- water transmission [transportation] подача воды, водоподача; транспортирование воды

5. Match the English and Russian equivalents.

1. complex of activities	a. внутренние озера или реки
2. complex of engineering structures	b. воспользоваться *чем-л.*, использовать в своих интересах, с выгодой для себя
3. adequate quantity	c. достаточное количество
4. adequate supply	d. достаточный запас
5. firefighting equipment	e. компания водоснабжения, водопроводная компания
6. industrial enterprise	f. комплекс инженерных сооружений
7. inland lakes or rivers	g. конкретные условия
8. maintenance	h. населенный пункт
9. populated locality	i. поддержание; сохранение; содержание и техническое обслуживание, уход; содержание в исправности; текущий ремонт; эксплуатация
10. rural area	
11. sewage disposal	
12. specific conditions	
13. to flow by gravity	

14. to take advantage of 15. water company	j. промышленное предприятие k. противопожарное вооружение l. сельская местность, сельский район m. совокупность мероприятий n. течь самотеком o. удаление [сброс] сточных вод

6. Match the terms and their definitions.

accomplish, elaborate, engineered, fittings, fixture, main, sewerage, supply, water purification

a. a piece of equipment that is fixed in position in a building

b. a principal pipe carrying water or gas to buildings, or taking sewage from them

c. a stock of a resource from which a person or place can be provided with the necessary quantity of that resource

d. achieve or complete successfully

e. any of several processes in which undesirable impurities in water are removed or neutralized

f. designed, developed, constructed

g. involving many carefully arranged parts or details; detailed and complicated in design and planning

h. small parts attached to a piece of equipment

i. the provision of drainage by sewers

7. Make sure you know the words and word combinations from the box and insert them into the sentences.

contamination, treatment, demand, supply of water, water sources, sewage disposal systems, methods, disastrous

The importance of a sufficient _____ for domestic and industrial purpose has long been a deciding factor in the location of cities. Early people realized this need and took advantage of natural _____ by establishing their settlements in close proximity to them.

As man`s communities grew on population, the _____ for water increased and the need for protection of the source of water increased and

the need for protection of the source of water supply against the possibility of _____ became evident. Progress and civilization have called for elaborate and various systems and _____ of water treatment.

Today water may be taken from any sources of water for human consumption after it has undergone a preliminary _____ to assure its purity.

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

8. Translate the following sentences into Russian paying attention to the underlined words that can be verbs, nouns or adjectives without changing their form and adding suffixes.

1. underground pipe; drain pipe; water pipe; these pipes contain either hot water or steam; town water is piped into the more modern buildings; water from the lakes is piped to several towns
2. underground channels; underground sources; underground pipe; underground pipeline; miners work underground
3. to consist of several components; component part
4. individual buildings; private individual
5. trunk main; secondary main; sewer main; water main; main water (водопроводная вода); a water main is a main line in a water supply system
6. to establish / set a standard; high standard; standard size
7. early people; early in the morning
8. usual term of transportation; the term "water supply"; such a system of pipes and fittings is termed *plumbing*
9. to service the whole area; to service the equipment; have this equipment serviced regularly; to offer / give / provide service; a service main
10. the occurrence of leaks and breaks; to check the pipes for leaks; a water leak; to leak like a sieve; water leaked into the basement; water was leaking from the pipe; a leaking gutter; the machine has broken
11. sewer system; sewer main (канализация); trunk sewer (магистральный канализационный коллектор); sanitary sewer (санитарный коллектор); to sewer a building

Now fill in the table with Russian equivalents to the words from the sentences above.

component, early, individual, leak, main, pipe, service, sewer, standard, term, underground

	NOUN	VERB	ADJECTIVE	ADVERB
break	разрушение; поломка	ломать(ся), разбивать(ся)	---	---

READING PRACTICE

9. Answer the following questions and read the text carefully to check your answers.

What is the difference between water supply and a water supply system?
What does water supply include?

Text A Water Supply Systems

"Children of a culture born in a water-rich environment,
we have never really learned how important water is to us.
We understand it, but we do not respect it."
William Ashworth, Nor Any Drop to Drink, 1982

An adequate supply of pure, wholesome and palatable water is essential to the maintenance of high standards of health and life and to provide the convenience modern society demands. So, the importance of a sufficient supply of water for domestic and industrial purposes has long been a deciding factor in the location of settlements, towns and cities. Even early people realized this need and took advantage of natural water sources.

In some regions water is available in unlimited quantities and converting it to use is not a difficult problem. This is especially true of populated localities which are situated on large inland lakes or rivers. However, there are towns and cities whose geographical location requires elabo-

rate *systems of water supply*, and providing a satisfactory supply of water in these inhabited localities becomes a serious engineering task.

Water supply is a complex of activities intended for the provision of various consumers (community, industrial enterprises, transport) with water. The term may also refer to the supply of water provided in this way.

A *water supply system,* or *water supply network,* is a complex of engineering structures or a system of engineered hydrologic and hydraulic components which are aimed at providing water supply for various water uses. These structures carry out the supply of water including *acquisition* of water from a variety of natural water sources, its *treatment*, *transmission*, *storage*, and *distribution* to the consumers. A water supply system is arrangements for transporting water from areas of abundance to an area of shortage.

1. Water acquisition is collection of water from a variety of natural water sources (both surface and underground ones).

2. Water treatment is purification of water to make it suitable for human consumption or for any other purpose. It is any of several processes (or their combination) in which undesirable impurities or pollutants are removed or neutralized. Water treatment is accomplished at various water treatment facilities. Conventional water treatment processes include coagulation and flocculation, sedimentation and flotation, filtration, disinfection, as well as some additional treatment methods (softening, aeration, carbon adsorption, distillation, deferrization, desalination, fluoridation, reverse osmosis).

3. Water transmission is transportation of water over long distances, especially in those areas where there is a significant mismatch between water supply and water demand.

4. Water storage is conservation of water in a variety of water storage facilities for future use.

5. A water distribution system is an elaborate network of pumps, pipelines, storage tanks, and other appurtenances. It must deliver adequate quantities of water at pressures sufficient for operating plumbing fixtures and firefighting equipment, yet it must not deliver water at such high pressures as to increase the occurrence of leaks and pipeline breaks.

In general, *water supply* can be represented as the following *scheme*:

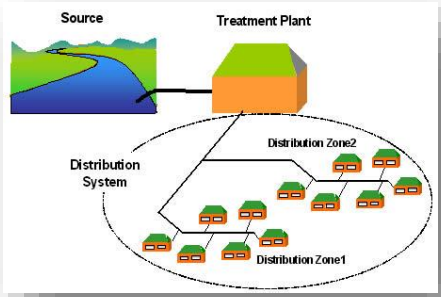
water acquisition [collection] ➔ water storage ➔ water treatment [purification] ➔ water distribution ➔ water consumption ➔ wastewater [sewage] dis-

Pict. 7. The General Scheme of Water Supply

Water supply systems get water from a variety of sources. *Water sources* include:

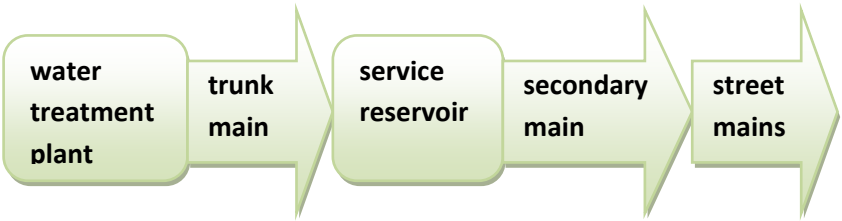
1. *underground sources* (groundwater from aquifers, artesian water);
2. *surface water* (water from rivers, lakes, reservoirs, as well as seas through desalination);
3. *water accumulation and conservation*.

The water is then, in most cases, purified, disinfected through chlorination and sometimes fluoridated. Treated water then either flows by gravity or is pumped to reservoirs which can be elevated (*e.g.* water towers) or can be on the ground.



Having been treated, water is to be distributed to all the water consumers served by the area water undertaking. Methods of *water distribution* vary. For towns and cities, water companies treat water collected from wells, lakes, rivers, and ponds and distribute it to individual buildings. In rural areas water is commonly obtained directly from wells.

The construction and maintenance of a *water distribution system* for a large city is a complex operation since there must be at least one water main in each street. A *water main* is a main line in a water supply system. The basic elements of a typical distribution system are shown below:



Pict. 8. The Main Elements of a Water Distribution System

The layout of water mains is greatly dependent on local conditions and topography.

Water mains can be divided into three classes:

1. a trunk main is the main supply line between the treatment plant and service reservoirs or water towers.

2. a secondary main is a supply line distributing water from the service reservoirs to the street service mains. In some cases they provide supplies to large industrial consumers.

3. service mains are the pipes along each street to which individual consumers are connected.

Once water is used, wastewater is typically discharged into *sewerage* and treated in a *wastewater treatment plant* (also called a *sewage treatment works*) before being discharged into a river, lake or the sea or reused for landscaping, irrigation or industrial use.

Sewerage (also called a *sewerage system,* a *sewage system,* a *sewer system,* a *collecting system, drainage, sanitary piping)* is intended for the provision of drainage (sewage disposal) by sewers.

A *sewerage network* (also called *a sewer network* or *a drainage system*) is a part of the sewerage system; it is a complex of underground pipes (pipelines) and sewers for the collection and disposal of sewage from populated localities and industrial enterprises to the sewage treatment works.

Plumbing [a plumbing system] is installed in a building and designed for the supply of water and the elimination of wastes. It is the system of pipes, tanks, fittings, and other apparatuses required for the water supply, heating and sanitation in a building.

The general scheme of water supply may vary depending on specific conditions.

COMPREHENSION CHECK

10. Decide whether the following statements are true (T) or false (F) according to the text. Correct the false statements.

1. The English term "water supply" has several meanings.
2. The presence of water supply systems has long been a deciding factor in the location of settlements, towns and cities.
3. Providing some regions where water is available in unlimited quantities with a satisfactory supply of water becomes a serious engineering task.
4. Every town and city in the world needs elaborate water supply systems.
5. Water supply is a complex of engineering structures intended for the provision of various consumers with water.
6. A water supply system is a complex of activities aimed at the provision of water to various consumers and for various water uses.
7. Water supply is the same as a water supply system.
8. The terms "a water supply system" and "a water supply network" are synonymous.
9. Water supply systems carry out the supply of water including acquisition of water from a variety of natural water sources, its treatment, transmission, storage, and distribution to the consumers.
10. Water acquisition is storage of water in a variety of natural water sources.
11. Natural water sources include both underground and surface ones.
12. The aim of water treatment is to make water suitable for human consumption or for any other purpose.
13. Water purification is accomplished at various sewage treatment facilities.
14. Water treatment is necessarily a combination of several processes in which undesirable impurities or pollutants are removed or neutralized.
15. A significant mismatch between water supply and water demand in an area requires transportation of water over long distances.
16. Water distribution systems must deliver adequate quantities of water at pressures sufficient for operating plumbing fixtures.

17. Water for any use is filtered, aerated, purified, disinfected with chlorine, ozone or ultraviolet, and fluoridated.

18. There are various methods of water distribution.

19. Water companies always treat water collected from natural water sources and distribute it to water users both in urban and rural areas.

20. There must be at least one water main in each city.

21. The layout of water mains depends on local conditions and topography.

22. Water mains can be divided into three classes: trunk mains, secondary mains and service mains.

23. Treated water is usually discharged into a sewerage system.

24. Sewage is treated in a sewage treatment plant.

25. Treated water is used for landscaping or irrigation.

26. A sewerage system is a part of the sewerage network.

27. Plumbing is a complex of underground pipes (pipelines) and sewers for the collection and disposal of sewage from populated localities and industrial enterprises to the sewage treatment works.

28. The general scheme of water supply does not depend on specific conditions.

11. Choose the right variant according to the text.

1. An adequate supply of pure, wholesome a**nd palatable water …**

a. is especially true of towns situated on large inland lakes or rivers.

b. is essential for the maintenance of high standards of health.

c. may be taken from any source of water.

d. should be protected from contamination by filtration.

2. There are **cities whose geographical location …**

a. makes water pass through an elaborate cycle of treatment.

b. requires elaborate systems of water supply.

c. makes the problem of water supply very difficult.

d. calls for modern systems of water treatment.

3. The geographic locatio**n of some towns and cities requires … .**

a. the removal of undesirable impurities at various water treatment facilities

b. the application of additional water treatment methods

c. elaborate water supply systems

d. transporting water from areas of shortage to an area of abundance

4. Even early people **took advantage of natural water sources by …**
a. building water power stations on them.
b. establishing their settlements near them.
c. providing sufficient water supply for their needs.
d. using water without much preliminary treatment.
5. **A water supply system is a complex of … .**
a. engineers
b. engineering structures
c. hydrology and hydraulics
d. water purification plants
6. Too high pressures in a water distribution system increase the **occurrence of … .**
a. undesirable impurities and pollutants
b. coagulation, sedimentation, filtration and disinfection
c. a significant mismatch between water supply and water demand
d. leaks and pipeline breaks

12. Match 1-13 to a-m to form complete sentences.

1. Water supply … 2. A water supply system, or water supply network, … 3. Water acquisition … 4. Water treatment … 5. Conventional water treatment processes … 6. Water transmission … 7. Water storage … 8. A water distribution system … 9. Water sources … 10. A water main … 11. A trunk main … 12. A secondary main … 13. Service mains …	a. … are the pipes along each street to which individual consumers are connected. b. … include coagulation and flocculation, sedimentation and flotation, filtration, disinfection, as well as some additional treatment methods. c. … include underground and surface sources, as well as water accumulation and conservation. d. … is a complex of activities intended for the provision of various consumers with water. e. … is a complex of engineering structures aimed at providing water supply for various water uses. f. … is a main line in a water supply system. g. … is a supply line distributing water from the service reservoirs to the street

	service mains. h. … is an elaborate network of pumps, pipelines, storage tanks, and other appurtenances aimed at delivering adequate quantities of water. i. … is collection of water from a variety of natural water sources. j. … is conservation of water in a variety of water storage facilities for future use. k. … is purification of water to make it suitable for human consumption or for any other purpose. l. … is the main supply line between the treatment plant and service reservoirs or water towers. m. … is transportation of water over long distances.

13. Find key words and phrases which best express the general meaning of each paragraph.

14. What parts of the text can you define? Do they correspond to the paragraph? Entitle each part.

1. _____
2. _____
3. _____
… _____

15. Write a summary of the text.

LANGUAGE FOCUS

16. Match the synonyms.

1. carry out	a. aggregate
2. combination	b. appurtenance/apparatus
3. commonly	c. back
4. complex	d. comfort

5. convenience
6. conventional
7. elevated
8. equipment
9. fixture
10. fluoridation
11. install
12. layout
13. location
14. main
15. pipeline
16. reverse
17. undertaking
18. wholesome

e. enterprise
f. facilities
g. fluorination
h. fulfill
i. generally/usually
j. healthsome
k. mixture
l. mount
m. overground
n. piping
o. placement
p. principal
q. scheme/plan
r. traditional

17. Match the antonyms.

1. abundance
2. connect
3. conventional
4. divide
5. early
6. healthy
7. high
8. including
9. limited
10. populated
11. salinization
12. satisfactory
13. softening
14. underground
15. untreated

a. desalination
b. detrimental
c. excluding
d. hardening
e. late
f. low
g. overground
h. separate
i. shortage
j. treated
k. unconventional
l. unite
m. unlimited
n. unpopulated
o. unsatisfactory

18. Fill in the table with the derivatives.

Noun	Verb	Adjective	Adverb
…	…	…	…

Distribution, storage, mismatch, complex, advantage, locality, various, location, undesirable, conventional, fixture, variety, elaborate, equipment, structure, desalination, company, maintenance, sufficient, arrangement, abundance, shortage, purify, disinfect, chlorinate, fluoridate, pump, individual, component, main, dependent, typically, apparatus, sewerage, sewage, sanitary, disposal, discharge, high, even, underground, neutralize, accomplish, distil, vary, especially.

19. Form the nouns from the following verbs.

to accomplish ➔
to accumulate ➔
to acquire ➔
to arrange ➔
to break ➔
to collect ➔
to connect ➔
to conserve ➔
to deliver ➔
to demand ➔
to discharge ➔
to dispose ➔
to distribute ➔
to eliminate ➔
to fit ➔
to install ➔
to intend ➔
to leak ➔
to locate ➔
to maintain ➔
to neutralize ➔
to plumb ➔
to provide ➔
to pump ➔
to purify ➔
to remove ➔
to service ➔
to settle ➔
to situate ➔
to store ➔
to supply ➔
to transmit ➔
to transport ➔
to treat ➔
to vary ➔
to undertake ➔

20. Read the following text and determine which of the underlined word-**combinations are "stone wall" constructions.**

Britain's Water Supply

Britain's water supplies are obtained partly from surface sources such as mountain lakes, streams impounded in upland gathering grounds and river intakes, and partly from underground sources by means of wells, adits and boreholes.

Such is the present demand for water in Britain that the reuse of water is being constantly extended. Two-thirds of London's water comes out of

the River Thames for purification. At this point the river has already been through the sewage system of several Thames valley towns. York, for example, drinks water out of the River Ouse, after its tributaries have drained a number of the county's towns. Nottingham takes water from the Derwent. Rivers provide most of Britain's water supply, and in inland communities they rake back most of the waste from human bodies, households and factories.

Modern methods of water purification and the capacity of rivers for self-purification make possible water reuse, and where water is in short supply, second-hand water is regularly drunk and so far without ill effect.

21. Translate the following text into English using the vocabulary of the text.

1. **Водоснабжение** – совокупность мероприятий по обеспечению водой различных потребителей – населения, промышленных предприятий, транспорта и др.

2. Комплекс инженерных сооружений и устройств, осуществляющих водоснабжение (т. е. получение воды из природных источников, ее очистку, транспортирование и подачу потребителям), называется **системой водоснабжения**, или **водопроводом**.

3. **Система водоснабжения** представляет собой комплекс сооружений для обеспечения определенной группы потребителей водой в требуемых количествах и требуемого качества. Кроме того, система водоснабжения должна обладать определенной степенью надежности, т. е. обеспечивать снабжение потребителей водой без недопустимого снижения установленных показателей своей работы в отношении количества или качества подаваемой воды.

4. В зависимости от назначения обслуживаемых объектов современные водопроводы подразделяются на **коммунальные** и **производственные** (промышленные или сельскохозяйственные).

5. Наиболее крупные **потребители воды** — предприятия металлургической, химической, нефтеперерабатывающей промышленности, а также ТЭС.

SPEAKING PRACTICE

22. Develop the following statement in 3-4 sentences.

However, there are inhabited localities where water supply becomes a serious engineering task.

23. Disprove the following statement in 3-4 sentences.

Water is available in unlimited quantities in all parts of the world.

24. Get ready to speak about water supply and water supply systems.

TEXT B

VOCABULARY WORK

25. Read the following international words and guess their meaning. Mind the stressed syllables. Prove that these words are international ones.

Model: infrastructure [ˈɪnfrəˌstrʌktʃə] **инфраструктура** (промышленная, городская); сети обслуживания населения; инженерные коммуникации

accessory [əkˈses(ə)rɪ]	integrate [ˈɪntɪgreɪt]
accumulate [əˈkju:mjəleɪt]	iodine [ˈaɪədi:n]
accumulator [əˈkju:mjəleɪtə]	ion [ˈaɪən]
aerate [eəˈreɪt]	locally [ˈləuk(ə)lɪ]
agent [ˈeɪʤ(ə)nt]	magnesium [mægˈni:zɪəm]
apartment [əˈpɑ:tmənt]	medical [ˈmedɪk(ə)l]
aqueduct [ˈækwɪdʌkt]	order [ˈɔ:də]

calcium [ˈkælsɪəm]	ozone [ˈəuzəun]
capital [ˈkæpɪtəl]	period [ˈpɪərɪəd]
cistern [ˈsɪstən]	private [ˈpraɪvɪt]
disinfect [ˌdɪsɪnˈfekt]	sodium [ˈsəudɪəm]
educational [ˌedjuˈke(ə)n(ə)l]	specific [spəˈsɪfɪk]
establishment [ɪsˈtæbliʃmənt]	ultraviolet [ˌʌltrəˈvaɪələt]
extra [ˈekstrə]	underground 1. *n*, *adj* [ˈʌndəgraund]; 2. *adv* [ˌʌndəˈgraund]
filter [ˈfɪltə]	
hydrant [ˈhaɪdr(ə)nt]	
institution [ɪn(t)stɪˈtju:ʃ(ə)n]	utilize [ˈju:tɪlaɪz]

26. Translate the following words and phrases and memorize them.

Nouns and noun phrases	
accessory	infrastructure
cistern	ion exchange
component	preservation
facility	water pressure
fire hydrant	watershed
Verbs and verbal phrases	
to add	to interfere with
to aerate	to maintain
to consist of	to prevent
to convey	to reach
to disinfect	to reserve
to draw *smth*. from	to soften
to filter	to vary
to integrate	
Prepositions	
depending on	in addition to

27. Study your topical vocabulary and memorize the new terms.

- (water-)pumping station насосная станция; насосная установка; водокачка
- accumulator tank сборный резервуар
- aqueduct акведук; водопровод; мост-водовод; водопроводящее сооружение; магистральный водопровод
- collecting [collection] tank сборный резервуар
- conduit труба, трубопровод; акведук; водовод; канал
- distribution piping сеть распределительных трубопроводов; система распределительных трубопроводов
- distribution reservoir буферное водохранилище; распределительный бассейн
- main главный канал; трубопровод; водопроводная магистраль; магистральный водопровод; *pl*. водопроводная сеть; система трубопроводов; линии энерго-, тепло-, газо- и водоснабжения; коммуникации
- main pipeline магистральный трубопровод
- pipe network водопровод
- pipeline tank сборный резервуар
- pressure vessel сосуд под давлением; резервуар под давлением
- pumping plant насосная установка; насосная станция
- storage facility водохранилище
- underground pipeline подземный трубопровод; заглубленный трубопровод
- water (supply) facilities водохозяйственные сооружения; система водоснабжения
- water conduit водопровод
- water intake водозаборное сооружение, водозабор; водоприёмник
- water main водопроводная сеть
- water tank ёмкость для воды; цистерна для воды; водяной бак
- waterworks водопроводная станция; водопроводное сооружение; водохозяйственная система; водонапорная станция

28. Match the English and Russian equivalents.

1. capital equipment 2. dissolved gas 3. previously listed 4. residential apartment buildings and private houses 5. tooth decay 6. ultraviolet light 7. usage point 8. water pressurizing components	a. вышеперечисленный b. жилые здания [многоквартирные дома] и одноквартирные дома c. капитальное [основное] оборудование *(оборудование, приобретенное организацией для использования в своей хозяйственной деятельности в течение длительного периода)* d. компоненты, служащие для поддержания давления воды e. место использования f. разрушение зубов g. растворенный газ h. ультрафиолетовое излучение, УФ-излучение

29. Match the terms and their definitions.

(1)

aerate, aqueduct, component, infrastructure, ion, ozone, pipeline, pump, raw

a. (of a material or substance) in its natural state; not yet processed or purified

b. a colorless unstable toxic gas with a pungent odor and powerful oxidizing properties, formed from oxygen by electrical discharges or ultraviolet light. It differs from normal oxygen (O_2) in having three atoms in its molecule (O_3)

c. a long pipe, typically underground, for conveying oil, gas, *etc*., over long distances

d. a mechanical device using suction or pressure to raise or move liquids, compress gases, or force air into inflatable objects such as tyres

e. a part or element of a larger whole

f. an artificial channel for conveying water, typically in the form of a bridge supported by tall columns across a valley

g. an isolated electron or positron or an atom or molecule which by loss or gain of one or more electrons has acquired a net electric charge (результирующий электрический заряд)

h. introduce air into (a material)

i. the basic physical and organizational structures and facilities (*e.g.*, buildings, roads, and power supplies) needed for the operation of a society or enterprise

(2)

aquifer, lake, ocean, pool/pond, reservoir, river, sea, spring, stream, well

a. a body of permeable rock that can contain or transmit groundwater

b. a large body of water surrounded by land

c. a large natural or artificial lake used as a source of water supply

d. a large natural stream of water flowing in a channel to the sea, a lake, or another such stream

e. a place where water or oil wells up from an underground source, or the basin or flow formed in such a way

f. a shaft sunk into the ground to obtain water, oil, or gas

g. a small area of still water, typically one formed naturally

h. a small, narrow river

i. a very large expanse of sea, in particular, each of the main areas into which the sea is divided geographically

j. the expanse of salt water that covers most of the earth's surface and surrounds its landmasses

30. Make sure you know the words and word combinations from the box and insert them into the sentences.

conduit, distribution system, reservoir, treatment plant, well

A water-supply system consists essentially of the following elements:

- a source of supply which may be a lake, stream, spring, or _____;
- a _____ for storing water for use during periods when demand is greater than the daily flow of water;

- conveying the water from the source of supply to the community is accomplished by means of a pipe line or a _____;
- removing impurities from the water to make it suitable for use requires a _____;
- a _____ of pipes is used for delivering the water throughout the various streets of the community.

31. Translate the following sentences into Russian paying attention to the underlined words that can be verbs, nouns or adjectives without changing their form and adding suffixes.

1. water tank; tank capacity; to tank a liquid
2. capital equipment; to invest capital; world capitals
3. main pipeline; underground pipeline; to pipeline water
4. a complete water supply system; complete period of time; to complete work
5. to reserve extra water; limited reserve; Australia has major coal, gas, and uranium reserves
6. to filter water; to pass through a filter; the solids were filtered out and only the liquid passed into the container
7. ion exchange; the exchange of ions; in exchange for *smth*; to exchange opinions
8. tooth decay; the odour of decaying vegetation

Now fill in the table with Russian equivalents to the words from the sentences above.

capital, complete, decay, exchange, filter, pipeline, reserve

	NOUN	VERB	ADJECTIVE
tank	бак, резервуар, цистерна	наливать в бак; хранить в баке	---

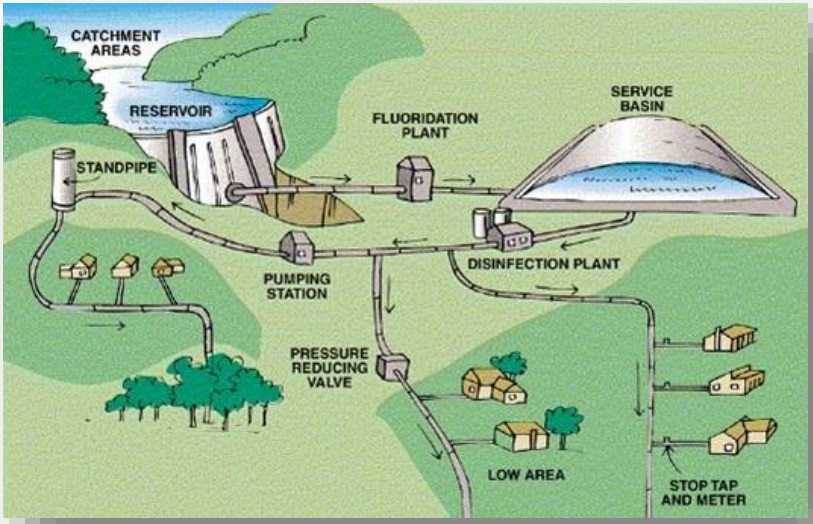
READING PRACTICE

32. Read the text carefully.

Text B The Main Components and Facilities of a Water Supply System

A water supply system typically consists of the following *components*:

1. *a watershed* or *geographic area that collects water*;
2. *a source of supply,* or *a reservoir of raw (untreated) water* (above or below ground) where the water accumulates (*e.g.* a lake, river, stream, spring, well, groundwater from an underground aquifer);
3. *a reservoir* for storing the water for use during periods when demand is greater than the daily consumption of water;
4. *an underground pipeline* or *a ground-level conduit (an aqueduct)* for conveying the water from the source of supply to the community;
5. *water treatment facilities* (also called "water treatment plants [stations/ works]" or "water purification plants [stations / works]") and
6. *wastewater treatment facilities* (also called "wastewater treatment plants [stations / works]", "sewage treatment plants [stations / works]") for removing impurities from the untreated water to make it suitable for various uses;
7. *a pipe network (a distribution system of pipes, usually underground)* for delivering the treated water to the consumers (which may be residential apartment buildings and private houses, industrial and commercial establishments, educational and medical institutions) and other usage points (such as fire hydrants);
8. *water storage facilities* (reservoirs, water tanks, or water towers for larger water systems; cisterns or pressure vessels for smaller water systems). Tall buildings may also need to store water locally in pressure vessels in order for the water to reach the upper floors.



Some systems are simpler and consist only of a source of supply, a main pipeline, and a small number of distribution piping; others are more complicated and include, in addition to elements previously listed, distribution reservoirs, additional water pressurizing components (pumping plants / stations), and other accessories.

All these water supply system components are integrated into *water infrastructure* - the stock of basic water facilities and capital equipment needed for the functioning of a country or area.

For the purposes of acquisition of water from a variety of natural water sources, its treatment, transmission, storage, and distribution to the consumers a number of *water supply facilities* are utilized:

- *water intake structures [facilities];*
- *water-pumping facilities [stations / plants]* supplying water to the point of its treatment;
- *water treatment facilities [structures/stations/plants/works]*, also called *water purification facilities [structures/stations/plants/works]*;
- *collection [collecting / accumulator/pipeline] tanks* for purified water;
- *water-pumping facilities [stations / plants]* supplying the purified water to towns, cities or industrial enterprises;

- *water conduits, aqueducts*, and *water mains [water-supply networks]* serving for water delivery to the consumers;
- *plumbing [plumbing systems]* installed in a building and designed for the supply of water and the elimination of wastes.

A complete water supply system is known as a *waterworks*. Sometimes this term is specifically applied to pumping stations, treatment stations, or storage facilities. Storage facilities are provided to reserve extra water for use when demand is high and, when necessary, to help maintain water pressure. Treatment stations are places in which water may be filtered to remove suspended impurities, aerated to remove dissolved gases, or disinfected with chlorine, ozone, ultraviolet light, or some other agent that kills harmful bacteria and microorganisms. Sometimes hard water is softened through ion exchange by which dissolved calcium and magnesium salts are replaced by sodium salts which do not interfere with soap. Salts of iodine and fluorine which are considered helpful in preventing goiter and tooth decay are sometimes added to water in which they are lacking.

Not all water supply systems are used to deliver drinking water. Systems used for purposes such as industry, irrigation and fire fighting operate in much the same way as systems for drinking water, but the water need not meet such high standards of purity. In most municipal systems hydrants are connected to the drinking water system except during periods of extreme water shortage. Because many cities draw water from the same water body into which they discharge sewage, proper sewage treatment has become increasingly essential to the preservation of supplies of useful water.

COMPREHENSION CHECK

33. Decide whether the following statements are true (T) or false (F) according to the text. Correct the false statements.

1. A watershed, a source of water supply, a reservoir for storing the water, a pipeline or an aqueduct, water or wastewater treatment facilities, a distribution pipe system, as well as water storage facilities are the main components of a water supply system.

2. Simpler water supply systems consist of a source of supply, a main pipeline, as well as additional water pressurizing components (pumping stations).

3. All water supply system components are integrated into water infrastructure.

4. Water supply facilities include water intake structures, water-pumping stations, water treatment plants, collection tanks, water conduits, aqueducts, water mains, as well as plumbing.

5. Water-pumping stations can vary according to their purpose.

6. Plumbing is designed for the supply of water and the elimination of wastes in a village, town or city.

7. A waterworks is not only pumping stations, treatment plants, or storage facilities, but also the whole water supply system.

8. Sometimes hard water is softened through ion exchange by which dissolved calcium and magnesium salts replace sodium salts.

9. Salts of iodine and fluorine are considered helpful in water softening.

10. Water supply systems used for purposes such as industry, irrigation and fire fighting operate in much the same way as systems for drinking water.

11. Water for irrigation or fire fighting needn't meet such high standards of purity as drinking water.

12. Cities never draw water from the same water body into which they discharge sewage.

13. Proper sewage treatment has become increasingly essential to the preservation of supplies of useful water because many cities draw water from the same water body into which they discharge sewage.

34. Answer the following questions.

1. What components does a water supply system typically consist of?
2. What is water infrastructure?
3. What purposes are water supply facilities utilized for?
4. What are these water supply facilities?
5. What is a waterworks?
6. What are water treatment stations intended for?
7. Are water supply systems used to deliver only drinking water?
8. Why is proper sewage treatment of vital importance?

35. Choose the right variant according to the text.

1. Sources of water, or reserv**oirs of raw water are … .** *(several answers possible)*

a. lakes, rivers, streams and springs
b. underground pipelines and ground-level conduits (aqueducts)
c. underground aquifers
d. reservoirs, water tanks and water towers

2. Underground pipelines and ground-level conduits (aqueducts) **are intended for … .**

a. conveying water from the source of supply to water consumers
b. removing impurities from untreated water
c. making water suitable for various uses
d. storing water for future use

3. Water and wastewater treatment facilities are i**ntended for … .**

a. water collection
b. water storage
c. water delivery
d. impurity removal

4. **… are water consumers.** *(several answers possible)*

a. residential apartments and private houses
b. industrial and commercial establishments
c. water purification works and wastewater treatment plants
d. educational and medical institutions

5. **All water supply system … are integrated into water infra**structure.

a. buildings
b. components

36. Find key words and phrases which best express the general meaning of each paragraph.

37. What parts of the text can you define? Do they correspond to the paragraph? Entitle each part.

1. _____
2. _____
3. _____
… _____

38. Write a summary of the text.

LANGUAGE FOCUS

39. Match the synonyms.

1. accessories	a. above-ground
2. collection tank	b. accumulator tank
3. conduit	c. aqueduct
4. ground-level	d. equipment
5. pipe network	e. pumping plant
6. pumping station	f. sewage treatment works
7. raw water	g. tank
8. vessel	h. untreated water
9. wastewater treatment plant	i. water intake facility
10. water intake structure	j. water pipeline
11. water main	k. water purification station
12. water treatment facility	l. water-supply network

40. Choose the odd word.

1. to conserve, to serve, to preserve, to store, to keep
2. plant, structure, pump, station, facility, works
3. network, system, component, mains
4. to supply, to provide, to deliver, to demand
5. to remove, to convey, to carry, to transport, to transmit
6. to treat, to purify, to clean, to distribute, to cleanse
7. treatment, purpose, purification, purifying, cleaning, cleansing
8. to maintain, to support, to sustain, to discharge
9. to use, to employ, to utilize, to pressurize, to consume, to apply, to exploit
10. reservoir, impounding reservoir, water storage reservoir, water storage basin, pumping station

41. Form the derivatives using the following prefixes: dis-, im-, infra-, re-, ultra-, un-, under-.

distribution ➔	suitable ➔	to place ➔
ground ➔	to charge ➔	to solve ➔
purified ➔	to connect ➔	treated ➔
purity ➔	to infect ➔	violet ➔
structure ➔	to move ➔	

42. While reading the following text, find the synonyms to the words in the right column of the table.

Modern Water Supply

Water sources for modern supply systems include wells, rivers, lakes, and man-made reservoirs.	present-day artificial
When points of use are near sources, direct water intake can be used. Offshore intakes are sometimes built in lakes to obtain water of better quality and to avoid freezing problems in winter. Reservoirs are formed usually by constructing dams near the collection point of mountain-water runoff or across rivers. Dams provide a way of regulating water collection and flow so that the supply remains constant.	usage constructed to get generally levees accumulation invariable
Modern aqueducts (comprising canals, closed tunnels, and large pipelines) deliver water by means of gravity in some cases, but usually some method of pressurization is used. After the water reaches collection points it is normally given some kind of treatment to improve its quality to a usable level. Most important is the purification process, which destroys harmful bacteria and deactivates viruses. Liquid chlorine is the most common chemical used in modern treatment plants and is usually applied before other treatment and	including with the help of pressurizing subjected to to better kills neutralizes prevalent used purification

as a final treatment before distribution. In some plants, ozone and ultraviolet light are used as disinfectants.	disinfectant agent
After treatment, water is pumped either directly into the distribution system or to an elevated water tank. For adequate distribution, water systems must operate under pressure. In some cases, the gravity drop of water from its elevated water tank provides enough pressure; otherwise, it is supplied by a pumping station. Adequate pressures range between 2 and 7 kilograms per square centimetre. Materials used in transporting water to homes and industries include pipes of cast iron, steel, concrete, and asbestos cement. Water meters record water usage at the site of consumption, and charges are levied to help pay for operation and maintenance of the system.	straight vessel work fall delivered **from … to ...** transportation enterprises register point functioning

43. Choose the right variant.

Distribution of Water

The treated water (flows / falls) to a pumping station where it is pumped into large cast iron (pipes / aqueducts) called *water mains*. Water mains run beneath the streets. They carry water to every (firefighting / fire) hydrant and connect with smaller pipes (that / what) lead to every home, office building and restaurant. The pumping station sends the water into the mains under enough (pressure / pressurize) to carry it to every tap. This pressure is usually so (low / high) that you cannot hold back the water by putting your finger under a fully opened tap.

Sometimes the (supply / demand) for water may be too great for the pressure a pumping station can supply. Then, water may only trickle (form / from) the tap. This can happen on (hot summer / cold winter) day when many people in the neighbourhood are (watering / planting) their lawns, filling garden pools, or taking showers. The (water / watery) pressure may also fall when fire fighters use a large amount of water to fight a large fire.

Most cities pump water into storage (taps / tanks) to help keep their water pressure high all the time. The tanks are (built / building) on hills, or they are tall water towers. When water is released from (this / these) tanks, gravity pulls the water downward giving it the pressure to rush (through / throughout) the water mains.

44. Make sentences that describe the functions of each system, facility or item of equipment. Use the correct form of the verbs. You may form nouns from the verbs if necessary.

Model: *A reservoir* is a pond or lake …
… (that / which is) used / utilized / intended / designed / built for storage of water.

A sewerage system is a system of piping …
… for the collection and transmission of sewage to the sewage treatment plant.

A water treatment plant …
… is used / utilized / intended / designed / built for removing impurities from the untreated water.

A sewage treatment plant …
… is used / utilized / intended / designed to purify mixtures of human and other domestic wastes.

A vessel …
is for holding liquid.

System / Facility / Item of Equipment	Verb	Function
1. *A water supply system* … 2. *A sewerage network* is a complex of piping and sewers … 3. *An aqueduct* is an artificial channel … 4. *A sewer* is an un-	*to be used for/to* *to be utilized for/to* *to be intended for/to* *to be designed for/to* *to be built for* *to be for* *for* *to*	1. … to provide water supply for a variety of water users. 2. … to collect and dispose of sewage from populated localities and industrial enterprises to the sewage treatment works.

derground pipe or open channel … 5. *A conduit* is any channel or pipe … 6. *A water meter* is an instrument … 7. *A water tower* is a tower or standpipe … 8. *A water well* … 9. *A waste pipe* … 10. *A main* is a duct or pipe … 11. *A water intake* is a structure … 12. *A tank* is a large chamber … 13. *A drain* is an underground artificial water passage … 14. *A drainage* is a system of drains …		3. … to convey water. 4. … to carry off drainage water and waste matter. 5. … to conduct the flow of water or other fluid. 6. … to measure the amount of water passing a specified point in a piping system. 7. … to store water in areas where ordinary water pressure is inadequate for distribution to consumers. 8. … to extract water from a zone of saturation. 9. ... to carry waste water from a basin, bath, or sink in a building. 10. … to supply or drain ancillary branches. 11. … to take water into a channel or pipe from a river. 12. … to hold liquid or gas. 13. … to collect and divert groundwater. 14. … to remove groundwater or surface water, to divert water from structures or to reclaim the soil.

45. Translate the following text into English using the active vocabulary.

Система водоснабжения (населенного места или промышленного предприятия) должна обеспечивать получение воды из природных источников, ее очистку, если это вызывается требованиями потребителей, и подачу к местам потребления. Для выполнения этих задач служат следующие сооружения, входящие обычно в состав системы водоснабжения:

а) водоприемные сооружения, при помощи которых осуществляется прием воды из природных источников,

б) водоподъемные сооружения, т.е. насосные станции, подающие воду к местам ее очистки, хранения или потребления,

в) сооружения для очистки воды,

г) водоводы и водопроводные сети, служащие для транспортирования и подачи воды к местам ее потребления,

д) башни и резервуары, играющие роль регулирующих и запасных емкостей в системе водоснабжения.

Схема расположения основных сооружений системы водоснабжения показана на рисунке:

Вода забирается из источника при помощи **водоприемного сооружения** 1 и подается насосами, установленными на **станции**

первого подъема 2а, на **очистные сооружения** 3. После очистки вода поступает в **сборный резервуар** 4, из которого забирается другой группой насосов, установленных на **станции второго подъема 2б**, и по **водоводам** 5 подается **в сеть труб** 6, разводящих воду к местам потребления.

Водонапорная башня (или напорный резервуар) может быть расположена в начале сети, в конце ее или в какой-либо промежуточной точке сети. Порядок расположения прочих сооружений также может быть различен.

SPEAKING PRACTICE

46. Make a list of the basic water supply system facilities and describe their purpose and functioning in brief.

47. Get ready to speak about the main components and facilities of water supply systems.

TEXT C

VOCABULARY WORK

48. Read the following international words and guess their meaning. Mind the stressed syllables. Prove that these words are international ones.

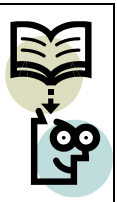
Model: toxic [ˊtɔksɪk] 1. яд; **токсичное вещество**, ядовитое вещество; 2. **токсичный**, ядовитый

centre [ˊsentə]	metallurgy [meˊtælədʒɪ]
critical [ˊkrɪtɪk(ə)l]	organization [g(ə)naɪˊzeɪʃ(ə)n]
degrade [dɪˊgreɪd]	organize [ˊɔ:g(ə)naɪz]
dinosaur [ˊdaɪnəsɔ:]	resident [ˊrezɪd(ə)nt]
mass [mæs]	revolution [ˌrev(ə)ˊlu:ʃ(ə)n]

49. Translate the following words and phrases and memorize them.

Nouns and noun phrases	
aim	emergency
commercial activities	implementation
cooling	industrial activities
dampening	municipal services
dispersal	scouring
drought	steam power
earthquake	waste material
Verbs and verbal phrases	
to be called	to exceed
to be subdivided into	to hire
to degrade	to service
to dig	to supply
to dissipate	
Prepositions	
as opposed to	in exchange for
Conjunctions	
as well as	either … or …

50. Study your topical vocabulary and memorize the new terms.



commercial water supply водоснабжение на коммерческой основе; водоснабжение предприятий торговли

- domestic water supply коммунально-бытовое водоснабжение
- domestic water use коммунально-бытовое водопо-требление; водопотребление коммунально-бытового водоснабжения
- industrial water supply промышленное [производственное] водоснабжение
- industrial water use промышленное водопотребление
- irrigation water supply водоподача на орошение
- irrigation water use водопотребление орошения
- public water supply коммунальное водоснабжение

51. Match the English and Russian equivalents.

1. bran muffins 2. industrial water usage [consumption] 3. Jack the Caveman 4. local resident 5. machine-building industry 6. manufactured goods 7. oil-refining and petrochemical industry 8. public-service 9. public-supply water systems 10. self-supplied domestic water withdrawals 11. thermal power station 12. to turn on the tap 13. water supply organization [utility]	a. водохозяйственная организация, предприятие коммунального водоснабжения, компании водоснабжения общего пользования b. коммунальный *(связанный со снабжением населения электричеством, водой, газом и т.п.);* компания общественного обслуживания *(по снабжению газом, электроэнергией, водой)* c. машиностроение d. местный житель e. нефтеперерабатывающая и нефтехимическая промышленность f. оладьи из отрубей g. отбор воды для бытовых нужд из природного источника h. открывать водопроводный кран i. пещерный человек j. промышленное водопотребление k. промышленные товары, товары промышленного производства, фабричные товары l. системы коммунально-бытового водоснабжения m. теплоэлектростанция, ТЭС

52. Match the terms and their definitions.

dissipate, domestic, industrial, machinery, public, public utility, self-, toxic, wastes

a. an organization supplying a community with electricity, gas, water, or sewerage

b. by one's own efforts; by its own action

c. causing or capable of causing death or illness if taken into the body; poisonous

d. disperse or scatter

e. a group of machines arranged to perform a useful function; machines collectively

f. materials that are not wanted; the unusable remains or byproducts of something

g. of or concerning the people as a whole; of or provided by the government rather than an independent, commercial company

h. of or for use in the home rather than in an industrial or office environment

i. of, relating to, or characterized by industry

53. Translate the following sentences into Russian paying attention to the underlined words that can be verbs, nouns or adjectives without changing their form and adding suffixes.

1. chief aim; to achieve / gain one's aim; to aim at
2. flood control; a river is in flood; the dam burst, flooding a small town; the river flooded its banks
3. to produce steam; water steam; steam engine; the equipment was originally powered by steam; the water was steaming
4. waste of time / money / energy; to go to waste; to dump industrial waste into rivers and seas; to recycle household waste; waste water; waste products; waste material; waste paper; we can't afford to waste electricity; to waste time / money / energy

Now fill in the table with Russian equivalents to the words from the sentences above.

aim, flood, steam, waste

	NOUN	VERB	ADJECTIVE	ADVERB
cool	прохлада, свежесть	охлаждать(ся), остывать	прохладный, свежий	невозмутимо, спокойно

READING PRACTICE

54. Read the following text with a dictionary.

Text C Classification of Water Supply Systems

Water supply is available water provided to fulfill a particular need. If the need is domestic, public, commercial, industrial, or agricultural, the water must fulfill both quality and quantity requirements.

Water supply systems are subdivided into several branches according to the purpose of facilities they service:

1. *domestic water supply*;
2. *public water supply*;
3. *industrial* and *commercial water supply*.

Water use in agriculture (for irrigation) is considered separately.

Domestic and Public Water Supply

Of all municipal services, provision of potable water is perhaps the most vital. All people depend on water for satisfying numerous domestic (household) needs indoors and outdoors.

Domestic water use just covers self-supplied domestic water withdrawals by those people and organizations that use their own wells to supply their water, as opposed to public-supplied (public-service) water.

Water generally gets to our homes in one of two ways. Either it is delivered by a city water supply organization (utility), or people supply their own water, usually from a well. So, water delivered to homes is called "public-supplied/ public-service" and water supplied by people themselves is called "self-supplied".

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

When the population was a lot more rural, people used to have to dig their own wells and create storage tanks for their water supply. But with the majority of urban population the public-supply water systems do that work for us. All we do is turn on the tap and pay the bills!

During times of droughts, floods, earthquakes, or other emergencies, vigorous efforts must be made to maintain public water supplies.

Industrial Water Supply

Water supply systems must also meet requirements for commercial and industrial activities.

The Industrial Revolution was the rapid development of industry that occurred in Britain in the late 18th and 19th centuries and brought about the introduction of machinery. It was characterized by the use of steam power, the growth of factories, and the mass production of manufactured goods. Water has always played a critical part in implementation of every industrial process. It is estimated that now about 22% of world-wide water use is industrial. The demand for water is sure to increase in future. Though water consumption depends on the region, as a whole, industrial water usage is lower than agricultural use.

The most important purposes of industrial water consumption are cooling, scouring, washing, dampening, steam generation, hydraulic transport, etc. The use of water for cooling exceeds all other kinds of water consumption as it is used in such branches of industry as metallurgy, oil-refining industry, chemical industry, etc. In general, the largest water users are enterprises of metallurgical, chemical, oil-refining, petrochemical, and machine-building industry, as well as thermal power stations.

Industry also uses water to dissipate and transport waste materials. In fact, many streams are now overused for this purpose, especially watercourses in urban centres. The use of watercourses for waste dispersal degrades the quality of the water and may reduce its usefulness for other purposes. This is especially true if the industrial wastes are toxic.

COMPREHENSION CHECK

55. Complete the following sentences according to the text.

1. Water supply is available water provided to fulfill … .
2. Water supply systems are subdivided into several branches according to … .

3. Water use in agriculture (for irrigation) … .
4. Of all municipal services, provision of potable water is perhaps … .
5. All people depend on water for satisfying … .
6. Water generally gets to our homes in … .
7. So, water delivered to homes is called … and water supplied by people themselves is called … .
8. … still exist all over the world.
9. All we do is … !
10. During times of droughts, floods, earthquakes, or other emergencies, vigorous efforts … .
11. Water supply systems must also meet requirements … .
12. Water has always played a critical part in … .
13. The demand for water is sure to … .
14. As a whole, industrial water usage is lower than … .
15. The most important purposes of industrial water consumption are … .
16. The use of water for cooling exceeds all other kinds of water consumption as it is used in such branches of industry as … .
17. The largest water users are enterprises of … .
18. Industry also uses water to … .
19. The use of watercourses for waste dispersal … .

56. Answer the following questions.

1. What needs does water fulfill?
2. What branches are water supply systems subdivided into?
3. What is domestic water use?
4. How does water get to our homes?
5. What role has the Industrial Revolution played?
6. Is agricultural water use higher than industrial one?
7. What are the most important purposes of industrial water consumption?
8. Why are many streams in urban centres overused nowadays?

57. Find key words and phrases which best express the general meaning of each paragraph.

58. What parts of the text can you define? Do they correspond to the paragraph? Entitle each part.

1. _____
2. _____
…. _____
3. _____

59. Write a summary of the text.

LANGUAGE FOCUS

60. Match the synonyms

1. branch	a. deteriorate
2. commercial	b. device/engine/mechanism
3. degrade	c. dissipation
4. dispersal	d. divide
5. fulfill	e. engineering industry
6. machine	f. essential
7. machine-building industry	g. field
	h. heat
8. municipal	i. inhabitant
9. power plant	j. intake
10. reduce	k. lower
11. resident	l. perform
12. subdivide	m. poisonous
13. thermal	n. power station
14. toxic	o. public/public-service
15. usefulness	p. suitability/applicability/adequacy
16. vital	q. trading
17. wastes	r. waste products
18. withdrawal	

61. Choose the odd word.

1. to degrade, to make worse, to refine, to become worse, to worsen, to deteriorate, to impair
2. to reduce, to decrease, to diminish, to impair, to disperse, to lower, to lessen, to decline, to fall, to drop
3. to maintain, to increase, to grow, to rise, to raise, to elevate, to heighten, to enhance

62. Choose the synonyms of the underlined words.

1. If the need is domestic, public, commercial, industrial, or agricultural, the water must fulfill both quality and quantity requirements.
   a. deliver
   b. meet
   c. carry out
   d. create
2. Of all municipal services, provision of potable water is perhaps the most vital.
   a. palatable
   b. drinkable
   c. fresh
   d. self-supplied
3. Domestic water use just covers self-supplied domestic water withdrawals by those people and organizations that use their own wells to supply their water, as opposed to public-supplied (public-service) water.
   a. by means of
   b. in order to
   c. in addition to
   d. in contrast with
4. So, water delivered to homes is called "public-supplied" and water supplied by people themselves is called "self-supplied".
   a. public water supply
   b. public-service
   c. public water supplies
   d. self-service
5. The Industrial Revolution was the rapid development of industry that occurred in Britain in the late 18th and 19th centuries.
   a. existed

b. situated
c. took place
d. took part

6. It was characterized by the use of steam power, the growth of factories, and the mass production of manufactured goods.

a. engineered
b. industrial
c. household
d. finished

7. It is estimated that now about 22% of world-wide water use is industrial.

a. characterized
b. calculated
c. claimed
d. required

8. The use of water for cooling exceeds all other kinds of water consumption.

a. surpasses
b. decreases
c. increases
d. exaggerates

9. In fact, many streams are now overused for this purpose, especially watercourses in urban centres.

a. underused
b. reused
c. recycled
d. overexploited

63. Read the following text and complete the table. Translate the following text into English using the active vocabulary and the tips below.

Классификация систем водоснабжения

Системы водоснабжения могут классифицироваться по ряду основных признаков.

По назначению различают системы водоснабжения (водопроводы) населенных мест (городов, поселков); системы производственного водоснабжения (производственные водопроводы), которые, в свою очередь, различают по отраслям промышленности (водопро-

воды тепловых электростанций, водопроводы металлургических заводов и т. д.); системы сельскохозяйственного водоснабжения.

В пределах одного объекта в соответствии с объединением различных функций устраивают водопроводы хозяйственно-питьевые, противопожарные и производственные.

По характеру используемых природных источников различают водопроводы, получающие воду из поверхностных источников (речные, озерные и т.д.); водопроводы, основанные на подземных водах (артезианские, родниковые и т.п.); водопроводы смешанного питания — при использовании источников различных видов.

По способу подачи воды различают водопроводы самотечные (гравитационные); водопроводы с механической подачей воды (с помощью насосов), а также зонные водопроводы, где вода подается в отдельные районы отдельными насосными станциями.

Кроме того, системы производственного водоснабжения можно различать по способу (кратности) использования воды: системы прямоточного водоснабжения (с однократным использованием воды); системы оборотного водоснабжения; системы с повторным использованием воды.

	Принцип классификации	**Типы водопроводов**
Системы водоснабжения (водопроводы)	по назначению	1. … 2. … 3. …
	по характеру используемых природных источников	1. … 2. … 3. …
	по способу подачи воды	1. … 2. … 3. …
	в соответствии с объединением различных функций *(в пределах одного объекта)*	1. … 2. … 3. …
	по способу (кратности) использования воды *(для систем производственного водосна-бжения)*	1. … 2. … 3. …

➔ **системы водоснабжения населенных мест** – systems of water supply of inhabited localities

➔ **системы производственного [промышленного] водоснабжения** – industrial water supply systems

➔ **системы сельскохозяйственного водоснабжения** – rural water supply systems

➔ **хозяйственно-питьевые водопроводы** – domestic [household] water supply systems

➔ **противопожарные водопроводы** – fire water supply systems

➔ **производственные водопроводы** – industrial water supply systems

➔ **водопроводы, получающие воду из поверхностных источников** – water supply systems obtaining water from surface water sources

➔ **водопроводы, основанные на подземных водах** – water supply systems based on groundwater

➔ **водопроводы смешанного питания** – mixed water supply systems

➔ **самотечные [гравитационные] водопроводы** – gravity water supply systems

➔ **водопроводы с механической подачей воды (с помощью насосов)** –supply systems with pump(ed) water feed

➔ **зонные водопроводы** – zonal water supply systems

➔ **системы прямоточного водоснабжения** – once-through water supply systems

➔ **системы оборотного водоснабжения** – water recycling systems / reverse water supply systems

➔ **системы с повторным использованием воды** – water reuse systems

SPEAKING PRACTICE

64. Find additional information on the water supply of your native city or town. Make a presentation.

65. Get ready to speak about the classification of water supply systems.

TEXT D

VOCABULARY WORK

66. Read the following international words and guess their meaning. Mind the stressed syllables. Prove that these words are international ones.

Model: ancient [ˊeɪnʃ(ə)nt] древний; старинный, старый; **античный**

arcade [ɑ:ˊkeɪd]	granite [ˊgrænɪt]
arch [ɑ:ʧ]	information [ˌɪnfəˊmeɪʃ(ə)n]
archaeological [ˌɑ:kɪəˊlɔʤɪk(ə)l]	initiate [ɪˊnɪʃɪeɪt]
basin [ˊbeɪsn]	innovation [ˌɪnəuˊveɪʃ(ə)n]
campaign [kæmˊpeɪn]	kilometer [kɪˊlɔmɪtə]
channel [ˊʧæn(ə)l]	litre [ˊli:tə]
clay [kleɪ]	massive [ˊmæsɪv]
concrete [ˊkɔŋkri:t]	mile [maɪl]
container [kənˊteɪnə]	pier [pɪə]
contour [ˊkɔntuə]	privileged [ˊprɪv(ə)lɪʤd]
cross [ˊkrɔs]	progress 1. *n* [ˊprəugres]
culture [ˊkʌlʧə]	2. *v* [prəˊgres]
drill [drɪl]	realization [ˌrɪəlaɪˊzeɪʃ(ə)n]
epidemic [ˌepɪˊdemɪk]	sense [sens]
evolution [ˌevəˊl(j)u:ʃ(ə)n]	series [ˊsɪəri:z]
fortress [ˊfɔ:trəs]	sterilize [ˊster(ə)laɪz]
fountain [ˊfauntɪn]	trench [tren(t)ʃ]

67. Match the English and Russian equivalents.

1. asbestos cement	a. а излишки использовались для …
2. brick-lined walls	b. асбестоцемент
3. cast-iron pipe	c. буферное водохранилище; распределительный бассейн
4. clay pipe	d. быть озабоченным *чем-л.*
5. cut stone	e. водохранилище; бак для воды; водосборный бассейн; резервуар
6. distribution reservoir	f. входить в употребление, начать использоваться
7. ductile iron	g. выдерживать давление
8. lead pipe	h. гравитационная песчаная фильтрация
9. open channel	i. добывать воду, получать воду, качать воду (из)
10. point of use	j. железобетон
11. private household	k. керамическая труба; гончарная (дренажная) труба
12. projects rendered impracticable	l. ковкое (*мягкое*) железо
13. reinforced concrete	m. место использования
14. rough concrete	n. неотделанный бетон, бетон после распалубки
15. slow-sand filtration	o. обмурованные стены
16. storage reservoir	p. открытое русло
17. the excess being used to …	q. планы оказывались неосуществимыми
18. to be concerned with *smth*	r. проводить воду через канал, пускать воду по каналу
19. to channel water	s. свинцовая труба; подводящая труба
20. to come into use	t. тёсаный камень
21. to draw water (from)	u. частное (домо)хозяйство *(семья, которая живет в частном доме)*
22. to withstand pressure	v. чугунная труба

68. Match the terms and their definitions.

advanced, aqueduct, arch, baths, conveyance, fountain, install, neglect, qanat [kə´na:t], tunnel

a. (in the Middle East) is a gently sloping underground channel or tunnel constructed to lead water from the interior of a hill to a village below

b. a curved symmetrical structure spanning an opening and typically supporting the weight of a bridge, roof, or wall above it

c. a public establishment offering bathing facilities

d. an artificial channel for conveying water, typically in the form of a bridge supported by tall columns across a valley

e. an artificial underground passage, esp. one built through a hill or under a building, road, or river

f. an ornamental structure in a pool or lake from which one or more jets of water are pumped into the air

g. fail to care for properly

h. far on or ahead in development or progress

i. the action or process of transporting *smth* from one place to another

j. place or fix (equipment or machinery) in position ready for use we're planning to install a new shower

READING PRACTICE

69. The following text is in the jumbled order. Look at the plan of the text, read the paragraphs and number them in the correct order according to the plan.

1. Water as an important factor in the development of early civilizations.
2. The emergence and development of advanced water supply systems in ancient times.
3. Highly advanced Roman aqueducts as one of the greatest achievements in the ancient world.
4. The purpose and description of Roman aqueducts.

5. The condition of water supply systems in Europe after the fall of the Roman Empire.

6. Some facts about the development of water supply systems over the past four centuries.

Text D Historical Background: Developments in Water Supply Systems

□ In the 17th and 18th centuries, distribution systems utilizing cast-iron pipes, aqueducts, and pumps were installed in London and Paris. However, cast-iron pipes with joints capable of withstanding high pressures were not used very much until the early 19th century. The steam engine was first applied to water pumping operations at about that time, making it possible for all but the smallest communities to have drinking water supplied directly to individual homes.

During the 19th century the pollution of most water supplies became so serious that slow-sand filtration was initiated; and by the end of the century the realization that diseases could be transmitted by water led to the use of sterilizing chemicals, usually chlorine compounds.

Asbestos cement, ductile iron, reinforced concrete, and steel came into use as materials for water-supply pipelines in the 20th century.

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

Water was an important factor in the location of the earliest settled communities, and the evolution of public (and later industrial) water supply systems is tied directly to the growth of cities. There is much archaeological evidence to indicate that ancient peoples were concerned with their water supply. In the development of water resources beyond their natural condition in rivers, lakes, and springs, the digging of shallow wells was probably the earliest innovation. Wells were sufficient for small communities, and rivers provided enough water for civilizations along the Tigris and Euphrates, the Nile, and the Indus rivers.

□ The need to channel water supplies from distant sources was an outcome of the growth of urban communities. Among the most notable

of ancient water conveyance systems are the aqueducts built between 312 BC and AD 455 throughout the Roman Empire. Some of these impressive works are still in existence. The writings of Sextus Julius Frontinus (who was appointed superintendent of Roman aqueducts in AD 97) provide information about the design and construction of this system. The outstanding features of the system were 11 major aqueducts totalling 359 miles (578 kilometres) in length – of which 30 miles were supported on stone arches – that delivered some 50,000,000 gallons (189,000,000 litres) of water to the city daily and supplied Rome itself. The great and highly advanced *Roman* waterway system known as the a*queducts* is among the greatest achievements in the ancient world.

☐ During the Middle Ages in Europe there was no notable progress in the methods or materials used to convey and distribute water. Water supplies were largely neglected, and epidemics caused by waterborne organisms were common.

Pict. 9. The multiple arches of the Pont du Gard in Roman Gaul (modern-day southern France). Its lower tiers carry a road across the river, and the upper tiers support an aqueduct conduit that carried water in Roman times

☐ The Romans constructed numerous aqueducts to bring water from distant sources into their cities and towns, supplying public baths, latrines, fountains and private households. Extending from a distant spring-fed area, a lake, or a river, a typical Roman aqueduct included a series of underground and aboveground channels. The longest was the Aqua Marcia, built in 144 BC. Its source was about 23 miles (37 kilometres) from Rome. The aqueduct itself was 57 miles long, however, because it had to meander along land contours in order to maintain a steady flow of water. For about 50 miles the aqueduct was underground in a covered trench, and only for the last 7 miles was it carried above ground on an arcade. In fact, most of the combined length of the aqueducts supplying Rome (about 260 miles) was built as covered trenches or tunnels.

When crossing a valley they were supported by arcades comprising one or more levels of massive granite piers and impressive arches.

The aqueducts ended in Rome at distribution reservoirs, from which the water was conveyed to public baths or fountains. The water was distributed from large storage cisterns to public fountains and baths by an elaborate system of lead pipes. A few very wealthy or privileged citizens had water piped directly into their homes, but most of the people carried water in containers from a public fountain. Water was running constantly, the excess being used to clean the streets and flush the sewers.

Ancient aqueducts and pipelines were not capable of withstanding much pressure. Channels were constructed of cut stone, brick, rubble, or rough concrete. Pipes were made of drilled stone or of hollowed wooden logs; clay and lead pipes were also used.

☐ But populations grew, the need for water increased, tools were developed, wells had to be dug deeper, and water had to be brought in from more distant sources. These ancient systems included storage reservoirs at water sources, canals and aqueducts for water conveyance to points of use, and water-distribution systems.

Highly advanced systems appeared about 2500 BC and reached their peak in the system supplying ancient Rome. Brick-lined wells were built by city dwellers in the Indus River basin as early as 2500 BC, and wells more than 1,600 feet (almost 500 metres) deep are known to have been used in ancient China. Construction of qanats, slightly sloping tunnels driven into hillside that contain groundwater, probably originated in northwestern Persia (now Armenia) about 700 BC. From the hillsides the water was conveyed by gravity in open channels to nearby towns or cities. The use of qanats became widespread throughout the region, and some are still in existence. Until 1933 the Iranian capital city, Tehran, drew its entire water supply from a system of qanats.

COMPREHENSION CHECK

70. Complete the following sentences according to the text.

1. Ancient peoples … .
2. About 2500 BC … .
3. About 700 BC … .

4. Between 312 BC and AD 455 … .
5. During the Middle Ages … .
6. In the 17th and 18th centuries … .
7. During the 19th century … .
8. In the 20th century … .

71. Find key words and phrases which best express the general meaning of each paragraph.

72. Write a summary of the text.

LANGUAGE FOCUS

73. Match the synonyms.

1. advanced	a. begin
2. ancient	b. carry / transport
3. convey	c. coated
4. impressive	d. cobblestone
5. innovation	e. cutting-edge / up-to-date
6. install	f. even
7. joint	g. grand
8. lined	h. junction
9. meander	i. mount
10. originate	j. novelty
11. rubble	k. old / antique
12. sloping	l. slanting
13. steady	m. wind

74. Match the antonyms.

1. capable	a. aboveground
2. directly	b. close / near
3. distant	c. decay
4. flourish	d. deinstall/uninstall/ dismantle
5. hollow	

6. impracticable 7. install 8. privileged 9. slow-sand filtration 10. steady 11. underground 12. wealthy	e. incapable f. indirectly g. poor h. practicable i. rapid-sand filtration j. solid k. unprivileged l. variable/changeable/ inconstant

75. Match the terms (names of materials) and their definitions.

asbestos, cast iron, cement, clay, concrete, granite, iron, reinforced concrete, rock, steel, stone, wood

a. a hard, relatively brittle alloy of iron and carbon that can be readily cast in a mold and contains a higher proportion of carbon than steel (typically 2.0 – 4.3%)

b. a hard, strong, gray or bluish-gray alloy of iron with carbon and usually other elements, used extensively as a structural and fabricating material

c. a heat-resistant fibrous silicate mineral that can be woven into fabrics, and is used in fire-resistant and insulating materials

d. a heavy, rough building material made from a mixture of broken stone or gravel, sand, cement, and water, that can be spread or poured into molds and that forms a stonelike mass on hardening

e. a powdery substance made by calcining lime and clay, mixed with water to form mortar or mixed with sand, gravel, and water to make concrete

f. a stiff, sticky fine-grained earth, typically yellow, red, or bluish-gray in color and often forming an impermeable layer in the soil. It can be molded when wet, and is dried and baked to make bricks, pottery, and ceramics

g. a strong, hard magnetic silvery-gray metal, the chemical element of atomic number 26, much used as a material for construction and manufacturing, esp. in the form of steel (Symbol: Fe)

h. a very hard, granular, crystalline, igneous rock consisting mainly of quartz, mica, and feldspar and often used as a building stone

i. concrete in which wire mesh or steel bars are embedded to increase its tensile strength

j. the hard fibrous material that forms the main substance of the trunk or branches of a tree

k. the hard, solid, nonmetallic mineral matter of which rock is made, esp. as a building material

l. the solid mineral material forming part of the surface of the earth and other similar planets, exposed on the surface or underlying the soil or oceans

SPEAKING PRACTICE

77. Find additional information on developments in water supply systems. Make a presentation.

78. Get ready to speak about the history of water supply systems.

FOLLOW-UP ACTIVITIES

79. Read the texts of UNIT 3 again and make notes under the following headings. Then use your notes to talk about *Water Supply Systems, The Classification of Water Supply Systems* and *The Main Components and Facilities of a Water Supply System.*

1. Water supply.
2. Water supply systems.
3. Water distribution systems.
4. The main components and facilities of a water supply system.
5. Domestic, public and industrial water supply.
6. Developments in water supply systems.
7. Water supply in Minsk.

SUPPLEMENTARY READING

Text 1. PLUMBING

Plumbing is a system of pipes and fixtures installed in a building for the distribution and use of potable (drinkable) water and the removal of waterborne wastes. It is usually distinguished from water and sewage systems that serve a group of buildings or a city.

Plumbing is the system of pipes, with their appurtenances and the fixtures and equipment attached to them, which furnish the domestic services needed for human health and well-being. In its more extensive phases as a pipe craft it includes, besides water piping and drains, various other systems, as piping for gas, air, and other domestic and industrial needs.

Nowadays the term "*plumbing fixture*" embraces not only showers, bathtubs, lavatory basins, and toilets but also such devices as washing machines, garbage-disposal units, hot-water heaters, dishwashers, and drinking fountains.

Materials

The water-carrying pipes and other materials used in a *plumbing system* must be strong, noncorrosive, and durable enough to equal or exceed the expected life of the building in which they are installed. Toilets and lavatories usually are made of stable porcelain or vitreous china, although they sometimes are made of glazed cast iron, steel, or stainless steel. Ordinary water pipes are usually made of steel, copper, brass, plastic, or other nontoxic materials; and the most common materials for sewage pipes are cast iron, steel, copper, and asbestos cement.

From the History of Plumbing

One of the problems of every civilization in which the population has been centralized in cities and towns has been the development of adequate plumbing systems.

In certain parts of Europe the complex aqueducts built by the Romans to supply their cities with potable water can still be seen. However, the early systems built for the disposal of human wastes were less elaborate.

Human wastes were often transported from the cities in carts or buckets or else discharged into an open, water-filled system of ditches that led from the city to a lake or stream.

Improvement in plumbing systems was very slow. Virtually no progress was made from the time of the Romans until the 19th century. The relatively primitive sanitation facilities were inadequate for the large, crowded population centres during the Industrial Revolution, and outbreaks of typhoid fever and dysentery were often spread by the consumption of water contaminated with human wastes. Eventually these epidemics were curbed by the development of separate, underground water and sewage systems, which eliminated open sewage ditches. In addition, plumbing fixtures were designed to handle potable water and water-borne wastes within buildings.

Evidence of installations designed for the supply of water and the elimination of wastes can be traced back to the earliest settlements of mankind, where materials such as clay, wood, lead and cast iron have been used. It is actually only during the 20th century that plumbing has developed into complex systems with many varieties of pipes and pipe joints. Thus for a very long time the plumber was an artisan in the joining and shaping of lead pipe, and the trade derived its name from the Latin word “plumbum”, “lead”.

Water Distribution Methods

Methods of water distribution vary. For towns and cities, water companies treat water collected from wells, lakes, rivers, and ponds and distribute it to individual buildings. In rural areas water is commonly obtained directly from wells.

In most cities, water is forced through the distribution system by pumps, although, in rare cases, when the source of water is located in mountains or hills above a city, the pressure generated by gravity is sufficient to distribute water throughout the system. In other cases, water is pumped from the collection and purification facilities into elevated storage tanks and then allowed to flow throughout the system by gravity. But in most municipalities water is pumped directly through the system; elevated storage tanks may also be provided to serve as pressure-stabilization devices and as an auxiliary source in the event of pump failure or of a catastrophe, such as fire, that might require more water than the pumps or the water source are able to supply. The pressure developed in the water-supply system and the friction generated by the wa-

ter moving through the pipes are the two factors that limit both the height to which water can be distributed and the maximum flow rate available at any point in the system.

Modern Plumbing Requirements

In mid 20th century plumbing has become the object of extensive scientific and technical studies in order to make the systems operate properly, and to safeguard human health, "safe" and "sanitary" being the key words. All the installations are governed by the laws, rules, and regulations of building safety engineers and health authorities through sanitary codes, building codes, and plumbing codes. With the development of modern living standards and the increased requirements in industrial work, plumbing is rapidly becoming an involved field which requires a great many new adaptations and special devices.

Water has to be delivered at the desired temperature and in a form that will cause no harm. For the ordinary tub- or bowl-type fixture the flow should enter the vessel at a quiet velocity in a non-splashing stream and in plentiful volume to give the user satisfaction. For flushing-type fixtures the pressure of the water must be efficient to operate the control valve and flush out the bowl and trap. In all cases the installation has to be made in such a manner that reverse flow is impossible. For fixtures with direct connection of the water pipe to any contamination source it becomes necessary to install devices such backflow preventers to ensure the cleanness of the water supply.

Friction loss in the pipes must be carefully measured so that pressure can be provided, either from the street main or auxiliary pumping equipment in the building, sufficient to overcome the friction in the pipes and the additional pressure necessary to lift the water up to the ___ outlet (static head). The water lines are provided with valves for shutoff purposes or for the throttling down of the flow. In each case it is necessary to know the characteristics of the particular water supply in order to select the material which will not be affected through corrosion by the water and in turn cause contamination of the water. For ordinary conditions, a galvanized steel pipe, brass, or copper is used. For such highly purified supplies as demineralized or distilled water, more expensive piping such as a tin or glass pipe may be used.

Pipe Size

The sizing of pipes for the conventional type of building is regulated by plumbing codes. A certain factor, or fixture unit, is assigned to each fixture or drain outlet. The various sizes of drains, risers, and vents are, depending somewhat on the method of installation and the length of pipe, allowed a given number of fixture units. For more involved installations, particularly industrial work where the actual discharges in gallons per minute may be known, the designer of a plumbing system may have to use hydraulic calculations in order to determine the correct size and slope of the drains.

For water piping the sizing is also a problem in hydraulics. There again it has been found practical in the conventional type of building to use fixture units to ascertain the probable maximum flow in gallons per minute. In both drainage and water lines allowance should be made for what is called respectively "base flow" and "constant flow". These are flows which, as the terms imply, for any period of a few minutes or hours may place a demand on the capacity of the pipe in addition to the fluctuating and momentary demand caused by the individual fixtures.

Equipment

The equipment required in plumbing systems consists of such items as storage tanks which furnish water from overhead through gravity, or the pressure type which pushes the water up, by having the tank partly filled with compressed air. Both types of tanks have to be supplied by pumps. Pumps are also used for lifting wastes from lower levels into the sewers at a higher level.

Hot water heaters, with or without storage tanks can be heated by steam, any kind of fuel, mostly gas or oil, and electricity. Depending on the type of usage, the heaters may vary from quick recovery, "instantaneous" types to slow recovery tank types. In the heating of water several problems come up. Allowance must be made for possible excess pressure due to the expansion of water when heated. Owing to the release of oxygen when water is heated, the corrosion factor is intensified, and minerals are precipitated, causing harm to the tank and coils. Thus there are various combinations of heaters to choose from, all according to the hardness of the water and the maximum temperature to which the water is to be heated.

Text 2. PLUMBING

Domestic water-supply systems for low-rise residential buildings have two sources, either municipal water-distribution systems or, where these are not available, wells that are drilled to underground aquifers which are free of contamination. Water is drawn from the wells with small submersible electric pumps, which are lowered through the well casing to the intake. Underground exterior water-supply pipes are usually cast-iron with threaded connections to contain the pressures applied to the fluid, which is typically sufficient to raise it four stories. Within the building, copper tubing with soldered connections is used for distribution because of its corrosion resistance and ease of fabrication; in some areas plastic pipe is also used. The domestic water supply is divided into cold and hot systems, the cold water being piped directly to the fixtures. The hot-water system first draws the supply through a hot-water heating tank, which raises its temperature to about 60°C (140°F) using electric resistance or gas heat. Domestic water heaters that use solar radiation to heat water in coils exposed to the sun on a glass-covered black metal plate (flat-plate solar collectors) are found in areas where there is ample sunshine and relatively high energy costs. The hot water is then distributed from the heater to the fixtures in a recirculating loop pipe system, in which gravity and temperature differentials maintain a constant temperature in period of low demand.

The primary residential use of water is in the bathroom, which typically includes a bathtub of cast iron or pressed steel with a ceramic porcelain coating (although fibre-glass-reinforced resin is also used), a ceramic lavatory, and a ceramic tank-type water closet. The bath and lavatory are supplied with hot and cold water through faucets with lever or screw-type valve controls. The valve of the water closet supply is also lever-operated and relies on the gravity power of the water in the tank for its flushing action. Shower baths are also common, often incorporated into bathtub recesses or in a separate compartment finished with ceramic tile. In some countries a bidet is included.

Other widely used plumbing fixtures include kitchen sinks, usually of cast iron or pressed steel with a ceramic porcelain coating, or of stainless steel; automatic dishwashing machines; and automatic washing machines for laundry. Kitchen sinks can be fitted with garbage disposals, which grind solid waste into a fluid slurry that is flushed out with wastewater.

Where the possibility of back siphonage of wastewater into the water supply exists, a vacuum breaker must be provided at the supply to prevent this happening, but most domestic plumbing fixtures are designed to avoid this possibility.

Drainage systems to remove wastewater are made of cast-iron pipe with threaded joints or bell-and-spigot joints sealed with molten lead or with plastic pipe with solvent-welded joints. The waste pipe of every plumbing fixture is provided with a semicircular reverse curve, or trap, which remains constantly filled with water and prevents odours from the drainage system from escaping into occupied spaces. Immediately downstream from each trap is an opening to a vent pipe system, which lets air into the drainage system and protects the water seals in the traps from removal by siphonage or back pressure. When wastewater leaves the building, it is drained through a backflow-prevention valve and into underground ceramic pipes. It then flows by gravity to either a private sewage treatment plant, such as septic tank and tile field, or to the public sewer system. If the discharge level of the wastewater is below the level of the sewer, a sewage ejector pump is required to raise the wastewater to a higher level, where gravity carries it away.

Text 3. HOUSE PLUMBING

A building's system for waste disposal has two parts: the drainage system and the venting system.

House plumbing consists of three separate pipe systems:

- cold water system
- hot water system
- drainage system

Plumbing also includes the water heater.

Cold and Hot Water Systems

Both cold and hot water systems operate under high pressure. Therefore, the pipes can run up and down without having any adverse effect on their performance. Also, their diameter can be small. The flow of water is completely controlled by valves.

As soon as the main water line enters the house, it is connected to a meter (municipal water supply only) that registers the amount of water consumed. Next to the meter is a shutoff valve that stops the flow of the

water to the entire house in case of emergency. The main water line then splits into two lines: one becomes the cold water line and the other goes to the water heater to be heated and becomes the hot water line. The hot and cold water lines run parallel to each other until they reach the valves of the faucets and the appliances where cold and hot water are mixed during the usage.

Drainage System

A drainage system operates under gravity. Thus the horizontal pipes have to be pitched toward their points of discharge. Also, they have to be wide in diameter. The horizontal drainage pipes are called branches; the vertical pipes are called stacks; the stacks that carry refuse are called soil stacks.

Sewage develops harmful gases. These gases must be vented to the atmosphere by means of the vertical stack vents that penetrate the roof. Sewage gases and insects are prevented from entering into the house by traps located at the discharge of each plumbing fixture.

Above ground drainage pipes may be made of cast iron, copper, or plastic, depending on the local codes. Ail underground drainage pipes are made of cast iron.

Plumbing Installation

Plumbing is installed in two distinct stages:

a. rough plumbing

b. finish plumbing (which includes the water heater and plumbing fixture).

Rough plumbing is the installation of all the pipes, fittings, and traps of the plumbing system. It after the wood frame is completed. Most of the rough plumbing is installed inside the walls ceilings. First, the plumber prepares a detailed drawing showing the diameters, lengths, and material of all the pipes and fittings based on the drawings and field measurements. The plumber may require some alteration in the wood framing in order to get the pipes and fittings through. The rough carpenter should cooperate fully with the plumber. However, you are expected to compensate the carpenter for any extra work.

It is to be noted that the stack walls in which the pipes and soil stacks are installed must not be of the bearing type, meaning that the ceiling joists should not bear on them. They should be wide enough to accommodate the soil stacks, or else boxes should be built around the stacks.

Many local codes require that the house trap be installed at a point just before the drainage pipe leaves the house. Its purpose is to prevent the gases and insects of the public sewer from filtering into the house.

Water Heater

Most water heaters consist of a heating furnace and a storage tank. The capacity of the storage tank varies between 40 and 80 gallons. The capacity of the water heater must be stated in the plumbing contract. The source of heat may be gas, oil, or electricity.

Another type of the water heater is the demand type. It has no storage tank. Rather, it consists of a copper coil through which the water to be heated circulates. Upon demand, the water in the coil is heated by either gas or hot water drawn through the boiler. Hot water continues to flow as long as there is demand.

Plumbing Fixtures

Plumbing fixtures are installed in two stages:

1. The bathtubs and showers are installed as soon as wood frame and roofing are completed. They are heavy and should be left for some time to allow their supporting wood frame to settle and shrink before installing the surrounding ceramic tiles. The plumber must cover the fixture with glued paper so that they do not get stained, scratched, or cracked.

2. The rest of the fixtures such as the lavatories, toilets, bidets, sinks, faucets, faucet knob, etc., should be installed just before the house is ready to be occupied, to avoid their being damaged during construction.

FINAL TEST

TAP WATER

1. Read the text.

Tap water (running water)[1] is part of indoor plumbing, which became available in the developed world in the late 19th century and common in the mid-20th century.

The provision of tap water is a massive infrastructure of piping, pumps, and water purification works.

Tap water delivers *public health*[2]*, fire protection, economic development,* and *quality of life*.

The availability of clean tap water brings major *public health benefits*[3]. Usually, the same administration that provides tap water is also responsible for the removal and treatment before discharge or reclamation of wastewater[4]. In many areas, chemicals containing fluoride are added to the tap water in an effort to improve public dental health. In some countries, this remains a controversial issue[5] for a portion of the population.

Tap water may contain various types of natural but relatively harmless contaminants such as scaling[6] agents like calcium carbonate in hard water and metal ions such as magnesium and iron, and odoriferous[7] gases such as hydrogen sulfide. Local geological conditions affecting groundwater are determining factors of the presence of these substances in water.

Occasionally, there are health concerns regarding the leakage of dangerous biological or chemical contaminating agents into local water supplies when people are advised by public health officials[8] not to drink the water, and stick to bottled water instead.

However, *bottled water* is sometimes not safer than tap water. Some time ago, Environmental Working Group did a study that tested popular brands of bottled water for contamination. They found 38 different harmful chemicals, including painkillers, fertilizer and arsenic, in 10 brands of bottled water. Plastic bottles can leach chemicals into your water. Lined[4] aluminum or stainless steel bottles are the safest alternative.

Fire protection. A well-maintained[9] water system is critical in protecting our communities from the ever-present threat of fire. In most communities, water flowing to fire hydrants[10] and home faucets[11] is transported by the same system of water mains[12], pumps and storage tanks.

Support for the economy. A safe, reliable water supply is central to the economic success of our communities. Tap water is critical to the day-to-day operations of existing businesses and to the viability of new commercial enterprises and residential developments[13]. From foods and beverages to toothpastes and perfumes, water is the primary ingredient in hundreds of thousands of everyday products. An increasing number of communities are using recycled water[14] for non-drinking purposes such as industrial cooling or irrigation.

Quality of life. Tap water is more than a convenience – it is central to our life. We can hardly imagine our everyday life without bathing, cooking, washing up, cleaning, washing, garden watering, air conditioning, car washing, carrying away wastes. What is more, any measure of a successful society – low mortality rates[15], economic diversity, productivity, public safety – is in some way related to access to safe water.

*** [1]tap water (running water) – водопроводная вода

[2]public health – здоровье населения

[3]benefit – выгода; польза; прибыль; преимущество

[4]reclamation of wastewater – использование сточных вод *(для полезных целей)*; обработка сточных вод

[5]controversial issue – спорный вопрос

[6]scaling – выпадение осадка *(из воды при нагревании)*

[7]odoriferous – вонючий, зловонный

[8]public health officials – органы здравоохранения

[9]well-maintained – хорошо обслуживаемый; содержащийся в исправности; поддерживаемый в порядке

[10]fire hydrant – пожарный гидрант

[11]faucet – водопроводный кран; регулирующий кран; вентиль; раструб; втулка; затычка

[12]water main – водопроводная магистраль; магистральный водопровод

[13]residential development – жилищное строительство, строительство жилья, жилая застройка

[14]recycled water – оборотная вода

[15]mortality rate – смертность, коэффициент смертности, уровень смертности

2. Choose the right variant according to the text.

1) **Indoor plumbing became … in the developed world in the** mid-20th century.

A. usual B. uncommon C. unique D. unavailable

2) Calcium carbonate, metal ions such as magnesium, iron, or **hydrogen sulfide are examples of natural but relatively …** contaminants contained in tap water.

A. hazardous B. dangerous C. harmless D. harmful

3) **Tap water … bottled water.**

A. is as safe as B. isn't safer than C. is much safer than D. is safer than

4) Water flowing to fire hydrants and home faucets is transported by **… water main and pump systems.**

A. some B. the same C. different D. various

5) **Industrial cooling and irrigation use … water for non-**drinking purposes.

A. drinking B. safe and clean C. recycled D. contaminated

6) **So, tap water provides …** *(several answers possible)*

A. quality of life B. public health C. fire protection D. economic development

3. Agree or disagree with the following statements (True / False).

1. Running water became available in the developing countries in the late 19th century and common in the mid-20th century.

2. The provision of running water is a massive infrastructure which includes pipe systems, pumps, and water purification stations.

3. The improvement of public dental health by adding chemicals containing fluoride still remains a controversial issue.

4. Local geographical conditions affecting groundwater determine the presence of various contaminants in running water.

5. Lined aluminum or stainless steel bottles are the safest alternative to plastic bottles.

6. Safe tap water is more than just a convenience – it is part of our everyday life activities.

4. Match the synonyms.

1. Central	A. Critical
2. Contaminant	B. Faucet
3. Discharge	C. Harmless
4. Safe	D. Pollutant
5. Tap	E. Purification
6. Treatment	F. Release

5. Match the opposites.

1. Increasing	A. Absence
2. Low	B. Decreasing
3. Natural	C. Harmful
4. Presence	D. High
5. Safe	E. Man-made / Artificial
6. Safety	F. Unsafeness

6. Form the plural of the following nouns.

1. Pump, fire, gas, enterprise, ingredient, business. bottle, alternative, issue, substance

2. Community, supply, country, society, industry, century, responsibility

7. **Translate the following "stone wall constructions" into** Russian.

Water purification system, water treatment plant, wastewater discharge and reclamation, tap water availability, contaminating agents

leakage, water supplies pollution, water main and pump systems provision

8. Translate the sentences taking into consideration the grammar phenomenon of conversion.

1. Industrial cooling and irrigation use recycled water for non-drinking purposes. – Industrial cooling and irrigation make use of recycled water for non-drinking purposes.

2. Chemicals containing fluoride are added to the tap water to improve public dental health. – Chemical substances containing fluoride are added to the tap water to improve public dental health.

3. Lined aluminum or stainless steel bottles are the safest alternative. – Lined aluminum or stainless steel bottles are the safest alternative variant.

4. A water main transports water to fire hydrants and home faucets. – Water is the main convenience without which we can hardly imagine our everyday life.

5. The treatment includes mechanical means to create contact between wastewater, cells and oxygen. – It means that chlorine is a toxic gas.

9. Choose the right variant paying attention to the degrees of comparison of the adjectives.

1) Chemicals containing fluoride are sometimes added to the tap water to make our tooth … .

A. more healthy B. healthier C. the most healthy D. the healthiest

2) Running water must be as … as possible.

A. cleaner and safer B. clean and safe C. more clean and safe . D . cleanest and safest

3) … leakages of dangerous biological or chemical contaminating agents into local water supplies take place (происходят), … people concern about their health.

A. More frequent; more B. The more frequent; the more C. The most frequent; the most D. Frequent; much

4) Tap water is … river water.

A. cleaner and less dangerous than B. less clean and more dangerous than C. as clean and safe as D. not as/so clean and safe as

5) The producers of bottled water must make their product as … as possible.
A. safer B. safe C. more safe D. safest

6) Stainless steel bottles for water are … plastic ones. *(several answers possible)*
A. less dangerous than B. more dangerous than C. not so dangerous as D. not as dangerous as

10. Choose the right tense form of the verbs in the Active and the Passive Voices.

1) Several years ago, the leakage of dangerous chemical contaminants … place. *(to take place – происходить)*
A. was taking B. takes C. took D. had taken

2) Today the issue of adding chemicals containing fluoride … controversial.
A. are B. has been C. is D. is being

3) More and more communities … recycled water for non-drinking purposes such as industrial cooling or irrigation.
A. are using B. use C. will use D. used

4) Several years ago, the problem of the contamination of bottled water with harmful chemicals … .
A. was studying B. study C. had studied D. was studied

5) After filtration, the water ……. into a disinfection tank.
A. is moved B. moves C. is moving D. has been moved

11. Determine the function of the verbs "to be" and "to have" in the following sentences.

a. main verb (смысловой глагол)
b. auxiliary (вспомогательный глагол)

c. modal (модальный глагол)
d. linking verb (глагол-связка)

1. Tap water is considered more than just a convenience in our homes – it is to provide quality of life of any community, so water is central to our life.

2. We have to admit that experts have controversial views on the addition of chemicals containing fluoride to the tap water, and they haven't come to a common opinion.

3. Some time ago they had to test their bottled water for contamination to see if their product was satisfactory. They had negative results. By now nothing has resulted from their efforts to make their bottled water safe enough.

4. Factors such as the development of human society, social and technological progress have resulted in changing of water resources.

5. Water pollution is contamination of water by foreign matters.

6. Chlorine has limited effectiveness against protozoans that form cysts in the water.

12. Translate the following sentences with the construction **"THERE + TO BE".**

1) There are harmful, as well as relatively harmless substances in groundwater.

2) **There isn't** enough water even for everyday washing, cleaning, drinking, cooking, bathing and carrying away wastes in many countries of the world.

3) There will be the ever-present threat of fire in any community.

4) There were such metal ions as magnesium and iron in the water sample.

5) There are also some nonpathogenic microorganisms in water.

There is usually a wide variation in total water demand among different communities.

Conclusion

It is easy for us to take the quality of our drinking water for granted — when we turn on the tap, we expect safe, pleasant-tasting water to flow out. Long before water reaches our tap, carefully managed systems are in place protecting our water and making it safe to drink, from the water falling as rain to the point when it reaches our tap.

Safe water is essential to sustain life — we all have a responsibility to make every effort to ensure the quality of our drinking water.

Water is essential for life. Our health depends on having an adequate supply of safe water — every day.

It is important that we all take responsibility for the management of our water resources and work together with those responsible for the provision of drinking water to ensure its use is sustainable.

Water is important; let's work together to maintain this precious resource!

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