МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ МІСЬКОГО ГОСПОДАРСТВА імені О. М. БЕКЕТОВА

ЗБІРНИК ЗАВДАНЬ

для самостійної роботи
з дисципліни

«ІНОЗЕМНА МОВА»

(англійська мова)

(для студентів 2 курсу денної форми навчання освітньо-кваліфікаційного рівня бакалавр напряму підготовки 6.060103 «Гідротехніка (Водні ресурси)» та 6.060101 «Будівництво» спеціальності «Водопостачання та водовідведення»)

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CONTENT

INTRODUCTION

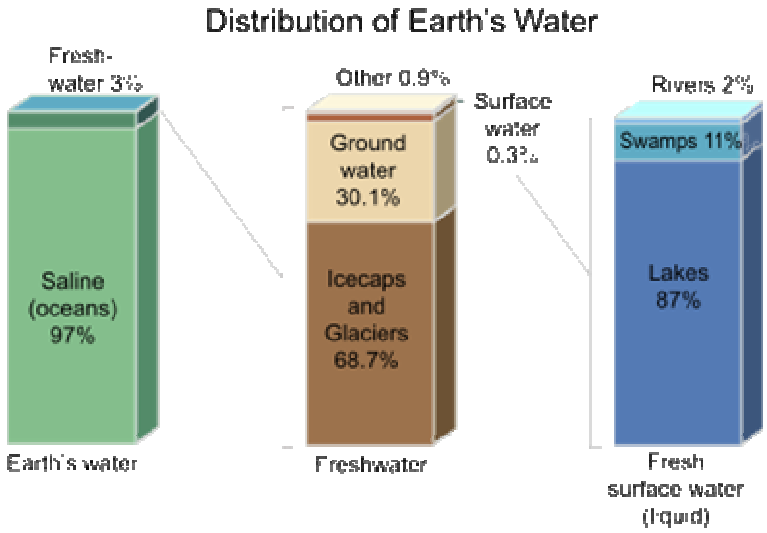
These educational materials are designed for the ESP students of the 2nd year of studies of the speciality “Water Supply and Distribution” to develop their knowledge and skills in technical English according to their profession.

This manual is based on the authentic texts from different sources concerning water supply and distribution problems. It contains the tasks for reading and translation, speaking, writing, vocabulary tasks, texts and tasks for summarizing. The manual consists of 5 units.

Each unit contains:

- pre-reading activity
- an authentic text for reading and translation;
- comprehension exercises;
- exercises for memorization and mastering key vocabulary;
- texts for summarizing.

UNIT 1
Water Resources



A graphical distribution of the locations of water on Earth.

Before reading the text, try to answer the following questions:

1. What do you think about the role of water in supporting the most part of living things on the Earth?
2. Could you imagine the Earth without water even for a week? Describe the changes happening to it.
3. Try to give the characteristics of water.

Water Resources

Water resources are sources of water that are useful or potentially useful.

They include agricultural, industrial, household, recreational and environmental activities.

Virtually all of these human uses require fresh water.

97% of the water on the Earth is salt water. However, only three percent is fresh water; slightly over two thirds of this is frozen in glaciers and polar ice caps. The remaining unfrozen fresh water is found mainly as groundwater, with only a small fraction present above ground or in the air.

Fresh water is a renewable resource, yet the world's supply of clean, fresh water is steadily decreasing. Water demand already exceeds supply in many parts of the world and as the world population continues to rise, so too does the water demand. Awareness of the global importance of preserving water for ecosystem services has only recently emerged as, during the 20th century, more than half the world’s wetlands have been lost along with their valuable environmental services for Water Education. The framework for allocating water resources to water users (where such a framework exists) is known as water rights.

1. Complete the sentences, using the text.

1. Water resources include .....
2. …….. is a renewable resource.
3. As the world population continues to rise, so .....
4. Human uses require only .....
5. Water rights .....

2. Give the Russian equivalents to the words and phrases:

household activities, valuable environmental services, allocating water resources, water rights, glaciers and polar ice caps, above ground or in the air, water demand, a renewable resource, world population.

Surface Water

Surface water is water in a river, lake or fresh water wetland. Surface water is naturally replenished by precipitation and naturally lost through discharge to the oceans, evaporation, evapotranspiration and sub-surface seepage.

Although the only natural input to any surface water system is precipitation within its watershed, the total quantity of water in that system at any given time is also dependent on many other factors. These factors include storage capacity in lakes, wetlands and artificial reservoirs, the permeability of the soil beneath these storage bodies, the runoff characteristics of the land in the watershed, the timing of the precipitation and local evaporation rates. All of these factors also affect the proportions of water loss.

Human activities can have a large and sometimes devastating impact on these factors. Humans often increase storage capacity by constructing reservoirs and decrease it by draining wetlands. Humans often increase runoff quantities and velocities by paving areas and channelizing stream flow.

The total quantity of water available at any given time is an important consideration. Some human water users have an intermittent need for water. For example, many farms require large quantities of water in the spring, and no water at all in the winter. To supply such a farm with water, a surface water system may require a large storage capacity to collect water throughout the year and release it in a short period of time. Other users have a continuous need for water, such as a power plant that requires water for cooling. To supply such a power plant with water, a surface water system only needs enough storage capacity to fill in when average stream flow is below the power plant's need.

Natural surface water can be augmented by importing surface water from another watershed through a canal or pipeline. It can also be artificially augmented from any of the other sources listed here; however in practice the quantities are negligible. Humans can also cause surface water to be "lost" (i.e. become unusable) through pollution.

Brazil is the country estimated to have the largest supply of fresh water in the world, followed by Russia and Canada.

1. ***Mark the sentences as True or False:***
    1. Precipitation is the only natural input to any surface water.
    2. The total quantity of water in the system at any given time is absolutely independent.
    3. Construction of reservoirs has a great impact on the proportions of water loss.
    4. Many farms require large quantities of water all the year round.
    5. European countries are estimated to have the largest supply of fresh water in the world.
2. ***Answer the questions:***
    1. What is surface water?
    2. What are the factors effecting the total quantity of water in the system?
    3. What is the difference in using water between a farm and a power plant?

Groundwater

Groundwater is water located beneath the ground surface. Groundwater is also often withdrawn for agricultural, municipal and industrial use by constructing and operating extraction wells. The study of the distribution and movement of groundwater is hydrogeology.

Groundwater makes up about twenty percent of the world's fresh water supply, which is about 0.61% of the entire world's water, including oceans and permanent ice. Global groundwater storage is roughly equal to the total amount of freshwater stored in the snow and ice pack, including the north and south poles.

Groundwater is also ecologically important. The importance of groundwater to ecosystems is often overlooked, even by freshwater biologists and ecologists. Ground waters sustain rivers, wetlands and lakes, as well as subterranean ecosystems.

The high specific heat capacity of water and the insulating effect of soil and rock can mitigate the effects of climate and maintain groundwater at a relatively steady temperature. In some places where groundwater temperatures are maintained by this effect at about 10°C, groundwater can be used for controlling the temperature inside structures at the surface. For example, during hot weather relatively cool groundwater can be pumped through radiators in a home and then returned to the ground in another well. During cold seasons, because it is relatively warm, the water can be used in the same way as a source of heat for heat pumps that is much more efficient than using air. The relatively constant temperature of groundwater can also be used for heat pumps.

Love Canal was one of the most widely known examples of groundwater pollution. In 1978, residents of the Love Canal neighborhood in upstate New York noticed high rates of cancer and an alarming number of birth defects. This was eventually traced to organic solvents and dioxins from an industrial landfill that the

neighbourhood had been built over and around, which had then infiltrated into the water supply and evaporated in basements to further contaminate the air. Eight hundred families were reimbursed for their homes and moved, after extensive legal battles and media coverage.

Another example of widespread groundwater pollution is in the Ganges Plain of northern India and Bangladesh where severe contamination of groundwater by naturally occurring arsenic affects 25% of water wells.

1. Give the Russian equivalents to the words and phrases:

is withdrawn, global groundwater storage, specific heat capacity of water, relatively constant temperature, high rates of cancer, birth defects, organic solvents, severe contamination.

2. Mark the sentences as True or False:

1. Groundwater is water located over the ground surface.
2. The study of the distribution and movement of groundwater is hydrogeology.
3. Groundwater makes up about thirty percent of the world's fresh water supply.
4. Groundwater is also geologically important.
5. Scientists often overlook the importance of groundwater to ecosystems.
6. Groundwater can be used for controlling the temperature beneath the surface.
7. Love Canal and the Ganges Plain of northern India and Bangladesh are widely known for groundwater pollution.

3. Answer the questions:

1. What is hydrogeology?
2. Is groundwater important to ecosystems?
3. What is Love Canal famous for?
4. What happened in the Ganges Plain of northern India and Bangladesh?

Use of Water

1. It is estimated that 15% of worldwide water use is industrial. Major industrial users include power plants, which use water for cooling or as a power source, ore and oil refineries, which use water in chemical processes, and manufacturing plants, which use water as a solvent. The portion of industrial water usage that is consumptive varies widely, but as a whole is lower than agricultural use. Water is used in power generation. Hydroelectricity is electricity obtained from hydropower. It is a low-cost, non-polluting, renewable energy source. The energy is supplied by the sun. Heat from the sun evaporates water, which condenses as rain in higher altitudes, from where it flows down.

Water is also used in many industrial processes and machines, such as the steam turbine and heat exchanger, in addition to its use as a chemical solvent.

2. It is estimated that 15% of worldwide water use is for household purposes. These include drinking water, bathing, cooking, sanitation, and gardening. Basic household water requirements have been estimated at around 50 liters per person per day, excluding water for gardens. Drinking water is water that is of sufficiently high quality so that it can be consumed or used without risk of immediate or long term harm. Such water is commonly called potable water. In most developed countries, the water supplied to households, commerce and industry is all of drinking water standard even though only a very small proportion is actually consumed or used in food preparation.

3. Recreational water use is usually a very small but growing percentage of total water use. Recreational water use is mostly tied to reservoirs. If a reservoir is kept fuller than it would otherwise be for recreation, then the water retained could be categorized as recreational usage. Release of water from a few reservoirs is also timed to enhance boating, which also could be considered a recreational usage. Other examples are anglers, water skiers, nature enthusiasts and swimmers.

In 2000, the world population was 6.2 billion. The UN estimates that by 2050 there will be an additional 3.5 billion people with most of the growth in developing countries that already suffer water stress. Thus, water demand will increase unless there are corresponding increases in water conservation and recycling of this vital resource.

4. Business activity ranging from industrialization to services such as tourism and entertainment continues to expand rapidly. This expansion requires increased water services including both supply and sanitation, which can lead to more pressure on water resources and natural ecosystems.

5. The trend towards urbanization is accelerating. Small private wells and septic tanks that work well in low-density communities are not feasible within high-density urban areas. Urbanization requires significant investment in water infrastructure in order to deliver water to individuals and to process the concentrations of wastewater – both from individuals and from business. These polluted and contaminated waters must be treated or they pose unacceptable public health risks.

6. Climate change could have significant impacts on water resources around the world because of the close connections between the climate and hydrologic cycle. Rising temperatures will increase evaporation and lead to increases in precipitation, though there will be regional variations in rainfall. Overall, the global supply of freshwater will increase. Both droughts and floods may become more frequent in different regions at different times, and dramatic changes in snowfall and snowmelt are expected in mountainous areas. Higher temperatures will also affect water quality in ways that are not well understood. Possible impacts include increased eutrophication. Climate change could also mean an increase in demand for farm irrigation, garden sprinklers, and perhaps even swimming pools.

1. Answer the questions:

1. What is the percentage of worldwide water use for industrial purposes?
2. What kind of activities do household purposes include?

3. In what way power plants, ore and oil refineries, and manufacturing plants use water?
4. Why expanding business activity requires increased water services?
5. What do you know about climate change? Is it so dramatic in your own country?

2. Match the following words with definitions:

Household	an overflow or accumulation of an expanse of water that submerges land.
Industrialization	treatment of water
Flood	the basic systems or equipment needed for an industry or business to operate successfully
Infrastructure	an extended period of months or years when a region notes a deficiency in its water supply
Renewable	the fertilization of surface water by nutrients
Sanitation	will continue to exist or will grow again and are therefore never used up
Urbanization	the business of films, TV, theatre productions
Eutrophication	building houses or towns in the countryside
Drought	connected with looking after a house and the people in it
Entertainment	developing a lot of industry

3. Put the words in to the gaps:

1. Higher temperatures will also affect _____ in ways that are not well understood.
2. Urbanization requires _____ in water infrastructure in order to deliver water to _____.
3. _____ can lead to more pressure on water resources and natural ecosystems.
4. Household purposes include_____.
5. Hydroelectricity is electricity obtained from_____.
6. Water is used in power_____.
7. Climate change could mean an increase in_____.
8. Water is also used in _____and machines, such as the steam turbine and heat exchanger, in addition to its use as a chemical solvent.
9. Polluted and contaminated waters must be treated_____.
10. Heat from the sun _____water.

4. Match the headings with the correct paragraph:

1. Water supply to households.
2. Expansion of business activity.
3. Significant impacts of climate change.
4. Industrial water usage.
5. Rapid urbanization.

Water Quality

Water quality is the physical, chemical and biological characteristics of water. The most common standards used to assess water quality relate to drinking water, safety of human contact and for the health of ecosystems.

In the setting of standards, agencies make political and technical/scientific decisions about how the water will be used. In the case of natural water bodies, they also make some reasonable estimate of pristine conditions. Different uses raise different concerns and therefore different standards are considered. Natural water bodies will vary in response to environmental conditions. Environmental scientists work to understand how these systems function which in turn helps to identify the sources and fates of contaminants. Environmental lawyers and policy makers work to define legislation that ensures that water is maintained at an appropriate quality for its identified use.

The vast majority of surface water on the planet is neither potable nor toxic. In fact, water quality is a very complex subject, in part because water is a complex medium intrinsically tied to the ecology of the Earth. Industrial pollution is a major cause of water pollution, as well as runoff from agricultural areas, urban storm water runoff and discharge of treated and untreated sewage (especially in developing countries).

The parameters for water quality are determined by the intended use. Work in the area of water quality tends to be focused on water that is treated for human consumption or in the environment.

Contaminants that may be in untreated water include microorganisms such as viruses and bacteria; inorganic contaminants such as salts and metals; pesticides and herbicides; organic chemical contaminants from industrial processes and petroleum use; and radioactive contaminants.

Water quality depends on the local geology and ecosystem, as well as human uses such as sewage dispersion, industrial pollution, use of water bodies as a heat sink, and overuse.

Some people use water purification technology to remove contaminants from the municipal water supply they get in their homes, or from local pumps or bodies of water. For people who get water from a local stream, lake, or aquifer (well), their drinking water is not filtered by the local government.

1. Give the Russian equivalents to the words and phrases:

to make technical/scientific decisions, reasonable estimate, environmental conditions, to define legislation, an appropriate quality, discharge of treated and untreated sewage, pesticides and herbicides, the local geology and ecosystem, water purification technology.

2. Answer the questions:

1. What is water quality? Which characteristics are used to test it?
2. Are there different standards of safety for different uses of water? Why?
3. What is the main cause of water pollution?
4. Which contaminants can be found in untreated water?
5. What does water quality depend on?
6. Is *water quality* a simple subject? Why?

3. Which statements are True (T) or false (F) according to the article?

1. Water quality depends on numerous factors.
2. The parameters for water quality are determined by the intended use.
3. Water is a complex medium separated from all Earth systems.
4. Industrial pollution is the major cause of water pollution.
5. Environmental scientists work hard to identify the sources and fates of contaminants.

Environmental Water Quality

Match the following words with their Russian equivalents:

1. toxic substances	A. первоначальный, прежний
2. landscape	B. достижение целей
3. achieving goals	C. жидкий кислород
4. alkalinity	D. землетрясения
5. dissolved oxygen	E. вымирающие виды
6. earthquakes	F. пейзаж
7. endangered species	G. токсичные вещества
8. designation	H. щёлочность
9. pristine	I. полив
10. irrigation	J. обозначение, определение

Environmental water quality, also called *ambient* water quality**,** relates to water bodies such as lakes, rivers, and oceans. Water quality standards vary significantly due to different environmental conditions, ecosystems, and intended human uses. Toxic substances and high populations of certain microorganisms can present a health hazard for non-drinking purposes such as irrigation, swimming, fishing, rafting, boating, and industrial uses. These conditions may also affect wildlife which uses the water for drinking or as a habitat. Modern water quality laws general specify protection of fisheries and recreational use and require as a minimum, retention of current quality standards.

There is some desire among the public to return water bodies to pristine or pre-industrial conditions. Most current environmental laws focus of the designation of uses. In some countries these allow for some water contamination as long as the particular type of contamination is not harmful to the designated uses. Given the landscape changes in the watersheds of many freshwater bodies, returning to pristine conditions would be a significant challenge. In these cases, environmental scientists focus on achieving goals for maintaining healthy eco-systems and may concentrate of the protection of populations of endangered species and protecting human health.

The complexity of water quality as a subject is reflected in the many types of measurements of water quality indicators. Some of the simple measurements listed below can be made on-site — temperature, pH, dissolved oxygen, conductivity, in direct contact with the water source in question. More complex measurements that must be made in a lab setting require a water sample to be collected, preserved, and analyzed at another location. Making these complex measurements can be expensive. Because direct measurements of water quality can be expensive, ongoing monitoring

programs are typically conducted by government agencies. However, there are local volunteer programs and resources available for some general assessment.

Inevitably after events such as earthquakes and Tsunamis, there is an immediate response by the aid agencies as relief operations get underway to try and restore basic infrastructure and provide the basic fundamental items that are necessary for survival and subsequent recovery. Access to clean drinking water and adequate sanitation is a priority at times like this. The threat of disease increases hugely due to the large numbers of people living close together, often in squalid conditions, and without proper sanitation.

After a natural disaster, as far as water quality testing is concerned there are widespread views on the best course of action to take and a variety of methods can be employed. There are a number of potable water test kits on the market widely used by aid and relief agencies for carrying out such testing.

The following is a list of indicators often measured by situational category for drinking water: alkalinity, color of water, pH, taste and odor, dissolved metals and salts (sodium, chloride, potassium, calcium, manganese, magnesium), microorganisms, dissolved metals and metalloids (lead, mercury, arsenic), dissolved organics, radon, heavy metals, pharmaceuticals and hormone analogs.

1. Answer the questions:

1. What is *ambient* water quality?
2. What do you know about the modern water quality laws?
3. What do the environmentalists do to protect water bodies?
4. What kinds of measurement do you know?
5. Which indicators are used to measure the quality of drinking water?

2. Complete the sentences, using the text:

1. Water quality standards vary_____
2. Toxic substances and high populations of certain microorganisms can present ____
3. Some of the simple measurements listed below can be made on-site_____
4. There are a number of potable water test kits_____
5. The following is a list of indicators often measured by situational category for drinking water: _____

3. Fill in the gaps:

1. Environmental water quality, also called_____**,** relates to water bodies such as lakes, rivers, and oceans.
2. These conditions may also affect _____which uses the water for drinking or as a habitat.
3. There is some desire among the _____ to return water bodies to pristine or pre-industrial conditions.

4. Environmental scientists focus on _____for maintaining_____.

UNIT 2

WSS Sector

History of WSS Sector

Match the following words with their Russian equivalents:

1. disposal	a) римляне
2. centralized	b) правительственные учреждения
3. aqueducts	c) городское планирование
4. distribute	d) большой город с пригородами
5. integration	e) распределять
6. conurbations	f) избавление, устранение
7. private carrier	g) частное транспортное средство
8. urban planning	h) водопровод, труба
9. governmental systems	i) объединение, укрупнение
10. the Romans	j) централизованный

The supply of water and its disposal has been managed in Europe for many centuries. Centralized water supply and sanitation started with the Romans who were responsible for the construction of aqueducts and systems to collect and distribute water. During the Middle Ages water was distributed through private carriers or/and organized through local communities or cities. The industrial revolution and the construction of modern industrialized conurbations in Europe was dependent upon managed water supplies. The United Kingdom was pioneered urban planning at that time.

The time of industrialization and development of cities (between 1800-1900) in terms of WSS is called the time of simple regime followed by the regimes of lower complexity between 1900-1950, medium (1980-1970), high complexity (1970-1985) and the era finally ended up in an so called attempt of integration from 1985 onwards. The terms reflect the approach of most (Western) European countries towards WSS at that time. It steadily developed from privately organized cooperation to governmental influenced systems. Together with water management in general, it nowadays comes back to private initiatives manifested in Public-Private cooperation.

Make up a summary of the text.

Water Supply Network

Match the following words with their Russian equivalents:

1. hydrologic components	a) необработанная питьевая вода
2. hydraulic components	b) удобрения
3. to provide water supply	c) гидрологические компоненты
4. a drainage basin	d) подземные трубы
5. underground aquifer	e) отдельная система
6. untreated drinking water	f) обеспечивать водоснабжением
7. water purification facilities	g) подземный водоносный слой
8. a separate system	h) гидравлические компоненты
9. underground pipes	i) возможности очистки воды

10. fertilizers j) бассейн (топограф.)

A water supply system or water supply network is a system of engineered hydrologic and hydraulic components which provide water supply. A water supply system typically includes:

1. A drainage basin;
2. A raw (untreated) water collection point (above or below ground) where the water accumulates, such as a lake, a river, or groundwater from an underground aquifer. Untreated drinking water (usually water being transferred to the water purification facilities) may be transferred using uncovered ground-level aqueducts, covered tunnels or underground water pipes;
3. Water purification facilities: treated water is transferred using water pipes (usually underground);
4. Water storage facilities such as reservoirs, water tanks, or water towers. Smaller water systems may store the water in cisterns or pressure vessels;
5. Additional water pressurizing components such as pumping stations may need to be situated at the outlet of underground or above ground reservoirs or cisterns;
6. A pipe network for distribution of water to the consumers (which may be private houses or industrial, commercial or institution establishments) and other usage points (such as fire hydrants).

Connections to the sewers (underground pipes, or aboveground ditches in some developing countries) are generally found downstream of the water consumers, but the sewer system is considered to be a separate system, rather than part of the water supply system.

Raw water (untreated) is collected from a surface water source (such as an intake on a lake or a river) or from a groundwater source (such as a water well drawing from an underground aquifer) within the watershed that provides the water resource.

Shallow dams and reservoirs are susceptible to outbreaks of toxic algae, especially if the water is warmed by a hot sun. The bacteria grow from stormwater runoff carrying fertilizer into the river where it acts as a nutrient for the algae. Such outbreaks render the water unfit for human consumption.

The raw water is transferred to the water purification facilities using uncovered aqueducts, covered tunnels or underground water pipes.

1. Answer the questions:

1. What is a water supply network?
2. What does it consist of?
3. What do you know about water storage facilities?
4. Where do we get raw water?
5. Why water purification is so important?

2. Ask as many questions to the text as possible. Use all types of questions.

3. Try to continue the sentences:

1. Water supply network is a system _____ .
2. Untreated drinking water may be transferred using _____ .
3. Water storage facilities are _____ .
4. A pipe network for distribution of water to the consumers may be _____ .

5. Shallow dams and reservoirs are susceptible to _____ .

Potable Water Supply

Match the following words with their Russian equivalents:

1. possible sources	a) отопление местности
2. domestic water systems	b) внутренние системы водоснабжения
3. contamination of drinking water	c) возможные источники
4. a domicile	d) приборы и устройства
5. district heating	e) кузнец
6. fixtures and appliances	f) обеспечение водоснабжением
7. to be estimated	g) разнообразие материалов
8. a running water supply	h) быть оцененным
9. a blacksmith	i) место проживания
10. a variety of materials	j) загрязнение питьевой воды

Potable water supply may come from several possible sources:

a) municipal water supply
b) water wells
c) delivered by truck
d) processed water from creeks, streams, rivers, lakes, rainwater, etc.

Domestic water systems have been evolving since people first located their homes near a running water supply, e.g., a stream or river. The water flow also allowed sending waste water away from the domiciles.

Modern indoor plumbing delivers clean, safe, potable water to each service point in the distribution system. It is imperative that the clean water not be contaminated by the waste water (disposal) side of the process system. Historically, this contamination of drinking water has been the largest killer of humans.

Domestic hot water is provided by means of water heater appliances, or through district heating. The hot water from these units is then piped to the various fixtures and appliances that require hot water, such as lavatories, sinks, bathtubs, showers, washing machines, and dishwashers.

Everything in a building that uses water falls under one of two categories: fixture or appliance. As the consumption points above perform their function, most produce waste/sewage components that will require removal by the waste/sewage side of the system. The minimum is an air gap. Fixtures are devices that use water without an additional source of power.

The earliest known evidence of drain tile being used for plumbing was found in Mesopotamia and is estimated to have been made around 3000 BC. The tiles were made from clay mixed with short lengths of straw. Both brass and copper pipes have been found in Egypt believed to have been made close to 2500 BC. The Romans made extensive use of lead pipe by joining sheets of lead into piping to carry their water supply and waste. During the Dark Ages following the fall of the Roman Empire, plumbing development virtually ceased for centuries except for isolated cases of plumbing installed in palaces and castles. In the 13th century, blacksmiths

formed sheets of iron and lap welded the seam to create iron pipe. Though it is unclear as to when galvanized iron pipe was first used, a French chemist named Melouin is credited with developing the process in 1742. The earliest known use forecast iron pipe is for the water supply to a fountain in Germany, built around 1560. In 1819 the first cast iron pipe constructed in the US, was manufactured in Weymouth, New Jersey. Before that time, cast iron pipe and fittings had to be imported from Europe. It was not until the 1960s that the hubless cast iron pipe was brought to the U.S. from Europe by way of Canada. During the early 1900s, heavy-walled copper joined with threaded fittings was in use, but limited to public buildings because of its high cost. However, during the 1930s Copper tube and fittings were developed which made copper economically feasible and increased its popularity. Polyvinyl Chloride (PVC) was produced experimentally in the 19th century but did not become practical to manufacture until 1926, when Waldo Semon of BF Goodrich Co. developed a method to plasticize PVC, making it easier to process. PVC pipe began to be manufactured in the 1940s and was in wide use during the reconstruction of Germany and Japan following WWII. Plastic supply pipes have become increasingly common, with a variety of materials and fittings employed, however plastic water pipes do not keep water as clean as copper and brass piping does. Copper pipe plumbing is bacteriostatic. This means that bacteria can't grow in the copper pipes.

The waste water from the various appliances, fixtures, and taps is transferred to the waste and sewage removal system via the sewage drain system. This system consists of larger diameter piping, water traps, and is well vented to prevent toxic gases from entering the living space. The plumbing drains and vents article discusses the topic further, and introduces sewage treatment.

1. Answer the questions:

1. What are the main possible sources of potable water supply?
2. What do you think about the history of domestic water systems? Is it ancient or modern one?
3. Why contamination of drinking water is considered to be the largest killer of humans?
4. Explain how domestic hot water is provided to the buildings?
5. When was the first iron pipe fixed?

2. Match the headings with the paragraphs:

a) Waste water
b) Potable water supply
c) Pipe materials
d) Hot water supply
e) Fixtures and appliances

3. Fill in the gaps:

1. _____ delivers clean, safe, potable water to each service point in the distribution system.

2. Historically, _____ of drinking water has been the largest killer of humans.
3. _____ of drain tile being used for plumbing was found in Mesopotamia and is _____to have been made around 3000 BC.
4. In the 13th century, blacksmiths formed _____ and lap welded the seam to_____.
5. _____ consists of larger diameter piping, water traps, and is well vented to prevent toxic gases from entering the living space.

Water As a Critical Resource

Match the following words with their Russian equivalents:

1. varied reasons	a) доступ к безопасной воде
2. prerequisite	b) требование
3. access to safe water	c) человеческое достоинство
4. physical and social health	d) предварительное условие
5. precipitation	e) выпадение осадков
6. human dignity	f) отдых, восстановление сил
7. contaminated water	g) различные причины
8. requirement	h) заражённая вода
9. starvation and death	i) физическое и социальное здоровье
10. recreation	j) голодание и смерть

Most importantly, fresh water is a fundamental requirement of all living organisms, crops, livestock and humanity included. The UNO considers access to it a basic human right and a prerequisite for peace. UN Secretary-General Kofi Annan stated in 2001, “Access to safe water is a fundamental human need and, therefore, a basic human right. Contaminated water jeopardizes both the physical and social health of all people. It is an affront to human dignity.” With increased development, many industries, including forestry, agriculture, mining, manufacturing and recreation require sizable additional amounts of freshwater to operate. This, however, has led to increases in air and water pollution, which in turn have reduced the quality of water supply. More sustainable development practices are advantageous and necessary.

According to the WHO, each human being requires a bare minimum of 20 litres of fresh water per day for basic hygiene; this equals 7.3 cubic metres per person, per year. Based on the availability, access and development of water supplies, the specific usage figures vary widely from country to country, with developed nations having existing systems to treat water for human consumption, and deliver it to every home. At the same time however, some nations across Latin America, parts of Asia, South East Asia, Africa and the Middle East either do not have sufficient water resources or have not developed these or the infrastructure to the levels required. This occurs for many varied reasons. It has resulted in conflict and often results in a reduced level or quantity of fresh water per capita consumption; this situation leads toward disease, and at times, to starvation and death.

The source of virtually all freshwater is precipitation from the atmosphere, in the form of mist, rain and snow, as part of the water cycle over eons, millennia and in the present day. Freshwater constitutes only 3% of all water on Earth, and of that, slightly over two thirds is stored frozen in glaciers and polar ice caps. The remaining unfrozen freshwater is mainly found as groundwater, with only a small fraction present in the air, or on the ground surface. Surface water is stored in wetlands or lakes or flows in a stream or river, and is the most commonly utilized resource for water. In places, surface water can be stored in a reservoir behind a dam, and then used for municipal and industrial water supply, for irrigation and to generate power in the form of hydroelectricity. Sub-surface groundwater, although stored in the pore space of soil and rock; it is utilized most as water flowing within aquifers below the water table. Groundwater can exist both as a renewable water system closely associated with surface water and as a separate, deep sub-surface water system in an aquifer. This latter case is sometimes called "fossil water", and is realistically non-renewable. Normally, groundwater is utilized where surface sources are unavailable or when surface supply distribution is limited.

1. Ask as many questions to the text as possible. Use all types of questions.

2. Fill in the gaps, using the text:

1. Fresh water is _____ of all living organisms, crops, livestock and humanity included.
2. Many industries, including _____, _____, _____, _____, _____ require sizable additional amounts of freshwater to operate.
3. Some nations across Latin America either do not have _____ _____ _____ or have not developed these or the infrastructure to the levels required.
4. _____ constitutes only 3% of all water on Earth.
5. _____ _____ is stored in wetlands or lakes or flows in a stream or river.

UNIT 3

Wastewater

Origins of Wastewater

1. Wastewater is any water that has been adversely affected in quality by anthropogenic influence. It comprises liquid waste discharged by domestic residences, commercial properties, industry, and/or agriculture and can encompass a wide range of potential contaminants and concentrations. In the most common usage, it refers to the municipal wastewater that contains a broad spectrum of contaminants resulting from the mixing of wastewaters from different sources.

2. Wastewater or sewage can come from:

Human waste: so called *black water* from lavatories; sewage treatment plant discharge; washing water, rainfall collected on roofs, yards.

Industrial waste: industrial site drainage, industrial process waters, organic, inorganic , extreme pH, agricultural drainage.

3. The composition of wastewater varies widely. This is a partial list of what it may contain: water (> 95%), pathogens, organic particles, inorganic particles, soluble inorganic material, animals, gases, emulsions, toxins.

4. Some industrial facilities generate ordinary domestic sewage that can be treated by municipal facilities. Industries that generate wastewater with high concentrations of conventional pollutants, toxic pollutants or other nonconventional pollutants such as ammonia need specialized treatment systems. Some of these facilities can install a pre-treatment system to remove the toxic components, and then send the partially-treated wastewater to the municipal system. Industries generating large volumes of wastewater typically operate their own complete on-site treatment systems.

Some industries have been successful at redesigning their manufacturing processes to reduce or eliminate pollutants, through a process called pollution prevention.

5. Sedimentation is often used as a primary stage in modern waste water treatment plant. Due to the large amount of reagent necessary to treat domestic wastewater, preliminary chemical coagulation and flocculation are generally not used, remaining suspended solids being reduced by following stages of the system.

6. Sediment (loose soil) washed off fields is the largest source of agricultural pollution in the United States. Farmers may utilize erosion controls to reduce runoff flows and retain soil on their fields. Common techniques include contour plowing, crop mulching, crop rotation, planting perennial crops and installing riparian buffers.

7. Nutrients (nitrogen and phosphorus) are typically applied to farmland as commercial fertilizer. Nutrients may also enter runoff from crop residues, irrigation water, wildlife, and atmospheric deposition. Farmers can develop and implement nutrient management plans to reduce excess application of nutrients.

1. Arrange the paragraph titles in the right order:

A. Agricultural wastewater.
B. Nutrient management.
C. Waste Water Treatment.
D. Wastewater constituents.
E. Wastewater origin.
F. Industrial wastewater.
G. Sedimentation.

2. Answer the questions:

1. What is wastewater?
2. What does wastewater consist of?
3. What is an origin of wastewater?
4. What do you know about nutrients?
5. What do some plants do to treat wastewater?

3. Match the following pollutants with their groups:

Pathogens	protozoa, insects, arthropods, small fish
Gases	paints, adhesives, mayonnaise, hair colourants
Emulsions	hairs, food, paper, plant materials
Organic particles	sand, metal particles, ceramics
Toxins	hydrogen sulphide, carbon dioxide, methane
Animals	ammonia, road-salt, sea-salt
Soluble inorganic material	bacteria, viruses and parasitic worms
Inorganic particles	pesticides, poisons, herbicides.

Sewage

Sewage is created by residences, institutions and commercial and industrial establishments. Raw sewage includes household waste liquid from toilets, baths, showers, kitchens, sinks that is disposed of via sewers. In many areas, sewage also includes liquid waste from industry and commerce.

The separation and draining of household waste into grey water and black water is becoming more common in the developed world, with grey water being permitted to be used for watering plants or recycled for flushing toilets. Municipal wastewater therefore includes residential, commercial, and industrial liquid waste discharges, and may include storm water runoff.

Domestic sewage is 99.9% pure water; the other 1% is pollutants. These pollutants although small, pose risk on a large scale. In urban areas, domestic sewage is typically treated by centralized sewage treatment plants. In the U.S., most of these plants are operated by local government agencies. Municipal treatment plants are designed to control conventional pollutants. Well-designed and operated systems can remove 90 percent or more of these pollutants. Some plants have additional sub-systems to treat nutrients and pathogens. Most municipal plants are not designed to treat toxic pollutants found in industrial wastewater.

Sewage systems capable of handling storm water are known as combined systems or combined sewers. Such systems are usually avoided since they complicate and thereby reduce the efficiency of sewage treatment plants owing to their seasonality. The variability in flow also leads to often larger than necessary, and subsequently more expensive, treatment facilities. In addition, heavy storms that contribute more flows than the treatment plant can handle may overwhelm the sewage treatment system, causing a spill or overflow. It is preferable to have a separate storm drain system for storm water in areas that are developed with sewer systems.

As rainfall runs over the surface of roofs and the ground, it may pick up various contaminants including soil particles and other sediment, heavy metals, organic compounds, animal waste, and oil and grease. Examples of treatment processes used for storm water include sedimentation basins, wetlands, buried concrete vaults with various kinds of filters, and vortex separators.

1. Answer the questions:

1. How sewage is created?
2. What does raw sewage consist of?
3. What is a combined sewer?
4. Do you know the examples of treatment processes used for storm water?

2. Match the words with their definitions:

organic compounds	to pass a substance through a system again for further treatment
contaminate	the precipitation in the form of raindrops
sewage	relating to living plants or animals
rainfall	any combination of two or more parts
compound	to make impure by touching or mixing, pollute
recycle	waste matter from domestic or industrial establishments

3. Complete the sentences:

1. Sewage is created by_____
2. Raw sewage includes_____
3. The separation and draining of household waste into grey water and black water is becoming _____
4. It is preferable to have a separate storm drain system for_____
5. Sewage systems capable of_____
6. Municipal wastewater therefore includes_____
7. Sewage also includes liquid waste from_____

4. Fill in the gaps with the words:

septic, sewage, pollutants, employ, control

1. Well-designed and operated systems can remove 90 percent or more of the_____.
2. Domestic sewage is typically treated by centralized_____ treatment plants.

3. Municipal treatment plants are designed to _____ conventional pollutants.
4. A household or business not served by a municipal treatment plant may have an individual_____ tank, which treats the wastewater on site and discharges into the soil.
5. Cities with sanitary sewer overflow _____one or more engineering approaches to reduce discharges of untreated sewage.

Sewage treatment. Process overview

Sewage treatment, or domestic wastewater treatment, is the process of removing contaminants from wastewater and household sewage, both runoff and domestic. It includes physical, chemical, and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce a waste stream and a solid waste or sludge suitable for discharge or reuse back into the environment. This material is often contaminated with many toxic organic and inorganic compounds.

To be effective, sewage must be conveyed to a treatment plant by appropriate pipes and infrastructure and the process itself must be subject to regulation and controls. Some wastewaters require different and sometimes specialized treatment methods. At the simplest level, treatment of sewage and most wastewaters is carried out through separation of solids from liquids, usually by settlement. By progressively converting dissolved material into solids, usually a biological flock which is then settled out, an effluent stream of increasing purity is produced.

Sewage can be treated close to where it is created, or collected and transported via a network of pipes and pump stations to a municipal treatment plant. Sewage collection and treatment is typically subject to local, state and federal regulations and standards. Industrial sources of wastewater often require specialized treatment processes. Conventional sewage treatment may involve three stages, called primary, secondary and tertiary treatment**.**

Primary treatment consists of temporarily holding the sewage in a quiescent basin where heavy solids can settle to the bottom while oil, grease and lighter solids float to the surface. The settled and floating materials are removed and the remaining liquid may be discharged or subjected to secondary treatment.

Secondary treatment removes dissolved and suspended biological matter. Secondary treatment is typically performed by indigenous, water-borne micro-organisms in a managed habitat. Secondary treatment may require a separation process to remove the micro-organisms from the treated water prior to discharge or tertiary treatment.

Tertiary treatment is sometimes defined as anything more than primary and secondary treatment. Treated water is sometimes disinfected chemically or physically prior to discharge into a stream, river, bay, lagoon or wetland, or it can be used for the irrigation of a golf course, green way or park. If it is sufficiently clean, it can also be used for groundwater recharge or agricultural purposes.

As of 2006, waterborne diseases are estimated to cause 1.8 million deaths each year. These deaths are attributable to inadequate public sanitation systems and it is clear that proper sewerage need to be installed**.**

Appropriate technology options in water treatment include both community-scale and household-scale point-of-use designs.

In order for the decrease of waterborne diseases to have long term effects, water treatment programs implemented by research and development groups in developing countries must be sustainable by its own residents. This can ensure the efficiency of such programs after the departure of the research team as monitoring is difficult because of the remoteness of many locations.

1. Answer the questions:

1. What is a sewage treatment?
2. What is the goal of this process?
3. What is a way to make sewage less dangerous for nature?
4. How many stages may conventional sewage treatment involve?
5. What is the reason for waterborne diseases to appear?

2. Fill in the gaps in the sentences, using the correct form of the verbs:

to convey, to call, to estimate, to require, to disinfect, to contaminate, to remove

1. Waterborne diseases _____to cause 1.8 million deaths each year.
2. Secondary treatment _____dissolved and suspended biological matter.
3. Conventional sewage treatment may involve three stages, _____primary, secondary and tertiary treatment.
4. Some wastewaters different and sometimes specialized treatment methods.
5. This material often _____ with many toxic organic and inorganic compounds.
6. To be effective, sewage must be _____ to a treatment plant.
7. Treated water sometimes _____ chemically or physically.

3. Decide whether the following statements are true or false, correct those ones which are false.

1. Secondary treatment is sometimes defined as anything more than primary and secondary treatment.
2. Sewage treatment includes just chemical and biological processes.
3. Conventional sewage treatment may involve three stages, called primary, secondary and tertiary treatment.
4. Treated water can be used for the irrigation of a golf course, green way or park.
   5. In order for the decrease of waterborne diseases to have long term effects, water treatment programs can be ignored by the residents.
6. Secondary treatment may require a separation process to remove the micro-organisms from the treated water prior to discharge.
7. The government should regulate and control the process of sewage treatment.
8. If treated water is sufficiently clean, it can be used for agricultural purposes.
9. Sewage must be transported to a treatment plant by appropriate pipes and infrastructure.
10. Appropriate technology options in water treatment include tree designs.

Sedimentation stages

Match the following words with their Russian equivalents.

1. tank	A. простейшие (микроорганизмы)
2. grease	B. растворимый
3. homogeneous liquid	C. смазочные вещества
4. mechanically driven scrapers	D. резервуар
5. saponification	E. осаждение, отложение осадка
6. biological content	F. омыление
7. biota	G. флора и фауна определённого района
8. soluble	H. однородная жидкость
9. protozoa	I. Разлагаемый
10. biodegradable	J. механические грейдеры (скребки)
11. sedimentation	K. биологический состав

In the primary sedimentation stage, sewage flows through large tanks, commonly called "primary clarifiers" or "primary sedimentation tanks". The tanks are large enough that sludge can settle and floating material such as grease and oils can rise to the surface and be skimmed off. The main purpose of the primary sedimentation stage is to produce both a generally homogeneous liquid capable of being treated biologically and a sludge that can be separately treated or processed. Primary settling tanks are usually equipped with mechanically driven scrapers that continually drive the collected sludge towards a hopper in the base of the tank from where it can be pumped to further sludge treatment stages. Grease and oil from the floating material can sometimes be recovered for saponification.

Secondary treatment is designed to substantially degrade the biological content of the sewage such as are derived from human waste, food waste, soaps and detergent. The majority of municipal plants treat the settled sewage liquor using aerobic biological processes. For this to be effective, the biota requires both oxygen and a substrate on which to live. There are a number of ways in which this is done. In all these methods, the bacteria and protozoa consume biodegradable soluble organic contaminants (sugars, fats, organic short-chain carbon molecules) and bind much of the less soluble fractions into floc.

The purpose of tertiary treatment is to provide a final treatment stage to raise the effluent quality before it is discharged to the receiving environment (sea, river, lake, ground). More than one tertiary treatment process may be used at any treatment plant. If disinfection is practiced, it is always the final process.

1. Answer the questions:

1. What is the main purpose of the primary sedimentation stage?
2. Why the tanks for the primary treatment should be of the large size?
3. How are the primary settling tanks usually equipped?
4. What is the main purpose of the secondary sedimentation stage?
5. Which way do the majority of municipal plants treat the settled sewage liquor?
6. What is the main purpose of tertiary treatment?
7. What biodegradable soluble organic contaminants do you know?

2. Fill in the gaps:

1. n the primary sedimentation stage, sewage flows through large tanks, commonly called _____ or _____.
2. he main purpose of the primary sedimentation stage is _____ both a generally homogeneous liquid and a sludge.
3. rease and oil from the floating material can sometimes be recovered _____.
4. econdary treatment is designed to substantially degrade the biological content of the sewage such as _____.
5. he biota requires both _____ and _____ on which to live.
6. he soluble organic contaminants are _____.
7. he receiving environment is _____.
8. f _____ is practiced, it is always the final process.

3. Try to define which stage of sedimentation these words are belong to:

Treatment	Process
primary	biodegradable, floc, human waste, aerobic biological processes, biota, oxygen, biological content
secondary	disinfection, final, effluent, discharge
tertiary	tanks, sludge, scrapers, homogeneous, floating material, saponification

Disinfection

The purpose of disinfection in the treatment of wastewater is to substantially reduce the number of microorganisms in the water to be discharged back into the environment. The effectiveness of disinfection depends on the quality of the water being treated (cloudiness, pH), the type of disinfection being used, the disinfectant dosage (concentration and time), and other environmental variables. Cloudy water will be treated less successfully since solid matter can shield organisms, especially from ultraviolet light or if contact times are low. Generally, short contact times, low doses and high flows all militate against effective disinfection. Common methods of disinfection include ozone, chlorine, or ultraviolet light.

Chlorination remains the most common form of wastewater disinfection in North America due to its low cost and long-term history of effectiveness.

Ultraviolet (UV) light can be used instead of chlorine, iodine, or other chemicals. Because no chemicals are used, the treated water has no adverse effect on organisms that later consume it, as may be the case with other methods. UV radiation causes damage to the genetic structure of bacteria, viruses, and other pathogens, making them incapable of reproduction. The key disadvantages of UV disinfection are the need for frequent lamp maintenance and replacement and the need for a highly treated effluent to ensure that the target microorganisms are not shielded from the UV radiation. In the United Kingdom, light is becoming the most common means of disinfection because of the concerns about the impacts of chlorine in chlorinating residual organics in the wastewater and in chlorinating organics in the receiving water.

1. Answer the questions:

1. What is the purpose of disinfection?
2. What does the effectiveness of disinfection depend on?
3. What parameters does a disinfectant dosage contain of?
4. Ozone, chlorine, or ultraviolet light are the common methods of disinfection, aren`t they?
5. Why does chlorination remain the most common form of wastewater disinfection in North America?
6. What are the key disadvantages of UV disinfection?
7. Why in the United Kingdom scientists prefer light as the most common means of disinfection?

2. Complete the sentences:

1. The purpose of disinfection in the treatment of wastewater is _____.
2. The effectiveness of disinfection depends on _____ .
3. The disinfectant dosage is _____ .
4. Common methods of disinfection include _____ .
5. Chlorination remains the most common form of wastewater disinfection in North America due _____ .
6. Ultraviolet (UV) light can be used instead of _____ .
7. UV radiation causes damage to _____ .
8. The key disadvantages of UV disinfection are _____ .
9. In the United Kingdom, light is becoming the most common means of disinfection because of _____.

UNIT 4
Water Politics

Classifications of Water Conflict Causes

Match the following words with their Russian equivalents:

1. transboundary	a) население земного шара
2. interactions	b) научные усилия
3. extremes	c) Всемирная Торговая Организация
4. cooperative	d) сельскохозяйственная торговля
5. scientific efforts	e) нехватка воды

6. global population	f) взаимодействие
7. World Trade Organization	g) внутригосударственный конфликт
8. agricultural trade	h) совместный
9. water shortages	i) заграничный
10. intrastate conflict	j) противоположность, крайность

According to Aaron Wolf there were 1831 water conflicts over transboundary basins from 1950–2000. They categorized these events as following:

1. No water-related events on the extremes
2. Most interactions are cooperative
3. Most interactions are mild
4. Water acts as irritant
5. Water acts as unifier
6. Nations cooperate over a wide variety of issues
7. Nations conflict over quantity and infrastructure.

International organizations play the largest role in mediating water disputes and improving water management. From scientific efforts to quantify water pollution, to the World Trade Organization's efforts to resolve trade disputes between nations, the varying types of water disputes can be addressed through current framework. Yet water conflicts that go unresolved become more dangerous as water becomes more scarce and global population increases.

The World Trade Organization can arbitrate water disputes presented by its member states when the disputes are commercial in nature. The WTO has certain groups, such as its Fisheries Center, that work to monitor and rule on relevant cases, although it is by no means the authority on conflict over water resources.

Because water is so central to agricultural trade, water disputes may be subtly implicated in WTO cases in the form of virtual water; water used in the production of goods and services but not directly traded between countries. Countries with greater access to water supplies may fare better from an economic standpoint than those facing crisis, which creates the potential for conflict. Outraged by agriculture subsidies that displace domestic produce, countries facing water shortages bring their case to the WTO.

The WTO plays more of a role in agriculturally-based disputes that are relevant to conflict over specific sources of water. Still, it provides an important framework that shapes the way water will play into future economic disputes. One school of thought entertains the notion of war over water, the ultimate progression of an unresolved water dispute—scarce water resources combined with the pressure of exponentially increasing population may outstrip the ability of the WTO to maintain civility in trade issues.

Water conflicts can occur on the intrastate and interstate levels. Interstate conflicts occur between two or more neighboring countries that share a transboundary water source, such as a river, sea, or groundwater basin. For example, the Middle East has only 1% of the world's freshwater shared among 5% of the world's population. Intrastate conflicts take place between two of more parties in the same

country. An example would be the conflicts between farmers and industry (agricultural is industrial use of water).

According to UNESCO, the current interstate conflicts occur mainly in the Middle East (disputes stemming from the Euphrates and Tigris Rivers among Turkey, Syria, and Iraq; and the Jordan River conflict among Israel, Lebanon, Jordan and the Palestine territories), in Africa (Nile River-related conflicts among Egypt, Ethiopia, and Sudan), as well as in Central Asia (the Aral Sea conflict among Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan and Kyrgyzstan). At a local level, a remarkable example is the 2000 Cochabamba protests, depicted in the 2010 Spanish film Even the Rain by Iciar Bollain.

Some analysts estimate that due to an increase in human consumption of water resources, water conflicts will become increasingly common in the near future.

1. Ask as many questions to the text as possible. Use all types of questions.

2. Match the headings with the paragraphs:

a) World Trade Organization
b) Notable conflicts
c) Response
d) Intrastate and interstate conflicts

3. Match the following words with their meanings:

1) interactions	a) something is less than expected or requires
2) irritant	b) a mutual action
3) cooperative	c) a great assortment
4) variety	d) involving the joint activity of two or more
5) shortages	e) something that causes annoyance

Water Politics

1. Read English words and phrases with their Russian equivalents:

Water politics –	политика использования воды
quantity and quality –	количество и качество
limited availability –	ограниченная доступность
mass consumption –	массовое потребление
strategic natural resource –	стратегический природный ресурс
contaminated water –	заражённая вода
minimal hygiene –	минимальная гигиена
tangible health benefits –	заметная польза для здоровья
sewage disposal –	сброс сточных вод
water-related diseases –	заболевания, связанные с качеством воды
high-tech manufacturing –	предприятия с высокими технологиями

Water politics, sometimes called hydropolitics, is politics affected by the availability of water and water resources, a necessity for all life forms and human development.

The availability of drinking water per capita is inadequate and shrinking worldwide. The causes, related to both quantity and quality, are many and varied;

they include local scarcity, limited availability and population pressures, but also human activities of mass consumption, misuse, environmental degradation and water pollution, as well as climate change. Water's essential nature makes it a strategic natural resource globally, and in its absence, an important element of political conflicts in many areas, historically. With decreasing availability and increasing demand for water, some have predicted that clean water will become the "next oil"; making countries like Canada, Chile, Norway, Colombia and Peru, with this resource in abundance, the water-rich countries in the world. The UN World Water Development Report (WWDR) from the World Water Assessment Program indicates that, in the next 20 years, the quantity of water available to everyone is predicted to decrease by 30%. Currently, 40% of the world's inhabitants have insufficient fresh water for minimal hygiene. More than 2.2 million people died in 2000 from diseases related to the consumption of contaminated water or drought. In 2004, the UK charity Water Aid reported that a child dies every 15 seconds from easily preventable water-related diseases; often this means lack of sewage disposal; see toilet. The United Nations Development Programmer sums up world water distribution in the 2006 development report: "One part of the world sustains a designer bottled water market that generates no tangible health benefits; another part suffers acute public health risks because people have to drink water from drains or from lakes and rivers." Fresh water — now more precious than ever in our history for its extensive use in agriculture, high-tech manufacturing, and energy production — is increasingly receiving attention as a resource requiring better management and sustainable use.

Riparian water rights have become issues of international diplomacy, in addition to domestic and regional water rights and politics. World Bank Vice President Ismail Serageldin predicted, "Many of the wars of the 20th century were about oil, but wars of the 21st century will be over water". This is debated by some, however, who argue that disputes over water usually are resolved by diplomacy and do not turn into wars

1. Answer the questions:

1. What is hydropolitics?
2. What are the causes, related to both water quantity and quality?
3. What do you think about water pollution? Is it really so dangerous?
4. What is the statistics on people`s death because of the water shortage or its contamination?
5. What does the UN World Water Development Report indicate about next 20 years?

2. Fill in the gaps:

1. Water politics is politics affected by _____ .
2. The availability of drinking water per capita is _____ .
3. The causes, related to both _____ of water, are _____.
4. More than _____ died in 2000 from diseases related to the consumption of contaminated water or drought.
5. With _____ availability and _____ demand for water, some have predicted that clean water will become the "next oil".

Water Politics by Country

Translate the following words and expressions:

per year, water consumption per capita, an average person, amount of water, an important strategic resource, the Arabian Peninsula, to decrease their overall water use, an international border.

With nearly 2,000 cubic metres of water used per person per year, the United States leads the world in water consumption per capita. Among the developed countries, the U.S. is highest in water consumption, then Canada with 1,600 cubic meters of water per person per year, which is about twice the amount of water used by the average person from France, three times as much as the average German, and almost eight times as much as the average Dane. In contrast, nine nations were able to decrease their overall water use since 1980 (Sweden, the Netherlands, the United States, the United Kingdom, the Czech Republic, Luxembourg, Poland, Finland and Denmark).

In Mexico City, an estimated 40% of the city's water is lost through leaky pipes built at the turn of the 20th century.

In the Middle East, water is an important strategic resource and political issue. By 2025, it is predicted that the countries of the Arabian Peninsula will be using more than double the amount of water naturally available to them. According to a report by the Arab League, two-thirds of Arab countries have less than 1,000 cubic meters of water per person per year available, which is considered the limit.

Within the Middle East, all major rivers cross at least one international border, with rivers like the Tigris and Euphrates crossing through three major Middle Eastern nations. This means that the nations, cities and towns downstream from the next are hugely affected by the actions and decisions of other groups they have little practical control over. In particular this is evident with the cutting of water supply from one nation to the next, just as issues of air pollution affect the states surrounding that which is producing the pollution initially. It is believed that up to 50% of water required for any specific state within the Middle East finds its source in another state.

With substantial, but falling rates of fertility, the issue of water distribution in the Middle East will not be easily dismissed.

In South America, the Guarani Aquifer, located between the countries of Argentina, Brazil, Bolivia and Paraguay, with a volume of about 40,000 km, is an important source of fresh potable water for all four countries.

2. Fill in the gaps:

1. Among the developed countries, the U.S. is _____in water consumption, with nearly _____ of water used per person per year.
2. _____ , _____, _____, _____, _____ were able to decrease their overall water use since 1980.
3. In the Middle East, water is an important _____ _____ and _____ issue.

4. Two-thirds of Arab countries have less than _____ _____ _____ of water per person per year available.
5. The Guarani Aquifer, located between the countries of Argentina, Brazil, Bolivia and Paraguay, is an important source of fresh potable water for all four countries.

3. Ask as many questions to the text as possible. Use all types of questions

Water Supply and Sanitation (WSS) in Spain

Read and translate words and phrases:

universal access, mixed private-public water companies, half of the population, municipality, a market share, seawater desalination, urban population, rural population , policy and regulation functions, undertaking hydrological studies.

Water supply and sanitation in Spain is characterized by universal access and generally good service quality, while tariffs are among the lowest in the EU. Almost half of the population is served by private or mixed private-public water companies, which operate under concession contracts with municipalities. The largest of the private water companies, with a market share of about 50% of the private concessions, is Aguas de Barcelona. However, the large cities are all served by public companies except Barcelona and Valencia.

Droughts affect water supply in Southern Spain, which increasingly is turning towards seawater desalination to meet its water needs.

Access to water supply and sanitation in Spain is universal. 98% of the urban population and 93% of the rural population is connected to sewers, while the remainder is served by on-site sanitation systems such as septic tanks.

Data about water sources and use vary according to the source of information. According to the utility association, about 74% of municipal water supply originates in surface water, only 19% in groundwater, and 7% in springs and desalination. This figure may include non-revenue water.

About 20% of treated wastewater in Spain is being reused, primarily for irrigation and landscaping.

A cornerstone of the legal framework for water supply and sanitation is the 1985 Water Law. Policy and regulation functions for water supply and sanitation are shared among various Ministries. For example, the Ministry of Environment is in charge of water resources management and the Ministry of Health is in charge of drinking water quality monitoring.

Basin Agencies are in charge of planning, constructing and operating major water infrastructure such as dams; elaborating basin plans; setting water quality targets, as well as monitoring and enforcing them; granting permits to use water, as well as inspecting water facilities for which permits were granted; undertaking hydrological studies; and to provide advisory services to other entities at their request. Basin Agencies are headed by a President who is nominated by the Cabinet at the proposal of the Minister of Environment. Each agency has a Board, a user assembly and a council to ensure broad participation by various stakeholders in its decision-making process, both in planning and operations. There are a total of 15

Basin Agencies in Spain for rivers that flow through more than one autonomous community. If a river runs entirely within the territory of an autonomous community the water administration of the respective autonomous community, instead of one of the basin agencies, is in charge of managing its water resources. This is the case in Galicia, Cataluna, the Balearic Islands, the Canary Islands, the Basque country and Andalusia.

While basin agencies do not provide water and sanitation services, they play an important role in determining the framework for the provision of such services.

Service provision is the responsibility of the more than 8,000 municipalities of Spain. Municipalities can provide services directly or through a municipal public company (54% of market share), or through concessions to a mixed public-private company (13%) or a private company (33%). In some cities water supply is the responsibility of a company, while sanitation services are provided directly by the municipality. This is the case, for example, in Barcelona and was the case in Madrid until 2008.

The main water service provider in Spain is Aguas de Barcelona (Agbar), a private company that provides water services to about 13 million people in more than 1,000 localities under concession contracts. Sewer services are provided to 8.25 million people in 365 localities, and wastewater treatment is carried out for 9.3 million people in 445 localities. The largest public water company is Canal Isabel II that serves the metropolitan area of Madrid.

The AEAS study says that a cup of coffee costs as much as 2.3 days of water supply. The average water and sanitation bill of Euro 191 per year accounts for only 0.6% of household expenditures.

92% of Spanish cities used increasing-block tariffs, i.e. the tariff per cubic meter increases as consumption increases. Many cities had a large fixed fee that included a consumption of between 60 and 180 cubic meter per year, thus providing no financial incentive to save water below this level.

The Ministry of Environment estimates the cost recovery for water supply and sanitation at "between 50% and 90%".

Spain spends €6,330 million annually on the capture, transport and extraction of underground water, plus water distribution and sanitation. However, the industry association estimates investments by its members, which supply water to 75% of the population, at "more than €290 million" annually.

The European Union is a major financier of the Spanish water and sanitation sector, both through grants by the European Commission and through loans from the European Investment Bank.

Match the headings with the paragraphs:

1. Investment.
2. Affordability.
3. General characteristics of WSS.
4. Financing.
5. Tariff structure.
6. Service provision.

7. Responsibility for water supply and sanitation.
8. Policy and regulation.
9. Links to water resources.

Fill in the gaps:

1. The largest of the_____ _____ _____, with a market share of about 50% of the private concessions, is Aguas de Barcelona.
2. _____ and _____ functions for water supply and sanitation are shared among various Ministries.
3. About _____% of municipal water supply originates in surface water, only _____ in groundwater, and 7% in springs and desalination.
4. _____ _____ is a major financier of the Spanish water and sanitation sector, both through grants by the _____ _____ and through loans from the_____ _____ _____ .

Water Supply and Sanitation (WSS) in Latin America

Match the following words with their Russian equivalents:

1. insufficient access	a) качество услуг
2. poor service quality	b) общественное здоровье
3. public health	c) поставщики услуг
4. financing of sanitation	d) доля населения
5. World Health Organization	e) недостаточный доступ
6. share of population	f) обильный , богатый
7. service providers	g) коммунальные услуги
8. abundant	h) жалкое качество услуг
9. utilities	i) финансирование
10. quality of service	j) Всемирная Организация Здоровья

Water supply and sanitation in Latin America is characterized by insufficient access and in many cases by poor service quality, with detrimental impacts on public health. Water and sanitation services are provided by a vast array of mostly local service providers under an often fragmented policy and regulatory framework. Financing of water and sanitation remains a serious challenge.

Access to water and sanitation remains insufficient, in particular in rural areas and for the poor. It also differs substantially among and within countries. According to the Joint Monitoring Program of the World Health Organization and UNICEF, in 2004 the share of population which was connected to an improved water source varied from 54% in Haiti to 100% in Uruguay. All together, 50 million people or 9% of the population of Latin America and the Caribbean did not have access to improved water supply, and 125 million or 23% did not have access to improved sanitation. Increasing access remains a challenge, in particular given the poor financial health of service providers and fiscal constraints on behalf of central and local governments.

As far as sanitation is concerned, only 51% of the population has access to sewers. Only an estimated 15% of the collected wastewater finds its way into

wastewater treatment plants, which often are not properly functioning. 26% of the population has access to forms of sanitation other than sewers, including septic tanks and various types of latrines, a level that is about as high as in the United States and almost twice as high as in Central Europe. The highest water use can be found in some utilities in Chile and Argentina, where water resources are abundant and water use is almost 500 liter/capita/day. The lowest water use is in the capital of Bolivia, with less than 50 liter/capita/day. In rural areas water use is sometimes even lower than this level.

Even for those having access to water supply, poor quality of service is often experienced, in the form of intermittent supply, low pressure and poor drinking water quality. However, differences in service quality between countries and between cities in Latin America are vast, and some service providers achieve a quality of service on par with developed countries.

Responsibility for water supply and sewerage service provision in Latin American countries is vested either in municipalities, or in regional or national companies. Municipalities are in charge of water and sanitation service provision in Brazil, Colombia, Ecuador, Guatemala, Mexico and Peru. While in most cases the companies are public, in a few notable cases they are mixed or private companies operating under concession, lease or management contracts. Chile and Venezuela are examples of countries that have created regional water companies; however, in the case of Venezuela, the United Nations reports that Venezuela remains one of the poorest in water service provision in this region. National public water and sewer companies, which have for the most part been created in the 1960s and 1970s, still exist in Costa Rica, the Dominican Republic, El Salvador, Haiti, Panama, Paraguay and Uruguay. About 90% of urban water and sanitation services in Latin America are provided by public entities. Many private concession contracts signed during the 1990s in Latin America have been either renegotiated or cancelled. Private and mixed companies, however, continue to provide services in many cities of Colombia, in most of Chile, some Brazilian cities, and in Guayaquil, Ecuador.

In rural areas, the provision of water services is usually the responsibility of community organizations.

Supporting the numerous community organizations that provide water and sanitation services in Latin America - mainly in rural areas - is a key public function that is often underestimated and neglected. Responsibility for this function, if it is defined at all, can be assigned to a government Ministry and its regional branches, a Social Fund or municipalities.

There are wide differences in the operational efficiency among urban water and sanitation utilities in Latin America. The two most common measures of operation efficiency are labor productivity and water losses. In terms of labor productivity, the most productive utilities have less than 2 employees per 1000 connections.

Without continuous supply, reliably good drinking water quality, and the prevention of sewer overflows, health is endangered and – especially if customer service is poor and billing complaints not resolved swiftly – it is difficult to justify a higher degree of cost recovery.

1. Answer the questions:

1. How would you characterize water supply and sanitation in Latin America?
2. What part of the population has access to sewers?
3. Which countries have the highest water use?
4. What is a government Ministry and its regional branches responsible for?
5. Are there any differences in the operational efficiency among urban water and sanitation utilities in Latin America?

2. Match the headings with the paragraphs:

a) Improving service quality.
b) Quality of service
c) Access to water and sanitation
d) Efficiency
e) Service provision
f) Features of water supply and sanitation in Latin America

3. Fill in the gaps:

1. Water _____and _____in Latin America is characterized by_____ .
2. In rural areas access to water and sanitation remains _____.
3. _____ million people or _____ of the population of Latin America and the Caribbean did not have access to _____.
4. _____ for water supply and sewerage service provision in Latin American countries is vested in municipalities or in _____or _____ companies.
5. _____ and_____ are examples of countries that have created regional water companies.
6. National public water and sewer companies still exist in _____ .
7. _____ are in charge of water and sanitation service provision in Brazil, Colombia, Ecuador, Guatemala, Mexico and Peru.
8. _____ continue to provide services in many cities of Colombia, in most of Chile, some Brazilian cities, and in Guayaquil, Ecuador.
9. There are _____ in the operational efficiency among urban water and sanitation utilities in Latin America.
10. It is difficult to justify _____ .

Water Treatment Situations In Different Countries

In the US and EU, uncontrolled discharges of wastewater to the environment are not permitted under law, and strict water quality requirements are to be met.

A significant threat in the coming decades will be the increasing uncontrolled discharges of wastewater within rapidly developing countries. In many developing countries the bulk of domestic and industrial wastewater is discharged without any treatment or after primary treatment only. In Latin America about 15% of collected wastewater passes through treatment plants. In Venezuela, 97 percent of the country's sewage is discharged raw into the environment.

In a relatively developed Middle Eastern country such as Iran, Tehran's majority of population has totally untreated sewage injected to the city's groundwater. In Israel, about 50 percent of agricultural water usage is provided through reclaimed sewer water. Future plans call for increased use of treated sewer water as well as more desalination plants.

Most of sub-Saharan Africa is without wastewater treatment.

Water utilities in developing countries are chronically underfunded because of low water tariffs, the inexistence of sanitation tariffs in many cases, low billing efficiency and low quality operational efficiency. In addition, wastewater treatment typically is the process within the utility that receives the least attention, partly because enforcement of environmental standards is poor. As a result of all these factors, operation and maintenance of many wastewater treatment plants is poor. Developing countries as diverse as Egypt, Algeria, China or Colombia have invested substantial sums in wastewater treatment without achieving a significant impact in terms of environmental improvement.

1. Answer the questions:

1. Is there any difference between the highly developed countries and developing ones in utility of wastewater?
2. Why do you think the bulk of domestic and industrial wastewater is discharged without any treatment in many developing countries?
3. In which Latin country the situation with discharging wastewater into the environment is the worst?
4. Why water utilities in developing countries are dramatically underfunded?
5. Which developing countries have made a progress investing substantial sums in wastewater treatment?

2. Decide whether the following statements are true or false, correct those ones which are false.

1. In Latin America about 15% of collected wastewater is discharged into the environment.
2. Operation and maintenance of many wastewater treatment plants in developing countries is poor.
3. In Israel, about 50 percent of agricultural water usage is injected to the city's groundwater.
4. Israel tends to maintain the enterprises for desalination of water.
5. Most of sub-Saharan Africa is with perfect wastewater treatment.

3. Make a short report about the wastewater treatment situation in your own country.

UNIT 5
POLLUTION.
FORMS OF POLLUTION

Pollution is the introduction of contaminants into an environment that causes instability, disorder, harm or discomfort to the ecosystem: physical systems or living organisms. Pollution can take the form of chemical substances, or energy, such as noise, heat, or light. Pollutants, the elements of pollution, can be foreign substances or energies, or naturally occurring; when naturally occurring, they are considered contaminants when they exceed natural levels.

The earliest known writings concerned with pollution were Arabic medical treatises written between the 9th and 13th centuries. King Edward I of England banned the burning of sea-coal by proclamation in London in 1272, after its smoke had become a problem. Air pollution would continue to be a problem in England, especially later during the industrial revolution.

It was the industrial revolution that gave birth to environmental pollution as we know it today. The emergence of great factories and consumption of immense quantities of coal and other fossil fuels gave rise to unprecedented air pollution and the large volume of industrial chemical discharges added to the growing load of untreated human waste. Chicago and Cincinnati were the first two American cities to enact laws ensuring cleaner air in 1881. Other cities followed around the country until early in the 20th century, when the short lived Office of Air Pollution was created under the Department of the Interior. Extreme smog events were experienced by the cities of Los Angeles and Donora, Pennsylvania in the late 1940s, serving as another public reminder.

The major forms of pollution are: air pollution, water pollution, soil contamination, littering, radioactive contamination, noise pollution, Light pollution, Visual pollution, thermal pollution, Pollution can also be the consequence of a natural disaster. For example, hurricanes often involve water contamination from sewage, and petrochemical spills from ruptured boats or automobiles.

Growing evidence of local and global pollution and an increasingly informed public over time have given rise to environmentalism and the environmental movement, which generally seek to limit human impact on the environment.

1. Answer the questions:

1. What is pollution?
2. What forms can pollution take of?
3. What historic period gave birth to environmental pollution? Why?
4. Which American cities were the first to regulate the air pollution?
5. Are modern people getting more aware of environment pollution?
6. Is there any role of mass media in supporting the environmental movement?

2. Match the forms of pollution with their definitions:

Air pollution	the release of chemicals by spill or underground leakage. Among the most significant contaminants are hydrocarbons, heavy metals, herbicides, pesticides and chlorinated hydrocarbons.
Water pollution	roadway noise, aircraft noise, industrial noise as well as high-intensity sonar.
Soil contamination	a small refuse or waste materials carelessly dropped, esp. in public places
Noise pollution	the release of chemicals and particulates into the atmosphere
Littering	a temperature change in natural water bodies caused by human influence, such as use of water as coolant in a power plant.
Light pollution	the presence of overhead power lines, motorway billboards, scarred landforms, open storage of trash or municipal solid waste.
Visual pollution	the release of waste products and contaminants into river drainage systems, liquid spills, wastewater discharges, eutrophication and littering.
Thermal pollution	light trespass, over-illumination and astronomical interference.

Water Pollution

Before reading the text answer the questions:

1. What do you know about pollution as a whole? What types of pollution do you know?
2. Are there any polluted bodies of water in your place?
3. How people in your place try to protect the environment? Have you ever taken part in the actions of such kind?

Water pollution is the contamination of water bodies such as lakes, rivers, oceans, and groundwater caused by human activities. Although natural phenomena such as volcanoes, storms, earthquakes also cause major changes in water quality and the ecological status of water, these are not deemed to be pollution.

All water pollution affects organisms and plants that live in these water bodies and in almost all cases the effect is damaging either to individual species and populations but also to the natural biological communities. It occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment to remove harmful constituents.

Water pollution is a major problem in the global context. It has been suggested that it is the leading worldwide cause of deaths and diseases, and that it accounts for the deaths of more than 14,000 people daily. An estimated 700 million Indians have no access to a proper toilet, and 1,000 Indian children die of diarrheal sickness every

day. Some 90% of China's cities suffer from some degree of water pollution, and nearly 500 million people lack access to safe drinking water. In addition to the acute problems of water pollution in developing countries, industrialized countries continue to struggle with pollution problems as well.

The governments of many countries have striven to find solutions to reduce this problem. Many pollutants threaten water supplies, but the most widespread, especially in underdeveloped countries, is the discharge of raw sewage into natural waters; this method of sewage disposal is the most common method in underdeveloped countries, but also is prevalent in quasi-developed countries such as China, India and Iran.

Sewage, sludge, garbage, and even toxic pollutants are all dumped into the water. Even if sewage is treated, problems still arise. Treated sewage forms sludge, which may be placed in landfills, spread out on land, incinerated or dumped at sea. In addition to sewage, nonpoint source pollution such as agricultural runoff is a significant source of pollution in some parts of the world, along with urban storm water runoff and chemical wastes dumped by industries and governments.

Water pollution has many causes and characteristics.

Industries discharge a variety of pollutants in their wastewater including heavy metals, organic toxins, oils, nutrients, and solids. Pollutants in water include a wide spectrum of chemicals, pathogens, and physical chemistry or sensory changes. Many of the chemical substances are toxic.

Discharges can also have thermal effects, especially those from power stations.

1. Answer the questions:

1. What is water pollution?
2. Why water pollution effects the whole natural biological communities?
3. Do you think governments are able to stop dumping the sewage, sludge, garbage and toxic pollutants into the water?
4. What is the situation in India, China and other developing countries?
5. Which natural phenomena also cause major changes in water quality?

2. Which statements are True (T) or false (F) according to the article?

1. The governments of many countries reduce this problem of pollution.
2. If sewage is treated, problems disappear.
3. Polluted water includes a wide spectrum of chemicals and pathogens.
4. 1,000 Indian children die of diarrheal sickness every week.

3. a) What do these numbers refer to?

90, 700, 14,000, 90%, 1,000

b) Make out questions to which the following numbers are answers.

Water Pollutants

Match the following words with Russian equivalents.

1. contaminants	A. моющие средства
2. pollutants	B. продукты гигиены
3. detergents	C. загрязняющие вещества
4. aquifers	D. разжижение, разбавление
5. electrical conductivity	E. заражающие вещества
6. hygiene products	F. всасывание, впитывание
7. transform	G. водоносный пласт
8. acidity	H. кислотность
9. dilution	I. электропроводимость
10. absorption	J. преобразовывать, превращать

The specific contaminants leading to pollution in water include a wide spectrum of chemicals, pathogens, and physical or sensory changes such as elevated temperature and discoloration. While many of the chemicals and substances that are regulated may be naturally occurring (calcium, sodium, iron, manganese) the concentration is often the key in determining what is a natural component of water, and what is a contaminant.

Many of the chemical substances are toxic. Pathogens can produce waterborne diseases in either human or animal hosts. Alteration of water's physical chemistry includes acidity (change in pH), electrical conductivity, temperature, and eutrophication. Eutrophication is the fertilization of surface water by nutrients that were previously scarce.

The microorganisms sometimes found in surface waters which have caused human health problems include: salmonella, viruses and parasitic worms.

Contaminants may include organic and inorganic substances.

Organic water pollutants include: detergents, food processing waste such as fats and grease, fuels such as gasoline, diesel fuel, jet fuels, motor oil, tree and bush debris from logging operations, various chemical compounds found in personal hygiene and cosmetic products.

Inorganic water pollutants include: acidity caused by industrial discharges, chemical waste as industrial by-products, fertilizers which are found in storm water runoff from agriculture, as well as commercial and residential use.

Most water pollutants are eventually carried by rivers into the oceans. In some areas of the world the influence can be traced hundred miles from the mouth by studies using hydrology transport models. Advanced computer models have been used in many locations worldwide to examine the fate of pollutants in aquatic systems.

Many chemicals undergo reactive decay or chemically change especially over long periods of time in groundwater reservoirs. Groundwater pollution is much more difficult to abate than surface pollution because groundwater can move great distances through unseen aquifers. Non-porous aquifers such as clays partially purify water of bacteria by simple filtration (absorption), dilution, and, in some cases,

chemical reactions and biological activity: however, in some cases, the pollutants merely transform to soil contaminants. Groundwater that moves through cracks and caverns is not filtered and can be transported as easily as surface water.

Water pollution may be analyzed through several broad categories of methods: physical, chemical and biological.

There are several ways to test water: physical, chemical, and biological.

Common physical tests of water include temperature, solids concentration and turbidity.

Water samples may be examined using the principles of analytical chemistry. Many published test methods are available for both organic and inorganic compounds. Frequently-used methods include pH, biochemical oxygen demand, chemical oxygen demand, nutrient, metals (including copper, zinc, cadmium, lead and mercury), oil and grease, total petroleum hydrocarbons, and pesticides.

Biological testing involves the use of plant, animal, and/or microbial indicators to monitor the health of an aquatic ecosystem.

1. Write down the endings of the following sentences:

1. Contaminants may include_____
2. Naturally occurring chemicals and substances are _____
3. Non-porous aquifers partially purify water of bacteria by_____
4. Groundwater can be transported _____
5. Organic water pollutants include_____
6. Alteration of water's physical chemistry includes_____

2. Put the questions to the text. Use different types of questions.

3. Fill in the gaps using the words:

computer, pollutants, analyzed, toxic, pollution, groundwater, aquatic

1. Most water _____are eventually carried by rivers into the oceans.
2. Many of the chemical substances are _____.
3. _____pollution is much more difficult to abate than surface _____because groundwater can move great distances through unseen aquifers.
4. Water pollution may be _____through several broad categories of methods.
5. Advanced _____ models have been used in many locations worldwide to examine the fate of pollutants in_____ systems.

4. Tell about the differences between the physical, chemical and biological ways of testing water. Which of them is the most difficult to provide?

Marine Pollution

Match the following words with their Russian equivalents:

1. marine pollution	A. сухогруз
2. residential waste	B. удушье
3. invasive organisms	C. ткань
4. nonpoint sources	D. загрязнение моря

5. devastating effects	E. организмы-захватчики
6. oil spills	F. отходы из жилых массивов
7. harmful algae	G. нефтяные пятна
8. suffocation	H. вредные водоросли
9. tissues	I. осколки, обломки
10. debris	J. опустошительный эффект

1. Marine pollution occurs when harmful effects can result from the entry into the ocean of chemicals, particles, industrial, agricultural and residential waste, noise, or the spread of invasive organisms. Most sources of marine pollution are land based. The pollution often comes from nonpoint sources such as agricultural runoff and windblown debris.

2. There are many different ways to categorize, and examine the inputs of pollution into our marine ecosystems. Generally there are three main types of inputs of pollution into the ocean: direct discharge of waste into the oceans, runoff into the waters due to rain, and pollutants that are released from the atmosphere.

3. Ships can pollute waterways and oceans in many ways. Oil spills can have devastating effects. While being toxic to marine life, the components in oil are very difficult to clean up, and last for years in the sediment and marine environment.

Discharge of cargo residues from bulk carriers can pollute ports, waterways and oceans. Ships create noise pollution that disturbs natural wildlife, and water from ballast tanks can spread harmful algae and other invasive species.

4. Discarded plastic bags, pack rings and other forms of plastic waste which finish up in the ocean present dangers to wildlife and fisheries. Aquatic life can be threatened through entanglement, suffocation, and ingestion. Fishing nets, usually made of plastic, can be left or lost in the ocean by fishermen. Known as ghost nets, these entangle fish, dolphins, sea turtles, sharks, dugongs, crocodiles, seabirds, crabs, and other creatures, restricting movement, causing starvation, laceration and infection, and, in those that need to return to the surface to breathe, suffocation.

5. Marine life can be susceptible to noise or sound pollution from sources such as passing ships, oil exploration seismic surveys. Sound travels more rapidly and over larger distances in the sea than in the atmosphere. Marine animals, such as cetaceans, often have weak eyesight, and live in a world largely defined by acoustic information. This applies also to many deeper sea fish, which live in a world of darkness. Between 1950 and 1975, ambient noise in the ocean increased by about ten decibels.

6. – Chinese and Russian industrial pollution such as phenols and heavy metals in the Amur River have devastated fish stocks and damaged its estuary soil.

– Wabamun Lake in Alberta, Canada, once the best whitefish lake in the area, now has unacceptable levels of heavy metals in its sediment and fish.

– Due to their high position in the food chain, mercury levels can be high in larger species such as bluefin and albacore. As a result, in March 2004 the United States issued guidelines recommending that pregnant women, nursing mothers and children limit their intake of tuna and other types of predatory fish.

– Some shellfish and crabs can survive polluted environments, accumulating heavy metals or toxins in their tissues. For example, mitten crabs have a remarkable

ability to survive in highly modified aquatic habitats, including polluted waters. The farming and harvesting of such species needs careful management if they are to be used as a food.

– Mining has a poor environmental track record. For example, according to the United States Environmental Protection Agency, mining has contaminated portions of the headwaters of over 40% of watersheds in the western continental US. Much of this pollution finishes up in the sea.

– Heavy metals enter the environment through oil spills or from other natural or anthropogenic sources.

7. Marine pollution is part of the problem of too much pollution by humans in general. There are only two ways to remedy this: either the human population is reduced, or the ecological footprint left behind by the average human is reduced. If we do not follow the second way, then the first way may be imposed upon us, as world ecosystems falter and cease to support us.

The second way is for us, individually, to consume and pollute less than we do currently. For this there must be social and political will, together with a shift in awareness, so more people respect their environment and are less disposed to abuse it.

8. At an operational level, regulations, and international government participation is needed. It is often very difficult to regulate marine pollution because pollution spreads over international barriers, thus making regulations hard to create as well as enforce.

9. Perhaps the most important strategy for reducing marine pollution is education. Most are unaware of the sources, and harmful effects of marine pollution, and therefore little is done to address the situation. In order to inform the population of all the facts, in depth research must be done to provide the full scale of the situation. Then this information must be made public.

1. Find out the titles for the paragraphs of the text:

1. Regulation of marine pollution.
2. Specific examples.
3. Strategy for reducing marine pollution
4. Noise pollution.
5. Solutions.
6. Main types of inputs of marine pollution.
7. Sources of marine pollution.
8. Plastic debris.
9. Pollution from ships.

2. Answer the questions:

1. What are the most sources of marine pollution?
2. What is noise pollution? Is it dangerous for humanity too? Why?
3. Why is plastic debris so dangerous to aquatic life?
4. What is the solution of the marine pollution problem?
5. What is the most important strategy for reducing marine pollution? Why education is so important in reducing any form of pollution?

3. Fill in the gaps with the words below:

regulations, agricultural runoff, to inform, full scale, noise pollution, inputs, aquatic life

1. The pollution often comes from nonpoint sources such as _____ and windblown debris.
2. Generally, there are three main types of _____ of pollution into the ocean.
3. Ships create _____ that disturbs natural wildlife, and water from ballast tanks can spread harmful algae and other invasive species.
4. _____can be threatened through entanglement, suffocation, and ingestion.
5. _____ and international government participation is needed.
6. In order _____ the population of all the facts, in depth research must be done to provide the _____ of the situation.

Effects of Pollution

Adverse air quality can kill many organisms including humans. Ozone pollution can cause respiratory disease, cardiovascular disease, throat inflammation, chest pain, and congestion. Water pollution causes approximately 14,000 deaths per day, mostly due to contamination of drinking water by untreated sewage in developing countries. As estimated 700 million Indians have no access to a proper toilet, and 1,000 Indian children die of diarrheal sickness every day. Nearly 500 million Chinese lack access to safe drinking water. 656,000 people die prematurely each year in China because of air pollution. In India, air pollution is believed to cause 527,700 fatalities a year. Studies have estimated that the number of people killed annually in the US could be over 50,000.

Oil spills can cause skin irritations and rashes. Noise pollution induces hearing loss, high blood pressure, stress, and sleep disturbance. Mercury has been linked to developmental deficits in children and neurologic symptoms. Older people are majorly exposed to diseases induced by air pollution. Those with heart or lung disorders are under additional risk. Children and infants are also at serious risk. Lead and other heavy metals have been shown to cause neurological problems. Chemical and radioactive substances can cause cancer and as well as birth defects.

Pollution has been found to be present widely in the environment. There are a number of effects of this:

– Sulphur dioxide and nitrogen oxides can cause acid rain which lowers the pH value of soil.

– Soil can become infertile and unsuitable for plants. This will affect other organisms in the food web.

– Smog and haze can reduce the amount of sunlight received by plants to carry out photosynthesis and leads to the production of troposphere ozone which damages plants.

– Invasive species can out compete native species and reduce biodiversity.

– The emission of greenhouse gases leads to global warming which affects ecosystems in many ways.

Carbon dioxide (CO_2), while vital for photosynthesis, is sometimes referred to as pollution, because raised levels of the gas in the atmosphere are affecting the Earth's climate. Disruption of the environment can also highlight the connection between areas of pollution that would normally be classified separately, such as those of water and air.

Pollution control is a term used in environmental management. It means the control of emissions and effluents into air, water or soil. Without pollution control, the waste products from consumption, heating, agriculture, mining, manufacturing, transportation and other human activities, whether they accumulate or disperse, will degrade the environment. In the hierarchy of controls, pollution prevention and waste minimization are more desirable than pollution control.

1. Answer the questions:

1. What are the effects of pollution on human health?
2. What is the situation in India and China due to terrible water supply system and air pollution?
3. What are the effects of pollution on environment?
4. Which form of pollution induces hearing loss, high blood pressure, stress, and sleep disturbance?
5. Which disease can cause chemical and radioactive substances?
6. Are the areas of pollution classified separately connected between?
7. What means pollution control?

2. Complete the sentences:

1. Ozone pollution can cause_____.
2. 1,000 Indian children die of _____ .
3. Nearly 500 million Chinese lack access to_____ .
4. Oil spills can cause _____ .
5. Lead and other heavy metals cause_____.
6. Smog and haze can reduce the amount_____.
7. The emission of greenhouse gases leads to_____.
8. Pollution control is a term used in_____.
9. Pollution control means the_____.
10. Carbon dioxide is sometimes referred to as _____.

3. Match the words with the definitions:

congestion	to bring notice or emphasis to
disperse	the act, process or industry of extracting coal, ores from the Earth
heating	to distribute over a wide area
manufacturing	the science or occupation of cultivating land; farming
mining	a tangible matter of which a thing consists
agriculture	the reaction of living tissue to injury or infection, characterized by heat, redness and pain

inflammation	the state of being overcrowded, overloaded
photosynthesis	a device or a system for supplying heat
highlight	the production of goods
substance	the synthesis of organic compounds from carbon dioxide and water using light energy

4. Match the heading with the paragraphs:

1. Pollution control.
2. The effects of pollution on environment.
3. The effects of greenhouse gases and global warming.
4. The effects of pollution on human health.

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