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Water is Life

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Учебное пособие разработано в соответствии с программой по иностранным языкам для неязыковых вузов. Включены аутентичные тексты по специальности, научно-популяр­ные статьи из зарубежных периодических изданий, а также упражнения, направленные на развитие навыков говорения, чтения и перевода оригинальной литературы в профессиональной сфере.

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**Unit 1**

**Water the Source of Life**

*“If you gave me several million years,*

*there would be nothing that did not grow in beauty,*

*if it were surrounded by water”.*

Jan Erik Vold, What All The World Knows, 1970

**Preface**

**Read the preface and answer the question: Why is water very important for life?**

The adult human body is about 50 to 65 percent water. A child’s body is approximately 75 percent water. The human brain is about 75 percent water. While the human body can live for weeks without food, it can only survive a few days without water. 220 million urban residents in the developing world lack a source of safe drinking water near their homes. Ninety percent of urban sewage in the developing world is discharged into rivers, lakes, and coastal water ways without any treatment. Agriculture consumes 60 to 80 percent of the fresh water resources in most countries, and as much as 90 percent in others.

Access to safe water is measured by the number of people who have a reasonable means of getting an adequate amount of water that is safe for drinking, washing, and essential household activities, expressed as a percentage of the total population. It reflects the health of a country’s people and the country’s capacity to collect, clean, and distribute water to consumers.

The Earth is seen from space as a blue planet not by chance. Life arose on the Earth owing to water. Even having left ocean for land, all living beings and plants have stayed inseparably linked with water. Water still serves as a basis for everything. A grown-up person consists of water by two-thirds. The constant presence of enough water in the organism determines the health-state of each person and so his life. It is through aquatic environment that the organism delivers nutrients to the cells, eliminates toxins and harmful substances, performs the daily “cleaning and purification” of the body. Water “greases” our vessels, regulates body temperature and provides normal digestion. People never notice the tremendous role of water in the life when it is continually within reach. But if one comes to find him/herself without water at least for several hours, even moisture becomes the greatest value then. We react to the slightest changes of water content in the organism very sharply. Experts are convinced that it is essential for a healthy person to drink about two litres of water daily.

**Notes:**

|  |  |  |  |
| --- | --- | --- | --- |
| Brain | | мозг | |
| Sewage | | сточные воды | |
| Owing to | | благодаря | |
| Nutrients | | питательные вещества | |
| Value | | ценность | |
| To grease | | смазывать сосуд | |
| To deliver | | доставлять | |
| To consume | | потреблять | |
| Cell | | клетка | |
| Eliminate | | уничтожать | |
| A resident | | житель | |
| Sharply | | остро | |
| Digestion | | пищеварение |
| To eliminate | | | уничтожать |

**Warming up**

**1. Arrange the words in categories as they relate to different water connected topics to form a semantic map:**

**Water cycle Water treatment Water pollution**

Rain, acid rain, bacteria, ice, substance, deposition, surface runoff, impurities, erosion, sewage, snow, distillation, droplets, wastewater, melting, chlorination, contamination, evaporation, sanitation, desalination, icecaps, mud, glaciers, filtration, conservation, sedimentation, respiration, precipitation, purification, turbidity, transpiration, distillation, liquid.

**2. Add some more words to each semantic map.**

**3. Quiz: What do you know about water?**

**How much of the water on earth is available to drink?**

95 %

26 %

1 %

**How much of your body is made up of water?**

75 %

95 %

6 %

**How much water should you drink daily for good health?**

1–2 glasses

3–4 glasses

6–8 glasses

**How long could you live without water?**

About one month

About seven days

One day

**A hundred years ago, earth had**

Much more water than there is now

A lot less water than there is now

The same amount there is now

**One half of the world's fresh water lies within the borders of one nation. That country is**

The USA

Canada

Russia

**Drinking water sources can be contaminated by**

Naturally occurring materials

Runoff from farm fields, parking lots and streets

All of the above

**Water that is safe to drink is called**

Potable

Piliated

Placoid

**What percentage of the world's population doesn't have access to clean water?**

38 %

17 %

2 %

**How many litres of water are needed to grow one kilogram of chicken?**

3.5 litres

3,500 litres

70,000 litres

**When water freezes it contracts (gets smaller).**

True

False

**In a water molecule, how is the charge distributed?**

Negatively on the hydrogen side and positively on the oxygen side

Neither of the above; water is nonpolar and has an evenly distributed charge.

Positively near the hydrogen atom and negatively near the oxygen atom

**What percentage of the Earth's water supply is fresh water?**

3 %

23 %

13 %

**4. Read the following quotations and translate them into Russian.**

“Water…“This has only two aspects; when mixed with anything its need and when not, it is life!

Water is its mater and matrix, mother and medium.

Water is the most extraordinary substance!

Practically all its properties are enormous, which enabled life to use it as building, material for its machinery.

Life is water dancing to the tune of solids”.

Albert Szent-Gyorgyi. (1972)

“Water is the driver of Nature”.

Leonardo da Vinci.

“Empty your mind, be formless, shapeless….like water…”

Bruce Lee.

**5. Which quotations do you agree/disagree with?**

**Reading for speaking and discussing**

1. **Give the Russian equivalents to the following**

**words:**

To provide, to include, sustaining, to abuse, to survive, sacred, precious, crucial, impart, to retain, mysterious, substance, alive, to dissolve, force, thus, to maintain, vital, to wrap, skin, vortex motion, to take for granted, to dew, stagnant, to approach, to increase, to spin, bulb, whirpool,

inherent.

**2. Guess the meaning of the following international words:**

Form, organism, source, basis, element, substance, harmony, energy, human, form, electrical, potency, literally, to regenerate, spiral, temperature, maximum, Celsius, characteristic, optimal, expert, to illuminate, principle, center,

concentrate.

**3. Read and translate the word combinations:**

To retain a harmony; to depend on water; to carry a sub tile electrical charge; to become stagnant; to expose to the air; to sustain life; glimmering threads of light; to lose absorbent ability; a whirling top; the vortex power of water.

**4. Read the text and say: a) what the headline of it means; b) why the word “magic” is used in the headline of the text.**

*Water…“This has only two aspects;*

*when mixed with anything its need and when not, it is life!”*

**Water – the Magic Source of Life**

Water is the basis for Creation of all Life. Today we know that since the beginning of life on earth all forms of life are born from water. The source and basis for life and survival for all organisms on earth is water. A sacred, cosmic element, water is our most precious and important food. Water is “blue gold,” because all living organisms depend on water. Our water quality is of crucial importance for sustaining life. The vitality and purity of water provide the foundation for the quality of health in all organisms. Water in its natural state retains a harmony and energy that is also part of the health that is imparts. This natural state and life energy retains a balance and order, which is passed to all life forms. Water sustains all forms of life, including human life.

Water is a mysterious substance yet we take it for granted. It is the most misunderstood and most abused element on Earth. Its chemical formula is H2O but that isn't all there is to it. Water is alive. It is the lifeblood of the Earth Water has its own living energy, and if water dies, our Earth dies with it.

Water makes up 60 to 70 % of our bodies. Minerals, proteins, sugars, and other substances dissolve in this water forming colloids, which carry a sub tile electrical charge. Thus water provides the electrical life force in all living things. Even dispersed into a fine mist, water continues to carry this vital life force, maintaining its potency and power. It is literally good to the last drop.

Since water is alive it continuously needs to regenerate itself by dewing in a spiral or vortex motion which we see in the shape of a tornado's funnel.

Water is the potent in its densest state at a temperature of 4 degrees Celsius. Above or below this magic temperature, water loses its maximum strength and absorbent ability. In its most potent form in forests or mountain streams, water is near 4 degrees Celsius but as it heats up, it becomes stagnant and powerless.

To be alive, water must be allowed, first, the freedom to flow in its characteristic spiral motion, and second, the freedom to approach its optimal cool temperature, of 4 degrees Celsius.

This rolling motion causes water to gather electrical force. As water moves across the Earth it cools itself and increases its internal power. Water stores this potential energy within itself and then gives the energy freely to all living things. Through this perpetual motion, water constantly exposes its “skin” to the air. Thus it constantly spins around upon itself like a whirling top.

Just like a spinster spinning her thread, Mother Nature attempts to twist water into a thread of life, which then becomes a sparkling strand of living electricity. We see this electricity as glimmering threads of light in swift mountain streams. Victor Schauberger an Austrian forester and expert on water, demonstrated how running water has the capacity to excite and illuminate light bulbs using this principle inherent in water.

The centripetal, inward-directed movement of water causes it to become rejuvenated and creates the sucking action evident in a whirlpool. As the water accelerates more toward the center of the vortex, the electrical potential increases to very high levels. This concentrated power within water can become the power of future technology – the vortex power of water.

**Notes:**

|  |  |
| --- | --- |
| Colloids | коллоиды |
| Subtile | утонченный |
| Mist | туман |
| Stagnant | застойный |
| Spinster | незамужняя женщина, старая дева |
| Vortex | вихрь |

**5. Find the words in the above text which match these definitions:**

1. A liquid without color or taste

2. A very small amount of liquid that forms a round shape

3. A small narrow river

4. All the plants, animals and things that exist in the universe that are not made by people

5. The ability to control people or things

6. The state of continuing to live or exist, often despite difficulty or danger

7. The state or quality of being pure

8. Energy and enthusiasm

**6. Explain the phrases from the text in your own words:**

1. To take for granted

2. To maintain potency

3. To be alive

4. To lose strength

5. To become stagnant and powerless

**7. What statement expresses the main idea of the text?**

1. Water sustains all forms of life, including human life.

2. The source and basis for life and survival for all organisms on earth is water.

3. The concentrated power within water can become the power of future technology – the vortex power of water.

**8. What statement answers the question: What does water need?**

1. Since water is alive it continuously needs to regenerate itself by dewing in a spiral or vortex motion.

2. To be alive, water needs the freedom to flow in its characteristic spiral motion.

3. Water needs the freedom to approach its optimal cool temperature of 4 degrees Celsius.

**9. What statement corresponds to the content of the text?**

1. Water stores the potential energy within itself which can become the power of future technology – the vortex power of water.

2. The water energy is given to all living things which retain a balance and order for sustaining life.

3. Running water has the capacity to excite and illuminate light bulbs that provide the foundation for the quality of health in all organisms.

**10. Complete the statement: A sacred, cosmic element, water …**

1. … becomes a sparkling strand of living electricity we see as glimmering threads of light in swift mountain streams

2. … a harmony and energy that is also part of the health that is imparts

3. … the most precious and important “blue gold” for all forms of life and lifeblood of the Earth”

**11. Write the summary of the text.**

**12. Retell the text “Water – the Magic Source of Life”**

**Reading for understanding**

**1. Read the text and answer the question: What is “safe” water and why is it important?**

**Safe Water**

Safe water includes treated surface water, as well as untreated but uncontaminated water from sources such as natural springs and sanitary wells. On average, a person needs about 20 liters of safe water each day to meet his or her metabolic, hygienic, and domestic needs. Without safe water, people cannot lead healthy, productive lives. For example, an estimated 900 million people suffer – and approximately 2 million die – from water-related diarrheal illnesses each year. Most, but not all, of these people live in low- and middle-income countries, and those at greatest risk are children and the elderly. Millions more people worldwide suffer from other water-related diseases, such as bilharzia, cholera, elephantiasis, and hookworm.

Improvements in water supply and sanitation tend to lead to improvements in people’s health and the quality of their lives. Throughout history, when people have had an adequate supply of safe water and have been able to practice good hygiene, they have been healthier and have had a better chance of living longer.

Access to safe water is critical to economies and ecosystems, too, and a scarcity of safe water can directly affect long-term prospects for sustainable development. Without an adequate water supply, factories that depend on water may have to close temporarily; crop yields may decline; sick workers may be unproductive; fisheries may be destroyed. The destruction of aquatic life not only cuts into the economy, but also damages the ecosystem. In addition, lack of a reliable system of piped water can prompt people to sink their own wells and deplete the fresh water supply. Air quality can also be affected by shortages of safe water. When people boil household water to kill dangerous bacteria, the fuel they burn can pollute the air. And when they use wood or charcoal as their source of fuel, forests can be destroyed causing additional environmental problems, including erosion and loss of top soil.

Aside from the fact that some regions of the world are naturally arid, the increasing, often competing demands for water are cutting into the global supply. Many rivers and watersheds are polluted by industrial, agricultural, and human waste products, while others are drying up because people are using the water faster than nature can replenish it. In areas with heavy rainfall or irrigation systems, people may waste water because it seems plentiful or cheap ignoring how much it costs to treat the water after it is used.

To get water is more difficult – and often more expensive – for the poorest people. In rural areas of developing countries, many women and children spend hours – in extreme cases up to six to eight hours each day – hauling water from rivers or wells. In cities, the poor often do not have water piped to their property; instead, they must buy or take water from other sources. People buying water from other sources may have to pay three to ten times what piped water costs in an area.

Moreover, the rapid growth of cities throughout the world can strain the capacity of governments to provide adequate sanitary facilities, leaving inhabitants, especially the poor, to live amid unhealthy open sewage ditches. Untreated sewage also tends to contaminate the water reserves closest to the cities, forcing communities to pipe water from further and further away as cities expand.

Industrial countries also are increasingly concerned about water quality and availability. Although these countries have stronger economies and greater capacity to collect, clean, and deliver water to citizens, per capita water consumption can be high as people wash cars, water lawns, and turn deserts into farmland, towns, and cities. They spend enormous amounts of money cleaning up water polluted by industrial waste, energy production, agriculture, and households.

In recent years, people, industries, farmers, and governments have begun to acknowledge that water is an economic good, not a “free” limitless resource. And as an economic good, there is a wide range in the quality and level of water delivery and sanitation services that people want and are willing to pay for.

In the end, it appears that when members of a community – households, factories, farmers, and businesses, together with scientists and policy makers – all participate in making decisions about the most feasible system of supplying safe water and sanitation, everyone tends to be more satisfied with the quality and price of these services.

**Notes:**

|  |  |
| --- | --- |
| Bilharzia | шистосомоз |
| Elephantiasis | слоновость |
| Hookworm | нематода |
| Hygiene | гигиена |
| Deplete | истощение |
| To haul | тащить |
| Sewage ditch | сточная яма |
| Per capita | на душу населения |

**2. Are the statements true or false? Correct the wrong ones.**

1. Without safe water, people cannot lead healthy, productive lives.

2. Most, but not all, of these people live in low and middle-income countries, and those at greatest risk are adults.

3. Throughout history, when people have had an inadequate supply of safe water and have been able to practice good hygiene, they have been healthier and have had a better chance of living longer.

4. With an adequate water supply, factories that depend on water may have to close temporarily; crop yields may decline; sick workers may be unproductive; fisheries may be

destroyed.

5. The destruction of aquatic life not only cuts into the economy, but also damages the ecosystem.

6. Many rivers and watersheds are polluted by industrial, agricultural, and human waste products, while others are drying up because people are using the water faster than nature can replenish it.

7. In rural areas of developing countries, many women and children spend some minutes each day hauling water from rivers or wells.

8. Untreated sewage also tends to contaminate the water reserves closest to the cities, forcing communities to pipe water from further and further away as cities expand.

9. Although these countries have neither economies nor greater capacity to collect, clean, and deliver water to citizens, per capita water consumption can be high as people wash cars, water lawns, and turn deserts into farmland, towns, and cities

10. In recent years, people, industries, farmers, and governments have begun to acknowledge that water is an economic good and a “free” limitless resource.

**3. Find in the text the equivalents to the following words and word combinations:**

Природные источники; чистые колодцы; страдать от болезней, вызванных водными бактериями; страны с низким и средним уровнем дохода; недостаток питьевой воды; разрушать экосистему; водопроводная вода; потребление воды; спрос на воду; сточные ямы; промышленные отходы; нескончаемый ресурс; политические деятели; качество доставляемой воды; принимать решения; дешевый; на душу населения; огромное количество; разрушение верхнего слоя земли; снижение урожая зерновых культур; поверхностные воды.

**4. Retell the text above in Russian.**

**Reading for translating**

1. **Focus on grammar: Infinitive**

**Forms of Infinitive**

|  |  |  |
| --- | --- | --- |
|  | Active | Passive |
| Indefinite  Continuous  Perfect  Perfect Continuous | To ask  To be asking  To have asked  To have been asked | To be asked  –  To have been asked  – |

**How to translate different forms into Russian**

Только для двух форм инфинитива, а именно Indefinite Infinitive Active и Indefinite Infinitive Passive, имеются соответствующие формы в русском языке: to ask спрашивать, to be asked быть спрошенным (спрашиваемым). Остальные формы инфинитива могут переводиться на русский язык изолированно, т. е. вне предложения. Continuous Infinitive – to be asking – употребляется со значением “спрашивать в какой-нибудь определенный момент”. Perfect Infinitive – to have asked – “спрашивать, спросить до какого-нибудь момента”. Perfect Continuous Infinitive – to have been asking – “спрашивать в течение отрезка времени, предшествующего какому-нибудь моменту”, и Perfect Infinitive Passive – to have been asked – “быть спрошенным (спрашиваемым) до какого-нибудь момента”.

**Functions of the Infinitive**

|  |  |
| --- | --- |
| Подлежащее | To read much is to know much. It is necessary to read much. |
| Часть простого сказуемого | I’ll read much in summer. |
| Часть составного именного сказуемого | My wish is to read much. |
| Часть сложного глагольного сказуемого | We must read much. I began to read much. |
| Дополнение | I decided to read much. They allowed us to drink a cup of tea. |
| Определение | He gave me a book to read. |
| Обстоятельство |  |
| 1) цели | He went to London to improve his English. |
| 2) следствия | It is never too late to learn. I came here to read. |

**How to Use the Infinitive**

Инфинитив обычно употребляют с частицей **to**, но в следующих случаях частица **to** не употребляется:

–после вспомогательных и модальных глаголов – can, may, must, shall, will, should, would;

–в оборотах – had better, would rather;

E. g. You had better learn it by heart.

I would rather take this apple.

–в сложных дополнениях с глаголами – to see, to hear, to watch, to feel, to make (в значении «заставлять») , to let (в значении «позволять»).

E. g. I saw him enter the room.

He didn’t hear you sing.

Let her say that!

Don’t make me do it!

**2. Read the sentences, translate them into Russian and find the function of the infinitive.**

1. To get water is more difficult – and often more

expensive – for the poorest people.

1. It is impossible to get there in 5 minutes.
2. You should drink potable water.
3. Farmers use irrigation to grow crops.
4. To smoke is harmful for your health.
5. Egypt and China were the first to use irrigation.
6. Your friend promised to listen to your story.
7. We’ll drink water found in groundwater aquifers, rivers, and freshwater lakes.
8. We are happy to receive a letter from you.
9. I bought some fish to fry it for supper.

**3. Use “to” if it is necessary.**

Farmers can \_\_\_ use treated water for irrigation..

Don’t make me \_\_\_ repeat it again.

I came here \_\_\_ water flowers.

Our duty is \_\_\_ study well.

We would rather \_\_\_ drink freshwater.

We are glad \_\_\_ see you.

You must \_\_\_ help your grandparents.

He will \_\_\_ graduate from the university soon.

I hear my friend \_\_\_ play the violin.

You should \_\_\_ visit the doctor if you are ill.

Let me \_\_\_ show you the way.

I wish you \_\_\_ do the city.

**4. Read and translate the text using a dictionary.**

**Water is not an essential ingredient for Life,**

**scientists now claim**

Billions of dollars are pumped into extraterrestrial exploration each year in the search for the ultimate prize – the discovery of life on other planets. But are we looking in all the right places? Prof Steven A Benner, who is working with NASA on the design of the next generation of Mars probes, believes that life could flourish without any need for water. In the December issue of Current Opinion in Chemical Biology, he and his colleagues at the University of Florida describe how organisms could survive in exotic environments such as on Saturn's moon Titan.

Benner and colleagues identify just two absolute requirements for life to exist: a suitable temperature range to allow chemical bonding, and an energy source (for example, the sun or radioactive decay). This contrasts with the common belief that life absolutely requires liquid water. Indeed, the authors speculate on the possibilities of life emerging in cold, icy environments, just like that of Titan, which meets both requirements and many “weaker” ones. “Life may even exist in more exotic environments, such as the supercritical dihydrogen-helium mixtures found on gas giants”, speculates Prof Benner, referring to the large gaseous planets such as Jupiter and Saturn. He even wonders if we may have missed exotic forms of life here on Earth. “This question is not as absurd as it might seem”, says Benner. “Just 50 years ago...life in the deep ocean was not known”.

Titan, currently being studied by the Cassini space probe, is perhaps an ideal place to look for life. The stunning pictures and data already sent back from the moon suggest a world of yellow clouds and oily black methane lakes, an environment that is thought to resemble that of the Earth billions of years ago. This puzzling moon is too cold for large quantities of liquid water to exist, however, which for many probably rules out life. Humans and, indeed, simple bacteria are mostly made up of water, so it is difficult to envisage life without it. But Benner believes this focus on water can blinker the search. “Why not use the hydrocarbons that are naturally liquid on Titan as a solvent for life directly?” – he muses. “In many senses, hydrocarbon solvents are better than water for managing complex organic chemical reactivity”.

We will soon know more. Next month, the European-built Huygens probe will detach from Cassini and touch down, or perhaps splash down, on Titan's surface. “The Huygens mission will be the first real input into this field for some time. Its potential for providing an “Aha!” experience with respect to weird life is enormous”, says Benner.

All life on Earth is widely supposed to have descended from a common ancestor. One consequence of this is that every organism uses the same general biochemistry. For example, all forms of life make use of proteins made from the same set of building blocks. But this may not be the only way to do things. Could creatures exist elsewhere in the Universe with a completely different biochemistry? Experiments in recent years have partly addressed such questions by re-engineering protein and DNA systems. For example, alternative amino acids to those found in living systems are capable of standing in for their natural counterparts. Professor Benner and colleagues now provide a wide-ranging exploration of just how far the chemistry of life can be pushed. “Is water necessary? Is carbon essential? Why not silicon?” asks Benner. One of the leading theories on the origins of life supposes that the earliest organisms used RNA instead of DNA to pass on their genetic information and to catalyse reactions. If this is correct, it demonstrates that alternative biochemistries are indeed possible. Benner suggests that “RNA organisms” might still exist. Because such life forms would not need the biochemical machinery to produce proteins, they would be much smaller than bacteria, hinting at possible environments we might look for them in. “Many minerals have pores that are smaller than one micron across. These might hold smaller RNA organisms”, says Benner.

While more exotic worlds might well harbour life, Mars remains the best bet. “There was water on Mars when there was life on Earth”, Benner points out. “This would not be particularly weird life, of course, in that it would be living in water, but it could easily be weird by Earth standards”. However, Benner concedes that “a simple“. ”We don't know” is often the best answer for some questions “Until life is encountered elsewhere, or aliens contact us, we will not have an independent second dataset. We may not even then, if the alien life itself shares an ancestor with life on Earth”.

**5. Read, translate and remember.**

Some facts about water

More than 70 % of our body weight is water

At birth, water accounts for approximately 80 percent of an infant’s body weight.

Unlike any other substance, water is lighter in its solid state than in its liquid state. That is why ice floats in water

More than two thirds of the surface of our planet is covered by water.

Of all the water on the earth, humans can used only about three tenths of a percent of this water.

Such usable water is found in groundwater aquifers, rivers, and freshwater lakes.

Somewhere between 70 and 75 percent of the earth’s surface is covered with water.

Nothing kills life quicker than lack of water.

Hot water is much heavier than cold water

Water prevents clogging of arteries in the heart and the brain.

Water is essential for the body’s cooling (sweat) and heating (electrical) systems.

Water is absolutely vital for making the immune system more efficient in different regions to fight infections and cancer cells where they are formed.

**Unit 2**

**Water Cycle**

*“We forget that the water cycle and the life cycle are one”.*

*Jacques Cousteau*

*“Between earth and earth's atmosphere, the amount of water remains constant;*

*there is never a drop more, never a drop less.*

*This is a story of circular infinity, of a planet birthing itself”.*

Linda Hogan, "Northern Lights," autumn, 1990

**Preface**

**Read and answer the question: What is the water cycle?**

What is the water cycle? I can easily answer that – it is “me” all over! The water cycle describes the existence and movement of water on, in, and above the Earth. Earth's water is always in movement and is always changing states, from liquid to vapor to ice and back again. The water cycle has been working for billions of years and all life on Earth depends on it continuing to work; the Earth would be a pretty stale place to live without it.

Where does all the Earth's water come from? Primordial Earth was an incandescent globe made of magma, but all magmas contain water. Water set free by magma began to cool down the Earth's atmosphere, until it could stay on the surface as a liquid. Volcanic activity kept and still keeps introducing water in the atmosphere, thus increasing the surface- and ground-water volume of the Earth.

**Warming up**

**1. Arrange the words in categories as they relate to different water connected topics to form a semantic map**:

**Evaporation Precipitation Surface runoff**

Ocean, gas, hail, moisture, heat, sleet, river, flow, solid, vapor, raindrop, stream, liquid, cloud, melt, water body, snow, creek, ice, lake, glacier, fog, sea, icecap, fall, surface, accumulate, aquifer, spring, freeze, store.

**2. Read and translate water quotations:**

“To every word of love I heard you whisper, the raindrops seem to play a sweet refrain.”

“The water that I shall give him will become in him a fountain of water springing up into everlasting life….”

“To live by a large river is to be kept in the heart of things.”

John Haines.

“Water, like religion and ideology, has the power to move millions of people. Since the very birth of human civilization, people have moved to settle close to it. People move when there is too little of it. People move when there is too much of it. People journey down it. People write, sing and dance about it. People fight over it. And all people, everywhere and every day, need it.”

Mikhail Gorbachev, President of Green Cross International quoted in Peter Swanson's Water.

**3. Which quotations do you agree/disagree with?**

**Reading for speaking and discussing**

1. **Give the Russian equivalents to the following words:**

Discharge, exist, sublimate, currents, cause, collide, particle, thaw, arrive, melt, gravity, accumulate, store, soak, replenish, emerge, seep back, fall out, influence, a great deal, empty, moisture, estimate, float, disappear, visible, sleet, hail, tiny, require, remove, support, velocity, exceed, updraft, simplify, define, divert, creek, affect, sediment.

**2. Read and translate the international words:**

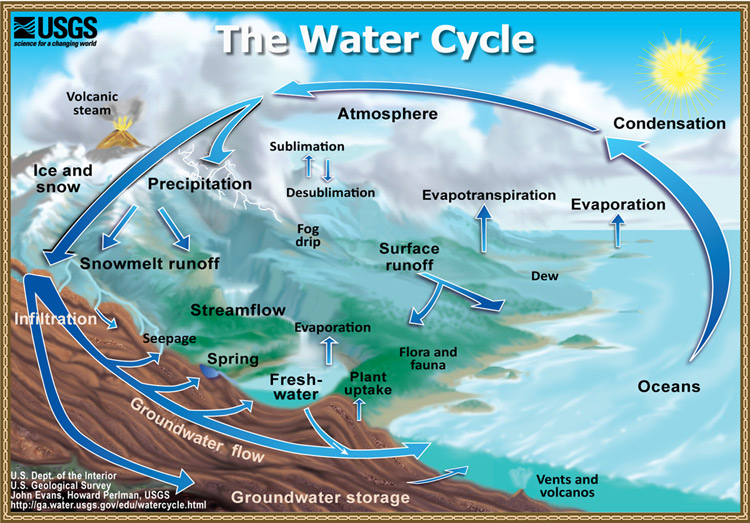
Cycle, graphic, portion, atmosphere, condensation, infiltration, ocean, start, temperature, accumulate, climate, gravity, period, energy, process, transport, million, storm, human, molecule, visible, actual, period, show, globe, geology, topography, natural, meteorological, channel, physical, aspect, form, geography.

**3. Read the text and say what water cycle is:**

**The Water Cycle**

The Water Cycle: color graphic showing the movement of water through the water cycle, from evaporation and transpiration to condensation, to water storage in the atmosphere, to precipitation, to water storage in ice and snow, surface runoff, snowmelt runoff to streams, streamflow and freshwater storage. A cut away shows the ground water portion of the water cycle, from infiltration to ground water storage and ground water discharge into springs and freshwater storage. Surface runoff, freshwater storage, ground water storage, and ground water discharge are all shown contributing to water storage in oceans, where the evaporation portion of the water cycle starts again.

The water cycle has no starting point. But, it'll begin in the oceans, since that is where most of Earth's water exists. The sun, which drives the water cycle, heats water in the oceans. Some of it evaporates as vapor into the air. Ice and snow can sublimate directly into water vapor. Rising air currents take the vapor up into the atmosphere, along with water from evapotranspiration, which is water transpired from plants and evaporated from the soil. The vapor rises into the air where cooler temperatures cause it to condense into clouds. Air currents move clouds around the globe, cloud particles collide, grow, and fall out of the sky as precipitation. Some precipitation falls as snow and can accumulate as ice caps and glaciers, which can store frozen water for thousands of years. Snow packs in warmer climates often thaw and melt when spring arrives, and the melted water flows overland as snowmelt. Most precipitation falls back into the oceans or onto land, where, due to gravity, the precipitation flows over the ground as surface runoff. A portion of runoff enters rivers in valleys in the landscape, with streamflow moving water towards the oceans. Runoff, and ground-water seepage, accumulate and are stored as freshwater in lakes. Not all runoff flows into rivers, though. Much of it soaks into the ground as infiltration. Some water infiltrates deep into the ground and replenishes aquifers (saturated subsurface rock), which store huge amounts of freshwater for long periods of time. Some infiltration stays close to the land surface and can seep back into surface water bodies (and the ocean) as ground-water discharge, and some ground water finds openings in the land surface and emerges as freshwater springs. Over time, though, all of this water keeps moving, some to reenter the ocean, where the water cycle “ends”– that means, where it “begins”.



**Components of the water cycle:**

Water storage in oceans

Evaporation

Sublimation

Evapotranspiration

Water in the atmosphere

Condensation

Precipitation

Water storage in ice and snow

Snowmelt runoff to streams

Surface runoff

Stream flow

Freshwater storage

Infiltration

Groundwater storage

Groundwater discharge

Springs

Global water distribution

**Water storage in oceans**: saline water existing in oceans and inland seas. The ocean is a storehouse of water. It is also estimated that the oceans supply about 90 percent of the evaporated water that goes into the water cycle. You know how the ocean is never still. You might think that the water in the oceans moves around because of waves, which are driven by winds. But, actually, there are currents and “rivers” in the oceans that move massive amounts of water around the world. These movements have a great deal of influence on the water cycle.

**Evaporation** is the process by which water changes from a liquid to a gas or vapor. Evaporation is the primary pathway that water moves from the liquid state back into the water cycle as atmospheric water vapor. Studies have shown that the oceans, seas, lakes, and rivers provide nearly 90 percent of the moisture in our atmosphere via evaporation, with the remaining 10 percent being contributed by plant transpiration. Heat (energy) is necessary for evaporation to occur. Energy is used to break the bonds that hold water molecules together, which is why water easily evaporates at the boiling point (212 °F, 100 °C) but evaporates much more slowly at the freezing point. In fact, the process of evaporation removes heat from the environment, which is why water evaporating from your skin cools you. Evaporation drives the water cycle. Only about 10 percent of the water evaporated from the oceans is transported over land and falls as precipitation. Once evaporated, a water molecule spends about 10 days in the air. The process of evaporation is so great that without precipitation runoff, and discharge from aquifers, oceans would become nearly empty.

**Evapotranspiration:** The process by which water vapor is discharged to the atmosphere as a result of evaporation from the soil and transpiration by plants.

**Transpiration:** The release of water from plant leaves. Transpiration is the process by which moisture is carried through plants from roots to small pores on the underside of leaves, where it changes to vapor and is released to the atmosphere. Transpiration is essentially evaporation of water from plant leaves. It is estimated that about 10 percent of the moisture found in the atmosphere is released by plants through transpiration.

**Precipitation:** The discharge of water, in liquid or solid state, out of the atmosphere, generally upon a land or water surface.

Precipitation is water released from clouds in the form of rain, freezing rain, sleet, snow, or hail. It is the primary connection in the water cycle that provides for the delivery of atmospheric water to the Earth. Most precipitation falls as rain. How do raindrops form?

The clouds floating overhead contain water vapor and cloud droplets, which are small drops of condensed water. These droplets are way too small to fall as precipitation, but they are large enough to form visible clouds. Water is continually evaporating and condensing in the sky. If you look closely at a cloud you can see some parts disappearing (evaporating) while other parts are growing (condensation). Most of the condensed water in clouds does not fall as precipitation because their fall speed is not large enough to overcome updrafts which support the clouds. For precipitation to happen, first tiny water droplets must condense on even tinier dust, salt, or smoke particles, which act as a nucleus. Water droplets may grow as a result of additional condensation of water vapor when the particles collide. If enough collisions occur to produce a droplet with a fall velocity which exceeds the cloud updraft speed, then it will fall out of the cloud as precipitation.

**Surface runoff**: Precipitation runoff which travels over the soil surface to the nearest stream channel. Surface runoff is precipitation runoff over the landscape.

Many people probably have an overly-simplified idea that precipitation falls on the land, flows overland (runoff), and runs into rivers, which then empty into the oceans. That is “overly simplified” because rivers also gain and lose water to the ground. Still, it is true that much of the water in rivers comes directly from runoff from the land surface, which is defined as surface runoff.

When rain hits saturated or impervious ground it begins to flow downhill. It is easy to see if it flows down your driveway to the curb and into a storm sewer, but it is harder to notice it flowing overland in a natural setting. During a heavy rain you might notice small rivulets of water flowing downhill. Water will flow along channels as it moves into larger creeks, streams, and rivers. Runoff flowing over bare soil deposits sediment into rivers, which is not good for water

quality.

As with all aspects of the water cycle, the interaction between precipitation and surface runoff varies according to time and geography. Surface runoff is affected by both meteorological factors and the physical geology and topography of the land. Only about a third of the precipitation that falls over land runs off into streams and rivers and is returned to the oceans. The other two-thirds is evaporated, transpired, or soaks into ground water. Surface runoff can also be diverted by humans for their own uses.

**Notes:**

|  |  |
| --- | --- |
| To saturate | насыщать |
| Sediment | примесь |
| Streambed | русло |
| Snowpack | снежный покров |
| Via | через |
| Tiny | крошечный |
| Velocity | скорость направления |
| To emerge | появляться |

**4. Match the items (1–15) with the definitions (A–O).**

|  |  |
| --- | --- |
| 1. Aquifer | **A.** A tremendous flow of water over what is usually dry land. |
| 2. Well | **B.** A prolonged period of time without rainfall. |
| 3. Evaporation | **C.** A layer of earth or rock that contains water. |
| 4. Transpiration | **D.** The science that pertains to water in terms of its properties, laws, and how it's distributed. |
| 5. Precipitation | **E.** The distribution of moisture in the forms of rain, snow, sleet, ice or hail. |
| 6. Percolation | **F.** The gradual process of being eroded by natural forces. |
| 7. Flood | **G.** To drip through small holes. |
| 8. Ice | **H.** Sending off moisture in vapor form.. |
| 9. Condensation | **I.** Water that is made solid by cold water |
| 10. Pollution | **J.** A region that has little or no rainfall that is usually sandy and without trees |
| 11. Xeriscape | **K.** A method for landscaping that occurs in arid areas. |
| 12. Erosion | **L.** The process or act of defiling |
| 13. Drought | **M.** The process of compressing air and water that normally results in precipitation |
| 14. Hydrology | **N.** A hole that is dug in the ground to get water, oil, gas or steam. |
| 15. Desert | **O.** When water fades away or disappears |

**5. Match the verbs with the nouns according to the text:**

|  |  |
| --- | --- |
| To heat | snow |
| To drive | clouds |
| To move | water |
| To collide | moisture |
| To melt | water cycle |
| To replenish | droplets |
| To release | aquifers |
| To produce | particles |

**6. What statement corresponds to the content of the text?**

1. The Sun heats water in the oceans, water evaporates and replenishes surface and ground water sources.

2. The water recharge occurs from evaporation and transpiration to condensation, to water storage in the atmosphere, to precipitation, to water storage in ice and snow, surface runoff, snowmelt runoff to streams, stream flow, and freshwater

storage.

3. The water cycle starts in the oceans, water evaporates as vapor into the air where cooler temperatures cause it to condense into clouds, cloud particles collide, grow and fall out of the sky as precipitation which falls back into the oceans.

**7. What statement answers the question: How do raindrops form?**

1. Water droplets consist of tinier dust, salt, or smoke particles, which act as a nucleus.

2. Water droplets consist of condensation of water vapor when the particles collide.

3. Water droplets must condense on even tinier dust, salt, or smoke particles, which act as a nucleus and grow as a result of additional condensation of water vapor when the particles

collide.

**8. What statement expresses the main idea of the text?**

1. The water cycle enables to replenish aquifers (saturated subsurface rock), which store huge amounts of freshwater for long periods of time, to accumulate and store as freshwater in lakes, rivers, to accumulate as ice caps and glaciers which can store frozen water for thousands of years.

2. It is from the salty oceans and seas through evaporation, evapotranspiration, transpiration, precipitation the most of fresh water comes-no longer salty and harmful.

3. Water moves from clouds to land and back to the ocean in a never ending cycle.

**9. Complete the statement: … provide most of the moisture in our atmosphere.**

1. Ice caps and glaciers, rain and snow, hail and fog…

2. Aquifers and groundwater seepage, watersheds and streams, creeks and plants…

3. Oceans, rivers, lakes, seas, ponds, canals, channels, plant leaves, soil…

**10. Translate the sentences into English:**

1. Круговорот воды не имеет отправной точки, но начинается он в океанах, поскольку именно там больше всего находится воды на Земле.

2. Солнце, которое приводит в движение круговорот воды, нагревает воду в океанах. Часть ее поднимается в виде пара в воздух.

3. Лед и снег могут превратиться непосредственно в водяной пар.

4. Пар поднимается в воздух, где под воздействием прохладной температуры превращается в облака.

5. Воздушные потоки способствуют движению облаков над землей, частицы облаков сталкиваются, растут и выпадают в виде осадков.

6. Зимой осадки выпадают в виде снега и могут накапливаться в ледяных шапках и ледниках.

7. Большее количество осадков выпадает обратно в океан или на сушу.

8. Сточные и грунтовые воды проходят фильтрацию, накапливаются и хранятся в виде пресной воды в озерах.

9. Часть воды проникает глубоко в землю и пополняет подземные водоносные резервуары, которые хранят огромные объемы пресной воды в течение длительного периода времени.

**11. Write the summary of the text.**

**12. Retell the text “The Water Cycle”.**

**Reading for understanding**

**1. Read the text and put the paragraph headings in the correct place.**

**Condensation**

**Sublimation**

**Stream flow**

It is the movement of water in a natural channel, such as a river.

The U.S. Geological Survey (USGS) uses this term to refer to the amount of water flowing in a river. Although USGS usually uses the term “stream” when discussing flowing water bodies, in these pages we'll use “rivers” more often to describe flowing creeks, streams, and rivers, since that is probably what you are more familiar with. Rivers are invaluable to not only people, but to life everywhere. Not only are rivers a great place for people (and their dogs) to play, but people use river water for drinking-water supplies and irrigation water, to produce electricity, to flush away wastes (hopefully, but not always, treated wastes), to transport merchandise, and to obtain food. Rivers are indeed major aquatic landscapes for all manners of plants and animals. Rivers even help keep the aquifers underground full of water by discharging water downward through their streambeds. And, we've already mentioned that the oceans stay full of water because rivers and runoff continually refreshes them. It is always changing, from day to day and even minute to minute. Of course, the main influence on it is precipitation runoff in the watershed. Rainfall causes rivers to rise, and a river can even rise if it only rains very far up in the watershed – remember that water that falls in a watershed will eventually drain by the outflow point. The size of a river is highly dependent on the size of its watershed. Large rivers have watersheds with lots of surface area; small rivers have smaller watersheds. Likewise, different size rivers react differently to storms and rainfall. Large rivers rise and fall slower and at a slower rate than small rivers. In a small watershed, a storm can cause 100 times as much water to flow by each minute as during base flow periods, but the river will rise and fall possibly in a matter of minutes and hours. Large rivers may take days to rise and fall, and flooding can last for a number of days. After all, it can take days for all the water that fell hundreds of miles upstream to drain past an outflow point.

It is the process in which water vapor in the air is changed into liquid water. It is crucial to the water cycle because it is responsible for the formation of clouds. These clouds may produce precipitation, which is the primary route for water to return to the Earth's surface within the water cycle. It is the opposite of evaporation. You don't have to look at something as far away as a cloud to notice condensation, though. It is responsible for ground-level fog, for your glasses fogging up when you go from a cold room to the outdoors on a hot, humid day, for the water that drips off the outside of your glass of iced tea, and for the water on the inside of your home windows on a cold day. Even though clouds are absent in a crystal clear blue sky, water is still present in the form of water vapor and droplets which are too small to be seen. Depending on meteorological conditions, water molecules will combine with tiny particles of dust, salt, and smoke in the air to form cloud droplets, which grow and develop into clouds, a form of water we can see. Cloud droplets can vary greatly in size, from 10 microns (millionths of a meter) to 1 millimeter (mm), and even as large as 5 mm. As water droplets combine (also known as coalescence) with each other, and grow in size, clouds not only develop, but precipitation may also occur. Precipitation is essentially water cloud in its liquid or solid form falling form the base of a cloud. This seems to happen too often during picnics or large groups of people gather at swimming pools.

For those of us interested in the water cycle, it is most often used to describe the process of snow and ice changing into water vapor without first melting into water. It is a common way for snow to disappear in certain climates. One way to see the results of it is to hang a wet shirt outside on a below-freezing day. Eventually the ice in the shirt will disappear. “Dry ice” is solid, frozen carbon dioxide, which sublimates, or turns to gas, at the temperature –78.5 °C. The fog is a mixture of cold carbon dioxide gas and cold, humid air, created as the dry ice sublimates. It occurs more readily when certain weather conditions are present, such as low relative humidity and dry winds. It also occurs more at higher altitudes, where the air pressure is less than at lower altitudes. Energy, such as strong sunlight, is also needed. If I was to pick one place on Earth where it happens a lot, I might choose the south side of Mt. Everest. Low temperatures, strong winds, intense sunlight, very low air pressure – just what is needed for it to occur.

**Notes:**

|  |  |
| --- | --- |
| Merchandise | товар |
| Streambed | русло |
| To fog up | запотевать |
| Altitude | высота, вершина |

**2. Are the statements true or false? Correct the false statements.**

1. Rivers are indeed major aquatic landscapes for all manners of plants and animals

2. It is not changing, from day to day and even minute to

minute.

3.The size of a river is independent on the size of its

watershed.

4. Large rivers may take months to rise and fall, and flooding can last for a number of days.

5. It is responsible for ground-level fog, for your glasses fogging up when you go from a cold room to the outdoors on a hot, humid day, for the water that drips off the outside of your glass of iced tea, and for the water on the inside of your home windows on a cold day.

6. Precipitation is essentially water cloud in its liquid or solid form falling form the base of a cloud.

7. The fog is a mixture of cold carbon dioxide gas and cold, humid air, created as the dry ice sublimates.

**3. Ask questions to these sentences:**

1. Rivers even help keep the aquifers underground full of water by discharging water downward through their streambeds.

2. Rainfall causes rivers to rise.

3. Depending on meteorological conditions, water molecules will combine with tiny particles of dust, salt, and smoke in the air to form cloud droplets, which grow and develop into clouds, a form of water we can see.

4. The fog is a mixture of cold carbon dioxide gas and cold, humid air, created as the dry ice sublimates.

**4. Find in the text the equivalents to the following words and word combinations:**

Выпадение осадков; водный бассейн; туман; испарение; питьевая вода; использованная вода; ландшафт; высота; капля воды; исчезать; влажный; получать; влиять; пыль; дым; облако; бесценный; снаружи; внутри; атмосферное давление; таять.

**5. Retell the text above in Russian.**

**Reading for translating**

1. **Focus on grammar: Complex Object (сложное**

**дополнение)**

Сложное дополнение в английском языке (**Complex object**) — это такой речевой оборот, которым мы показываем впечатления или ожидания от действий других людей. Ниже мы рассмотрим случаи употребления и правила complex object.

С точки зрения грамматики, сложным дополнением является конструкция, состоящая из существительного или объектного местоимения + инфинитив.

E.g. I hate him to spend all the time in front of the comp!

Ненавижу, когда он проводит все время за компьютером.

**How to translate the sentences with Complex**

**Object**

**Complex object** с английского языка обычно переводится сложносочиненным предложением, с союзами **что, чтобы, когда, как**. Существительное (местоимение) является подлежащим, а инфинитив — сказуемым придаточного предложения:

**How to use the infinitive in Complex Object**

|  |  |
| --- | --- |
| 1.These verbs take an object and the infinitive with **to:** | |
| Advise | I advise you **to** study English |
| Allow | Greg allowed the children **to** play games |
| Ask | Don’t ask me **to** work at the weekends! |
| Encourage | Nelly encouraged them **to** read. |
| Force | Mom forced her son **to** stay there. |
| Order | The officer ordered the soldier **to** stay still. |
| Persuade | Please, persuade Alice **to** take the job. |
| Invite | Nick invited his friends to celebrate the birthday. |
| Need | The boss needs me **to** do it. |
| Remind | Remind everybody **to** attend the meeting. |
| Teach | She taught me **to** speak English. |
| Tell | Dad told his son **to** go to bed. |
| Want | Marry wants me **to** wash up. |
| Warn | Kelly warned her brother not **to** leave the house. |
| 2. These verbs take an object and the infinitive **without to:** | |
| Feel | I felt his hand touch my shoulder. |
| Hear | Did you hear him say it? |
| Let | Let them stay here any longer! |
| Make | Mom made them work hard. |
| Notice | I didn’t notice the machine start. |
| See | Do you see him play in the garden? |
| Watch | You can watch people make clothes. |

**2. Use “to” where it is necessary:**

1. She felt her hand \_\_\_\_ tremble.

2. He felt his heart \_\_\_\_ beat with joy.

3. Nobody noticed him \_\_\_\_ come in and sit down.

4. I felt Nick \_\_\_\_ put his hand on my shoulder.

5. She felt tears \_\_\_\_ roll down her cheeks.

6. We saw them \_\_\_\_ jump with parachutes.

7. I heard the door of the entrance hall \_\_\_\_ open and close softly.

8. They all gathered on the hill \_\_\_\_ watch the sun rise.

9. I heard him \_\_\_\_ tell the teacher about it.

10. She heard somebody \_\_\_\_ walk up to her do

11. I want her \_\_\_\_ cook breakfast.

12. I would like my friends \_\_\_\_ be happy.

13 Do you want me \_\_\_\_ open the window?

14. She didn't wish the students \_\_\_\_ smoke here.

**3. Read and translate the text using a dictionary.**

**Underground "Fossil Water" Running Out**

By Brian Handwerk, for National Geographic News

In the world's driest places, ‘fossil water” is becoming as valuable as fossil fuel, experts say. This ancient freshwater was created eons ago and trapped underground in huge reservoirs, or aquifers. And like oil, no one knows how much there is – but experts do know that when it's gone, it's gone.

“You can apply the economics of mining because you are depleting a finite resource”, said Mike Edmunds, a hydrogeologist at Oxford University in the Great Britain.

In the meantime, though, paleowater is the only option in many water-strapped nations. For instance, Libya is habitable because of aquifers – some of them 75,000 years old – discovered under the Sahara's sands during 1950s oil

explorations.

The North African country receives little rain, and its population is concentrated on the coasts, where groundwater reserves are becoming increasingly brackish and nearing

depletion.

Since Libyan President Muammar Qaddafi launched his Great Man-Made River Project in the 1980s, an epic system of pipes, reservoirs, and engineering infrastructure is being built. It will be able to pump from some 1,300 paleowater wells and move 230 million cubic feet (6.5 million cubic meters) of H2O every day. But while fossil water can fill critical needs, experts warn, it's ultimately just a temporary measure until conservation measures and technologies become status quo.

Engineers in Jordan hope that the country's large fossil-water resources can help stem its chronic water shortage.

But the project has encountered an unexpected stumbling block. The Disi's fossil water was recently found to contain 20 times the radiation levels considered safe for drinking. The water is contaminated naturally by sandstone, which has slowly leached radioactive contaminants over the eons.

Radiation contamination has been found in Israel, Egypt, Saudia Arabia, and Libya, Vengosh said.

Bringing fossil water to the surface may cause other water quality issues. When aquifers are depleted, they can be subject to an influx of surrounding contaminants such as saltwater – a particular problem near coastal areas.

“People think about quantity when they are pumping, they don't ask about renewability as much – and that’s the big issue”.

“In a very arid region one could argue that it doesn't matter’ how old the water is, Vengosh said. “But in semi-arid areas, the ability to delineate between fossil water and replenished groundwater is always important”.

**Notes:**

Paleowater – palaeo – connected with ancient times.

**4. Read, translate and remember**.

Some facts about water

Pure water (solely hydrogen and oxygen atoms) has a neutral pH of 7, which is neither acidic nor basic.

The earth is a closed system, similar to a terrarium, meaning that it rarely loses or gains extra matter. The same water that existed on the earth millions of years ago is still present today.

Water energizes food, and food particles are then able to sup-ply the body with this energy during digestion. This is why food without water has absolutely no energy value for the body.

Water dissolves more substances than any other liquid. Wherever it travels, water carries chemicals, minerals, and nutrients with it.

**Unit 3**

**Farm Water**

*“Water and air, the two essential fluids on which all life depends,*

*have become global garbage cans”.*

Jacques Yves Costeau

**Preface**

**Read the text and answer the questions: What is farm water used for? What leads to farm water scarcity?**

Farm water, also known as agricultural water, is water committed for use in the production of food and fibre. On average, 70 per cent of the fresh water withdrawn from rivers and groundwater is used to produce food and other agricultural products. Farm water may include water used in the irrigation of crops, water used to leach harmful salts from agricultural fields and water used for environmental management.

Fifty years ago, the common perception was that water was an infinite resource. At this time, there were fewer than half the current number of people on the planet. People were not as wealthy as today, consumed fewer calories and ate less meat, so less water was needed to produce their food. They required a third of the volume of water we presently take from rivers. Today, the competition for water resources is much more intense. This is because there are now nearly seven billion people on the planet, their consumption of water-thirsty meat and vegetables is rising, and there is increasing competition for water from industry, urbanization and biofuel crops. To avoid a global water crisis, farmers will have to strive to increase productivity to meet growing demands for food,

while industry and cities find ways to use water more

efficiently.

Successful agriculture is dependent upon farmers having sufficient access to water. However, water scarcity is already a critical constraint to farming in many parts of the world. Physical water scarcity is where there is not enough water to meet all demands, including that needed for ecosystems to function effectively. Arid regions frequently suffer from physical water scarcity. It also occurs where water seems abundant but where resources are over-committed. This can happen where there is overdevelopment of hydraulic infrastructure, usually for irrigation. Symptoms of physical water scarcity include environmental degradation and declining groundwater. Economic scarcity, meanwhile, is caused by a lack of investment in water or insufficient human capacity to satisfy the demand for water. Symptoms of economic water scarcity include a lack of infrastructure, with people often having to fetch water from rivers for domestic and agricultural uses. Some 2.8 billion people currently live in water-scarce

areas.

**Notes:**

|  |  |
| --- | --- |
| To leach | протекать |
| Water-thirsty | обезвоженный |
| Biofuel crops | биотопливные культуры |
| Water scarcity | недостаток воды |
| Suffer from | страдать от |
| A lack of | нехватка |

**Warming up**

1. **Read and translate water proverbs and water**

**sayings.**

1. *A fish out of water*. (Not feeling at home where you are).

2. *Blood is thicker than water.* (Family is more important than anyone or anything else).

3. *Don't make waves*. (Don't make trouble; do what others are doing).

4. *Don't wash your clothes in public. (*Don't tell private things to people that you may not be able to trust).

5. *Dry up your drip.* (Be quiet. Shut your mouth).

6. *He is wet behind the ears*. (He still has a lot to learn about life).

7. *In deep water*. (In a place you are not feeling comfortable).

8. *It is like drinking a glass of water*. (It is very easy to do).

9. *It is raining cats and dogs*. (It is raining extremely hard).

10. *Plenty of water ran under bridges*. (So much time passed by).

11. *Still waters run deep*. (The quiet people can be the smartest and wisest).

12. *They are like water and fire/They are like devil and holy water*. (These two people are absolutely contrasting).

**2. Match the proverbs and sayings with the Russian equivalents.**

1.Чувствовать себя не в своей тарелке. 2.Не выносить сор из избы. 3. Век живи, век учись. 4. Льет как из ведра. 5. Сколько воды утекло. 6. Молчание-золото. 7. В гостях хорошо, а дома лучше. 8. Кто старое помянет, тому…9. Своя рубашка ближе к телу. 10. В тихом омуте черти водятся. 11.Мутить воду. 12. Легко, как дважды два. 13. Они близки как черт и ладан.

**Reading for speaking and discussing**

1. **Give the Russian equivalents to the following**

**words:**

Divert, spring, flood, arid, wastewater, semi-arid, sewage, hazard, crop, remain, raw, aim, assess, apply, include, approach, disturb, restriction, supplementation, reduce, manure, feature, society, weed, harvesting, maintenance, consider, supply, behavior, contaminate, lucrative, nutrient.

**2. Read and translate the following international words:**

Reservoirs, special, form, region, project, risk, farmer, human, result, climatic, condition, general, pathogens, effective, agriculture, application, period, contrast, basis, economy, season, adequate, institute, method, industry, globally, utilization.

**3. Read the text and answer the question: What water is used for irrigation?**

**Irrigation**

Irrigation is the artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall. Additionally, irrigation also has a few other uses in crop production, which include protecting plants against frost, suppressing weed growth in grain fields and preventing soil consolidation. In contrast, agriculture that relies only on direct rainfall is referred to as rain-fed or dry land farming.

Irrigation has been a central feature of agriculture for over 5000 years, and was the basis of the economy and society of numerous societies, ranging from Asia to Arizona.

Irrigation water can come from groundwater (extracted from springs or by using wells), from surface water (withdrawn from rivers, lakes or reservoirs) or from non-conventional sources like treated wastewater, desalinated water or drainage water. A special form of irrigation using surface water is spate irrigation, also called floodwater harvesting. In case of a flood (spate) water is diverted to normally dry river beds using a network of dams, gates and channels and spread over large areas. The moisture stored in the soil will be used thereafter to grow crops. Spate irrigation areas are in particular located in semi-arid or arid, mountainous regions. While floodwater harvesting belongs to the accepted irrigation methods, rainwater harvesting is usually not considered as a form of irrigation. Rainwater harvesting is the collection of runoff water from roofs or unused land and the concentration.

Around 90 % of wastewater produced globally remains untreated, causing widespread water pollution, especially in low-income countries. Increasingly, agriculture uses untreated wastewater as a source of irrigation water. Cities provide lucrative markets for fresh produce, so are attractive to farmers. However, because agriculture has to compete for increasingly scarce water resources with industry and municipal users, there is often no alternative for farmers but to use water polluted with urban waste, including sewage, directly to water their crops. Significant health hazards can result from using water loaded with pathogens in this way, especially if people eat raw vegetables that have been irrigated with the polluted water. The International Water Management Institute has worked in India, Pakistan, Vietnam, Ghana, Ethiopia, Mexico and other countries on various projects aimed at assessing and reducing risks of wastewater irrigation. They advocate a multiple-barrier approach to wastewater use, where farmers are encouraged to adopt various risk-reducing behaviors. These include ceasing irrigation a few days before harvesting to allow pathogens to die off in the sunlight, applying water carefully so it does not contaminate leaves likely to be eaten raw, cleaning vegetables with disinfectant or allowing fecal sludge used in farming to dry before being used as a human manure. The World Health Organization has developed guidelines for safe water use.

There are numerous benefits of using recycled water for irrigation, including the low cost (when compared to other sources, particularly in an urban area), consistency of supply (regardless of season, climatic conditions and associated water restrictions), and general consistency of quality. Irrigation of recycled wastewater is also considered as a means for plant fertilization and particularly nutrient supplementation. This approach carries with it a risk of soil and water pollution through excessive wastewater application. Hence, a detailed understanding of soil water conditions is essential for effective utilization of wastewater for irrigation.

**Notes:**

|  |  |
| --- | --- |
| Multiple-barrier approach | многоуровневый подход |
| Arid | сухой, засушливый, безводный |
| To contaminate | загрязнять, заражать |
| Guidelines | руководство к |
| Supplementation | добавление, пополнение |

**4.** **Find the words in the above text which match these definitions:**

1. The used water

2. The supply of water to an area of land through pipes or channels

3. A large amount of water covering an area that is usually dry

4. The state of being dirty

5. The process of removing salt from sea water

6. A burrier that is built to stop water flowing

7. The use of something for practical purposes

8. Used water produced by human bodies that are carried away through special pipes

**5. Match the verbs with the nouns according to the text:**

|  |  |
| --- | --- |
| To rely on | fresh products |
| To refer to | arid regions |
| To assist in | pathogens |
| To protect against | rainfall |
| To store in | dry land farming |
| To locate in | irrigation |
| To provide for | frost |
| To be loaded with | growing crops |
| To use for | soil |

**6. Complete the statement: Irrigation needs …**

1. …to feed the growing population with fresh and healthy products

2. …to supply water to the land and soil

3. …to assist in the growing of agricultural crops, maintenance of landscapes, and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall.

**7. What statement expresses the main idea of the text?**

1. Because agriculture has to compete for increasingly scarce water resources with industry and municipal users, there is often no alternative for farmers but to use water polluted with urban waste, including sewage, directly to water their crops.

2. The farmers’ behaviors include ceasing irrigation a few days before harvesting to allow pathogens to die off in the sunlight, applying water carefully so it does not contaminate leaves likely to be eaten raw, cleaning vegetables with disinfectant or allowing fecal sludge used in farming to dry before being used as a human manure.

3. The International Water Management Institute has worked on various projects aimed at assessing and reducing risks of wastewater irrigation and advocate a 'multiple-barrier' approach to wastewater use, where farmers are encouraged to adopt various risk-reducing behaviors.

**8. What statement answers the question: What water should be used for irrigation?**

1. The moisture stored in the soil will be used thereafter to grow crops.

2. Agriculture uses untreated wastewater as a source of irrigation water.

3. Irrigation water can be extracted from springs or by using wells, withdrawn from rivers, lakes or reservoirs, can be used like treated wastewater, desalinated water or drainage water.

**9. Translate the sentences from Russian into**

**English.**

1. Орошение – это искусственное применение воды на земле или почве.

2. Оно используется для выращивания сельскохозяйственных культур, поддержания ландшафтов и рекультивации нарушенных земель в засушливых районах и в периоды недостаточного количества осадков.

3. Поливная вода может поступать из грунтовых вод (добывается из родников или с помощью скважин), поверхностных вод (выведение из рек, озер или водохранилищ) или из нетрадиционных источников, таких как очищенные сточные воды, обессоленная вода или дренаж воды.

4. Для полива используют поверхностные воды, так называемые паводковые воды.

5. Около 90 % сточных вод остается неочищенной, вызывая повсеместное загрязнение воды, особенно в странах с низким уровнем дохода.

6. Все чаще сельское хозяйство использует неочищенные сточные воды как источник поливной воды.

7. К значительной опасности для здоровья может привести использование орошаемой воды с наличием в ней возбудителей, особенно если люди едят сырые овощи.

8. Международный институт управления водными ресурсами разработал проекты, направленные на оценку и снижение рисков сточных вод орошения.

9. Они включают в себя прекращение полива за несколько дней до сбора урожая, чтобы позволить возбудителям умереть в лучах солнца, применять воду аккуратно, чтобы не загрязнять листья, которые едят сырыми, очищать овощи с дезинфицирующим средством.

10. Орошение переработанных сточных вод также рассматривается как средство для удобрения растений и особенно питательных добавок.

**10. Write the summary of the text.**

**11. Retell the text “Irrigation”.**

**Reading for understanding**

**1. Read the text and say what types of irrigation are used for agricultural lands.**

**Types of irrigation**

Various types of irrigation techniques differ in how the water obtained from the source is distributed within the field. In general, the goal is to supply the entire field uniformly with water, so that each plant has the amount of water it needs, neither too much nor too little. Irrigation may be surface, drip (or micro) irrigation, sprinkler irrigation, center pivot irrigation, sub-irrigation, in-ground irrigation.

In surface (furrow, flood or level basin) irrigation systems, water moves across the surface of agricultural lands, in order to wet it and infiltrate into the soil. Surface irrigation can be subdivided into furrow, border strip or basin irrigation. It is often called flood irrigation when the irrigation results in flooding or near flooding of the cultivated land. Historically, this has been the most common method of irrigating agricultural land and still is in most parts of the world.

Drip (or micro) irrigation, also known as trickle irrigation, functions as its name suggests. In this system water falls drop by drop just at the position of roots. Water is delivered at or near the root zone of plants, drop by drop. This method can be the most water-efficient method of irrigation, if managed properly, since evaporation and runoff are minimized. The field water efficiency of drip irrigation is typically in the range of 80 to 90 percent when managed correctly.

In modern agriculture, drip irrigation is often combined with plastic mulch, further reducing evaporation, and is also the means of delivery of fertilizer. The process is known as fertigation.

In sprinkler or overhead irrigation, water is piped to one or more central locations within the field and distributed by overhead high-pressure sprinklers or guns. A system utilizing sprinklers, sprays, or guns mounted overhead on permanently installed risers is often referred to as a solid-set irrigation system. Higher pressure sprinklers that rotate are called rotors and are driven by a ball drive, gear drive, or impact mechanism. Rotors can be designed to rotate in a full or partial circle. Guns are similar to rotors.

Center pivot irrigation is a form of sprinkler irrigation consisting of several segments of pipe (usually galvanized steel or aluminium) joined together and supported by trusses, mounted on wheeled towers with sprinklers positioned along its length. The system moves in a circular pattern and is fed with water from the pivot point at the center of the arc. These systems are found and used in all parts of the world and allow irrigation of all types of terrain.

Sub-irrigation has been used for many years in field crops in areas with high water tables. It is a method of artificially raising the water table to allow the soil to be moistened from below the plants' root zone.

Most commercial and residential irrigation systems are “in ground” systems, which mean that everything is buried in the ground. With the pipes, sprinklers, emitters (drippers), and irrigation valves being hidden, it makes for a cleaner, more presentable landscape without garden hoses or other items having to be moved around manually. This does, however, create some drawbacks in the maintenance of a completely buried system.

**Notes:**

|  |  |
| --- | --- |
| Drip (or micro) irrigation | капельное орошение |
| A solid-set irrigation system | система орошения на твердой установке |
| Center pivot irrigation | орошение с центральной поворотной системой |
| Arc | дуга |
| Buried in the ground | подземная система орошения |
| Manually | вручную |
| Drawbacks | недостатки |

**2. Are the statements true or false? Correct the false statements.**

1. Surface irrigation can be subdivided into furrow, border strip or basin irrigation.

2. Water is delivered far from the root zone of plants, drop by drop.

3. In modern agriculture, drip irrigation is often combined with plastic mulch, further reducing evaporation, and is also the means of delivery of fertilizer.

4. Higher pressure sprinklers that rotate are called rotors and are driven by a ball drive, gear drive, or impact mechanism.

5. The system moves in a circular pattern and is fed with water from the pivot point at the end of the arc.

6. Sub-irrigation is a method of naturally raising the water table to allow the soil to be moistened from below the plants' root zone.

7. Most commercial and residential irrigation systems are “in ground” systems, which mean that everything is buried in the ground.

**3. Find in the text equivalents to the following words and word combinations.**

Приспособление; цель; слишком мало; сельскохозяйственные земли; просачиваться в землю; наводнение; удобрение; хорошее качество; распыление; вращение; высокое давление; круглый; все виды земли; вручную; подземные системы орошения; недостатки; частичный; засушливый климат; известь; распределять; уровень поверхности земли.

**4. Retell the text in Russian.**

**Reading for translating**

1. **Focus on grammar: Complex Subject (сложное**

**подлежащее)**

Complex Object и Complex Subject – схожие конструкции, в них обеих используется инфинитив. Однако, в отличие от сложного дополнения, в сложном подлежащем основными составляющими элементами помимо инфинитива является либо имя существительное в общем падеже, либо местоимение в именительном падеже. А инфинитив в Complex Subject в английском языке может быть во всех своих шести формах.

Например:

to write

to have written

to be written

to have been written

to be writing

to have been writing

В предложениях с конструкцией Complex Subject еще одним основным элементом является сказуемое, особенно глагол, которым оно выражено, так как именно от глагола будет зависеть, в действительном (активном) или страдательном (пассивном) залоге будет стоять сказуемое. Предложения с конструкцией Complex Subject в английском языке обычно переводятся на русский язык с помощью таких оборотов, как «говорят, сообщают, думают, видели, слышали, оказалось, случилось» и т.п.

**How to use Complex Subject**

Как уже отмечалось, конструкция Complex Subject в английском языке применяется с определенными глаголами. Эти глаголы условно можно разделить на несколько групп. Итак, в качестве сказуемого в предложении могут находиться глаголы, выражающие:

1.Осведомленность, знание, утверждение: to know (знать), to think (думать), to state (заявлять, утверждать), to report (сообщать), to say (говорить), to announce (сообщать).

|  |  |
| --- | --- |
| E. g. She is known to live in France. | Известно, что она  живет во Франции. |
| The film festival was reported to take place in July this year. | Сообщали, что кино-  фестиваль пройдет в  июле в этом году. |
| He was thought to study here. | Думали, что он  учится здесь. |

2. Предположение: to expect (ожидать), to suppose (предполагать), to believe (верить), to consider (считать, полагать), to ask (спрашивать).

|  |  |
| --- | --- |
| E. g. The student is expected to become a famous writer. | Ожидают, что этот студент станет известным писателем. |
| The tickets were supposed to be sold in the afternoon. | Предполагали, что билеты продадут к обеду. |

3. Восприятие: to see (видеть), to hear (слышать), to notice (отмечать).

|  |  |
| --- | --- |
| E.g. The car was seen to disappear. | Видели, как машина скрылась. |
| She was seen to enter. | Видели, как она вошла. |

4. Также Complex Subject в английском языке используется после таких словосочетаний, как to be likely (вероятно), to be unlikely (маловероятно), to be certain (несомненно), to be sure (обязательно).

|  |  |  |
| --- | --- | --- |
| E. g. She is likely to succeed. | Вероятно, ее ждет успех. | |
| The bag is not likely to have been stolen | | Маловероятно, что сумку украли. |

Все перечисленные глаголы, будучи сказуемыми, могут стоять в любом времени, но только в страдательном (пассивном залоге – Passive voice). Есть еще группа глаголов, которые употребляются с конструкцией Complex Subject в английском языке, но в действительном (активном – Active voice) залоге. Это следующие глаголы:

to appear – появляться, казаться; to seem – казаться; to happen – случаться; to prove / to turn out – оказаться.

|  |  |
| --- | --- |
| E. g. The second part of the movie appeared to be less interesting. | Оказалось, что вторая часть фильма не такая интересная. |
| He seems to be sleeping. | Кажется, что он спит. |

На самом деле, конструкции Complex Object и Complex Subject не представляют никакой сложности, а, наоборот, облегчают нашу речь, делая ее более похожей на англоязычную, а не на речь родного языка. Они очень популярны и употребляются повсеместно.

**2. Translate the sentences into Russian.**

1. Many books are known to be published in our country every year. 2. You are supposed to graduate in four years. 3. Radium is said to be very radioactive. 4. This device was known to have been designed in that laboratory. 5. His invention is considered to be of great importance. 6. The sun is known to represent a mass of compressed gases. 7. This type of rocket is supposed to have many advantages. 8. For a long time the atom was thought to be indivisible. 9. The helium atom was found to have two electrons. 10. I did not know what I was expected to say to that, so I said nothing. 11. He was said to be one of the most promising water experts. 12. The number of the unemployed is reported to be increasing with every year. 13. A hare is known to run very fast. 14. The man was seen to take off his coat. 15. The diamond content of the mines in Western Yakutia is said to be in no way inferior to that of the world-famous South African mines. 16. The crisis was announced to be over but they should prepare for the worst. 17. People consider the climate there to be very healthy. 18. It was announced that the Chinese dancers were arriving next week. 19. It is reported that the flood has caused severe damage to the crops. 20. It was supposed that the crops would be rich that year. 21 It has been found that this mineral water is very good for the liver. 22. It is said that the weather in Europe was exceedingly hot last summer.

**3. Read and translate the text using a dictionary.**

**Ancient irrigation**

The first people to grow plants had to learn three main tasks: how to concentrate desirable plants into a manageable area; how to prevent weeds from growing there; and how best to encourage the plants to flourish. In short, people learned to plant, weed, and water or drain crops. In the English climate, there is enough natural rainfall to grow staple crops. But in a dry climate, most crop plants need water, and it must be provided by the farmer. Irrigation has been the technology underlying many of the world's greatest civilizations.

But irrigation is not easy. Usually, irrigation schemes require a large investment of money or labor or both. Water supplies must be safe and reliable. In each growing season, water of the right quality must be delivered at the right time and place in the right quantity at the right price, and irrigation water must later be drained off the crops. Even within one growing season, irrigation systems need continual

maintenance.

The long-term hazards of irrigation are even greater. Investment in irrigation projects pays best in dry areas where evaporation is high. Water is never pure, but has mineral salts dissolved in it. Evaporation will therefore make it saltier still. Rivers flowing through dry or desert areas lose water by evaporation, and become salty. For example, the water in the lower Colorado contains over a ton of salt per acre-foot of water.

Many areas in dry climates have natural brackish or salty lakes, or even dry salt pans. Soils are often laden with lime (calcium carbonate) or salt (sodium chloride), and many sedimentary rocks contain natural salts. Promising irrigation areas thus may have natural salts in rocks or soils that will easily be transferred into fields as soon as irrigation water is applied, and even that water may come from rivers that have become saltier from evaporation along their courses.

As water is used on crops, it spreads out as a thin sheet, exposed to the surface. Much of it may evaporate, making it more saline. It may dry up altogether, leaving a thin layer of salts on and in the soil. Even under normal circumstances, plants absorb moisture from the soil, leaving behind excess salts. Eventually salts build up in the surface soils until they become infertile. Over time, therefore, soils in dry irrigated areas tend to become salinized.

The only way to deal with this problem is to apply enough water so that salt is flushed off or flushed through the soil. The flushing must remove salts from the area altogether, along natural or artificial drainage. In well-drained areas with a dry season and a wet season, natural flushing takes place each year. But in poorly-drained areas, over-watering simply mobilizes the salt while the water table rises to ground level. Capillary action draws the saline water to the surface, where the salt dries out as a surface deposit, and the problem is made worse rather than better. Once the soil is saturated, with water up to the surface, there is no way to leach salts out of the soil, and the fertility of the region is destroyed unless major drainage channels are built to carry away the salt. Even flushing may not be a net environmental plus: flushing simply delivers salt somewhere else, perhaps to downstream users, or into groundwater supplies. Flushing also leaches away soil nutrients with the salts.

Therefore, irrigation can only be maintained on a long-term basis in the following conditions. Water is applied in such a way that salt is not allowed to build up in the soil. Usually, this means that a lot of good-quality water is applied, and that drainage is rapid and efficient. Soils need a large infusion of fertilizer, to balance the flushing that is required to keep them salt-free.

A region that can be irrigated on a long-term basis thus has:

–An abundant supply of good water.

–Well-drained soil.

–Good regional drainage.

–A supply of fertilizer for the soil.

If any of these conditions fails, the system will eventually fail. Such failures have brought down civilizations that solved the engineering and logistic problems of designing, building, and maintaining irrigation systems, but neglected the long-term effects of salinization or nutrient depletion. Long-term problems of irrigation may not appear for a long time: today, for example, the valleys and basins of the San Joaquin, Rio Grande, Indus, Nile, Murray-Darling, Jordan, and Tigris-Euphrates are being irrigated, with progressive and visible increases in salinization and water-logging, and no remedy in sight. Only a few civilizations based on irrigating dry country have lasted for any length of time: sensible civilizations should not try to grow wetland crops in arid climates.

The major success stories for civilizations based on agricultural irrigation are Egypt and China. The major stories of failure are happening right in front of us. In present-day California, a giant industry is trying to maintain an irrigation economy with a diminishing supply of poor-quality water, on clay soils with very poor natural drainage, in an almost landlocked plain with poor or non-existent regional drainage, applying water that has been stripped of its natural load of silt.

**4. Read, translate and remember.**

Some facts about water

**Why water is in great need.**

Without water, nothing lives.

Comparative shortage of water suppresses and eventually kills some aspects of the body.

Water is the main source of energy – the “cash flow” of the body.

Water generates electrical and magnetic energy inside each and every cell of the body – it provides the power to live.

**Appendix**

**Water Quiz Keys:**

1) 1 %

2) 75 %

3) 6–8 glasses

4) About seven days

5) The same amount there is now

6) Canada

7) All of the above

8) Potable

9) 17 percent

10) 3500 litres

11) True

12) Positively near the hydrogen atom and negatively near the oxygen atom

13) 3 %

**Content**

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