UNIT 4

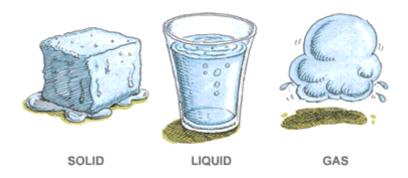
WATER AND APPLICATION OF WATER



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STARTER: Look at the pictures and share your ideas with the group.



Step 1. Answer the following questions and try to predict what is going to be discussed in the session.

- What do you see in the pictures?
- What forms (states) of water are described in them?
- What is the difference between the forms?

Step 2. Read the Reading Passage.

Water is the source of life and civilization. Without it nothing can survive in the world. Humanity can develop only on the base of water and everything in the nature is balanced because of the water. That's why it is considered as the most essential and needful element of all.

Water (H2O) is the most abundant compound on Earth's surface, covering about 70 percent of the planet. Naturally, water exists in liquid, solid, and gaseous states. Usually we meet indynamic equilibrium between the liquid and gas states at standard temperature and pressure. At room temperature, it is

a tasteless and odorless liquid, nearly colorless with a hint of blue.

Perhaps, you have already observed that many substances dissolve in water and that's why it is commonly referred to as *the universal solvent*. Because of this, water in nature (or natural water as we call it) and in use is rarely pure. Analogically, some of its properties may vary slightly from those of the pure substance (However, there are also many compounds that are essentially, if not completely, insoluble in water).

Do you know water is the only unique substance found naturally in all three common states of matter? Yes, it is the three-stated element and *it is essential for all life on Earth*. Another interesting fact is that water usually makes up 55% to 78% of the human body. It says about necessity of it in the life and great demand of it for human being is growing day by day.

Step 3. Fill in the gap of the following statements and explain the meaning of the missing words.

In nature, ... exists in liquid solid, and gaseous states. It is in ... between the ... and gas_states at standard temperature and pressure. At...., it.... and odorless liquid, nearly colorless with a

Many substances dissolve in water and it is commonly referred to as *the* universal.....

Step 4. Do the following statements agree with the information in Reading Passage?

YES (Y)	if the statement agrees with the information
NO (N)	if the statement contradicts the information
NOT GIVEN (NG)	if there is no information on this passage

The first decomposition of water into hydrogen and oxygen, by

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electrolysis, was done in XX century	
Water (H2O) is the most plentiful compound on Earth's surface,	
covering about 70 percent of the planet.	
In nature, water exists in liquid, solid, and energies states.	
Water can use affectively by human being	
Step 5. Learn some essential details on the history of water and	d make some
notes on essential data.	
History	
The first decomposition of water into hydrogen and oxygen, by electrolysis, was done in 1800 by an English chemist William Nicholson. In 1805, Joseph Louis Gay-Lussac and Alexander von Humboldt showed that water is composed of two parts hydrogen and one part oxygen. Gilbert Newton Lewis isolated the first sample of pure heavy water in 1933. The properties of water have historically been used to define various temperature scales. Notably, the Kelvin, Celsius, Rankine, and Fahrenheit scales were, or currently are, defined by the freezing and boiling points of water. The less common scales of Delisle, Newton, Réaumur and Rømer were defined similarly. The triple point of water is a more commonly used standard point today ² .	
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Step 6. Make some questions to the given arguments.	
Ex: Who isolated the first sample of pure heavy water?	_
1	_
2	
3	;

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² http://en.wikipedia.org/wiki/Properties_of_water

WHAT DO THESE WORDS MEAN?

water – a colorless, transparent, odorless, liquid which forms the seas, lakes, rivers, and rain and is the basis of the fluids of living organisms

compound – a thing that is composed of two or more separate elements; a mixture

liquid — a substance that flows freely but is of constant volume, having a consistency like that of water or oil

tasteless – 1) lacking flavor 2) considered to be lacking in aesthetic judgment or to constitute inappropriate behavior

solvent – the liquid in which a solute is dissolved to form a solution ■ a liquid, typically one other than water, used for dissolving other substances ■ something that acts to weaken or dispel a particular attitude or situation

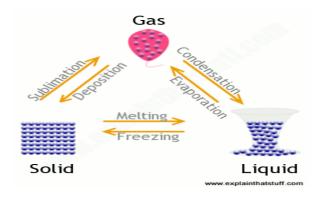
state of matter – a physical condition as regards internal or molecular form or structure

heavy water – water in which the hydrogen in the molecules is partly or wholly replaced by the isotope deuterium, used especially as a moderator in nuclear reactors

temperature scale – temperature condition

SESSION 14 WATER STRUCTURE

STARTER: Look at the picture and share your ideas with your group-mates.



Step 1. Answer the questions.

- What can you see in the picture?
- Have you ever heard about the types of the water?
- How can you explain heavy, liquid and light waters?

Step 2. Read the following text attentively.

As it was mentioned in the previous passage, water can be met in the three states (liquid, solid and gaseous). Today you are going to study the fourth state of water in the nature. Let's study all the states in order.

The states of the water are also broadly categorized by phase of matter. The *liquid phase* of them is the most common among water's phases (within the Earth's atmosphere and surface) and it is interesting to sign that it is generally denoted by the word "water." The *solid phase* of water is known as ice and commonly takes hard, amalgamated crystals structure (such as ice cubes, or loosely accumulated granular crystals, like snow). The *gaseous phase* of water is

known to everybody as water vapor (or steam).

As it was mentioned in above-stated paragraph, there is *the fourth state* of the water in the nature and it is an interesting fact. Have you ever heard about supercritical fluid? It is considered as the fourth state of the water and is much less common than the other three. Additionally, this type of water only rarely occurs in nature, in extremely uninhabitable conditions. One example of naturally occurring supercritical water is found in the hottest parts of deep water hydrothermal vents, in which water is heated to the critical temperature by scalding volcanic plumes and achieves the critical pressure because of the crushing weight of the ocean at the extreme depths at which the vents are located.

Heavy water is water with a higher-than-average deuterium content, up to 100%. Chemically, it is similar but not identical to normal water. This is because the nucleus of deuterium is twice as heavy as protium, and this causes noticeable differences in bonding energies. Because water molecules exchange hydrogen atoms with one another, hydrogen deuterium oxide (DOH) is much more common in low-purity heavy water than pure dideuterium monoxide (D_2O). Humans are generally unaware of taste differences, but sometimes report a burning sensation or sweet flavor. Rats, however, are able to avoid heavy water by smell. Toxic to many animals, heavy water is used in the nuclear reactor industry to moderate (slow down) neutrons.

Light water more specifically refers to deuterium-depleted water (DDW), water in which the deuterium content has been reduced below the standard 155 ppm level.

Concluding, it is important to say that studying the structure of water in nature may give us ideas how to keep it safe and poor for us and future generation.

Step 3. Match the statements in the box A with the words in the box B.		
А	В	
composed of molecules that move freely among	nuclear	
themselves but do not tend to separate like those of gases		
Having a grainy or granulated surface	deuterium	
an isotope of hydrogen with one proton and one neutron in	gas	
the nucleus having an atomic weight of 2014.		
relatively great expansion and contraction with changes in	granular	
pressure and temperature		
pertaining to or involving atomic weapons	solid	
Frim or compact in subtance	liquid	

Step 4. List <i>adjective + noun</i> word combination from the text.	
Wordcombinations	Paragraph

Step 5. Complete the sentences by your own understandings.
Solid water –
Heavy water –
Light water –
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WHAT DO THESE WORDS MEAN?

liquid phase – a distinct period or stage in a process of change or forming part of liquid's development

solid phase – firm and stable in shape phase; not liquid or fluid

granular – resembling or consisting of small grains or particles

crystal – a piece of a homogeneous solid substance having a natural geometrically regular form with symmetrically arranged plane faces

ice cube – a small block of ice made in a freezer, especially for adding to drinks amorphous – without a clearly defined shape or form

gaseous phase – relating to or having the characteristics of a gas

water vapor – water in the gaseous state, esp. when due to evaporation at a temperature below the boiling point

supercritical fluid – above a critical a substance that has no fixed shape and yields easily to external pressure; a gas or (especially) a liquid critical temperature

critical pressure – the pressure of a gas or vapour in its critical state

hydrothermal vent – an opening in the sea floor out of which heated mineral-rich water flows

volcanic plume – a long cloud of smoke or vapour resembling a feather as it spreads from its point of origin as a result of volcano

deuterium – a stable isotope of hydrogen with a mass approximately twice that of the usual isotope (Symbol: D)

heavy water – the water in which the hydrogen in the molecules is partly or wholly replaced by the isotope deuterium, used especially as a moderator in nuclear reactors

neutron – a subatomic particle of about the same mass as a proton but without an electric charge, present in all atomic nuclei except those of ordinary hydrogen **light water** – the water containing the normal proportion (or less) of deuterium oxide, i.e. about 0.02 per cent, especially to distinguish it from heavy water

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SESSION 15	IRRIGATION

STARTER: Look at the picture and answer the following questions. Try to predict what is going to be discussed in the session.



- What is described in the picture?
- How do you think and imagine the first invention of a man how to grow plants?
- Does water used by men eventually return to the environment?

Step 1. Team-work.

Re-grouped into three groups do the following tasks:

a) pay attention to the proverb:

Knowledge is like a garden: if it is not cultivated, it cannot be harvested (African proverb).

b) be attentive to the metaphors used in the saying. What do they describe? Discuss it with your partners and other teammates.

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c) choose proverbs in English and Uzbek languages similar to the meaning of this proverb.

Step 2. Read the Reading Passage attentively.

Think of what your supper table might be like if water was not used to irrigate crops. Do you think you could survive very long without heaping servings of fruits and vegetables? Irrigation water is essential for keeping fruits, vegetables, and grains growing to feed the world's population, and this has been a constant for thousands of years.

Throughout the world, **irrigation** (water for agriculture, or growing crops) is probably the most important use of water (except for drinking and washing a smelly dog, perhaps). Almost 60 percent of all the world's freshwater withdrawals go towards irrigation uses. Large-scale farming could not provide food for the world's large populations without the irrigation of crop fields by water gotten from rivers, lakes, reservoirs, and wells. Without irrigation, crops could never be grown.

Irrigation has been around for as long as humans have been cultivating plants. Man's first invention after he learned how to grow plants from seeds was probably *a bucket*. Ancient people must have had strong backs from having to haul buckets full of water to pour on their first plants. Pouring water on fields is still a common irrigation method today—but other, more efficient and mechanized methods are also used. One of the more popular mechanized methods is the center-pivot irrigation system, which uses moving spray guns or dripping faucet heads on wheeled tubes that pivot around a central source of water. The fields irrigated by these systems are easily seen from the air as green circles. There are many more irrigation techniques farmers use today, since there is always a need to find more efficient ways to use water for irrigation.

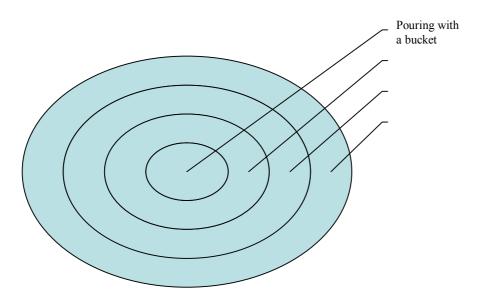
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Step 3. Choose the title for the passage. Explain the reason of your choice.

Step 4. Put headings to the paragraphs.	
Headings	Paragraphs
Water returning to the environment	
Ancient people and irrigation	
No very long surveying without irrigation	
Artificial application of water	
Irrigation throughout the world	

Step 5. Complete the mind-map according to the text and fill in the columns. Compare the features and give explanation of each choice.

History of Irrigation



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WHAT DO THESE WORDS MEAN?

irrigation – supplying water to land or crops by different means

fresh water – clean water

large-scale farming – involving large numbers or a large area of farm culture

river – a large natural stream of water flowing in a channel to the sea, a lake, or another river

lake – a large area of water surrounded by land

reservoir – a large natural or artificial lake used as a source of water supply

well – a shaft sunk into the ground to obtain water, oil, or gas

seed – a small object of flowering plant, capable of developing into another such plant

first plant – beginning crop

irrigation technique – watering technology

water source – water resource; a place, where a river or stream begins

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SESSION 16

IRRIGATION: ARTIFICIAL APPLICATION OF WATER

STARTER: Answer the following questions:

- What are the natural and artificial applications of water?
- How do you define the terms "usable", "unusable", and "reusable", towards the water?
- What do you know about returning the water used by human to the environment?
- Describe the ways of loosing water in use.

Step 1. Read the Reading Passage.

Water is an essential element for our being and surviving. When we use water in our home, or when an industry uses water, about 90 percent of the water used is eventually returned to the environment where it replenishes water sources (water goes back into a stream or down into the ground) and can be used for other purposes. But only about one-half of the water used for irrigation, is reusable. The rest is lost by evaporation into the air, evapotranspiration from plants, or is lost in transit, by a leaking pipe, for example.

We used to call irrigation as the artificial application of water to the land or soil, because natural sources of watering the plants (raining, snowing, flooding etc.) aren't irrigation means as themselves. 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 growing in grain fields and helping in

preventing soil consolidation. In contrast, agriculture that relies only on direct rainfall is referred to as rain-fed or dryland farming. Irrigation systems are also used for dust suppression, disposal of sewage, and in mining. Irrigation is often studied together with drainage, which is the natural or artificial removal of surface and sub-surface water.

Step 2. Do the following statements agree with the information in Reading Passage? In boxes 1-3 on your answer sheet write. Time – 5 min.

YES (Y) if the statement agrees with the information

NO (N) if the statement contradicts the information

NOT GIVEN (NG) if there is no information on this passage

N	Irrigation is the natural application of water to the land or soil.
	Irrigation systems are also used for dust suppression, disposal of
	sewage, and in mining.
	Irrigation is seldom studied together with drainage, which is the
	natural or artificial removal of surface and sub-surface water.
	Water for irrigation is lost by leaking pipes.

Step 3. Find the words to the definitions.		
Definitions	Words	
a formal request for assistance, employment, admission	application	
to a school, etc.		
preparing the land to grow crops.		
to continue living.		
the supplying of water to dry land.		

Step 4. Using NO MORE THAN THREE WORDS from the passage, answer the

following ques	stions. Write your	answers in the lines below.
1. What kind	of application dea	als the irrigation with?
Irrigation dea	als with the artific	ial application of water
2. Is irrigation	the artificial app	lication of water to the land or soil?
3. Is drainage surface water?		e natural or artificial removal of surface and sub-
		·
Step 5. Write	adverbs for the	given adjectives and make up sentences using
them.		
Essential	essentially	That blessed union has contributed so
		essentially to the prosperity of both countries.
Artificial		
Natural		
Additional		
Eventual		
Step 6. Mak	ke some notes (on the topic, including returning water to the
environment	(1), artificial appl	ication of water (2) and wide usage of irrigation in
the world an	nd in your area. I	Base your ideas on your own understanding and
experience.		
1		·
2		·
		·

WHAT DO THESE WORDS MEAN?

reusable – an attribute for the things or actions which can be used more than once
 leaking – be accidentally lost or admitted through a hole or crack in a container or covering

pipe – a tube used to convey water, gas, oil, or other fluid substances

transit – the carrying of people or things from one place to another

maintenance – the process of preserving a condition or situation or the state of being preserved

landscape – all the visible features of an area of land; a picture of an area of countryside

revegatation – production a new growth of vegetation on (disturbed or barren ground)

disturbed soil — having had the anormal pattern of soil or functioning disrupted inadequate — lacking the quality or quantity required; insufficient for a purpose rainfall — the fall of rain ■ the quantity of rain falling within a given area in a given time

soil consolidation – the act of solidification of soil or state of being consolidated of soil

dust suppression – the action of depressing (lowering) of moving soil (dust)

sewage – waste water and excrement conveyed in sewers

mining – the process or industry of obtaining coal or other minerals from a mine
 sub-surface – the stratum or strata (layer of earth) below the earth's surface
 evaporation – turning from liquid into vapour

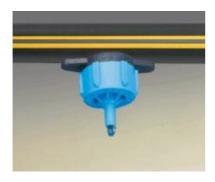
evapotranspiration – the process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants

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SESSION 17

TYPES OF IRRIGATION

STARTER: Look at the pictures below and tell your understanding.





Step 1. Skimming the text quickly try to order passages and make the whole topic.

Do you know what is drip irrigation and how does it function? **Drip irrigation**, also known as *trickle irrigation*, functions as its name signs. The water in this system falls drop by drop just at the position of roots (water is delivered at or near the root zone of plants, drop by drop). It is important to manage this process properly that the method can be the most water-efficient method of irrigation.

It is known that various types of irrigation techniques (methods) differ in how the water obtained from the source 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. The modern methods are efficient enough to achieve this goal. The irrigation techniques are commonly divided into drip irrigation, surface irrigation and localised irrigation.

П	In surface irrigation systems, water moves over and across the land by
	simple gravity flow in order to wet it and to infiltrate into the soil. Surface
	irrigation can be subdivided into furrow, borderstrip 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.
П	Localized irrigation is a system where water is distributed under low
	Localized irrigation is a system where water is distributed under low pressure through a piped network, in a pre-determined pattern, and applied
	pressure through a piped network, in a pre-determined pattern, and applied
	pressure through a piped network, in a pre-determined pattern, and applied as a small discharge to each plant or adjacent to it. Drip irrigation, spray or
	pressure through a piped network, in a pre-determined pattern, and applied as a small discharge to each plant or adjacent to it. Drip irrigation, spray or micro-sprinkler irrigation and bubbler irrigation belong to this category of

Step 2. Choose the title for the passage. Explain your choice.

Step 3. Match each topic in A with two items in B.

Α	В
Drip irrigation	applied as a small discharge to each plant
	subdivided into furrow, borderstrip or basin irrigation
Surface irrigation	water is distributed under low pressure
	water falls drop by drop
Localized irrigation	trickle irrigation
	flood irrigation

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Step 4. Fill in the gaps and complete the text with the words in the box.		
Water	Types	Source
Plant	Efficient	Supply

Various ... of irrigation techniques differ in how the water obtained from the ... distributed within the field. In general, the goal is to ... the entire field uniformly with ..., so that each ... has the amount of water it needs, neither too much nor too little. The modern methods are ... enough to achieve this goal.

Step 5. Pay attention to the topic sentences and complete with controlling ideas.

4. 1	e water in this system falls drop by drop just at the position of roots.	
It de	ls with the drip irrigation technique.	

5. 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.

_____.

6. It is often called **flood irrigation** when the irrigation results in flooding or near flooding of the cultivated land.

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7. Drip irrigation, spray or micro-sprinkler irrigation and bubbler irrigation belong to this category of irrigation methods.

WHAT DO THESE WORDS MEAN?

drip irrigation - watering grounds/plants/crops by the means of falling water
drop by drop

trickle irrigation – the supply of a controlled restricted flow of water to a number of points in a cultivated area

position of root – placing of root

root zone – the part of a plant which attaches it to the ground or to a support, typically underground, conveying water and nourishment to the rest of the plant via numerous branches and fibers

water-efficient method – water-saving method

surface irrigation system – irrigating system below the earth's surface

flood irrigation – watering with an overflow of a large amount of water beyond its normal limits, especially over what is normally dry land

localized irrigation – local watering



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SELF-CONTROL on UNIT 4 (total 15 points)

Step 1. VOCABULARY CHECK (5 points). These are the important words that you have studied in Unit 4. You should make sure that you know these words before you go on to Unit 5.

compound	localized irrigation
deuterium	neutrons
drip irrigation	position of root
evaporation	reservoir
evapotranspiration	river
first plant	root zone
fresh water	seed
floodwater harvesting	solid phase
granular	sprinkler or overhead irrigation
heavy water	surface irrigation system
hydrothermal vent	supercritical fluid
irrigation	temperature scale
irrigation technique	trickle irrigation
lake	volcanic plume
large-scale farming	water-efficient method
light water	water vapor
liquid phase	well

Step 2. TRUE-FALSE ACTIVITY (5 points). Which of the following bits of information is given (G) or not given (NG) in Unit 1?

1. Iceberg of the world considered one of the sources of water
2. Before water component was divided into hydrogen and oxygen part
3. Gaseous type of water is mostly can be crystal and takes hard

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- 4. Farming, fruits, vegetables and grains are not mostly dealt with irrigation. They are not essential.
- 5. Artificial application of water named as an irrigation means._____

Step 3. COMPREHENSION TASK (5 points). Read and explain the meaning of the following proverbs and wise-sayings on gardening and planting. Underline metaphorical and specific usage of some expressions.

- 1. A hive of bees in May is worth a load of hay.
- 2. A lawsuit is a fruit-tree planted in a lawyer's garden.
- 3. A patent on seeds is a patent on freedom. If you have to pay for patented seeds, it's like being forced to buy your own freedom.
- 4. A plant is like a self-willed man, out of whom we can obtain all which we desire, if we will only treat him his own way.
- 5. Advances in medicine and agriculture have saved vastly more lives than have been lost in all the wars in history.



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