

WATER - Syllabus JAG03 / JAZ03

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Based on Addison-Wesley Earth Science - Chapters 7 and 8

The Earth's Fresh Water

Section 1 Water on the Ground

Water collects on the ground

Water runs off the ground

Section 2 Water in the Ground

Water soaks into the ground

Porosity and permeability + **translation**

Zones of water in the ground (**Take the copy at school.**)

Water comes out of the ground + **listening test**

Revision test

Ocean

Section 1 The Bottom of the Ocean

Sounding the ocean bottom

The topography of the ocean bottom

Resources of the ocean bottom

Section 2 Properties of Ocean Water

Salinity

Temperature and density

Sea ice

Water absorbs light

Water pressure

Resources of ocean water

Section 3 The Circulation of Ocean Water

Directions of motion in a wave

Deep ocean circulation

The beginning, middle, and end of a wave

Effects of wave action

Tides

Revision test

WATER

Introduction – Reading for specific information

How many percent of the earth's surface is covered by water? –

Why is water a very unusual earth material? Give at least two reasons.

Help: (AW= Addison-Wesley) textbook, p.336, Fig.7-1.

1/

2/

Where is water found as a liquid?

–

–

–

Where is water found as a solid?

–

–

–

–

Where is water found as a gas? Why can we not see it?

Table 7-1 on page 337 in AW textbook shows the distribution of water on the earth.

Task: Describe the table using suitable expressions for comparing and contrasting.

Note: Czar miliarda = US one billion = Br one thousand million

*What happens when water **freezes**?*

*What happens when water **condenses**?*

*What happens when water **evaporates**?*

*What affects the **rate** of evaporation from the surface and just below the surface?
(Page 347)*

As green plants make food, they give off water vapor to the atmosphere through pores in their leaves in a process called **transpiration**. Water also evaporates from the surface of a human skin when our body gets rid of its moisture. *How do we call that process?*

During all the years between the formation of the earth and now, water has been moving continuously into and out of the atmosphere in a process called **water cycle** or **hydrologic cycle**.

Task: Describe the process in pairs. (Fig. 7-2 on p.338)

Key words: cool, cause (as a verb), enter, fall (back), return, soak into, stay on the surface, run off, precipitation, (under) ground water supply

Grammar revision: 1.vyjádření stejné míry

2.vyjádření přímé úměry

Why is this process, on a worldwide basis, a balanced system?

Our Science Heritage – Water and Ancient Civilizations

Task 1: Read the text on p. 339 and say what happened

11 000 ago –

9 500 ago –

8 500 ago –

5 000 ago –

Task 2: Suggest a headline for each paragraph.

1.

2.

3.

4.

5.

Conversation Topic

Think of a stream near your home. Where does it start? Try to give the exact location.

What larger body of water does it flow into?

Is it pleasant-sounding?

Is it clean or polluted?

Does it provide a habitat for many plants and animals?

Key words: **spring, start** (pramen, pramenit), **stream** (potok, pramínek, říčka), **streamlet** (potůček, strouha, pramének); **the upper reaches of a river** (horní tok); **brook, creek** (potok)

Find some more expressions on this topic:

Pramen=

studna=

řečiště, koryto=

průliv=

přehrada: nádrž

pramenit=

zřídlo, vřídlo=

splavný tok=

průplav=

hráz

“vyvěračka”=

Define aqueduct -

Homework: *Remind the formation of a glacier (JAG02 - Erosion) and prepare the test on the following page.*

The Earth's Fresh Water

How many percent of all the earth's water is fresh water?

Section 1 Water on the Ground

Water collects on the ground

Task: Fill in the missing gaps with one of the following words:

Almost as enough even
body damming melts soaked dug (inf=)
causes, supply, dam = nouns or verbs?

Water can return to the earth as rain or snow which may **pile up** to great depths. Increasing pressure on the bottom layers _____ **that** snow to change to ice. Most of the earth's fresh water _____ is stored in glaciers and other forms of ice. Glaciers, moving masses of ice and snow, flow downhill and out of their center. They usually move very slowly, **gouging** and reshaping the land _____ they go. In order for glaciers to exist, more snow must fall than _____ each year. Most of the glaciers are located near the poles where the energy from the sun, _____ in summer, is not strong _____ to melt all the ice and snow.

Water collects in lakes, ponds, and swamps. A lake forms when water collects in a hole or depression in the earth's surface. The Great Lakes are the largest body of fresh water on earth. Their content of water is _____ twice as much as all the water in the earth's atmosphere! They are thought to have been formed about 250 000 years ago, when a glacier _____ the lake beds out of the rock surface. The rock and soil that were **scooped out** of the **hollow** formed natural _____. When the southern part of the glacier melted, water filled the huge hollows and formed the lakes. Many lakes of the world were formed that way. Some lakes form when water fills the craters of inactive volcanoes. **Reservoirs** are lakes usually formed by _____ a river.

A **pond** (Us) is a _____ of water that is smaller and shallower than a lake. Ponds and lakes that are filled with water and vegetation are called **swamps** (the word comes from a Greek word meaning **sponge**.) They are low-lying water-_____ **marshes** and **bogs**. Swamps provide a home for many varieties of plants and animals.

Pronounce correctly: supply [], gouging [], swamp [], sponge [],
reservoir [], soak []

What do these words mean in Czech?

to pile up=	to gouge= scoop out= dig out
to dam (damming)=	a dam=
a hollow =	sponge=
marsh=bog=	peat bog =

Grammar: a) vazba akuzativ+ infinitiv:

b) vazba nominative+infinitiv:

Find the examples in the text above.

Task: Look at the pictures in AW textbook, p. 340-342 and read the figure notes.

Water runs off the ground

A large amount of liquid water that falls to the earth has no place to collect. Much of this water flows directly off the surface and is known as runoff which occurs in two ways:

- **Sheet runoff** has no channels to direct its flow. It runs off as broad flat sheets of water.
- In **streams** water flows in channels between banks of soil, rock and other material. The banks give the direction of the flow.

When water falls onto a mountain ridge or when snow melts on the ridge, water will run off on both sides of the ridge. The highest land that separates the direction in which water will run off is called a **divide (Br watershed)**. See Fig.7-7, p.343.

The mightiest river systems in the world begin as small flows that feed into little stream channels and these flow into larger ones until they form a river. Streams and small rivers that empty into one large river system are called **tributaries**. Eventually the large main river empties into the sea.

All the area of land that drains into a river, along with its system of streams and other tributaries, is called a **river basin, or a catchment area**.

Check yourself in a pair

1. What are two ways in which runoff occurs? How are they different?
2. *What is a divide?*
3. *What are the names of the entire area that serves as a source of runoff for a river system?*
4. *What are tributaries?*
5. *What is the opposite of broad? Which word is similar?*

Homework

Prepare a short report on a lake or a pond near your home. Find out how it was formed. Is there any evidence that the lake was higher or lower than it was when you observed it? Where does the lake get its water?

Is the lake filling in with sediments and plants?

You may add any interesting information.

Useful vocabulary:

Br pond = Us small lake = rybník, pool = tůňka, tarn = mountain lake

moorland = vřesoviště, marsh = travnatá bažina, swamp = sezonně zaplavovaná

bažina, peat bog = rašeliniště, alga, pl.algae = řasy, blue green = sinice;

liquid wastes, sewage = odpadní vody, carp = kapr, pike = štika, trout = pstruh, eel = úhoř, catfish = sumec; punt = pramice, mud, muddy = bláto, blátivý

Do the ROPOT of this section.

Section 2 Water in the Ground

Water soaks into the ground - Porosity and permeability

Most of the earth's liquid fresh water is found neither in lakes nor in rivers, but in the ground. Water can soak into or flow into a material through **pore spaces** between particles in a process called **infiltration**. The total volume of the pore spaces in a certain volume of material is called **porosity**. Pore spaces among round-shaped particles of loose materials like sand can account for about one third of the total volume. Sandstone, therefore, is quite porous because of frequent pore spaces between the sand grains and the cementing material. Other kinds of rock, such as granite, which may consist of interlocking crystals or tightly pressed layers, will have a very low porosity or no porosity at all.

Water does not infiltrate into all materials at the same rate. It will soak into a dry sandy soil almost immediately, but on the other hand, it may form a puddle on top of clay soil. We say that sand has a high **permeability** – the ease with which water flows through a material.

Does rock with a high porosity necessarily have a high permeability?-

Permeability depends on the number and size of the pore spaces and whether these pore spaces are interconnected. Clay is made up of flat, irregular particles that may be many times smaller than sand particles. When they fill the pore spaces among sand particles, they greatly reduce the permeability of the material.

Another factor that affects the size of pore spaces and permeability is packing. Water will pass more quickly through loosely packed soil, but when soil is tightly packed, the flat particles of clay can fit together almost like a jigsaw puzzle. Water passes through very slowly, if at all.

What does the packing of soil depend on? –

Where and why is soil more tightly packed? –

Are pore spaces always needed for high permeability? Can you describe a situation in which a material has a low porosity but a high permeability? –

Check yourself

Explain the difference between porosity and permeability. Give examples of materials.

Give the opposites of: rounded tightly permeable regular porous

Conversation Topic

*Some people claim they can find underground water with a stick. This is called **witching** or **dowsing [au]**. Have you ever tried this technique? If so, have you succeeded? If no, have you seen someone using it? Is it scientific? Support your reasoning.*

Zones of water in the ground – take the copy at school

PERMEABILITY

Translate the following story. Use proper grammar rules. Check the words in bold.

Učitel filozofie jednoho dne přišel do třídy.

Když se studenti usadili, vzal ze šuplíku **nádobu** a naplnil ji až **po okraj** kameny.

Potom se **zeptal** studentů, zda si **myslí**, že **je** nádoba plná? Studenti s ním souhlasili, že je. (souslednost!)

Potom profesor vzal krabičku s kaménky a **vysypal** je do nádoby s kameny, zatřásl nádobou a samozřejmě, že kaménky propadaly mezi kameny.

Profesor se zeptal znovu. Je teď nádoba plná?

Studenti se pousmáli a souhlasili, že je.

Ale profesor vzal krabičku s velmi **jemným** pískem a vysypal ho do nádoby.

Samozřejmě písek vyplnil i ty nejmenší **mezírky** mezi kameny.

Ted už byla nádoba opravdu plná.

Potom profesor řekl: „Touto ukázkou jsem chtěl **znázornit**, že život je jako tato nádoba.

Kameny **znázorňují** důležité věci ve vašem životě, jako jsou vaše rodina, partner, zdraví, děti..., všechno, co je tak důležité, že kdybyste to ztratili, bylo by to velmi **zničující**.

Kaménky znázorňují ostatní, méně důležité věci. Například vaše zaměstnání, dům, auto... A písek je všechno ostatní. **Drobnosti**.

Když dáte písek do nádoby jako první, nezůstane vám žádné místo pro kameny.

To stejné platí i v životě. Když budete ztrácet čas a energii na **drobnosti - materiální věci**, nikdy nebudete mít čas na věci, které jsou skutečně důležité.“

Pak přistoupil student a ptá se profesora. Myslíte, že je nádoba už plná?

Profesor **připustil**, že ano. Student vzal půllitr piva a vлил ho do nádoby.

Pivo se **vsáklo** do písku. **Ponaučení?** Na pivo se vždycky **místo** najde!!

Homework – Listening test in ROPOT: Geysers and Hot springs

Geysers and hot springs

1. How are geysers and hot springs **formed**?
2. Which **types of conduits** does the speaker describe?
3. **How** do open conduits **act**?
4. What happens in **more restricted conduits**?

Geysers in Yellowstone National Park (YNP)

1. Which **famous geyser** are the tourists expecting to see?
2. What time is the **next prediction**?
3. Are there any **active volcanoes** in Yellowstone National Park?
4. What was said about **past eruptions**?
5. How far from the earth surface does a column of hot magma **below** Yellowstone National Park (YNP) rise?
6. Are geysers **the only** magma driven features in YNP?

Water comes out of the ground

In general, the water table is more or less parallel to the earth's surface. But if, as shown in Fig. 7-14, the ground slopes or the impermeable layer slopes, then gravity will cause ground water to move slowly toward the lowest level. *What will happen if the water table intersects the earth's surface on a slope?* It will flow out of the ground in a **spring**. Many ponds and lakes are **fed** by underwater springs, but if they are not located in a hollow or basin, they can also feed water into a stream finding or creating a channel over a period of time. There is a type of spring that is not fed by water from the local water table. In a special arrangement of underground rock layers there is a middle layer of permeable rock which passes between two layers of impermeable rock. This combination is called an **artesian system** shown in Fig. 7-15 on p.359. Water can pass through the middle layer called **aquifer** (from two Latin words that mean to carry water). Depending on the length of the aquifer, it may take hundreds or even thousands of years for water to travel the full length.

What materials form aquifers?

Which rock is commonly found in the impermeable top and bottom layers?

What is the speed of water in an aquifer? Why?-

The downward flow and the weight of the water **force** it to the surface wherever there is a crack or break in the layer of impermeable rock above the aquifer. The flow of water from an aquifer is called an **artesian spring**. Due to pressure in the aquifer, water sometimes **gushes up** above the surface like a fountain.

Sometimes water **erupts** from the earth in a spectacular way – see fig.7-16, p.361. In areas of volcanic activity, ground water may **sink** to great depths through very deep cracks and be heated by hot magma or by hot igneous rocks. Because the pressure is much greater at these depths, the boiling point of water is **raised** well above 100°C. Suddenly, the superheated water changes to steam which forces the water resting on it out through openings in the rock above.

What is the spelling and pronunciation of this feature in English? –

Where can they be found?

Why do you think Old Faithful got its name? –

Check yourself

- 1. Describe an artesian system.*
- 2. How does an artesian spring originate? What causes an artesian spring to gush up out of the ground? Draw a diagram that shows this.*
- 3. Compare an artesian spring and a geyser. How are they similar and how are they different?*

Conversation Topic

Read about a career of a hydrologist on p. 358 and discuss your possible interest.

Do the ROPOT of this section, Revision test ROPOT and prepare the written test.

The Earth's Fresh Water – Revision test

Translate:

Čím vyšší je propustnost, tím rychleji může tekutina procházet horninou.

Přehřátá voda se mění na páru a ta žene vodu, která spočívá na ní, ven otvory v hornině nad ní.

V pouštní oblasti dochází k odpařování z půdy brzy po té, co se přežene bouřka.

Odhaduje se, že Velká jezera obsahují dohromady téměř dvakrát více vody než je jí v atmosféře.

Domníváme se, že Velká jezera se vytvořila asi před 250 000 lety.

Use nominative+ infinitive construction.

The Great Lakes ...

Sumerové zvýšili obsah soli v půdě **do takové miry**, že se již nedaly pěstovat plodiny.

Add suitable nouns:

Permeable
Recycling
Invisible
Melting
Sheet

Example: kind people

loose
irregular
cemented
capillary
inactive

Give synonyms (words of similar meaning):

sink into –
moist –
rapid –

Example: fine - nice

gouge –
cling to –
flow into –

Word formation

Contain - , deepen - , widen - , empty =

Give the other forms (minulý čas a příčestí trpné) of these verbs:

cling –
sink –
soak –
feed –
dig-

raise –
rise –
flow –
fly –
lie -