GEOGRAPHY KNOWLEDGE IS THE KEY TO LIFE(?)
Oktatási segédanyag

a Jurisich Miklós Gimnázium angol-magyar kéttanítási nyelvű tagozata számára

Szerkesztette: Végh Balázs a köszegi Jurisich Miklós Gimnázium tanulója

Lectorálta: Samantha Dicken
MaryClaire Yatsko

Bírálók: Varga B. Imre szaktanár
Dr. Mátrai István
Dr. Mátrainé Tálos Ilona
Nagy Marietta

1. kiadás
CROATICA KIADÓ
Budapest, 2005.

2. javított kiadás
XY KIADÓ
FOREWORD

Documentaries on the world’s most spectacular regions have always been the best way to make people interested in geography, or biology, but I personally think that a fascinating textbook like this, may have the same effect. It provides you with the essence of the curriculum, using images and glosses as well. Although it’s easy to understand, there are also plenty of useful terms. This is a book for 15-17 aged students, who have at least pre-intermediate language skills in English and want an excellent guide to expand their vocabulary. It is certainly recommended to enthusiastic parents, who feel like improving their knowledge through self-education when they have some freetime.

The title is clearly indicating what I find extremely important:

"KNOWLEDGE IS THE KEY TO LIFE."

VÉGH BALÁZS

Key to the signs used

geography: special focus on the words or sentences you really need to memorize, highlighted in bold.

[DfkdagGREFk]: phonetic symbols tell you how to pronounce a given word.

"COMING SOON": you have a chance to take a test, but you won’t get a mark.

?: after each unit, you can find a few questions which help you with the study.

☑: extra homework.

☐: this sign is used for referring to interesting examples and notes.

*: a certain word with a precise definition is present in the back of the book.

Thanks very much to:

VARGA B. IMRE for his brilliant idea of the project and for the materials which form this book.

DR. MÁTRAI ISTVÁN and DR. MÁTRAINÉ TÁLOS ILONA for their kind help, patience and support.

SAMANTHA DICKEN and MARYCLAIRE YATSKO for the thorough edit.

NAGY MARIETTA for her efficient, hard work on language teaching.

JUSTIN MORGAN for his help with the achievement of a pretty good command of English.

PATÓ ATTILA, KOVÁCS TOMASZ, KRIZMANICH GERGELY and PÁSTI SZABOLCS for their computational advice.

and last, but by no means least, my family, relatives and classmates for their encouragement throughout my work on the book.
UNIT 1.1— WHAT IS GEOGRAPHY?

The term geography comes from the ancient language of Greece and means 'earth description’. It is the study of where things are located and how they got there. Geography also refers to our interaction with the environment and the movement of materials, living things, and ideas across the Earth’s surface. Human geography explains how the activities of people vary throughout the world. It includes the geography of economic and political activities, of cities and farms, and of religions and languages. Physical geography relates to the Earth’s natural features such as mountains, rivers, soil, vegetation and world climates, too. Human and physical geography are used to describe the world’s regions. A region is an area with common characteristics that make it different from any other area in the world. Geographers use regional geography to discover how areas are the same or different. Regions can be areas of similar language, economy or religion.

UNIT 1.2— MAPS AND SCALES

A map is a proportionally reduced areal-view of the Earth’s surface as a horizontal plan. Projection is a mathematical conversion from spherical to planar coordinates. In order to map a spherical object onto a flat surface, we use projection which aligns known map locations with their true locations on Earth. A conical projection can be made as if a cone were placed on a globe with its point directly above the North Pole. Conic projections are not widely used in mapping because of their relatively small zone of reasonable accuracy. An azimuthal projection is the result of a plane being placed against (tangent to) a globe so that it touches the globe at one point, in this case at the North Pole. A cylindrical projection can be imagined in its simplest form as a cylinder that has been wrapped around a globe at the Equator. In reality, cylindrical map projections: Mercator, Peters, Gall are not so simply constructed.
- Cylindricals are true in the high-latitudes and distortion increases towards the poles.
- Conics are best suited for maps of mid-latitudes, especially those elongated in an east-west direction. Distortion increases away from this standard.
- Azimuthals are true only at their centre point, but generally distortion is worst at the edge of the map.

**Topography** is the configuration of the land surface, and it is shown on topographic maps with contour lines.

**Planimetry** includes the representation of natural and artificial elements of the surface. On a map the elevation (=height of the land above sea level) is given by contour lines. The interval height between adjacent contour lines is ten metres. Every 5th contour line is noticeably thicker than the others. Contour intervals that are closer together mean that there is a greater change in elevation over a shorter distance.

**Cartography** is the art, science, and technology of creating maps. The use of scales allows a cartographer to graphically represent a geographic area. **Map scale** is defined as the relation between the size of the map and the size of the real area, on the ground. The larger the scale, the smaller geographic areas it shows in detail. There are three ways to represent the scale of the map:

- **Verbal scale**: saying such as 1 cm = 5 km.
- **Graphic/Bar scale**: a line or bar marked by any recognized measure of distance.
- **Ratio scale**: is a representative fraction (RF) that expresses one unit of a measurement on the map which is equal to the number of the same units on the ground. **□**: 1: 500. This ratio indicates that one unit on the map is equal to 500 units of the same size on the ground.

Maps are classified into groups depending on the **scales** and **contents**:

- large-scale map  
- medium-scale map  
- small-scale map  
- topographic maps  
- geographical maps  
- thematic maps  
- satellite maps

**Unit 1.2**: What is a map? What kind of map projections do you know? How do contour lines work? What are topography and planimetry? What do the particular map scales indicate? How are maps classified?
To determine a straight-line distance between two points on a map, lay a straight-edged strip of paper so that the edge of the paper touches both points and extends past them. Make a tick mark on the paper at each point. To convert the map distance to ground distance, move the paper down to the graphic scale. But you can measure this distance with the aid of a compass, using the same method. To measure distance along a road, river or other curved line you need a piece of string. First of all, draw a long, straight line on a paper and then fit the string onto the curved distance on the map. After you have completed the measurement, put the piece of string along the straight line on the paper. OK, all done! Of course, there are other techniques as well; you may achieve the same result by using a compass or Opisometer.

Orientation refers to the direction in which an object is pointing or located, in other words it is the determination of the cardinal points: north, northwest, west, southwest, south, southeast, east and northeast.

Determination of the northern direction:
- with the help of the frame
- with gnomon
- with a watch
- Pole star
- Compass

Latitude [aLīTkTJUdD] tells you how far north or south from the Equator [kaKwEkTe] you are. Longitude [algNDfktTJUdD] tells you where the position of a place is in the world, in relation to east or west from Greenwich [aGRENkTt]. Lines of latitude and longitude form the grid reference [bGRkDAEFReNS] that we use on maps and charts. Latitude and longitude are measured in degrees (°). Each degree of latitude corresponds to a distance on the Earth's surface of about 111 km (=69 miles/60 nautical miles). Each degree of longitude corresponds to a distance that varies according to how far north or south you are. This is about 111 km at the Equator, reducing to zero at the poles.

Unit 1.3: How could you define orientation? Explain how to measure straight line and curved distances on the map. If you got lost in the forest at night, what would you do? What do you know about the grid
UNIT 1.1-3 — "COMING SOON"

1) What does human and physical geography include? page 4
2) Give a short summary of map projections, please define each one. page 4
3) What is topography? page 5
4) How do contour lines work? page 5
5) Tell us something about map scales. page 5
6) What is a ratio scale? page 5
7) How are maps classified? page 5
8) What would you use if you wanted to measure a curved distance? page 6
9) How could you determine the northern direction? page 6
10) How many kilometres does each degree of latitude correspond to? page 6

How far is it from A to B?

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Szombathely</td>
<td>Budapest</td>
</tr>
<tr>
<td>Pécs</td>
<td>Győr</td>
</tr>
<tr>
<td>Nyíregyháza</td>
<td>Székesfehérvár</td>
</tr>
<tr>
<td>Vienna</td>
<td>Belgrade</td>
</tr>
<tr>
<td>Graz</td>
<td>Zagreb</td>
</tr>
</tbody>
</table>

Open your atlas on page 6 and look for the motorway M1 (Vienna–Budapest). Finally, try to measure the distance of it using a… It’s your turn now.

Determine the geographical location of the following cities with the aid of grid reference.

- Nagykanizsa
- Kalocsa
- Nagyvárad (ROM)
- Krakow (POL)
- Sevilla (ESP)
- Padova (ITA)
- Hamburg (GER)
- London (UK)
- Edinburgh (UK)
- Brasilia (BRA)
- Buenos Aires (ARG)
- New Orleans (USA)
- Philadelphia (USA)
- Beijing/Peking (CHN)
- Tokyo (JPN)
- Baku (AZE)
- Tunis (TUN)

Measure the distance between the two black points on the map.

Which projection do you think this detail of the globe belongs to?
UNIT 2.1—THE STRUCTURE OF THE EARTH*

layer is called the crust. It is the rigid, rocky outer surface of the Earth, composed mostly of basalt and granite. The crust consists of plates, which are free to drift slowly across the surface of the planet. There are two types of crust — continental and oceanic. Continental crust is less dense, much older and much thicker than the oceanic crust. The layer of rock below the crust is called the mantle. It is composed of silicon, oxygen, magnesium, iron, aluminium and calcium. Convection currents carry heat from the hot inner mantle to the cooler outer mantle. The lower part of the upper mantle that exhibits plastic (flowing) properties is called the asthenosphere. Below the mantle is the core. The outer core is the molten iron-nickel layer that surrounds the inner core. The inner core is the solid centre of the Earth that is very hot and under great pressure. The flow of materials in the core is also responsible for the magnetic field, which protects the Earth from cosmic rays – electromagnetic radiation from the Sun.

How was the Earth formed? How many layers is the Earth made up of? Tell us more about these layers. What properties do a continental and an oceanic crust have?

UNIT 2.2—PLATE TECTONICS

Our planet was most probably created about five billion years ago. At first it was just a ball of molten rock and gases. The immense amount of heat energy released at this time is still being radiated, even today, as the planet slowly cools down. As the cooling began, denser materials such as iron sank into the core of the Earth, while lighter silicates, other oxygen compounds and water rose towards the surface. In consequence distinct layers began to form. The Earth is made up of several of these different layers. The outer layer is called the crust. It is the rigid, rocky outer surface of the Earth, composed mostly of basalt and granite. The crust consists of plates, which are free to drift slowly across the surface of the planet. There are two types of crust — continental and oceanic. Continental crust is less dense, much older and much thicker than the oceanic crust. The layer of rock below the crust is called the mantle. It is composed of silicon, oxygen, magnesium, iron, aluminium and calcium. Convection currents carry heat from the hot inner mantle to the cooler outer mantle. The lower part of the upper mantle that exhibits plastic (flowing) properties is called the asthenosphere. Below the mantle is the core. The outer core is the molten iron-nickel layer that surrounds the inner core. The inner core is the solid centre of the Earth that is very hot and under great pressure. The flow of materials in the core is also responsible for the magnetic field, which protects the Earth from cosmic rays – electromagnetic radiation from the Sun.

How was the Earth formed? How many layers is the Earth made up of? Tell us more about these layers. What properties do a continental and an oceanic crust have?

UNIT 2.2—PLATE TECTONICS

The Earth’s crust is composed of huge floating plates. These plates "float” or move very slowly on the molten material of the mantle. This process is known as plate tectonics. Some of today's continents can fit together like a jigsaw, for example Africa and South America. This is because these continents, like all the continents, were once joined together, and have since split and drifted apart in a process called continental drift. It was Alfred Wegener who first proposed the theory of continental drift. This movement is caused by convection currents in the mantle. Plate movements in the asthenosphere are small and slow, but the effects over time can be huge. Plates either pull apart, push together or slide next to each other. Plates meet at plate boundaries (=margins). Convergent plate boundaries (destructive plate margins) are found where two plates run into each other. When two oceanic lithospheres collide, one of them subducts beneath the other. The subducting lithosphere is bent downward to form a deep ocean trench, magma rises from the mantle and an island arc is created. When an oceanic and a continental plate run into each
other, the more dense oceanic plate always subducts beneath the latter, meanwhile both of them slip.\footnote{between Nazca Plate and South American Plate.} When two continental lithospheres collide (\rightarrow collision plate margins), the two continents weld together in a suture zone. Fold mountains are formed such as the Himalayas. \footnote{Indo-Australian and Eurasian Plate.}

At \textit{divergent plate boundaries} (\rightarrow constructive plate margins), plates move away from each other such as at the Mid-Atlantic Ridge. Where plates diverge, hot, molten rock rises and cools, adding new material to the edges of the oceanic plates. This process is known as \textit{seafloor spreading}. \footnote{North American and Eurasian Plate.} At \textit{transform-fault boundaries} (\rightarrow conservative plate margins) plates move horizontally past each other. \footnote{San Andrew Fault Zone.}

\textbf{UNIT 2.3—VOLCANOES}

Volcanoes are found in three states — extinct\footnote{Kilauea, dormant and active\footnote{Etna, Hekla, Mauna Loa, Cotopaxi}. An \textit{extinct volcano} will never erupt again. A \textit{dormant volcano} has not erupted in 2000 years. An \textit{active volcano} has erupted recently and is likely to erupt again. Volcanoes are located along both destructive and constructive plate margins and also at hot spots\footnote{Hawaii}. \textit{Hot spots} are immobile. Volcanic islands occur when the oceanic plate leaves its place above the hot spot being on the spot and magma breaks through the bottom of the plate somewhere else.

- The main features of a volcano are: magma chamber, vent, side vent, conduit, lava, crater and ash cloud. -
A magma chamber contains magma (molten rock) deep within the Earth’s crust. A vent is an opening in the Earth’s surface through which volcanic materials erupt. A side vent is a vent in the side of a volcano. A conduit [aKgNDfUKT] is a passage through which magma flows in a volcano. Lava [alhdve] is molten rock; it usually comes out of erupting volcanoes. Crater is a bowl-shaped depression produced by a volcanic eruption. An ash cloud forms in the air after some volcanic eruption.

The most destructive aspects of volcanoes are lahars and pyroclastic flows. Lahars are volcanic mudflows created when water and ash mix. When lahars settle, they can be metres thick and as hard as cement. Lahars can occur long after a volcanic eruption. Pyroclastic flows are avalanches containing hot volcanic gases, ash and volcanic bombs.

A geyser: Old Faithful is a hot spring through which jets of water and steam erupt. From the mouth of the geyser, a tube like hole filled with water extends into the Earth’s crust. Fumarole is a vent in the ground in volcanic regions emitting steam and other gases in the form of powerful jets. Solfatara is a volcanic vent through which vapours and gases gently seep, usually working a late stage in volcanic activity. Mud volcano is a small volcano shaped cone of mud and clay usually less than 1-2 m tall. Lapilli/Lapillus are rock fragments between 2 and 64 mm. Caldera is a huge depression formed after a volcanic eruption or collapse of a volcano. Crater is a bowl-shaped depression produced by a volcanic eruption.

Types of rocks can be igneous: granite, rhyolite sedimentary: limestone, dolomite and metamorphic: marble, mica-slate, clay-slate.

A volcano, which occurs at a constructive plate margin, has properties that magma is basaltic, lava is low in silica, during eruption mainly lava erupts and some violent-gases easily escape and the frequency of eruption time is regular and can be continuous. The volcano has a broad base and gentle sides. A volcano, which occurs at a destructive plate margin, has properties that magma is acidic, lava is rich in silica, during eruption potentially explosive-lava shatters into pieces, lava bombs, ash and dust erupt and there are from time to time long dormant periods.

Why do people live close to volcanoes?

People live close to volcanoes because geothermal energy can be harnessed by using the steam from underground. This steam is used to produce electricity for domestic and industrial use. Countries such as Iceland and New Zealand use this method of generating electricity. Volcanoes attract millions of visitors around the world every year. This creates many jobs for people in the tourism industry. Lava from deep within the Earth contains minerals: gold, silver, copper which can be mined once the lava has cooled. Often, mining towns develop around volcanoes. Volcanic areas often contain some of the most mineral rich soils in the world. This is ideal for farming.

- Mount St. Helens (2549 m), USA -

7
UNIT 2.4—FORMATION OF PLUTONIC MAGMATIC ROCKS AND ORES

The molten rock doesn’t always reach the surface. The magma may solidify if it reaches a lower temperature level and become plutonic magmatic rock. The most frequent one is granite (quartz+feldspar+mica). As the temperature decreases, the components of the slowly cooling, hot magma separate out in a definite sequence. During this process, rocks as well as ores are formed. Ores are minerals or mineral associations that are suitable for the extraction of metals, which can be used in everyday life and in industry. The ore minerals of heavy metals, these are nickel and platinum, separate out first. This is followed by the separation and accumulation of the minerals of iron, chromium and vanadium. A further decrease in the temperature induces the slow crystallization of the bulk of magma and it solidifies into plutonic igneous magmatic rock. The gases and vapours from magma prepare places for the minerals of tin, uranium and thorium. The hydrothermal solutions reaching the highest places fill the rock fissures with non-ferrous ores: minerals of copper, zinc, lead and precious metals such as gold and silver. The ancient massifs are the richer sources of ores, which separated out from the incandescent magma.

UNIT 2.5—FOLDS AND FAULTS – MOVEMENTS IN THE CRUST

A fault is the result of rock layers that break and move apart, in other words, a fault is a zone of fractures between two blocks of rock. Faults allow the blocks to move relative to each other. This movement may occur rapidly in the form of an earthquake or slowly in the form of a creep. During an earthquake the rock on one side of the fault suddenly moves in relation to the other. Normal fault is a dip-slip fault in which the block above the fault has moved downward relative to the block below. Thrust fault is a dip-slip fault in which the upper block above the fault plane moves up and over the lower block. Strike-slip fault is a fault on which the two blocks slide past one another.

1. right-lateral strike-slip fault
2. left-lateral strike-slip fault

A rift valley is a long, narrow block sunk between two parallel faults. Rift valleys are the subsidence of the land between two normal faults. These can be hundreds of miles in length. East-African rift valley A horst is a horizontal block raised between two normal faults. Sas-hegy, Gellért-hegy A basin is the broader, larger depression of the Earth’s surface surrounded by mountains or hills. Káli basin
Folds are bends in rock layers caused by compression. Folds occur in elastic rocks, which tend to bend rather than break. A fold consists of an **anticline** (upward) and a **syncline** (downward) arch. The sides of a fold are called limbs, while the backbone is called the axis and occurs where two limbs meet. A symmetrical fold shows mirror images on both sides of the axial plane, while an asymmetrical fold doesn’t have a mirror image. An overturned fold occurs when the axial plane is tilted and the beds may dip in the same direction on both sides of the axial plane. An extreme example of an overturned fold happens when the axial plane is horizontal and is called a recumbent fold.

**UNIT 2.5:** What do you know about the normal/thrust/strike-slip fault? What is a rift valley/basin? Tell us an example of a horst. What are folds? Explain the four types of folds you know.

**UNIT 2.6—EARTHQUAKES**

An earthquake is a sudden shaking movement of the Earth’s surface. Earthquakes occur along plate boundaries. When plates move past, towards or away from each other, the movement is uneven. Friction forces the plates to get stuck and this causes pressure to build up. Earthquakes occur when this build up of pressure is released. The point where the earthquake starts is called the **focus**. Focal depth is the vertical distance between the focus (=hypocentre) and epicentre. The point at ground level directly above the focus is called the **epicentre**. This point is expressed by geographical latitude and longitude.

Earthquakes generate several kinds of **seismic waves including primary and secondary waves**. The P-waves move in a compressional motion similar to the motion of a slinky, while the S-waves move in a shear motion perpendicular to the direction the wave is travelling. You can imitate the motion of P and S-waves using a slinky (the metal ones work best) and a piece of rope. The effects of earthquakes vary. This is a result of a variety of factors such as the strength of the earthquake, the level of population in an area and the level of economic development of the area struck.

The magnitude (size) of an earthquake is measured using a seismometer. This is a machine that measures movements in the Earth’s surface. The **Richter Scale** measures earthquakes on a logarithmic scale. Intensity is the rating of the effects of an earthquake at a particular place based on the observations of the affected areas, using a descriptive scale like Modified Mercalli Scale.
Unit 2.6: What is an earthquake? What are focus and epicentre? Tell us everything you know about primary and secondary waves. What comes to your mind about Richter and Mercalli Scales? 📝: Try to imitate the motion of P and S-waves and show it to your classmates next lesson.

- regions where earthquakes occur „too frequently“ -

*****

The strongest earthquake recorded in Hungary took place in Komárom in 1763. 279 houses collapsed and 785 were seriously damaged. 63 people were killed and 102 injured.

*****

In the early morning of August 15, 1985, strong earthquakes shook several regions in Transdanubia. The centre of the quakes was in the vicinity of Berhida and Peremarton, where a number of houses and public buildings were damaged and chimneys fell down. The quakes caused damage on the shores of Lake Balaton, and were also felt in Budapest. The first quake was observed at 6.13 a.m. The main quake (grade 5 on the Richter Scale, and grade VII on the Mercalli-Sieberg Scale) took place at 6.28 a.m. The earthquake series was an average of grade 3.5 on the Richter scale, it lasted till the end of August. However, post-quake vibrations (aftershocks) were observed later, too.

*****

At 5.46 a.m. on 17th January 1995 an earthquake measuring 7.2 on the Richter Scale struck the heavily populated city of Kobe, Japan. The earthquake occurred along the destructive plate boundary where the Pacific and the Philippine Plate (oceanic) meet the Eurasian Plate (continental). Many freeways and buildings were destroyed, despite the strict building regulations, and 5000 were killed. Fires spread as a result of broken mains, 250,000 people were left homeless.

*****

It has been estimated that more than 14 million people have died as a result of earthquakes in the last 400 years.
UNIT 2.1-6—“COMING SOON”

1) When was our planet formed? page 8
2) What layers is the Earth composed of? page 8
3) What is plate tectonics? page 8
4) What happens if two oceanic lithospheres collide? page 8
5) Please tell us an example of collision plate margins. page 9
6) What are the main features of a volcano? page 9-10
7) Why do people live close to volcanoes? page 10
8) How are plutonic magmatic rocks created? page 11
9) Explain the movement of faults and folds. page 11-12
10) What is an earthquake? page 13

Label the diagram of the Earth’s structure, and then describe each layer.

What can you see in the picture? What is the Ring of Fire?

Study the movement of the plates.

What does a fold consist of? These drawings may remind you…
UNIT 3.1—MOUNTAIN FORMATION

The material of mountains is accumulated in sediment basins. Rivers, wind and ice transport material: sand and finally deposit it in sediment basins, seas and oceans. Sedimentary rocks originate from material deposited in sediment basins and from the residues of the living creatures in the seas. Among sedimentary rocks, we may distinguish rocks of clastic, chemical and biogenic origin. At great depth rocks are recrystallized as a result of high pressure and temperature, and form metamorphic rocks. As you read in one of the previous units, plutonic magmatic rocks are formed when magma solidifies reaching some level of lower temperature.

Mountains are built from the material accumulated in sediment basins during processes which last for millions of years. Mountain formation is associated with the edges of colliding plates. All the mountains formed in the same orogenic period are called a mountain system. The Eurasian mountain system was formed through the collision of two continental plates. The folding and lifting of thick sea sediments played a decisive role in its formation. Generally, during the discussion of mountain formation, two processes are separated. Tectogenesis describes the formation of folded and ruptured structures, while orogenesis the rising of these. The lithosphere plates depending on their thickness and mass, sink into the asthenosphere at different depth.
The main motive power of mountain formations is the subducting plates because mountains occur at convergent plate margins. When two oceanic plates collide, andesite-rhyolite volcanic mountains, v. island arcs are formed. Mauna Kea (4205 m) is an example of a volcanic mountain. When an oceanic and a continental plate collide, andesite-rhyolite volcanic activity is the dominant process because of the subduction. Some parts of the sediment transported by the oceanic plate fold to the edge of the continental plate. However, these folded sedimentary rocks play second fiddle. When two continental plates collide, the oceanic plate between them subducts and the most part of its sediment is folded. Finally, the ocean is totally eliminated. This folded sediment is pressed to the edge of the continental plate and then a mountain composed of sedimentary rocks occurs. The last two variations explain how the most common type of mountain, a folded mountain is created. Erosional mountains are formed by wind or water wearing down weak spots in land and carrying it away. Non-resistant material is washed away, whereas the stronger material remains. Block-fault mountains are created by the vertical faulting of large blocks of earth.

Unit 3.1: How could you classify the rocks? Revise the formation of plutonic magmatic-, sedimentary- and metamorphic rocks. Give a brief summary of mountain formation. How many types of mountain do you know?

UNIT 3.2—INTERNAL AND EXTERNAL FORCES

The crust of our planet is formed and varied by the constantly active internal and external forces. Internal forces are those surface- and rock forming effects which are caused by the magma flows and plate tectonics: earthquakes, mountain formation. External forces refer to the manifestations of those energies which exist on sources beyond our celestial body. Cosmic rays like this: the radiation of the Sun, the gravitation of celestial bodies and kinetic energy. Cosmic rays raise wind, recycle water, make rocks crumble and cherish motion and life. Wind, ice, water and the Earth’s surface forming activity of living things are not the external force itself, but the means of the energy sources of external origin. The work of external forces begins with the disintegration and weathering of rocks. What are physical weathering and disintegration (=chemical weathering)?

Weathering is the way of the destruction of rocks in which physical processes take part. The main reason for physical weathering is the quick change in volume caused by the major fluctuation in the temperature and the frequent freezing-melting of water that enters the rock fissures. Disintegration is the way of the destruction of rocks in the course of which chemical changes reach the rocks. Its efficiency depends on the quantity of acids dissolved in water and the temperature.

Erosion is the process by which the surface of the land or rock is gradually damaged by the action of water, the wind, the sea or glaciers. Read the next paragraph on the natural features produced by the wind.

A deflation hollow is a small area in the ground that is lower than the ground around it, caused by the constantly blowing wind carrying loose sediment. A sand dune is a hill of sand that has been formed by the wind or sea. It can be crescentic (barchan, parabolic), linear and star: in the Sahara desert. A balanced rock can be formed when sand carried by the wind brushes against alternate indurated rocks. What do we mean by water action? See the examples.

A canyon is a long valley with steep sides made of rock: the Grand Canyon. A meander or loop is part of a river where it has gradually worn away to form a wide curved path in the shape of a letter S. Nowadays, along the River Tisza there aren’t so many meanders thanks to the river controls directed by István Széchenyi in the 1840s. A cave is a large hole in the side of a hill or under the ground that opens to the surface: Aggtelek.
What natural features are the constructive glaciers able to create?

A **fjord** is a narrow section of the sea that continues into the land between high rocks: Norway’s coastal region. A moraine is a deposit of rocks and debris left behind by glaciers. When glaciers melt, moraines remain as hills or ridges. A **moraine lake** can be formed in the valley surrounded by these hills: Lake Maggiore, Lake Como. **U-shaped valleys** are created by glacial erosion of a stream valley. Stream valleys are generally V-shaped: in the Alps.

**UNIT 3.2**

Explain how the internal and external forces work and mention some examples as well. What are weathering and disintegration? What is erosion? Revise the natural features produced by both wind and water. What is a fjord and which country has plenty of them? Explain in your own words how a moraine lake is formed. Tell us an example of a U-shaped valley.

**UNIT 3.3—a—SLOPE FORMS**

A **slope** is a part of the relief which makes an angle with the horizontal. A **convex slope** is a surface undergoing destruction. A typical example of a convex slope is the slope of a deepening rift valley. A **concave slope** is a surface undergoing building-up. Accumulation takes place on its low-lying flattening surface. ”An **S-shaped slope** is the mix of these.” A straight slope is generally formed on rock layers indicating a surface undergoing destruction. The harder the rock, the greater its slope may be. Slope stability is affected by steepness, shape, water content of the slope and slope modification. The steepness of a slope is a
major factor in determining its potential for erosion. Generally, the steeper a slope, the more susceptible it is to erosion and landslides. The existence of steep slopes may actually be a good indication of previous landslides. Very steep slopes, however, may be relatively stable because they are solid rock.

UNIT 3.3/b—MASS MOVEMENT TYPES

Variations in water content and rates of movement produce a variety of forms. A rockfall is simply a volume of rock made up of individual pieces that fall independently through the air and hit a surface. A debris avalanche is a mass of falling and tumbling rock, debris, and soil. It is differentiated from a slower landslide by the tremendous velocity of onrushing material. The extreme danger of a debris avalanche results from its high speed and consequent lack of warning. A landslide is a sudden rapid movement of a cohesive mass of material (soil, rock, etc.) that is not saturated with moisture. It involves a large amount of material falling simultaneously. A common type of slide is the rotational slide or slump which occurs when surface material moves along a concave surface. Frequently water is present along this movement plane and acts as a lubricant. The simplest form of rotational slump is when a small block of land shifts downwards. The upper surface of the slide appears to rotate backwards and often remains intact. When the moisture content of moving material is high, the term flow is used. Flows include earthflows and more fluid mudflows.

 unidad 3.3/a-b: What is a slope? Go to the blackboard and try to draw the four types of slope forms. Explain how a rockfall takes place. Where have mudflows caused devastation in the past twenty years? Did they cost many lives?
UNIT 3.1-3/b—"COMING SOON"

1) How do you classify the rocks?  
2) What is the mountain formation associated with?  
3) What’s the main power of mountain formations?  
4) What is physical weathering?  
5) What is chemical weathering?  
6) How is a deflation hollow (=blowout) formed?  
7) What is a meander?  
8) What is a fjord?  
9) List all types of slope and please define each one.  
10) What is a rockfall?

–This feature can be seen in valleys, which..–Stop! I guess, it’s a ........

The so-called ripple marks consist of low barchanoid dunes, right?

What is a canyon?

What do you call it?
We don’t know exactly the circumstances of the Earth’s formation but we have established suppositions about the progress of events. The solar system and our planet inside were probably formed from a cloud of interstellar dust and gas about 4.6 billion years ago. As a consequence of the continuous meteor impacts, the Earth’s surface was cut up by craters, meanwhile immense amount of heat was developed. As a result of this the ancient Earth melted and changed into an incandescent, hot bolide. The materials of the young Earth became settled in layers according to the gravitational pull. You can imagine this process very easily if you observe how a handful of fluvial deposit sinks down in a dish of water. Dense sediment reaches the bottom of the dish while lighter sediment is accumulated a bit higher up. The materials of the Earth occurred somehow like this, too. Denser materials sank into the centre of the Earth while the lighter ones settled down outside. However not only the internal materials of our planet, but also a huge bulk of water and air from outside became fixed as a result of gravitation. According to the most accepted view the first known life appeared 3.5 billion years ago. It was then that the first photosynthesizing plants developed.

**UNIT 4.1:** When do we date the Earth’s formation? What happened as a consequence of meteor impacts? Why did the ancient Earth change into a hot bolide? How did the materials of the Earth occur? When did the first known life appear? Do the experiment and describe to your classmates what you have observed.

**UNIT 4.2—THE ANCIENT MASSIFS**

Scientists believe that there were four mountain formations in the Precambrian period. The continental areas formed at that time represent the ancient massifs of today’s continents. The ancient massifs consist of fundamental fragments of the Earth’s crust and the units built up of the residues of the mountain systems folded to them. There are two types of ancient massifs:

- **Exposed**: there are iron, zinc, nickel, platinum and copper ore deposits in large quantities.
- **Unexposed**: are rich in mineral oil, natural gas, rock salt, black- and brown coal.

Most of them are indented, undulating plains: Baltic-, Canadian shield and there also step-fault ancient shields can be found: South-Chinese mountain region, Brazilian plateau which occurred as a result of later structural movements.

**UNIT 4.2: What do the continental areas formed in the Precambrian period represent? What do the ancient massifs consist of? List the most important -that’s ten- ancient shields.**
As a consequence of plate movements, two mountain systems were formed in the Paleozoic era. The mountains of Caledonian orogenesis connected ancient Europe with ancient North America, while the Variscan orogenesis lasting for 120 million years connected all the then existing continents into one supercontinent, called Pangea. This continent was surrounded by the one and only unified ocean called Panthalassa.

The flora and fauna spread over the land in the Paleozoic era. The bulk of the black coal deposits were formed in the Carboniferous period.
The Mesozoic era is considered placid in terms of surface developments because there were no big mountain formations, though in a few places on the ancient shields lava flows in large volumes occurred. However, the most important event of the Mesozoic era is the disintegration of Pangea. The new oceanic ridges call forth the rise of sea level and the land was mostly flooded. In the marginal region of the Pacific Ocean, formation of the Pacific mountain system started at the border of the rock plates moving towards each other. Plate movements that had begun in the Mesozoic era continued in the Cenozoic era (Tertiary). North America became completely separated from Eurasia and connected with South America. The Antarctic and Australian continents separated too. The northwards-bound African Plate collided with the Eurasian Plate. Plate fragments (micro-plates) formed at their edges determined the directions of the European members of the Eurasian mountain system. During the Pleistocene epoch of the Quaternary Ice Age, glaciers (represented on map in white) covered much of the Earth’s northern hemisphere. Ice Ages consist of glacial periods and warmer interglacial periods. Although the Pleistocene, the Earth’s most recent glacial event, ended 10,000 years ago, many scientists believe that the Earth remains in an interglacial state of the Quaternary Ice Age.

The Pleistocene is the best-known glacial period (Ice Age) of the Earth's history. Its ice sheets at one time covered all of Antarctica, large parts of Europe, North America, South America, and small areas in Asia. The glaciation was not continuous but consisted of several glacial advances interrupted by interglacial stages, during which the ice retreated and a comparatively mild climate prevailed. The term "Ice Age" is usually applied to the earlier part of the Pleistocene, and although continental ice sheets withdrew from North America and Europe about 10,000 years ago, at the end of this epoch, many scientists believe that Quaternary Ice Age is not over yet. Remains of the mammoth and reindeer have been found in glacial deposits, which were contemporary with the latter periods of this Ice Age.
<table>
<thead>
<tr>
<th>Era</th>
<th>M.y.</th>
<th>Period</th>
<th>Epoch</th>
<th>Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precambrian</td>
<td>2,600</td>
<td></td>
<td></td>
<td>Formation of the crust and the ancient ocean, orogenesis</td>
</tr>
<tr>
<td>Archeozoic</td>
<td>4,600</td>
<td>Age of the Earth</td>
<td></td>
<td>First trace fossils</td>
</tr>
<tr>
<td>Paleozoic</td>
<td>570</td>
<td>Cambrian</td>
<td></td>
<td>Corals, snails, continents are lifeless</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>Silurian Ordovician</td>
<td></td>
<td>Caledonian orogenesis, Primitive fish</td>
</tr>
<tr>
<td></td>
<td>405</td>
<td>Devonian</td>
<td></td>
<td>First terrestrial plants</td>
</tr>
<tr>
<td></td>
<td>350</td>
<td>Carboniferous</td>
<td>Variscan orogenesis</td>
<td>Primitive insects, first amphibians</td>
</tr>
<tr>
<td></td>
<td>285</td>
<td>Permian</td>
<td></td>
<td>First terrestrial reptiles</td>
</tr>
<tr>
<td></td>
<td>195</td>
<td>Jurassic</td>
<td>Beginning of the formation of the Pacific mountain system and the present oceans</td>
<td>Primitive birds, primitive reptiles</td>
</tr>
<tr>
<td></td>
<td>235</td>
<td>Triassic</td>
<td>Beginning of the disintegration of the Pangea</td>
<td>First coniferous trees</td>
</tr>
<tr>
<td>Mesozoic</td>
<td>137</td>
<td>Cretaceous</td>
<td>Beginning of the formation of the Eurasian mountain system</td>
<td>First phanerogamous plants, palms, deciduous trees</td>
</tr>
<tr>
<td></td>
<td>67</td>
<td>Eocene Paleocene</td>
<td></td>
<td>Ancestors of domesticated animals</td>
</tr>
<tr>
<td></td>
<td>37</td>
<td>Oligocene</td>
<td></td>
<td>Main period of the formation of the Eurasian and Pacific mountain systems</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Miocene</td>
<td></td>
<td>Ancestors of domesticated animals</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Pliocene</td>
<td></td>
<td>Present living creatures</td>
</tr>
<tr>
<td>Cenozoic</td>
<td>2.5</td>
<td>Quaternary</td>
<td>Holocene</td>
<td>Present living creatures</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Formation of the present surface</td>
</tr>
</tbody>
</table>
- map of mountain chains (above); map of block mountains (below) -
UNIT 4.4—MOUNTAIN CHAINS

The present young mountain chains of the world were created because of the constant but very slow movement of the Earth's plates. When the plates of the Earth collide, the crust folds into high mountain ranges. Earthquakes and volcanic eruptions prove that their formation is still not completed in many places. Due to the volcanic activity, the Eurasian mountain system is rich in brown coal, mineral oil, natural gas, rock-salt and potassium salt. Mountain chains are built up of parallel ranges. Many high, and only slightly destroyed mountains, became glaciated in the Ice Age, what’s more, there are some that are still being glaciated.

The roots of the world's great mountain ranges contain some of the oldest rocks on Earth. These rocks were once buried deep inside the Earth and have been raised into mountains by the collisions of the plates. Plates travel at a very slow rate about 2 to 10 cm per year. The Indian Subcontinent was a very fast mover, clipping along at over 10 cm per year. When it slammed into the Eurasian Plate over 24 million years ago, the collision built the highest mountain range in the world, the Himalayas.

Eurasian mountain system

1. Atlas
2. Pyrenees
3. the Alps
4. the Appenines
5. the Dinaric Mountains
6. the Carpathians
7. Balkan
8. rim mountains of Asian Minor
9. Caucasus
  • rim mountains of Iranian basin
  • the Himalayas

Pacific mountain system

• mountains of East Asia
  (from Kamchatka to Indonesian archipelago)
• the Rocky Mountains (=the Rockies)
• the Andes

UNIT 4.4: How were the mountain chains created? What are the two mountain systems that were formed in the Mesozoic era? List their members and then look at the map.

UNIT 4.5—BLOCK MOUNTAINS

Block mountains were primarily created through the destruction and division of mountain chains. The low, flat-rigged remnants of the destroyed mountain chains were no longer folded, they were only fractured and partly raised due to their high solidity. Block mountains are richer in mineral resources: copper, lead, tin and zinc and precious metals: gold and silver than the mountain chains. In forests, gulfs of the neighbouring seas and valleys enormous black coal deposits and in some places mineral oil, natural gas, rock salt and potassium salt deposits were formed. The surface of the medium and low mountains are smoothly-shaped, except for the block mountains of Scotland and Scandinavia.

Variscan mountain system

3. mountains of South-England (=Pennine)
4. mountains of France
5. the German mid-mountains
6. rim mountains of Bohemian basin
7. Polish mid-mountains
8. Rhodope
9. the Urals
• Australian Great Watershed Mountains
• southern part of Appalachians

Caledonian mountain system

(silurian ordovician)
1. Norwegian Mountains
2. mountains of Scotland
  • mountains of East-Greenland
  • northern part of Appalachians

UNIT 4.5: How were the block mountains created? What are the two mountain systems that were formed in the Paleozoic era? List their members and then look at the map. What’s the surface of block mountains like?
Plains are regions where the relative differences in height are less than 200 m/km² and the slope doesn’t exceed 6% (v. 60 cm/100 m). If the differences in height don’t reach 30 m, the area is a **perfect plain**, but if they do, it is called an **imperfect plain**. Plains were formed by either siltation (=filling-up) or denudation. Plains are mostly found above sea level, and very rarely below it. Plains lying lower than sea level are **lowlands**: ~ occupy a quarter area of the Netherlands, between 0-200 m may be referred to as **plainlands**: Kisalföld, the Great Hungarian Plain and those which are higher than 200 m are called **plateaus**: Tibet. The plainland is the main site of agricultural production and most metropolises are situated on plainlands as well.

The wildlife of the Hortobágy (the Puszta) is extremely rich, particularly as regards to water-lovers. At least 150 species of bird live here, the alkaline areas graced by the short-toed lark, the floating vegetation by the sooty tern, and the overgrown meadows by the stone curlew. Before river regulation, the Hortobágy was highly suited for the rearing of long-horned cattle. The **grey ox** was grazed in the grassy areas, and thanks to its hardy nature was able to survive outdoors even under extreme conditions. For centuries the herdsman’s sole companion was any one of the brave and intelligent dog breeds — **the puli, kuvasz, pumi or komondor** — while the skin of the long-haired **racka sheep** protected him against the cold. The herdmoman would build himself a modest shelter, with a hood or hearth, formed from bundles of reeds propped against one another. **The nine-span stone bridge** can also be visited on the Hortobágy River from which you can get a breathtaking view of the region.

**Unit 4.6**

How were the plains formed? How could you classify them?
UNIT 5.1— THE ATMOSPHERE

The Earth is surrounded by a blanket of air, which we call the **atmosphere**. It reaches over 560 kilometres from the surface of the Earth, so we are only able to see what occurs fairly close to the ground. Life on Earth is supported by the atmosphere, solar energy, and our planet's magnetic fields. **The atmosphere absorbs the energy from the Sun, recycles water and other chemicals, and works with the electrical and magnetic forces to provide a moderate climate.** The atmosphere also **protects us from high-energy radiation and the frigid vacuum of space.** The envelope of gas surrounding the Earth changes from the ground up. Four distinct layers have been identified using thermal characteristics (temperature changes), chemical composition, movement, and density.

The **troposphere** starts at the Earth's surface and extends 8 to 14.5 km high. This part of the atmosphere is the most dense where the temperature drops from 17°C to -52°C as you climb up higher in altitude. Almost all weather is in this region, too. The **tropopause** separates the troposphere from the next layer. The tropopause and the troposphere are known as the **lower atmosphere.** The **stratosphere** starts just above the troposphere and extends to 50 km high. This part of the atmosphere is drier and less dense than the troposphere. The temperature in this region gradually increases to -3°C, due to the absorption of ultraviolet radiation. The ozone layer, which absorbs and scatters the solar ultraviolet radiation, can also be found here. **99% of the "air" is located in the troposphere and stratosphere.** The **stratopause** separates the stratosphere from the next layer. The **mesosphere** starts just above the stratosphere and extends to 85 km high. The temperatures fall again as low as -93°C, as you increase in altitude. The chemicals are in an excited state, as they absorb energy from the Sun. The **mesopause** separates the mesosphere from the thermosphere. The **thermosphere** starts just above the mesosphere and extends to 600 km high. The temperatures go up as you increase in altitude due to the Sun's energy. Temperatures in this region can rise as high as 1.727°C. Chemical reactions occur much faster here than on the surface of the Earth. This layer is known as the **upper atmosphere. The exosphere starts at the top of the thermosphere and continues until it merges with interplanetary gases or space.** In this region of the atmosphere, hydrogen and helium are the prime components and are only present at extremely low densities.

The atmosphere is composed primarily of nitrogen (N\textsubscript{2}, 78%), oxygen (O\textsubscript{2}, 21%), and argon (Ar, 1%). A myriad of other very influential components is also present which include the water, greenhouse gases or ozone and carbon dioxide. **The atmosphere is a mixture of different gases but it also contains particles in liquid and solid states.** The atmospheric gases, whose quantities may be stable over long periods, are called **constant gases**: nitrogen, oxygen, argon, neon, helium, krypton, xenon. Those whose quantities
may change observably within several years or decades are the **variable gases**: carbon dioxide, methane, hydrogen, ozone. And last but not least, those whose quantities change within days or weeks are the **strongly variable gases**: carbon monoxide, water vapour, nitrogen dioxide, ammonia, sulphur dioxide, hydrogen sulphide.

---

UNIT 5.1—Tell us everything you know about the atmosphere. How have the layers been identified? What are the main characteristics of the particular layers? What is the atmosphere composed primarily of? What sort of gases do you know? See greenhouse effect

UNIT 5.2—HEATING OF THE ATMOSPHERE

Heating of the atmosphere depends on many crucial factors. The larger the **angle of incidence of the radiation**, the greater and faster the warming-up of the air, since more solar radiation reaches a given area of the Earth’s surface. The air temperature in the troposphere isn’t spread evenly either because of the **spherical shape of the Earth**. The third one is the **relief**: in the northern hemisphere, the southern slopes get more solar radiation that’s why they are ideal for growing all kinds of grapes and figs as well. The heating of the air can be affected by the **material and colour of the Earth’s surface** too. The ability of the surface to reflect radiation is called the **albedo**.

<table>
<thead>
<tr>
<th>reflecting surface</th>
<th>albedo</th>
</tr>
</thead>
<tbody>
<tr>
<td>crisp snow</td>
<td>0.81-0.85</td>
</tr>
<tr>
<td>sea ice</td>
<td>0.3-0.4</td>
</tr>
<tr>
<td>dry stubble</td>
<td>0.3-0.32</td>
</tr>
<tr>
<td>wheat/barley</td>
<td>0.21-0.24</td>
</tr>
<tr>
<td>wet ground</td>
<td>0.12-0.24</td>
</tr>
<tr>
<td>sand</td>
<td>0.1-0.25</td>
</tr>
<tr>
<td>deciduous forest</td>
<td>0.1-0.15</td>
</tr>
<tr>
<td>coniferous forest</td>
<td>0.15-0.2</td>
</tr>
<tr>
<td>lake</td>
<td>0.08-0.12</td>
</tr>
<tr>
<td>seawater</td>
<td>0.08-0.1</td>
</tr>
</tbody>
</table>

UNIT 5.3—VARIATION IN TEMPERATURE

The air temperature varies during the day: it generally rises from the early morning up to 2 p.m. and then drops until sunset. During the daytime, the air warms up as a result of the solar radiation. However, at night it cools down since only the emission of heat takes place. Consequently, the **Earth’s rotation is the basic reason for the daily variation of the air temperature**. The **daily mean temperature** is the average value (or arithmetic mean value) of temperatures measured at four fixed times a day. The **daily variation of temperature** is the difference between the minimum and maximum temperatures measured within 24 hours. The **duration of sunshine** is defined as the number of hours of sunshine.

The top quality of Hungarian vegetables and fruits is well-known all over the world thanks to the long duration of sunshine. **Growing season** is the period of the year when crops and other plants grow successfully. The length of a growing season varies from place to place. Due to the decrease of temperature, the vegetation changes as the height above sea level increases. All plants require a certain amount of heat, and therefore they grow only where this quantity of heat is available. **Timberline** is the boundary above which continuous forest vegetation ends.

Unit 5.3: How could you define the daily mean temperature and the daily variation of temperature? What are the duration of sunshine and growing seasons? What is timberline? See equinox and solstice
UNIT 5.4—MAPS OF ISOTHERMS, ISOBARS AND ISOHYETS

An isotherm is a line connecting points of equal temperature. Isotherms are drawn with the aid of the data of annual, monthly or daily mean temperatures. An isobar is a line drawn on a weather map that connects places with the same air pressure → cyclones and anticyclones. An isohyet is a curved line that connects places of equal precipitation.

UNIT 5.5—THE WIND

The air pressure is the force that air produces on a particular area → 1 cm$^2$ and it varies continuously. This is found by dividing the force acting on a surface, which is measured in newtons, by the area it affects, which is measured in square metres. Pressure is measured in pascals. The movement of air is caused by the different warming-up of the air. So, air flows from an area of high pressure towards an area of low pressure. Winds are the movement of air parallel to the Earth’s surface and they’re named according to the direction from which they arrive. The greater the difference between the air pressure of two areas, the higher the wind blows. Apart from the winds that extend for the whole troposphere and the gales caused by cyclones, there are plenty of well-known local winds such as bora, eddy-wind, sea breeze, s(c)irocco etc. Phoen is a warm, dry wind that blows down the mountainside. Wind is mainly used as energy source in agriculture → wind power but it is also essential for sailing and hang-gliding.

UNIT 5.6—CYCLONES AND ANTICYCLONES

Cylones (=lows) [aSAkbKLeMN] are severe storms in which air tends to spin anticlockwise (AmE=counterclockwise) in the northern hemisphere and clockwise in the southern hemisphere. There is low pressure at their centre that’s why the winds inside blow not only inwards but also upwards. Cyclones are associated with areas of clouds and precipitation. Most of the cyclones occur over the oceans in torrid and temperate zones ➡:Icelandic ~. Anticyclones (=highs) are large weather systems in which air spins clockwise in the northern hemisphere and anticlockwise in the southern hemisphere. There is high pressure at their centre, thus the winds inside blow outwards and downwards.
Anticyclones are associated with clear sky. Most of them occur at the poles and the tropics: Syberian ~, Azori ~. Cyclones and anticyclones are of great importance since they exchange the warm and cool air in the low and high latitudes.

**UNIT 5.7—THE GLOBAL AIR CIRCULATION**

The continuous movement of air masses in the lower atmosphere is caused by air pressure differences. At the Equator and along 60° latitudes, low pressure zones develop, while the poles and the regions along 30° latitudes are surrounded by high pressure zones. The direction of this moving air may change due to the Coriolis force. Solar radiation warms the air over the Equator, which causes it to rise. The rising air then proceeds south and north towards the poles. From approximately 20° to 30° north and south latitude, the air descends. Then, the air flows along the Earth’s surface back towards the Equator and starts the cycle again. The westerlies (=westerly winds) blow between 30 and 60° latitudes. However, the winds which blow from the latitudes of 30° towards the Equator are called the trades (=trade winds). The polar winds dominate the areas closest to the poles. The jet stream is a powerful wind current found in the upper levels of the troposphere which blows from the west to the east due to the Earth’s rotation. This rapid current is typically thousands of kilometres long but only a few hundred kilometres wide and thick. Wind speed within jet streams might as well make 300 mi/h. The strongest jet streams generally occur in winter when large temperature differences exist between low and high latitudes. There are two main types of jet streams: subtropical and polar.
A monsoon [MgNaSUdN] is a seasonal shift of winds caused by the great annual variation of temperature that occurs over large land areas in contrast with associated ocean surfaces. The name derives from the word “mausim”, Arabic for season. These winds blow from the southwest during one half of the year and from the northeast during the other. This pattern is most evident on the southern and eastern coastal regions of Asia, though it does occur elsewhere, such as in the southwestern United States. Monsoons are primarily associated with the moisture and copious rainfalls that they bring in summer. They are considered to produce a dry winter. We distinguish monsoons of tropical and temperate zones. Near the Equator, from about 20° north and 20° south, the northeast and southeast trades converge in a low pressure zone known as the Intertropical Convergence Zone or ITCZ. Solar radiation in the region forces the air to rise through convection, which results in a plethora of precipitation.

UNIT 5.8—MONSOONS

UNIT 5.9—WATER IN THE ATMOSPHERE

Water vapour is usually explained in a way like this: water in the form of a gas produced by evaporation below its boiling point. The relative humidity (of the air) is the degree of saturation of the atmosphere, which contains water vapour. If the water vapour content of the air at a definite temperature per unit volume is expressed as a percentage of its water vapour capacity, you get the relative humidity of the air.
The humidity of the air plays a great part in the life of plants. When the air is dry, the water requirements of the plants are high, as they transpire and evaporate much water. However, the humidity of the air is also an important factor for industry. In humid air iron soon becomes rusted, wood rots, cotton threads easily break etc.

Clouds form when the temperature of ascending air falls below the dew point*, the water vapour content becomes partly superfluous and finally the excess of water separates out. Clouds consist of water drops and/or ice crystals depending on the height. We distinguish high-level clouds → above 6 km ☁:cirrus, mid-level clouds → between 2-6 km ☁:stratus and low-level clouds → below 2 km ☁:cumulus. Cirrus is a type of thin cloud that forms at the highest levels of the atmosphere. Stratus is a flat grey cloud that is lower in the sky. Cumulus is a large low white cloud that is round at the top and flat at the bottom. And last but not least, we should talk a little about the formation of fog. Fog is a cloud formed at ground level that reduces visibility to 1 km or less. There are two types of fog: radiation~ and advection~. Radiation fog occurs mostly over the land, usually in cool weather. Advection fog arises when humid air flows over cool ground or water.

<table>
<thead>
<tr>
<th>°C</th>
<th>-25</th>
<th>-15</th>
<th>-10</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>water vapour g/m³</td>
<td>0.7</td>
<td>0.5</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>9</td>
<td>13</td>
<td>17</td>
<td>23</td>
<td>30</td>
</tr>
</tbody>
</table>

Calculate the relative humidity of the air at 20 °C that contains 9 g of water vapour per m³. (The Table shows that this air can hold a further 8 g of water vapour per m³ because it can hold 17 g per m³ altogether. As 9 g is 53% of 17 g, the relative humidity of the air is 53%.)

† Unit 5.9: What is water vapour? Calculate the relative humidity of the air at different temperatures. How do clouds form? What do they consist of? How are clouds classified? What is fog? What types of fog do you know?
UNIT 5.10—PRECIPITATION

Precipitation [PRkbSkPkaTEktN] can be formed only if the air cools down, since its water vapour content may separate out then. When the air is cooled by the surface, the so-called surface precipitation occurs in the form of dew, hoar-frost or rime-frost. Dew is formed on bright windless nights when the air temperature falls as low as the dew point (at which condensation begins=over 0°C) so that a part of its water vapour content separates out in the shape of water drops on surface objects. Hoar-frost occurs in the very same way like dew but in this case the temperature falls below the freezing point. It occurs when water vapour touches a very cold surface and freezes instantly on it. This can happen to the leaves and branches of plants, and will cover them with ice crystals that look like spiky fingers. It can also occur on other freezing surfaces such as soil and metal, and that’s why it can often be seen on cars. Rime-frost is formed when humid air flows over icy ground. The temperature is below zero, so snowflake- or leaf-like ice crystals can be observed on flowers, trees, fences etc.

And one more thing we have to talk about: the falling precipitation. It is formed by the cooling of the ascending air. Air rises when it is warmed, crosses mountains and finally a cold front or a warm front develops. While the air is rising, it cools down by 1°C per 100 m. If the air continues to rise after reaching the dew point, cloud formation begins and then the temperature decreases by only 0.5°C per 100 m. As we have already studied, clouds contain either water drops or ice crystals. When the ice crystals have grown so much that they cannot remain suspended in the rising air stream, the precipitation starts to fall. It can reach the Earth’s surface as snow, rain, hail etc.

UNIT 5.11—FRONTS

A front is actually the zone of two air masses of different temperature and humidity. Fronts often bring dramatic changes in the weather within a very short time. Most precipitation and the changeable weather are associated with the movements of fronts. In order to keep you interested in geography, only the basic types of fronts will be discussed. A warm front occurs where warm air catches up to a cold air mass. Generally, with the passage of a warm front, the temperature and humidity increase, the pressure rises and fog may be produced. It causes soft rainfalls lasting a few days or snow in a broad belt (300-400 km wide). A cold front is defined as the transition zone where a cold air mass replaces a warm(er) air mass. A warm front occurs where warm air catches up to a cold air mass. Generally, with the passage of a warm front, the temperature and humidity increase, the pressure rises and fog may be produced. It causes soft rainfalls lasting a few days or snow in a broad belt (300-400 km wide). A cold front is defined as the transition zone where a cold air mass replaces a warm(er) air mass. As a result of the sudden chill, showers, snow or hail may take place in a narrow belt (50-70 km wide). On a weather map, warm and cold fronts are represented by red and blue solid lines. A stationary front occurs when neither warm nor cold air mass moves. It may develop into a warm or a cold front. Rain is common along this front too.

UNIT 5.10: How is precipitation classified? Tell us as much about dew/hoar-frost/rime-frost as you can. What is called the dew point? snow crystals. See acid rain

UNIT 5.11: What is a warm/cold/stationary front? Who was the first to use the word “front”?
1) How many layers of the atmosphere can be distinguished? page 27
2) What is the atmosphere composed primarily of? page 27
3) The larger the angle of incidence of the radiation… page 28
4) What is the growing season? page 28
5) Sum up what you know about the wind. page 29
6) What are cyclones and anticyclones? page 29
7) What is called a jet stream? page 30
8) What is a monsoon? page 31
9) When do clouds form? page 32
10) Advection fog arises… page 32
11) What is the dew point? page 33
12) What is a front? page 33
13) A cold front is defined as… page 33

Explain the process of global air circulation. What winds develop in the particular regions?

None of the air masses moves. Then, it must be a …… front.

As I can see, the lines on this map connect places of equal temperature. No doubt, these are …………

When does the hoar-frost occur?
Briefly, the water cycle (=hydrologic cycle) is the continuous process by which water in oceans, seas, rivers, lakes, soil, living things etc. evaporates into the atmosphere, where it forms clouds that produces rain, snow or hail so that it falls back to the ground again. The water cycle, which is one of the conditions of life on the Earth, is supplied with energy by solar radiation.

As the image also shows, the water loss from vegetation into the atmosphere is called transpiration. However, in the case of water bodies the term evaporation is used instead. Condensation [bKgNDeNaSEktN] refers to the cooling of a gas so that it changes into a liquid, for instance as water vapour cools, it condenses to become water droplets, which, when heavy enough, fall as rain. Soil consists of extremely small pieces of rock, decayed organic matter, air, minerals and water. Soil moisture is the quantity of water stored by the soil. Soil erosion takes place when soil is gradually removed by rain, wind or sea. Sometimes it is made worse by farming practices, like for example cutting down trees, leaving the ground without any plant cover or using heavy vehicles on slopes. All waters accumulated in the soil and rocks are called underground waters that do take part in the water cycle. Groundwater collects (and flows) over the uppermost impermeable layer □:clay that means it can be found very close to the surface. Its level may rise during rainfalls and floods. Between the impermeable layers usually there is also a water-bearing layer □:sand, dolomite. When precipitation is accumulated in this layer, this clear water is called confined water□: reserves under the Great Hungarian Plain. If it hasn’t got any natural outflow, the uppermost
impermeable layer is artificially opened up and then the water is brought to the surface by artesian wells. We talk about **mineral water** if the spring water contains different kinds of minerals, or to be more precise its dissolved material content is more than 1 g/l (=1 g per litre). Hungarian mineral waters: Kékkúti, Szentkirályi, Theodora, Lillafüredi, Balfi are well-known all over the world. Most of them have some therapeutic effect. **Thermal water** is spring water the temperature of which exceeds the annual mean temperature of the given area; in our country it is **warmer than 20°C**. Hungary may be deservedly proud of its thermal spas: Harkány, Hévíz, Zalakaros, Bükk as they are very popular holiday resorts, visited by the Germans and Austrians year by year.

**Unit 6.1**: Explain the process of water cycle to your classmates. Define the following concepts: transpiration, evaporation and condensation. What does the soil consist of? What is soil moisture? When does soil erosion occur? What is groundwater/confined water/thermal water/mineral water? What’s the comprehensive name of these waters? **Unit 6.2**: Where does the term artesian well derive from or where were these wells built first?

**UNIT 6.2—LIMESTONE FEATURES**

Limewater (=karst water) is a type of water containing a lot of calcium carbonate or calcium sulphate that is stored in the joints and hollows of rocks. It can mostly be found in such rocks that have a natural disposition to karst formation such as limestone. **Limestone** is a white or grey sedimentary rock that consists mainly of calcium carbonate and is formed from the remains of tiny shells and skeletons deposited on the sea bed. Rainwater accelerates the decay of limestone areas. Many limestone features are the results of the destructive, transporting and constructive work of limewater. The best-known one is **dolina** that tends to be a shallow, plate-like depression and sometimes it may be filled with water. However, on the surface there is another feature created, called a **swallow hole**. It is an exposed funnel-shaped limestone joint through which water oozes. **Karren**, which can also be found on the surface of limestone ranges, occurs when precipitation or melted waters dissolve the rock. Karren refers to the narrow furrows and edged, crested ridges that may develop into one metre-deep „basins” years after. Stalactites and stalagmites are types of dripstone that are formed over many years by chemicals in water drops. A **stalactite** is a long pointed piece of rock that hangs down from the roof of a cave, while a **stalagmite** rises up from the floor. But what if they meet? The joined-up stalactite and stalagmite is called the **pillar**.

A **cave** is a hole (or system of holes) formed naturally in the rocks of the Earth’s crust and the dimensions of which make it possible for a man to find enough room inside. Speleology is the scientific study of caves. Limestone ranges are rich in caves since the water dissolves and hollows out the rock. A cave that has a vertical vent as an entrance is called a **chimney**. It is mostly created by the action of the so-called underground streams (AmE=lost rivers) and melted waters.
UNIT 6.2: What is limewater? What is limestone and how is it formed? List the limestone features and then define at least three of them. What is a cave? What is a chimney? – now we are not thinking of that chimney which takes smoke through the roof! 🤔: What did Dr. Jakucs László discover?

UNIT 6.3—SURFACE WATERS

Surface waters is the comprehensive name of standing and running watercourses. Oceans, seas, rivers, springs and lakes belong to this group. Springs refer to the underground waters that rise to the surface. A spring can be found where faults or the impermeable layer cut off the way of water in the water-bearing layer.

A river is a body of flowing water in a natural channel that takes part efficiently in the formation of the Earth’s surface. If the water finds difference in level, it accelerates and starts to move in the direction of the steepest gradient. A drainage basin (=catchment area) əː of the Amazon=7,180,000 km² is an area of country from which rainwater flows into a particular river system, in other words this region is drained by a river and its tributaries [aTRkBJmTRk]. Tributaries are small rivers running into the main one, that form part of the same drainage basin system. The boundary separating the individual drainage basins, which usually lies along the crest of hills and ridges, is called a watershed. The source is the beginning of a river/stream, while the mouth (=estuary) is the place where it becomes wide and joins the sea. The path taken by a river as it goes from the source to the mouth is called the course.

In the upper course of the river, it cuts rapidly downwards, as the river puts almost all of its energy towards cutting down to base level. This causes the most distinctive river feature, the V-shaped valley. Rocks and other material are washed into the river from the steep valley sides during times of heavy rainfall, adding to the material being carried by the river. A waterfall often will form where a band of harder rock lies over a softer one. As the river flows over the edge of the harder, more resistant rock, into its plunge pool, it erodes away the softer rock below, creating an overhang. Once the overhang is big enough the whole thing collapses due to gravity and its own weight. The whole process then occurs again. This means that over time waterfalls will move backwards up the valley, leaving a steep sided, deep, narrow valley, called a gorge, in front of them. The Spanish equivalent of a gorge is the term "canyon". As the river cuts its deep V-shaped valley in its upper course, it follows the path of the easiest rock to erode. Thus it tends to wind its way along, leaving the more resistant areas of rock as interlocking spurs. Meanders occur in the mid course and lower course of the river, where it is beginning to cut laterally as it gets closer to base level. Meanders are basically bends in the river, where the faster water on the outside of the bend has cut into the bank, eroding it and creating a river cliff. At the same time the slow moving water on the inside of the bend deposits its load, building up a shallow slip-off slope. Meanders migrate downstream as they cut through the valley sides. This creates a line of parallel cliffs along the sides of the valley.
In the lower course of the river meanders can become so pronounced that they can form ox-bow lakes. In the lower course the rapid lateral erosion cuts into the neck of the meander, narrowing it considerably. Eventually the force of the river breaks through the neck, and as this is the easiest way for the water to go, the old meander is left without any significant amount of water flowing through it. Quickly the river deposits material along the side of its new course, which completely block off the old meander, creating an ox-bow lake. Levees [aLEVkZ] are naturally formed banks along the sides of a river channel in its lower course, as it flows through the flood plain. They are formed by the river depositing material when it floods. During a flood the river deposits its heaviest, coarsest material closest to its normal course. Over years this deposition has built up the natural embankments, built of coarse material. Beyond them the flood plain has been built up of the finer material that was deposited further away from the normal course of the river. The flood plain is the area of alluvial deposits found beside the river in its lower course. As meanders move slowly down the course of the river they erode away the valley to create a wide valley floor, and they deposit layers of alluvial material on the slip-off slopes. Over time this builds up into a large flood plain. River terraces are pieces of flat land which are raised above the flood plain. They used to be the flood plain but the river has cut down deeper and formed a new one at a lower level. Deltas occur where a river that carries a large amount of sediment meets a lake or the sea. This meeting causes the river to lose energy and drop the sediment it is carrying. Deltas form two types, called arcuate and bird’s foot. An arcuate delta is one, which builds out into the sea, extending the coastline, as the Nile Delta does in Egypt. A bird’s foot delta is an extension of this as “fingers” of material form further off the edge of the delta. The delta of the Mississippi River shows these characteristics.

In the upper course of the river valley the land is the highest, steepest and most exposed. The weather tends to be colder, wetter, windier and more humid than lower down the course. The soil is often waterlogged and acidic so no wonder it is hard to make good use of the land here. However, sheep and deer farming and forestry are fairly extensive. The lack of development favour the hill walkers and rock climbers and some areas in the highest section can be used for winter sports, for example skiing and snowboarding. The heavy rainfalls do make the land suitable for reservoirs and rapid running rivers may be dammed to build hydroelectric power stations. In the mid course the land is getting lower, less steep and the weather conditions aren’t so extreme either. Mixed farming now plays a significant role and there are also small settlements (villages, towns) with public transport. The population density is greater thanks to the wider range of accessible facilities. In the lower course the land is flat or very gently sloping and the weather here is the warmest. The fertile soil is ideal for arable farming. The road and rail networks link all the major cities. Although the largest industrial areas are located here the population is the greatest.

Unit 6.3: What is a river? List the features you studied and try to explain the formation of a V-shaped valley in your own words. Give a brief summary of the land uses of each course.
UNIT 6.4—USES OF RIVER BASINS AND FLOOD CONTROL

For thousands of years, rivers have been the focal point of people’s activities. Rivers can be used for domestic purposes, providing food, generating electricity and so on.

1) **Domestic uses**: rivers provide a source of fresh drinking water, a source of food (fishing) and a transport route, all of which were very important to the location of early settlements.

2) **Fertile soil**: flood plains provide areas of rich, fertile alluvial soil which enables farmers to grow crops.

3) **Transport**: rivers are an economic way to travel and transport goods, especially heavy and bulky stuff.

4) **Irrigation**: is the bringing of water into fields through the system of pipes, ditches etc. in order to make crops grow. In some areas irrigation is essential to ensure the survival of crops.

5) **Hydroelectric power**: dams are built across large rivers so the force of water can be used to generate hydroelectric power.

6) **Tourist attractions**: river cruises are organised so that tourists can enjoy the fresh air and have a panoramic view of the natural environment.

7) **Industrial use**: industries also use water for production purposes.

Building dams across rivers can also cause problems. Obviously, there are the advantages of creating a large reservoir which can be used for drinking water or as the source of water for a hydroelectric power scheme. The reservoir will often also be used for recreational purposes. However, the building of a large dam can also cause problems by affecting the flow of water further down the river, by flooding areas of farmland and even towns or villages, and by affecting entire ecosystems.

Although rivers have their uses, they have destructive powers, too. Firstly, when flooding occurs, properties are lost, good farmland with crops can be destroyed and sometimes even people are killed. What’s more, there are outbreaks of diseases. Other problems caused by rivers include obstruction of passage way for ships and silting of river mouth, making the port shallower.

**Hard engineering** involves building structures or changing the bed of the river in order to control the flow of water. Flooding is a serious problem in MEDCs* and LEDCs* alike. Both face the problem that a large percentage of settlements have been built on and around waterways. But MEDCs have better facilities for flood management, warning and dealing with the after-effects.

Unit 6.4: Tell us all the advantages of rivers you know. What are dams and why do we need them? What problems can they cause? What happens if flooding occurs? What is hard engineering?
UNIT 6.5—LAKES

A lake is a body of water surrounded by land in which aquatic vegetation occupies only a small area. If water flows out of the lake by an outlet, then it is called an open lake. However, lakes from which water leaves by evaporation are closed. Lakes are supplied with rainwater, snow and water that comes from melting ice or groundwater seepage. Generally, open lakes contain fresh water, while closed lakes may become salty. The latter phenomenon takes place when evaporation removes water in the form of water vapour and leaves behind a residue of dissolved salts: Salt Lake in Utah. Needless to say lakes vary in size and depth as well. Some measure only a few square metres, these are called ponds. Other lakes that are unusually big are sometimes called seas: Caspian Sea. Lakes certainly exist at many different elevations, for example Lake Titicaca lies high in the Andes and the Dead Sea 400 metres below sea level.

The Great Lakes were created by tectonic movements and glacial erosion.

Lake basins are formed in several ways:

1) Lots of lakes were created by glaciers: Great Lakes that covered large areas of land some 18,000 years ago. The huge masses of ice gouged large holes in the ground as they were moving slowly along.

2) Ox-bow lakes are formed through the action of meandering rivers: Lake Szelidi.

3) After a volcano has erupted and become inactive, its crater may be filled with rain or melted snow: Lake St Ann, Lake Albano.
4) Lakes can be the result of faults and folds: Lake Baykal, Dead Sea, Lake Balaton which make natural basins.
5) As glaciers flow, they push rocks and debris into ridge-like moraines. After these huge masses of ice have melted, moraines remain and surround small basins where water collects after a while: Lake Como.
6) Lakes are often formed by wind such as Lake Fehér near Szeged.
7) Lakes may also be created by landslides or mudslides.

Decline of lakes is determined by some important factors listed and explained below.

1) When the bed of the stream or river flowing out of the lake becomes deeply incised, it may drain off the entire lake.
2) A lake can dry out if the evaporation is much greater than the water supply of the lake.
3) Sediment deposited by rivers and wind fills up the basin of a lake.
4) Human activity also speeds up the decline of lakes. Watercourses transport fertilizers and other chemicals in large quantity.
5) Eutrofization= the overgrown aquatic vegetation and the accumulated decayed matter of animals gradually shallow and fill the lake.

The process takes place step by step:

lake → marsh → moorland

The Aral Sea, which is located on the border between Uzbekistan and Kazakhstan, was 69,530 km$^2$ according to the data of 1960. At that time it owned the title of the fourth biggest lake in the world behind the Caspian Sea, Lake Superior and Lake Victoria. However, its area shrank to 31,200 km$^2$ by the end of the 1990s. But of even greater concern, the volume of water has diminished from 1040 km$^3$ to 231 km$^3$. So far 24 species of fish have died off due to the substantial increase in the salinity of water. Within 30 years, a Belgium-sized quantity of water disappeared from the basin of the lake. The decline of the Aral Sea is the result of so much irrigation in the cotton fields in the USSR.
Economic value of lakes:

1) Freshwater lakes may be well utilized for fish farming.
2) They tend to be very popular holiday and sports resorts.
3) Navigation on lakes is highly developed.
4) Cellulose production
5) High salt content

UNIT 6.5: What is a lake? What are the defining characteristics of open lakes and closed ones? How are lake basins formed? What are the major factors in the decline of lakes? Remember to learn by heart what economic value lakes have.

UNIT 6.6—OCEANS AND SEAS

The World Ocean is the continuous water shell that occupies about 71% of the Earth’s surface. The continents divide the water shell into oceans and seas.

The specific heat of water is twice or three times as much as the one of the materials building up the land, that is to say much more thermal energy is needed to push up the temperature of water by 1°C than that of land. Seas warm up to a much greater depth than the mainland does because solar radiation can penetrate to a depth of 200 m in water. Seas cool down less and more slowly than the land due to the action of waves and ocean currents.

As water flows in rivers, it picks up small amounts of mineral salts from the rocks and soil of the river bed. This slightly salty water flows into the oceans and seas and since the oceanwater only leaves by evaporation, the salt remains dissolved. Consequently, water is getting saltier and saltier as time passes. The salinity (=salt content) of oceanwater is about 3.5%, i.e. there is 35 g of salt in 1 litre of water. The saltiest water is in the Red Sea and Persian Gulf, which have a salinity of 40 o/oo (40 parts per thousand=4%). The least salty seas can be found in the polar regions where the melting ice and rain dilute the salinity.

Tides are periodic rises (=flow) and falls (=ebb) in the level of the sea caused by the gravitational interaction between the Earth and the Moon. The pull of the Moon causes the ocean to bulge out in the direction of the Moon, while the other flow on the opposite side depends on the centrifugal force. Since the Earth is rotating while this is happening, two tides occur each day. Spring tides are especially strong tides, which happen near the new moon and the full moon each month. If you study the figure carefully, you will recognise that a spring tide occurs when the Earth, the Sun and the Moon ”can be found in a line”. The proxigean spring tide is a rare high tide that takes place once in one and a half years at the most when the Moon is at proxigee (very close to the Earth). Neap tide is a kind of low tide which occurs during quarter moons when the gravitational forces of the Moon and the Sun are perpendicular to one another (with respect to the Earth).

UNIT 6.6: How do oceans become salty? What is a tide? What are the particular types of tides?
Ocean currents are the strong movement of water in one direction. Only the upper layers take part in the process of currents because the friction slows and stops the motion as depth increases. The direction of one particular current might be modified by the Coriolis force and the shape of the continents. Ocean currents are kept moving by the steadily blowing winds. The northeasterly and southeasterly trade winds on both sides of the Equator drive the water of oceans from east to west. The continents divert the water masses arriving at their coasts in a northerly and southerly direction. At around 40-50° latitudes the currents are turned to the northeast by the action of the southwesterly winds. When they arrive at a land mass again, they branch into two and one of them returns to the Equator. Therefore, current rings are developed in the northern and southern hemispheres, one of which runs around the Earth in the belt of the westerlies.

Notes:

- Ocean currents are the strong movement of water in one direction.
- Currents are kept moving by the steadily blowing winds.
- Current rings are developed in the northern and southern hemispheres.
- One of the circles stretches across the Earth.
- Ocean currents tend to spin clockwise in the northern hemisphere and anticlockwise in the southern hemisphere due to the Earth’s rotation.
- Warm currents transport warm water from the Equator towards the polar regions, while cold currents bring fresh, cool water from the poles.
- Ocean currents heat the western coastal areas and cool the east side of the continents in the northern hemisphere, and do the exact opposite in the southern hemisphere. Eastwards to the interior of the continents in the northern temperate zone, however, the summer is getting warmer and the winter more severe [SkaVke].
The fish stock of the seas is one of the vital sources for humankind. For instance, tuna is still considered to be the favourite delicacy and many people have increased the amount of salmon, crab and shell fish they consume. (Fish prefer living in water at the encounter between warm and cold ocean currents since it is richer in plankton and oxygen.) However, in the future the flora of the seas may provide food for the population of the Earth on a larger scale than ever. Seas also count as important oil rigs. Nowadays, more than twenty countries mine for crude oil and natural gas on their coastal waters.

Unit 6.7: What are ocean currents? Explain the process of currents with a classic example. What are warm and cold ocean currents different in? How do currents rotate? Why are seas essential?

UNIT 6.8—COASTAL LANDFORMS

The coastal system is an ever-changing physical environment, powered primarily by the waves. The movement of waves can be either constructive (=depositional) or destructive (=erosive) but in sum, they carry material along the coastline and this overall process of transportation is called the long shore drift. The way how landforms are created depends largely on the height, steepness, geological structure and the indentations of the coastline, and the depth of the sea. For example, the great energy of steep waves is released forward as they break against the cliffs or the salt in the seawater slowly dissolves them, which happens only if the rock is not resistant enough. Basically, there are two main processes that take part in the formation of coastal landforms: abrasion (=corrasion: includes erosion, deposition and corrosion) and hydraulic action. Destructive features are mainly to be seen on headlands. Waves start by attacking the main points of weakness in the rock. These joints or faults are increased until a sea cave is created. The waves continue to damage the cave, which finally results in an arch being formed through the headland. Afterwards, the roof of the arch collapses due to erosion, leaving behind a high upright section called a stack, or if the rock is worn away so much that it doesn’t rise out of the sea, a stump. Cliffs are formed when destructive waves attack the bottom of the rock face. However, many landforms are built up by the long shore drift. A beach is a gently sloping deposit of sand, shingle and pebbles that has been transported from further along the coast. It is formed in the bay where the soft rock has been...
eroded away, and a **headland** of more resistant, hard rock is left behind. A **bar** is a ridge of sand that blocks off a bay or river mouth, creating a **lagoon** [LeaGUdN]. A **tombolo** is a bar of deposited material linking the mainland to an island.

- a stack that may become a stump in the near future -  

- a tombolo -

Types of coasts:

- Rias: form when estuaries and inlets are flooded
- Fjords: form when glacial valleys are drowned
- Coral reef coast (barrier, atolls: islands in the form of a ring, made of coral)
- Volcano and lava flow coast
- Delta coast
- Fault coast

†Unit 6.8: What’s the movement of waves like? What is the long shore drift? What is abrasion? List as many constructive and destructive features as you can. What types of coasts do you know? See barrier, atolls
UNIT 6.1-8—"COMING SOON"

1) Define all types of underground waters. page 35-36
2) What’s a stalactite? What if it joins a stalagmite? page 36
3) What is called a drainage basin? page 37
4) When are waterfalls created? page 37
5) What uses of river basins do you know? page 39
6) How are lakes formed? page 40-41
7) How does the decline of lakes take place? page 41
8) Explain the movement of ocean currents. page 43
9) Why are seas essential? page 44
10) What does the formation of the coastal system depend on? page 44
11) What’s the difference between a stack and a stump? page 44
12) What types of coasts do you know? page 45

What are tides? How does the river behave in its lower course and what features does it meanwhile create?

What natural features can be found in the upper course? What’s the water cycle?
UNIT 7.1 — GEOGRAPHICAL ZONALITY

The weather is the variation in the physical state of the air relating to hourly, daily atmospheric conditions such as air temperature, pressure, precipitation, humidity, cloudiness, ascending and descending air masses and the wind. However, it depends largely on solar radiation. Climate refers to the average and usual weather conditions of a particular area or country. The climate of a region describes how these variables may be over a long period, for instance the South of France in the summer is hot and dry. Many factors affect the climate of different areas around the world. The main ones are listed below:

- **Solar radiation:** it determines first and foremost the heating of the Earth’s surface, which then affects the air temperature, cloud development and precipitation. Unequal heating of the surface may create pressure gradients that result in wind. The polar regions experience the least heat since the rays here arrive at the smallest angle. (The closer a place to the Equator, the greater the angle and therefore the more intense the radiation.)
- **Air masses:** can have a great influence over the day-to-day weather and long-term climate of a certain place.
- **Pressure systems:** have a significant impact on the precipitation in different climatic regions. Generally, areas dominated by low pressure tend to be moist, while those controlled by high pressure are dry.
- **Ocean currents:** Many areas beside the sea are affected by ocean currents. The climates bordering cold currents are usually drier as the cold oceanwater helps to stabilize the air and inhibit cloud formation and precipitation.
- **Topography:** The orientation of mountains to the prevailing wind has an effect on precipitation. Windward (=facing towards the wind) slopes receive more precipitation due to the orographic uplift of the air. Leeward sides, however, are in rain shadow.

Additional factors:
- Altitude
- Latitude
- Distance from the sea

World biomes are controlled by climate. The climate of a region will determine what plants will grow there, and what animals will inhabit it. All three components — climate, plants and animals — are interwoven to create the fabric of a biome.
A plant's environment is made up of many factors. One of the most important is the weather — sunlight, temperature, and precipitation (rain, melted snow, and other moisture). Soil and other plants and animals that live in the same area are also included in the environment. All these factors form what is called a *natural community*.

A *habitat* is any place where a certain animal or plant species lives. Examples of a habitat include a lake, a desert, or forest, or even a drop of water. All habitats on Earth are part of the *biosphere*. Since the Earth is always changing, habitats continually vary as well. **Habitats of similar climate and vegetation are called biomes.** In different parts of the world, the same biome may contain different species, but will contain similar life forms. For instance, trees are the dominant forms of the rainforest, no matter where the rainforest is located.

**Soil** is the loose, fertile uppermost layer of the Earth’s crust in which plants grow. Soil consists of extremely small pieces of rock, decayed organic matter, air, water, and minerals. Climate, parent material, topography (relief), organisms and time, all influence the formation of soil types. **Humus [aHJUdMeS]** forms when plants and leaves decay on the ground and improve the soil for growth of other plants. **Translocation** includes numerous processes but is primarily the downward movement of water or minerals in the soil. Another important process is **leaching**, by which soluble salts are removed as a result of water passing through the soil. **Soil moisture** is also essential because it influences the upward and downward movement of nutrients and water in the soil. Typical soils: podzol, tropical soil(s), terra-rossa, brown earth soil(s), permafrost, lithosols (=raw soils)

**Soil erosion** takes place when soil is gradually washed away by the rain, wind or sea. It’s sometimes made worse by decrease in hedgerows, development, population pressure, farming practices such as cutting down trees, leaving the ground without any plant cover or using heavy vehicles on slopes.

**O-A:** upper organic layer, made up of leaf litter and humus. Here biological activity is at its maximum. Leaching may occur.

**E-B:** zone of accumulation or leaching, clays etc. taken from A are redeposited. A and E-B account for the **true soil**.

**C:** recently weathered material. → **subsoil**

It is possible for a surface horizon to exist, this is when humus is slow to decompose. Layers between horizons may not always be clear, depth can vary, and humus can mix in the soil or be a separate layer.
Unit 7.1: What are weather and climate? What factors affect the climate? What is a biome? Study the map and try to memorize the ten world biomes. Read the short text that contains plenty of good terms relating to environment. What is soil/humus/soil moisture? Explain the two main processes how soil may form. How does soil erosion occur? What are the major soil layers?

UNIT 7.2 — MOIST TROPICAL CLIMATE + CLIMATE CLASSIFICATION

The true torrid zone is actually located between the imaginary lines called Tropic of Cancer and Tropic of Capricorn. The annual mean temperature everywhere exceeds 20°C and it has got a minor annual fluctuation, too. Within this zone, where the prevailing wind system is the trades, particular climatic differences are the result of the movement of air masses changing from place to place. So the torrid zone is divided into belts not according to temperatures but to the distribution of rainfall.

- **Equatorial belt**: it may rain every day.
- **Transitional belt and tropical monsoon regions**: it rains in the summer months.
- **Tropical belt**: there may be no rain for days, months or even years.

Equatorial belt/Moist tropical climate - tropical rainforest -

The equatorial belt is characterized by one, **hot, muggy climate**. There is only one season: rainy summer. It tends to have **high temperatures** (**25-27°C**) that mostly stay the same throughout the entire year and **precipitation is evenly distributed (2500-3000 mm/year)**. High surface heat and humidity cause the air to rise and cumulus clouds to form early in the afternoons almost every day. Hail is also frequent. The climate on eastern sides of the continents are influenced by maritime tropical air masses which flow out from the wet western sides of oceanic high-pressure cells, and bring lots of summer rainfall. Rainforest is the natural community richest in different species of animals, plants and birds on Earth. We can distinguish four parts of a rainforest: **emergents, canopy, understory and forest floor** (from top to bottom). Rainforests are considered to be important environmental areas and many people want them to be protected by law. Since more and more deforestations have been carried out in the past few years, this great effort would be best to be attempted as soon as possible.

**Plants**: Bengal bamboo, coconut tree, jambu, strangler figs, ferns, lianas

**Animals**: orangutan, proboscis monkey, bonobo, jaguar, ocelot, tiger

**Birds**: toco toucan, harpy eagle, macaw, quetzal

(+ insects, anaconda, iguana, caiman, piranha, electric eel etc.)

In spite of the abundant vegetation, **the moist tropical climate doesn’t favour humus formation**, as even the small amounts are washed away by surface run-off. In the area we can find **tropical red soil**, the colour of which is given by iron and aluminium hydroxides. **Rocks also disintegrate rapidly** due to the constant high temperatures and heavy precipitation.
Equatorial belt // Moist tropical climate – tropical rainforest

- **Average temperature**: 25-27°C
- **Annual precipitation**: 1500-2500 mm
- **Latitude range**: 10°S to 25°N
- **Global location**: Amazon Basin; Congo Basin of Central Africa; East coast of Central America, Brazil, East coast of Madagascar, Malaysia, Indonesia, Philippines

**UNIT 7.3 — WET-DRY TROPICAL CLIMATE**

In the wet-dry tropical climate – as its name also shows – **two seasons** can be distinguished, which is obviously due to the shifting influence of the ITCZ*. The wet season is warm, humid and there are frequent violent thunderstorms, while during the dry season semidesert conditions prevail. The trades dominate over the dry season and as a result it gets a little cooler, but will become very hot just before the rainy season. It’s important to note that the length of the wet period, the annual total precipitation and fluctuation decrease as you move away from the Equator. Needless to say, the vegetation and soil vary as well. The annual
mean temperature is between 20-27°C. Thanks to the intensive humus formation, you can find **fertile, dark red soil** in this region. Consequently, sheep and cow farming technology is highly developed, mainly in South Africa and Australia. The destruction of the surface here is very fast and therefore the landscape may provide some interesting features such as **tropical monadnocks**. **Savanna** [SeaViNe] is a rolling grassland scattered with shrubs and isolated trees, which can be found on either side of the Equator on the edges of tropical rainforests. Most of the animals on the savanna have long legs (\( \rightarrow \) **ungulates**) or wings to be able to migrate. The savanna is a perfect place for birds like hawks and buzzards. The wide, open plain provides them with a clear view of their prey, hot air updrafts keep them soaring, and there is the occasional tree to rest on or nest in. Many large **herbivores** \([\text{HrdBkbvjd}]\) (=grass-eating mammals) can survive because they move around and eat the plentiful grasses. There are also **carnivores** \([\text{KhdNkbvjd}]\) (=meat eaters) who catch and eat them in turn. Plants of the savannas are highly specialized to grow in this environment of drought. They have long tap roots that can reach the deep water table, thick bark to resist annual fires, trunks that can store water, and leaves that drop off during the winter to conserve water. The grasses have adaptations that discourage animals from grazing on them; some are too sharp or bitter tasting for some animals, but not others, to eat.

**Plants:** acacia, baobab, eucalyptus, gum tree  
**Animals:** lion, giraffe, zebra, African elephant, koala bear, kangaroo, cheetah, hyena  
**Birds:** emu, hawk, buzzard  
(+ black mamba, Nile crocodile, etc.)

As the distance from the Equator increases, the vegetation in the area changes: first comes **woodland savanna**, then **shrub savanna** and finally **grassland**. Here are some classic examples of a savanna, that we are most familiar with:

- East-African acacia savannas \([\text{e'Kkte Se'viNeZ}]\)  
- The Llanos of the Orinoco basin in Venezuela and Columbia  
- Brazil’s cerrado  
- The pine savannas of Belize and Honduras

---

**Transitional belt//Wet-dry tropical climate** - savanna -

- **Annual mean temperature:** 20-27°C  
- **Annual precipitation:** 700-1500 mm  
- **Latitude range:** 15°-25°N and S  
- **Global location:** Northern and Eastern India, Burma, Indo-Chinese peninsula, Western Africa, Southern Africa, South America and north coast of Australia

---

\( \uparrow \) **Unit 7.3:** Describe the wet-dry tropical climate. Why does it have two distinct seasons? Mention some basic facts of a savanna: what animals, plants live there, for example. What different types of a savanna are there?
The tropical belt is strongly influenced by the descending air masses year-round and as a result, annual rainfall is less and its distribution is irregular and very unreliable. The aridity creates large areas of desert, even along the coasts of the continents, like for example in Africa, Saudi Arabia and Australia: Atacama, Sahara, Namib, Kalahari, Arabian-desert.

Tropical desert and steppe climates roughly correspond, this means they have remarkably similar vegetation and animal kingdom, both are controlled by **cool winter and hot summer. There is hardly any precipitation (150-200 mm) in the desert**, moreover, years or decades may pass without rain. Here is also the highest temperature: 57.8°C, Libya that has ever been recorded. No wonder it’s called the driest region on Earth. The annual mean temperature is above 18°C, though **daily fluctuation is extremely high**: frosts might occur at night. Relative humidity tends to be rather low. **On the steppes, however, only semiarid conditions exist and there is no lack of precipitation (200-700 mm)**. Desert and semidesert are the main areas of the surface-forming action of the wind: sand dunes are built up, basins are gouged that water might fill for a short period. Sometimes odd rock forms can be seen too. Despite the fact that deserts and steppes get very little precipitation, over 500 species of plants, antelopes and rare carnivores live there. Along the northern and southern edges of tropical deserts, however, the only significant plant is date palm, which grows in oases.

**Plants:** barrel cactus, soaptree yucca, desert ironwood, brittle bush  
**Animals:** antelope, bobcat, coyote, desert tortoise, camel, desert bighorn sheep

Tropical belt//**Tropical steppe climate**  
- desert biome -

- **A.m.t.:** 18-20°C  
- **A.p.:** 200-700 mm  
- **G.l.:** Australia, North and South Africa, Southwest Asia, Argentina, Western USA

Tropical belt//**Tropical desert climate**  
- desert biome -

- **A.m.t.:** above 18°C  
- **A.p.:** 0-200 mm  
- **L.r.:** 15°-25°N and S  
- **G.l.:** Chile, Peru, Arabia, Iran, Africa, Pakistan, Mexico

---

**Unit 7.4: What is the tropical belt greatly influenced by? What are the main characteristics of the tropical climates? What natural features are created by the action of the wind? What’s the desert biome like?**
UNIT 7.5 — TROPICAL MONSOON REGIONS

The climate of the tropical monsoon regions (dry, sunny winter and rainy, hot summer) reminds us about the typical weather conditions of the transitional belt. A crucial part of the precipitation falls during the summer (A.p.: 1500 mm) and the annual mean temperature is about 25-28°C. The highest temperature is measured just before the wet period. This summer onshore – winter offshore air movement can be associated with the migration of the ITCZ or the relief. Tropical monsoons mainly occur and are the most powerful on the Hindustan peninsula. The South Asian tropical monsoon forest is sometimes called the jungle. It’s the natural habitat of the Indian elephant, tiger, black panther and the cobra. People grow rice in the fields (paddies ['PiDkz]=rice fields), which are often flooded by the heavy monsoon rains.

UNIT 7.5: Describe the tropical monsoon climate. List some animals that live in the jungle.

UNIT 7.6 — MEDITERRANEAN AND HUMID SUBTROPICAL CLIMATES

The so-called season turns, which are based on the Earth’s orbit (=Earth’s rotation) and its inclined axis, fully develop in the temperate zone. Four, more or less distinguishing seasons alternate throughout the whole year. The annual mean temperature frequently changes between 0-20°C, while the fluctuation variances can be traced back to the differences in winter cooling. In the temperate zone the prevailing wind system is the westerlies, though on the edges it is still dominated by the descending air masses of the trades and the polar winds. By the way, there are three belts: the warm and true temperate belts divide into additional areas. The cold temperate belt is almost missing from the southern hemisphere.

- Warm temperate belt (subtropical)
- True temperate belt
- Cold temperate belt (subarctic)

Warm temperate belt/ Mediterranean climate

- chapparal or maquis biome -

The countries of southern Europe are firstly renowned for their mediterranean climate, but it develops on the west side of other continents, too. During the summer the descending branch of the trades bring dry, hot weather, but from autumn they let the westerlies transport cyclones and some rainfall. Since this climate has a mild, moist winter and summer with bright sunshine, it’s often called: dry summer subtropical. In winter it gets cool and foggy, that’s why there is frost danger on the coasts. Plants have specially adapted to the extreme
difference in rainfall and temperature between winter and summer seasons. Unfortunately, evergreen forests have largely been eliminated, nowadays the **chapparal/maquis biome** covers the whole region of the Mediterranean Sea. Holly groves, cork oak, parasol pine, bay trees are fairly common, also the Lebanon cedar remains here and there, but the main area is occupied by evergreen shrubs such as oleander, laurel, fig cactus (plural: cacti) and agave species. As for crops, farmers either grow olive trees, grapes and fig or own citrus orchards. In limestone ranges you can find "terra rossa", while the cinnamon-coloured earth soil may be seen in deciduous forests. **The deforested mountainsides are badly damaged by soil erosion.** The mediterranean areas are chiefly shaped by rivers, but their activity is limited to the rainy season. So the **volume of the rivers is very unsteady:** during the summer they almost dry out, in winter they flood.

**Plants:** blue oak, Lebanon cedar, olive tree, holly, bay tree, oleander, laurel  
**Animals:** aardwolf, grey fox, wild goat, spotted skunk

Warm temperate belt//Mediterranean climate – chapparal/maquis biome:

- **Annual mean temperature:** 12-19°C  
- **Annual precipitation:** 500-700 mm  
- **Latitude range:** 30°-50°N and S  
- **Global location:** Central California, Chile, Mediterranean Sea borderlands, Cape Town region of South Africa, Southwestern Australia, Iranian Highlands

The humid subtropical climate is very much like the one of the tropical monsoon regions or we can say it’s the complete opposite of the mediterranean climate. It may form on the east side of the mainland. The monsoon winds blow from inland and because of this the weather in winter tends to be a little bit cool and relatively dry. However, the summer is hot and rainy due to the anticyclones flowing from the seas towards the continents. The climograph shows that these regions experience much colder winters and more annual rainfall than mediterranean areas. As you see on the news, huge natural catastrophes devastate every summer; many people are flooded out or contract a disease. The subtropical monsoon rains favour its biome, called the **bamboo**. Tropical monadnocks make the landscape even more wonderful. Besides, tea shrubs and mulberry trees are also valuable plants. The agriculture isn’t so intensive except for **cotton fields, paddies and tea plantations**, since there are poor, red or yellow soils. **The surface may slowly be eroded by physical weathering in winter, and by disintegration (=chemical weathering) in summer.**

Warm temperate belt//Humid subtropical climate

**Memphis, TN**

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitation (mm)</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>250</td>
<td>300</td>
<td>350</td>
<td>400</td>
<td>350</td>
<td>300</td>
<td>250</td>
<td>200</td>
<td>150</td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>30</td>
<td>30</td>
<td>35</td>
<td>30</td>
<td>25</td>
<td>20</td>
<td>15</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
</tr>
</tbody>
</table>

**Warm temperate belt//Humid subtropical climate – bamboo:**

- **Annual mean temperature:** 14-16°C  
- **Annual precipitation:** 700-900 mm  
- **Global location:** South and Central China, eastern coastal region of South Africa, Southeastern USA, east coast of South America
UNIT 7.7 — MARITIME CLIMATE

The maritime climate occurs in the areas which are close to the ocean. The influence of the seas leads to **minor annual mean fluctuation, mild winter, cool summer**, and **precipitation is evenly distributed**. The sky is often cloudy or foggy. **During the day the weather is very unsettled**: sunny periods may be followed by torrential rain. Its biome includes oak and beech forests, but in North America and Norway, pine trees (=conifer [aKgNkFe]) can be found instead. The grass is permanently green, which results in **developed husbandry**. Most of the areas beside the sea are covered with **leached, brown earth soil**, but **podzol** forms in northern places.

**Plants**: American beech, white oak, carpet moss, pecan  
**Animals**: bald eagle, black bear, red squirrel, duckbill platypus, white-tailed deer

True temperate belt // Maritime climate  - deciduous forest biome -

The significant difference between climate characteristics of Vancouver and London arises from location, local topography and last but not least, ocean current influence. Precipitation in the region of Vancouver is nearly double that of London because of the orographic uplift of the air. The dry summer in Vancouver is due in part to the subsiding subtropical high pressure lying southerly and the milder winter temperatures in London are the result of the moderating action of the North Atlantic Drift.

![Climographs of Vancouver, British Columbia and London, England](image)

True temperate belt // Maritime climate – deciduous forest biome:

- **Annual mean temperature**: 5-10°C  
- **Annual precipitation**: 600-1000 mm  
- **Global location**: Coastal Oregon, Washington, British Columbia, Southern Alaska, Southern Chile, interior of South Africa, Southeast Australia and New Zealand, Northwest Europe

Unit 7.7: Compare the mediterranean climate to humid subtropical climate. Describe the chapparal/maquis biome that belongs to the region of the Mediterranean Sea. What are the three major products of the subtropical monsoon areas? Study the climographs and look for the global locations in your atlas.
UNIT 7.8 — HUMID CONTINENTAL CLIMATE

The humid continental climate mostly develops in Central Europe, including our lovely country as well. As you move further inland the continents, the annual mean fluctuation rises from 10°C up to 20°C, the precipitation is getting less and partly falls in the form of snow, and the volume of the rivers becomes unsteady. It’s characterized by cold winter and warm summer, what’s more, even drought may occur. However, on the eastern edges the summer monsoon brings abundant rainfall.

The deciduous forest biome of the continents differ just in a few species. The hot, dry areas are occupied by woodlands. The predominant soil type is still the brown earth soil, its leaching extent depends on the precipitation. Rocks are removed by both physical weathering and disintegration. Furthermore, action of the wind, surface run-off and rivers also erode them.

True temperate belt//Humid continental climate – deciduous forest biome:

- Annual mean temperature: 0-10°C
- Annual precipitation: 500-1000 mm
- Global location: Eastern and Midwestern USA from the Atlantic Ocean to 100th meridian, eastern part of Central Europe, Northern China and Korea

Unit 7.8: Explain how the variations in weather conditions take place. Describe the deciduous forest biome.

UNIT 7.9 — MIDLATITUDE STEPPE AND DESERT CLIMATES

These midlatitude climates have close relations with their tropical equivalents, the only reason why they’re so similar beside climate and soil characteristics is being located in the interior of the continents, occasionally in the vicinity of the seas, but in basins surrounded by mountains. The midlatitude desert is considered to be an arid climate and there certainly are some areas: Takla Makan, Gobi desert that receive very little precipitation, about 100-200 mm per year. The lack of precipitation in the basins is caused by the west wind-air masses: after they’ve transported some rainfalls to the exterior mountainsides, they enter the basins as a phoen. The other major factor might be the action of high pressure anticyclones, which are associated with dry weather, you see. Temperatures vary with latitude, elevation and continentality. The annual mean fluctuation is very high (it may exceed 30-40°C) and the relative humidity tends to be approximately 50%. Needless to say, the volume of the rivers is fairly unsteady. Disintegration is controlled by the heat during the summer, and by frosts during the winter. Midlatitude deserts depending on the soil type can be classified into three groups: sandy, rocky and clay. The fauna and flora therefore vary. The grasslands are named according to the length of the grass and where they are found: they are called steppes in Eurasia, praire in North America and pampas in South America. Grasslands are known for their fertile black soil (=chernozjom).
SUBARCTIC CLIMATE

The subarctic climate is said to have long (6-9 months), severe winters and relatively warm, rainy summers. Due to the fact that the northern edge of the belt overhangs the Arctic Circle, in some areas it frequently gets dark or the exact opposite, the sun doesn’t set for days. The lowest temperature $\square:-78^\circ C$, Syberia and the greatest absolute fluctuation $\square:113^\circ C$ have also been measured in this section of the northern hemisphere. The precipitation falling in part, in the form of snow is a bit slight, but it still provides medium water supply. Its biome is the taiga, the largest area of pine trees on Earth. This place has got leached, grey-coloured, infertile podzol.

Plants: Norway spruce, fir
Animals: reindeer, moose/elk, fox, wolf
Cold temperate belt//Subarctic climate – taiga:

- **Annual mean temperature**: between 0° and -10°C
- **Annual precipitation**: 200-300 mm
- **Global location**: Northern North America, northern part of Asia

**UNIT 7.10**: Tell us about the subarctic climate as much as you can. Why are there “light nights and dark daytime”? 😃 In which city has the lowest temperature been recorded?

**UNIT 7.11 — TUNDRA CLIMATE**

The frigid zone is heavily influenced by the bitter polar winds. The annual mean fluctuation everywhere stays below 0°C and snowstorms change rainfalls. The frigid zone is sorted into two belts:
- Arctic belt → two seasons
- Polar belt → one season

In the tundra climate the chilly winter lasts 9-10 months and its short summer makes you feel as if it were March or April. Although the Sun’s rays reach the ground at a smaller angle, they’re able to thaw the snowfield, forming the region into a waterlogged, marshy place. The annual mean temperature usually fluctuates between 0° and -15°C. The coastline may be milder thanks to the warm ocean currents. About 80% of the precipitation falls in the form of snow and it decreases with the distance from the sea. Storms are frequent, which bring cold, polar air masses to lower latitudes. The **tundra** biome is composed mainly of moss and lichen, but shrubs, birch and pine trees can be seen as well. During the summer, **droves of reindeer**, migrating from the taiga, graze on the tundra. The so-called **tundra soil** tends to be rocky and sandy at the same time. Like in the subarctic climate, the disintegration caused by frosts, is significant here too.

**Plants**: arctic moss, bearberry, pasque flower
**Animals**: arctic fox, caribou, grizzly bear, musk-ox, polar bear, snowy owl

Arctic belt//Tundra climate – tundra:

- **Annual mean temperature**: between 0° and -15°C
- **Annual precipitation**: below 400 mm
- **Global location**: Iceland, Scandinavian Highlands, Novaja Zemlja, islands in the Arctic Ocean, Canada, Alaska, arctic archipelago, coastal regions of Greenland

**UNIT 7.11**: What are the winters and summers like? Explain the formation of marshes in the area. What’s the tundra biome composed mainly of? 😃 By what kind of method do you think the houses are built in this region?
UNIT 7.12 — ICE CAP

The Ice Cap climate experiences the lowest temperatures on Earth. In fact, climatologists have described it as the „polar desert“. **Temperatures here never reach 0°C,** even in the warmest period. During the bitterly cold winter, 3-6 month-long polar daytimes alternate with 3-6 month-long nights. The annual total precipitation is altogether 200-400 mm. In the polar belt there is no sign of natural vegetation and soil. The surface is covered by – a few cliffs excluded – snow and ice sheets. The permanent cover of ice of Greenland and the Antarctic [iNaThdKTkK] was formed during the Quaternary Ice Age.

**Plants:** algae  
**Animals:** seal, walrus  
**Birds:** penguin, auk

Polar belt/Ice Cap:

- **Annual mean temperature:** between -10° and -55°C  
- **Annual precipitation:** 200-400 mm  
- **Global location:** inner Greenland, islands near the poles, the Antarctic

**Unit 7.12: What interesting phenomenon may be observed in the Ice Cap climate?**

UNIT 7.13 — HIGHLAND CLIMATE

In the mountains, climate characteristics vary according to the elevation based on altitudinal zonality. This means that the soil, vegetation, land uses etc. have also been arranged into the zones, which are located above one another. The zones created in this way may be separated by the timberline and snowline. The annual mean temperature drops by 0.5°C with 100 m rise in height, but there is more precipitation. The spectacular mountain scenery attracts lots of tourists every year. Rivers are used to produce energy, or irrigation.

**Tierra helada:** potato, barley  
**Tierra fria:** wheat, maize  
**Tierra templada:** coffee, cotton  
**Tierra caliente:** banana, cacao, sugar cane

**Unit 7.13: Describe the highland climate? What do you call the zones developed in the mountains?**
1) The largest desert of the world belongs to this climate. ..............................
2) Brown earth soil is the predominant soil type. ..............................
3) People grow rice in the fields. ➔ paddies ..............................
4) The sky is often foggy and cloudy. ..............................
5) This climate has developed on the west side of the mainland. ..............................
6) The natural vegetation is the savanna. ..............................
7) How many belts are there within the frigid zone? ..............................
8) The chilly winter lasts 9-10 months. ..............................
9) As you move further inland the continents, the temperature rises. ..............................
10) This climate has got a mild winter and cool summer. ..............................
11) The sun may not set for days. ..............................
12) The ............... biome is composed mainly of moss and lichen. ..............................
13) The precipitation is evenly distributed throughout the entire year. ..............................
14) You can find terra rossa in this area. ..............................
15) One of the common animals is the caribou. ..............................

Which climates do you think graph A and B belong to? Be careful, the precipitation is measured in inches while the temperature in Fahrenheit.

CLIMOGRAPH A

CLIMOGRAPH B

1 inch = 2.54 cm ;
1°F-32= -31×5= -155÷9= -17.2°C

The photo shows the…… biome.

Label the diagram of the tropical rainforest.
ACID RAIN: Scientists have discovered that air pollution from the burning of fossil fuels is the major cause of acid rain. It was first noted in the mid-1800's, but did not become a chief concern until the 1980's. Acidic deposition, or acid rain as it is commonly known, occurs when emissions of sulfur dioxide (SO$_2$) and oxides of nitrogen (NO$_x$) react in the atmosphere with water, oxygen and oxidants to form various acidic compounds. This mixture forms a mild solution of sulphuric and nitric acid. Sunlight increases the rate of most of these reactions. These compounds then fall to the ground in either wet form: rain, snow, fog or dry form: gas, particles. About half of the acidity in the atmosphere falls back to ground through dry deposition as gases and dry particles. The wind blows these acidic particles and gases onto buildings, cars, homes, and trees. Acid rain can make trees lose their leaves or needles, which turn brown and fall off. All of this happens partly because of direct contact between trees and acid rain or when trees absorb soil that has come into contact with acid rain. A lake polluted by acid rain will support only the hardiest species. Fish die off, and that removes the main source of food for birds. Architecture and artwork can be destroyed by acid rain too. Acid particles can land on buildings, causing corrosion. When sulphur pollutants fall off onto the surfaces of buildings (especially those made out of sandstone or limestone), they react with the minerals in the stone to form a powdery substance that can be washed away by rain.

A problem is that it is not only the producers of acid rain, who suffer from its consequences, especially when gases are found in the upper troposphere. As the prevailing wind direction for the UK is from the southwest, much of the acid rain we produce is carried away over the North Sea to Scandinavian countries.

ANEMOMETER: it measures wind speed and records in knots.

ARABLE FARMING: cereals: wheat, barley, maize, roots: sugar beet, potatoes, vegetables.

ATOLL: an island in the shape of a ring, made of coral.

AVAILANCHE: like landslides but consists mainly of snow. Material travels up to 150 km and destroys everything in its path.

BARRIER REEF: a large long mass of coral in the sea, not far from land.

BRITISH ISLES, THE: it is used for referring to Great Britain, Northern Ireland, the Republic of Ireland and lots of small islands near their coasts. → See Great Britain, the UK

CLIMOGRAFH: it shows average monthly temperatures as points joined with a line and monthly precipitation totals as vertical bars.

COAL: it is used for heating, smelting and power production. Demand has fallen while the cost of mining coal has continued to rise. Most coal is extracted by shaft mining but opencast methods are becoming more common.

CONTINENT, THE: the part of Europe, especially Western Europe, that is on one continuous area of land, as opposed to the UK or Ireland, which are islands. → See the British Isles, Great Britain, the UK
CONVERGENCE: plates moving towards each other.

CORROSION: impact of particles carried by water wears away the surface they pass over.

DEFORESTATION: the process of cutting down and removing trees, especially from large areas of land. Deforestation is bad for the environment, as there are fewer trees to take in carbon dioxide and this can lead to an increase in global warming. It also involves the destruction of habitats and can cause soil erosion. See global warming, soil erosion

DENSITY: it refers to the number of people etc. in a given area.

DESERIFICATION: through over-grazing, vegetation disappears, and desert-like conditions spread.

DEW POINT: temperature at which water vapour condenses.

DIVERGENCE: plates moving away from each other.

DROUGHT: lack of water, that can result in famine if the harvest fails.

EARTH, THE: the planet on which we live

ENERGY: a river gains energy from the volume and force of the water and loses it by friction with the land surface.

ENERGY BUDGET: transfer of heat.

EROSION: wearing away of the Earth's surface.

EQUATOR, THE: an imaginary line that goes round the Earth and divides it into the northern and southern hemispheres. See the Earth

EQUINOX: one of the days in the year when the daytime and night are the same length. The vernal equinox is on 20/21 March and the autumnal equinox is on 22/23 September.

EVAPORATION: conversion of water from its liquid to its gas state. The amount of water converted depends on the level of heating and the capacity of the air.

EVAPOTRANSPIRATION: combination of evaporation and transpiration. See evaporation, transpiration

FLOOD: occurs after very heavy or persistent rain, during rapid snowmelt, when high tides inundate low-lying coastal areas or when river banks collapse.

FOG: occurs when the temperature of the air above the ground falls below the dew point and droplets remain suspended in the air. See dew point

FREEZE-THAW: water penetrates into the rock and into cracks. When water freezes, it expands, causing pressure, and the rock begins to shatter.

FROST: like dew but the water vapour condenses into fragments of ice because of lower temperatures.
**GAS:** it occurs in fields of sedimentary rock and is used in the chemical industry, producing anaesthetics, anti-freeze and acetone used in synthetic fibre production.

**GLOBAL WARMING:** It is the increase in the Earth’s temperature that is caused partly by the amounts of carbon dioxide in the atmosphere. Global warming poses an extraordinary challenge. The world's leading atmospheric scientists tell us that a gradual warming of our climate is underway and will continue. This long-term warming trend poses serious risks to our economy and our environment. It poses even greater risks to many other nations, particularly poorer countries that will be far less able to cope with a changing climate and low-lying countries where sea level rise will cause significant damage. Meeting the challenge of global warming will require sustained effort over decades - on the part of governments, who must establish the rules and modify them as we learn more of the science, and as technological solutions begin to manifest themselves; on the part of industry, who must innovate, manufacture, and operate under a new paradigm where climate change will drive many decisions; and on the part of the public, who must also switch to a more climate-friendly path in their purchases and lifestyles.

**GMT:** Greenwich Mean Time – the time at Greenwich that is used as international standard.

**GRADIENT:** steepness of a slope. To find out the gradient of a slope, find the difference in height in metres between the bottom and top of the slope.

**GREAT BRITAIN:** is used for referring to the countries of England, Scotland and Wales. It is often simply called Britain. ➔ See the British Isles, the UK

**GREENHOUSE EFFECT:** Atmospheric scientists first used the term ”greenhouse effect” in the early 1800s. At that time, it was used to describe the naturally occurring functions of trace gases in the atmosphere and did not have any negative connotations. It was not until the mid-1950s that the term greenhouse effect was coupled with concern over climate change. In recent decades, we often hear about the greenhouse effect in somewhat negative terms. **The problem we now face is that human actions, particularly the burning of fossil fuels (coal, oil and natural gas) and land clearing, are increasing the concentrations of these gases, creating the prospect of global climate change. The enhanced greenhouse effect** is the process by which the Earth’s surface and lower atmosphere are getting warmer as a result of pollution caused by gases: carbon dioxide, sulphur dioxide, oxides of nitrogen, which take place during human actions. The heat from the Sun cannot escape, leading to a general rise in the Earth’s temperature called global warming. The Earth is covered by a blanket of gases which allow light energy from the sun to reach the Earth's surface, where it is converted to heat energy. Most of the heat escapes our atmosphere, but some is trapped. This natural effect keeps the Earth warm enough to sustain life. It is important to remember that without the greenhouse effect, life on Earth as we know it would not be possible. ➔ See global warming, greenhouse gas

**GREENHOUSE GAS:** a gas: carbon dioxide that doesn’t let heat escape from the Earth’s atmosphere and causes the greenhouse effect. The level of greenhouse gases in the atmosphere has increased in recent years mainly because of the burning of fossil fuels and also of deforestation. ➔ See deforestation, greenhouse effect
GRID REFERENCE: a set of numbers and letters that shows a particular position on a map. The numbers and letters relate to the lines of the map’s grid (=an arrangement of straight lines that cross each other to form a series of squares).

HAIL: hail stones are produced in convection clouds when the air rises and falls very rapidly.

HUMIDITY: amount of moisture in the air.

HURRICANE: an intense low pressure vortex (=powerful spinning current of air) with winds of at least 33 m per second blowing around it.

HYDRAULIC ACTION: force of the moving water, especially sea waves, prises rocks away.

IRRIGATION CHANNEL: a passage dug in the ground that is used for bringing water to land in order to make plants grow.

ITCZ: Intertropical Convergence Zone.

LANDSLIDE: rapid movement of unstable material caused by very heavy rainfall or rapid snowmelt.

LEDCS: Less Economically Developed Countries. ➔ See MEDCs

MAGMA: molten rock inside a volcano, as opposed to lava, which flows outside a volcano.

MEDCs: More Economically Developed Countries. ➔ See LEDCs

MIGRATION: movement of animals from one region to another.

MIST: less dense form of fog. ➔ See fog

MIXED FARMING: cereals, root crops, vegetables, cattle, pigs. ➔ See arable farming

MONOCULTURE: the growing of one crop or the keeping of one type of livestock. ➔ See polyculture

OIL: use of oil has increased very rapidly since World War II. Oil is now expensive because the oil producing countries set up OPEC to ensure a high price for the product. ➔ See OPEC

OPEC: Organisation of Petroleum Exporting Countries. ➔ See oil

POLYCULTURE: the growing of several crops or keeping several types of livestock. ➔ See monoculture

POWER: modern industries require electricity. Some use it as their main source of power, and are sited close to a cheap supply. Oil, natural gas and coal are used as fuels and for power. Whether a factory is closer to the source of power or raw materials depends on the cost of transport. ➔ See coal, gas, oil

PRECIPITATION: how water returns to the ground, for example as rain, drizzle, sleet, snow and hail. The result of air forced to ascend over mountains, or rising and cooling through convection.
PRESSURE: the atmosphere exerts pressure due to the weight of the air. As air is heated it expands and becomes less dense, so exerts less pressure. As it cools, it contracts, becomes more dense and exerts more pressure. Pressure is measured by a barometer, recorded in millibars and shown on maps by isobars.

Richter Scale: it measures the intensity of earthquakes.

River Basin: the area drained by streams and rivers that all flow into one major river.

Sleet: mixture of rain and snow.

Soil: it can be improved by crop rotation and fertilizers. Animal manure is a simple and effective fertilizer, but in many areas, it is dried for fuel. Artificial chemical fertilizers are expensive and usually need to be imported.

Soil Erosion: it can be reduced by keeping a protective vegetation cover to prevent soil being blown or washed away. Contour ploughing along the lie of the land, or terracing, reduces the amount of soil washed away from sloping land.

Solstice: summer solstice is the day of the year when the sun is above the horizon for the longest amount of time, around 21 June in the northern hemisphere and 21 December in the southern hemisphere. Winter solstice is the day of the year when the sun is above the horizon for the shortest amount of time, around 21 December in the northern hemisphere and 21 June in the southern hemisphere.

Spit: strip of sand or pebbles extending from one side of a bay, deposited where tides meet with the calmer waters of the bay or inlet.

Thermal Power: it is generated from coal or oil. Fuel is burnt to heat water and convert it into steam which is channelled to produce a force that turns turbines. Turbines cause dynamos to rotate and produce electric current, which is carried by transmission lines to the consumers.

Tornado: violent, whirling vortexes of rising air producing a funnel-shaped cloud above.

Transpiration: process by which vapour is given off plants so that they can absorb more moisture from the ground. See evaporation, evapotranspiration

Transportation: movement of eroded material, the load.

Trough: area of low pressure between two high pressure areas. Air is unstable so showery weather can be expected.

United Kingdom, The: it is used for referring to Great Britain and Northern Ireland as a political unit. It is often simply called the UK. See the British Isles, Great Britain

USSR, The: the Union of Soviet Socialist Republics: the name of the group of states in Russia and Eastern Europe that formed a single country until 1991.

Weathering: physical weathering is the break-up of rocks where they stand, prepares the surface for this erosion. Chemical weathering (=disintegration) causes rocks to decompose. Mechanical weathering refers to the mineral grains in rocks that expand when they're warmed during the day. Cooling at night causes contraction. This weakens rock and it begins to disintegrate.
VOCABULARY

Word classes

abbr. = abbreviation  [ebBRkdVkaEktN]  rövidítés
adj. = adjective  [aiDlkKTkV]  melléknév
adv. = adverb  [aiDVRdB]  határozószó
det. = determiner  [DkTRdMkNe]  determináns
n. = noun  [NAmN]  főnév
num. = number  [aNsMBd]  szám
prep. = preposition  [bPREPaaZktN]  előljárószó
pron. = pronoun  [aPRemNAmN]  névmás
sg. = something  [aSmMkN]  valami
sy. = somebody  [aSMkBeDk]  valaki

abrasion  n.  [eaBRkEN]  hullámverés
ancient massif  n.  [bEkNT(e)NT aMiSkDF]  össmasszívum
arch  n.  [hdTt]  ítt: kőkapu
azimuthal  adj.  [aiZkMepl]  azimutális
balanced rock  n.  [aBiLeNST RgK]  kőgomba
bar scale  n.  [Bhd bSKEkl]  rácsmérték
basalt  n.  [aBiSjLDt]  bazalt
block mountains  n.  [bBldK aMAmNTkNS]  röhegységek
cardinal points  n.  [aKhdDkNL bPgkNTS]  égtáj
cartography  n.  [KhdaTgGReFk]  térképészet
climate  n.  [aKLakMeT]  éghajlat
conduit  n.  [aKgNDfUt]  kút
confined water  n.  [KeNaFAkND bwjdTe]  rétegvíz
contour lines  n.  [aKgNTme bAkNZ]  szintvonalkak
core  n.  [Kjd(R)]  mag
cosmic rays  n.  [bKgzMkK aREkz]  kozmikus sugárzás
crust  n.  [KRsd]  kéreg
deflation hollow  n.  [DkdaFLEktN aHgkem]  deflációs mélyedés
direction  n.  [DAkaREkT]  irány
disintegration  n.  [DkSbkNTkaGREkT]  mállás
distance  n.  [aDkSTeNS]  távolság
dolina  n.  [DemakTakNe]  dolina, tóbör
ebb  n.  [EB]  apály

elevation  n.  [bElkVEkT]  tengerszint feletti magasság
Equator  n.  [kaKWEkTe]  Egyenlítő
equinox  n.  [akdKWkbNgKS]  napéjegyenlőség
fault  n.  [FjdLT]  vetődés
flow  n.  [FLEM]  ítt: dagály
fluctuation  n.  [bFlsKTUaEkT]  hőingás
fold  n.  [FemLD]  gyűrödés
gas  n.  [GiS]  gáz
gnomon  n.  [aNgmMgN]  napóra
granite  n.  [aGRinKT]  gránit

greenhouse effect  n.  [kaeFkT]  üvegházhatás
Greenwich  n.  [aGRENkT]  Greenwich
grid reference  n.  [bGRkD aREFReNS]  térképhálózat, fohálózat
heat energy  n.  [HkdT aENEdTf]  hőenergia
height  n.  [HakT]  magasság
high-latitudes  n.  [Hak aLTkTJUDZ]  magas szélességek
horst  n.  [HjdST]  sasbérc
human geography  n.  [aHJUdMeN DfkagGREkF]  társadalomföldrajz
humidity  n.  [aHJUdMKDkTk]  pára/vízgöztartalom
iron  n.  [aAkeN]  vas
<table>
<thead>
<tr>
<th>English</th>
<th>Hungarian</th>
</tr>
</thead>
<tbody>
<tr>
<td>isobar</td>
<td>izobár</td>
</tr>
<tr>
<td>isohyet</td>
<td>izohiéta</td>
</tr>
<tr>
<td>isotherm</td>
<td>izoterma</td>
</tr>
<tr>
<td>ITCZ</td>
<td>termikus egyenlítő, hőégenlítő</td>
</tr>
<tr>
<td>karren</td>
<td>karrmező, ördögszántsáta</td>
</tr>
<tr>
<td>kilometre (=km)</td>
<td>kilométer</td>
</tr>
<tr>
<td>latitude</td>
<td>szélességi kör</td>
</tr>
<tr>
<td>leaching</td>
<td>kilúgozás</td>
</tr>
<tr>
<td>longitude</td>
<td>hosszúsági kör</td>
</tr>
<tr>
<td>mantle</td>
<td>köpeny</td>
</tr>
<tr>
<td>material</td>
<td>anyag</td>
</tr>
<tr>
<td>metamorphic</td>
<td>átalakult (közvetett)</td>
</tr>
<tr>
<td>mid-latitudes</td>
<td>közepes szélességek</td>
</tr>
<tr>
<td>mountain chains</td>
<td>lánchegységek</td>
</tr>
<tr>
<td>movement</td>
<td>mozgás</td>
</tr>
<tr>
<td>nautical mile</td>
<td>tengéri mérföld</td>
</tr>
<tr>
<td>North Pole</td>
<td>Északi-sark</td>
</tr>
<tr>
<td>Opisometer</td>
<td>gördülő távolságmérő</td>
</tr>
<tr>
<td>ore</td>
<td>érc</td>
</tr>
<tr>
<td>orientation</td>
<td>iránymeghatározás</td>
</tr>
<tr>
<td>oxygen</td>
<td>oxigén</td>
</tr>
<tr>
<td>phoen</td>
<td>főn, bukszél</td>
</tr>
<tr>
<td>physical geography</td>
<td>természetföldrajz</td>
</tr>
<tr>
<td>planimetry</td>
<td>síkrajz</td>
</tr>
<tr>
<td>plate tectonics</td>
<td>lemeztektonika</td>
</tr>
<tr>
<td>Pole star</td>
<td>sarkcsillag</td>
</tr>
<tr>
<td>pressure</td>
<td>nyomás</td>
</tr>
<tr>
<td>projection</td>
<td>vetület</td>
</tr>
<tr>
<td>ratio scale</td>
<td>aránymérték</td>
</tr>
<tr>
<td>regional geography</td>
<td>regionális földrajz</td>
</tr>
<tr>
<td>relief</td>
<td>domborzat</td>
</tr>
<tr>
<td>ripple marks</td>
<td>szélbarázda</td>
</tr>
<tr>
<td>rock</td>
<td>itt: közvetett</td>
</tr>
<tr>
<td>saturation</td>
<td>telítettség</td>
</tr>
<tr>
<td>scale</td>
<td>méretarány</td>
</tr>
<tr>
<td>sea level</td>
<td>tengerszint</td>
</tr>
<tr>
<td>seafloor spreading</td>
<td>tengerfenéktörés</td>
</tr>
<tr>
<td>sedimentary</td>
<td>üledékes (közvetett)</td>
</tr>
<tr>
<td>silicates</td>
<td>szilikátok</td>
</tr>
<tr>
<td>snowline</td>
<td>hóhatár</td>
</tr>
<tr>
<td>soil</td>
<td>talaj, termőföld</td>
</tr>
<tr>
<td>soil moisture</td>
<td>talajnedvesség</td>
</tr>
<tr>
<td>solstice</td>
<td>napforduló</td>
</tr>
<tr>
<td>stack</td>
<td>abráziós torony</td>
</tr>
<tr>
<td>stationary front</td>
<td>vésztégló front</td>
</tr>
<tr>
<td>structure</td>
<td>szerkezet</td>
</tr>
<tr>
<td>stump</td>
<td>abráziós szirt/zátony</td>
</tr>
<tr>
<td>subduction zone</td>
<td>alábukás zóna</td>
</tr>
<tr>
<td>surface</td>
<td>felszín</td>
</tr>
<tr>
<td>thematic</td>
<td>tematikus</td>
</tr>
<tr>
<td>tide</td>
<td>árapály</td>
</tr>
<tr>
<td>timberline</td>
<td>erdőhatár</td>
</tr>
<tr>
<td>topographic</td>
<td>domborzati, helyrajzi</td>
</tr>
<tr>
<td>topography</td>
<td>topográfia, domborzat</td>
</tr>
<tr>
<td>translocation</td>
<td>vegyi mállás (talajban)</td>
</tr>
<tr>
<td>English</td>
<td>Pronunciation</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>vegetation</td>
<td>[VEDfeaTEktN]</td>
</tr>
<tr>
<td>verbal scale</td>
<td>[aVrdBl bSKEkl]</td>
</tr>
<tr>
<td>water vapour</td>
<td>[aWjdTe bvEkPe]</td>
</tr>
<tr>
<td>weathering</td>
<td>[aWEqerRkn]</td>
</tr>
</tbody>
</table>
FELHASZNÁLT IRODALOM


INTERNET CÍMEK

www.s-cool.co.uk
www.uwsp.edu
www.blueplanetbiomes.org