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English for Environmental Studies

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Contents:

ECOLOGY BASICS - 1

Discussion: *think of a definition for the science of Ecology; try to use some of the words below.*

animals	***activities***	***plants***	***ecosystem***
environment	***relationship***	***people***	***organisms***

Write your definition of Ecology on the line below, then read the introductory article, think about the highlighted words and fill in the blanks with suitable words from the list above.

.....

.....

The environment is **physical** – the air, water, **climate** and **soil**, and **biological** – all _____ and _____ which live at a **location**.

The combination of these two environments is called a **habitat**. Each **species** can only live in its own habitat.

For animals, the most important part of the habitat is the plant life, because plants provide **food** and **shelter**. Together they form a community, an _____. It gets energy from the sun and cycles of **nutrients**.

Vocabulary: *match the highlighted words to the pictures and then describe the scheme of a **food web**, using as many words below as possible.*

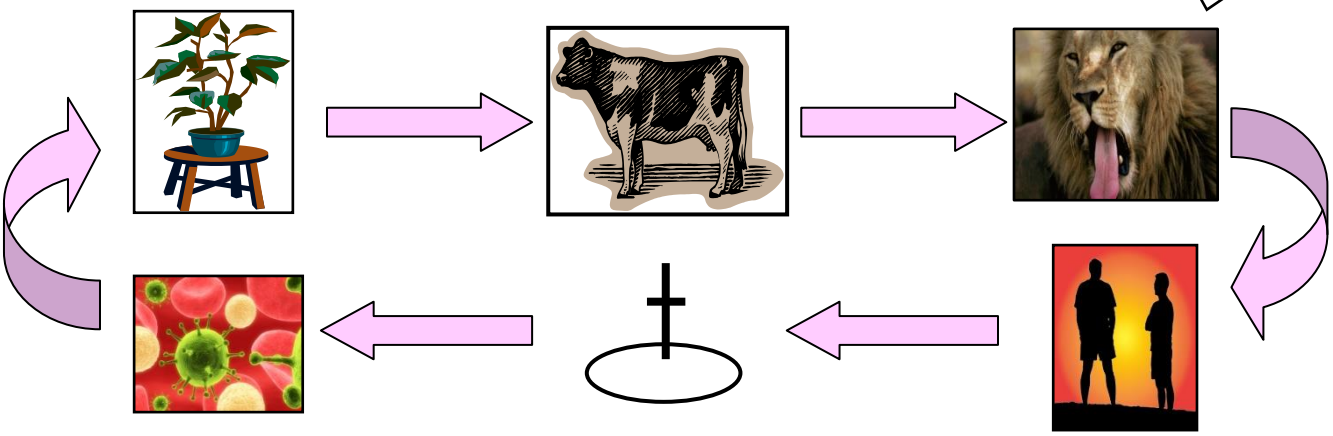
become,
decompose
die
eat
hunt
need
produce
use
get/acquire

CO_2, O_2
nutrients
photosynthesis
source of energy

4

carnivores *– animals which eat animals*
herbivores *– animals which eat plants*
omnivores *– animals which eat animals and plants*
detritivores *(decomposers) – micro-organisms which "eat" dead organic matter*
dead organic matter *- dead organisms*
primary producers *- plants*

THE FOOD WEB



Writing: *write a short text about a food web.*

.....

.....

.....

.....

Reading: THE STORY OF THE CROSSBILL

Starter: What is the Czech equivalent for the term "niche"?

Every organism has a niche. A **niche** is a role in a community, or environment. An organism's niche is the place where it lives, the food of the organism, how it gets the food etc. Some niches are **broad** and some are **narrow** and specialised.

The crossbill is a bird with a narrow and specialised niche. It lives in the northern forests and in the mountain areas. It lives at the top of the trees and visits the ground only when it needs to drink.

The most important **feature** of the crossbill's body is the **beak**. It has two parts and they are **crossed**. This beak is very useful for the crossbill, because it helps it to get food.

The crossbill feeds on **seeds** of the **cones** of **coniferous** trees. It uses the beak (bill) for opening the cone and its tongue for getting the seed out of the cone.

This is a very specialised diet, but cones are **available** in many parts of the world, so crossbills are **common**. But they cannot take other food and that is why they cannot colonise new habitats. Their only habitat is coniferous forests and the best diet for them is cone seeds.

Although the crossbill has such a narrow niche, there is room for specialisation. In Europe, the common crossbill feeds on the seeds of **spruce** and **larch** cones. In other areas, such as Scotland, some Mediterranean islands and North Africa, the crossbills feed on the seeds of **pines**. They have heavier and bigger beaks, because pine cones are harder. The parrot crossbill (which lives in Scandinavia and Northern Asia) has the heaviest beak, because pines in northern areas have the hardest cones.

Vocabulary: *find words for the definitions below in the text.*

an opposite to narrow / ***a small object produced by plants from which a new plant grows***

.....

the fruit of a tree which has leaves like needles / ***trees which have leaves like needles***

.....

Find names of trees in the text.

Comprehension: *answer the questions.*

1. ***Why does the crossbill live only in coniferous habitats?***
2. ***What is the most important feature of the crossbill's body and why?***
3. ***How is the parrot crossbill (living in Scandinavia and Northern Africa) adapted for its habitat?***

Grammar - Present Simple for common facts: *make questions and negatives.*

1. The crossbill lives in coniferous forests. Where _____ ?
2. Crossbills feed on insects. (not) _____.
3. Crossbills have heavy beaks. Why _____ ?
4. The crossbill uses their beak for killing small animals. (not) _____.

Grammar – Adjectives / Comparatives:

*There are 3 types of forming **comparatives** and **superlatives** in English. Find examples of these types in the text. Make statements about animals, plants, places and use **comparatives** / **superlatives** of the following adjectives.*

cold	***large***	***fast***	***widespread***	***dry***	***populated***	***long***	***tall***
high	***diverse***	***thick***	***narrow***	***damaging***	***interesting***	***rare***	***thin***

.....

.....

.....

ECOLOGY BASICS - 2

Warm-up - Basic vocabulary: *rewrite the following words with the correct spelling.*

enrovinmetn _____	***hitabat*** _____	***silo*** _____
ecsoystme _____	***selhret*** _____	***fdoo*** _____
docepomse _____	***netruints*** _____	***celitma*** _____

Add one or two words to the following terms:

dioxide	***producers***
matter	***trees***
= decomposers	***= animals which hunt herbivores***

Vocabulary for defining: *match the terms below to one of the general categories on the left.*

	USEFULL GENERAL TERMS			
THING	PRODUCT	METAMORPHOSIS	TREND	STRUCTURE
	HUMAN BEINGS	OBJECT	MATERIAL	REACTION
PLACE	AREA	PROCESS	EVENT	UNIT
	ANIMAL	LAYER	COMPONENT	ORGANISM
	LOCATION	INTERACTION	COMPOUND	TOOL
LIVING CREATURES	ACTIVITY	INTERFERENCE	HABITAT	REGION
	POPULATION	ENVIRONMENT	PERSON	DEVICE
	ELEMENT	FACILITY	INSTRUMENT	PLANT
ACTION / PHENOMEN	SPACE	INFLUENCE	CYCLE	RELATIONSHIP
	SPECIES	MATTER	INSTITUTION	DOCUMENT

DEFINITIONS *Study definition examples and make definitions for the terms in the table.*

- photosynthesis is
- a national park is
- ozone is
- the atmosphere is
- a predator is
- a desert is
- a wing is
- the greenhouse effect is
- pesticides are
- a power station is
- a field is
- the Montreal's Protocol is
- pollution is
- farming is
- CO2 is
- the Kyoto meeting was
- erosion is

Definition examples:

- A thermometer is a device which measures temperature.
- A thermometer is a device for measuring temperature.

Reading: PLANET REPORT

Starter: What are the most serious environmental problems of today? What are the main causes?

Our planet is 4,600 million years old – but imagine for a moment that it is only 46 years old.

- Life began in the oceans 4 years ago.
- Dinosaurs **appeared** (and disappeared) last year.
- Modern man arrived 4 hours ago.
- One hour ago he learned how to farm.
- One minute ago **industry** started to develop.

In the last 60 seconds man has **polluted** the air, sea and land, has used most of the Earth's oil, gas and coal, has completely killed more than 500 species of animals, birds and plants, and the human _____ has grown from 1 billion (in 1830) to 6 billion today. It is a disaster and it is still happening. Fortunately many scientists and world leaders realize that the Earth is in danger.

1. It is possible that 25% of animals, birds, fish and **insects** will be extinct by the year 2030.Why is this happening? The first reason is **pollution**. Millions of animals die every year, because human beings pollute their **habitats**. The second reason is **hunting**. Man hunts and kills millions of animals. And the third reason is the environment itself. The space where animals can live is becoming smaller, because humans cut down trees and need space for roads, houses and farming.

2. Human activities produce a lot of _____ and pollution. Pollution is very _____ to people, wildlife and the environment. It is causing many environmental problems today, for example the creation of acid rain and the _____.

3. 94% of the world's energy comes from _____– oil, gas and coal. But they are not **infinite** – they are **non-renewable resources**. Therefore scientists are looking for new ways to produce energy. There are several choices for human beings. For example **nuclear power** – but it produces nuclear waste and it is dangerous. The best choice is to use **renewable sources of energy**. The energy from the sun, sea, wind and under the ground is natural and _____. But technologies for using the renewable energy are very expensive.

4. 40% of the world's **rainforest** have disappeared in the last 80 years. In South America, 50 hectares disappear every minute. The destruction of the rainforests is continuing because people need wood and paper, minerals and medicines, and more space for farms and houses etc. Destroying forests is called _____ and it is not only taking place in South America. It is an international problem. Another process which is helping land disappearance is called _____. In Africa, for example, the Sahara desert is growing bigger. The main cause for desertification is **erosion**.

Vocabulary: *choose a title for paragraphs 1-4.*

LAND ***WILDLIFE*** ***ENERGY*** ***POLLUTION***

Fill in the blanks, use the words below.

desertification ***harmful*** ***population*** ***environmentally friendly***
fossil fuels ***waste*** ***deforestation*** ***greenhouse effect***

Comprehension: *are these statements true or false?*

1. In 1830, the human population was 2 billion.
2. It is possible that by the year 2030 there will be only 50% of today's animal and plant species.
3. The fossil fuels will not last forever.
4. Now we have only 40% of the rainforests.
5. Destroying forest is taking place mainly in South Africa.
6. The Sahara desert is growing bigger because the soil erodes.
7. There are 3 processes that help to the land disappearing.

The **temperature** on the Earth / **rise** / now ?
……

Herbivores / **eat**/ plants.
……

The **Earth** / not **orbit** / around the Moon.
……

Nowadays / **scientists** / **develop** / new technologies for using renewable energy.
……

Where / **elephants** / **live** ?
……

Many **countries** / not **reduce**/ the production of CO2 / presently.
……

The **air pollution** in big cities / **cause** / many environmental problems / these days.
……

Each **species** / **live** / in its own habitat.
……

Grammar – Actual trends x Common facts:

*Make questions, positive and negative sentences according to the hints in the box, use **Present Simple** (I work) or **Present Continuous** (I am working).*

ECOLOGY BASICS - 3

Warm-up 1-Environmental terms: *choose from the words below and complete the terms.*

acid _____ *nuclear* _____ *the ozone* _____ *air* _____ *tropical* _____
pine _____ *narrow* _____ *coniferous* _____ *flood* _____ *natural* _____
public _____ *solar* _____ *human* _____ *exhaust* _____ *harmful* _____
climate _____ *(non)renewable* _____ *global* _____ *fossil* _____
the greenhouse _____ *endangered* _____ *waste* _____ *sustainable* _____

(control, warming, effect, management, energy, cones, fumes/gases, fuels, species, niche, waste, rain, layer, pollution, development, rainforest, disasters, transport, resources, change, activities, substances, trees)

Warm-up 2-Definition practise: *define the terms, use the clues below.*

Detritivores _____
Erosion _____
Fossil fuels _____
The rainforest _____

(the Equator, surface, dense, disrupt, heavy rainfall, rocks, dead bodies, caused by…)

Grammar practise 1-Adjectives – Comparatives - Superlatives:

Fill in the table with comparatives and superlatives of the given adjectives. Are they all meaningful?

dry			*large*		
interesting			*important*		
thin			*bad*		
far			*natural*		
easy			*coniferous ?*		

Grammar practise 2-Present Simple for common facts: *study the table.*

It /the lion	Dolphins/they
Where does it /the lion live? It /the lion lives in the savannah. It /the lion doesn't live in water.	Where do dolphins/they live? Dolphins/they live in the sea/ocean. Dolphins/they don't have legs.

Make sentences about animal species in the table and ask questions to get the missing facts.

Animal species:	*food*	*habitat*	*length of life*	*legs*
the crocodile		*water (rivers, lakes)*		
bald eagles			*20*	
the lion	*antelopes etc.*			
dolphins			*20*	
the rabbit				*4*
spiders		*different habitats*		
More examples?				

(Where…, What…, How long…, How many…)

Reading: THE GAIA HYPOTHESIS

Starter: Do you know what the amount of oxygen in the Earth's atmosphere is?

What is the Gaia hypothesis? The idea is that we have discovered a living organism, which is bigger, older and more complex than anything from our wildest dreams. That organism is the Earth (or Gaia). The idea was introduced by James Lovelock. In the 60's, he worked for NASA on experiments which looked for life on Mars.

He analysed the atmosphere of Mars and he found out that the composition of Mars' atmosphere has not changed during its history. By contrast, the composition of the Earth's atmosphere has changed, but it has still kept a balance. Life first appeared on the Earth about 3,500 million years ago. From that time until now, the Earth's climate has changed very little as the fossil fuels show. But the heat from the sun, the properties of the earth, and the composition of the atmosphere have changed during the same period. This probably means that there must be some complex process, which has kept the atmosphere in balance.

The experiments found no life on Mars but Lovelock started to see the Earth from a different perspective. He began to think that our planet is an organism, a self-regulating system, a living being. He named that being Gaia (after a Greek goddess). Gaia is not only the biosphere where living organisms exist. It is also not only the biota – the collection of all individual living organisms.

Gaia is also the rocks, the air and the oceans. Gaia has been influencing the Earth since the origins of life, and it will influence it for as long as life on Earth exists. For example, the Gaia hypothesis says that biota produces active processes that keep the temperature, oxidation, acidity and other important properties of the rocks and waters constant.

Maybe it is hard for you to believe that the Earth is alive. But many atoms in the rocks down in the magma were part of the life of which we have all come from.

Comprehension 1: *answer the following questions.*

Who introduced the hypothesis?
How did it happen?
Can you explain the main principles of the hypothesis?

Comprehension 2 - Discussion: *read about the arguments and discuss them.*

ARGUMENTS FOR AND AGAINST THE GAIA HYPOTHESIS

+ The Earth's original atmosphere had no oxygen. The beginning of photosynthesis 2.5 billion years ago started to produce oxygen which was released into the atmosphere (presently 21%). Geological research shows that the amount of oxygen on the Earth has been the same for the past billion years.

+ If the amount of oxygen in the atmosphere was 35%, the planet would burn up. Why has the amount of oxygen stayed the same, i.e. below the dangerous levels?
Why did the amount of oxygen build up from 0 to 21%, and then stop? One possible answer is the biological production of methane by bacteria. Methane has stabilised oxygen concentrations, because it combines with oxygen to produce CO_2.

+ We know that climate has changed in the past, but the change was not extreme. Although the output from the sun has changed greatly, the earth's temperature has not changed very much. One of the reasons why our planet has not burned up is the production of plankton, because it removes CO_2 from the atmosphere.

- Oxygen was first produced more than 3 billion years ago. But it took 2 billion years before it built up in the atmosphere. Why did it take so long? And when it finally was built up, it was a poison for the then-existing life, which had to move to anaerobic environments. So oxygen helped the evolution of aerobic life (because it developed the ozone layer), but it killed a part of the major life forms 2 billion years ago.

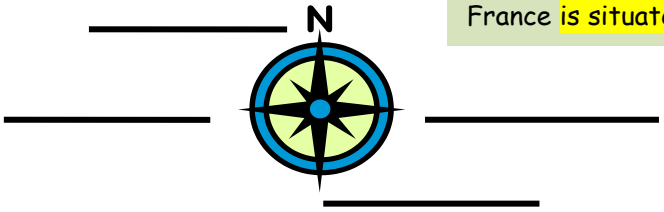
- Gaia cannot reproduce herself, so it cannot be alive.

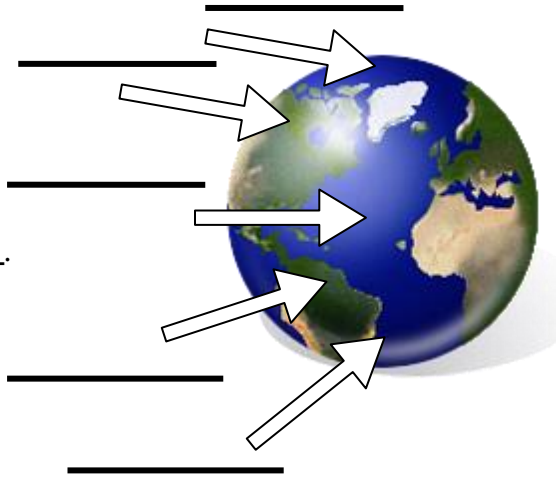
- The theory is not scientific, because it cannot be proved by a controlled experiment.
- Some scientists say that organisms cannot produce global action, because it is not in their genetic code.

EARTH SCIENCE - 1

Vocabulary for geographic position: *fill in the blanks, study the examples.*

France is situated _____ Europe, _____ England.





Antarctica lies _____.
The Amazonian rainforest is located _____.
The USA are situated _____.
Australia lies _____.

Vocabulary for the Earth's description: *fill in the blanks; use the clues in the box.*

Our planet is called _____. The planet is surrounded by _____. At the centre of the Earth, there is _____. The surface layer is _____.
The Atlantic is an _____.
There is the La Manche _____ between England and France.
The Alps are _____.
Sweden is a _____ .
In 1991, there was a war in the Persian _____.
The Nile is a _____.
The Baltic is a _____.
Gobi is a _____.
The Bahamas is a _____.
Is Africa the largest _____?
Corsica is an _____ in the Mediterranean Sea.
Everest is the highest _____.
Loch Ness is a _____.
Italy lies on a _____.
The _____orbits around the Earth and the Earth orbits around the _____.
Large blocks of ice floating on the sea are called _____ and large blocks of ice in the upper parts of mountains are called _____.
The positions of places on the Earth's surface are given in _____ and _____ (degrees and minutes).

Clues:

iceberg / glacier

group of islands

the Earth's core

gulf (bay) peninsula

the Earth's crust

latitude / longitude

10

Describe the position of the places above, use suitable vocabulary from the first activity.

Reading: THE FORMATION OF FOSSIL FUELS

Starter: Explain the term "fossil fuels". What was the original material of fossil fuels?
Where can you find fossil fuels? What do we use fossil fuels for?

Fossil fuels are the **remains** of plants, animals, and micro-organisms which lived millions of years ago. 300 million years ago tropical **freshwater swamps** covered many regions of the Earth. Climatic conditions in the swamps were extremely good for plant growth. The result of this rapid growth was large accumulation of plant material. The plant material collected under water and no **decomposition** was allowed. Therefore a mass of organic material (called **peat**) formed in swamps.

Scientists think that it took 300 years to accumulate 9 meters of peat. Because of geological changes some of the swamps which contained peat became seas and the plant material collected in the swamps was now at the bottom of a sea. There the plant material was covered by **sediments**. The weight of the plant material and the weight of sediments **compacted** the material into a harder form – **lignite**. After a very long time, lignite changed into soft coal. The pressure continued and, in combination with the heat from the Earth's centre, it changed soft coal into **anthracite** – hard coal. During this process, which covered hundreds of millions of years, present **deposits** of coal were created.

Oil (petroleum) originated from microscopic **marine** organism. When these organisms died, their decay released oil. Oil pools formed between **shale** rock, which was covered by **sandstone layer**, and **impermeable** rock cap.

Natural gas, like coal and oil, formed from fossil remains. In fact, geological conditions which were good for oil formation were also good for natural gas formation.
During formation of natural gas, organic material changed to lighter, more **volatile** substances than substances found in oil. The most common substance in natural gas is methane.

Coal was the first fossil fuel which was extensively used. It became extremely important during the **Industrial Revolution** in the early eighteen century. Burning of coal provided energy for machines in factories. When the first cars were developed, people started to use oil.

Vocabulary: *find English equivalents for the following Czech words in the text.*

mořský _____ ***průmyslová revoluce*** _____ ***vzniknout (z)*** _____
rašelina _____ ***bažina*** _____ ***pozůstatky/zbytky*** _____
tlak _____ ***nepropustný*** _____ ***rozklad*** _____

Grammar 1 – Past events: *make questions about missing facts in the table.*

Fossil fuels:	*originate from?*	*when?*	*when / people/ discover?*	*when / people/ start/ to use?*
oil		300 million years ago		
coal			Around 2000 BC	
natural gas	fossil remains			

Grammar 2 – Irregular verb forms: *fill in the table with past forms of the given verbs.*

be		come		fight		hit		pay		sow	
beat		cost		find		hold		prove		speak	
become		cut		fly		keep		put		stand	
begin		deal		forget		know		read		steal	
bend		dig		freeze		lay		ride		swim	
bite		do		get		lead		run		take	
blow		draw		give		learn		say		think	
break		drink		go		leave		see		throw	
bring		drive		grow		let		sell		understand	
build		eat		hang		lie		send		wake	
buy		fall		have		light		set		wear	
catch		feed		hear		lose		shoot		win	
choose		feel		hide		meet		sit		write	

Grammar 3 – Environmental Milestones: *fill in the blanks with proper verb forms (regular/ irregular).*

1. 65 million years ago, dinosaurs _____ (become) extinct.
2. In 1866, a German zoologist Ernst Haeckel _____ (choose) the word "ecology" to describe the study of relationships between organisms and where they live.
3. In 1945, a nuclear bomb _____ (hit) the cities of Hiroshima and Nagasaki.
4. In 1971, a group of Canadian activists _____ (establish) Greenpeace.
5. A team of British scientists _____ (find) a hole in the ozone layer over the Antarctic in 1983.
6. 24 countries _____ (meet) in Montreal to sign an agreement to stop production of chlorofluorocarbons in 1987.
7. Due to global warming, Arctic sea ice _____ (decrease) by 27% between 2005 and 2007.
8. At the beginning of 2013, the number of people on the planet _____ (stand) at 7 billion.

EARTH SCIENCE - 2

Warm-up 1 – Geographic position: *describe the places and their geographic position.*

Cairo (Káhira) _____ ***the Caribbean*** _____ ***the Pacific*** _____
Madagascar _____ ***Australia*** _____ ***the Amazon*** _____
the Himalayas _____ ***Ontario*** _____ ***Italy*** _____
Antarctica _____ ***the Gobi*** _____ ***the Seychelles*** _____
České Středohoří _____ ***Polabská nížina*** _____ ***Sázava*** _____
Českomoravská vrchovina _____ ***Rožmberk*** _____

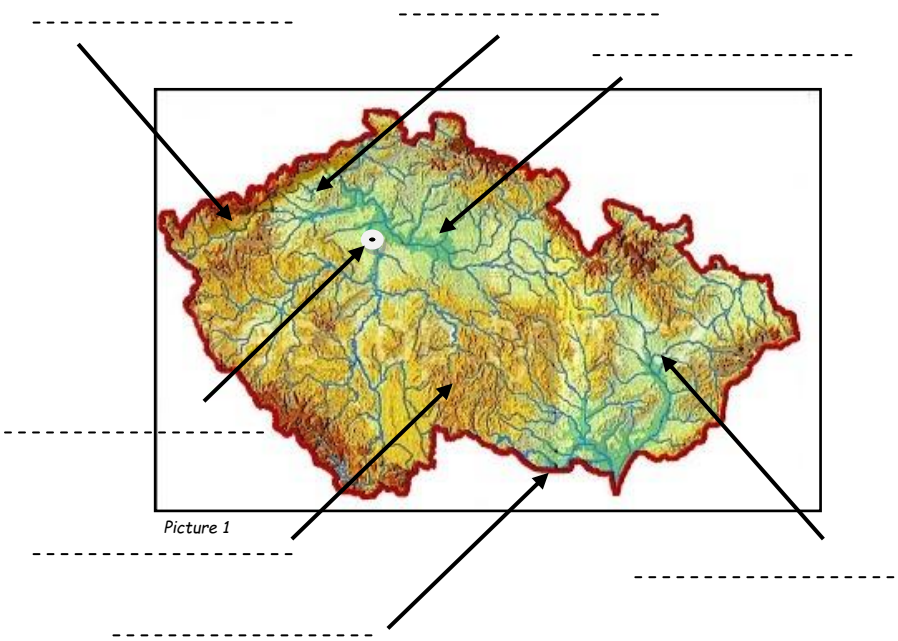
Warm-up 2 – Using "the" with geographic names: *complete with "the" where necessary.*

the?	Bahamas (*group of islands*)		Africa (*continents*)
	Elbe (*rivers*)		France (*countries' names including a single word*)
	Lake Geneva (*lakes*)		Czech Republic (*countries' names including "Republic", "Kingdom" etc.*)
	Pacific (*oceans*)		Paris, Moscow, London (*cities, towns, villages*)
	Baltic Sea (*seas*)		Mont Blanc (*individual mountains*)
	Sahara (*deserts*)		Alps (*mountain ranges*)

Vocabulary for the Czech Republic: *choose words from the box to label the picture.*

Clues:

highland / upland
capital city
lowland
border
affluent / confluence
mountains (mountain ranges)
river / pond / lake (water bodies)
river / drainage basin
(catchment / watershed area)
brown coal basin
valley
town / urban district / village / settlement
forest / woodland
flood area
flood plain
hill
meadow
branch/brook/stream/creek
protected landscape area / national park
Ústí nad Labem region
agricultural area / arable land / grassland
swamp / peatland
highway / road
railway / transportation route
pasture land / grazing land



Picture 1

What is the climate in the CR like? What is the highest / the lowest point?
What is the longest river / the largest pond? What is the largest national park?

Reading: SAVE ANTARCTICA!

Starter: What is the geographic position of Antarctica? Is Antarctica the smallest continent?

Have you ever wanted to know what immaculate nature looks like? Visit the Earth's largest, driest and windiest place – Antarctica.

Antarctica is unique: it belongs to every country in the world, it is the largest wildlife reserve on Earth, it is an important part of the world's weather system and an open-air laboratory for the monitoring of global pollution. However, the most important thing is that most of the destructive human activities have not reached Antarctica so far. Antarctica covers 10% of the earth's land surface; the total area is 14 million square kilometres. The whole place is constantly under an icecap and the ice is so heavy that it has pressed 1/3 of Antarctica under sea level. The icecap contains

90% of the planet's fresh water, but Antarctica receives only about 15 centimetres of rain or snow every year.

Antarctica has attracted people for centuries, mostly because it has rich resources. But the best thing people can do for Antarctica is to leave it untouched. It is a wildlife paradise – seals, whales, penguins, seabirds and other species enjoy the perfect harmony of the Antarctic food web. But the food web is very fragile and lately it has been damaged by human activities like hunting, fishing, mining and other human activities. Antarctica is very important for the world's weather system. The Antarctic snow returns 80% of solar energy coming from the sun back into space. It is also is an ideal monitoring laboratory. It shows that today's pollution problems have global consequences. Antarctic research has also shown that since 1800 carbon dioxide has grown by 25% in the atmosphere.

Antarctica's wildlife has been exploited for many years because of oil and mineral extraction, hunting and fishing. Although it seems strange, for the last 25 years polar tourism has been one of the main threats to Antarctica's wildlife.

Vocabulary: *substitute some of the underlined words with the following terms.*

continent	***component***	***precipitation***	***increase***	***harm***
research	***permanently***	***reflect***	***impact***	***wildlife sanctuary***

Comprehension: *answer these questions about Antarctica.*

Why is Antarctica unique? ***Is Antarctica important for the global ecosystem?***
Why/how is Antarctica threatened?

Grammar – Past Simple x Present Perfect: *find a suitable place for the following sentences in the text.*

1. During the 2009/2010 season, over 37,000 tourists visited Antarctica.
2. There was only 11 centimetres of precipitation last year.
3. In 2010, about 150,000 tonnes of krill were caught.

Vocabulary – (the) soil / (the) ground / country / (the) Earth / land:
match the pictures with proper terms from the list above, fill in the sentences and then find a synonym for each term.

1. The crossbill visits the _____ when it needs to drink.
2. Farmers are destroying the rainforest because they need new _____.
3. The Equator is an imaginary line around the _____.
4. The precipitation falls to the _____ as rain or snow.
5. There are 3 basic types of pollution: the air pollution, the water pollution and the _____ pollution.
6. The _____ is a part of the solar system.
7. Reptiles lay eggs on _____.
8. Human beings have killed many animal and plant species on _____, in the air and in water.
9. There is no vegetation on the _____ in the rainforest.
10. Industrialised _____ produce a lot of waste.
11. The ozone hole allows the UV radiation to reach the _____.
12. Many _____ joined the Kyoto meeting.
13. Seeds need a rich _____ for germination.

(Synonyms: surface, globe, area, floor, planet, loam, state…)

EARTH SCIENCE - 3

Warm-up – Human Impact (Present Perfect): *What has happened since 1/1/201_? Match the facts and numbers, make sentences.*

Forest loss (hectares):	**2.7 mil**
Erosion from farmlands (metric tons):	**14,800**
Carbon dioxide emissions (metric tons):	**360,000**
Distance travelled by the Earth within the solar system (miles):	**10,440**
Human biological waste (metric ton):	**66,600**
Fish caught (tons):	**1296**
Lightning strikes to the Earth:	**2.5 mil**

Vocabulary for Biomes of the world: *read about biomes, match them to the terms on the right.*

1. These areas get less than 25 cm of precipitation per year, the climate is very hot, dry and windy there, soils are sandy in these areas, there is almost no green vegetation, and the animals which live there have an ability to live with a minimal amount of water.

2. In these areas the amount of water is very low (only between 25 and 75 cm of precipitation per year), they have hot summers and mild winters, the dominant vegetation is grasses, trees are rare.

3. These have a winter-summer change of seasons, during the winter trees lose their leaves, these areas have constant precipitation (about 100 cm per year).

4. These areas are near the Equator, the temperature is quite warm and constant there, it rains nearly every day, so the plant growth is extremely rapid, the number of species living there is incredible.

5. These areas have very hot summers and mild winters, they were originally woodlands, but human activities caused that the dominant vegetation is scrub.

6. These areas do not have trees, they have a permanently frozen soil layer (permafrost), the amount of precipitation is very small (only 25 centimetres per year), during the short summer only very small plants and lichens can grow and these are food for the few mammal visitors like caribou, reindeer or arctic hare.

7. These areas are covered by coniferous forests (spruces, larches and firs are the most common), winters are very long and harsh, many of the animal inhabitants come only for summers.

the desert

the temperate deciduous forest

the tropical rainforest

the taiga (boreal forest)

the tundra

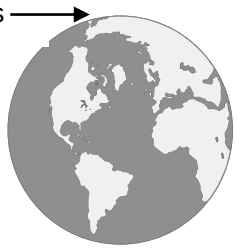
the Mediterranean scrub

the savanna(h)

Put the biomes in the right order; start from the Equator.

Polar ice caps →

the Equator →



Fill in the table, describe characteristic features of each biome (use the words below).

	Precipitation	Climate	Dominant vegetation + animal species
the tropical rainforest			
the tundra			
the temperate deciduous forest			
the savannah			
the Mediterranean scrub			
the desert			

Precipitation: (very, extremely) high, average, (very, extremely) low

Climate: (very, extremely) hot, warm, mild, cold
(very, extremely) wet, dry
wet season, dry season, four seasons (spring, summer…)

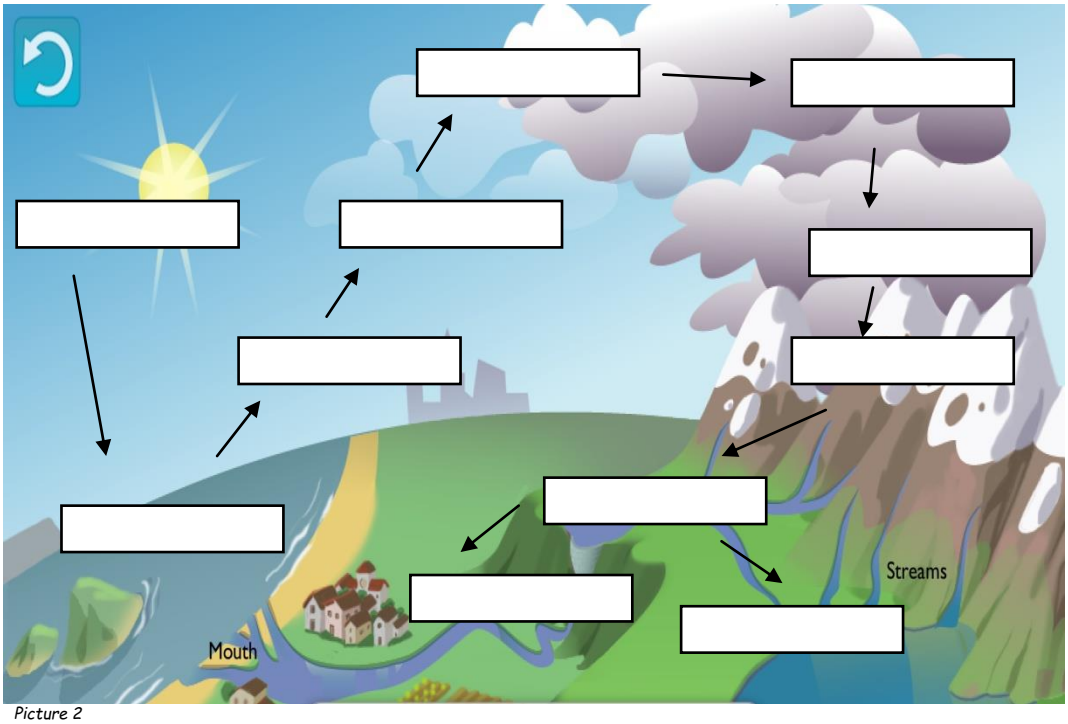
Vegetation: coniferous / deciduous trees, the rainforest, scrub, grasses…

Biological diversity: (very, extremely) high, average, (very, extremely) low

Vocabulary – the Water Cycle: *fill in the blanks with the words from the box.*

soil
seawater
clouds
water vapour
groundwater
condensation
the sun
precipitation
surface
rivers
land

(rain)water, plants
temperature



Picture 2

Fill in the table, choose from the list of verbs, and then describe the water cycle.

rise	***cool***	***precipitate***	***absorb***	***fall down***
condense	***form***	***radiate***	***evaporate***	***move (to)***
flow	***transpire***	***run off*** *(the surface)*	***heat/warm***	***leak /seep*** *(into)*

Water cycle vocabulary:	
nouns	verbs

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WILDLIFE - 1

Discussion: *think of the following questions and try to answer them.*

- Many animal and plant species are becoming endangered or extinct… Why?
- What do people do to protect (preserve) wildlife?

Reading: THE PARTS OF A PLANT AND THEIR FUNCTION

Starter: Why are plants very important for all life on Earth?

A plant is a living organism. It contains different parts; every part has a particular purpose, or specialised function. If one part of the plant is not functioning properly the whole plant will suffer. But we can cut flowers off the plant or prune the roots. Such damage is only temporary and so the plant will continue to grow.

The basic parts of a plant are the root system, which is below the ground, and the shoot system, which is above the ground. The root of a plant has two main functions. It absorbs water and minerals from the soil through the root hairs. The root hairs are single cells near the tip of each root. The other main function of the root is to hold the plant in position in the soil.

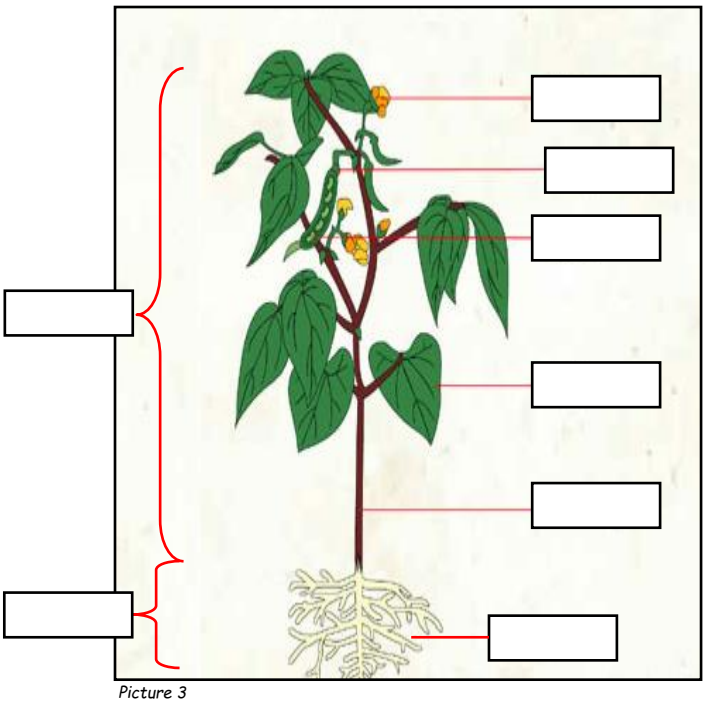
Plants such as **sugar beet** and **carrots** are able to store (keep) food in their roots. In this way they can grow for more than one season. In addition, some plants (*legumes*) have special bacteria which live on their roots. These bacteria take nitrogen out of air which is in the soil. Such leguminous plants usually help to increase the fertility of the soil.

The shoot system above the ground consists of the stem, the leaves, flowers and fruit. One of the functions of the stem is to support the plant. Another important function is that the stem transports water and minerals from the roots to the leaves and flowers. Organic materials such as sugar travel from the leaves down the stem to the roots. The leaves grow out of the side of the stem; their main job is to make food for the plant by the process of photosynthesis.

The flower contains the reproductive organs of the plant. The stamens produce the male sex cells, which are in the pollen grains. The stigma produces female sex cells and later it receives pollen, which leads to fertilisation.

The fruit holds seeds and protects them while they are developing. The seeds develop into another plant.

Vocabulary: *label the picture of a plant; look in the text for the necessary terms.*



Picture 3

Which of the following parts are included in the picture?

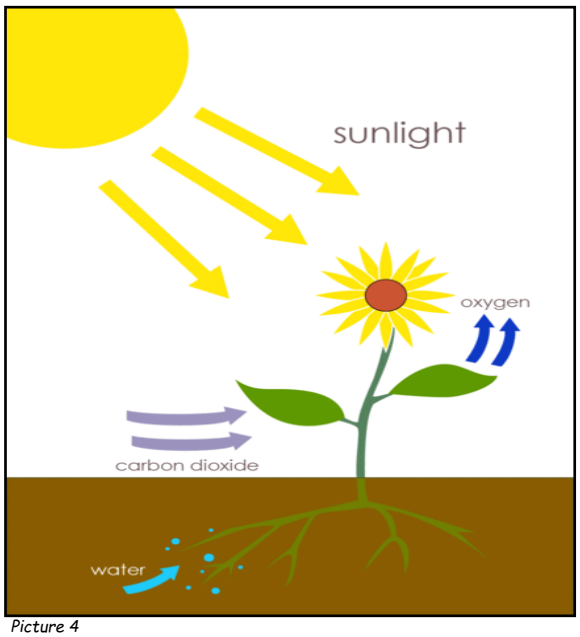
bud thorn bulb petal

Do you know the names of these flowers in English? Compare their bodies.

Comprehension: *describe the function of each part of a plant body, use the words below.*

NOUNS:

carbon dioxide
chlorophyll
inorganic matter
nutrients
organic matter
oxygen
pollen
reproductive organs
seeds
(the) soil
sugar glucose
sunlight energy
water



Picture 4

VERBS:

absorb
bring
contain
form
hold
join
produce
protect
react
release
support
take place
transport

Grammar – Nouns (plurals, countability): *study these nouns from the text. Are they countable (C) or uncountable (UN)?*

organism part damage ground water function bacteria photosynthesis soil leaves

Do they have singular and plural forms? If yes, what are they?

What is the plural form of the following nouns?

church –	mouse –	nucleus –
tomato –	goose –	bacterium –
volcano –	woman –	sheep –
country –	man -	fish –
calf –	child –	deer -
wolf –	fungus –	analysis –
half –	species –	axis –

Vocabulary for the life-cycle of plants: *put the following stages in the correct order.*

Germination: when the seed germinates, it gets bigger and shoots grow on it.

The seed falls from the fruit.

Pollination: the plant is pollinated
when the stigma receives pollen, then the flower is **fertilised**.

Roots and leaves grow from the seed.

The plant produces flowers.

The plant **decomposes**.

The fruit is formed.

A seed gets to the soil.

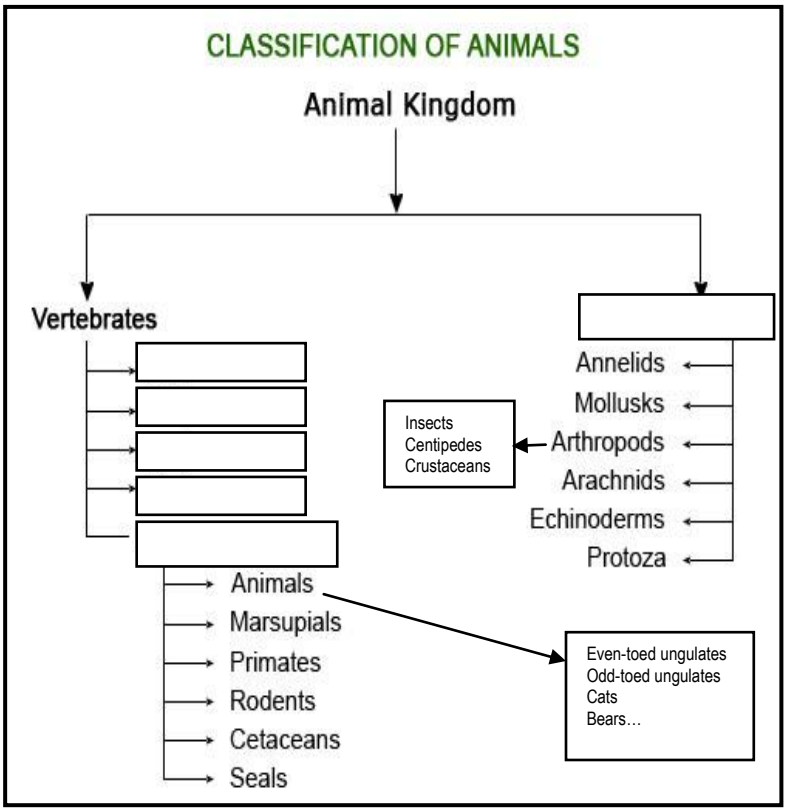
Buds are formed.

The plant dies.

1. .....
2. .....
3. .....
4. .....
5. .....
6. .....
7. .....
8. .....
9. .....
10. .....

WILDLIFE - 2

Vocabulary for the classification of animals: *study the table.*



amphibians	**birds**
fish	**invertebrates**
mammals	**reptiles**

Pictures 5-11

Read the characteristics below and match them to proper group names, then fill in the table with the terms on the right.

_____ - they give birth to live young animals and the young animals get milk from their mothers. Their **skin** is usually covered in **hair or fur [1]** and they are worm-blooded. They usually have 4 legs (**forelegs and hind legs**), they can be **paws** with sharp **claws [2]**, or they have **hooves [3]**. They usually have pointed **ears [4]** and a **tail**. Sometimes they have **antlers [5]**, **horns** or **tusks [6]**, some of them have a **trunk [7]**. Mostly they live on land, but some of them are adapted for life at sea.

_____ - they have wings **[8]** and usually they can fly, their body is covered in **feathers [8]**. They have a **beak**, **claws** and a **tail [9]**. They lay eggs.

_____- they are cold-blooded, they are usually covered in **scales [10]**. Some of them have 4 legs; others have bodies without any legs. They lay eggs on land.

_____- they are cold-blooded, they lay eggs in water and they live in water, before they become adult. As adults, they live both in water and on land.

_____- they are cold-blooded, their body is covered in **scales [10]**. They live in water and they get oxygen from water by using **gills [11]** and most of them use **fins [12]** for swimming in water.

_____- these are organisms without a backbone (spine) or spinal column, they include insects (6 legs), spiders (8 legs), worms etc., sometimes they have shells.

Describe typical features of the following examples and classify them.
(e.g. Bears belong to mammals, they have large strong bodies covered by thick fur, two pointed ears and two forelegs and two hind legs with sharp claws.)

gorillas	***ants***	***rats***	***whales***	***earthworms***
spiders	***snails***	***crabs***	***kangaroos***	***antelopes***

Reading: THE ELEPHANT

Starter: Describe the body of an elephant. Where does it live? Why is it endangered?

The elephant is one of the most extraordinary animals. It is the largest land mammal in the world. It has a bulky body, legs like pillars, large ears, and a long flexible trunk. There are only two _____ of the elephant in the world, African and Asian elephants. Both are about the same size, up to 3 meters tall, they weigh as much as 5 tonnes. The African elephant has large rounded ears which look like the map of Africa. It lives only in southern part of Africa. The Asian elephant has smaller ears which are pointed at the bottom, like the map of India.

An elephant's trunk

An elephant's trunk is a tube which was formed from its nose and the top lip. It is controlled by muscles and it works like an arm with a hand at the end. Asian elephants have a smooth trunk with one finger-like point at the end of the trunk. African elephants have a wrinkled trunk with two "fingers". The trunk is very _____ for elephants; it provides a tool for smelling, breathing, touching, eating, drinking, picking up objects and many other activities.

The life of the African elephant

An adult elephant can eat 300 kg of green food each day. One of the main sources of food for them is trees. They stand up on their hind legs and with their trunk they pull down fruits and branches of a tree. They also eat roots, bark and even wood when there is not enough food. They often kill the trees, which means that they destroy their own food supply. Elephants need between 70 and 90 litres of water every day. During the _____ season, elephants use their tusks, trunk and feet to dig holes in order to find water. Sometimes these holes are several metres deep. They provide a water source for other animals.

Elephants live in social groups called herds. Adult males (bulls) leave the family herd at the age of 14, and either live alone or join other bull elephants in "male herds". Bulls join cows only at breeding times. The family herd works and travels together. When a calf is born, all the adults in the herd help. The calf is 1 meter tall and weighs 150 kilograms.

The poaching problem

In 1997, 1.3 million elephants lived in Africa. Now there are only about 609,000 elephants there. Between 1986 and 1989 poachers killed more than 300,000 elephants. The main reason why poachers kill elephants is their tusks. Poachers sell their tusks for ivory which is a much demanded and expensive material. Since 1979, ivory poachers have _____ elephant population in Africa to 1/2. Asian elephants are not killed for ivory, because their tusks are very small. But often they are domesticated and used as working animals.

The habitat loss

The second threat to elephants is losing their forest habitat. People _____ forest in Asia and Africa, because they need land for farming and other activities.

Vocabulary: *try to guess appropriate words to fill in the blanks.*

Draw and label a picture of a tree, look for names of parts of a tree in the text .
What are the members of an elephant family?

Comprehension: *find answers for these questions in the text.*

1. Why and when do elephants dig holes? How do they do it?
2. Why are elephants endangered?
3. What do elephants eat? How do they get their food?

Grammar – Numbers and amounts: *read the numbers/years in the last two paragraphs.*

Can you read the following numbers, examples and years?

144 227 306 1,789 23,095 56,340 850,000 3,408,677 5,350,540 45,606,000

1/2 2/3 3/4 5/7 $\frac{234}{851}$ 7^3 4^2 5^8 $\sqrt{5}$

1 1/4 + 2 2/3 = 3.9167 4 3/4 + 2 1/2 = 2.25 43 – 5 = 10 : 2.5 = 4 7 x 5 =

1.935 70% €50.99 1990 (years) 2005 (years) 2013 (years)

WILDLIFE - 3

Warm-up - Animal description: *what are the names of the following animal species?*

(clues: the Squirrel, the Chimpanzee, Crayfish (freshwater lobsters), the Moose, the Pike, the Golden Eagle)

Pictures 12 - 17

*Describe in details animal species in the pictures, their habitat (and biomes), diet and typical features of their body (use the following **adjectives** for specification):*

shapes:	**straight**	**pointed**	**rounded/curved**	
properties:	**flexible**	**strong**	**sharp**	**smooth/rough**
proportions:	**large /small**	**long /short**	**thin/thick**	

Vocabulary for animal relationships: *read the definitions and match them with the terms in the grey rectangle, then think of examples of the relationships.*

20

- an animal which kills/hunts other animals is a _____.
- an animal which is killed is a _____.
- an interaction in which two organisms try to get the same limited food is _____.
- a relationship in which one organism (_____) lives in/on another organism (_____) is _____.
- a relationship in which one organism benefits and the other is not affected is _____.
- a relationship in which both organisms benefit is _____.

MUTUALISM (MUTUALISTIC RELATIONSHIP)
PARASITE
PREDATOR
PARASITISM (PARASITIC RELATIONSHIP)
PREY
COMMENSALISM (COMMENSAL RELATIONSHIP)
HOST
COMPETITION (TO COMPETE)

Reading: THE TROPICAL RAINFOREST

Starter: Discuss the problems of today's rainforests.

SECTION 1:

In 1940, 15 per cent of the earth's land surface was covered by tropical rainforest. Today we have less than half of it. Timber companies, farmers, ranchers and others have destroyed the other half. The total area of today's rainforest is the same size as the United States. Tropical rainforest is only around the Equator in three main regions – Latin America, Africa and Asia and there are also small areas on some Caribbean and Pacific islands and on the north-east coast of Australia.

The Ecosystem of the Rainforest: the climate in the rainforest is very hot and wet, it does not change and therefore it is suitable for plant growth. The number of plant and animal species in the rainforests is incredible, there is more than half of the species in the world. The biological diversity is very great – 100 square metres of the Amazonian forest contain 230 different trees. A typical temperate forest has only about 15 tree species. And there are more than 2,500 species of trees in the Amazon altogether. The

ecosystem of the rainforest has several layers. At the top, there is the first layer – the canopy. The canopy is the tops of trees, mass of leaves. There is a limitless supply of food for animals. It absorbs sunlight and rain – only 2 per cent of the sunlight get through the canopy to the ground. The second layer is the understorey. It is the trunks of trees and creepers. Because the canopy does not have enough space, animals use the understorey for moving around the forest. The last layer is the ground; there is almost no vegetation, because there is almost no sunlight. The ground is a habitat for large mammals and insects.

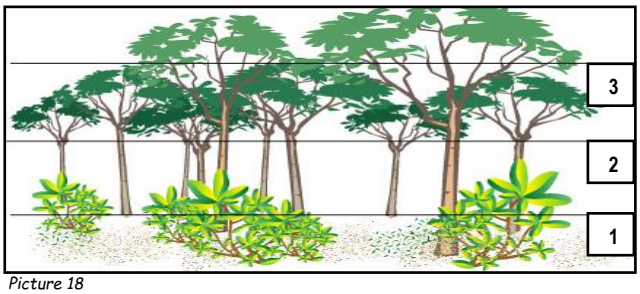
Vocabulary: *find the following words in the text and think about their meaning.*

timber ***suitable*** ***biological diversity*** ***layer*** ***mass*** ***trunk*** ***absorb***

Comprehension: *answer the questions, look in the text for necessary details.*

What is the total area of today's rainforests?
Where are the rainforests?
How many tree species are there in the Amazonian forest altogether and how many of them are there in 100 square metres?

Label the picture of the rainforest's structure with proper words:



Picture 18

SECTION 2

Why are rainforests so important? Rainforests have more animal and plant species than the rest of the world and we still do not know many of them. We can use a lot of these species in medicine, agriculture and industry. At least 5 per cent of all rainforest plants can help us to cure diseases. The most famous example is the rosy periwinkle from Madagascar. It helps to cure leukaemia and some types of cancer. Some rainforest plants can be used as new crops in agriculture. For example in Mexico scientists found a new type of maize. It is much more resistant to maize diseases than the normal type. But because human beings destroy the rainforest so fast, they lose these useful plant species before some of them are discovered and identified. Tropical rainforest is a source of many valuable products – for example fruits, oils, cocoa, vanilla, many spices etc. Tropical rainforest is also home for many Indian tribes who live in harmony with the plants and animals around them. Now many of them are threatened by the "civilized" world and they lose their natural habitat. Rainforests are also important for the global ecosystem. The trees in the rainforest absorb carbon dioxide and release oxygen. They are a part of the carbon cycle which affects global warming. Living trees hold large quantities of carbon. But when humans cut them and burn them, most of the carbon returns to the atmosphere. Trees also hold a lot of water and release it slowly and steadily. They are important for soil protection and watershed management.

Why do people destroy the rainforest? There are several causes of rainforest destruction. For example the timber companies which cuts trees for industrial uses. They use only the best wood like mahogany, ebony and rosewood but they destroy many others with their machines and equipment. But trees are the most important component of the rainforest ecosystem, without them it cannot exist. The soil in the rainforests is surprisingly poor and infertile, only the surface layer of the soil contains some nutrients from the decomposing organic matter, most of the nutrients are in the trees. When people cut trees, the surface layer of the soil is exposed to heavy rains, and they wash all the nutrients away. The land becomes an infertile desert with no vegetation, because nothing can grow there. There are also other reasons for cutting down trees. For example farming: farmers cut down the rainforest, because they need land for their crops. But because the soil is very poor there, they soon have to move and cut another patch of forest. People also cut the rainforests because they need space for cattle ranches. The cattle provide cheap beef for export – mainly for hamburgers in fast food restaurants.

Vocabulary: *find the following words in the text and think about their meaning.*

diseases ***maize*** ***cancer*** ***resistant*** ***tribes*** ***carbon cycle*** ***infertile*** ***crops***

Comprehension: *answer the questions, look in the text for necessary details.*

What is the relationship between the rainforest and agriculture? Do all people damage the rainforest?
What are the reasons for destroying the rainforest? Why are the rainforest trees important?

LAND USE - 1

Discussion: *think of the following question and try to answer it.*

- What is the difference between organic/bio food and industrially produced food?

(try to use the following words: organic, industrial, farmers, pesticides, chemical substances, (un)healthy, genetically modified, natural…)

Vocabulary – Important verbs: *divide the verbs into 3 groups according to their meaning.*

fertilise	plant	breed	sow	rake	pollinate	flower
till	reproduce	germinate	harvest	graze	decompose	
domesticate	plough/plow	ripen	pasture	cultivate	spray	
wean	irrigate	milk	grow	weed (out)	raise	fallow
feed	pick	infest	tend	aerate	store	control (pests) cut

Field work:	
Plant life-cycle:	
Animal husbandry:	

Reading: SUSTAINABLE AGRICULTURE

Starter: How is the word "sustainable" used nowadays?

The Benefits of Sustainable Agriculture:
Sustainable agriculture means that plant or animal products are produced without farming techniques that harm the environment, public health, human communities, and animal welfare.

Environmental Preservation
Sustainable farms guarantee that crops are produced and animals are raised without using toxic chemical pesticides, synthetic fertilizers, genetically modified seeds or techniques that degrade soil, water or other natural resources. Biodiversity is protected by growing a variety of plants, using crop rotation, conservation tillage and pasture-based livestock husbandry.

Protection of Public Health
Because sustainable farms make sure that hazardous pesticides are avoided, they are able to grow fruits and vegetables that are safer for consumers, workers, and local communities. Similarly, livestock is raised without using antibiotics or growth promoters and livestock waste is managed carefully and responsibly, therefore sustainable farmers also protect humans from hazardous pollutants.

Sustaining Local Communities
Through sustainable farms, local and regional economies are supported, because they create jobs and build strong communities.

Animal Welfare
On sustainable farms, animals are tended with respect; they can move freely and consume a natural diet.

The Negatives of Industrial Agriculture
Unfortunately, most food is produced on industrial farms which are controlled by powerful corporations.
Although industrial agriculture now produces great quantities of food at low prices, it threatens the environment, human health, rural communities, and animal welfare.

Industrial Crop Production
Today, industrial crops are successfully produced on huge monocrop farms, which use chemical pesticides, synthetic fertilizers and genetically modified crops. But these practices degrade soil, reduce biodiversity, generate air and water pollutants and threaten the health of farm workers, neighbours, and consumers.

Industrial Livestock Production
Now the majority of meat, eggs, and dairy products are produced on enormous industrial livestock facilities. They are known as factory farms and they confine thousands of animals in cramped conditions without access to the outdoors. Factory farms also generate a huge amount of waste, which pollutes air, water, and soil and degrades the natural environment.

Vocabulary / Comprehension: *which words, terms and groups of words show the positives of sustainable agriculture and the negatives of industrial agriculture?*

Sustainable agriculture - Positive features:			Industrial agriculture - Negative features:		
verbs	adjectives	nouns	verbs	adjectives	nouns

Describe the difference between sustainable agriculture and industrial agriculture.

Grammar 1 – Connectives: *study the highlighted connectives and adverbs in the text.*

Grammar 2 – The Passive: *compare the sentences based on the text. What is the difference?*

- Animals can move freely and consume a natural diet.
- Sustainable farms create new jobs.
- Sustainable farmers grow fruits and vegetables that are safer for consumers.

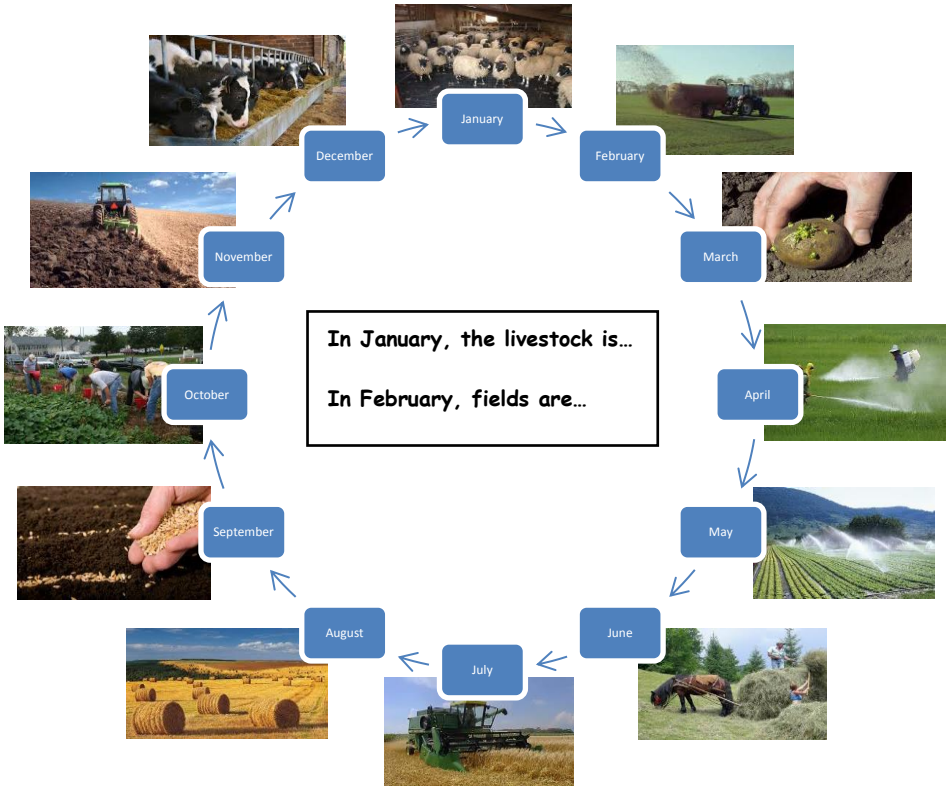
- Unfortunately, most food is produced on industrial farms.
- Crops are produced and animals are raised without using toxic chemical pesticides.
- Biodiversity is protected by growing a variety of plants, and using crop rotation.

How do we form the passive form in English?

_____ + _____

Find all examples of the passive in the text. Fill in the table with proper forms.

	Active	Passive
Present simple	**Power stations produce emissions of SO_2.**	
Present continuous		
Present perfect		
Past simple		
Past continuous		
Future		



Describe typical activities for each month in the scheme; use the passive form in different tenses and the verbs below.

apply liquid fertiliser / spray fields
cart straw
combine / harvest cereals
feed livestock
harvest potatoes
house livestock
irrigate
make hay
plant potatoes
plough / till
sow/drill wheat
spread slurry (manure)

LAND USE - 2

Grammar practise – The Passive: *transform active sentences into the passive form.*

1. Poachers have killed more than 250,000 elephants since 1986.

2. Chemical factories are producing large amounts of harmful substances.

3. When did they build the power station?

4. Human activities destroy natural habitats.

5. Hopefully, people will use renewable sources of energy in the future.

6. They were recording changes of temperatures every hour last week.

Reading: PREVENTING SOIL EROSION

Starter: Can you create a definition of "soil erosion"?

1. Maintaining crop residue cover

One of the best ways to _____ erosion is to protect the soil surface with a cover of growing plants or crop residue. Crop residue is the remains (leaves, stems etc.) of crops which are left on a field after the harvest. For example, it can be straw (the dried stems of crops like wheat) or stubble (the short pieces of stems left in the ground). Crop residue _____ the impact of rain and it slows the flow of water. It also _____ snow, reduces evaporation and increases moisture in the soil.

2. Terracing

When we need to cultivate a steep slope or a mountain, we can use terracing. It means _____ing terraces so that individual fields are flat.

3. Use crop rotations

Soil erosion can be reduced when we _____ two or more different crops in one area. This is called rotation. Crop rotations can use forages, oilseeds, cereals or legumes. If you use crop rotation adequately, it will improve soil quality and soil fertility and legumes will add nitrogen.

4. Contour farming

Contour farming is tilling at right angles to the slope of the land. This technique is useful on gentle slopes - it creates contour lines (furrows) along the slope and these furrows _____ the flow of water.

5. Windbreaks

Windbreaks are the best protection against wind erosion. It is planting trees or other plants which _____ exposed soil from the full force of the wind.

6. Fallowing

Fallowing is when a field is left without crops, unplanted. Usually farmers leave fields resting for 1 year out of every 7. If a field fallows for one year, the moisture in the soil will be accumulated and the land will be more productive the next year. We should provide crop residue during the fallow year to _____ the amount of organic mater.

7. Strip farming

Strip farming is when we _____ strips of crops like hay, wheat or other grains and strips of row crops like maize, soybeans, cotton or sugar beet. This also reduces soil erosion because it slows the flow of water.

8. Maintain organic matter

Organic matter (e.g. dead plants) is very important for good crop production and for reducing soil erosion. During decomposition, this material _____ nutrients for plants. Organic matter and micro-organisms _____ soil particles into larger aggregates. Soil with larger aggregates has more large pores to hold water. Loam is an ideal soil for growing most crops - it combines absorbing properties of large particles with the nutrient richness of clay particles. Poorer soils or steep slopes can be used for growing undemanding and resistant crops like forages.

Vocabulary 1: *fill in the blanks in the text with the following verbs (in the correct form).*

join ***provide*** ***hold*** ***slow*** ***reduce*** ***build*** ***protect*** ***release*** ***grow*** ***plant*** ***prevent*** ***increase***

Think about the meaning of the highlighted key words.

Vocabulary 2: *which crops and crop types are mentioned in the text? Fill them in the table.*

Vegetables		Root crops				Fruits
carrots	wheat rice	potatoes	beans lentils	clover		apples

Fill the following examples in the table and add your own examples.

maize (corn), peas, olives, sunflower, soybeans, oats, peanuts, mustard, rye, sugar beet, turnip/rape plant, grasses, barley, lucerne

Vocabulary 3: *what do they say about soil types in the text? Study the table and fill in the Czech equivalents.*

Soil particle size:	0,002 mm	0,002-0,06 mm	0,06-2 mm	2-60 mm
Soil type:	**clay -** a soil type with small soil particles and with a lot of moisture; it holds water very well but the pores in clay are very small -only little water can infiltrate to lower layers.	**silt -** a soil type which has bigger and smooth soil particles, the become dusty when dry.	**sandy soils -** a soil type with large sand particles, it has larger pores; that is why water flows rapidly through sandy soils.	**gravel soils –** a soil type with large particles, it is not suitable for growing plants. It doesn't hold moisture because it has very large pores. .....

Comprehension: *match pictures 1-6 to the techniques from the text, describe the pictures.*

Pictures 19 - 24

Grammar – Conditional clauses (type 1): *study examples from the text and fill in the table.*

"If a field fallows for one year, the moisture will be accumulated and the land will be more productive."

"If you use crop rotation adequately, it will improve soil quality and soil fertility and legumes will add nitrogen."

Complete the form of ***Conditional clauses (type 1)*** *in the table.*

Conditional clauses for real situations (type 1):

If _____ , _____ .

_____ **if** _____ .

LAND USE - 3

Grammar practise 1 – Conditional clauses: *match the corresponding halves.*

(If) causes	effects
People / continue to / destroy natural habitats	the climate / change / dramatically / in the near future
Rivers' pollution / be controlled / steadily	the soil fertility / improve
Farmers / use / crop residue / adequately	destructive floods / come back / more often
Global warming / not slow down / significantly	many animal and plant species / not survive
We / not stop / soil degradation / soon	the fish population / eventually / increase

Use the corresponding halves and form examples of Conditional clauses (type 1).

Grammar practise 2 – Connectives: *match the corresponding halves.*

although ***because*** ***but*** ***on the other hand*** ***similarly/correspondingly*** ***therefore/so*** ***unfortunately***

Many environmental organizations are trying to protect the African elephants...	...human activities produce huge amounts of the greenhouse gases.
Some areas of the world are harmed by serious floods.	...they protect the local area from harmful substances.
Sustainable farmers manage livestock waste responsibly...	Agriculture significantly contributes to their production.
The global temperature is increasing...	...poachers still kill thousands of them.
Industrial activities produce a lot of greenhouse gases.	Other areas are dramatically affected by lack of water.

Use the corresponding halves and suitable connectives above the table to form meaningful sentences.

Reading: PESTICIDES

*Starter: Do you know what **pesticides** are?*

A pesticide is any substance used to kill, repel, or control plant or animal pests. Pesticides include herbicides for destroying weeds and other unwanted vegetation, insecticides for controlling a wide variety of insects, fungicides used to prevent the growth of moulds and mildew, disinfectants for preventing the spread of bacteria, and compounds used to control mice and rats.

Pesticides are not a modern invention. Ancient or medieval farmers experimented with chemicals such as arsenic, sulphur or lead to protect their crops. In 1939, Dichloro-Diphenyl-Trichloroethane, or DDT, was discovered to be extremely effective and rapidly became the most widespread insecticide in the world. Twenty years later, 86 countries decided to ban its use because of serious harmful effects of DDT on biosphere. But today there are still over 350,000 registered pesticide products, and the _____is a 12.5 billion dollar industry.

Because of the _____in food production, people are exposed to low levels of pesticide residues through their diets. Scientists do not have a clear understanding of the health effects of pesticide residues yet. Pesticides can probably cause a number of health problems, including neurological and hormone system disorders, birth defects, cancer, and other diseases. Children are especially endangered by the

harmful effects of pesticides due to their lower body mass, rapid development, and higher consumption of affected products. In children, _____ in food can cause delayed development; problems with the reproductive, hormone, and immune systems; certain types of cancer; and damage to other organs.

Many sustainable farms use alternatives to the _____- techniques which control pests but minimize environmental damage. For example, they use predatory insects to kill plant-eating pests or use mechanical pest traps. Other techniques used by sustainable farms include crop rotation and intercropping (strip farming). These techniques eliminate pests, help reduce weeds, encourage plant diversity and prevent insect and pest infestation.

When you prepare conventional food, you can do several things to reduce _____. Washing fruits and vegetables helps remove some pesticide residues – but only for certain pesticides (others are not affected by washing). Peeling fruits and vegetables is a more effective method of _____. For meat and dairy products, it is best to consume food that contains less fat, because pesticides accumulate in the fat of animals. The best way to prevent consuming pesticides is to eat organic products, meat, and dairy products. Organic food is grown without using pesticides.

Comprehension 1: *match titles below to the corresponding paragraphs.*

A Brief History of Pesticides ***Pesticides and Public Health*** ***What Can You Do?***

Alternatives to Pesticides ***What Are Pesticides?***

Vocabulary 1: *fill in the blanks in the text with the following phrases.*

pesticide business ***intake of pesticides*** ***widespread use of pesticides***

removing pesticides ***heavy use of pesticides*** ***exposure to certain pesticides***

Vocabulary 2: *divide the underlined adjectives into the three groups in the table.*

Positive meaning	Neutral meaning	Negative meaning

Comprehension 2: *try to say a few sentences about the content of each paragraph.*

Try to use as many words and phrases from the previous activities as you can.

Grammar – Conditional clauses (type 2): *complete the examples with proper forms.*

If farmers used alternative methods of controlling pests, they could _____ .

_____ , agricultural products would be much safer for consumers.

If people ate only organic food, _____ .

Conditional clauses for hypothetical situations (type 2):

If _____ , _____ .

_____ **if** _____

POLLUTION - 1

Discussion: *put the words into correct order to form a definition for "pollution".*

harmful discharge a environment of is the substances pollution into

.....

- We usually speak about three types: _____, _____ and _____ pollution.

Vocabulary – Suffixes & Prefixes for forming words: *use the suffixes and prefixes below to form suitable words for the categories in the table.*

-e -able -ing -er -ant -(t)ion -al -ful -ed -ous -ment -less dis- re- un-

	verb	noun – naming the process / action	noun – substance carrying the action	verb form - performing the action	verb form – afected by the action	adjective
pollut-						
contaminat-						
dispos-						
discharg-						
recycl-						
harm-						
treat-						

Use words including the "pollut-" segment and fill them in the following sentences.

1. Air _____ is a serious problem in big cities, mainly because of exhaust fumes from cars.
2. Waste liquids from factories _____ rivers and lakes.
3. Acid rain is caused by _____ gaseous emissions from coal-burning power stations.
4. The rivers in Northern Bohemia were _____ by chemical industry.
5. Methane can be a serious _____ which probably contributes to global warming.
6. Paris is one of the most _____ cities in Europe.

Reading: EUTROPHICATION

Starter: Do you know what the word "algae" means (originally from Latin)?

Causes of algal blooms ***How to prevent eutrophication?*** ***What is eutrophication?***
Impacts of eutrophication ***Sources of nutrients***

a. Eutrophication is a process when high nutrient concentrations in an aquatic ecosystem stimulate blooms of algae. It affects the quality of water and the balance of the ecosystem.

b. The growth of algae in natural waters is caused by the supply of nutrients, light, temperature, the flow regime and other factors. The most important factor is the supply of nutrients (phosphorus and nitrogen).

c. Large quantities of nutrients come from agricultural activities. Modern agriculture uses a lot of artificial fertilisers (for example phosphates or nitrates), which end up in rivers and lakes as run-off from fields. Another important source of nutrients is sewage disposal – untreated sewage is often directly pumped into rivers and lakes.

d. Blooms of algae damage the aquatic ecosystem in many ways. First, algae block sunlight and this causes death of underwater vegetation. This vegetation is an important source of food for many aquatic animals. When algae die and decompose, they deplete oxygen in the aquatic ecosystem. Fish and other aquatic organisms cannot survive without oxygen. Some algal species are poisonous and they affect the health of aquatic mammals, fish and birds.

e. There are two major ways to fight eutrophication. One of them is using organic fertilisers, for example manure. The second is proper treatment of sewage before it is pumped into a river, lake or an ocean.

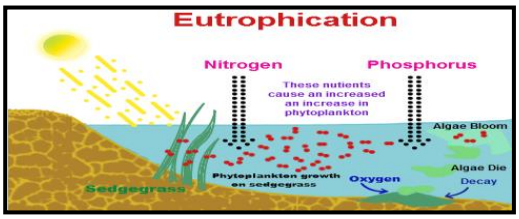
Vocabulary: *find connotations between these words/terms, create sentences.*

nutrient ***stimulate*** ***bloom*** ***algae*** ***flow regime*** ***fertilisers***
run-off ***sewage (disposal)*** ***deplete*** ***manure*** ***treatment***

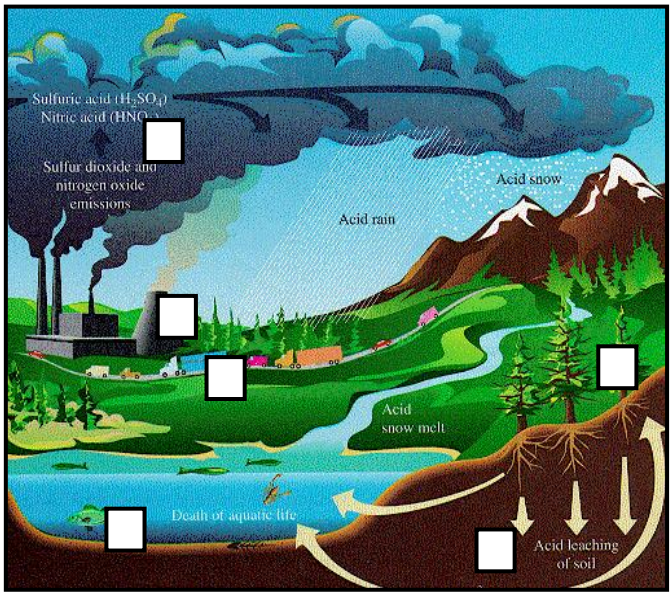
Comprehension: *match the titles from the brown rectangle above to the paragraphs a – e.*

Using the information and terms from the text, describe the principles of eutrophication.

Pictures 25 - 27



Reading & Grammar – Acid rain: *read and match the six paragraphs to the white boxes in the picture.*



Picture 28

1. Exhaust fumes from cars are a major source of NO_x which is produced by all combustion processes – burning of the rainforest, industry emissions, power stations etc.

2. Acid rain also decreases the pH of lake water which, for example, causes abnormal bone development of fish. It eventually leads to their death. The low pH also means less calcium, which is important for crayfish to build their skeleton. Without enough calcium crayfish die.

3. SO_x and NO_x reach the upper layers of the atmosphere and they react with water and sunlight to form sulphuric and nitric acids. These acids enter clouds and sometimes travel long distances, before they fall down as acid rain.

4. Millions of hectares of forests, in over 20 countries, have died because of acid rain and other air-borne pollutants. Mostly it is conifers at high elevations. Acid rain causes a decrease in nutrients in the soil and the trees starve to death.

5. Power stations, which burn fossil fuels – coal or oil, are one of the major sources of acid rain. They produce most of man-made sulphur dioxide. A large coal-fired power station emits 1 tonne of SO_2 every 5 minutes.

6. Acids deposit in the soil and they eventually leak into groundwater.

Using words from the texts,fill in the table with suitable nouns and verbs, describe acid rain creation.

Cars, burning processes, factories, power stations	**……..**
……..	**rise, enter, react, produce/form**
Acids	**……..**
Acid rain	**kills trees, decreases nutrients, releases heavy metals**
Acid rain	**……, kills fish**
Acids	**....., contaminate**
NOUNS - WHO, WHAT?	**VERBS - DO WHAT?**

Grammar – Articles: *Find nouns in the paragraphs 1, 3, 4, 5, study usage of articles and fill in the table below (according to the examples). Then think about the examples in the right box and fill in articles where necessary.*

		A / AN	THE	No article
UNCOUNTABLE				
COUNTABLE	SINGULAR			
	PLURAL			

__every living organism needs __source of __energy.
There is __layer of __gases in __atmosphere.
__roots absorb __water and __minerals from __soil.
__some habitats are destroyed by __climate change.

Alternatives: my, …… / some, …… / this, …… / each, …… / (the) other, …… / much, ……

POLLUTION - 2

Warm-up - Forming words: *form words from the segments and sufixes to fill in the blanks.*

Contaminat-	Pollut-	Dispose/discharg-	Poison-	Recycl-	Harm-

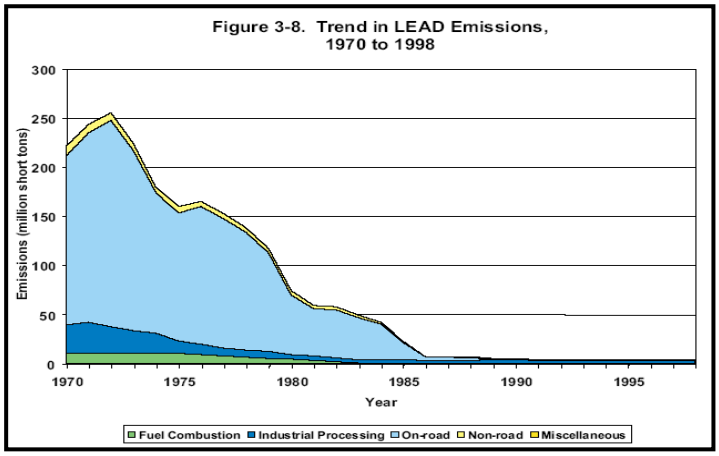
-e -able -ing -er -ant -tion -al -ful -ed -ous -less

1. Paper is one of the most frequent waste materials, but it can be _____.
2. Nuclear waste can _____ the groundwater.
3. Pesticides are usually _____ substances. But organic fertilisers, e.g. manure, are _____.
4. Coniferous forests in the Northern Bohemia were _____ by acid rains.
5. Chemical factories _____ large amounts of waste water into rivers.
6. Paper, glass, plastics and metals are _____ materials.
7. Acid rain is caused by _____ gases.
8. CO2 is a _____ which probably contributes to global warming.

Grammar practise - Articles: *put articles where necessary.*

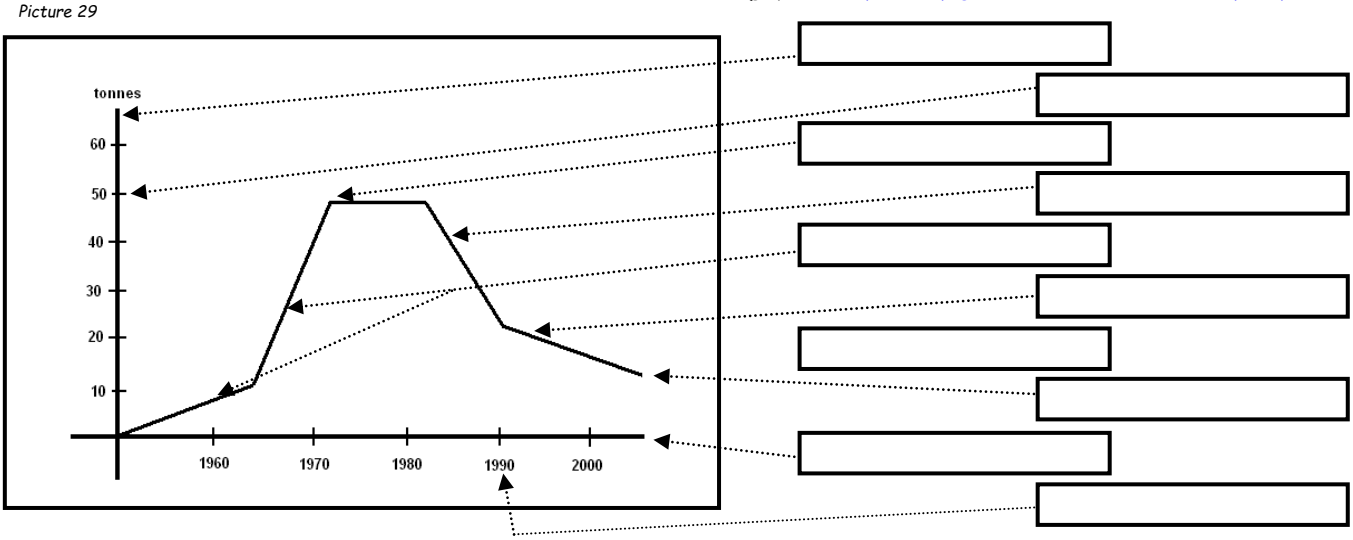
Squirrel is small mammal. It has rounded body, strong legs, pointed ears and flexible hairy tail. Its skin is covered by thick fur. Squirrels are herbivores, they eat nuts and other fruits. They usually climb to top of tree and look for food. Squirrel mostly lives in forests, but we can also see it in city park or in garden, as it climbs branches of tall tree. Their reproduction is not very productive, they usually have 3 or 4 young squirrels.

Vocabulary - Graphs: *read the description of the graph and elicit suitable words for labelling the graph below.*

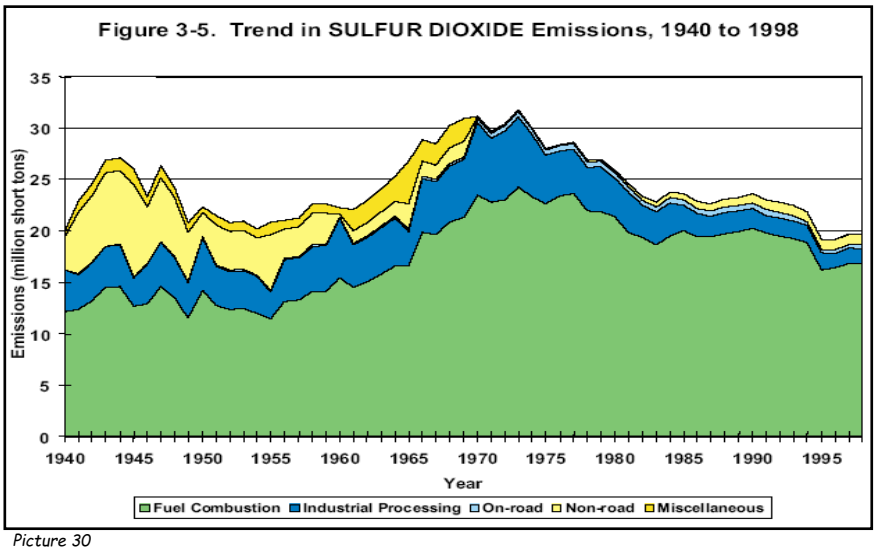


Picture 29

The graph shows the trend in lead emissions from various sources (in the U.S.) between 1970 and 1998.
The vertical axis shows the figures of lead emissions (in million tons) and the horizontal axis shows the time period between 1970 and 1998. The curve, which goes through the graph, shows the progress of the figures in the given time. Between 1970 and 1972, the curve rapidly rises (the figures increase) and it reaches the peak (the maximum point) in 1972. Between 1972 and 1980 the curve rapidly descends/falls (the figures decrease), after 1980 it falls slowly and in 1986 the curve reaches a plateau. The figures remain constant until 1998.
(*graph from http://www.epa.gov/ttn/chief/trends/trends98/chapter3.pdf*)



Describe in detail the following graph. What information does it show or predict?



Picture 30

*What is the overall trend of the graph – **upward** or **downward**?*

At what figure did the SO_2 emissions stand in 1980?

……
……
……
……
……
……
……
……

Reading: THE OZONE DEPLETION

because	**which**	**who**	
but	**where**	**if**	**when**

Starter: What is ozone? Why is it important?
What is happening with the ozone layer and why?

Ozone is a blue gas with an unpleasant smell. It is a form of oxygen _____contains three atoms (O_3) instead of the usual two. It is extremely toxic, even in low concentrations. Fortunately, 90 percent of the ozone in the atmosphere is in the stratosphere, _____ it forms a layer, _____ is thinner around the Equator and thicker at the poles. The ozone is essential for our planet _____ it absorbs harmful ultraviolet radiation. It removes all the UV-C and much of the UV-B. In fact it is also produced by ultraviolet radiation, _____ it causes splitting of ordinary oxygen into single oxygen atoms, _____ attach to oxygen molecules and form ozone. Scientists also discovered that sunlight energy can produce ozone from industrial and vehicle pollution near the Earth's surface. Ozone near the Earth's surface is a serious pollutant, _____ contributes to forest damage, _____ the stratospheric ozone is extremely beneficial _____ it protects plants and animals on the surface from harmful ultraviolet rays. Ozone reactions in the stratosphere absorb 99 percent of the ultraviolet light energy _____ comes from the sun.

In 1985, it was discovered that a thinning of the ozone layer occurred over the Antarctic. Subsequently, ozone depletion has also been found near the North Pole. The scientists _____ studied the thinning found out that some regions showed 95 percent depletion. These facts have caused that several countries are trying to protect the ozone layer.

In the 1930s, CFCs (chlorofluorocarbons) started to be used as refrigerants (for refrigerators and other cooling equipment) _____ they were stable, non-toxic and non-flammable. Their cheapness and stability was also good for aerosol propellants and for blowing bubbles into foamed plastics.

It was in 1974 _____ scientists discovered that CFCs are able to reach the stratosphere and interfere with the natural ozone balance. Chlorine reacts with ozone and these reactions destroy ozone and reduce the probability that it will be reformed.

Since then, many steps have been taken to ban or reduce the production of CFCs. But _____ CFCs emissions were reduced to zero today, the chemical reactions _____ deplete the ozone layer would continue for at least a century. There are two reasons for this. The CFCs _____ we are releasing now will reach the stratosphere after a long time; and chlorine atoms are active for a very long time _____ they are broken away.

Vocabulary: *find words in the text…*

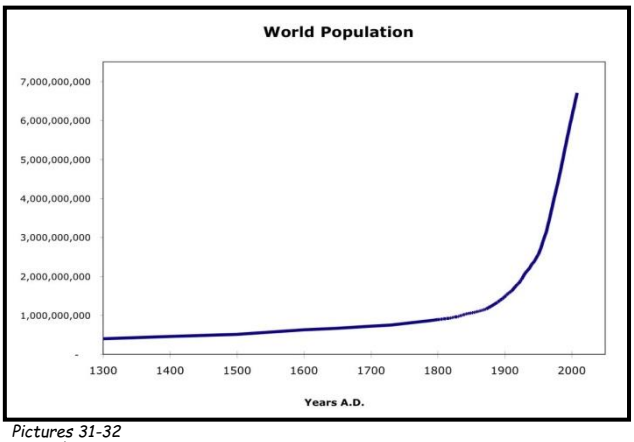
- ***denoting the output from the Sun***
- ***describing properties of ozone and CFCs***
- ***describing problems of disintegrating ozone layer***

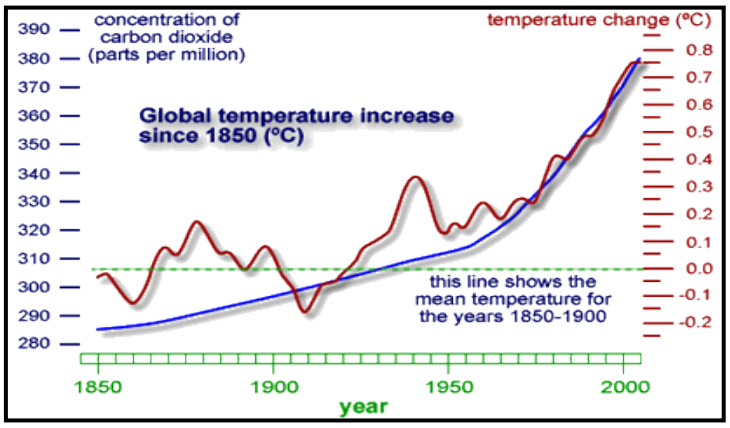
Comprehension & Connectors: *fill in the blanks with the connectors from the brown rectangle. Answer the questions.*

What is the relationship between ultraviolet rays and ozone?
What are CFCs? ***Is ozone always beneficial for us?***

POLLUTION - 3

Warm-up – Graph description: *study the following graphs.*





Pictures 31-32

Answer the questions below. Describe the graphs in detail; try to use expressions from the brown box.

1. ***How did the world population grow between 1300 and 1500?***
2. ***What happened around 1900?***
3. ***What was the trend in the global temperature from 1850 to 1920?***
4. ***What number did the world population reach around 2010?***
5. ***By how much did the global temperature fall between 1940 and 1950?***

More words to use:

Verbs (going up):
(begin, start to) rise, grow, shoot up…

Verbs (going down):
(begin, start to) decline, drop, sink…

Adverbs & intensifiers:
slightly, a little, a lot, sharply, suddenly, steeply, gradually, gently, steadily

Prepositions:
between 1995 and 2000, from 1995 to 2000
X… rose from Y to Z / X… fell to Y in 1920
X… fell / rose by 50%

Reading: THE GREENHOUSE EFFECT

Starter: Why is the temperature on the Earth increasing? Do human activities contribute to this process?

In the 1960s Professor Bert Bolin predicted that the "global warming" (caused by an increase in the amount of carbon dioxide in the atmosphere) would lead to significant changes in the Earth's climate.
1…… But most experts now agree that the amount of carbon dioxide in the atmosphere will double from 0.03% to 0.06% in the next 50 years and that temperatures worldwide will rise by 2^{O} Celsius.

Although a temperature rise of $2^{O}C$ does not seem significant, the local effects can be much greater: by 2025 a rise of $10^{O}C$ is possible in polar regions and 4° in Northern Europe. The first effects will be felt very soon, perhaps we are already feeling them now… But how does the Greenhouse effect operate and why can such a small proportion of CO_2 have such harmful effects?

When living creatures breathe out and when things are burned, CO_2 enters the atmosphere.
2…… But the balance of nature has been disturbed. In power stations, in factories and cars, we are burning more and more fossil fuels. 18 billion tons of CO_2 enter the atmosphere every year. And the destruction of forests means that there are fewer trees to convert the CO_2 into oxygen.
3……

As sunlight enters the atmosphere, the surface of the Earth is warmed. Some of this heat escapes back into space, but the rest is trapped by CO_2, which acts like the glass in a greenhouse – it allows sunshine and heat to pass in but not out again. 4…… As the temperature rises, the amount of water vapour in the air will increase and this too will absorb more of the Earth's heat. The oceans too will become warmer and store more heat.

According to some scientists, the polar icecaps will start to melt and the oceans will expand as more ice and snow melts. Because the exposed ground, formerly covered in snow, won't reflect the heat so well it will absorb more sunlight and this will lead to even more snow melting.
Scientists predict that the level of the sea will rise by 1 1/2 m in the next 25 years. This will affect many low-lying areas of the world – millions of people today live less than one metre above the sea level.
5…… For Northern Europeans, the extra warmth can be welcome – but there will probably be increased rainfall.

But many areas will suffer: the southern states of the USA can expect hotter summers and less rainfall, which will lead to worse conditions for agriculture, and the Mediterranean region can be much hotter and drier than now.

Many experts believe that the Greenhouse Effect will bring significant changes to the Earth's climate, though they do not all agree how long this will take, or what form it will take.
6……

Comprehension: *fill in the blanks in the article with these sentences, there is one extra.*

a. ***Until the last century all of this CO_2 was absorbed by trees and plants, which converted it back into oxygen.***

b. ***So the amount of CO_2 in the atmosphere is increasing all the time.***

c. ***Some areas can benefit: the higher temperatures will allow a longer growing season.***

d. ***At the time, his predictions seemed like science fiction.***

e. ***It seems that inhabitants of this planet have to prepare for living in a warmer world.***

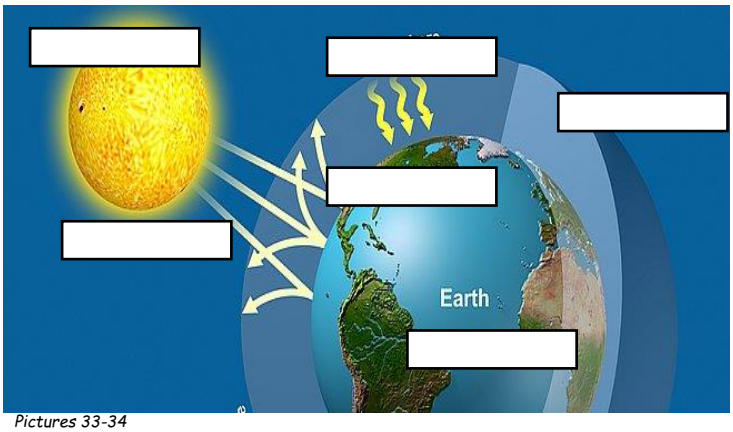
f. ***Consequently, the temperature rises.***

g. ***Surprisingly, the amount of CO_2 in the atmosphere has decreased.***

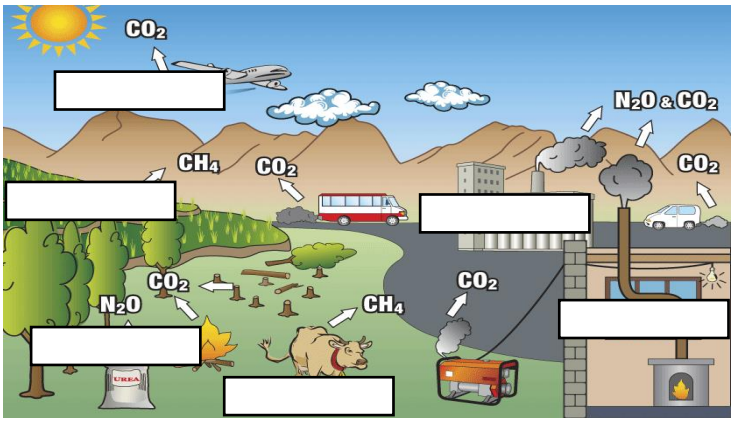
Grammar – Future predictions using "will": *think of and write a few predictions about the future of the world (GE, global warming, climate change), use "will" + "I (don't) think…" / "I am (not) sure…"*

……
……

Vocabulary – the Greenhouse Effect: *match the terms in the box with the blanks in the pictures.*



Pictures 33-34



the atmosphere
greenhouse gases (CO_2, H_2O, CH_4, N_2O…)
the Earth's surface
reflected infrared radiation
the Sun
thermal radiation/heat from the Sun

burning the rainforest
traffic (cars, trucks, planes…)
industry
animal husbandry
industrial agriculture (e.g. growing rice)
household fossil fuel use

Use the terms in the box and the following verbs to describe the greenhouse effect and its possible connection to global warming.

emit/(re)radiate	***reflect (back)***
change into	***absorb/trap***
regulate	***go (pass) through***
produce	***burn***
grow	***increase*** *(the concentration of)*

WASTE - 1

Discussion: *think about examples of waste types in the pictures and where they come from.*

Vocabulary – Waste classification: *according to the examples, choose the correct category for each column in the table; then divide the adjectives below the table into the four categories.*

Properties ***Origin*** ***Legal definitions*** ***Form***

agricultural	*solid*	*acidic*	*controlled*
		(non-)flammable	

sewage, liquid, commercial, difficult, inert, volatile, recyclable, industrial, beneficial, hazardous, slurries, radioactive, Municipal Solid Waste (MSW), powders, alkaline, organic, photodegradable, non-recyclable, reactive, construction/demolition, medical, carcinogenic, gaseous, infectious, household, biodegradable, (non-)combustible, special…

Categorize the following waste materials, use the adjectives above.

fast food packaging ……
tires ……
paints ……
waste oil ……
manure ……
paper ……
crop residue ……
nuclear waste……
glass containers ……

Reading: WHAT TO DO WITH WASTE?

Starter: How did people treat waste in the past (e.g. during the Middle Ages)?
How do people treat waste now?
What are the main problems connected to waste management / waste disposal?

Landfilling:
A modern landfill is a site where people deposit waste, it is usually a hole in which each day's deposit of waste is covered with a layer of soil.

Before selecting a landfill site, we must think about groundwater geology, soil type and other important factors. We also need extensive construction activities to prepare the site for use. In addition, each landfill has to have monitoring and collection systems which monitor landfill gas (methane and other gases) production and groundwater contamination. This means that landfills are very complex and expensive (up to 1 million dollars for 1 hectare of a landfill). In some landfills, landfill gas (methane), which is produced by decomposing waste, can be collected and used for generating electricity.

The water which goes down through the landfill creates leachate – a liquid substance often full of pollutants. If leachate escapes out of the landfill, it may contaminate the groundwater. That is why leachate should be collected and treated.

Today, almost 80 percent of municipal solid waste goes into landfills. But in some cases, landfills had to be closed, because the peak of their capacity had been reached. Landfilling will not be able to handle enormous quantities of waste, especially near big cities, where population density is high.

Incineration:
Incineration (or combustion) is burning waste in special facilities, called incinerators.

Today, about 13 percent of municipal solid waste is incinerated. Incinerators are able to reduce the amount of municipal solid waste up to 90 percent by volume and 75 percent by weight.

Primary risks of incineration can be air-quality problems and the toxicity and disposal of the ash. Older incinerators produced poisonous gases, smoke and foul odour. Modern incinerators must have filters, scrubbers etc., but they might still release small amounts of pollutants into the atmosphere; these pollutants can be certain metals, acid gases and dangerous chemicals like dioxins. Because the ash from incineration contains lead, mercury, and arsenic from such items as batteries, it may become a hazardous waste.

Most incinerators can be also used for producing energy. The heat from the burning is converted into steam or electricity. Some incinerators are self-fuelling facilities, which means that their operation is very cheap.
But the construction costs of incinerators could reach 250 million dollars.

Recycling:
About ten percent of waste is treated through recycling. Although the recycling programs grow, we recycle only a small percentage of municipal solid waste. Recycling is a suitable alternative to landfilling or incineration, but it presents several problems. Most packaging plastics are recyclable, but the technology for recycling is different for every type of plastic. Because each type has its own chemical composition, different plastics cannot be recycled together. But scientists are researching new technologies which will be able to increase the quantity of recycled plastics and mixing of different plastics during recycling. Now recycling companies have to separate different plastic products before recycling. But in the future we should recycle most of our waste and we should reduce the amount of the landfilled and incinerated waste and the environmental impact of waste disposal.

Comprehension & Vocabulary: *compare the three methods according to the following factors.*

1. *What is the amount of MSW processed by the technique?*
2. *Does it have any by-products? Are they useful or harmful?*
3. *What is the impact on the environment?*
4. *Is the technique expensive? If yes, why?*
5. *What are advantages /disadvantages and future perspectives of each technique?*

Grammar - Modals: *study all examples of modal verbs in the text (highlighted in blue), fill them in the table. Think about the usage of modals in English.*

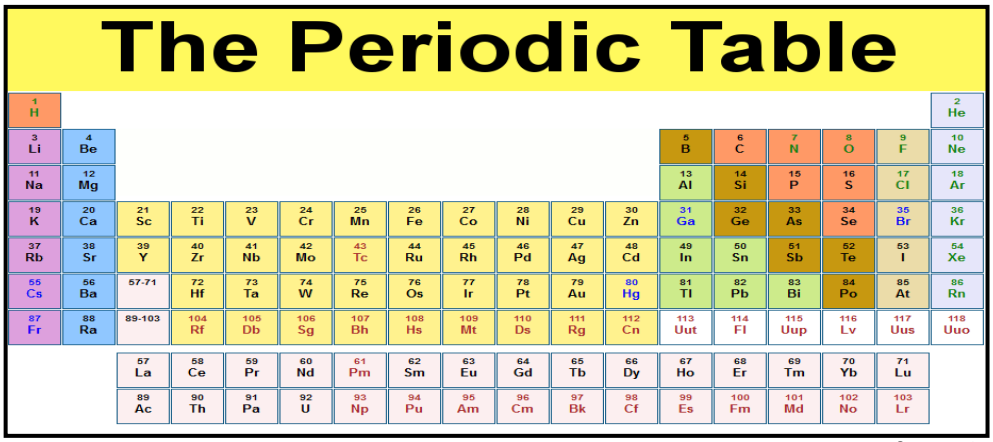
Ability	Obligation / Necessity	Possibility / Probability	Advice / Suggestions	Permission

WASTE - 2

Grammar Practise - Modals: *use suitable forms of modals in the following examples.*

1. A modern landfill _____ utilize monitoring systems to prevent groundwater contamination.
2. Because CFCs are very stable, they _____ go up to the upper stratosphere and destroy ozone.
3. People _____ think globally and act locally to reduce the environmental impact of each individual.
4. Unfortunately, different types of plastics _____ be recycled together.
5. Global warming _____ have serious environmental consequences in the near future.
6. Industrialized countries _____ ignore the disproportionate exploiting of the world's resources.

Vocabulary – Chemical Elements & Compounds: *think about English names of chemical elements and do the tasks.*



Picture 35

What are the English names of these elements?

H .....
O .....
C .....
S .....
N .....
Al .....

What are the symbols for these elements?

Sodium		**Copper**		**Calcium**		**Uranium**		**Manganese**	
Iron		**Magnesium**		**Chlorine**		**Lead**		**Gold**	
Phosporus		**Tin**		**Chromium**		**Mercury**		**Fluorine**	

What are the basic groups of chemical compounds? How do we read the following chemical formulae (sg. formula)? Are they organic or inorganic? What is their physical form, s_____, l_____ or g_____?

CO_2 ..... H_2SO_4 ..... SO_2 .....

Match the names of chemical compounds and their formulae.

sodium nitrate ..... ***hydrochloric acid*** .....
carbonic acid ..... ***nitric acid*** .....
sodium chloride ..... ***methane*** .....
dihydrogen monoxide ..... ***methanol*** *(methyl alcohol)* .....
ammonia *(trihydrogen nitride)* ..... ***PET*** *(polyethylene terephthalate)* .....

HCl $(C_{10}H_8O_4)_n$ $NaNO_3$ CH_4 HNO_3 H_2CO_3 NH_3 H_2O $NaCl$ CH_3OH

Reading: NUCLEAR WASTE DISPOSAL

Starter: Do you know how nuclear waste is treated?

Electricity is the main power of our age. We must realise that electricity helps us to operate almost all conveniences we use each day: our refrigerators, washing machines, DVD players, microwave ovens, and personal computers. Electricity also powers modern life-saving medical equipment. And it fuels industry and also modern agriculture.
One of the modern ways of generating electricity is nuclear energy. The Nuclear Age began in July, 1945 when the US tested their first nuclear bomb near Alamogordo, New Mexico. America has more than 100 nuclear power plants now. They supply nearly 20 percent of the nation's electric power. In some states,

nuclear energy supplies over half of all electricity. Nuclear energy is one of the cleanest ways to produce electricity. It does not create air pollution or greenhouse gases. It does not contribute to smog or acid rain.

But we must also consider the disadvantages. The most serious problem is the waste from nuclear power stations. Nuclear waste (high-level or low-level radioactive waste) is produced at every stage of the nuclear cycle. A typical nuclear power plant produces about 30 tons of used fuel each year. This is not a large amount: all the used fuel produced by all America's nuclear power plants since the first one started operating over 30 years ago would cover an area of a football field about five yards deep. All of America's nuclear power plants produce only about 3,000 tons of used fuel every year. By contrast, the U.S. produces about 300 million tons of chemical waste every year. However, the global amount of spent fuel was 220,000 tonnes in the year 2000, and is growing by approximately 10,000 tonnes each year. Much of this nuclear waste will remain hazardous and radioactive for thousands of years, and it has to be isolated from the biosphere. After it is removed from the reactor, used fuel is stored at nuclear power plant sites in steel-lined, concrete containers. The containers have to be filled with water, because the fuel's temperature is very high and it has to be cooled down.

It is almost unbelievable, but we must admit, that after 50 years of using nuclear energy we still have not found a safe solution for nuclear waste disposal. Most scientists agree that the safest method of highly radioactive nuclear waste disposal is burying waste underground in deep geological disposals. But we are not able to predict if the storage containers, the store itself, or the surrounding rocks will offer enough protection to stop radioactivity from escaping. Before the waste is deposited underground, it has to be stored above the ground for ten years because of the waste's high temperature. One of the most likely mechanisms of pollution in connection with waste disposal in underground rocks is the contamination of groundwater. Underground waters may come into contact with radioactive elements that have leached out from the waste and contaminate the drinking water of local and distant communities. That is why the waste has to be placed in glass containers, which are protected by thick steel canisters.

But we must not forget that nuclear waste remains radioactive for tens or hundreds of thousands of years. No language has ever existed longer than a few thousand years, and no one knows if pictograms or other symbols will be interpreted correctly. There is no reliable method to tell future generations about the existence of nuclear waste dumps.

Comprehension & Vocabulary: *think about the topic of the text and its main features.*

Choose about 7-8 ***key words*** *which describe the topic of the article, you might need to use a dictionary. Then answer the following questions.*

How do people produce electricity? ***What are advantages and disadvantages of nuclear power?***
Why is nuclear waste hazardous? ***What do they do with nuclear waste in nuclear power stations?***

Grammar – Must & Have to: *study all examples of must and have to in the text (underlined).*

…….	……
✓ ***General obligation /necessity, coming from outside*** ✓ ***Adding infinitives by "to"*** ✓ ***More common in scientific language*** ✓ ***Negatives use "don't", "didn't" etc.*** ✓ ***Used in past and future forms***	✓ ***Personal /emotional obligation/necessity, coming from the speaker*** ✓ ***Adding infinitives without "to"*** ✓ ***Less common in scientific language*** ✓ ***Negatives use "not"*** ✓ ***Not used in the past and future forms***

Choose a more suitable form in the following examples.

1. Because of increasing temperature, many species **must / have to** move to colder areas.
2. Rich countries **mustn't / don't have to** ignore the disproportionate exploiting of the world's resources.
3. Due to lack of wood, inhabitants of Western Europe **must / had to** look for new sources of energy at the end of the Middle Ages.
4. We believe that politicians **must / have to** consider their contribution to wildlife conservation.

WASTE - 3

Warm-up – Chemical Elements: *write the correct names of elements, choose their symbols.*

Pb	Sn	Cu	Fe	Na	C	Hg	Au	S

corban _____ *eadl* _____ *sphulur* _____
cporep _____ *nit* _____ *glod* _____
curymer _____ *niro* _____ *posruspho* _____

Na	O	Mg	N	Cr	H	Cl	Al	Ca	U	F

3 names ending with (- gen) _____ _____ _____
6 names ending with (- um) _____ _____ _____
_____ _____ _____
2 names ending with (- ine) _____ _____

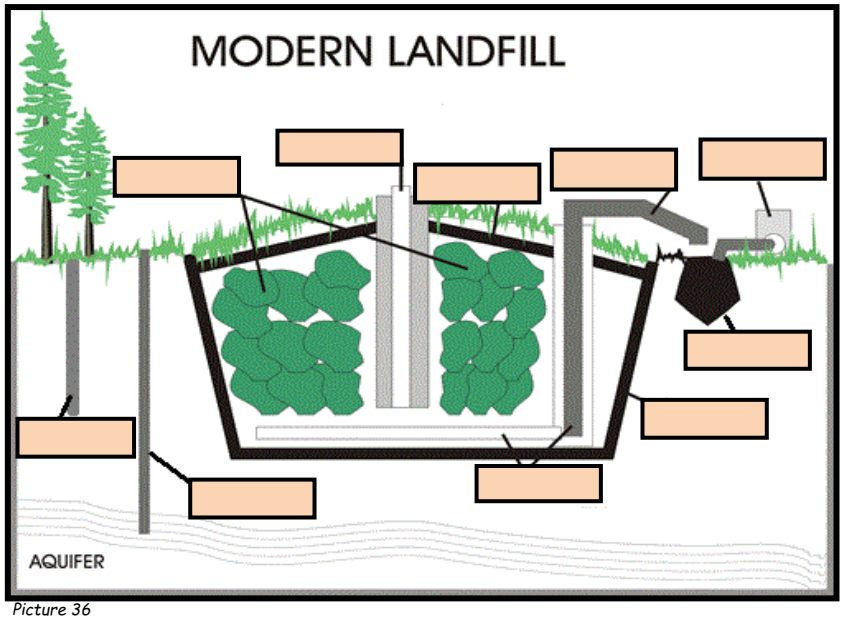
Vocabulary – Materials: *fill in the table with examples of materials.*

metals	plastics	textiles	construction materials

Add examples to each group.

packaging *composting* *recyclable materials* *organic materials* *environmentally friendly*

Vocabulary & Speaking – Modern landfills: *match the terms with the boxes in the scheme.*



Picture 36

cap
leachate drainage system
plastic liner
groundwater well
reservoir / tank
decomposing waste (garbage)
leachate treatment system
landfill gas system
gas explosion monitoring
collection pipes

Describe in details the position and function of each landfill component, use the words / verbs below.

interior *exterior* *base/bottom* *top* *middle* *surface*
front *back* *side(s)* *tip* *edge(s)* *end*

---

store / deposit *transport* *collect* *monitor* *protect X from Y*
purify / treat *cover* *prevent* *pump off* *isolate X from Y*

Reading: COMPOSTING

Starter: What is the best way to treat organic waste?

Composting is the transformation of organic material (plant matter) into a material called compost, usually in a compost pile. Invertebrates (insects and earthworms), and micro-organisms (bacteria and fungi) are able to transform the material into compost. Composting is a natural form of recycling, which continually occurs in nature.

There are many reasons why composting is an important practice. It is one of the ways how to reduce the amount of waste. The product of composting (compost) is beneficial for soil structure, soil fertility, pH balance, erosion control and water retention. Composting is more effective and usually cheaper than landfilling, incineration etc.

Composting uses the natural process of decomposition. When a plant dies, it is attacked by micro-organisms and invertebrates in the soil, and it is decomposed to humus. This is how nutrients are recycled in an ecosystem.

Important factors for the composting process:

A. Carbon and nitrogen are the two fundamental elements in composting, and their ratio (C:N) is very important. The bacteria and fungi in the compost pile use carbon and nitrogen as an energy source. Carbon is the "food" and nitrogen is the digestive enzyme. The proper ratio is 30 parts carbon to 1 part nitrogen (30:1). The composting process slows if there is not enough nitrogen, and too much nitrogen cause the creation of ammonia gas which might create unpleasant odours. Leaves can be a good source of carbon; fresh grass, manure and blood meals are sources of nitrogen.

B. Decomposition in the compost pile is more effective and faster when the compost material is in contact with air. When we want to get the contact with air, we should break the material into smaller parts. The increased surface area means that the micro-organisms are able to digest more material, reproduce more quickly, and generate more heat.

C. The decomposition in the compost pile depletes all the available oxygen. Aeration provides oxygen to the centre of the compost pile. Decomposition can occur only if oxygen is present. This is called aerobic decomposition. It might happen naturally, for example by wind. Turning the compost pile is an effective way to add oxygen and it brings new material into contact with microbes. If the compost pile is not aerated, it may produce an odour characteristic for anaerobic decomposition.

D. Micro-organisms can use organic molecules only if they are dissolved in water, so compost piles should have a water content of 40-60 percent. If the water content is below 40 percent, the microbial activity will slow down or stop. If the water content is above 60 percent, aeration stops, nutrients are washed away, decomposition slows, and the odour from anaerobic decomposition could be released. When you squeeze a handful of the material, it should have the water content of a sponge.

E. Micro-organisms create heat as they decompose organic material. A compost pile with temperatures between 90° and 140°F (32°- 60°C) is composting efficiently. Temperatures higher than 140°F (60°C) are able to stop the activity of many important organisms in the pile. During winter months in cold climates the process of decomposition slows down. Compost piles often release steam in cold weather. Some micro-organisms like cold temperatures and will continue the decomposition process.

(www.oldgrowth.org/compost/compost .html)

Vocabulary – Materials: *fill in the table with words from the first three paragraphs.*

composting activities	*composting site*	*composting agents*	*composting products*

Comprehension – Group work: *read about one factor influencing composting (A-E).*

*Choose five **key words** from the given part and think of a good title for it. Then prepare a short talk (explanation) about the particular composting factor. Use a dictionary if necessary.*

Grammar - Possibility/probability: *study all highlighted examples of modal verbs in the text expressing possibility / probability.*

*Think of and write a few sentences about the present / future of the world (the GE, global warming, climate change etc.), use **can/can't**, **could**, **might /might not**, **may**…*

ENERGY - 1

Discussion & Vocabulary: *fill in the table with words below.*

Renewable sources of energy		Non-renewable sources of energy	
Examples:	Powered by / produced from:	Examples:	Formed from / by:

solar energy ***coal*** ***biofuels*** ***the rotation of turbines by wind*** ***geothermal energy***
fossil fuels ***metal ores*** ***biomass*** ***prehistoric marine organisms 2x*** ***vegetable oils***
wind power ***sunlight*** ***natural gas*** ***biological material (plants)*** ***the Earth's crust heat***
hydro energy ***oil*** ***nuclear energy*** ***movement of water*** ***geological processes***
prehistoric decomposed /compacted organic material ***uranium***

Compare the two groups, use words as:
last ***limited*** ***forever*** ***limitless*** ***living organisms*** ***come from*** ***(in)exhaustible*** ***consume*** ***renew***

Reading: ALTERNATIVE ENERGY

Starter: The alternative sources of energy are not used very much. Why?

Energy comes in many forms – heat, light, sound, electrical and mechanical. There is not any shortage of energy in the world. If you stand on a beach on a windy day you can see the strength of the wind and the waves and the powerful burning light from the sun. The problem is how to convert this energy into the type of energy we need most today – electricity. A device that converts one form of energy to another is called a generator. The traditional generator converts heat energy from coal or gas into electrical energy. The generators of the future will hopefully utilise some renewable form of energy in a similar way.

Wind power has been used for a few hundreds of years in the form of a windmill, which converted mechanical energy (wind) into another form of energy (the milling process). The modern version of the windmill is the aerogenerator (wind turbine), which converts wind energy into electricity. The aerogenerator is relatively cheap and quick to build. Wind power is clean and plentiful, and an aerogenerator does not cause much damage to the environment. But there are also a lot of problems: for example the storage of electricity for calm days – on calm days, when there is not a lot of wind, aerogenerators produce only little energy. And wind power can only be used in few places. Many aerogenerators are sited in coastal or mountainous areas.

Water can provide energy in three ways: wave, tidal and hydroelectric.

1. **Wave power** can be utilised by special facilities such as rafts which convert the wave power into electrical energy. The problem is how to transmit the electrical energy from the sea to the land. Wave power stations can also harm the local ecosystem. They must be carefully planned and located in places where they will not damage marine and shore wildlife.
2. **Tidal energy** is utilised by building a barrage (dam) across a river estuary with a large difference between high tide and low tide. The water rising or flowing back to the sea is used for turning turbines which generate electricity.
3. **Hydroelectric energy** uses the mechanical energy of flowing rivers to generate electricity. It needs fast flowing rivers, so hydroelectric power stations are usually sited in mountainous regions where the current of the river is faster. The power station is a dam which holds a lot of water. The energy of the stored water is used to turn the turbine inside the dam. Like wave and tidal power, hydroelectric power stations have high construction costs, but low running costs – they need only a little money for their operation and service. Hydroelectric power is clean and renewable, but dams and reservoirs can destroy the ecological balance of the rivers and surrounding wetlands.

Solar power is energy generated from the sun. For example solar panels on the roofs of houses heat water for bathing and for central heating systems. The industrial version of the solar panel is the solar furnace, in which huge, curved solar panels, together with a system of mirrors, concentrate a large amount of solar energy onto a small area. The heat energy produces a lot of steam which generates electricity. Solar power is clean, renewable, non-polluting and does not damage the environment. But there are also a few disadvantages – for example, the amount of energy depends on the season, the region of the world, the weather, and solar systems cost a lot of money.

Geothermal energy is the energy from the hot centre of the Earth. The Earth has a core of hot rock under the solid crust. In some places (Iceland, New Zealand…) the crust is very thin and the hot rock is only a few meters under the surface. The energy from the hot rock can be used to heat houses or to generate electricity. If we developed the technology to get deeper under the earth's surface, many other countries could use geothermal energy. Nowadays we use little geothermal energy, although the supply of it is almost limitless.

Vocabulary: *Match the four verbs form the text with their definition/synonym.*

convert	***generate***	***utilise***	***damage***	***transmit***
= produce *(electricity)*	***= use***	***= harm***	***= transport***	***X → Y***

Comprehension: *think about the question in the Starter section and try to answer it.*

Read the first paragraph and answer the following questions:

What is a generator? What are examples of using a generator?

Read the rest of the text and answer the following questions about each type of alternative energy:

What is the source of energy (type of energy)? ***What technology do we need?***
Are there any advantages or disadvantages? ***What is the impact on the environment?***

Grammar – "Quantifiers": *fill in the table according to the examples in the text / questions.*

We use…	*with countables*	*with uncountables*	*in positive sentences*	*in negative sentences*	*in questions*
SOME					
ANY					
MUCH					
MANY					
A LOT OF					
(A) FEW					
(A) LITTLE					

Fill in the sentences with proper quantifiers; answer the questions, if possible.

1. Primitive humans did not use _____ fossil sources of energy.
2. _____ gases in the atmosphere function as greenhouse gases.
3. General environmental indicators can be applied to _____ chosen area.
4. Does wind power have _____ disadvantages?
5. How _____ forms of water power are there and what are they?
6. Aerogenerators produce only _____ energy in comparison to coal-fired power stations.
7. Are there _____ problems with wave power?
8. _____ micro-organisms are able to continue the decomposition process in the pile during winter months.
9. Electricity helps us to operate _____ conveniences: our fridges, DVD players, microwave ovens, PCs etc.
10. _____ landfills had to be closed, because the peak of their capacity had been reached.
11. Can we get _____ details about this project?
12. How _____ is it to prepare 1 hectare of a landfill?

ENERGY - 2

Discussion & Vocabulary: *think about the nouns and verbs in the boxes.*

Nouns:	***Verbs:***
people	***maintain***
energy / power	***convert***
electricity / electrical energy	***provide***
fossil fuels x biofuels	***supply***
life	***develop***
alternative sources of energy	***consume***
energy sources	***utilise***
energy policy	***need***
energy / power systems	***depend on***
power stations / plants	***save x waste***

Study the definitions below and match them to suitable words from the first box.

*How **did /do/will** people get energy for their lives in **the past /today /in the future**?*

Use the words in the boxes to comment on the contemporary problems of energy sources.

- ✓ _____ *are fuels that contain geologically recent energy. They are produced from living organisms.*
- ✓ _____ *contain high percentages of carbon and include coal, petroleum, and natural gas.*
- ✓ _____ *are derived from sources that do not use up natural resources or harm the environment.*
- ✓ *A* _____ *is an industrial facility for the generation of electric power. It usually uses a generator that converts mechanical power into electrical power.*

Reading: THE HISTORY OF ENERGY CONSUMPTION

Starter: What was the first type of energy used by the human race?

INTRODUCTION:

Every form of life and all societies need a constant input of energy. If the energy flow through organisms or societies stops, they cannot function and begin to disintegrate. Some organisms and societies are more energy efficient than others. In general, history shows that more complex industrial societies have the greatest energy needs.

An energy input is essential to maintain life. In any ecosystem, the sun provides the energy to support all forms of life. The first transfer of energy takes place during the process of photosynthesis, when plants convert light energy into chemical energy during the production of food. Herbivores utilise the food energy in the plants. The herbivores provide a source of energy for carnivores. Primitive humans were not different from other animals in an ecosystem, because their energy requirements were supplied by food. In hunter-gatherer cultures people had only biological energy demands; they had to hunt wild animals or gather wild plants to survive.

WOOD

Early in the human history, even before people could read or write, they began to use additional sources of energy, because they wanted to make their lives more comfortable. The development of domesticated plants and animals provided a more dependable supply of food. Domesticated animals were also able to provide energy for transportation, farming and other tasks.

Early civilisations like the Aztecs, Greeks, Egyptians, Romans, and Chinese depended on human muscle, animal muscle, and fire as a source of energy. The material which provided most of the energy for the developing civilisations was wood. The controlled use of fire was the first use of energy in a form other than food. The use of fire also separated humans from other animals. Thanks to the energy of fire, people could cook their food, heat their houses, and they were able to develop a primitive form of metallurgy.

Western Europe and North America were able to use wood as a fuel for a long period of time. The forests of Europe supplied enough fuel until the thirteenth century. But the heavy use of wood resulted in a shortage, and people had to look for alternative forms of energy.

FOSSIL FUELS

They found a new source of energy in fossil fuels, especially coal. The regions of the world which had available coal deposits were able to switch to this new fuel and participate in the Industrial Revolution. During the Industrial Revolution, the burning of coal provided the energy to run machines. The machines replaced human and animal labour in manufacturing and transporting goods. Nations without a source of coal could not participate in the Industrial Revolution. Within two hundred years, the daily energy consumption (per capita) of industrialised countries increased eight times; this energy was supplied primarily by coal. Later new sources of energy were discovered: oil and gas.

But people did not think about the environmental impact of fossil fuels in the past. Nowadays the intensive use of fossil fuels is one the main reasons for global warming and other negative influences on the environment. Human beings must look for alternative and more energy-saving sources of energy.

Vocabulary: *which of the underlined words in the text are synonyms? Form groups below.*

input of energy	***energy flow***	***energy efficient***	***energy needs***
transfer of energy	***source of energy***	***energy requirements***	***energy-saving***
energy demand	***use of energy***	***energy consumption***	

Fill in the sentences with suitable words.

1. Self-fueling incinerators do not need _____.
2. Oil is a non-renewable _____.
3. _____ of an american family is/are uncomparable to a third world family.
4. Natural ecosystems use a perfect _____.
5. Vehicle producers are trying to design more _____ cars.
6. Oil remains the world's major _____, it supplies 40 percent of the world's _____.

Comprehension: *think about and answer the questions below.*

What is the basic transfer of energy?

How did primitive humans get energy?

How did agriculture start?

How did people use fire?

Why did people stop to use wood?

When and how did people start to use coal/oil?

Grammar – "to infinitives": *study usage of "to infinitives" in the text and then fill in the table with more examples.*

Verbs followed by "to infinitives"	***"to infinitives" after adjectives***	***"to infinitives" expressing purpose***
be able to, have to ***would like to*** ***tend to*** ***manage to*** ***try to*** ***expect to*** ……. ……. ……. ……. …….	***(It is) important to*** ***(not) necessary to*** ***essential to*** ***useful to*** ***vital to*** ……. ……. ……. ……. …….	***CFCs production was banned in 1987 by the Montreal Protocol to reduce their destructive effects on the ozone layer.*** ……. ……. ……. ……. …….

ENERGY - 3

Grammar practise – "to infinitives": *rewrite the sentences using "**to infinitives**".*

1. The pressure was increased, because we wanted to get the results faster.

.....

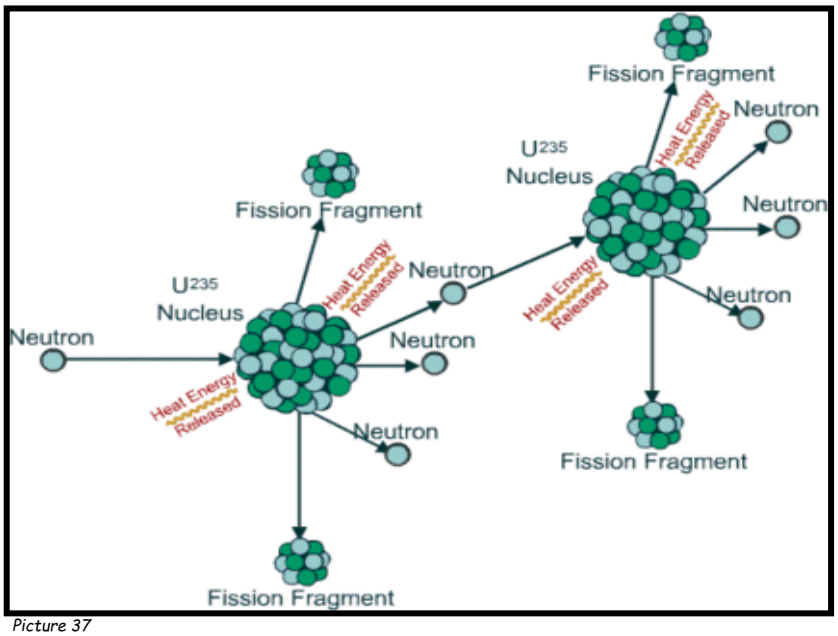
2. We need an intensive worldwide campaign in order to be able to solve the future environmental crisis. *(essential to)*

.....

3. Many African countries have been experiencing problems with the lack of freshwater. *(tend to)*

.....

Discussion & Vocabulary – Nuclear Fission: *study and think about the scheme below.*



Picture 37

Study the nouns and verbs below the picture.

Describe the nuclear reaction, use the words below.

.....
.....
.....
.....
.....
.....
.....
.....
.....

neutron	***atom***	***nucleus/nuclei***	***fission***	***fission fragment***	***heat energy***	***chain reaction***
split	***form***	***hit/bomb***	***release***	***produce/generate***	***lead (to)/cause***	

Reading: NUCLEAR ENERGY

Starter: What is your attitude to using nuclear energy for electricity production?

Nuclear (or atomic) energy comes from the energy in the nuclei of atoms. Atoms are the basic building blocks of all **matter**. Atoms contain small negative **particles** (electrons) which move around the central nucleus. The nucleus contains positive particles (protons) and neutral particles (neutrons), holding them together with a large amount of energy. In all chemical reactions the arrangement of electrons changes but the nuclei do not change. In a nuclear reaction, the arrangement of protons and neutrons changes. Most reactions in the world are chemical reactions; nuclear reactions are rare. Every nuclear reaction produces energy in the form of radiation.

In a **nuclear fission**, the nucleus of an atom splits and it releases some protons or neutrons and a large amount of energy. For example, when an atom of uranium-235 splits, it forms two smaller atoms ("fission fragments") and it releases three neutrons. Uranium-235 is the fuel for the nuclear bomb. But it is not easy when we want to split the nuclei of an atom. There are only few substances in the world, which have unstable nuclei. These substances undergo a process of natural radioactive **decaying**. This natural decay is very slow, sometimes it takes hundreds of years. Being very slow, the process releases only little energy.

In the 19th century, the British scientist Baron Rutherford **discovered** how to split nuclei more quickly. He bombarded the nuclei with high-speed neutrons. When you bombard nuclei with high-speed neutrons, the neutrons split the nuclei, which release another free neutrons. These neutrons bombard other nuclei and the result is a chain reaction. The chain reaction leads to a fast, explosive release of energy. This is the principle of nuclear weapons and nuclear power stations, which convert the energy of nuclear fission to electricity.

The most common type of a nuclear power station today is **the pressurised water reactor**. The fuel in the core of the reactor is uranium-235. The reactors use special heavy metal or graphite **rods**, which regulate the speed of decay of uranium-235, because they absorb free neutrons. The energy from nuclear fission is used for heating water under pressure and producing steam. This steam turns a turbine, which generates electricity.

The nuclear energy does not produce greenhouse gases or other air pollution. It is also much cheaper than energy from **combusting** fossil fuels. But it also presents some problems. There is a danger of an accident. Nuclear power stations are also a potential source of harmful radioactive radiation. The radiation causes cancer and birth effects. The most serious problem is the nuclear waste – the **used fuel** produced by operating nuclear reactors. The nuclear waste is highly radioactive and toxic. It loses the radioactivity very slowly; sometimes it takes hundreds of thousands of years.

And there is always a danger of using a nuclear weapon. Today's nuclear weapons are thousands of times more powerful than the nuclear bombs which the US used in 1945.

(according to Environment Today, Greenhalgh Trisha, Longman, 1997)

Vocabulary: *study all highlighted words / terms in the text.*

Try to guess the meaning of the highlighted words according to their context, if necessary use a dictionary.

Comprehension: *use the highlighted words to explain how a nuclear power station works.*

What are advantages and disadvantages of nuclear power? What is your personal opinion about using nuclear energy? Try to use your own ideas to advocate or protest against nuclear energy.

Grammar – Gerunds: *study usage of gerunds in the text and then fill in the table with more examples.*

Verbs followed by gerunds (…-ing)	*Gerunds after prepositions / connectors*	*Gerunds as nouns*	*Gerunds as participles*
like, love, hate, (don't) mind… ***start, continue, finish…*** ***can't help…***	***after, before, until…*** ***for, from, like, as*** ***w_ _ _, a_ _ _ _*** ***b_, a_, i_, o_***	***<u>using</u> organic fertilizers*** ***smoking*** ***swimming*** *…*	***<u>being</u> very slow***

*Rewrite the sentences, use **gerunds** and words in the brackets. Fill in the boxes with proper forms of the verbs.*

1. Ozone is essential. It absorbs ultraviolet rays. (for)

……

2. Because CFCs are extremely stable, they remain active for a long period of time.

……

3. The impact of acid rain on trees ranges from minimal to serious; it depends on the region and on the type of pollutant.

……

4. Sulphuric and nitric acids travel long distances with air currents and later they become acid rain. (before)

……

<u>Verbs followed by "to + infinitives":</u>

Most countries _____ to ban the production of CFCs.

Developing countries _____ to have serious problems with overpopulation.

Sustainable development procedures _____ to reduce our future environmental impact.

European countries _____ to increase the share of renewable sources in energy production.

The Czech government should _____ to extend mining limits in the Most region.

Environmental NGO's _____ to promote reducing the share of nuclear-based energy.

tend, intend, try, agree, plan, refuse, manage, expect, decide...

<u>Verbs followed by gerunds:</u>

Ireland doesn't _____ smoking in bars.

Elementary schools should _____ eating healthy food.

The job _____ travelling to Japan once a month.

Most European countries do not _____ hunting wild animals without a special licence.

The government _____ implementing new strategies for using biofuels.

Environmental NGO's _____ reducing the share of nuclear-based energy.

Municipal offices should _____ recycling plastic bottles and paper.

encourage, urge, permit, involve, allow, support, propose...

THE ENVIRONMENT OF THE CZECH REPUBLIC - 1

Vocabulary: *use the terms below to complete the sentences, sometimes it is necessary to find a proper form of the words to suit the sentences.*

capital city ***polluted area*** ***lowland*** ***affluent*** ***spring*** ***basin*** ***upland*** ***peat land***
Moldau ***river basin*** ***border*** ***protected landscape area*** ***Elbe*** ***flood plain*** ***poison***

The river _____ _____ in the mountains and then it flows through fertile _____.

The highway from the _____ to the Czech-German _____ goes through a _____.

The brown coal _____ in Northern Bohemia is situated inside a very _____.

The river _____ has many _____ and its _____ is very large.

Peat from _____ is a very good fertilizer.

The _____ ecosystems on riverbanks of many Czech rivers are very vulnerable to human impact.

In the southeast of the Czech Republic, there is a large _____.

During the 1980s, acid rain _____ large forest areas in Northern Bohemia.

Discussion: *study the map, describe the Czech Republic*

Describe in details the following features of the Czech Republic. Find facts about CR at www.czech.cz or www.czechtourism.com/home/ (or similar websites).

- ✓ ***geographical features***
- ✓ ***location***
- ✓ ***physical features***
- ✓ ***population***
- ✓ ***industry and agriculture***
- ✓ ***transport***
- ✓ ***political situation***
- ✓ ***history***
- ✓ ***environmental issues***

Picture 38

Reading: THE TERRITORY AND THE CLIMATE OF THE CZECH REPUBLIC

Starter: Try to characterize the geographical position and the climate of the Czech Republic.

The Czech Republic is a **landlocked** country situated in the middle of a **temperate** zone of the northern hemisphere in the central part of Europe. Among European states it **occupies** 21st place in terms of area (78 866 km$^{2)}$, 12th place in terms of the number of inhabitants (10 512 419, 31.12.2013) and 13th place in terms of population density (130 people per 1 km$^{2)}$. It **shares** its border with Poland (761.8 km), Germany (810.3 km), Austria (466.3 km) and Slovakia (251.8 km).

The Czech Republic is the source of the main European **watersheds**, because it **divides up** the watersheds of the North, Baltic and Black seas. The watershed junction of these three seas is Kralicky Sneznik (1 423 m above sea-level). The main river axes in Bohemia are the river Elbe (Labe) (370 km) and the river Vltava; in Moravia, mainly the river Morava (246 km) and the river Dyje (306 km); and in northern Moravia and Silesia, the river Odra (135 km) and the river Opava (131 km).

The Czech Republic lies on the **junction** of two mountain chains, which are different in age and geological and geomorphological evolution. Western and central Bohemia are filled up with the Czech Highlands, which were **formed** at the end of the Palaeozoic. They have an upland and low mountain nature (Sumava, Cesky les, Krusne hory, Krkonose, Orlicke hory, Jeseniky). The Western Carpathians push into the eastern part of the state, which gained their present form in the Tertiary (Beskydy). The boundary between both mountain systems is filled up with a ravine zone.

The **climate** of the Czech Republic is mild but variable locally and throughout the year. It **differs** markedly among the various regions of the Czech Republic, depending on the height above sea level. **Generally** speaking, the higher you are, average temperatures may drop more and **rainfall** is more likely. Many other factors also play a role in this – the border mountain ranges, for example, **significantly** influence ground-level air flow and rainfall.

Various height levels of the sun during the year **cause** the changing of the seasons, differentiated from each other mainly by the development of temperatures and precipitation. **Similarly** to the **whole** moderate northern band, the beginning of the year in the Czech Republic is also characterized by a **cold** winter. Spring is followed by a **warm** summer and **chilly** autumn. The alternation of the seasons has a marked effect, above all on **vegetation**. The damp (wet) continental climate over most of the Czech Republic causes warm summers with a lot of rain; cold, snowy winters; and generally changeable conditions. July is the hottest month everywhere, January the coldest. From December through February, temperatures are below freezing (0^0Celsius) even in the lowlands, and are much lower in the mountains. There is no real 'dry season', and the long, sunny hot summer is often broken by sudden, heavy **thunderstorms**. Winter brings 40 to 100 days of snow on the ground (about 130 in the mountains), plus fog in the lowlands.

The weather at any given time may differ significantly from the long-term average. This variability of the weather is caused mainly by the changeable location and magnitude of two main pressure centers: the Icelandic Low and the Azores High. Mainly during the warm middle of the year, it can generally be said that expansion of the high **pressure** projection into our territory causes warmer and drier temperatures, whereas the Icelandic Low manifests itself with a greater number of atmospheric fronts, which bring more clouds and precipitation.

The climate of the Czech Republic can then be labeled as **moderate**, of course with great local diversity seen throughout the year. Further changeability then is up to the weather itself.

(according to www.czech.cz)

Vocabulary: *divide the highlighted words into the four categories below.*

nouns	verbs	adjectives	adverbs

Comprehension: ***study the text and choose the most relevant data.***

Use the words listed above to describe the territory and the climate of the Czech Republic.

Grammar – "Noun Modifiers": *study the examples of noun modifiers in the text (highlighted in yellow).*

Study the following examples and think about the highlighted expressions.

Millions of tons of carbon dioxide are released **into the air**.

The temperature is increasing **like in a greenhouse**.

People, living in urban areas, are suffering **from air pollution**.

Human activities produce **a lot of greenhouse gases**.

Noun modifiers (nouns as adjectives) = nouns connected to a basic noun to form multiple-word names, terms, expressions etc.

Think of nouns which could be added to (in front of /after) the following words.

habitat, earth, soil, nature, animal, plant, waste, energy, acid, water, wind, fuel…

……

……

THE ENVIRONMENT OF THE CZECH REPUBLIC - 2

Warm-up – The Czech Republic data: *complete the chart, use the data from the list below.*

The highest point	
The lowest point	
The largest pond	
The largest lake	
The longest river	
The largest watershed area	
The warmest mineral spring	
The deepest gorge	
The largest national park	
The largest protected landscape area	
The settlement with the highest elevation	
The settlement with the lowest elevation	
The largest settlement	
The smallest settlement	
The largest dammed area	

Černé jezero - Black Lake (18.4 ha, max. depth - 39.8 m, Klatovy district)
Hranická gorge (244.5 m, Prerov district)
Prague (1,246,780 inhabitants (1. 1. 2013), the capital city)
Beskydy (1,160 km^2, the Beskydy mountains)
Vřídlo at Karlovy Vary (72 °C)
Šumava (685.2 km^2, the Šumava mountains)
Vltava (433 km)
Labe (51,103.9 km^2)
Hřensko (130 m above sea-level, Děčín district)
Filipova Hut' (1,093 m above sea-level, Klatovy district)
Rožmberk, 489 ha (max. depth - 6.2 m, Jindřichův Hradec district)
Závraty (14 inhabitants, České Budějovice district)
Sněžka, 1,602 m above sea-level (Krkonoše mountain range)
Lipno (4,870 ha, in the Český Krumlov and Prachatice districts)
Labe effluence at Hřensko (115 m above sea-level, Děčín district)

Reading: USTI NAD LABEM REGION

Starter: What do you know about the area surrounding Ústí nad Labem?

Location

Usti nad Labem (Ustecky) region is situated in the northwest of the Czech Republic, along the border with the Federal Republic of Germany. To the northeast it borders with Liberec region, to the west with Karlovy Vary region and a small part of Pilsen region. To the south it borders with Central Bohemian region. The north border of the region is also the border with German Saxony region.

Along the border with Germany, the area is enclosed by Krusne hory, Labske piskovce and Luzicke hory mountain ranges. The southeast of the region consists of flatland, from which rises Ceske stredohori. Majority of the region belongs to the Elbe drainage area, which is the most important waterway in the Czech Republic and which enables water transport among the Czech cities situated on the Elbe and Vltava rivers and places in Germany, as well as the North Sea port Hamburg. The rivers Ohre and Bilina cross west part of the region. Decin Township has the river Ploucnice.

Population

The area of Usti region is divided to seven townships with 354 municipalities. Considering the population (according to the Czech Statistical Office), the Usti region with the 819 442 persons in 2002 placed fifth in the Czech Republic. The population density is higher that the state average and is different from township to township. Area with the highest density is the lignite coalfield near Krusne hory mountains. The area of 5,335 sq. km takes 6.8% of the Czech Republic overall area.

Industry
The industrial importance of the region is given by the rich mineral resources, especially the lignite coalfields and the power and chemical industries connected with the coalfields. The economical activities, in the past aimed especially at the coal mining, power industry and chemistry had and still has negative influence on the environment. Structural changes during the last couple years caused the number of jobs in the industry decrease. Services industry was not able to offer enough job possibilities, which resulted in the increased rate of unemployment. Agriculture in the region is mainly famous for vegetables and hops growing.

Transport
Through the townships of Teplice and Litomerice runs an important international road E 55 connecting the north and south of Europe. Near Lovosice, the road changes to D 8 highway. Next important road connection is the road along Krusne hory to Germany, through Chomutov and Louny to Prague.
The main train connection is the international line from Germany through Usti nad Labem to Prague.

Specifics
Owing to its rich settlement history, Usti region has many historical sights. Among the most popular are the baroque castle in Duchcov, Romanesque rotunda on Rip, gothic church in Most, monastery in Osek and the castles Ploskovice and Libochovice. In the regional gallery in Litomerice exceptional painting collections can be found. From the natural beauties, the most famous is the National Park Ceske Svycarsko with well-known Pravcicka brana.

Comprehension: *study the text above.*

Grammar - Summarizing: *study the structure of the summarizing process.*

1. **Identifying the key points of a text**
2. **Paraphrasing key points at a sentence-level**
3. **Transforming sentence-level paraphrases into reported speech**
4. **Adding sequential markers**

Prepare a summary of the text, try to use the following structures:

in general…, according to (the facts, the text)…, given the (facts/information/hypothesis)…, in short, as noted by, generally speaking…, in my opinion/in my view…, as suggested in the text…, in summary, bassically, in other words, for example, such as, for instance…

Project work I: *think about the text above.*

Prepare a speech / presentation about your hometown and the surrounding region.
Focus on the following areas:

1. **Geographical and demographic features**
2. **Agriculture and industry**
3. **Environmental problems/issues**
4. **Cultural and social issues**
5. **My hometown/region and the EU**

Collect all neccesary data and terms from the following and similar / corresponding web pages:

http://www.czech.cz/en/Home-en
http://europa.eu/index_en.htm
http://ec.europa.eu/ceskarepublika/index_cs.htm
http://www.kr-ustecky.cz/EN/

THE ENVIRONMENT OF THE CZECH REPUBLIC - 3

Warm-up – Vocabulary overview: *complete the sentences with suitable words in proper forms.*

SOx and NOx react with water in the atmosphere and they produce _____.

In the atmosphere, there are _____ which trap heat radiation and regulate the Earth's temperature.

A/an _____ is usually a hole in the ground filled with _____ .

High concentrations of nutrients in water stimulate blooms of _____.

Paper, glass, plastics and metals are _____ materials.

Water which goes down through a landfill creates _____. It is a harmful liquid full of pollutants and landfill companies have to _____ and _____ it, because it may _____ ground water.

The product of composting is _____.

A hydroelectric power station is usually a/an _____ across a river.

80% of _____ (waste from households) goes into landfills.

Modern agriculture uses a lot of _____ to increase soil fertility.

In 1930s, people started to use _____, which destroy ozone and cause ozone _____.

The sun _____ heat energy.

We need to build a/an _____ to use wind as a source of energy.

Burning of waste, called _____, produces polluting gases, heat and _____.

Acid rain kills coniferous trees, because it _____ the level of nutrients in the soil.

The process of depleting O_2 in a water ecosystem (caused by overgrown algae) is called _____.

Nuclear waste is _____ for thousands of years and we have to put in steel _____.

Reading: THE QUALITY OF THE ENVIRONMENT IN PRAGUE

The environment, especially the air pollution in the town centre and some closer suburb areas is very similar with the most affected regions such as the Usti region, the Liberec region and the Moravian-Silesian region. The landscape was deforested, dried and built over. The terrain was heightened by embankments, Vltava was regulated and weirs were built. When the town fortification was cleared down, the space was used, in contradiction to other European cities, as building space and therefore there is not much greenery in Prague.

The quality of air in Prague is, even though there were some improvements over the last ten years, unsatisfactory. The pollution of air by sulphur dioxide decreased over the last ten years, but it is still over the annual limit (Air Pollution Act and regulations to the law) in the centre of the town and in the Vltava valley. The air pollution by air borne dust also decreased, but it is still slightly over the annual limit (20 % of the area). The tetroxide nitrogen pollution is over the limits in all monitored aspects and is the worst in central Prague, along the main car traffic arteries.

The numbers for the dust and sulphur dioxide pollution slowly increase in the long term. The air pollution by lead continually decreases in Prague. With the increase in car traffic during summer months also the ozone concentrations increase, but this increase is not dramatic, yet.

The most serious problem of the physical issues is noise emissions. From this point of view, Prague is the worst affected region in the whole of Czech Republic. The number of inhabitants exposed to the high level of noise reaches approximately 30 %. It is supposed that approximately 90 % of the acoustic energy in the town is

generated by the road traffic. The influence of vibrations on the human body has similar results as the high level of noise. The vibrations also strongly influence the condition of buildings and often are the cause of serious and irreversible damage of the historical sights. Thermal pollution is mainly connected with the changes in the character of the town's landscape.

From the point of view of the environment preservation, there are four state nature preserves in the area of Prague (Prokop Valley, Radotin Valley, Roztoky Grove, Satalice Pheasantry), two preserved natural areas (Petrin Rocks, Royal Preserve), two protected habitats and 75 protected natural monuments.

*(taken from **www.czech.cz**)*

Reading: ENVIRONMENTAL ISSUES IN THE EUROPEAN UNION

Protected areas in the EU

Recognising that nature does not respect national borders, the EU has strong nature protection legislation. Starting with measures to protect wild birds and extending this to many threatened plants and animals and their habitats, this has culminated in the creation of Natura 2000, a pan-European network of areas designed to protect species and habitats in their natural environment. Consisting of over 26 000 sites, the network is the largest in the world. Now virtually complete, it covers almost 18 % of EU territory — an area equivalent in size to the Czech Republic, Germany and Poland combined. Natura 2000 recognises that humans are an integral part of nature and that the two work best in partnership with one another. Its aim is not to exclude economic activities, but rather to place certain limits on them so as to safeguard valuable species and habitats. Its financing is integrated into key EU policy sectors. Agriculture, particularly its rural development strand with agri-environment and forest measures, is the most important of these. The EU's cohesion policy (which encourages economic growth in EU Member States and regions) plays a major role in funding investments, especially in the new Member States. The Natura 2000 programme nurtures healthy ecosystems which provide valuable services such as fresh water, carbon storage and protection against floods and coastal erosion. Collectively, these services are estimated to be worth EUR 200 to EUR 300 billion a year — significantly more than the annual cost of some EUR 6 billion to manage the network.

Biodiversity

One of the core aims of European environmental policy is to protect the web of life that surrounds us. The natural world faces many threats around the globe, and biodiversity — the term used to emphasise the richness of the natural world with all its species and genetic variety — is in decline all over the planet. To counter those threats, the EU is committed to halting and reversing the loss of biodiversity and ecosystems by 2020. Biodiversity is important in its own right, but it also provides a vital stream of goods such as food, fibre, fuel and medicines, and it performs essential services like climate regulation, flood prevention, water purification, pollination and soil formation. All are necessary for economic prosperity, security, health and quality of life. The EU first adopted a biodiversity action plan in 2006. Then, just months after the world agreed an ambitious global agenda in Nagoya, Japan, it finalised an updated strategy in early 2011. This has as a headline target to halt the loss of biodiversity and the degradation of ecosystem services in the EU by 2020, restoring them as far as feasible, and to increase Europe's contribution towards averting biodiversity loss globally.

(according to http://europa.eu/pol/env/index_en.htm)

Project work 2: *study the texts above.*

Prepare a speech / presentation about environmental issues of the Czech Republic (and the EU). Focus on the following areas:

1. **The environment in the CR in the past**
2. **The environment in the CR in the early 90's**
3. **The environment in the CR after 2000**
4. **What should be done in the area of the environmental protection in the future?**
5. **How does the European Union promote environmental issues?**

Collect all neccesary data and terms from the following and similar / corresponding web pages:

http://www.czech.cz/en/Home-en
http://europa.eu/index_en.htm
http://ec.europa.eu/ceskarepublika/index_cs.htm

List of picture links and references:

Picture 1 - http://en.wikipedia.org/wiki/Outline_of_the_Czech_Republic

Picture 2 - http://www.google.cz/url?sa=i&rct=j&q=&esrc=s&frm=1&source=images&cd=&cad=rja&docid=Ur-Qu1aw6Kx9GM&tbnid=2grD44vbJAq3OM:&ved=0CAUQjRw&url=http://www.iphoneglance.com/index.php/2013/01/01/water-cycles-a-fun-educational-app-review/&ei=LApUUuvOFoHvswbxmIHwDA&bvm=bv.53760139,d.Yms&psig=AFQjCNF_5rcU92bt2lax55HvHkJ6KDHm_A&ust=1381325651464339

Picture 3 - http://www.infovisual.info/01/003_en.html

Picture 4 - http://upload.wikimedia.org/wikipedia/commons/d/db/Photosynthesis.gif

Picture 5 - http://en.wikipedia.org/wiki/File:Ursus_arctos_-_Norway.jpg

Picture 6 - http://en.wikipedia.org/wiki/File:Masai_Giraffe_right-rear_foot.jpg

Picture 7 - http://en.wikipedia.org/wiki/File:Tanzanian_Elephant.jpg

Picture 8 - http://en.wikipedia.org/wiki/File:Red_deer_stag_2009_denmark.jpg

Picture 9 - http://en.wikipedia.org/wiki/File:Lacertae_skin.jpg

Picture 10 - http://en.wikipedia.org/wiki/File:House_Sparrow_mar08.jpg

Picture 11 - http://en.wikipedia.org/wiki/File:White_shark_(cropped).jpg

Picture 12 - http://upload.wikimedia.org/wikipedia/commons/e/e9/Lonesome-Lake-Moose.jpg

Picture 13 - http://en.wikipedia.org/wiki/File:Golden_Eagle_in_flight_-_5.jpg

Picture 14 - http://en.wikipedia.org/wiki/File:Blacksquirrelrev.jpg

Picture 15 - http://en.wikipedia.org/wiki/File:Esox_hdm.JPG

Picture 16 - http://en.wikipedia.org/wiki/File:Austropotamobius_pallipes.jpg

Picture 17 - http://en.wikipedia.org/wiki/File:Lightmatter_chimp.jpg

Picture 18 - http://blog.growingwithscience.com/2011/11/weekend-science-fun-birds-of-the-rain-forest/

Picture 19 - http://en.wikipedia.org/wiki/File:FieldWindbreaks.JPG

Picture 20 - http://organic-rams.co.nz/organic-rams.co.nz/SABBATICAL_FALLOWING.html

Picture 21 - http://www.country-magazine.com/photography/scenic/scenic-prairie-tapestries/

Picture 22 - http://www.oneacrefund.org/blogs/information/post/http-www.oneacrefund.org-blog-p1432/559

Picture 23 – http://www.extension.umn.edu/agriculture/tillage/optimum-tillage-systems-for-corn-and-soybean/maintaining-crop-residue-with-different-tillage-systems/

Picture 24 - http://stormwater.montana.edu/resource/!SSL!/WebHelp/Gallery/Surface_Stabilization_BMPs/general_photos_14.htm

Picture 25 - http://www.lakescientist.com/lake-facts/water-quality/

Picture 26 – http://eutrophication.yolasite.com/

Picture 27 – http://chemistry.tutorvista.com/biochemistry/eutrophication.html

Picture 28 - http://www.glogster.com/autumnsnow/acid-rain-poster/g-6m903nofhna35u28vkl77a0

Picture 29 – http://www.epa.gov/ttn/chief/trends/trends98/chapter3.pdf

Picture 30 - http://www.epa.gov/ttn/chief/trends/trends98/chapter3.pdf

Picture 31 - http://blog.dssresearch.com/?p=229

Picture 32 - http://www.climatechoices.org.uk/pages/cchange3.htm

Picture 33 - http://knowledge.allianz.com/environment/climate_change/?126/what-is-the-greenhouse-effect

Picture 34 – http://ch.myclimate.org/uploads/media

Picture 35 - http://www.chemicool.com/

Picture 36 - The National Energy Education Project, Public Domain

Picture 37 - https://sites.google.com/site/worldwidescience12134/home/energy-resources-and-consumption/nuclear-energy

Picture 38 - http://en.wikipedia.org/wiki/File:Un-czech-republic.png

VOCABULARY LIST

Ecology Basics:

Adjectives:
bad
big
broad
cold
diverse
dry
easy
environmentally friendly
far
fast
good
harmful
high
important
interesting
large
long
narrow
populated
renewable (non-renewable)
tall
widespread

Verbs:
appear
become
change
die
eat
have
hunt
influence
kill
live
need
produce
use

Nouns:
activity
air (the)
animal
animals
area
atmosphere (the)
balance
beak
carnivores
claws
climate
carbon dioxide (CO_2)
component
compound
cones
coniferous trees
crossbill (the)
cycle
dead organic matter
deciduous trees
decompose
deforestation
desertification
detritivores (decomposers)
device
document
ecosystem
element
energy
environment (the) (biological, physical)
erosion
event
facility
feathers
food and shelter
fossil fuels
Gaia hypothesis (the)
greenhouse effect(the)
habitat
habitat
herbivores
human beings
industry
influence
institution
instrument
interaction
interference
land
larch
layer
location
material
matter
metamorphosis
nature
niche
nuclear power
nutrients
oxygen (O_2)
object
omnivores
organism
person
photosynthesis
pine
plants
pollution

population
primary producers
process
product
rainforest (the)
reaction
region
relationships
resources (renewable, non-renewable)
seeds
soil
source (of energy)
space
species
spruce
structure
substance
tail
tool
trend
unit
waste
water
wildlife
wings

Earth Science

Adjectives:
agricultural
arable
average
biological
capital
cold
constant
dominant
dry
frozen
gaseous
high
hot
impermeable (material)
liquid (liquid substance)
low
marine
mild
permanent
rapid
slow
solid (solid substances)
thick
thin
warm
wet
windy

Verbs:
absorb
accumulate
cause
combine
compact
condense
contain
cool
cover
damage
evaporate
fall down
flow
form
harm
help
increase
move (to)
originate
precipitate
radiate (heat)
reflect
remain
rise
run (off the surface)
use

Nouns:
affluent
angle of latitude
angle of longitude
area
atmosphere (the)
basin (brown coal basin)
Black Triangle (the)
border
branch/brook/stream/creek
breathing
burning (burning processes)
carbon dioxide
city
climate
clouds
component
confluence
continent
core (the)
crust (the)
country
decay
decomposition
degree
deposit
desert
diversity (biological)
Earth (the)
East (the) (in the east of…, to the east of…)
Equator (the)
flood area
flood plain
floor
forest / woodland
fossil fuels
gas (substance)
glacier
globe
grassland
grasses
ground (the)
groundwater
group of islands
gulf (bay)
highland / upland
highway / road
hill
channel
iceberg
impact
Industrial Revolution (the)

industry
island
lake
land
latitude
loam
longitude
lowland
mantle (the)
meadow
Mediterranean scrub (the)
meridian (Zero Meridian)
minute
Moon (the)
mountain
mountain range
nitrogen
North (the) (in the north of…, to the north of…, in the Northern Hemisphere,
at the North Pole)
ocean
oxygen
pasture land / grazing land
peat
peat land
peninsula
planet
pond
precipitation
pressure
protected landscape area
rain
rainforest
railway
rainwater
river
river basin /watershed area
route (transportation route)
savanna(h) (the)
sea (the)
sanctuary
seasons (spring, summer, autumn (fall), winter,
dry/west season)
seawater
soil (the)
South (the) (in the south of…, to the north of…, in the Southern Hemisphere,
at the South Pole)
spring
state
strait
Sun (the)
surface
swamp
taiga (the) (boreal forest)
temperate deciduous forest (the)
temperature
town / urban district / village / settlement
tropical rainforest (the)
Tropic of Cancer (the)
Tropic of Capricorn (the)
tundra (the)
valley
vegetation
water vapour
West (the) (in the west of…, to the west of…)

Wildlife

Adjectives:
cold-blooded
curved
domesticated
extraordinary
female
fertilised
flexible
large
long
male
organic
pointed
reproductive
rough
rounded
sharp
short
small
smooth
straight
strong
suitable
thick
thin
useful
worm-blooded

Verbs:
absorb
bring
contain
dig
domesticate
fly
form
germinate
hold
join
lay
pollinate
produce
protect
react
release
support
take place
transport
weigh

Nouns:
amphibian
antler
backbone (spine)
bark
beak
bird
branch
bud
bulb
bull
calf
cancer
canopy
carbon cycle
carbon dioxide
cell (sex cells)
chlorophyll
claw
commensalism (commensal relationship)
competition (to compete)
cow
crop
diseases
diversity (biological)
ears
egg
feather
female
fertilization
fin
fish
flower
fruit
fur
germination
gill
hair
herd
hole
hoof /hooves
horn
host
infertile
inorganic matter
insect
invertebrate
ivory
layer
leaves
leg (forelegs and hind legs)
maize
male
mammals
mass
matter
muscle
mutualism (mutualistic relationship)
nutrient
organ

oxygen
parasite (parasitic relationship)
parasitism
petal
poacher
pollen
pollination
predator
prey
reptile
resistant
root
root hairs
root system
scale
seed
shell
shoot system
spider
spinal column
stamens
stem
stigma
sugar glucose
sunlight energy
tail
thorn
timber
time (breeding time)
tribes
trunk
tusk
understory
wing
wood
worm

Land Use

Adjectives:
ancient
conventional
cramped
effective
endangered
flat
genetically modified
gentle (slope)
harmful
hazardous
healthy (unhealthy)
industrial
industrially produced
low
modern
natural
organic/bio
rapid
resistant
right (angle)
safer
steep (slope)
sustainable
synthetic
toxic
undemanding
unwanted
wide
widespread

Verbs:
aerate
apply (liquid fertiliser)
breed
cart (straw)
combine
control (pests)
cultivate
decompose
degrade
domesticate
expose
fallow
fallow
feed
fertilise
flower
generate
germinate
graze
grow
harm
harvest
hold
house
increase
infest
irrigate
join
make (hay)
milk
pasture
pick
plant
plough/plow
pollinate
prevent
protect
provide
raise
rake
reduce
release
remove
reproduce
ripen
slow
sow
spray
spread slurry (manure)
store
tend
threaten
till
wean
weed (out)

Nouns:
access
aggregate
agriculture
apple
barley
beans
carrot
cereal
clay
clover
contour
corporation
exposure (to pesticides)
fallowing
fertilizer
forage
fruit
grass (grasses)
gravel (gravel soils)
husbandry (animal husbandry)
intake (of pesticides)

legume
lentil
livestock (livestock waste)
loam
lucerne
maize (corn)
moisture
mustard
oat
oilseed
olive
peanut
pea
pesticide
pore
potato
remain
residue (crop residue)
rice
root crop
rotation (crop)
rye
sugar beet
silt
soil (sandy soils)
soil fertility
soil particle
soybean
straw
strip
stubble
sunflower
terrace
turnip/rape plant
use (of pesticides)
vegetables
welfare
wheat
windbreaks

Pollution

Adjectives (+Adverbs):

active
algal
artificial
beneficial
cheap
constant
contaminating / contaminated
dischargeable
discharged
disposable
disposed
dry
essential
exposed
flammable
global
harmful
harmless
horizontal
hot
household
increased
industrial
infrared
low-lying
ordinary
organic
poisonous
polluting / polluted
possible
rapidly
recyclable
recycled
serious
significant
slowly
stable
thermal
thick
thin
toxic
treatable
treated / untreated
ultraviolet
unpleasant
various
vertical
warm

Verbs:

absorb
affect
agree
allow
attach
ban
become
benefit
block
breathe
bring
burn
cause
change into
contain
contaminate
contribute (to)
cover
damage
decrease
deplete
deposit
descend
discharge
discover
dispose
disturb
double
emit
enter
escape
expand
expect
expose
fall (down)
form
go through
harm
increase
interfere (with)
kill
lead (to)
leak (into)
melt
operate
pass (in / out)
pollute
predict
produce
protect (from)
radiate
reach
react
recycle
reduce
reflect
regulate
release
remain
remove

rise
show
split
stimulate
suffer
trap
treat

Nouns:
acid
agriculture
algae
atom
axis
balance
bloom
burning (burning processes)
carbon dioxide
CFCs (chlorofluorocarbons)
chlorine
climate
condition
contaminant
contamination
cooling equipment
curve
damage
discharge
disposal
Earth's surface (the)
effect
emission
eutrophication
exhaust fume
factory
fertiliser
figure
flow regime
fossil fuels
gas
global warming
graph
greenhouse
greenhouse effect (the)
greenhouse gases
harm
heat
heavy metals
husbandry (animal husbandry)
ice
icecap
industrial agriculture
industry
light
light energy
maximum point
molecule
nutrients
oxygen
ozone
ozone depletion
ozone layer
peak
plateau
pollutant
pollution
power station
production
progress
radiation
rain (acid rain)
rainfall
ray
reaction
recycling
refrigerants
run-off
scientist
sewage
snow
source
stratosphere
sunlight
temperature
thinning
time period
traffic
treatment
trend
vehicle
warmth

Waste

Adjectives (+Adverbs):

acidic
aerobic
agricultural
alkaline
anaerobic
beneficial
biodegradable
carcinogenic
cheap
chemical
combustible / non-combustible
commercial
complex
concrete
construction/demolition (waste)
controlled
deep
different
difficult
digestive
enormous
extensive
flammable / non-flammable
full (of)
fundamental
gaseous
hazardous
household
industrial
inert
infectious
liquid
medical
microbial
natural
nuclear
organic
photodegradable
plastic
poisonous
primary
radioactive
reactive
recyclable / non-recyclable
reliable
safe
self-fuelling
sewage
solid
special
steel
steel-lined
suitable
used
volatile

Verbs:

aerate
become
break
bring
burn
bury
close
collect
contaminate
contribute (to)
convert
cool (down)
cover
create
deplete
deposit
digest
dissolve
generate
handle
incinerate
isolate X from Y
mix
monitor
occur
predict
prepare
present
prevent
protect X from Y
provide
pump (off)
purify / treat
put
reach
reduce
release
reproduce
research
select
separate
slow
store
supply
transform
transport
treat
use

Nouns:

aeration
amount (of)

ash
bomb (nuclear)
burning
cap
capacity
chemical composition
collection pipes
combustion
compost pile
composting
construction (costs)
construction / demolition (waste)
contact (with)
container
contamination
content
convenience
crop (crop residue)
decomposition
density
disadvantage
electricity
energy (nuclear)
equipment
filter
gas (gas explosion monitoring)
glass (glass containers)
groundwater
groundwater well
heat
humus
impact
incinerator
landfill (landfill gas, landfill gas system)
landfilling
layer
leachate (leachate drainage system, leachate treatment system)
liner
manure
methane
MSW - Municipal Solid Waste
nutrient
odour
operation (costs)
packaging (fast food packaging)
paints
paper
plant (nuclear power plant)
plastics
pollutant
powders
power
radioactivity
ratio
reactor
recycling
reservoir / tank
risk
scrubber
sewage
site
slurries
soil
solution
steam
substance
surface area
technology
temperature
tires
transformation
used fuel
waste (nuclear waste)
waste disposal
waste oil

Chemical elements:

aluminium
calcium
carbon
copper
fluorine
gold
hydrogen
chlorine
chromium
iron
lead
magnesium
manganese
mercury
nitrogen
oxygen
phosphorus
sodium
sulphur/sulfur
tin
uranium

Chemical compounds:

ammonia (trihydrogen nitride)
carbon dioxide
carbonic acid
dihydrogen monoxide
hydrochloric acid
methane
methanol (methyl alcohol)
nitric acid
PET (polyethylene terephthalate)
sodium chloride
sodium nitrate

sulphur dioxide
sulphuric acid

Materials (plastics, textiles, construction materials):

PE – polyethylene
PET – polyethylene terephthalate
PVC – polyvinyl chloride
PS – polystyrene
HDPE – high-density polyethylene
LDPE – low-density polyethylene
acryl
artificial fibre (fiber)
cotton
flax
hemp
leather
nylon
polyester
silk
wool
asphalt
bricks
carton / cardboard
clay
concrete = sand + cement + water
glass
paper
sand
stone / gravel
wood
woodchip

Energy

Adjectives (+Adverbs):
calm
compacted
decomposed
efficient
energy-saving
essential
exhaustible
geological
heat (thermal)
important
inexhaustible
limited
limitless
living
local
marine
mechanical
natural
necessary
non-renewable
organic
prehistoric
pressurised
primitive
renewable
surrounding
used
useful
vital

Verbs:
cause
combust
come (from)
consume
convert
cook
damage
decay
depend (on)
develop
discover
flow
form
gather
generate
heat
hit/bomb
hunt
last
lead (to)
maintain
need
operate
participate (in)
produce
provide
release
renew
replace
save
split
supply
survive
transmit
turn
utilise
waste

Nouns:
aerogenerator (wind turbine)
atom
balance
biofuels
biomass
coal
consumption
costs (construction, running costs)
dam
demand
deposit
Earth's crust (the)
electricity
energy / power (alternative, electrical, geothermal, hydroelectric, nuclear, solar, tidal, wave, wind...)
fire
fission
flow
fragment
fuel (fossil fuels)
furnace
gas (natural gas)
generator
heat
hunter-gatherer
Industrial Revolution (the)
input
life
machine
material
metallurgy
movement
muscle
need (energy needs)
neutron
nucleus/nuclei
oil
ore (metal ores)
organism

panel
particle
people
policy
process
reaction (chain reaction)
reactor
requirement
rod
rotation
source
station / plant (power)
storage
sunlight
system
transfer
turbine
uranium
use (energy use)
vegetable
wetland
wind
windmill
wood

Examples of verbs followed by gerunds (-ing forms):
(the relevant examples are highlighted in grey)

admit
advise
allow
anticipate
appreciate
avoid
begin
can't bear
can't help
can't see
can't stand
cease
complete
consider
continue
defend
delay
deny
despise
discuss
dislike
don't mind
dread
encourage
enjoy
finish
forget
hate
imagine
involve
keep
like
love
mention
mind
miss
need
neglect
permit
postpone
practice
prefer
propose
quit
recall
recollect
recommend
regret
remember
report
require
resent
resist
risk
start
stop
suggest
tolerate
try
understand
urge

Examples of verbs followed by "to" + infinitives:
(the relevant examples are highlighted in grey)

agree
appear
arrange
ask
begin
can't bear
can't stand
care
cease
choose
claim
continue
decide
demand
deserve
expect
fail
forget

happen
hesitate
hope
intend
learn
manage
need
neglect
offer
plan
prefer
prepare
pretend
promise
refuse
remember
seem
start
stop
swear
tend
threaten
try
vow
wait
want
wish
would like