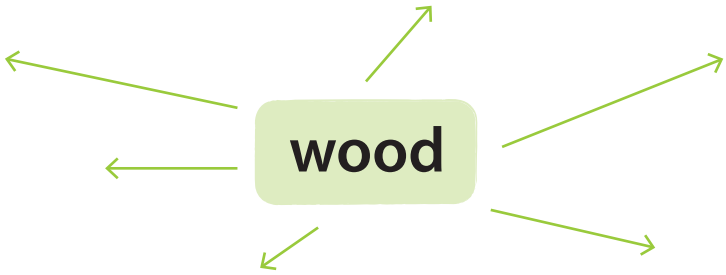
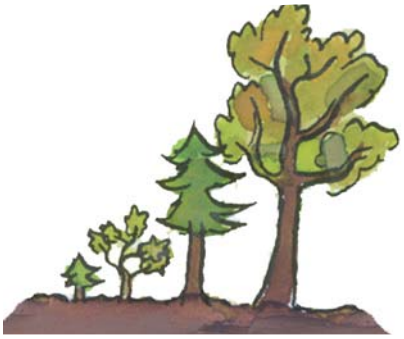
Bioenergy from wood

WORKSHEET

Place for your ideas



How does a tree grow?



➔ **How is wood made up?**

➔ **What is necessary for its growth?**

➔ **Which sources of energy does the tree need to grow?**

Reading

1) Turn the page and read the story „The trees turn the energy of the Sun into wood". Follow the instructions.
2) Choose at least four facts from the text that are important to the story (you can use **! - marked facts**). Write them down and explain why each fact is important to the story.

Important facts:	Why have I chosen the fact?
1	
2	
3	
4	

H, C, O where do you go?

Write the equation of photosynthesis with formulas that represent chemical substances (O_2 • H_2O • CO_2 • $C_6H_{12}O_6$).

\+ \+ **energy from the Sun** → \+

carbon dioxide + water + energy from the Sun → glucose + oxygen

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The trees turn the energy of the Sun into wood

Read the text below and use 3 different marks (√ ? !) for:

- √ a fact I already know
- ? a fact that I don't understand and would like to ask about
- ! a fact that seems important to me

Plants bind a large amount of carbon dioxide and water into their bodies. Photosynthesis is the process of turning these two components into sugar – glucose. This reaction needs a lot of energy that plants take from the Sun. Plants get the energy via their leaves. How it this possible? As you may know green leaves contain a special pigment called chlorophyll. This pigment absorbs sunlight and transforms it into the energy needed for photosynthesis. Photosynthesis can be written as the following equation:

carbon dioxide + water + energy from the Sun → glucose + oxygen

Glucose is the main source of energy for plants; however it also creates cellulose – a major component of wood. In cellulose, energy can be stored for a long time. On the other hand, plants can release energy from their supply by breaking down sugars if needed. Similarly, people burn the wood to produce energy. In fact burning is the opposite reaction to photosynthesis. Burning requires oxygen and releases the water and carbon dioxide.

The balance of wood

The energy we get from the wood comes originally from the Sun. When the trees are big enough to be harvested, we cut them and use the wood to build houses, make furniture or burn it for energy. In the place of harvested tree we can plant another one. A sapling develops into a mature tree gaining biomass from CO_2 . The amount of carbon dioxide emitted by burning wood is almost the same as the amount the tree absorbes during its lifetime by absorbing CO_2 from the air. It means that the uptake and loss of carbon is in balance for the wood lifecycle. We can say the wood is a carbon neutral material and a renewable source as well.

Vocabulary:

to bind	–	vázat	cellulose	–	celulóza	to gain	–	získat
carbon dioxide	–	oxid uhličitý	component	–	složka, část	to emit	–	uvolnit, vypustit
photosynthesis	–	fotosyntéza	to store	–	ukládat	uptake	–	příjem
to turn into	–	přeměnit	to release	–	uvolnit, vypustit	loss	–	ztráta
glucose	–	glukóza	to break down	–	rozbít, rozložit	lifecycle	–	životní cyklus
to contain	–	obsahovat	to require	–	vyžadovat	carbon neutral material	–	uhlíkově neutrální materiál
pigment	–	barvivo	to harvest	–	pokácet, sklidit	renewable source	–	obnovitelný zdroj
chlorophyll	–	chlorofyl	furniture	–	nábytek			
to absorb	–	pohltit	to plant a tree	–	zasadit (pěstovat) strom			
equation	–	rovnice	sapling	–	mladý stromek, sazenička			
oxygen	–	kyslík	to develop	–	vyvinout (se)			

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TEACHERS GUIDE

LES VE ŠKOLE
ŠKOLA V LESE

GOALS:

- to improve vocabulary in the terminology of forest and environment
- to introduce basic vocabulary for understanding the photosynthesis and its components
- to strengthen the ability of reading and understanding short texts in English

age 13-15 | 60 min | 20 - 30 min

Intermediate English

MATERIALS:

worksheets, items listed below provide for each group of 8-10 students (i.e. 2-3 sets for classroom): sugar in cubes, balloons in 2 colors, bottle / glass of water, any symbol of the Sun (orange, lemon), green leaves, piece of wood, candle and matches

KEYWORDS:

0. basic:	water, air, forest, leaf, wood, sun, to grow, to build, to burn, to catch, sugar, plants, to need, reaction, atom, energy
1. new:	photosynthesis, glucose, sunlight, carbon dioxide, oxygen, pigment, atmosphere, to release, to bind, to contain, to absorb, balance, to turn into, equation, cellulose, supply, molecule, renewable, formula, lifecycle, to plant a tree, sampling, uptake, loss, to develop
2. by-product:	group, cooperate, screenplay, sketch, matches, candle, brainstorming, mark

Plan of the lesson:

1) What do we know already? Brainstorming

5 min

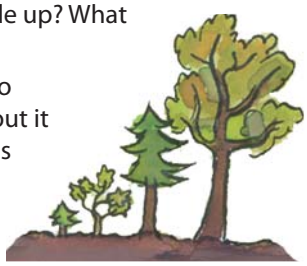
Motivation: Bring a piece of wood or bunch of twigs to the classroom.

Hand out the worksheets to students. Students try to make up and write down as many words connected to wood as possible in 1 minute. Next, they share words from their list within the group of four. They explain the meaning of words that others may not know.

2) How does a tree grow?

10 min

Students focus on the first task in worksheet. They read three simple questions: How is wood made up? What is necessary for its growing? Which source of energy does the tree need to grow?



Each group of students checks their brainstormed list for the words that can possibly help them to answer the questions about how a tree grows. If they don't find any, they are allowed to think about it for a while and add some more words. If they are resourceful enough they complete the answer as a sentence. Students fill up all answers into the worksheet.

Afterwards some students volunteer to read out their answers. Teacher writes them down on the blackboard for others.

3) The trees turn the energy of the Sun into wood Reading and comprehension

15 min

Each student is given a text on photosynthesis "The trees turn the energy of the Sun into wood" (second page of worksheet). In the next step, students verify their previous answers and learn new facts when reading the short story about photosynthesis. For better understanding, students are advised to use three different marks (√ ? !) that would make further orientation around the text easier.

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The three marks stand for:

- a fact I already know (√)
- a fact that I don't understand and would like to ask about (?)
- the fact that seems important to the topic (!)

The marks can be placed right into the text or next to the paragraph. Teacher explains the meaning of each mark and makes sure students will use marks properly. Then students read the story, analyze the text and mark the facts at the same time.

4) The trees turn the energy of the Sun into wood Discussion

In pairs students share their marked words of √ and ? . Together they discuss all questions or doubts and try to answer them. To get the right meaning of unknown expressions they use the vocabulary sheet attached. If necessary they ask teacher for advice. Teacher assists in explanation of new words. Supposing students find it difficult to understand and process new information it is necessary to spend more time on the explanation of whole sentences or paragraphs and let students digest the text bit by bit.

Teacher then reads the story aloud in order to demonstrate the right pronunciation. Then students practice how to pronounce the words correctly. Mainly some tricky words such as photosynthesis, carbon dioxide, equation etc.

5) Important facts

Each student notes at least four facts that are important to the topic of the story. One can use the ! – marked facts or find any other in the text. Students are encouraged to explain why they have chosen the facts. They compose an explanation for each fact. There is a box in a worksheet to fill the important facts in. Finally, students share some of their facts with others. They read facts out and find out who else picked the same expressions.

6) New vocabulary

In case students need more practice to remember new words, the teacher can provide a simple game of teams/pairs. One describes a word (object, verb, adjective…) without actually mentioning it and the others guess. There is a rule of 1 minute maximum to explain a single word. The game can be played either open as a competition when students guess aloud, or silently – this means no one guesses aloud but writes their guess on a piece of paper.

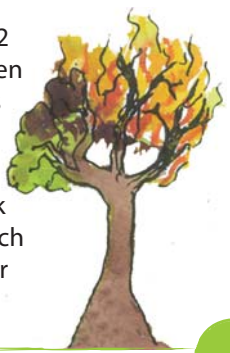
7) H, C, O where do you go? Spelling

Students compose the equation of photosynthesis with formulas of particular chemical substances (O_2, H_2O, CO_2 and $C_6H_{12}O_6$) and write it down on the worksheet. Afterwards they learn to read (spell) chemical symbols as well.

Photosynthesis equation: $(6)\ CO_2 + (6)\ H_2O$ (+ energy from the Sun) $\longrightarrow C_6H_{12}O_6 + (6)\ O_2$

8) The drama of photosynthesis and burning Dramatization, speaking

As a reflection of the lesson students dramatize the process of photosynthesis and burning with given materials. The class divides into groups of 8–10. Each group is supplied with: sugar in cubes, balloons of 2 colors (symbol of gasses CO_2 and O_2), bottle / glass of water, any symbol of the Sun (orange, lemon), green leaves, piece of wood (twigs), candle and matches (you have better skip the matches if not sure students would handle a burning candle safely).



Emphasize that the drama should show the reactions in a symbolic way, e.g. it's not advised to actually make a fire and burn a piece of wood or stuff the CO_2 – balloon into the glass of water. The task is to work out the screenplay and to divide roles among all members of a group. They must follow a simple rule: each member of the group has to participate and say at least 2 sentences in a sketch. Give a time limit both for the preparation and rehearsal (5 mins and 3 mins respectively is recommended).

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One by one the groups rehearse their sketch.

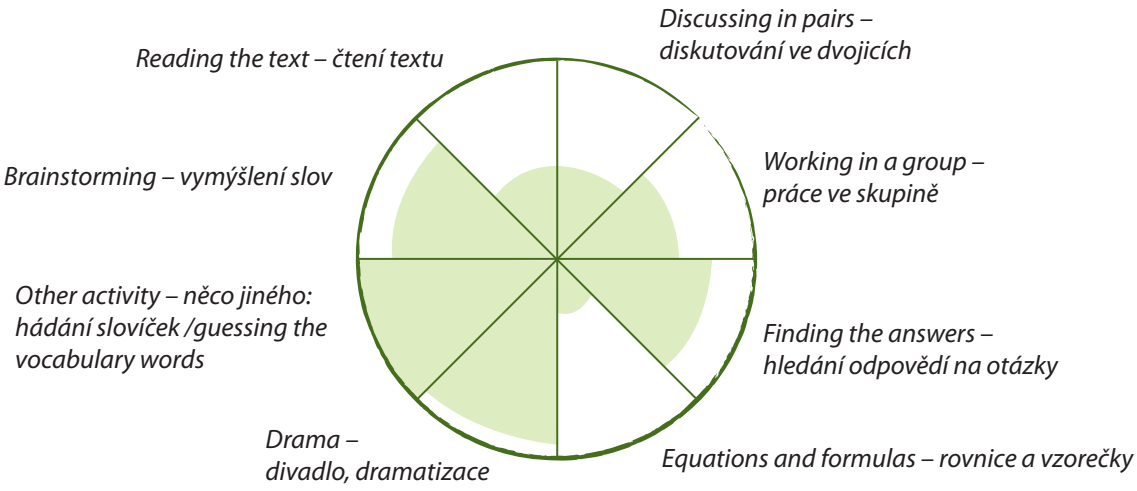
At the end students sit in a circle and reflect on their involvement in their play. They can express their feelings, praise the others or suggest what could be improved for next time.

9) Evaluation

5 min

Save some time for a brief evaluation at the end of the lesson. Ask students to write a short evaluation. An example of an evaluation sheet is attached below. First, the pizza diagram shows the preferences of each student during the lesson. Second, students analyse their own progress in a particular skill. Finally, students sum up if they have any recommendations or comments on the lesson.

An example of pizza diagram:



There you can see that student was the most absorbed by games – drama and guessing. He/She also liked brain-teasing challenges such as inventing words or finding the answers. The least he/she liked to work with the equations and formulas.

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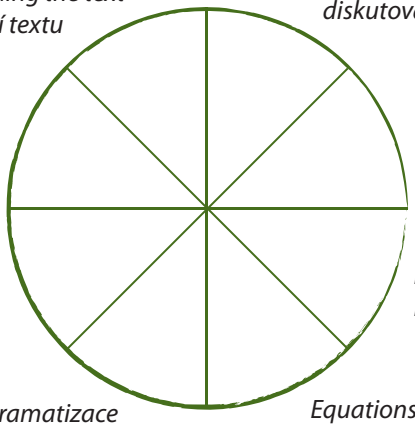
Evaluation sheet

1) Mark each slice of pizza according to your liking of a given activity. The more you liked an activity, the more you should color in a slice of the pizza.

I liked the most:



Other activity – něco jiného:

.....

2) Show on the axis how much you have improved in:

	I have improved very much. — *I haven´t improved at all.*
Spelling – spelování	
Reading – čtení	
Understanding the text – porozumění textu	
Speaking – mluvení	
New vocabulary – nova slovíčka	
Discussing – diskutování	

3) Finally, my suggestions to the lesson:

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