

10. PLASTICS

1. Introduction. In pairs, discuss the questions below.

1. What products are commonly made of plastics – what are their properties?
2. Do you prefer to drink wine / beer from glass or from plastic ? Why?
3. Do you buy bottled water? Why – why not?
4. Do you know any disadvantages or problems related to using plastic?
5. What can we do with plastic waste?
6. Give reasons why the plastics are widely used nowadays.

ADVANTAGES
<i>One advantage of</i> <i>Another point in favour of X is</i>
DISADVANTAGES
<i>Major disadvantage of...is</i> <i>Another point against X is</i>

GIVING REASONS:

<i>There are many reasons why...</i>	<i>First of all</i>
<i>The first reason why ... is ...</i>	<i>Secondly</i>
	<i>Furthermore ... / What is more</i>

2. Academic vocabulary: Use the verbs in the gaps. <http://science.howstuffworks.com/plastic.htm>

disposal	occurring	compounds	variety	infinite
properties	significant	items	dissolving	

Plastics are everywhere. While you're reading this article, there are probably numerous plastic ¹_____ within your reach (your computer, your pen, your phone). A plastic is any material that can be shaped or molded into any form - some are naturally ²_____, but most are man-made.

Plastics are made from oil. Oil is a carbon-rich raw material, and plastics are large carbon-containing ³_____. They're large molecules called polymers, which are composed of repeating units of shorter carbon-containing compounds called monomers. Chemists combine various types of monomers in many different arrangements to make an almost ⁴_____ variety of plastics with different chemical ⁵_____. Most plastic is chemically inert and will not react chemically with other substances - you can store alcohol, soap, water, acid or gasoline in a plastic container without ⁶_____ the container itself. Plastic can be molded into an almost endless ⁹_____ of shapes, so you can find it in toys, cups, bottles, utensils, wiring, cars, even in bubble gum. Plastics have revolutionized the world.

Because plastic doesn't react chemically with most other substances, it doesn't decay. Therefore, plastic disposal poses a difficult and ⁸_____ environmental problem. Plastic hangs around in the environment for centuries, so recycling is the best method of ¹⁰_____. However, new technologies are being developed to make plastic from biological substances like corn oil. These types of plastics would be biodegradable and better for the environment.

2. Name some examples of different monomers found in plastics.

3. What are the types of reactions by which monomers combine to form polymers?

Compare your answers with the passage:

The monomers that are found in many plastics include organic compounds like *ethylene, propylene, styrene, phenol, formaldehyde, ethylene glycol, vinyl chloride* and *acetonitrile*. Because there are so many different monomers that can combine in many different ways, we can make many kinds of plastics.

There are a few ways that monomers combine to form the polymers of plastics. One method is a type of chemical reaction called a *condensation reaction*. In a condensation reaction, two molecules combine with the loss of a smaller molecule, usually water, an alcohol or an acid.

Another way that monomers can combine to form polymers is through *addition reactions*. Addition reactions involve rearranging electrons of the double bonds within a monomer to form single bonds with other molecules.

After reading, try to pronounce the words in *italics*:

LISTENING: NEW FINDINGS ABOUT A CHEMICAL IN PLASTICS²

Vocabulary:

unsafe level (in the urine) (adj+n)	nebezpečná hladina chemikálie (v moči)
within the limits (prep+n)	v rámci limitů
twice as likely	dvakrát více pravděpodobný
swallow (v)	spolknout
cause of these conditions (n+n)	příčina těchto stavů
safety research (adj+n)	výzkum bezpečnosti
Findings must be reproduced.	Výsledky zkoumání musí být zopakovány.

A. Listen to the news article and answer these questions:

- What products may contain Bisphenol A?
- How can people be exposed to BPA?
- What diseases may be caused by this chemical?
- How many people participated in the study?
- Who was the leader of the research?
Where was he from?
- Where was the study published?

B. Now listen to the middle part and fill in the gaps (1.03 – 1.50)

The scientists are studying the chemical BPA (Bisphenol A), which is used to make hard, polycarbonate plastics.

Researchers divided almost one thousand five hundred American adults into four groups based on BPA ...1..... in their urine.

All the levels were within the limits ...2..... safe by the United States Food and Drug Administration.

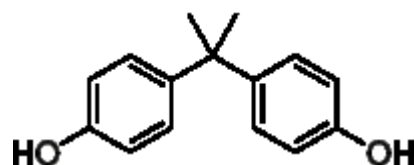
Yet the ...3..... found that the highest group was more than twice as likely as the ...4..... group to have heart disease or diabetes, or both.

The Food and Drug Administration and chemical ...5..... officials said the study does not show that bisphenol A ...6..... the diseases.

C. Speaking. Work in pairs. Summarize the main points of the news article.



Canadian Environment Minister John Baird, left, and Health Minister Tony Clement hand out baby bottles that are free of BPA. In April, Mister Clement announced Canada's plans to limit use of the chemical.



Bisphenol A

READING: PLASTICS FROM ORANGES³

Vocabulary: Do you know these expressions?

catalyst (n) – katalyzátor	readily abundant (adv+adj) – snadno dostupný
pump CO ₂ in the atmosphere (v+n) – vhnět CO ₂ do atmosféry	investigate (v) – zkoumat, vyšetřovat
derivative (n) – derivát	petroleum / crude oil (n) – ropa
building block (adj+n) – stavební jednotka	greenhouse gas (adj+n) – skleníkový plyn
carbon-based compound (adj+n) – sloučenina na bázi uhlíku	emit (v) – vydávat, uvolňovat
disposable products (adj+n) – produkty na jedno použití	fossil fuels (adj+n) – fosilní paliva
renewable resources (adj+n) – obnovitelné zdroje	

1. Read the text quickly. What is the main topic of the text?

- Creation of a new polymer
- Using carbon dioxide
- Research into household cleaners
- Disposable plastic products

PLASTICS FROM ORANGES ⁴ (BBC News)			
Cornell University researchers created a novel polymer using CO ₂ , an oil present in orange peel and a catalyst that speeds the reaction along.	1	This polymer has many of the characteristics of polystyrene, which is used in numerous disposable plastic products.	8
The team hopes CO ₂ could one day be collected for making plastics instead of being pumped into the atmosphere.	2	"Almost every plastic out there, from the polyester in clothing to the plastics used for food packaging and electronics, goes back to the use of petroleum as a building block," said Professor Coates. "If you can get away from using oil and instead use readily abundant, renewable and cheap resources, then that's something we need to investigate.	9
Details of the research were published in the Journal of the American Chemical Society.	3		
Plastics are polymers, long-chained carbon-based (organic) molecules.	4		
Limonene is a carbon-based compound that makes up about 95% of the oil in orange peel and is used to give household cleaners their citrus smell.	5	What's exciting about this work is that from completely renewable resources, we were able to make a plastic with very nice qualities."	10
Geoffrey Coates, a professor of chemistry at Cornell in Ithaca, US, and colleagues used a derivative of this oil called limonene oxide as one of the building blocks for their polymer.	6	Coates' team is interested in using carbon dioxide as an alternative building block for polymers in industry. The gas could be isolated and used to produce plastics such as polylimonene carbonate.	11
The researchers used a helper molecule, or catalyst, to get the limonene oxide to react with CO ₂ and form a new polymer called polylimonene carbonate.	7	CO ₂ is the principal greenhouse gas caused by human activities, and is emitted by fossil fuel burning.	12

2. Complete the table below. Ask a question for each item in the table and answer it.

	Question:	Answer:
Researchers Based at (Place):		
Research Reported in (Magazine):		
Research Led by (Scientist):		
Name of New Plastic:		

3. Now decide if these sentences are true or false. If it is false, say what is true.

- a) The scientists used CO₂, an oil present in orange peel and a catalyst to produce the new plastic. T/F

- b) Limonene makes up 95% of the new plastic. T/F

- c) Polylimonene carbonate gives household cleaners their citrus smell. T/F

- d) The new polymer is similar to PVC. T/F

- e) The building block of most plastics is petrol. T/F

- f) The new plastic is made of renewable resources. T/F

- g) CO₂ is used up by fossil fuel burning. T/F

4. Read the text again. Find the English equivalents of the expressions below:

- a) katalyzátor urychlí reakci
 b) dlouhé řetězce molekul
 c) četné výrobky z plastů na jedno použití
 d) mít zájem využít oxid uhličitý
 e) velmi pěkné vlastnosti
 f) nejdůležitější skleníkový plyn
 g) způsobený činností člověka
 h) snadno dostupný obnovitelný zdroj

SUMMARIZING

Work in groups of 3. Each student has a different text. Read your part and then summarize the information from your text and present it to your partners. When each of you presents the information, you will be able to answer all questions below.

1. Can you describe the process of making plastics in four basic steps?
2. What kinds of additives are used in the production to get desired properties of plastics?
3. Which substances contain natural polymers?
4. How can biopolymers be obtained – describe the processes.
5. What are the advantages and drawbacks of bioplastics?
6. Why aren't some types of plastics recycled?
7. Which steps are there in the recycling process?
8. Evaluate the use of plastics by the society. (reasons, benefits, problems + solutions,...)

Space for your notes from the reading

HOMEWORK: Grammar Revision

past simple – minulý čas prostý	past continuous – minulý čas průběhový
<p>I /we/ he/she/it <u>lived</u> you/they in London.</p> <p>Negative: <u>didn't live</u></p> <p>Question: Where did we/you/they <u>live</u>? he/she/it</p>	<p>I <u>was</u> He/she/it <u>working</u>.</p> <p>Negative: <u>was not (wasn't)</u></p> <p>We/you/they <u>were</u> <u>working</u>. <u>weren't</u></p> <p>Question: Where was I <u>working</u>? were we/you/they was he/she/it</p>
<p>- odehrálo se a skončilo v minulosti Ptáme se: <i>When? Kdy?</i> typické výrazy: <i>yesterday, last week, in 1998</i> I got up early yesterday. Sam went to the USA last year. When I was young, I had a cat.</p> <p>- slovesa vyjadřující stav, modální slovesa like, believe, think, mean, can, need, want ...</p>	<p>- děj probíhal v přesně určeném okamžiku v minulosti <i>at 10 o'clock last night, this time yesterday</i> At 10 o'clock last night I was playing tennis.</p> <p>- dočasné situace We were living with friends because our new flat wasn't ready.</p> <p>- právě probíhající děj byl něčím přerušen We were having supper when the phone rang. I was standing at the traffic lights when the accident happened.</p>

A. Complete the sentences:

- 1) Tom burnt his hand while he *was cooking dinner*.
- 2) The doorbell rang while I
- 3) We saw an accident while we
- 4) Mary fell asleep while she
- 5) The television was on but nobody

B. Choose the right tense – past simple or past continuous.

- 1) Jane *was waiting* (wait) for me when I *arrived* (arrive).
- 2) What(you/do) this time yesterday? I was asleep.
- 3) How fast(you/drive) when the accident(happen)?
- 4) John (take) a photograph of me while I(not / look).
- 5) We were in a very difficult position. We (not/know) what to do.
- 6) I haven't seen Alan for ages. When I last(see) him, he (try) to find a job in London.
- 7) I (walk) along the street when suddenly I(hear) footsteps behind me. Somebody (follow) me. I was frightened and I(start) to run.
- 8) When I was young, I (want) to be a bus driver.
- 9) (you/go) out last night? No, I was too tired.
- 10) A car (stop) and the man (get) out.
- 11) At 8 o'clock yesterday evening I (have) dinner with some friends.

Sources:

² Available at <http://www.voanews.com/specialenglish/2008-09-24-voa1.cfm>

³ Based on *Plastics from Oranges* - Handout by Mária Sabolová

⁴ Available at <http://news.bbc.co.uk/1/hi/sci/tech/4191737.stm..>