1. THE ATOM QUIZ

1. The smallest particle of an element to still be that element is the

☐ atom ☐ proton ☐ molecule

2. This is a substance made up of only one kind of atom.

☐ mixture ☐ compound ☐ element

3. The center of the atom that contains the proton and neutron is the

☐ shell ☐ nucleus ☐ orbit

4. Changing the number of neutrons of an atom changes its:

☐ isotope ☐ ion ☐ charge

5. Which two particles would be attracted to each other?

☐ electrons and neutrons ☐ electrons and protons ☐ all particles are attracted to each other

6. The neutron has this sort of charge.

☐ negative ☐ alternates positive and then negative ☐ no charge

7. Most of the mass of an atom is in the nucleus.

☐ True ☐ False

8. The total number of protons in the atom is its

☐ atomic weight ☐ atomic energy ☐ atomic number

9. The sum of the protons and neutrons in an atom is its

☐ atomic weight ☐ atomic energy ☐ atomic number

10. The part of the atom that orbits the nucleus is the

☐ proton ☐ neutron ☐ electron

11. The chemical combination of two or more atoms in fixed amounts is called a

☐ mixture ☐ orbit ☐ compound

12. The smallest part of a compound that still is that compound is a

☐ mixture ☐ molecule ☐ nucleus

13. When atoms share electrons it is called a

☐ chemical bond ☐ radiation ☐ current

14. Atoms with an electrical charge due to giving up or taking on more electrons are called

☐ ions ☐ solutions ☐ isotopes

2. BONDING

Listening: Available at http://bcs.whfreeman.com/thelifewire/content/chp02/02020.html

Click on ANIMATION - NARRATED

A. Covalent Bonds

1) **Watch the animation and answer the question: What is the most versatile element on Earth and why?**

2) **Listen again and fill in the gaps:**

A covalent bond _____when two atoms share electrons. In the case of two hydrogen atoms, each _____its single electron with the other. This sharing allows each to fill its electron shell with two electrons. The pair of shared electrons _____a covalent single bond.

Let´s now _____ oxygen, an atom with eight electrons. Two electrons fill the innermost shell, and the other six electrons _____ in the next shell. This outer shell needs two more electrons to _____ it (the octet rule). Two oxygen atoms form a covalent double bond by sharing two electron pairs from their outer shells.

Carbon is perhaps the most versatile element on Earth, in large part because it contains only four electrons in a shell that can _____eight. To fill its outer shell, carbon forms four covalent bonds with up to four other atoms.

In a molecule of _____, carbon shares electrons with hydrogen atoms, forming four covalent single bonds. Although this molecule is _____ simple, carbon often forms the backbone of large, complex molecules. With each carbon atom able to bond to four other atoms, _____ molecules are incredibly diverse.

Triple bonds are _____, but nitrogen gas molecules (the most _____molecule in the air we breathe) form triple bonds. The two nitrogen atoms share three pairs of electrons, allowing each to have eight electrons in its outermost _____.

B. Ionic Bonds

1) **Listen to the recording and note down the key expressions.**

2) **Try to reconstruct the information.**

3. THE ARTICLE

Fastest View of Molecular Motion

A. Vocabulary I – Revision

There is a list of expressions from the text that you are supposed to be familiar with. Revise that vocabulary and make sure that you really know what the expressions mean.

motion (n)	observation (n)	state (n)	release (v)	x-ray (n)
effect (n)	behave (v)	involve (v)	researcher (n)	equal (v)

B. Vocabulary II – New Expressions

Can you explain the following expressions? Ask your colleague if you are in doubt.

rely on (v)	timescale (n)	devise (v)	essence (n)
provide (v)	rip away (v)	encode (v)	burst (n)
devise (v)	pulse (n)	draw back (v)	underpin (v)
stringent (adj)	accuracy (n)	insight (n)	fire (v)

Reading activities

A. Scanning

Read the text quickly and try to answer the following question:

1. What was the timescale that the researchers watched molecules on?
2. What molecules and/or what parts of molecules did they observe?

B. Comprehension I:

Read the text again and answer the questions below:

1. What material did the researchers use when they were trying to observe motion in a molecule?
2. What instrument was used at the experiment?
3. In the experiment – where exactly did the researchers find the information about the motion of protons in a molecule?

C. Comprehension II:

Re-read the text and make questions for the following answers.

1. In the journal Science.
2. Within x-rays released after re-collision.
3. It will help scientists understand how molecules behave in chemical processes.

4. Quantum computing.

D. Vocabulary Building

Give the English equivalents of the following Czech expressions:

1. provádět pozorování
2. vynalézt novou techniku
3. uvolnit rentgenové paprsky
4. účinek na pohyb protonů v molekule
5. řízení chemických reakcí
6. provádět testování
7. jedna atosekunda se rovná miliardtině miliardtiny sekundy
8. pochopit podstatu
9. excitovaný stav

Post-reading Activities

A. Description

Give a brief description of the experiment.

B. Hunt for Info

Try and find the English expressions for the following (The definitions follow U.S. usage in which a billion is a thousand million and a trillion is a 1 followed by 12 zeros.):

one thousandth of a second
one millionth of a second
one billionth of a second
one trillionth of a second
one millionth of a nanosecond

C. Translation

Translate the underlined sections of the text below. Remember, this is not to be word-for-word translation.

Fastest view of molecular motion

Scientists have made the fastest ever observations of motion in a molecule.

They "watched" parts of a molecule moving on an attosecond timescale - where one attosecond equals one billion-billionth of a second.

The researchers say the study gives a new in-depth understanding of chemical processes and could be used in future technologies such as quantum computing.

The study, which relies on short pulses of light from a specially built laser, was published in the journal Science.

"Understanding how something changes in time means really understanding its essence, and we are now looking at changes on a very, very fast timescale," said team member Dr John Tisch, of Imperial College London, UK.

Ultra-fast process

The researchers devised a new technique to "see" the motion of protons, one of the building blocks of an atom, in molecules of hydrogen and methane.

The technique involves firing a very short but intense laser pulse at a molecule, which rips an electron away, leaving the molecule in an excited ionised state.

The electron is then drawn back to the molecule, and when it collides a very short burst of x-rays is released.

"That has encoded information within it about the state of the molecule at the point of re-collision, and can give us information about the motion of the protons in this molecule," Dr Tisch told the BBC News website.

The process is ultra-fast, and the team was able to observe the effect the laser had on motion in the molecules with an accuracy of 100 attoseconds - the fastest ever recorded.

The team said being able to see detailed molecular motion would help scientists understand how molecules behaved in chemical processes, thus providing possibilities for controlling molecules.

"Control of this kind underpins future technologies, such as control of chemical reactions, quantum computing and high brightness x-ray light sources for material processing," said Professor Jon Marangos, another Imperial College author on the Science paper.

"We now have a much clearer insight into what is happening within molecules and this allows us to carry out more stringent testing of theories of molecular structure and motion."

HW: Articles - Členy

The definite article: the **člen určitý: the** (lze přeložit *ten, ta, to*) – se používá:

1. mluvíme-li o někom/něčem opakovaně (bylo zmíněno už dříve)
   Once upon a time there was a king. And the king had three daughters.
2. je-li něco dále blíže určeno
   the force of gravity, the man that we saw yesterday
3. je-li podstatné jméno určeno konkrétní situací *Give me the book, please.*
4. označení osoby nebo věci jediné svého druhu *the Sun, the Earth, the Queen*
5. u zpodstatnělých přídavných jmen označujících celou třídu
   the young (mladí lidé), the English (Angličané)
6. ve 3.stupni přídavných jmen k označení nejvyšší míry vlastnosti *the most interesting*
7. u řadových číslovek *the first place*
8. před názvy řek, moří, pohoří, novin, organizací, hudebních nástrojů
   the Thames, the Pacific Ocean, the Guardian, the European Union, the piano

The indefinite article: a / an **člen neurčitý a / an** (lze přeložit *nějaký, jeden*) se používá:

1. mluvíme-li o něčem poprvé *I have a new book.*
2. s názvy povolání, národnosti, politického přesvědčení, návyku (jeden svého druhu)
   He is a doctor / a Buddhist / a socialist / a smoker
3. ve spojeních *a few, a little (málo) ... as a child (jako dítě)…*
   six times a week (sedmkrát za týden)… half an hour (půl hodiny)
   such an idiot (takový idiot) ... quite a shock (docela šok)

Zero article „nulový člen“ - **žádný člen** se nepoužívá:

1. v množném čísle podstatných jmen počitatelných, která by v jednotném čísle měla člen neurčitý *I have a new book. I have new books.*
2. v obecném významu - v množném čísle, před nepočitatelnými a abstraktními podstatnými jmény *People are selfish. Give me some bread. Beauty is precious.*
3. před většinou geografických názvů kromě řek, moří, pohoří, před jmény
   Prague, England (ale: the United Kingdom, the USA), Charles
4. u názvů dopravních prostředků s předložkou by *by car, by bus*

Exercises: Fill in the gaps with the right articles (*the – a/an – no article*)

1. I want to buy ..... laptop computer next week.

Can you please go to ..... grocery store on fifth street and buy 2 cartons of milk?

Please meet me at the train station in ..... hour from now.

…… President of the United States will be visiting …… Australia next week.

"What do you do?" -- "I'm ……. teacher."

He's from ……. USA.

Have you read ……. book which I gave you last month?

Susan works in …… London.

"Did you lock …… door?" -- "Oh I forgot!"

I usually go to school by ……. bike.

Who was ……. first man on …… Moon?

"Can I borrow your calculator?" -- "Sure, but …… display is broken."

She's bought ……. new car. She drives a Mercedes now.

I learned to play ……. piano when I was 10.

…… British are well known for their humour.

Who is ……. best actor in Hollywood?

…… Dead Sea is full of minerals.

2. This is my …… friend Josh. He is from …… United Kingdom. He lives in ….. house in ….. Bristol. …… house is small but he has got …… large garden. He is …… policeman and he likes …… job very much. He goes to …… work by …… car. It takes about half …… hour. He is married and has got …… three children. He is …… very happy man.

3. ..... atoms are considered to be …… basic units in ….. science. At …… beginning of …… 20-th century it was thought that …… atoms were very much like …… planets orbiting …… Sun. That model suggested that …… particles with …… negative charge are moving around …… nucleus situated in …… centre. ….. force of …… attraction between …… positive and …… negative electricity was thought to keep …… electrons in their orbits. …… new approach to ….. structure of …… atom was suggested by …… young physicist in 1913. …… scientist was …… Niels Bohr.