8. Discoveries in Science

1. Vocabulary – collocations.

Match the words that go together. There are more possible options.

1) invent	a) a theory / hypothesis
2) discover	b) research
3) formulate	c) a new law / principle
4) develop	d) a new technique
5) propose	e) a new drug
6) carry out	f) a new machine

2. Do you know the names that are connected with some inventions and discoveries?

Who was invented / discovered / developed / formulated … what?

a) the law of gravity	1. John Dalton, chemist
b) the structure of DNA	2. Darwin, biologist
c) the modern theory of evolution	3. Marie Curie, chemist and physicist
d) the theory of relativity	4. Newton, mathematician, physicist
e) steam engine	5. James Watt, inventor
f) radioactivity	6. Watson, Crick and Wilkins, scientists
g) x-rays	7. Wilhelm Conrad Roentgen, physicist
h) atomic theory	8. Einstein, physicist

Now check your answers in pairs. Ask subject questions. Choose the right verbs.

Example:

*Who **formulated** the law of gravity?*

3. Video – 100 Greatest Discoveries: Signature Light of Elements

https://www.youtube.com/watch?v=4geYghIc6Tc

vocabulary:

ENGLISH	CZECH	ENGLISH	CZECH
to conduct an experiment	provést pokus	to spread	rozprostřít, rozpřáhnout
to determine	určit, zjistit	device	zařízení, přístroj
to indicate	ukázat, být známkou	spectrum (pl.:spectra)	spektrum
shade	odstín, tón	burner	hořák
to remind of sth/sb	připomenout něco	to pass through	projít
prism	prizma, hranol	ribbon	stuha
to feature	obsahovat	bar code	čárový kód
tool	nástroj, nářadí	legacy	dědictví, odkaz

Watch and answer the questions, then discuss your answers with a partner.

1. What are the names of the two scientists who discovered the phenomenon?
2. How was the first spectroscope built? Why?
3. What did the combinations of bright colours and dark lines indicate? What do they compare them with in the film?
4. Which two elements were discovered by the two scientists, thanks to this method?
5. What else did they discover?
6. How is the method used in the modern science?

4. **Group work – presentations + discussion**

- Work in small groups and prepare brief information (2 – 3 mins) about an important discovery or about work of a famous scientist.
- Each team presents the information to the class.
- Listen to all presentations and evaluate the importance of the discoveries.
- Put the discoveries in the order of importance (1st being the most important). Be ready to justify your decision. Try to agree on the order in your group.

5. **Technologies for determining chemical structure**

http://www.chemheritage.org/discover/online-resources/chemistry-in-history/themes/biomolecules/dna/watson-crick-wilkins-franklin.aspx

Watch the programme and note down two examples of technologies + their uses.

6. **Read about the discovery of DNA structure and complete the tasks below.**

James Watson

molecular biologist, geneticist, zoologist

Francis Crick

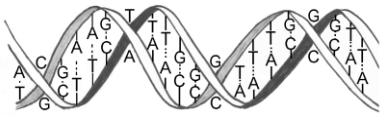
molecular biologist, biophysicist

Maurice Wilkins

molecular biologist, biophysicist

Francis Crick and James Watson, two Cambridge scientists, worked together to investigate the structure of DNA. Crick was a physicist and Watson a zoologist, but their work also made use of X-ray crystallography by Maurice Wilkins and Rosalind Franklin at King's College Hospital in London. In fact, it was one of Franklin's photographs that suggested that genes were arranged in a double helix structure. In 1953, Crick and Watson discovered the structure of DNA.

a) What shape is the DNA structure?



b) Write the nouns used for experts in these areas:
e.g. chemistry chemist

1. biology
2. mathematics
3. zoology
4. genetics
5. physics

7. LIFE OF A SCIENTIST

Based on wikipedia.org and nobelprize.org

Work in pairs (A/B). Read a text about James Watson, who discovered the molecular structure of DNA (together with Crick and Wilkins and Franklin) and who is still alive today. You don't have the same information. Ask and answer questions to complete the facts.

Example: **A has the text** James Watson was born ... *(When?)*
and asks: When was James Watson born? - take turns in asking

Student A

James Dewey Watson was born ..... *(When?)*. He started studying at the University of Chicago at the age of fifteen. Then he studied ..... *(Where?)*. He received a PhD in Zoology in 1950. Then he worked ..... *(Where?)*. Together with Crick and Wilkins he discovered the structure of the DNA. He was awarded the Nobel Prize in Physiology or Medicine ..... *(When?)*. Since then, he has received 14 honorary degrees from different universities.

During his lifetime, James Watson has written …..... *(How many?)* books. Their names are: Molecular Biology of the Gene, The Double Helix, The DNA Story, Molecular Biology of the Cell, and Recombinant DNA: A Short Course.

James Watson has been working as a head of Cold Spring Harbor Laboratory since 1994. He published his genome online ..... *(When?)*. At the moment he is carrying research on autism.

James Watson lives ..... *(Where?)*. Since childhood, he has been interested in bird-watching.

Student B

James Dewey Watson was born on April 6, 1928, in Chicago. He started studying at the University of Chicago …….. *(When?)*. Then he studied at Indiana University. He received a PhD in ……. *(What?)*.

Then he worked at Cavendish Laboratory at the University of Cambridge. Together with Crick and Wilkins he discovered ..... *(What?)*. He was awarded the Nobel Prize in Physiology or Medicine in 1962. Since then, he has received ..... *(How many?)* honorary degrees from different universities.

During his lifetime, James Watson has written five books. There names are: Molecular Biology of the Gene, The Double Helix, The DNA Story, Molecular Biology of the Cell, and Recombinant DNA: A Short Course.

James Watson has been working as a head of Cold Spring Harbor Laboratory since ……. *(Since when?)*. He published his genome online on May 31, 2007. At the moment he is carrying out research on …… *(What kind of research?)*James Watson lives in Cold Spring Harbor, a village on the North Shore of Long Island. Since childhood, he has been interested in …… *(What?)*.

Homework: study the phrases for argumentation to be prepared for a discussion in the following week

ARGUMENTATION

source: H. Němcová, English for Biologists

Advantages / disadvantages	
▪ It has both (its) advantages and disadvantages ▪ One of the advantages / disadvantages of...is ▪ There are advantages / disadvantages to...-ing ▪ A further advantage (of) / problem (with)... is	▪ There are certain drawbacks ▪ The (main) advantage / disadvantage of...is ... ▪ The (main) drawback (of) / problem (with) ... is ▪ What are the advantages and disadvantages of ...
Different points of view are included	
▪ While it is true to say that ... ▪ On the other hand, ... ▪ It is not always the case that ... ▪ On the contrary, ... ▪ This (question) can be looked at from several points of view. Firstly ... ▪ Opponents of ... take a very different view ▪ It is often suggested that ...	▪ This (problem) should be considered in relation to ... ▪ It can be examined in terms of ... ▪ Xxx. must be taken into account ...
Your own point of view	
▪ In my opinion ▪ The first thing to be considered is ... ▪ It is a fact that ... ▪ There is no doubt that ...	▪ I believe that (x I think) ▪ One of the main arguments in favour/against X is that ...
Agreement	**Partial agreement**
▪ I agree with X when he says/writes that...	▪ On the one hand ..... on the other hand ▪ ... but ... ▪ ... however ...
Emphatic agreement	**Cautious agreement**
▪ X is certainly correct when he says that ... ▪ I completely agree with X when he writes that...	▪ X may be correct when he says that...// is saying that ...
Disagreement	**Contrast with what has preceded**
▪ I disagree with X when he says that ...	▪ instead ▪ in comparison ▪ on the contrary ▪ on the other hand ▪ by contrast
Conclusions	
▪ in conclusion ▪ to conclude ▪ to sum up briefly	in brief to summarize altogether overall then therefore thus finally in addition

lesson based on A. Rozkošná, English for Chemists, 2012