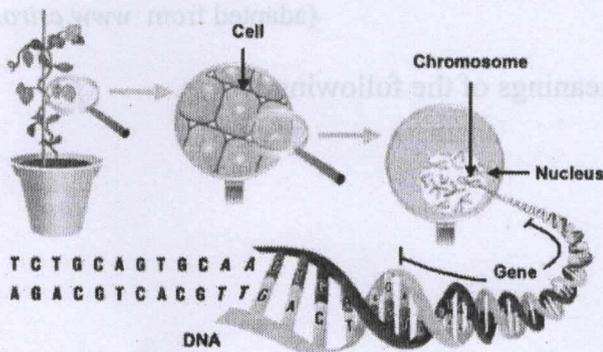
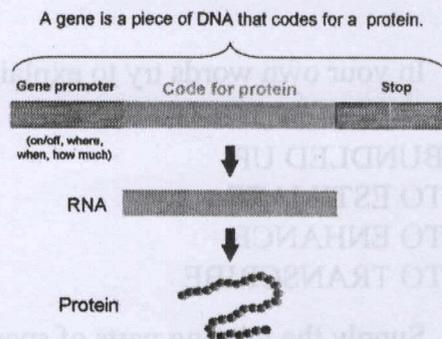


## UNIT 5

# GENETICS AND GENETIC ENGINEERING



[17]



[18]

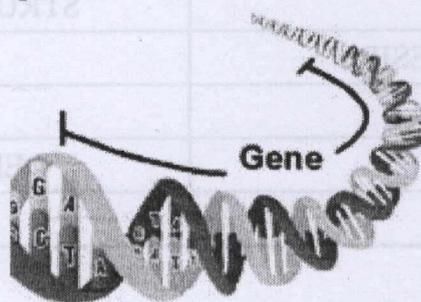
5.1. Read the sentence below. Tell your partner if you agree with it.

‘Gene technology provides the opportunity to improve human and animal health, create a safer and more sustainable food supply and generate prosperity.’

(adapted from [www.csiro.au](http://www.csiro.au))

5.2. Read the text and answer the following questions.

1. What is a gene made up of?
2. What is a genome?
3. What do genes do?
4. How do genes work?



[19]

## GENES

All living things have genes. Genes are coded instructions that determine what an organism will look like and how it will function. A gene is made up of DNA (deoxyribonucleic acid), a long, thread-like molecule that contains the blueprint for an organism.

DNA is found in nearly all cells. In plants and animals it is bundled up into chromosomes. Each cell contains the entire DNA blueprint for that organism.

The complete set of genes for an organism is called the genome. The genome for plants and animals is estimated to contain 25 000 to 50 000 genes.

Using gene technology, scientists can introduce new characteristics into an organism such as a plant, or enhance existing characteristics or delete characteristics depending on whether they are considered desirable or undesirable.

Genes carry the instructions for making proteins. All living things are made up of proteins and the things proteins make. Proteins may be structural parts of the organism such as keratin in hair and nails, or they may make other sorts of molecules – like starch, oil, fibre, or fat – which are used by the organism.

A gene works as a coded template to make proteins. When it is activated the gene is transcribed into messenger ribonucleic acid or mRNA, which moves from the nucleus of a cell into the body of the cell where many copies of a specific protein are then manufactured. These proteins are then involved in all aspects of the life of a cell.

(adapted from [www.csiro.au](http://www.csiro.au))

**5.3.** In your own words try to explain the meanings of the following words.

1. BLUEPRINT
2. BUNDLED UP
3. TO ESTIMATE
4. TO ENHANCE
5. TO TRANSCRIBE

**5.4.** Supply the missing parts of speech.

NOUN	VERB	ADJECTIVE
FUNCTION		
	ENHANCE	
		ACTIVATING
	STRUCTURE	
DESIRE		
		INSTRUCTIONAL
	DEPEND	
		COMPLETE

**5.5.** Complete the sentences with the right form of the words from exercise 5.4.

1. Genome is a \_\_\_\_\_ set of chromosomes.
2. The lecture was about the changing the \_\_\_\_\_ of agricultural biotechnology industry.
3. After implementing new methods they expect quality \_\_\_\_\_.
4. What kind of a/an \_\_\_\_\_ is necessary for stimulating the development of this structure?
5. This dictionary may very well \_\_\_\_\_ as a reference for us.

6. Students of this department usually feel enthusiasm and a strong \_\_\_\_\_ to learn more.
7. The \_\_\_\_\_ materials for this course will be published soon.
8. How much money you get \_\_\_\_\_ on how good your results are.

5.6. Have you ever wondered how it is possible to modify genes? Read the text to find out.

### Why can we modify genes?

Genes have three basic parts – an ‘on’ switch, an ‘off’ switch and the region that codes for a protein.

For a gene to work, it must have all three basic parts, but they do not have to be from the same organism. This is because the DNA of all living things is made up of the same four molecular components called nucleotides.

Each of the four nucleotides has a different base, called adenine, guanine, thymine and cytosine.

This means the gene for a particular characteristic that has been identified in one organism can be permanently introduced into another organism after being modified so it will be recognised by the new organism, which then adopts this new characteristic. For example, you could take the protein-producing part of a gene in corn that produces vitamin A and combine this with the on and off gene switches from a seed gene from rice. The result would be a gene that produces more vitamin A in rice seed.

(adapted from [www.csiro.au](http://www.csiro.au))

5.7. Without looking back at the text above, try to explain how it is possible to modify genes.

### Language review: MODAL VERBS

Look at these examples of the **MODAL VERBS** in the text:

*For a gene to work, it **MUST** have all three basic parts, but they **DO NOT HAVE TO** be from the same organism.*

*For example, you **COULD** take the protein-producing part of a gene in corn that produces vitamin.*

Other common modal verbs are: CAN, MUSTN'T, MAY, MIGHT, SHOULD, WOULD, NEED, OUGHT TO

Remember:

I / you / we / they **HAVE TO**, **DON'T HAVE TO**, **DO YOU HAVE TO**.....?

He, she, it **HAS TO**, **DOESN'T HAVE TO**, **DOES he/she HAVE TO**...?

The Past of **MUST** and **HAVE TO** is **HAD TO**, the Future is **WILL HAVE TO**

5.8. Fill the gaps with the appropriate modal verb.

1. The research \_\_\_\_\_ be conducted in accordance with the rules in order to be accepted.
2. You \_\_\_\_\_ enter this laboratory without special clothing.

3. Do you think people \_\_\_\_\_ worry so much about genetically modified food?
4. During the next month's conference the scientists \_\_\_\_\_ take these facts into consideration as they seem very groundbreaking.
5. There \_\_\_\_\_ be no other option but to support their point of view.

5.9. Listen to some information about Implications of Genomics for Medical Science and answer the following questions.

1. What is genome-based research enabling medical research to do?
2. How much time does it take for a company to receive the FDA approval to launch a new drug?
3. What are the factors that contribute to people's risk of developing the most common diseases?

5.10. Read the text entitled: 'Transferring the gene in Plants'. Put the nouns from the box into the appropriate gaps 1–6.

microbe • ability • cells • plant • makeup • particles

Once the modified gene has been developed it then needs to be transferred to the new \_\_\_\_\_ (1).

To do this, the gene must be inserted into a single plant cell where it becomes a permanent part of the cell's genetic \_\_\_\_\_ (2).

Two methods are commonly used to transfer genes into plants:

- biolistics
- agrobacterium.

Biolistics involves coating the gene construct onto tiny gold or tungsten \_\_\_\_\_ (3), which are then shot into the cell using a miniature gun.

Agrobacterium is a soil \_\_\_\_\_ (4) that infects a wide range of plants and normally transfers a number of its own genes into a host plant's genome.

Because of its natural \_\_\_\_\_ (5) to transfer genes to plant \_\_\_\_\_ (6) scientists replace the bacterial genes in agrobacterium with the modified gene.

The gene is then transported directly into plant cells using the same mechanism that would otherwise carry the microbe's genes into a plant.

The agrobacterium method is the most common method used to transfer genes.

(based on [www.csiro.au](http://www.csiro.au))

5.11. Write questions to the answers based on the text above.

1. \_\_\_\_\_  
TWO.
2. \_\_\_\_\_  
USING A MINIATURE GUN.

3. \_\_\_\_\_  
IT IS A MICROBE.
4. \_\_\_\_\_  
INTO A HOST PLANT'S GENOME.
5. \_\_\_\_\_  
THE AGROBACTERIUM METHOD.

**5.12.** Find the words hidden in the word search and translate them into Polish. There are 13 words.

The words have been printed down and across.

O	M	A	X	K	E	N	H	A	N	C	E	E	S	B	V	L	F	Q	R	T
X	O	T	S	F	L	M	E	O	Q	A	R	P	R	O	T	E	I	N	O	F
C	L	J	E	D	W	G	H	M	C	L	P	Z	G	R	P	C	B	C	I	K
A	E	F	S	U	S	T	A	I	N	A	B	L	E	W	Y	Y	R	P	I	M
A	C	P	T	O	O	C	V	I	T	A	M	I	N	E	S	T	E	L	L	Y
F	U	Y	I	Q	S	B	Q	U	Z	J	C	Y	O	R	X	J	P	A	A	E
C	L	P	M	J	B	E	P	O	I	Q	E	V	M	Y	C	G	K	N	Y	F
Z	E	W	A	T	K	D	Z	J	M	B	L	U	E	P	R	I	N	T	R	V
A	O	B	T	U	X	S	S	J	H	M	L	W	B	M	S	O	K	H	P	V
O	S	E	E	D	D	V	B	F	N	G	U	I	S	P	Q	R	Q	C	I	Q
T	V	X	E	G	C	S	G	Q	Z	S	H	P	F	R	E	P	L	A	C	E

## GLOSSARY

adenine – adenina

blueprint – plan

bundle – pęczek, pasmo

cytosine – cytozyna

enhance – ulepszyć

estimate – oszacować

fibre – włókno

genome – genom

guanine – guanina

transcribe – przepisać

nucleotide – nukleotyd

prosperity – powodzenie

protein – białko

starch – skrobia

sustainable – trwały, odnawialny

template – matryca

thread – nić

thymine – tymina