

# Leaving Certificate

# Biology

## Cell Biology

Please see *Teachers' Notes* for explanations, additional activities, and tips and suggestions.

<b>Learning Support</b>	Vocabulary, key terms working with text and writing text	Pages 3-9, 12-15
<b>Language Support</b>	Vocabulary, key terms, grammar, working with text and writing text	Pages 3-15
<b>Subject class</b>	Key vocabulary	Pages 3-9
<b>Learning focus</b>	Using Biology textbooks and accessing curriculum content and learning activities.	
<b>Levels for Language Support students</b>	Students' English-language skills should be developed to <b>Level B1</b> during funded Language Support. Mainstream subject learning will require the development of skills at <b>Level B2</b> if students are to cope with public examinations.	
<b>Acknowledgement</b>	The <i>English Language Support Programme</i> gratefully acknowledges the permission of Gill and Macmillan to reproduce excerpts from <i>Biology Now!</i> by Tommy Murtagh.	
<b>Contents of this Unit</b>	Keywords Vocabulary file Activating students' knowledge Focus on vocabulary Focus on grammar <i>(passive form, prepositions, the imperative)</i> Focus on reading Focus on writing <i>(writing paragraphs)</i> Answer Key	<b>Page</b> 3,4 5,6, 7 8,9 10,11  12,13,14 15 16,17

## Using this unit

### Learning support, language support and mainstream subject class

The sections *Focus on vocabulary*, *Focus on reading* and *Focus on writing* are suitable for **Learning Support**.

The sections *Activating students' knowledge*, *Focus on vocabulary*, and *Focus on grammar* have been designed, in particular, for **Language Support** classes.

*Focus on vocabulary*, *Focus on reading* and *Focus on writing* are suitable for use in **Learning Support**, **Language Support** and **subject classes**.

### Answer Key

Answers are provided at the end of the unit for all activities except those based on free writing.

### Textbooks

This unit focuses on the section *Cell Biology* of the Leaving Certificate Biology curriculum. Students will need to use their textbooks if they are to gain the most benefit from the activities.

### Learning Record

The Learning Record is intended to help students monitor their progress. This can be downloaded or printed from the website in the section *Advising Students and Record of Learning for the Leaving Certificate*. A copy of the Learning Record should be distributed to each student for each Unit studied.

Students should:

1. Write the subject and topic on the record.
2. Tick off/date the different statements as they complete activities.
3. Keep the record in their files along with the work produced for this unit.
4. Use this material to support mainstream subject learning.

### Symbols

Symbols are used throughout the unit to encourage students to develop their own learning and support materials.



prompts students to file the sheet when they have completed the activity. This is used for activities which can be used as a reference in the future e.g. for subject classroom, revision, homework etc.



prompts students to add vocabulary, definitions, or examples of vocabulary in use to their own personal glossary for the topic. A personal glossary makes study and revision more efficient.

## Keywords

### Nouns

acetyl  
activation  
activity  
agar plates  
alcohol  
alginate  
amino acids  
attachment  
barrier  
beads  
beaker  
bilayer  
biomolecules  
buffer  
carbon  
carrier  
catalase  
catalysts  
cell membrane  
cell wall  
cellulose  
centrioles  
chains  
chloride  
chlorophyll  
chloroplast  
chromatids  
chromatin  
chromosome  
concentration  
cycle  
cytoplasm  
denaturation  
diffusion  
dioxide  
diploid  
division  
DNA  
dropper  
electron  
energy  
enzyme  
ethyl  
eyepiece  
fermentation  
filter  
fructose  
funnel  
glucose  
glycolysis  
graduated cylinder

hydrogen  
immobilisation  
invertase  
lactose  
light  
lipid  
liquid  
lumen  
manipulated  
material  
membranes  
metabolism  
methylene  
microscope  
mitochondria  
mitochondrion  
mitosis  
mixture  
ml  
molecules  
nerve  
nucleolus  
nucleus  
offspring  
organelles  
organisms  
organs  
osmosis  
oxygen  
parent  
pepsin  
peroxide  
PH  
phosphate  
phospholipids  
photosynthesis  
plastids  
pores  
presence  
process  
products  
prophase  
protease  
protein  
rate  
reaction  
reproduction  
resin  
respiration  
ribosomes  
RNA  
sap  
skin

slide  
sodium  
solution  
spindle  
stage  
structure  
substrate  
sucrose  
sugar  
syringe  
temperature  
test  
threads  
tissue  
tube  
turgidity  
vacuole  
variable  
variables  
volume  
water  
xylem

### Verbs

to add  
to contain  
to control  
to convert  
to form  
to germinate  
to occur  
to prevent  
to release  
to release  
to repeat  
to separate  
to stain

### Adjectives

active  
aerobic  
anaerobic  
bounded  
cellular  
chemical  
chopped  
denatured  
distilled  
eukaryotic

### Continued...

genetic  
immobilised

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

**Leaving Certificate Biology: Cell Biology**

metabolic  
multicellular  
nuclear  
optimal  
optimum  
permeable  
prokaryotic

pyruvic  
reusable  
sensitive  
specific  
temporary  
**Other terms**  
can (do)

gently  
Krebs  
selectively

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_  
Leaving Certificate Biology: Cell Biology

Vocabulary file for the topic  
**Cell Biology**

Word	Meaning	Page(s) in my textbook	Note
cell			
light microscope			
electron microscope			
nucleus			
cytoplasm			
cell membrane (plasma membrane)			
cell wall			
plastids			
vacuoles			
optimum activity			

**NAME:** \_\_\_\_\_ **DATE:** \_\_\_\_\_  
**Leaving Certificate Biology: Cell Biology**

<b>Word</b>	<b>Meaning</b>	<b>Page(s) in my textbook</b>	<b>Note</b>
mitochondria			
ribosomes			
prokaryotic cells			
eukaryotic cells			
metabolic pathway			
catalyst			
substrate			
enzyme			
hydrophilic			
hydrophobic			
denatured enzymes			

## Introduction

### Activating students' existing knowledge

Use a spidergram to activate students' ideas and knowledge on the key points in this chapter. See **Teachers' Notes** for suggestions.

Possible key terms for the spidergram:

### What are living things made of?

- Invite newcomer students to provide key words in their own languages.
- Encourage dictionary use.
- Encourage all students to organise their vocabulary into relevant categories (e.g. meaning, nouns, keywords, verbs etc.).



All students should record vocabulary and terms from the spidergram in their personal dictionaries.

Language Level: B1  
 Individual / pair

## Focus on vocabulary



### 1. Prefixes

Prefixes are placed before words and change the meanings of those words. We often use 'un' or 'in' to make a word negative.

For example: **tidy** (positive)      **untidy** (negative)  
**complete**                      **incomplete**

**to cover** (to place over, hide or protect)      **to uncover** (to remove, reveal or find)

Sometimes a prefix indicates number. For example: **monolingual** (speaking *one* language) **bilingual** (speaking *two* languages)

Understanding prefixes helps you to understand the meaning of the word.

Check your textbook or dictionary to see what these prefixes mean and write the meaning in the grid.

<b>hydrophilic</b>	hydro_____	
<b>microfibrils</b>	micro_____	
<b>chromoplasts</b>	chromo_____	
<b>anaerobic</b>	an_____	
<b>prokaryotic</b>	pro_____	
<b>ultra structure</b>	ultra_____	
<b>impermeable</b>	im_____	
<b>bilayer</b>	bi_____	

### 2. Matching

Match each term in Column A with a definition in Column B. Draw a line between them. Look at your text book if you need help.

Column A	Column B
cell metabolism	gases spreading through
nuclear membrane	the chemical reactions within cells
protein factories	the heat and light produced by the sun
organic catalysts	the covering of the nucleus which has thousands of pores
diffusion of gases	the places where enzymes and other proteins are made
solar energy	enzymes that can change the speed of a reaction without becoming permanently changed



### 3. Key phrases in use

The sentences below are all from your text books. They are missing 4 of the key terms from exercise 2. Select the correct ones.

- a) The sun produces a vast amount of \_\_\_\_\_ which is absorbed by plants.
- b) The pores in the \_\_\_\_\_ are used for communication with the cytoplasm.
- c) Photosynthesis is an example of \_\_\_\_\_.
- d) Enzymes are \_\_\_\_\_ made from protein.

### 4. Vocabulary in use

Write a short sentence using each of the following terms. Check your Word File, text book or dictionary if you need help.

microscopes

\_\_\_\_\_

nucleolus

\_\_\_\_\_

DNA

\_\_\_\_\_

bacteria

\_\_\_\_\_

eyepiece

\_\_\_\_\_



Language Level: B1  
Individual / pair

## Focus on grammar

### 5. The passive form

The passive form of verbs is often used in scientific text.

The passive form is made by using the verb **to be** with the past participle of the active verb.

Example:

- **We added** drops of iodine solution (active sentence).
- Drops of iodine solution **were added** (passive form).  
Note that the verb **to be** is in the past tense to indicate that the action took place in the past.

When we want to say **who** or **what** did the action, we use **by**.

- The school **was decorated by** the students.

Put the sentences below into the passive form. Be careful about the tenses!

- a) A catalyst changes the speed of a chemical reaction.

The speed of \_\_\_\_\_

- b) Long chains of amino acids form proteins.

Proteins \_\_\_\_\_

- c) We dissolved sodium alginate in water to make a solution.

Sodium alginate \_\_\_\_\_

- d) Use a cork borer to cut holes in a starch-agar plate.

A cork borer \_\_\_\_\_

- e) In 1662 Robert Hooke examined sections of cork.

Sections of cork \_\_\_\_\_

- f) Cells contain information for cell activity.

Information \_\_\_\_\_

## 6. Prepositions

(preposition: a word used before a noun to show place, direction, time etc)

When we give instructions for an experiment it is necessary to use different prepositions in order to explain exactly what must be done.

Prepositions have been removed from these instructions for *Examining plant cells*. In the box below, you will find one preposition for every gap.

- Peel a thin layer of epidermis \_\_\_\_\_ inside one of the fleshy layers of an onion bulb.
- Lay the tissue \_\_\_\_\_ a drop of water \_\_\_\_\_ a microscope slide.
- Hold a cover slip \_\_\_\_\_ 45° and lower gently to exclude any air bubbles.
- Add a few drops of iodine solution \_\_\_\_\_ one side of the cover slip (treat all stains as hazardous and avoid direct contact).
- Draw the stain \_\_\_\_\_ the tissue by soaking up fluid \_\_\_\_\_ the other side \_\_\_\_\_ filter paper.
- Focus \_\_\_\_\_ low and then high power.
- Observe the nucleus, chromatin, cytoplasm and cell wall.

in      to      from      under      with      on      at      across      on

## 7. The Imperative

When we give instructions or directions we use the **Imperative Form**. In the sentences in the box above the imperative has the same form as the 'bare infinitive' that is the infinitive (to peel) without 'to' (peel).

Read through the sentences again, find all the imperative forms and list them below. If you come across any unfamiliar verbs, check them in your dictionary and write down the meaning.

You should find 9 imperatives in addition to the sample.

Imperative	Meaning	Imperative	Meaning
<i>peel</i>	<i>Remove the skin from fruit or vegetable</i>		

## Focus on reading



8. Read the text carefully and find the correct statement below. There is one correct answer for each question. Circle the correct answer.

### Microscopes

#### The light microscope

The light microscope uses light rays and at least two convex glass lenses. It can magnify up to 1400X at the very most. It can separate objects about 0.2 $\mu$ m. apart. It is portable and relatively inexpensive and is suitable for daily use in schools, colleges, hospitals and laboratories. It can examine living tissue but usually the tissue samples must be thin enough to allow light to pass through. It reveals the nucleus, cell organelles, cell walls, vacuoles and chromatin.

The microscope is a precision instrument and needs to be treated gently at all times. Do not bump it off the desk or allow any part to become wet or stained. Focusing should be done gently and slowly and the microscope should not be moved unless its bulb is cold.

#### The electron microscope

The electron microscope uses a beam of electrons rather than a beam of light and focuses them with electromagnets. The image is a photomicrograph which is a grainy, black and white picture. It has about 500 times the power of the light microscope. It magnifies up to about 500,000 times. At this extreme, a dressmaking pinhead appears to have a diameter of several kilometres and a typical cell seems the length of a classroom. It reveals the details of organelles and cell structures such as cilia, flagella and membranes.

The electron microscope is very expensive and not portable. Expensive training is required to use it. Objects viewed are usually within a vacuum and are, therefore, dead.

- 1) The light microscope magnifies, at the most, up to
  - a) 500 times.
  - b) 500,000 times.
  - c) 1400 times.
  - d) 0.5 times.
- 2) For the light microscope, living tissues must be
  - a) portable.
  - b) inexpensive.
  - c) treated
  - d) thin.
- 3) To focus a light microscope you must be
  - a) gentle.
  - b) cold.
  - c) wet.
  - d) stained.
- 4) The electron microscope uses
  - a) a beam of light.
  - b) sunlight.
  - c) a bulb.
  - d) a beam of electrons.
- 5) A disadvantage of the electron microscope is that it
  - a) is inexpensive.
  - b) is not portable.
  - c) takes a photomicrograph.
  - d) magnifies up to 500,000 times.

## 9. Reading for the main idea

It is not always necessary to read through every sentence and paragraph of text. Nor do you have to understand every single word. However, it is important to read with a purpose.

1. In this exercise you must read each paragraph (taken from your textbook) to decide on the main idea of that paragraph.
2. Then write **a phrase** on the blank line which **summarises** the topic of the paragraph.

You should **try** to read quickly, without stopping to check every word. However, sometimes it is necessary to read with more focus when the topic is not immediately clear.

a) Topic: \_\_\_\_\_

Nearly all living cells have a single, prominent nucleus (mature red blood cells in mammals and phloem sieve tubes in plants do not). The nucleus contains the chromosomes of the cell. These are clearly visible only during cell division. When a cell is not dividing, chromosomes form a mass of threads referred to as chromatin.

b) Topic: \_\_\_\_\_

The cell membrane consists of two layers of phospholipid molecules forming a greasy, lipid bilayer around the perimeter of the cell. The 'heads' of the lipid molecules are hydrophilic- they are attracted to water. The tails of the molecules are hydrophobic – they repel water.

c) Topic: \_\_\_\_\_

In all enzyme-controlled reactions, the enzyme works on a specific raw material (the substrate) and encourages it to turn into the products of the reaction. The enzyme itself does not become permanently changed and is reusable at the end of the reaction.

d) Topic: \_\_\_\_\_

Nothing can 'happen' anywhere in the world (or in the universe) without energy to make it happen. It is the motivator behind every single event that ever takes place anywhere. This rule applies in biology and so living organisms always require an input of energy to continue to live and carry out their life processes. Generally living organisms obtain their energy either directly from the sun or from energy-rich chemicals – food.

e) Topic: \_\_\_\_\_

Enzymes heated above their maximum temperatures are denatured – irreversibly destroyed by the heat. Egg white heated in a frying pan is denatured protein. It is impossible to turn it back into its original, fluid and transparent state.

## 10. Reading for specific information

Read the following extracts from your textbook. Don't read slowly though every word and sentence.

Read the questions first

Read the text in order to find the answers.

Underline the key sentences when you have found the answers.

**Tip:** It's a good idea to time yourself so that you learn how to find important information quickly.

### a) Enzyme structure

#### Questions:

1. What are proteins made from?
2. What is the primary structure?
3. What is the secondary structure?
4. What does folding produce?

All enzymes are made from protein and all proteins are formed from long chains of amino acids. The primary structure of an enzyme is the order of amino acids in its chains. The secondary structure is the way in which the chains are folded in three dimensions. The folding produces shapes (*active sites*) on the surface of the enzyme that correspond to the shapes of specific substrate and product chemicals.

### b) Ribosomes

#### Questions:

1. Where are ribosomes found?
2. What are ribosomes made from?
3. What are made in ribosomes?
4. What are a number of ribosomes called when they are attached to a strand of mRNA?

Thousands of ribosomes are found in the cytoplasm of every cell. They are tiny, grain-like structures made from protein and RNA. They act as '*protein factories*': they are the places where enzymes and other proteins are made. DNA in the nucleus directs the ribosomes and they follow nuclear instructions brought to them by messenger RNA (mRNA). Several ribosomes often lie along a single strand of mRNA to form a *polysome*.

Language Level: B1 / B2  
Individual / pair

## Focus on writing

### 11. Writing a paragraph

#### Remember!

- A paragraph is a unit of information unified by a central controlling idea.
- Paragraphs should focus on one piece of information.
- The main idea in a paragraph is often expressed in one particular sentence (called the topic sentence). This sentence is usually at the beginning of a paragraph, but can come at the end or even in the middle.
- It is important to organise the information logically in a paragraph.

a) Write a paragraph on the topic: *The Structure of a Cell*.

Include a sentence about each of the following points. Use your **textbook** if you need to check the information.

- What are the main parts?
- What does the nucleus do?
- What is the cytoplasm?
- What is the function of the cell membrane?
- What is the additional part in plant cells?

b) Write a paragraph on the topic: *The properties of enzymes*.

Include a sentence about each of the following points. Use your **textbook** if you need to check the information.

- What are enzymes made from?
- Where are they formed?
- How are they used?
- How do they react to heat or cold?
- How do they react to pH changes?

### Answer Key

#### Focus on vocabulary

##### 1. Prefixes

<b>hydrophilic</b>	hydro_____	water
<b>microfibrils</b>	micro_____	very small
<b>chromoplasts</b>	chromo_____	colour (plastids that manufacture and store coloured pigment)
<b>anaerobic</b>	an_____	not (negative)
<b>prokaryotic</b>	pro_____	before (prokaryon means before a nucleus)
<b>ultra structure</b>	ultra_____	beyond (the structures of a cell that are <b>beyond</b> the range of a light microscope)
<b>impermeable</b>	im_____	not (negative)
<b>bilayer</b>	bi_____	two (2)

##### 2. Matching

Column A	Column B
cell metabolism	the chemical reactions within cells
nuclear membrane	the covering of the nucleus which has thousands of pores
protein factories	the places where enzymes and other proteins are made
organic catalysts	enzymes that can change the speed of a reaction without becoming permanently changed
diffusion of gases	gases spreading through
solar energy	the heat and light produced by the sun

##### 3. Key phrases in use

- e) The sun produces a vast amount of **solar energy** which is absorbed by plants.
- f) The pores in the **nuclear membrane** are used for communication with the cytoplasm.
- g) Photosynthesis is an example of **cell metabolism**.
- h) Enzymes are **organic catalysts** made from protein.

#### Focus on grammar

##### 5. The passive

- a) The speed of a chemical reaction is changed by a catalyst.
- b) Proteins are formed of/by long chains of amino acids.
- c) Sodium alginate was dissolved in water to make a solution.
- d) A cork borer is used to cut holes in a starch-agar plate.
- e) Sections of cork were examined by Robert Hooke in 1662.
- f) Information for cell activity is contained in cells.

##### 6. Prepositions

- Peel a thin layer of epidermis **from** inside one of the fleshy layers of an onion bulb.
- Lay the tissue **in** a drop of water **on** a microscope slide.
- Hold a cover slip **at** 45° and lower gently to exclude any air bubbles.
- Add a few drops of iodine solution **to** one side of the cover slip (treat all stains as hazardous and avoid direct contact).
- Draw the stain **across** the tissue by soaking up fluid **on** the other side **with** filter paper.
- Focus **under** low and then high power.
- Observe the nucleus, chromatin, cytoplasm and cell wall.



## 7. The imperative

- Peel a thin layer of epidermis \_\_\_\_\_ inside one of the fleshy layers of an onion bulb.
- Lay the tissue \_\_\_\_\_ a drop of water \_\_\_\_\_ a microscope slide.
- Hold a cover slip \_\_\_\_\_ 45° and lower gently to exclude any air bubbles.
- Add a few drops of iodine solution \_\_\_\_\_ one side of the cover slip (treat all stains as hazardous and avoid direct contact).
- Draw the stain \_\_\_\_\_ the tissue by soaking up fluid \_\_\_\_\_ the other side \_\_\_\_\_ filter paper.
- Focus \_\_\_\_\_ low and then high power.
- Observe the nucleus, chromatin, cytoplasm and cell wall.

## Focus on reading

## 8. Microscopes

1. c)
2. d)
3. a)
4. d)
5. b)

## 9. Reading for the main idea

Suggested answers:

- a) the appearance of the nucleus / what the nucleus looks like
- b) the lipid bilayer of the cell membrane / the formation of the cell membrane
- c) the enzyme's effect on the substrate / enzyme-controlled reactions
- d) the importance of energy for life and living things
- e) denatured enzymes

## 10. Reading for specific information

### a) Enzyme structure

All enzymes are made from protein and all proteins are formed from <sup>1</sup>long chains of amino acids. The primary structure of an enzyme is <sup>2</sup>the order of amino acids in its chains. The secondary structure is <sup>3</sup>the way in which the chains are folded in three dimensions. The folding produces <sup>4</sup>shapes (active sites) on the surface of the enzyme that correspond to the shapes of specific substrate and product chemicals.

### b) Ribosomes

Thousands of ribosomes are found <sup>1</sup>in the cytoplasm of every cell. They are tiny, grain-like structures made from <sup>2</sup>protein and RNA. They act as '*protein factories*': they are the places where <sup>3</sup>enzymes and other proteins are made. DNA in the nucleus directs the ribosomes and they follow nuclear instructions brought to them by messenger RNA (mRNA). Several ribosomes often lie along a single strand of mRNA to form <sup>4</sup>a polysome.