

Leaving Certificate

Biology

Cell Biology

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

Levels	Students' English-language skills should be developed to Level B1 during funded Language Support. Mainstream subject learning will require the development of skills at Level B2 if students are to cope with public examinations.	
Language focus	Key vocabulary, word identification, sentence structure, extracting information from text, writing text, grammar.	
Learning focus	Using Biology textbooks and accessing curriculum content and learning activities.	
Acknowledgement	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.	
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Using this unit

Language support and mainstream subject class

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

Focus on reading and *Focus on writing* are suitable for use in either Language Support or 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...

NAME: _____ **DATE:** _____
Leaving Certificate Biology: Cell Biology

genetic
immobilised
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

Word	Meaning	Page(s) in my textbook	Note
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 students to provide key words in their own languages.
- Encourage dictionary use.
- Encourage students to organise their vocabulary into relevant categories (e.g. meaning, nouns, keywords, verbs etc.).



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

NAME: _____ DATE: _____

Leaving Certificate Biology: Cell Biology

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.

hydrophilic	hydro_____	
microfibrils	micro_____	
chromoplasts	chromo_____	
anaerobic	an_____	
prokaryotic	pro_____	
ultra structure	ultra_____	
impermeable	im_____	
bilayer	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



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 μ 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*.

NAME: _____ DATE: _____

Leaving Certificate Biology: Cell Biology

Level: B1 / B2
Individual / pair

Focus on writing

10. 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

hydrophilic	hydro_____	water
microfibrils	micro_____	very small
chromoplasts	chromo_____	colour (plastids that manufacture and store coloured pigment)
anaerobic	an_____	not (negative)
prokaryotic	pro_____	before (prokaryon means before a nucleus)
ultra structure	ultra_____	beyond (the structures of a cell that are beyond the range of a light microscope)
impermeable	im_____	not (negative)
bilayer	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 ¹**long chains of amino acids**. The primary structure of an enzyme is ²**the order of amino acids in its chains**. The secondary structure is ³**the way in which the chains are folded** in three dimensions. The folding produces ⁴**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 ¹**in the cytoplasm of every cell**. They are tiny, grain-like structures made from ²**protein and RNA**. They act as '*protein factories*': they are the places where ³**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 ⁴**a polysome**.