Preface

“A subtle thought that is in error may yet give rise to fruitful inquiry that can establish truths of great value.” Isaac Asimov

Welcome to Academic English for Biology, a complete course for international students preparing to study Biology in English at university level!

What’s in the course?

Academic English for Biology is designed specifically to improve your ability to study Biology-related texts effectively in English. It is written for international students who are planning to embark on an undergraduate programme of Biology and speak English as a foreign language. With this course, you will develop your knowledge of academic and scientific conventions and you will improve your skills in the following areas:

• reading and understanding of informal and formal Biology articles, lab reports and lectures in English.
• listening to lectures, understanding sign-posting language, identifying main points in a lecture and improve your note-taking skills
• noticing writing conventions for different audiences and purposes within the same discipline and improving your academic writing skills
• contributing effectively in seminars and discussions
• preparing and giving effective presentations
• improving academic vocabulary and prominent language features
• improving study skills such as note-taking
• improving your critical reading and writing skills with peer-review evaluations

What’s in a unit?

English for Biology has ten (10) units. It has been designed to analyse, sequence and present the target language in a way that accords to foreign language learning needs and a common core Biology 101 college syllabus. It is an attempt to match the goals and objectives of a General Biology programme and English for Academic Purposes (EAP) featuring formality, paraphrasing, summarising and use of evaluative language. Each unit starts with the learning objectives for that unit. Also, warm up activities are designed so that the learner can be engaged by the text and is willing to authenticate it by taking
interest. At the back of the book there is a glossary with biological terms and audio scripts as well as evaluation criteria for each skills discussed in this book.

Pre-text activities are expected to generate discussion and introduce the topic of the unit. The discussion section contains pictures, diagrams and tables contributing to the interest of the topic of the reading text that follows.

### Reading

The readings although simplified, abridged and edited versions of authentic undergraduate resource books are expected to offer students a balanced coverage of relevant topics.

To ensure that the texts are accessible to learners at this early stage, texts are edited or chosen in accordance to the criteria of length, density of new information and presence of accompanying material such as pictures and diagrams. As such, learners are exposed to a few samples of authentic language with genre analysis in the final part of the book.

### Reading comprehension

Each text is followed up by an appropriate reading comprehension task. Students are often asked to look for and identify specific information or show understanding of the general gist, match topics to paragraphs and classify information.

### Vocabulary building

Context is seen as vitally important. The book attempts to establish a coherent context with thematically integrated skills and exercises that connect in terms of topic and skill development.

### Writing and academic style

Meaningful examples and a variety of general English for Academic purposes reading, writing and note-taking skills are provided in this book. Students should build on the functions of language such as coherence and cohesion, exemplifying, cause and effect, summarising, peer-reviewing and evaluating. Students are given guidance to develop these important skills in confidence.
Presentation and discussion skills

Students are guided with regards to presentation structure, presentation slide design and delivery. They are also encouraged to discuss topics that are relevant to each unit, practice their conversational skills and authenticate the topic presented later on.

I wish you every success and hope you enjoy your time learning English for Biology.

Kallia Katsampoxaki-Hodgetts
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Review of Scientific Method and Inorganic Chemistry for biologists

Themes
Science basics, units, quantities, abbreviations and symbols, steps in the scientific method, atomic structure, chemical bonds, acids/ bases, redox reactions, types of energy, thermodynamics’ laws

Academic presentation skills
Using visuals to enhance the impact of your presentation

Academic reading skills
Skimming and scanning

Academic vocabulary skills
Academic word lists and collocations

English for Chemistry skills
Reading a chemical formula

Note-taking skills
Linear style with abbreviations and symbols
Discussion

Task 1 Before you read the text, work in pairs as instructed below.

1 Consider what science means to you. Then, devise a diagram with all the steps that a scientist takes before and after they conduct an experiment.

2 Compare your diagram with one of your peers.

3 Explain the difference between deductive and inductive reasoning and give examples.

4 Define (in)dependent variables and control group. Why are they important when testing a hypothesis?

5 Discuss whether peer-reviewing is important in science.

Note-taking practice

1 Listen to the lecture on the nature of science and write down only what you think is very important to remember. Did the lecturer hold the same views on the issues you discussed earlier? Why? Why not?

2 In pairs, use your notes to write up the accompanying presentation slides. What would you include? What would you leave out?

3 Check your slides with the following guidelines to see if you met the necessary standards for an effective scientific presentation.

<table>
<thead>
<tr>
<th>STATE</th>
<th>ATOMIC/ MOLECULAR MOTION</th>
<th>ATOMIC/ MOLECULAR SPACING</th>
<th>SHAPE</th>
<th>VOLUME</th>
<th>COMPRRESSIBILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid</td>
<td>Oscillation/vibration about fixed point</td>
<td>Close together</td>
<td>Definite</td>
<td>Definite</td>
<td>Incompressible</td>
</tr>
<tr>
<td>Liquid</td>
<td>Free to move relative to one another</td>
<td>Close together</td>
<td>Indefinite</td>
<td>Definite</td>
<td>Incompressible</td>
</tr>
<tr>
<td>Gas</td>
<td>Free to move relative to one another</td>
<td>Far apart</td>
<td>Indefinite</td>
<td>Definite</td>
<td>Compressible</td>
</tr>
</tbody>
</table>

Table 1 Properties of liquids, solids and gases
Enzyme Biochemistry

Themes
Activation energy, substrates, inhibition and regulation of enzyme activity, factors affecting enzyme function, glycolysis pathway, Krebs cycle

Note-taking skills
Lecture cues and signposting language: identifying moves in a lecture

Academic vocabulary skill
Word families
Confusing words
Adverbs: degree, opinion, frequency, manner

Academic writing skills
In-text citations and References; Why and how we use them
Introduction to formality and academic style

Note-taking practice
Lecture on respiration and ATP
Noticing (in)formality: Transition from informal to formal
Discussion

Task 1 Place the following words in the following scheme: enzyme, active site, substrate, cleft, end product (Fig. 1).

![Figure 1](image1.png)

**Figure 1** Visual representation of enzyme mechanism.

Task 2 Define the terms precursor and intermediate as shown in Figure 2.

![Figure 2](image2.png)

**Figure 2** Visual representation of a simple metabolic pathway under normal conditions.
Lecture cues and signposting language

Good lecturers tend to use signposting language in order to help their students follow what is being said, understand the lecture’s structure, purpose and content.

Some of the cues you should be looking for during a lecture are listed below. What phrases would you expect to hear?

<table>
<thead>
<tr>
<th>PURPOSE OF LECTURE CUES</th>
<th>SIGNPOSTING LANGUAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>set the scene</td>
<td></td>
</tr>
<tr>
<td>prepare students of what's coming up next or give overview</td>
<td></td>
</tr>
<tr>
<td>check whether administration matters are understood, resolved or met</td>
<td></td>
</tr>
<tr>
<td>ask rhetorical questions i.e. for emphasis</td>
<td></td>
</tr>
<tr>
<td>provide historical background</td>
<td></td>
</tr>
<tr>
<td>provide demonstrations and examples</td>
<td></td>
</tr>
<tr>
<td>analyse, compare and contrast theories, practices, viewpoints or evidence</td>
<td></td>
</tr>
<tr>
<td>use facts and figures, graphs and charts to present, analyse or provide evidence</td>
<td></td>
</tr>
<tr>
<td>signal the end of the lecture and/or summarise key points</td>
<td></td>
</tr>
</tbody>
</table>
DNA Replication Processes & Steps; Transcription & Translation

Themes
DNA replication, DNA polymerase, DNA's leading and lagging strands, transcription of mRNA, regulation of gene expression, intron and exon splicing, codons, translation of mRNA to protein

Academic presentation skills
Using mind maps to organise ideas and concepts

Academic vocabulary skills
Word formation and use in context

Academic writing skills
Style: Avoiding wordiness
Accuracy: Subject-verb agreement
Collaborative task

Task 1 Watch the following video on DNA replication and complete the mind-map. Compare your mind map with one of your classmates and make adjustments.

https://www.youtube.com/watch?v=2LnXpaVUG0Y

Figure 1 DNA replication process and steps.
No cell is able to survive with making just one protein. In other words, even the simplest of cells have a large bank of protein blueprints, i.e. the genomes, to draw from. A single molecule of DNA may have many thousands of protein coding regions. In fact, the genetic information of DNA is in the form of a chemical code. This DNA code is the order of nucleotides that ultimately dictates which amino acids are used to synthesise a protein. In general, the path of information is from DNA transcription to RNA and from RNA translation to protein, often referred to as the Central Dogma of molecular genetics.

Without replication, the daughter cells cannot be transcribed nor translated. DNA replication occurs in cells in preparation for cell division. It is the process of duplicating the genetic material prior to its distribution to daughter cells. As the DNA duplex is unwound with the assistance of the enzyme helicase, its two strands are separated in opposite directions along the DNA molecule, and new DNA nucleotides bond to the nucleotides on the existing DNA strands using the base-pairing rules and an enzyme, DNA polymerase. Since the two parent strands of DNA are antiparallel, the new strands are oriented in opposite directions along the parent templates. The leading strand elongates toward the replication fork adding nucleotides continuously to its growing 3’ end whereas the lagging strand elongates away from the replication fork and is synthesised discontinuously as a series of short segments known as Okazaki fragments (Fig 1). After all gaps between Okazaki fragments are completed, the enzyme DNA ligase joins the fragments to the lagging strand.

The genetic information stored as a DNA code is then transcribed using DNA as a template to synthesise RNA. There are three principal types of RNA: messenger RNA (mRNA), ribosomal RNA (rRNA) and transfer RNA (tRNA). The mRNA transcribed from DNA is read by ribosomes in increments of three nucleotides known as codons which are correlated to the single amino acid required for protein synthesis (Fig. 2).
Electroporation: common molecular biology technique

**Themes**
DNA plasmids, restriction enzymes and ligase, electroporation, heat shock transformation, agarose gel electrophoresis, bacterial transformation, recombinant DNA

**Academic discussion skills**
Asking for clarification; Asking for opinions

**Note-taking practice**
Introduction to Plasmids

**Academic vocabulary skills**
Laboratory equipment
Definitions/Confusing words in science

**Academic Writing skills**
Style: Focusing on Language of Experimental Data
Common pitfalls in scientific writing: ambiguity, personification, contractions, numerals and phrasal verbs
Laboratory report structure
Style: Scientific tables and graphs: Formatting
Peer-reviewing a student’s sample laboratory report

**Note-taking practice**
Following instructions and revising a manuscript after teacher feedback
Discussion

Task 1 In pairs, describe the laboratory rules and regulations that students must observe before, during and after lab work.

Task 2 In pairs, discuss why the following safety measures should be followed in a biology lab:

Chemical containers should be properly labeled and closed when not in use.

Chemicals should be segregated and stored by compatibility.

Flammable chemicals should be stored in areas free of ignition sources.

Fume hoods or bio-safety cabinets should be used for general storage.

Compressors should be equipped with pressure gauges and pressure relief valves.

Oxygen and Acetylene when stored together should be separated by a 5’ noncombustible barrier.

Expressions of negative purpose

To answer the above questions you can use expressions of negative purpose. These are:

<table>
<thead>
<tr>
<th>NEGATIVE PURPOSE EXPRESSIONS</th>
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<tbody>
<tr>
<td>so as not to</td>
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<tr>
<td>for fear that …should/might</td>
</tr>
<tr>
<td>in order not to</td>
</tr>
<tr>
<td>lest that…should/might</td>
</tr>
</tbody>
</table>
**Task 3** You are going to listen to a description of an experimental process in which the following laboratory equipment is mentioned. Match the terms with the pictures (there are more than one piece of equipment in some pictures):

<table>
<thead>
<tr>
<th>Term</th>
<th>Picture 1</th>
<th>Picture 2</th>
<th>Picture 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>agar plates</td>
<td><img src="image1" alt="Picture 1" /></td>
<td><img src="image2" alt="Picture 2" /></td>
<td><img src="image3" alt="Picture 3" /></td>
</tr>
<tr>
<td>autoclave (steriliser)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>buffer solution</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Bunsen burner</td>
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<tr>
<td>centrifuge or microfuge</td>
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<tr>
<td>electrode</td>
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<tr>
<td>electroporation cuvette</td>
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<tr>
<td>Eppendorf tubes</td>
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<tr>
<td>fluorescent colonies</td>
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<tr>
<td>fluorescent optical microscope</td>
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<tr>
<td>incubator</td>
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<tr>
<td>six well plate,</td>
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<td>pH meter</td>
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<tr>
<td>pipette</td>
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<tr>
<td>test tube</td>
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<tr>
<td>test tube rack</td>
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</tbody>
</table>
Plasmid Isolation

In the following video, Katie Wolfson (2012) provides an excellent introduction to a typical plasmid isolation technique.

Task 4 Watch the video online and take down the steps described by the narrator.
From Plant cell to Plant development

Themes
Plant cell structure, plant stem and leaf structures, shoot system growth, root system, nitrogen, xylem and phloem, sporophytes, tropisms, seasonal growth cycles, mechanisms in plant development

Academic presentation skills
Predicting what’s coming up in a lecture; presentation approaches

Academic vocabulary
Word formation and use in context
Compound words in biology
Common prefixes and suffixes

Academic writing skills
Style: Academic caution

Note-taking skills
Identifying key points in a lecture
Advances in Materials Science and Biology: Bioluminescence and “glow in the dark” plants
Discussion

Predicting what is coming up in an academic article, paper, lecture or discussion is an important skill that helps students save time and focus on what is really important for that matter.

Task 1 In groups of four or five, try to map out the content of a lecture entitled “From Plant cell to mechanisms of plant development”. Reading the themes in the beginning of the unit might help you although the content should not be restricted to these issues only.

Task 2 In pairs, consider a way of presenting these items. Three very popular ways of presenting new ideas are the following:

a From general to specific using classifications and taxonomies
b Chronological arrangement
c Similarities and differences of relevant or not so relevant approaches

Task 3 Listen to the lecture on “Plant cell mechanisms and plant development” and check whether your predictions were accurate.
Introduction to key vocabulary: Plant cell and structure

The following scheme features a generic plant cell (Fig. 1) and plant structure (Fig. 2) with some key components.

Task 3 Place the terms describing the generic plant cell components in the correct site:

cell membrane, cell wall, chloroplast, cytoplasm, endoplasmic reticulum, Golgi body, mitochondrion, nuclear pore, nuclear membrane, nucleus, nucleolus, ribosome, starch granule

Figure 1 Plant cell components