Preface

Our Unique Planet is an upper-intermediate reading comprehension book focusing on key areas of science and technology. The book's 22 units cover a wide variety of contemporary topics, which today's college and university students will find both familiar and interesting.

The topics include space exploration, research into health and diseases, new technology, tsunamis and volcanoes. The book also presents and explains some of the basic concepts of science such as the nature of the particles that make up matter, the origin of life on Earth and human evolution. Students using the book will develop their reading skills and gain exposure to scientific texts. They will also expand their science vocabulary, and develop skills in interpreting visuals such as diagrams and graphs.

While presenting challenging and relevant subject matter, *Our Unique Planet* is also written in language that is clear and "reader-friendly." This highly accessible style makes the book useful not only for science students, but also for students of English generally.

How to use this book

Background information and essential words and phrases
This introductory vocabulary activity is designed to prepare students for the main reading passage. Key vocabulary and concepts are introduced in contexts that refresh and consolidate students' existing knowledge of the topic.

Reading passage
After completing the introductory vocabulary activity, students read the main passage. Ten words or phrases have been selected in each passage for study in the following vocabulary exercise. Where appropriate, the passages make reference to the accompanying diagrams. Each reading passage is also accompanied by a glossary, which gives Japanese translations of selected words and phrases.

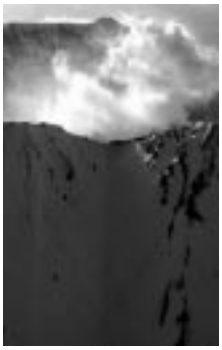
Vocabulary study
In this activity, students match ten key words or phrases from the reading passage to their correct meanings. Students are encouraged to deduce the meanings from the context, rather than using a dictionary.

Comprehension questions
These multiple-choice questions test that important ideas and details from the passage have been understood. Three types of question are presented throughout the book: gap-fill style, in which students choose the correct word or phrase to fill a gap in a sentence, sentence-completion style, in which students choose the correct ending for a sentence, and question-and-answer style, in which students choose the correct answer to a question. Some of the comprehension questions relate directly to the accompanying diagram, giving students valuable practice in interpreting information in visual form or in a graph.

Summary and listening practice
This activity presents a one-paragraph summary of the reading passage with several words missing. First, students draw on their comprehension of the passage to write as many words as they can. Then they listen to a recording of the summary on the accompanying CD to complete the task. As well as giving a useful example of how a summary should be written, this activity also gives students the opportunity to hear the key language of the unit in spoken form.

Structure and written expression
This activity is based on TOEIC® Test exercises. Students choose the correct words or phrases to complete sentences relating to the passage. This activity focuses on both the meaning of words and correct grammatical forms.

Contents



The Origin of Life on Earth

UNIT 1

BACKGROUND INFORMATION AND ESSENTIAL WORDS AND PHRASES

Complete the sentences using words or phrases from the box below. You may change the form of the words or phrases.

ancestor
amino acid
hypothesis
organic
bacteria
oxygen-dependent

1. A(n) _____ is an idea that scientists develop to explain the occurrence of an event or set of facts.
2. _____ are the smallest and simplest living things.
3. All living things are made of _____ compounds, which are based on carbon.
4. If plants did not give off oxygen as a waste product, _____ animals could not exist.
5. Proteins, which contain many _____, form a major part of all living things.
6. The earliest _____ of modern plants appeared in the oceans.

From Single Cells We Came

We know about the major steps in the evolution of life on Earth thanks to scientific evidence provided by fossils, including those of very simple, early forms of life. However, the question of how life *began* remains a matter for hypothesis. There are three main hypotheses to explain the origin of life on Earth. One is that life was created by a Supreme Being or spiritual force. Most cultures have their own beliefs or religions to explain a creator. However, since these beliefs cannot be proven or **disproven**,[1] they are outside the boundaries of science and won't be discussed here. Another hypothesis is that life began in another part of the universe and arrived on Earth on something like a meteor or comet. But the hypothesis that most scientists believe is that life began on Earth as a result of chemical reactions.

In 1953, Stanley Miller and Harold Urey at the University of Chicago **demonstrated**[2] that some organic compounds could be created by **simulating**[3] the conditions of early Earth. In an experiment, they sent electric currents through a mix of gases over a pool of water. The electric currents simulated lightning; the gases were the same as those found in the Earth's early atmosphere; the pool simulated the early oceans. After a week, Miller and Urey found several amino acids in the pool. Amino acids combine to form proteins, and are therefore essential to the formation of living cells. Miller and Urey's experiment, while not actually producing a living organism, gave support to the hypothesis that life began on Earth as a result of chemical reactions.

By 3.5 billion years ago, the first living things, single-celled bacteria, had appeared in the sea. These first bacteria obtained their energy from amino acids and produced methane and carbon dioxide as **waste**.[4] Fossils of these bacteria have been found in rocks 3.5 billion years old. The bacteria became attached to floating sand grains that built up over long periods and **hardened**[5] into **structures**[6] of rock, known as stromatolites. Some of these structures are still found today in remote parts of Australia.

Gradual changes over more than one billion years **gave rise to**[7] a new type of cell which, unlike bacteria, had a nucleus. These cells got their energy from a different source—the sun—in a process called photosynthesis. This produces oxygen as a waste product. Because these cells could feed themselves using the sun's energy, their food was less limited than the bacteria's food, and they **flourished**.[8] Over many millions of years of evolution, these cells eventually gave rise to plants. If it weren't for the development of these organisms using photosynthesis, the Earth's atmosphere would contain no oxygen, and oxygen-dependent animals such as humans would never have appeared.

Stromatolites, like these in northwestern Australia, are made up of bacteria and sand that have hardened into rock structures over many thousands of years.

About one billion years ago, when life still existed only in the oceans, organisms made up of many cells started to appear and increase in size. The ancestors of modern plants appeared in the oceans nearly 700 million years ago, and around 440 million years ago, the first land plants appeared. These early land plants differed from the plants we are **familiar with**[9] today. Many of them **lacked**[10] true roots, stems and leaves. Animal life, too, developed first in the ocean and then moved onto land. About 560 million years ago, the first animals appeared in the oceans, and about 460 million years ago, tiny mites and spider-like creatures left the water to explore the land.

There are many gaps in our understanding of how life began and developed on Earth. We will probably never know the full story.

GLOSSARY

VOCABULARY STUDY

Match each word or phrase with its definition. Try to guess the meaning from the context without using a dictionary.

1. disproven	a. to show that something is true
2. demonstrate	b. result in, or lead to
3. simulate	c. to become hard
4. waste	d. to grow well and in large numbers
5. harden	e. a solid object built from smaller parts
6. structure	f. to create conditions similar to something
7. give rise to	g. knowing something well
8. flourish	h. to be without something; to not have something
9. familiar with	i. shown to be not true
10. lack	j. material that a living thing does not need and gets rid of

COMPREHENSION QUESTIONS

Circle the best answer, a, b, c or d, to each of these questions.

1. Most scientists believe that life on Earth began:
   a. on a meteor or comet.
   b. as a result of chemical reactions.
   c. in a pool of water.
   d. in another part of the universe.

2. Miller and Urey's experiment produced _____ in a pool of water.
   a. a living organism
   b. oceans
   c. amino acids
   d. single-celled bacteria

3. Roughly how long ago did the first living things appear on Earth?
   a. 3.5 billion years ago
   b. one billion years ago
   c. 700 million years ago
   d. 440 million years ago

4. Where did the first living things appear on Earth?
   a. In the sea
   b. In remote parts of Australia
   c. In rocks
   d. In mounds

5. Unlike the first bacteria, a cell that has a nucleus gets its energy from:
   a. oxygen.
   b. the sun.
   c. water.
   d. plants.

6. How were the first land plants different from modern plants?
   a. Early plants didn't have true roots.
   b. Early plants didn't have stems.
   c. Early plants didn't have leaves.
   d. All of the above (a, b *and* c)

SUMMARY AND LISTENING PRACTICE

Read the paragraph and fill in as many blanks as you can. Then listen to the recording and fill in the rest of the blanks.

Most scientists believe that life on Earth began as a result of chemical _____. In the 1950s, two scientists demonstrated that _____ acids could be created by sending electric _____ through a mix of gases over water. The first living things, which were single-celled _____, appeared in the sea 3.5 billion years ago. Then a new type of cell appeared which took in energy from the sun in a process called _____ and gave off oxygen as a _____ product. Later, plants and animals developed in the sea and then moved onto _____. There is still a lot that we do not know about how life began on Earth.

STRUCTURE AND WRITTEN EXPRESSION

Complete the sentences using the most appropriate words or phrases. You may refer to the main text to choose the best option.

1. Most scientists believe that life on Earth began _____ chemical reactions.
   a. resulted b. as a result of c. resulting d. as a result

2. The gases in Miller and Urey's experiment were _____ those in the Earth's early atmosphere.
   a. the same as b. same as c. same d. as same

3. The first living things obtained their energy _____ amino acids.
   a. by b. of c. from d. at

4. The first living things _____ carbon dioxide and methane as waste.
   a. produced b. obtained c. appeared d. found

5. Early land plants differed _____ modern plants.
   a. from b. at c. to d. with

6. The plants we are familiar _____ today have roots and leaves.
   a. from b. at c. to d. with