FACULTAD NACIONAL DE INGENIERÍA

DEPARTAMENTO DE IDIOMAS

SHORTCUT

A TASK-BASED READING TEXT FOR ACADEMIC PURPOSES

PROYECTO BOLIVIANO-BRITÁNICO PARA LA ENSEÑANZA DEL INGLÉS

AIDA MERCADO CASTELLÓN

LOURDES FOREST DE TORREZ

Facultad Nacional de Ingeniería
Departamento de Idiomas
Oruro - Bolivia

SHORTCUT

A task-based reading text for academic purposes

Aida Mercado Castellón

and

Lourdes Forest de Torrez

PROYECTO BOLIVIANO – BRITÁNICO PARA LA ENSEÑANZA DEL INGLES

Aida Mercado Castellón, Lourdes Forest de Torrez
Teléfonos: 5277574 - 4792006
Oruro – Bolivia
E – mail : adymerk@yahoo.es
lourdesforest@hotmail.com

Registrado en la Dirección Nacional de Derecho de Autor,
según Resolución Administrativo Nº 1 – 316 / 2000

DEPOSITO LEGAL 5 – 1 – 147 – 2000

CONTENTS

Foreword
Presentación
Acknowledgements

Title	Language/Skill Focus	Page
Unit I UNSOLVED MYSTERIES		
1 THE DINOSAURS	Using cognates Scanning Guessing unknown words Using phrasal verbs Recognising cause & effect relationship Working out contextual reference Language Focus: Connectors showing cause/effect Use of pronouns	2
2 THE EGYPTIAN PYRAMIDS	Ordering topics Transferring information Note taking Reading for gist Gap filling Working out contextual reference Looking up words according to a definition Language Focus: Revision of Passive Structures: Present, Past, Progressive, Present Perfect Tenses and Modals	9
3 UFO	Scanning Matching sentence halves Multiple choice Matching vocabulary items Inferring Language Focus: Revision of Modal Auxiliary Verbs	15
UNIT II FROM COUNTING TO COMPUTERS		
4 NUMBERS	Selecting titles from a list Transferring information to a table Dealing with different uses of numbers Transferring information to a chart Language Focus: Relative Clauses	23
5 PIONEERS	Jigsaw reading: Blaise Pascal, Charles Babbage, Marie Curie, Albert Einstein Deciding statements as True or False Language Focus: Noun + Noun Structure	30
6 DIALOGUE IN CYBERSPACE	Matching words with their synonyms Scanning Predicting Ordering events Skimming Summarising information Locating information Translating Language Focus: Compound Nouns	35

UNIT III HOW THINGS WORK

7 COMPUTERS TODAY 43
Scanning
Skimming
Contextual reference
Language Focus: Prefixes

8 THE RADIO TELESCOPE 47
Scanning and skimming
Working out contextual reference
Language Focus: Comparisons: Expressing similarity and difference: Equivalence, Non-equivalence, the Superlative and Parallel Increase

9 SUSPENSION BRIDGES 52
Locating information
Transferring data to a chart
Word Building: dictionary definitions
Language Focus: Suffixes I - noun-forming suffixes; adjective-forming suffixes

UNIT IV SOURCES OF ENERGY

10 NATURAL RESOURCES 60
Dealing with unfamiliar words
Transferring information from a diagram
Language Focus: Sentence connectors for giving reasons: *so as to, in order to, so that, so, to.*

11 ENERGY FROM THE EARTH 64
Scanning and locating information
Gap filling
Sequencing
Making information questions
Labelling Diagrams
Language Focus: Suffixes II - verb-forming suffixes; adverb-forming suffixes

12 RENEWABLE AND NON-RENEWABLE SOURCES OF ENERGY 70
Sorting out words
Predicting from pictures
Scanning and skimming
Working out contextual reference
Multiple choice
Sentence Connectors: contrast, cause-effect, time sequence

UNIT V FUTURE TRENDS IN SCIENCE

13 GENE FOODS 77
Matching summaries with sections of the text
Skimming
Classifying information
Transferring information to a chart

14 LASERS 81
Predicting
Matching words with their definitions
Looking for specific information
Gap filling
Transferring information to a table
Matching titles with text
Describing functions: Use for + Ving and Use to + V

15 ROBOTICS 87
Predicting from pictures
Selecting items
Matching main ideas with text
Skimming
Deciding statements as True or False
Transferring data to a table
Writing: describing characteristics
Language Focus: Finding main ideas and supporting details

WORKBOOK

1 Synthetic Stones 95
2.The Rosswell Incident 97
3. The Computer Revolution 99
4. The Development of Technology 101
5. The Dangers of Genetic Engineering 103
6. Solar Power 105

EXTENSIVE READING

1. Reading English Newspapers
   a. Dolly, the first clone? 109
   . b. Lucky At The End 110
2. Reverse Creation 111

APPENDIX A

Answer Key to Self-study Lessons 113
Answer Key to Extensive Reading

APPENDIX B

I. How Language Works - Parts of Speech 120
II Sentence Connectors 123
III. Commonly Used Verbs in Academic English 125

APPENDIX C

Glossary of Technical Terms 129

BIBLIOGRAPHY

To our sons Oscar Pablo,
Freddy Alejandro and Fabrizio

FOREWORD

The writers of this book, Aida Mercado and Lourdes Forest, are dedicated ESP teachers who have been involved in materials development for a number of years. In 1997/98 they were awarded a scholarship by the British government to spend 6 months at Thames Valley University in London. They used this time to extend their knowledge of course design and methodology, to collect authentic reading texts, and to design the activities for this book.

This textbook, which is intended to help Bolivian undergraduate students of science and technology to develop their academic reading skills, is the result of the writers' dedication and extremely hard work during their time in London. Teachers and students using these materials will find a variety of interesting texts and activities that are intended to teach reading skills in a systematic way rather than simply testing students comprehension.

It has been my great pleasure to work with Aida and Lourdes while this book was being developed, and I wish them every success in the use of these materials.

Nick Andon
Thames Valley University
London

January 2000

ACKNOWLEDGEMENTS

We are very grateful to John Wood for the opportunity he has given us to attend a course on Designing ESP Materials at Thames Valley University in London through the Bolivian-British Project for the Teaching of English.

We would also like to thank our teachers in that institution: Rose Clark, Dermot Murphy, John Waterman and John O'Regan for having shared some of their experience and knowledge with us.

We are thankful as well to our authorities at the Universidad Técnica de Oruro and the Facultad Nacional de Ingeniería, especially Msc. Ing. Rubén Medinacelli and Ing. Willy Camargo for their support.

Special thanks are due to Nicholas Andon, whose valuable advice and help were essential for the development of this book.

PRESENTACIÓN

SHORTCUT fue elaborado en Thames Valley University, Londres bajo la supervisión del Profesor Nicholas Andon, docente de dicha institución y pretende llenar una de las grandes necesidades en nuestra institución, la Facultad Nacional de Ingeniería, que es la de contar con un texto que se adapte a nuestra realidad (clases numerosas y poco tiempo disponible), puesto que los textos diseñados en otros países no consideran nuestras características particulares y no siempre pueden ser adecuados a nuestro requerimientos.

Un rasgo predominante del E.S.P. (English for Especific Purposes) es la lectura, y en menor grado la escritura, sobre las otras habilidades (escuchar y hablar), debido a que es una prioridad para nuestros estudiantes leer manuales, artículos científicos, textos académicos y otros escritos en Inglés, y sobre todo la Internet, todo lo cual constituye una valiosa fuente de información y actualización. Por otro lado, y de acuerdo a los resultados obtenidos en el Cuestionario de Análisis de Necesidades (Needs Analysis Questionnaire) aplicado a los estudiantes de la Facultad Nacional de Ingeniería, se confirmo que una necesidad básica de nuestros estudiantes es la lectura, tanto durante los estudios académicos, la elaboración de tesis de grado, como durante el desempeño profesional.

El presente texto en su Tercera Edición, tiene como objetivo primordial desarrollar en los estudiantes la habilidad de leer sin ayuda, textos auténticos con una comprensión adecuada. Tomando en cuenta este factor es que la presente edición tiene cambios importantes: se actualizó la información, se añadieron ejercicios, se incluyeron nuevas técnicas de lectura y también se diseño una nueva sección, WORKBOOK (cuaderno de tareas) que facilitaran en mayor medida el logro del objetivo propuesto. Todo ello se conseguirá a través de técnicas de lectura tales como:

- Selección de ideas principales y detalles de apoyo
- Inferencia del significado de las palabras no conocidas por el contexto
- Localización de información específica **(scanning)**
- Enlace de ideas mediante palabras de conexión: **however, instead of, therefore**, etc.
- Reconocimiento de relaciones de causa y efecto
- Transferencia de información de y a diagramas
- Comprensión y descripción de procesos
- Predicción del contenido de un texto a partir de títulos, dibujos, etc.
- Inferencia de información no explícitamente mencionada
- Utilización del conocimiento previo del tema en discusión, etc.

Los ejercicios y actividades que acompañan los pasajes de lectura están diseñados para proporcionar al estudiante eficaces estrategias de lectura independiente para lidiar posteriormente con textos auténticos fuera de la clase. También se incluye estructuras gramaticales esenciales para una eficiente comprensión de los temas. Se ha puesto mucho énfasis en el trabajo en parejas o en pequeños grupos de tres o cuatro estudiantes. Así se logran varias ventajas: optimización del tiempo de clases, el compartir conocimientos de modo tal que los estudiantes con menor conocimiento del idioma aprendan de los mejor preparados; mayor participación de los alumnos, en vez de las tradicionales clases donde el profesor realiza la mayor parte de la actividad.

Los textos de lectura fueron seleccionados con la finalidad de motivar al lector-estudiante e incluyen material variado, interesante e intelectualmente estimulante, tanto del terreno científico como del semi-científico. Se ha evitado incluir temas de un campo tecnológico muy especializado donde el único interés se centraría en descifrar el idioma extranjero. Otra razón para este hecho es que los destinatarios de este texto son alumnos de diferentes especialidades y carreras y con un nivel de Inglés pre-intermedio. Muchos de los pasajes contienen vocabulario no conocido porque se considera importante que el material de lectura sea lo más auténtico posible. Dicho de otra forma, que no haya sido especialmente escrito para estudiantes del idioma, ya que éstos deben ser expuestos a escritos reales tan pronto como sea posible.

Las autoras de esta nueva edición de **Shortcut** (Senda que abrevia el camino), esperamos que este trabajo contribuya efectivamente a mejorar el nivel de Inglés de nuestros estudiantes y que tanto éstos como los colegas docentes disfruten del proceso.

September, 2005

Aida Mercado Castellón

Lourdes Forest de Torrez

I UNSOLVED MYSTERIES

1 The Dinosaurs

2 The Egyptian Pyramids

3 UFO

Learning Goals:

In this unit, you will read about ...

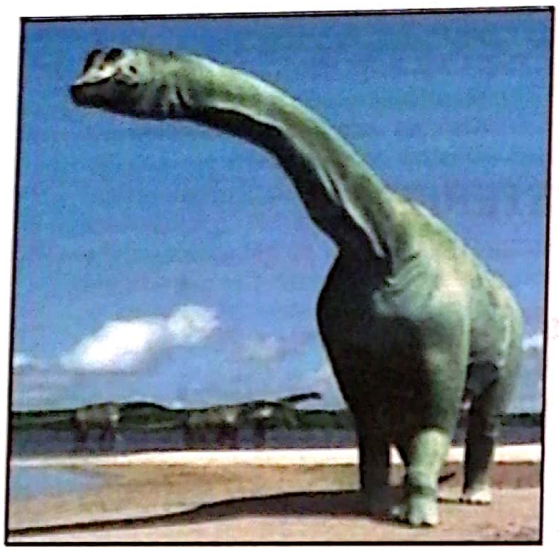
- Some characteristics of dinosaurs and some theories about their extinction.
- The Egyptians; how they lived and strange facts about the Pyramids they built.
- UFOs and what some people think about them.

In this unit, you will practise:

- Scanning texts to look for specific information.
- Guessing the meaning of some unknown words through context and/or their similarity to Spanish.
- Recognising cause-effect relationships in a reading passage.

Lesson 1

THE DINOSAURS



Task 1 What do you know about dinosaurs? Read the statements below. Put a tick (✓) next to the ones you think are true. Put a cross (X) next to the ones you think are false.

1. All dinosaurs are reptiles.
2. Some of them ate plants, others ate meat.
3. People knew almost nothing about them until the 19th century.
4. We still don't know their colour or their body temperature.
5. Some dinosaurs had two brains.
6. Man did not exist when the dinosaurs were living.
7. More than a thousand species of dinosaurs have been found.
8. Some species of dinosaurs were the size of a chicken.

Learning Note *Before you read something in English, it is useful to think about what you already know about the topic. This really helps you to understand.*

Task 2 These adjectives, i.e. descriptive words, are from the text you are going to read. Which ones refer to size? Underline them and compare your selection with a partner. Check the words in your dictionary if you do not know their meaning.

giant	peaceful	usual	tall	fierce
sharp	tiny	large	terrible	gigantic
full	good	huge	small	long

Task 3 Read **Part 1** of the text carefully. Underline all the **cognates** (English words with a similar form in Spanish) that you can find. Now reread **Part 1** and see if you can understand it easily.

1 BACK IN TIME, an ***extraordinary*** group of animals lived on Earth. They lived for over 165 million years but then, 65 million years ago, they disappeared off the face of the Earth in the most mysterious extinction.

Many of them were gigantic, like the Brachiosaurus, 22 metres long, about as tall as a four-storey building and weighing about 70 tonnes. But others were tiny, the size of a chicken. Some were peaceful and ate only plants; others were fierce meat-eaters with sharp teeth. All, however, were reptiles just like living iguana lizards.

Some of them had two brains - one in the head, the usual place, and a small one at the base of the spine.

Task 4 Scanning

Learning Note	*Scanning is a useful strategy for finding specific information. To scan you must go through the text very quickly and ignore the words which will not help you.*

Now practise scanning by reading **Parts 2 and 3** of the text to find the following information.

1 The name of the one-eyed monster of the Odyssey.
2 The name of the scientist who discovered the first dinosaur in the 19th century.
3 The person who gave the name to these animals.
4 The meaning of the word *dinosaur.*

2 The Early Mysteries

Bones of dinosaurs and other large animals were first described by scientists in the 1600s, but before that, the Romans had found such remains which became the source of legends. Giant skulls with an opening in the middle of the head almost certainly inspired the one-eyed Cyclops of the *Odyssey*, the ancient Greek poem. For centuries people believed that large fossils were the remains of animals drowned in the biblical flood.

3 First Discoveries

Although dinosaur fossils have been buried for millions of years, people knew almost nothing about these extraordinary creatures until the the 19th century.

One of the first people to discover dinosaur bones was an English doctor, Gideon Mantell, who, in 1822, found large teeth encrusted in stone. When he also found some bones nearby, he began to do some serious research and concluded that the remains belonged to some giant reptile, which he named *Iguanadon*, meaning iguana tooth.

In 1841, another eminent scientist of the time, Sir Richard Owen, gave these animals a group name, '*dinosaurs*' which means '*terrible lizards*'. Thus the dinosaur hunt began all over the world.

Task 5

The following statements are all true, but not all of them are mentioned in the text. Read **Parts 4** and **5** quickly and put a cross next to the ones that are **not** mentioned. Check your answers with your partner.

1. Satellites are used to search for fossils of dinosaurs.
2. The era during which the dinosaurs lived is called the Mesozoic, and is divided into three periods: the Triassic, the Jurassic and the Cretaceous.
3. One of the theories about the dinosaur extinction says that mammals ate all the dinosaurs' eggs.
4. Many other species also disappeared at the same time as the dinosaurs.
5. Some people think that dinosaurs did not really become extinct.
6. Palaeontologists cannot explain why other closely related groups such as crocodiles did not become extinct along with the dinosaurs.

4 The latest investigations

Modern technology has enabled palaeontologists to make great progress in the last ten years. New dating techniques, computers, scanners, X-ray machines, electronic microscopes and even satellites have all provided new ways of searching for, collecting and analysing fossils. Computers especially, are now helping palaeontologists to analyse huge sets of data and to record the position of fossils during excavations. They are also being used to produce and compare images.

New discoveries are being made faster than ever thanks to new excavation techniques. In 1996 a dinosaur sitting on a nest full of eggs was found in Mongolia. It seems that it was a good parent, guarding its nest even to the point of death.

The fossils found reveal a great deal about the dinosaurs. Skeletons indicate their size and shape, while their teeth show how and what they ate. The shapes of their limbs and their tracks tell us about how they moved. Their remains may reveal the age at which they died and whether they had diseases. But we do not know their body temperature or colour, the number of species or why they died out.

5 Still to solve

Dinosaurs disappeared from the Earth quite suddenly, but how and why this happened is still a mystery. After ruling the Earth for more than 100 million years, they disappeared in a matter of months along with the huge marine reptiles and winged reptiles. About 70% of all animals died out at the end of the dinosaur age, but some groups such as birds and mammals survived. "Why did the dinosaurs become extinct?" This is a question that palaeontologists are often asked. A scientist once counted more than a hundred theories about the extinction of the dinosaurs. However, some scientists think that the dinosaurs did not really die out, because their descendants, the birds, still exist today. They refer to the naturalist Charles Darwin's *Theory of Evolution*, which states that species are constantly developing and adapting themselves to changes in food supply and climate.

Task 6 Guessing unknown words

Learning Note *When you read, you will frequently meet new words. Some of them are not relevant for your understanding of the text, so these unfamiliar words can be ignored because they do not help you to achieve your purpose. But there are some which you can 'guess' from the context.*

Now practise guessing unknown words choosing the options with the closest meaning for the words in italics, then refer back to the text. Which words helped you to make your guess?

1 Many of them were gigantic like the Brachiosaurus ***weighing*** about ***70 tonnes***. (Part 1)
a) ***pesaban*** b) median c) contaban

2 The Romans had found such ***remains*** which became the source of legends. (Part 2)
a) reliquias b) monumentos c) restos

3 Large fossils were the remains of animals ***drowned*** in the biblical flood. (Part 2)
a) perdidos b) ahogados c) desaparecidos

4 Computers especially, are now helping palaeontologists to analyse huge sets of data and to ***record*** the position of fossils during excavation. (Part 4)
a) recordar b) grabar c) registrar

5 In 1996 a dinosaur sitting on a ***nest*** full of eggs was found in Mongolia. (Part 4)
a) cesto b) nido c) cueva

6 The shapes of their limbs and their ***tracks*** tell us how they moved. (Part 4)
a) huellas b) esqueletos c) dimensiones

7 Their remains may reveal the age at which they died and whether they had ***diseases.*** (Part 4)
a) descendientes b) enfermedades c) malformaciones

8 After ***ruling*** the Earth for more than 100 million years, they disappeared in a matter of months. (Part 5)
a) caminar b) vivir c) dominar

Task 7

Read the whole text carefully and answer the following questions. Check your answers with a partner.

1 What did dinosaurs eat?

2 When did people first find evidence about the existence of dinosaurs?

3 Name three examples of modern technology which help scientists to study the dinosaurs.

4 Name two things that computers can do in this field.

5 Not all animals died out along with dinosaurs. Which groups survived?

6 Why do some scientists believe that dinosaurs did not really disappear?

Task 8 **Cause and Effect Relationships**

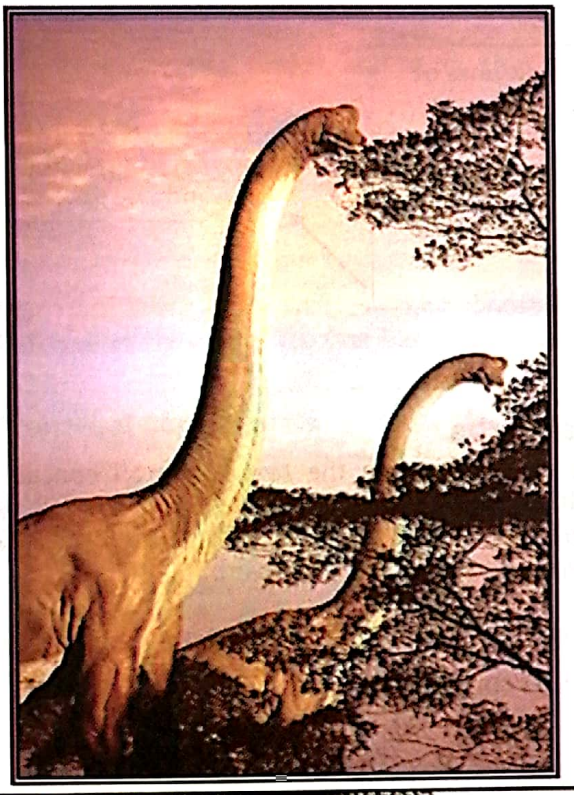
Read the text below carefully and use the information to complete the charts on the next page. These charts will show the cause-effect relationships in different theories about dinosaur extinction. The first one has been done for you as an example.

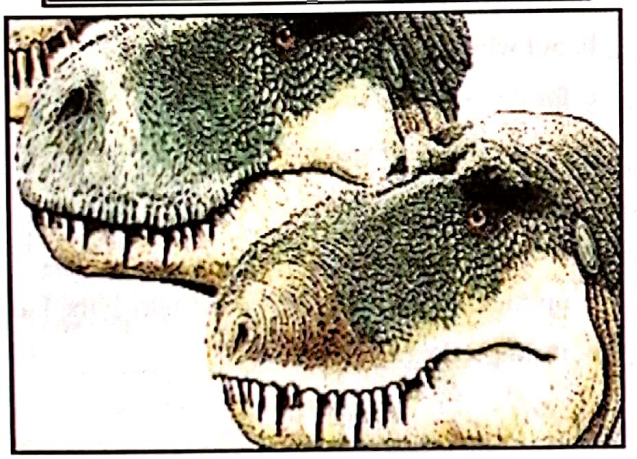
N.B. Sometimes the effect precedes the cause.

THEORIES ABOUT THE END OF THE DINOSAURS

WHY did the dinosaurs come to an end? Scientists are still debating a number of theories about it.

- Some palaeontologists believe that volcanic explosions could have wiped out dinosaurs. They refer to huge volcanic eruptions in the Deccan region in India 66 million years ago that went on for a million years. These eruptions threw dust and gas into the atmosphere, which resulted in climate changes, difficult for the dinosaurs and other creatures to endure.

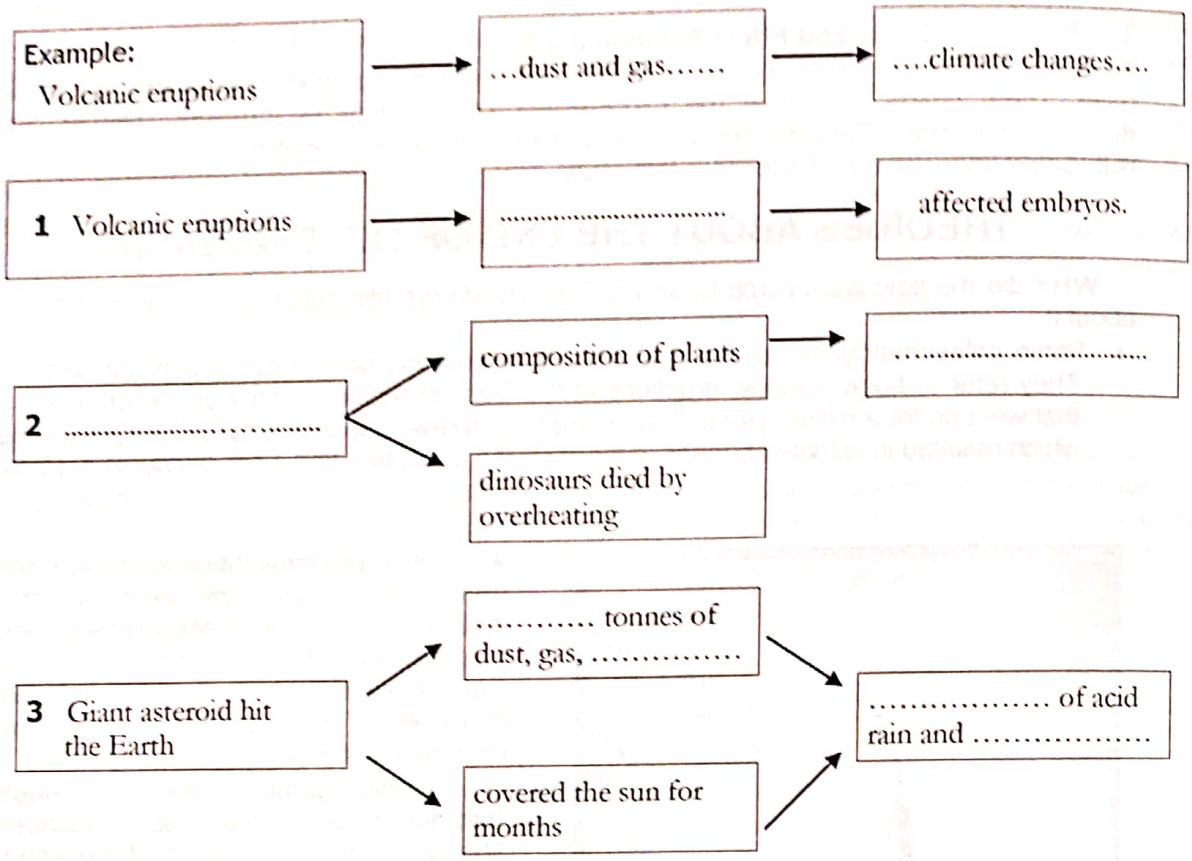




- Others also think that volcanic eruptions might have caused the extinction of the dinosaurs, but for a different reason: one of the rare elements released by the volcanoes was selenium, which is very poisonous, especially to growing embryos, so this could have resulted in the end of the species.
- Another group of scientists suggests that dinosaurs lost their habitat because of changes in the temperature of the world. In many areas, it seems that the air and sea became hotter changing the composition of certain plants, which the dinosaurs fed on, and these became dangerous for them to eat. Also, a rise in temperature could have caused large dinosaurs to die out simply by overheating.
- The most popular theory for the extinction of the dinosaurs is that the Earth was hit by a huge asteroid at least 10km across and weighing 4 million tonnes, so that billions of tonnes of dust, gas and water vapour were thrown into the atmosphere. The sun stayed covered by a thick layer of dust for several months and this fact caused showers of acid rain and fires that spread through the continents. New evidence found in Yucatan, Mexico, seems to back up this theory. From a huge crater under the sea, geologists drilled sedimentary rocks containing large amounts of iridium, a rare metal that generally comes from space, which shows that an asteroid impact took place 65 million years ago.

The question is: why would an asteroid kill all dinosaurs and other groups of animals and yet leave other closely related groups, such as crocodiles, unaffected?

The mystery remains unsolved.



Task 9 Vocabulary - Phrasal Verbs

The following sentences are taken from the text. They all contain Phrasal Verbs (also known as Multi-word Verbs), i.e. a verb + another word, generally a preposition, like ***up***, ***down***, ***out***, ***off***, ***back***, ***on***, etc. Match these sentence halves to show which preposition goes with each verb.

Palaeontologist believe that volcanic eruptions could have **wiped out** dinosaurs.

Iridium is a rare metal, which generally **comes from** space.

1 The plants which the dinosaurs **fed**	___ a. **in** climate changes.
2 The volcanic eruptions **resulted**	___ b. **out** why the dinosaurs became extinct.
3 Showers of acid rain and fires **spread**	___ c. **for** dinosaurs fossils.
4 Scientists are still trying to **find**	___ d. **on** for a million years.
5 Huge volcanic eruptions in India **went**	___ c. **out** by overheating.
6 Dinosaurs could have **died**	1 f. **on** became dangerous to eat
7 Satellites are used to **search**	___ g. **up** the theory of a giant asteroid hitting the Earth.
8 New evidence found in Mexico **backs**	___ h. **through** the continents.

Task 10 Contextual Reference

Learning Note	When you read, you will find pronouns and other reference words which refer to something already mentioned in the text. It is important for you to recognise this relationship in order to facilitate your reading comprehension.

Look at the following example:

Nowadays the weather is changing dangeroulsly in the world. These changes cause catastrophes **which** scientists are unable to prevent. **They** produce tsunamis, hurricanes, floods, and so on, **that** cause thousands of victims **who** lose everything and very often **their** own lives as well

Now read these short articles about dinosaurs. Connect the underlined words with an arrow to the ones they refer to. One has been done for you as an example.

Cannibal coelophysis

A recently discovered ***skeleton*** of a coelophysis dinosaur contained the remains of another coelophysis inside **its** rib cage. The animal on the inside is too large to be an unborn baby so **it** was probably the last meal of a cannibal dinosaur.

How many dinosaurs?

Palaeontologists have found about 1,000 species of dinosaur - a tiny fraction of all the species that ever lived. Each species was represented by millions of individuals, so, even if only **one** in a million dinosaurs was fossilised, thousands of **them** must still remain to be discovered and named.

Dinosaurs today

The author of "Sherlock Holmes" , Sir Arthur Conan Doyle was the first **one** to suggest, in **his** book "The Lost World" that dinosaurs might still exist. Many people said that **they** have seen living sauropods in Africa, but no expedition has ever found **them**.

Dinosaur in jail

In 1992, the FBI 'arrested' Sue, the tyrannosaurus rex, **which** was at the centre of a legal battle over **her** ownership. Nobody knows when **they** will let **her** get out of jail!

LESSON SUMMARY

Here are the things you studied in this lesson.

- Recognising cognates: *plants, reptiles, spine*
- Guessing unknown words from context
- Cause and effect
- Phrasal verbs: *Volcanic eruptions **resulted in** climate changes*

  *How do scientists **find out** the age of dinosaurs?*

- Contextual reference: *Some **dinosaurs** took care of **their** nests.*

KEY WORDS

back up	at least
belong	brains
develop	huge
drill	layer
enable	limbs
endure	overheating
feed (fed)	poisonous
go on (went-gone)	remains
hit	research
provide	source
release	supply
reveal	tiny
search	
spread	
state	
throw (threw, thrown)	
weigh	
wipe out	

What other useful new words did you find in this lesson? Write them in the table at the end of this unit. Make sure you learn all these words. Remember, a good vocabulary is essential for reading.

LESSON EVALUATION How did you find this lesson? Tick the best answer.

Too easy ☹ About right ☺ Too difficult ☹

Interesting ☺ So-so 😐 Boring ☹

Would you like to read more about this topic?

Lesson 2

THE EGYPTIAN PYRAMIDS

Task 1 How much do you know about the Egyptian Pyramids? See if you can answer these questions. Then compare your results with a partner.

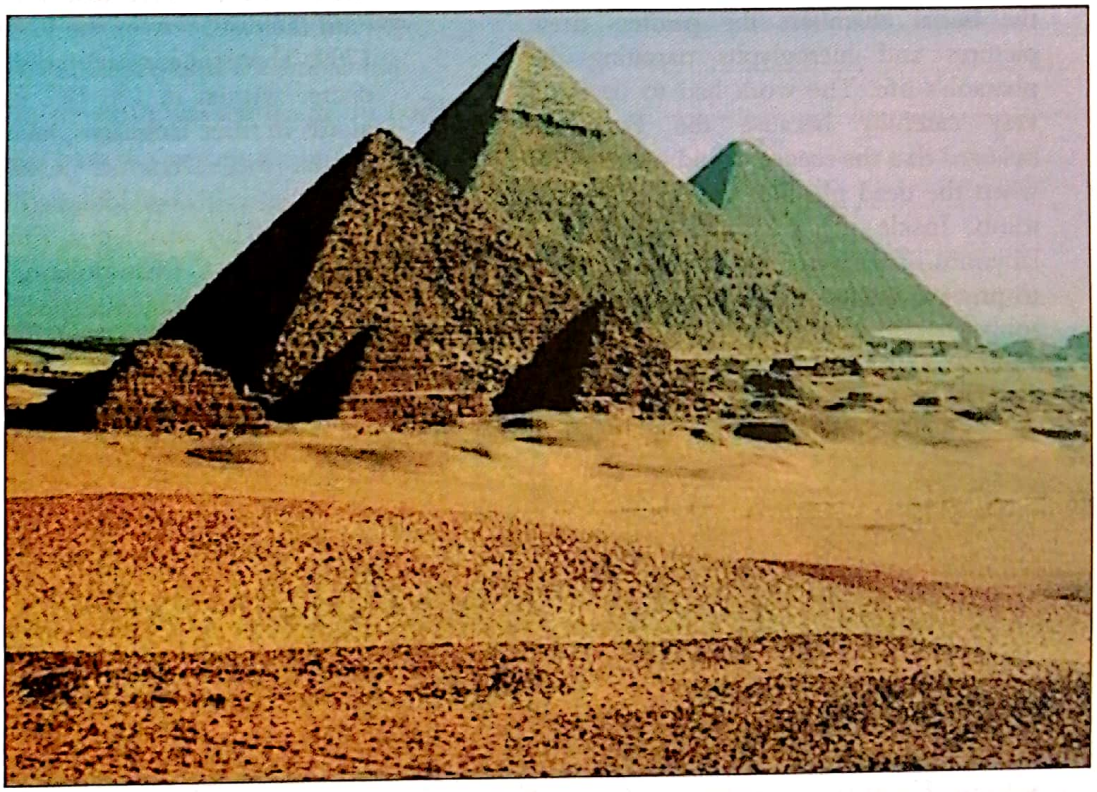
1 How old are the Egyptian Pyramids?
a 10,000 b 4,500 c 2,000 years old.

2 How many workers were probably needed to build the pyramid?
a 5,000 b 10,000 c 100,000

3 The pyramids were built to be used as
a tombs b temples c fortresses

4 Why was the discovery of the Rosetta Stone so important?
a It contains important data about the construction of the pyramids.
b It describes life in ancient Egypt.
c It led to the deciphering of Egyptian hieroglyphs.

5 How long did it take to build the Great Pyramid of Cheops?
a 10 years b 20 years c 5 years



Task 2 Read the text quickly to check your answers to Task 1.

1. FOR THOUSANDS of years the Egyptian pyramids in Giza were considered among the Seven Wonders of the World and they are the only ones still existing. Of the ten pyramids at Giza, the first three are the most important. The largest one, the Great Pyramid of Cheops was erected for the tomb of Pharaoh Khufu, who died in 2566 BC. It is about 147m high (having lost about 10m off the top over the years), and its base is about 230m² in area. It is made up of about 2,300,000 massive blocks of stone, each one weighing about 2.5 tonnes. It is believed that the construction took about 20 years and 100,000 workers.

2. Many scholars think that the pyramid shape had an important religious meaning for the Egyptians, perhaps symbolising the slanting rays of their god the Sun. The slanting sides of the pyramid were intended to help the soul of the king to climb to the sky and join the gods.

3. The ancient Egyptians believed in life after death, so when a pharaoh was buried, many treasures and useful objects for the next world were buried with him. Inside the burial chambers the painters drew pictures and hieroglyphs narrating the pharaoh's life. The work had to be done very carefully because the Egyptians believed that the scenes would come to life when the dead pharaoh was sealed in the tomb. Inside the pyramid there was a labyrinth of passages and rooms intended to prevent the burial chamber from being robbed.

4. Over the ages, the Egyptians became experts at preserving bodies by embalming them. They believed that the dead would need to use their bodies in the next life. The process of mummification took about 70 days. The brains were taken out through the nose and the other organs were removed and placed in special jars. Only the heart was left so that it could be weighed in the next life. Embalming involved drying the body out with salty crystals called ***natron***. Afterwards, it was stuffed and covered with oils and then wrapped in bandages. The mummy was then placed inside two or three richly decorated coffins in the shape of the body.

5. In 1922 the English archaeologist Howard Carter made an amazing discovery in Egypt. He found the tomb of the young pharaoh Tutankhamun. This find has provided a great deal of information about the way of life of the ancient Egyptians.

6. The written language left by the Egyptians, the *hieroglyphs*, consisted of a thousand pictures and symbols. Each of these could stand for an object, an idea or a sound. However, by AD 600 no one understood hieroglyphs, so the secrets of ancient Egypt were lost for 1,200 years until the discovery of the Rosetta Stone in 1799. This stone, which contained a royal decree written in 196 BC, had the same words in three languages, hieroglyphic text at the top, Demotic (a later Egyptian language) in the middle, and Greek at the bottom. This enabled a French scholar, Jean François Champollion, to decipher and translate the hieroglyphs.

7. Now that hieroglyphs can be read, it is possible to learn a great deal about the ancient Egyptian world.

Task 3 Look back at the text and find words that mean the same as the Spanish words below. (The first number indicates the paragraph in which the words appear and the second, the line in the paragraph.)

maravillas (Paragraph 1; Line 3) ..wonders..
constituida (Para. 1, L. 12) ..made up..
forma (Para. 2, L. 2) ..shape..
oblicuos (Para. 2, L. 4) ..slanting..
alma (Para. 2, L. 6) ..soul..
enterrado (Para. 3, L. 2) ..buried..
sellado (Para. 3, L. 10) ..sealed..
evitar (Para. 3, L. 13) ..prevent..
colocados (Para. 4, L. 8) ..placed..
rellenado (Para. 4, L. 13) ..stuffed..
envuelto (Para. 4, L. 14) ..wrapped..
asombroso (Para. 5, L. 2) ..amazing..
representar (Para. 6, L. 4) ..stand for..
permitió (Para. 6, L. 14) ..enabled..

stuffed

Task 4 In pairs, read the text again and put these four topics in the order in which they appear.

3 Beliefs of the Egyptians about the next life

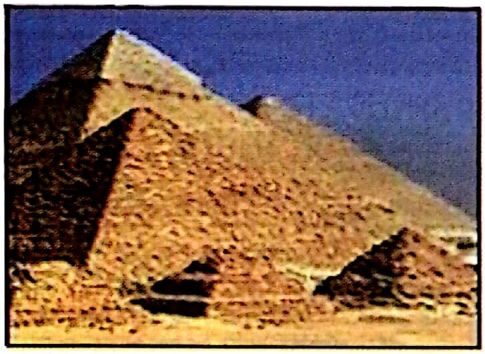
1 Characteristics of the Great Pyramid

5 Discovery of Tutankhamun

4 The preservation of bodies

Task 5 Read the first part of the text carefully and complete the chart below.

CHARACTERISTICS OF THE GREAT PYRAMID OF CHEOPS



Height:	147 m
Area of base:	230 m2
Number of stone blocks:	2.300000
Weight of each stone:	2,5 tonnes
Construction time:	20 years
Number of workers:	100000

Task 6 Practise taking notes of relevant facts completing the following with information from the text.

1 What the pyramid shape symbolises. ....The slanting rays of the sun.....

2 The reason for the labyrinths inside the pyramid. ...To prevent being robbed/from the thieves

3 The reason for embalming the dead. ...to preserve bodies for next life

4 The substance used for embalming. ...NATRON.....

5 Why the heart was left inside the body. ...IT could weigh in the next life.

6 How long the process took. ...70 days.....

7 What hieroglyphs represented. ...narrate the pharaoh's life.....

8 What Howard Carter found. ...The tomb of Tutankhamon....

9 The importance of his discovery. ...Tt gave a great deal of information about the Egyptians.....

10 The Rosetta Stone and its importance. ...A Royal Decree, it could enable to decipher the hieroglyphs

Task 7 Reading for Gist (Skimming)

Learning Note *When you read for gist you only want to know what the text is about in general, so you do not need to read or understand every word. This technique of reading is called* ***skimming****. It is a good idea to read a text for gist before you try to understand it in detail in order to have a general idea of the topic.*

To practise skimming, read the text below very quickly, then, from the three sentences below, put a cross against the one that does not correspond to what the text is about.

1 The origin of the Great Pyramid
2 Its amazing characteristics
3 The technology used in building the Great Pyramid

MYSTERIES OF THE GREAT PYRAMID

THE GREAT PYRAMID poses some vital questions which the scientific and archaeological community has been unable to solve so far.

There has been a controversy between two groups of serious students of the Great Pyramid. One group, which included Sir Isaac Newton, believes that God sent prophets to direct the building in the same way that He directed Noah to build the ark before the biblical flood. The other thinks that the geometric marvels of the pyramid are the results of knowledge lost with Atlantis or other highly advanced, but now destroyed civilisations. The Great Pyramid has been called 'The Bible in Stone' because its passage systems reveal in a silent geometry a remarkable chronography of prophetic time in stone. The Egyptians were not even supposed to have had this knowledge.

Analysing the pyramid mathematically and using the system of pyramid inches, some scientists have found the dimensions of the Earth, the equatorial circumference of the Earth and even a calendar of human history. Through the narrow passages, wide galleries and chambers, it has been found that the walls and turns coincide perfectly with significant world events, such as the birth of Christ, the Crusades, both World Wars and a highly significant event that was going to take place in September, 2001. Of course, there are firm believers (and non-believers) in the authenticity of this claim.

But the real and concrete facts include the following:

a) The remarkable character of its placement. Joseph Seiss and other serious archaeologists have demonstrated that the pyramid is in the centre of gravity of the continents. It is also located in the exact centre of all the land area of the world, dividing the Earth's landmass into approxim.ately equal quarters. The north-south axis (31 degrees east of Greenwich) is the longest land meridian, and the east-west axis (30 degrees north) is the longest land parallel on the globe. There is obviously only one place where these land-lines of the terrestrial Earth can cross, and it is at the Great Pyramid! This incredible fact requires an explanation.

b) The measurement of the pyramid is done in what is called *'pyramid inches'*. Adding up the feet and inches of the pyramid and applying a little math, we find that the precision of the monument is incredible. First of all, the value of pi (π) can be found: the original pyramid was 481.3949 feet which, when compared to its base of 3032.16 feet is the same relationship that the circle has to its radius (481.3949 feet × 2 × 3.14 = 3023.16 feet).

c) While it is the oldest man-made structure on the face of the Earth, the Great Pyramid is also the most accurately oriented and extended due north, south, east and west with only three minutes deviant, although some engineers think that this is mainly due to subsidence. Modern man's best construction, the Paris Observatory, is six minutes of a degree off true north. Many architects and engineers who have studied the pyramid structure, agree that with all our technological development, we could not build the same structure today.

Does this mean that the development of technology sometimes runs in reverse?

Task 8 Contextual Reference
Using the line references given, find what the words in bold refer to:

Ex: that **he** directed Noah (line 5)
He = *God*

1 ... **which** the scientific and archaeological ... (line 1) .....

2 ... the **other** thinks that (line 6) .....

3 ...character of **its** placement (line 21) .....

4 ... and **it** is at the Great Pyramid (line 28) .....

5 ... a circle has to **its** radius (line 35) .....

Task 9 Find words in the text which mean the same as:

Ex. Ask a question (line 1) *pose.*

1 Without sufficient ability (l. 2) .....

2 Understanding of a subject (l. 11) .....

3 Locality, position (l. 21) .....

4 Exactly, precisely (l. 37) .....

5 Directly towards (l. 37) .....

6 Going down slowly (l. 39) .....

7 To have the same opinion (l. 41) .....

Task 10 Test your understanding of both texts by answering the following questions.

1 What was the original height of the Great Pyramid?
2 What was its total weight?
3 How many years ago was Tutankhamun's tomb discovered?
4 How long did the mummification process take?
5 Name three things some scientists claim that the structure of the pyramid reveals.

Task 11 **Filling Gaps**

Read the text below and complete the blanks with words from the box.

remains * lost * believe * discovered * located * robbed * constructed * stones

There are many ancient (1) ___remains___ all over the world that have been surrounded by mystery. One of these is at Tiahuanaco. Massive (2) ___stones___ were used to build this ceremonial centre. Archaeologists (3) ___believe___ that Tiahuanaco was (4) ___constructed___ around 700 AD, but after 1200 AD it was abandoned and became a ruin.

Tiahuanaco is (5) ___located___ near Lake Titicaca and it was soon (6) ___robbed___ by the Spanish who (7) ___discovered___ most of its treasures and statues.

Much of the information about this structure has been (8) ___lost___ and many of its secrets may never be known.

after death
lose lost lost
believe believed
discover
locate
rob
construct

Language Focus Passive Structures

Compare these sentences:

Active The Egyptians built **the Great Pyramid** in 2566 BC.
object

Passive **The Great Pyramid** was built in 2566 BC.
subject

The passive structure or passive voice is often used in written English when an impersonal effect is required to express an objective reporting. In other words, we use the passive when ***the doer*** of an action is less important than ***the action done***.

The structure is formed by using the auxiliary **Be** in its different tenses + **the past participle** of the verb. Look at the basic structures in the passive voice.

THE PASSIVE VOICE

Subject	Verb Be	Past Participle		
Scenes of daily life	are	shown	on the tomb walls.	(Present Simple)
The Egyptian tools	were	made	of wood and copper.	(Past Simple)
Most of the treasures	have been	lost	through the years.	(Present Perfect)
New excavations	are being	done	in other sites.	(Pres. Continuous)
The pyramids' shape	may be	connected	with the sun worship.	(Modal Verb)

Task 12 Look at these sentences, underline the correct form of the verb and decide whether the sentences are in active or passive voice.

1 The Great Pyramid of Cheops **built/*was built*** more than 2,000 years ago.
2 Many archaeologists **have/have been** examined this pyramid.
3 The Egyptians believed that the hieroglyphs painted on the tombs walls **would be/ would** come to life.
4 The Rosetta Stone **enabled/ was enabled** a French scholar to decipher the hieroglyphs.
5 Some people **believe/ are believed** that the Great Pyramid contains revelations about an event which **will be taken/ will take** place on September 17th, 2001.
6 2,300,000 blocks of stone **were used/used** in its construction.
7 The Great Pyramid of Cheops **called/has been called** the Bible in stone.
8 New archaeological sites **are being discovered/discovered** in other places of the world.

Task 13 Look back at the passage you completed in **Task 11** about **Tiahuanaco.** Underline all the sentences which have a passive verb structure.

LESSON SUMMARY

Here are the things you studied in this lesson.

- Reading for gist
- Reading and taking notes
- The passive *The great Pyramid of Cheops **was built** around 4,500 years ago*
  *It **is visited** by thousands of people every year.*
  *Many of its secrets **have not been** discovered yet.*

KEY WORDS

agree		a great deal	
believe		body	
bury		deviant	
dry out		fact	
include		foot/inch	
intend		jar	
involve		knowledge	
join		shape	
make up		so far	
place		such as	
prevent		way	
remove			
take place			

What other useful new words did you find in this lesson? Write them in the table at the end of this unit. Make sure you learn all these words. Remember, a good vocabulary is essential for reading.

LESSON EVALUATION How did you find this lesson? Tick the best answer.

Too easy ☹ About right ☺ Too difficult ☹

Interesting ☺ So-so 😐 Boring ☹

Would you like to read more about this topic?

Lesson 3

UFO

Task 1 Before reading the text, discuss these ideas with a partner.

1 What do you think the acronym UFO stands for?

2 Do you believe in UFOs? Choose **a**, **b** or **c**.

a I don't believe the stories of UFOs.
After reading this text, you may think differently.

b I believe UFOs exist but they are military experiments.
This text may confirm your theory or make you think otherwise.

c I believe UFOs come from outer space.
You are in the right mood to enjoy reading these texts.

Task 2 Scan the text to find the following information.

1 The name of the galaxy in which our planet is.
2 The name of two satellite stations.
3 The year in which one of the first UFOs was seen.
4 What this alien spaceship looked like.

ARE WE ALONE in the universe? This is a question which the human race has been asking for thousands of years. The recent discovery of two new planets suggests that our galaxy, the Milky Way, with 100 million stars, must be full of life out there somewhere.

Meanwhile scientists are impatiently awaiting the results from the Infra-red Space Observatory (ISO), a European satellite that can detect heat from distant planets, or the Hubble Space Telescope which is equipped to take pictures of newly discovered worlds.

Another question which is being asked is whether our planet is being visited by aliens from space. Scientists have been studying the evidence for a long time.

One of the first reports of a spaceship visiting the Earth was in 1948. Two American pilots were flying at night when they saw a strange object. It was about 100 feet long and looked like a cigar. It travelled faster than any jet plane and spread a blue light around it. This light was so strong that it shook their plane, then the UFO disappeared.

Since then, thousands of people have reported unusual and terrifying encounters with beings in command of these machines. There are cases in which people and even small animals have been kidnapped, taken into a UFO and examined by alien humanoids. A few of them have never returned. Are aliens from other planets studying us? Why do governments conceal these facts? Are we alone in the universe? So far these questions have never been answered properly.

Task 3 Match these sentence halves and then compare what you did with your partner. If you are working independently, check your answers in **Appendix A** (page 113)

1 The Infra-red Space Observatory
2 The light spread by the UFO was so strong
3 There are reports of a few people
4 The Hubble Space Telescope ___
5 Some people have been contacted

(a) 4 captures images from space bodies.
(b) 3 who disappeared completely.
(c) 5 by intelligent humanoids from outer space.
(d) 2 that it agitated their plane violently.
(e) 1 is able to sense temperature produced by planets.

Task 4 One of the following options is correct according to the text. Read the text carefully and then tick (✓) the correct answer.

1 **a** The UFOs come from Mars, one of the planets in our galaxy.
b Most probably there are lots of planets in the Milky Way with the conditions necessary to support life.
c There are two planets with abundant life in the Milky Way.

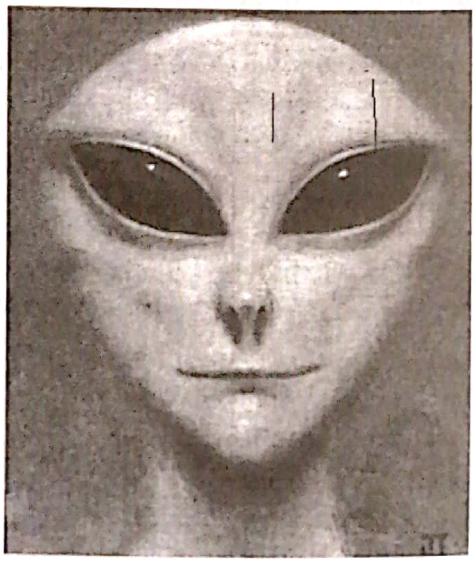
2 **a** The ISO and the Hubble are two satellites equipped to send information about new discoveries.
b The two satellites permit scientists to give help to astronauts in space.
c The Hubble Space Telescope takes pictures for TV signal emissions.

3 The American pilots ...
a ... went after the UFO.
b ... were kidnapped by the UFO.
c ... described the UFO.

4 Some people ...
a ...had to give away their little animals to the aliens.
b ... reported being checked inside the spacecraft.
c.. gave descriptions of the humanoids commanding the UFOs

Task 5 These terms are from the texts you will read next. Match them with their Spanish meanings.

A	B
1 available	a ___ acelerar
2 suddenly	b ___ aunque
3 speed up	c ___ pesadilla
4 glow	d _1_ disponible
5 nightmare	e ___ extender, esparcir
6 surveillance	f ___ esconder, ocultar
7 spread	g ___ de pronto, repentina-mente
8 rather than	h ___ observación
9 although	i ___ brillo, brillar
10 conceal	j ___ en vez de, en lugar de



Task 6 These are fragments of true statements made by four real people. Read through them and identify the person by his/her statement, then underline the word(s) that gave you the clue for your selection.

a Ms Leah Donaldson, a bank manager, and her report of a UFO seen when driving at night.

b Mr George Tyrell, a civil engineer, and his report of a crashed UFO which stopped the normal functioning of instruments.

c Dr Herman Oberth, an aerodynamicist, father of modern rocketry, and his theory of how UFOs are able to travel at extraordinary speeds.

d Captain Edgar D. Mitchell, Apollo 14 astronaut, reporting about UFOs seen in space.

1 "UFOs are conceived and directed by intelligent beings of a very high order ... They are propelled by distorting the gravitational field, converting gravity into usable energy. My colleagues and I are sure that they do not originate in our solar system, perhaps not even in our galaxy, but we feel that they use Mars or some other planet as a way station. ...Under the observed conditions, it would be impossible for any terrestrial structure to survive the friction at those speeds and altitudes. Any metals or non-metals available would melt.
... We have been helped in our advancement in certain scientific fields by people of other worlds...".

2 "This matter is the most highly classified subject, even more than the H-bomb. Flying saucers exist. Everyday our radar instruments capture objects of form and composition unknown to us, but the government doesn't want to make it public. Why? – They are afraid that people may think of some kind of horrible invaders, so we have to avoid panic by all means... Neil Armstrong sent the message to Mission Control that two large mysterious objects were watching them after they landed near the moon module, but NASA censored his message. Aldrin took colour movie film of the UFOs from inside the module and continued filming them after he and Armstrong went outside... I am sure that we were not alone. when we were in space. ...There was a constant surveillance by UFOs."

3 "It was past midnight. We were driving home from the theatre in the town nearby, when we noticed a strange glow from behind the mountain beside the road. It was a bright light like flames. We thought that there was a fire somewhere. Suddenly, as the car turned the bend, we saw it. The strange black-silver object was about 100 metres above the ground. It was as huge as a big plane, but round-shaped like a flattened bowl. There was a terrifying low noise all over the place. My husband tried to speed the car up, but the engine, the radio and the lights went dead. We were paralysed with terror, but then, the nightmare ended. The object, which had been rocking back and forth, began to move slowly away before shooting up. It was out of sight in an instant. Abruptly the car lights and radio came back on. Everything lasted just a few seconds, but this is something I will never, ever forget".

4 "I was employed by a fab-building firm. Several others and myself were taken to a remote place in Pennsylvania. We were informed that everything was top secret and security people were assigned to us. Some type of aircraft had crashed in this area and the government felt that it would be easier and faster to do all their investigation right in the place rather than to move the remains of the crash and any other evidence that the soil could contain. ... The crash site was an enormous hole about 100 feet in diameter, although the aircraft was much larger. I only saw two thirds of the rear end because the rest was covered by large canvas blankets. There was a very small reading of radio waves in the area and a great deal of free magnetic energy, so it was difficult to use our instruments, even to establish the correct time. Every watch was a different time. I managed to hold one small portion of the craft in my hand. It was a kind of material that none of us could identify. It was about one square foot and an inch thick, it weighed almost nothing. I tried to scratch it with a pocket knife but the knife did nothing to it. ... They told us that it was a new type of aircraft of a foreign government but, of course, I don't believe it".

Task 7 Read the fragments again and find answers to these questions.

1 How do the UFOs get their energy according to Dr Oberth? converting gravity into usable energy
2 Which problem does he refer to which prevents our spacecraft from doing interplanetary travel? The friction at those speeds and altitutes
3 Why couldn't Ms Donaldson and her husband escape? Because the engine, the radio and all went dead
4 How long did the whole incident last? it lasted a few seconds
5 Why do governments hide information concerning UFOs, according to Captain Mitchell? Prevent people and avoid panic
6 What did astronaut Aldrin do during the memorable trip to the moon? Aldrin filmed UFOs from inside the module
7 What anomalous things in the instruments did Mr Tyrell observe in the crash site? very small reading of radio waves, too much magnetic energy.
8 What did he have in his hands and how does he describe it? one small portion of the aircraft in his hand. it was an square food and inch think.

Language Focus Revision of Modal Auxiliary Verbs

Study this table which shows Modal Auxiliary Verbs and their functions.

Modal	Examples
1 CAN - CANNOT - IMPOSSIBLE Used to express physical or mental ability, permission and also possibility.	• Laser beams **can** be used to store and read information. • The energy in uranium **cannot** be released by burning. • **Can** the students use their cell phones in class? - No, they **can't.** • Flights **can** sometimes be delayed in this region because of bad weather.
2 MAY Denotes possibility or permission.	• **May** I borrow your dictionary? – Of course you **may.** • Solar energy **may** be installed in homes in the near future.
3. MIGHT PODRIA Used to indicate uncertainty and possibility.	• Today's computers **might not** be in use in ten years. • Scientists **might** discover new electronic components.
4 MUST MUST NOT- PROHIBITION Used for obligation, necessity or a degree of certainty	• CDs must **not** be left near strong magnetic fields. • Engineers **must** wear safety helmets at construction sites. • The use of natural gas **must** be cheaper than electricity.
5 SHOULD Expresses recommendation or advice.	• Students of English **should** learn ten new words a day. • People **should not** smoke inside their workplace. • Everybody **should** help to protect the environment.
6 WILL Denotes intention or future meaning.	• We **will** have to find new forms of energy to replace non-renewable sources. • In twenty year's time some people **will** be living in space, inside a computerised colony.
7 WOULD Expresses intention following a condition.	• If we had enough resources, we **would** improve health and education in Bolivia. • Without computers, disabled people **would not** be able to perform many activities.
8 COULD Used in polite requests, possibilities and as the past tense of CAN	• **Could** you help me solve this problem? • We **could** save a lot of trees if we recycled used paper. • In the past most people **could** live no longer than 50 years.

Task 8 Read through the text below and underline every **modal verb** that you can find. Notice the meaning it has in that context.

" Those babies are huge... enormous... you ***wouldn't*** *believe it. I'm telling you that there are other space craft out there...on the crater edge... they're on the moon watching us."*

This is how Neil Armstrong reported the presence of alien spaceships when men reached the moon for the first time. Some UFO researchers are sure that not all the conversations between ground control and the astronauts were broadcast to the general public at that time.

Although humankind has made remarkable progress during its brief fifty-year space age, we have taken a few steps so far. This short time is insufficient to explore the "*final frontier*" of the vast space with billions of stars and planets.

Earth's nearest star, Alpha Centaury, would take 4·5 years travelling at the speed of light (300,000 kilometres per second). On the other hand, all reports agree that UFOs can travel at great speed. If these craft actually come from outer space, they should certainly have to be able to travel huge distances in a short period of time.

How can UFOs travel so fast? There are a number of theories which may explain this fact:

- UFOs can create an artificial field of gravity in front of them which enables them to achieve high speed This gravity field would also explain why some UFOs have strange effects on machines here on Earth.
- Another explanation is that UFOs can dematerialise, beam their atoms across space and time, and re-materialise at their journey's end.
- Some scientists believe that UFOs must be nuclear powered and are pushed through space by a stream of radiation.
- Since other planets in our solar system are too hot or too cold to support life forms, could UFOs come from beyond the solar system?
- One amazing suggestion is that there must be a number of universes that are existing at the same time, parallel to one another. Might it be possible that UFOs visitors come from these parallel worlds?

Do you know any other theory to explain UFOs travel capabilities?

Will some day our spaceships travel to other worlds?

can
must
~~may~~
might
would
could
should

I may travel to La Paz

Task 9 Have you ever heard or read stories about UFOs? Have any of your friends ever seen one? What do **you** believe? In small groups discuss these questions and then report back to the class on what you think about the topic.

LESSON SUMMARY

Here are the things you studied in this lesson.

- Revision of Modal Auxiliary Verbs.
- Matching vocabulary items.

KEY WORDS

avoid	aircraft
broadcast	back and forth
conceal	bend
crash	canvas
go dead (went, gone)	field
improve	flat
kidnap	rear end
land	surveillance
last	wave
look (like)	
manage	
melt	
perform	
shake (shook, shaken)	
speed up (sped)	

What other useful new words did you find in this lesson? Write them in the table at the end of this unit. Make sure you learn all these words. Remember, a good vocabulary is essential for reading.

LESSON EVALUATION How did you find this lesson? Tick the best answer.

Too easy ☹ About right ☺ Too difficult ☹

Interesting ☺ So-so 😐 Boring ☹

Would you like to read more about this topic?

UNIT 1 - VOCABULARY

Write down any new words that you found in Unit 1 (lessons 1, 2 & 3). Write a definition, translation or example sentence for the new words in the spaces provided.

Review these words regularly, together with the lists of key words at the end of each lesson. Learn these words well - your teacher will test you on them! Remember, a good vocabulary is essential for reading.

New word or expression	Explanation (translation, definition, example sentence

II FROM COUNTING TO COMPUTERS

4 Numbers

5 Pioneers

6 Dialogue in Cyberspace

Learning Goals:

In this unit, you will read about:

- Numbers, their history and uses in English.
- Four well-known people who "made a difference" in science.

In this unit, you will practise:

- Locating information in a reading text.
- Transferring information to a chart or a table.
- Making brief summaries of relevant information.
- Defining things.
- Compound nouns.
- Writing numbers.

Lesson 4 NUMBERS

Task 1 A QUIZ How much do you know about the following. Try to answer all these questions.

SCORE	
8-10	Excellent
6-7	Good
3-5	Fair
0-2	Bad

1 Why do we count in tens?
2 Which of these peoples invented the symbol for zero: the Greeks; the Romans; the Indians; the Arabs?
3 What was the first counting machine that people invented?
4 How big was the first electronic computer?
5 What made computers smaller, cheaper and more reliable in the 1970's?
6 What is the origin of our modern number system?
7 True or False? Early civilisations used binary, trinary, quinary or hexadecimal systems.
8 An Englishman established the basis for the development of modern computers. What was his name?
9 What's the difference between odd and even numbers?
10 What do these words have in common: *nought, zero, nil and love?*

Now check your results by reading the text below where you will find more information

: 1. HUMAN LANGUAGE depends on two main elements - words and numbers. Our daily lives are full of numbers: ages, sizes, money, time, dates, measurements, etc. People from the pyramid-builders and explorers of the ancient world to the astronauts and computer programmers of modern times, have used them. It is impossible to imagine the world without numbers and, of course, science, especially mathematics, involves numbers.

2. THE EARLIEST evidence for numbers goes back over 8,000 years. Counting marks have been found on very old stones and wooden sticks, and crude drawings representing numbers have been discovered on the walls of caves. However, the first proper numbers were probably made by the Sumerians in the region known as Mesopotamia. About 5,500 years ago, they developed a system of symbols to represent words and numerals using a wooden "pencil" called a *stylus* which was pressed into a clay tablet to produce the marks known as *cuneiform* writing

Most probably, the very first way of counting was on the ten fingers of a man's hands. Aristotle noted that the development of the decimal system comes from this fact. In spite of this, many early civilisations used binary, trinary and quinary systems. Even today there are still some primitive tribes who count no further than three.

3. THE BABYLONIANS, as traders, needed a quick and easy way of dealing with large numbers. They used the sexadecimal system based on sixties, and that is the main reason why we still measure time as 60 seconds in 1 minute, and 60 minutes in 1 hour.

The Romans, on the other hand, were poor mathematicians, even though they were so advanced in other ways. They relied on numbers to organise their armies and conquer their vast empire, but they had no symbol for zero Their system of numerals is still seen today on some clock faces, for instance.

The numerals we use today, i.e. 1, 2, 3 and so on, are basically Arabic in origin. The Arabs also popularised the use of the symbol for zero, even though it was really an invention of the ancient Indians. Arabic numerals began to be used in Europe in the 10th century. Other ancient peoples like the Chinese, Egyptians, Greeks and Mayas in Central America, all developed their own number system and numerals.

4. IN TODAY'S world, many complex sums can be calculated in less than a second. How did man manage to reach this point?

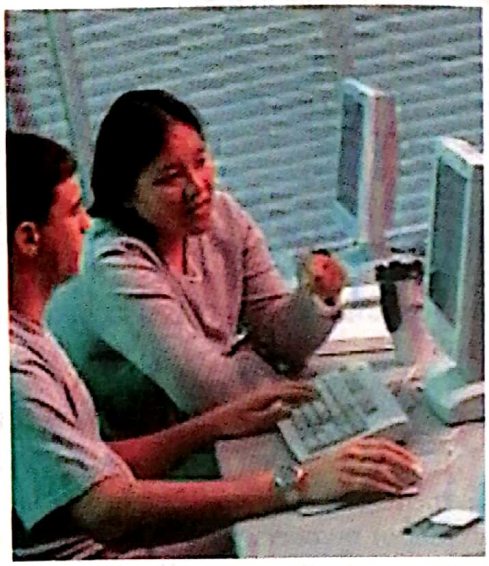
For centuries, people tried to find a device that could do calculations faster and more accurately than by doing them on pencil and paper. The first attempt was the invention of the abacus in the 16th century. Although it cannot do calculations itself and requires a skilled operator, it is still used in some parts of the world because it can be used without knowing how to read.

The first mechanical calculator based on gear wheels was devised by Blaise Pascal in the 17th century, but it could only do additions and subtractions. Gottfried Liebniz improved this design to make a machine that could multiply.

During the 1830s Charles Babbage designed a machine which could do various types of calculations with different sequences of instructions through switches and levers. He devised several versions of his Analytical Engine, which had various features of the modern computer, such as a program and a memory store. For this reason he is now considered the father of computers. Later on, the mechanical parts were replaced by newer devices which used tiny pulses of electricity and the first electronic computer was born.

5. THE COMPUTER AGE really began in the 1940s and several scientists took part in this process. An early type of specialised computer made in England was the Colossus, which helped to break the codes used for enemy messages in World War II. Then the Harvard Mark I (1943) was developed at Harvard University. It was the first automatic computer, but it was partly mechanical and not fully programmable.

In 1946 the Electronic Numerical Integrator and Calculator or ENIAC was built and it became the first electronic, programmable computer. It was developed at the University of Pennsylvania, USA, and it was so big that filled several rooms.



Since then computer technology has evolved a great deal in a relatively short time. But the breakthrough in the development of computers as we know them today was the invention of the microchip in the1970's, which made computers smaller, faster and more dependable.

It has been said that if transport technology had developed as rapidly as computer technology, a trip across the Atlantic Ocean would take only a few seconds now.

Task 2 Working in pairs, read the text again, select the best title for each section from the following.

A The First Steps in Calculating Devices ____
B Computer Evolution ____
C Early Use of Numbers ____
D Numbers Through Human History ____
E Numbers and Everyday Life ____

Task 3 Answer these questions and give the number of the paragraph where you found this information. Then check your results with your partner.

1 What did Aristotle say about the decimal system? (Paragraph ___)
2 What did the Indians do for the development of counting? (Paragraph ___)
3 Why is the abacus still in use? (Paragraph ___)
4 Which two important elements did Babbage's Analytical Engine have? (Paragraph ___)
5 How did microchips improve computer design? (Paragraph ___)

Task 4 Working in pairs, use the information in the text to complete the following table, then check your answers with another pair.

DATE	EVENT
.....8,000 BC.....	Marks in wood sticks and stones, drawings in caves, etc.
.....	Sumerians invented signs to represent numbers using the stylus.
10th Century	.....
.....	Abacus invented
17th Century	.....
.....	Babbage designed the Analytical Engine.
1940	.....
.....	Harvard Mark I, first automatic computer developed.
1946	.....
.....	Invention of microchip.

HOW NUMBERS ARE USED IN ENGLISH

Dates

6/8/1825 the sixth of August, eighteen twenty five
14/10/1906 the fourteenth of October, nineteen 'o' six

Telephone numbers

0181 996 2234 'o' one eight one, double nine six, double two three four
00501 52 51892 double 'o' five 'o' one, five two, five one eight nine two

0 is pronounced in different ways:
0 = nought (in British English)
0 = zero (in American English)
0 = 'o' (like the letter **o** when numbers are pronounced one by one)
0 = nil (in football) 3 - 0 three nil
0 = love (in tennis) 15 - 0 fifteen love

Money

£10.20 ten pounds, twenty (pence) or ten, twenty
$ 25.90 twenty five dollars, ninety (cents)
Bs.465 four hundred and sixty-five bolivianos

Fractions

½ a half
¾ three quarters
⅞ seven eighths
24⅔ twenty-four and two thirds

Decimals

4.32 four point three two
7.865 seven point eight six five

Notice!

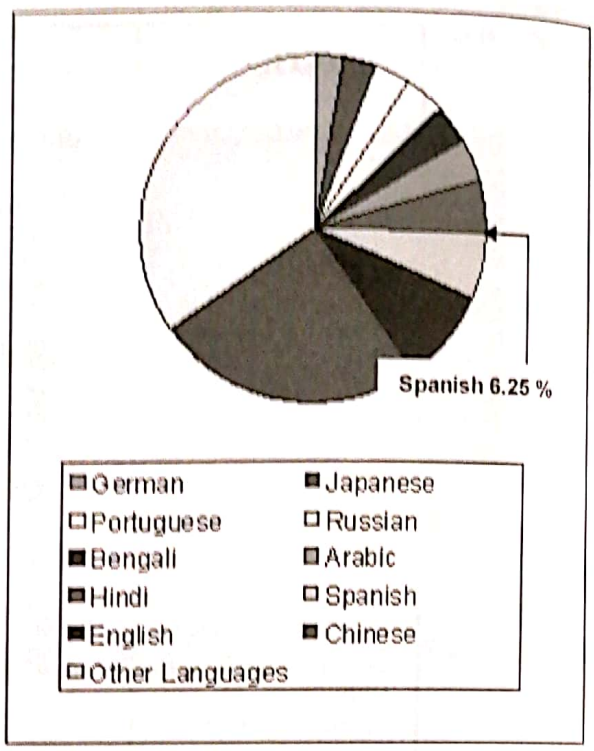
7,865 seven thousand eight hundred and sixty-five.

Task 5 Read the passage below and transfer the information into the pie chart using figures.

THERE ARE approximately seven thousand million people and over six thousand languages in the world. Do you know how many people speak which language? Here are the ten most important ones and the percentage of people who speak them as their first language – or mother tongue – according to the Cambridge Encyclopaedia of Languages:

Chinese is spoken by twenty-five per cent of the world; English, although one of the most important languages, is spoken by only eight point seven five per cent. Six point two five percent people speak Spanish, our native language. Hindi is spoken by five percent. Arabic, Bengali and Russian are spoken by the same number of people; three point seven five. Portuguese by three point four per cent. Japanese is spoken by three per cent. As for German, two point five percent of the world's population speak it.

And what about the five thousand, nine hundred ninety remaining languages? They are spoken by thirty four point eight five per cent of the world.



Task 6 **WORD-PLAY**

Find ten words related to the reading text. The words can run in any direction even diagonally or backwards, but always in a straight line. When you find one draw a circle around it. The clues below will help you with the task.

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

CLUES:

1. Early computer used to break the enemy's codes in the Second World War.
2. They conquered the world but they were not good mathematicians.
3. He is considered a pioneer in the invention of computers.
4. The numerals we use today have this origin.
5. First device to make calculations faster.
6. He first designed the mechanical calculator based on gear wheels.
7. Important number introduced by the Indians.
8. Huge computer developed at the University of Pennsylvania.
9. Number system based on ten.
10. Used to produce cuneiform writing.

Language Focus Making Definitions

RELATIVE CLAUSES

One way of defining things, especially in academic writing, is through relative clauses. A relative clause, like an adjective, adds extra or essential information to a noun, and tells us more precisely what something or someone is. A relative clause is a group of words with a subject and a verb which contains important or additional information about a person, a thing, a place, etc. to help us to identify who or what we are referring to. The relative clause is linked to the main clause by ***who*** or ***that*** for people and ***which*** or ***that*** for things.

Look at these examples:

I am reading a book. It is about UFOs.
(2 sentences)

I am reading a book **which/that** is about UFOs
(1 sentence)

Now study the examples in the table:

Main clause	**Relative clause**
An ecologist is a specialist	**who (that) studies the environment.**

People: who - that

An archaeologist is a researcher. He studies ancient cultures.
An archaeologist is a researcher **who/that** studies ancient cultures.

Things and animals: which - that

Dinosaurs are animals. They lived millions of years ago.
Dinosaurs are animals **which/that** lived millions of years ago.

A seismoscope is an instrument. It detects earthquakes.
A seismoscope is an instrument **which/that** detects earthquakes.

Task 7 Make good sentences from this table. Use the words in column 1 and 3 once only, and then compare your sentences with your partner's.

1 There are many people		a. ____ is considered a computer genius.
2 Einstein was a remarkable scientist	**who**	b. ____ protects the Earth from the Sun.
3 Bill Gates is an American millionaire		c. ____ can be dangerous for health.
4 The ozone layer is formed by a colourless gas		d. ____ is played with sixteen pieces.
5 The Internet is a world-wide web	**which**	e. ____ developed the Theory of Relativity.
6 Smoking is an awful habit		f. ____ was killed in the USA in 1980.
7 Chess is a game for two people		g. ____ provides thousands of information items.
8 John Lennon was a great rock musician		h. ____ have seen UFOs.

The relative pronouns ***who, which*** or ***that*** may be left out or eliminated when they are the object of the sentence. Consider the following examples:

Subject	Verb	Object	Relative Clauses
Fleming	discovered	penicillin.	Penicillin (that) Fleming discovered has saved many lives.
We	met	the new teacher.	The new teacher (who) we met is from Australia.
Champollion	deciphered	the hieroglyphs.	The hieroglyphs (which) Champollion deciphered tell us about the ancient Egyptians' world.

In the following cases, the relative pronouns cannot be left out because they are the subject of the relative clause:

Chaplin was a great comic actor **who** also directed his films.
subject

The Internet is a computer facility **which** has millions of users already.
subject

Very often there is a preposition after the verb in the sentences where the relative pronoun has been eliminated. These sentences need special attention when translating.

Verb + Preposition	Examples
look for	The information * you were **looking for** can be found in this website.
travel in	The cars * people **travelled in** during the 1930s are valuable collector's pieces now.
talk about	The topic * we will **talk about** in this TV programme deals with drug abuse.
dispose of	The toxic waste * rich countries **dispose of** must not be buried in poor countries.
	* The place of the missing relative pronoun

Task 8 Here are other examples where the relative pronoun has been left out. Practise translating them.

1 The recycling problems we are dealing with now were solved abroad some time ago.

2 The results about AIDS research thousands of patients were counting on are not available yet.

3 The trip I was dreaming of has been postponed.

4 The job Sarah is looking for should be near her home.

5 The personnel the company relies on must have a post grade in management.

6 The course we are interested in begins on Monday.

7 The problems our environmentalists are worried about will be discussed in a convention.

8 The award I would like to apply for requires a good knowledge of English.

9 The unemployment problem the government is thinking of will be considered in a few days.

10 The topic we will talk about in our next programme will deal with UFOs.

KEY WORDS

be born		accurately	
depend on		although	
deal with (dealt)		attempt	
evolve		clay	
handle = manipulate		crude	
improve		dependable	
involve		device	
measure		further	
reach		gear	
regard		in spite of	
rely on		own	

What other useful new words did you find in this lesson? Write them in the table at the end of this unit. Make sure you learn all these words. Remember, a good vocabulary is essential for reading.

LESSON EVALUATION How did you find this lesson? Tick the best answer.

Too easy ☹ About right ☺ Too difficult ☹

Interesting ☺ So-so 😐 Boring ☹

Would you like to read more about this topic?

Lesson 5

PIONEERS

In this unit you will read about four people who, from different fields, contributed to the development of science, and hence to human progress. They had some features in common: curiosity, a need to succeed and, above all, great persistence. Some of them failed, some succeeded; but all four of them entered into history as pioneers of human development.

Task 1 **JIGSAW READING.** Work in groups. Each group is going to read one of the following 4 texts and go through the following activities:

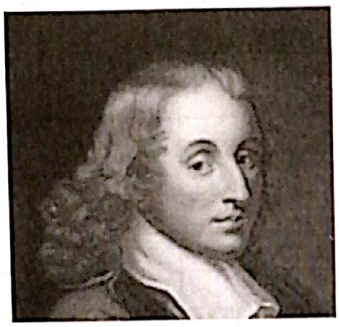
a Identify new words, work out their meaning from context or look them up in your dictionary.
b Answer the questions according to the information contained in your reading text.

Be ready to report what you read to other groups.

1 Who did you read about?
2 When and where was s/he born? When did s/he die?
3 What was his/her main achievement?
4 How did s/he contribute to the development of science?

- he was born in France in 1623 and died in 1662
- he invented an analitycal engine
- he developed a new brach of mathematics known as probability theory

BLAISE PASCAL



PASCAL'S TRIANGLE

```
          1
        1   1
      1   2   1
    1   3   3   1
  1   4   6   4   1
1   5  10  10   5   1
1   6  15  20  15   6   1
```

Pascal's triangle is made by adding two numbers next to each other in the same line, putting the result on the line below and one space to the left.

This brilliant mathematician and physicist was born in France in 1623. His father wanted to educate the child by himself and decided to remove all mathematics books from the house. Blaise's curiosity was stimulated by this fact and he started to work on geometry at the age of 12. When he was only 16 years old, he published his *Essay on Conic Sections* and he was already working in advanced areas of mathematics, such as projective geometry at that time.

In 1640, the family moved to Rouen, where his father worked as tax collector for the government. There, Blaise invented the first digital calculator to help his father with his tax calculations. He worked on it for three years, between 1642 and 1645. The device, called the *Pascaline*, could do additions and subtractions and it resembles a mechanical calculator of the 1940s. This part of his scientific work is now remembered by the computer programming language - *Pascal* - named after him. At that time, he also began a series of experiments on atmospheric pressure.

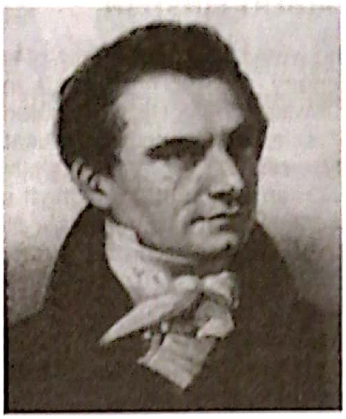
In 1647 he proved that vacuum existed, but he had a polemical discussion with other scientists who did not believe in vacuum, among them, the famous mathematician Descartes, who in a letter to a friend, wrote of him: *"...has too much vacuum in his head"*. Very soon, he would realise that Blaise was right.

In 1653 he worked on his *Treatise on the Equilibrium of Liquids*, in which he explained the law of pressures. A critic said of this work *"It is a complete outline of a system of hydrostatics and the first in the history of science"*. He also used the sequence of numbers now called Pascal's triangle not for fun, but to develop a new branch of mathematics known as *probability theory* which deals with the chances that events might happen, such as: How likely is rain today? or What are the probabilities of someone winning the lottery?

Blaise Pascal was very religious, and at the age of 32, he retired to a monastery where he died in 1662.

- he was born in england in 1792 and he died in 1871
- he invented a calculating machine to speed up and simplify matehematical calculations.
- he designed the analytical engine

CHARLES BABBAGE
1792 – 1871



The English scientist Charles Babbage is considered the father of computers although he never saw his invention finished.

Babbage wanted to invent a calculating machine to speed up and simplify mathematical calculations. He worked on designs using gears, cogs and levers.

His first version, called the *Difference Engine*, was completed in 1833. This machine could work out the logarithms of numbers. Then Babbage went on to design his *Analytical Engine* which was shown at the Paris Exhibition in 1855. It had several features of the modern computer, such as a program (a card with holes punched in it), and a memory store; it could accept input (numbers), do calculations using a set of rules, and give results on printed paper. He was assisted in his work by Ada Lovelace, daughter of the poet Lord Byron. She is remembered by a computer programming language called ADA, used by the US Department of Defence.

Babbage's Analytical Engine would have been the first proper computer although it was mechanical, not electronic. However, he continually changed the plans as he tried to design several improved versions of it. When he ran out of funds, he tried to invent a mathematical system for winning money by placing bets on horse races. Unfortunately, it failed, and he lost even more money, so he could never complete his invention. However, his ideas are the basis of today's computers.

- she was born in poland in 1867 and died in 1934
- she worked in the field of radiactivity
her movile x.ray

MARIE CURIE

Marie Curie was born in Poland in 1867. From an early age she was interested in science, so she became a scientist at a time when women scientists were very rare.

In 1889 she went to France to study at the university and there she married a French scientist, Pierre Curie. Both shared a passion for study and research. Their work on the field of radioactivity was characterised by long hours in a poor-equipped laboratory.

In 1903 they both received the Nobel Prize for their work on physics. Unfortunately, Pierre died in a traffic accident in 1906, so she lost her partner, not only in marriage but in research as well, so she had to educate two small children alone. However, she continued her research work.

During her investigations, while examining pitchblende, a uranium ore, she discovered radium and polonium. In 1910 she succeeded in isolating radium metal. She also gave the name radioactivity to the emission of radiation from atoms. Today, the word '*curie*' is used for the unit of measurement of radioactivity. One of the first practical uses of her discovery was a mobile X-ray unit, which helped wounded soldiers during World War I.

In 1911 she was given a second Nobel Prize, this time in chemistry, for the discovery of two new elements. So she became one of only four people to receive two Nobel Prizes. Now it is horrifying to think about her and other scientists handling uranium, a radioactive element, with their unprotected hands, ignorant of the danger. Not surprisingly, in 1934, she died of leukaemia caused by an overexposure to radioactivity.

She used to say to their children: *"One should not notice what has been done. One should only see what remains to be done".*

In 1995, and breaking the norms of centuries of sexism, the remains of this remarkable woman and scientist were buried by the French government in the Pantheon reserved to the nation's *'Great Men'.*

- he was born in 1879 in Germany and died in 1955
-he developed the theory of relativity

ALBERT EINSTEIN

The man who would change the face of science in the 20th century was born in 1879 in Ulm, Germany in a Jewish family. He contributed more than any other scientist to the modernisation of physical reality. His Theory of Relativity is considered as human notion of the highest quality. However, the beginning of his academic life was not successful. In 1895 he failed an exam for an electrical engineering degree at the University of Zurich. Very disappointed, he confessed in a letter to a friend: *"my disposition for the abstract and mathematical world and my lack of imagination and practical ability for every day life".*

In 1900 he succeeded in graduating as a teacher of mathematics and physics, but he had great difficulty in finding a job as a teacher. Instead, he worked as a technical expert in Bern from 1902 to 1909 in a patent office.

During this time, he managed to complete a great variety of theoretical physics publications written in his free time and without contact with books or colleagues. He also managed to earn a doctorate from the University of Zurich in 1905. In his first pages, he examined the electromagnetic radiation of light. He also described the phenomenon according to which electromagnetic energy seems to be emitted from radiating objects in discrete quantities. The energy of these *quanta* was directly proportional to the frequency of the radiation, all of which seemed to contradict classical theories.

Einstein used the quanta hypothesis to describe the electromagnetic radiation of light. He also showed that mass and energy are equivalent.

Later, he proposed what is today called *The Special Theory of Relativity* where he assumed that the speed of light remains constant in all frames of reference.

But Einstein's main contribution to science was to unify important parts of classical mechanics and electrodynamics.

In 1921 he received the Nobel Prize, not for relativity but for his work on the photoelectric effect.

In 1932, during a visit to the USA, he was offered a post at Princeton University as a temporary professor. He left Germany for a provisional visit of five months but the Nazis came to power in Germany and he never returned to his country. He died in New Jersey in 1955.

A week before his death, he agreed to sign a manifesto urging all nations to stop nuclear weapons. So the last act of his life was for international peace.

This extract of an interview will give us an idea of his character. He said to a journalist: *"If I give you ten cents, you will be ten cents richer and I will be ten cents poorer. But if I give you an idea, you will have a new idea but I will have it, too".*

Task 2 Now make new groups of four - each having read a different passage. Report what you have read in your former group and exchange information taking turns to ask and/or answer the questions below. Listen and take notes of what other students tell you about their readings.

1 What was the name of the digital calculator invented by Pascal? What could it do?
2 How did Madam Curie's research on radium contribute to medicine?
3 What caused her death?
4 Why couldn't Einstein return to Germany?
5 Which of Pascal's discoveries led to discussions among scientists?
6 What did Einstein first want to study?
7 What did Pascal publish when he was 16?
8 Why is Babbage considered the 'father of computers'?
9 What could Babbage's Difference Machine do?
10 Why couldn't he complete his last invention?
11 Which of these people received two Nobel Prizes?
12 What problem did Einstein investigate in the research for his doctorate?

pascaline, x-ray, leusemia, nazis came to power, vacuum existed, electric engiennering, essay conic section, diseño maquina analitica, work out logaritmos, sin dinero, madam curie, radiacion electromagnetica de la luz

Task 3 Read the other three sections and check the information you received and the notes you wrote.

Task 4 Decide whether the following statements are true (T) or false (F) according to the texts. Make changes in the false ones so that they become correct. Then check your answers in your group.

1 ___ Pascal's triangle was the beginning of a new branch of mathematics.
2 ___ Einstein did not pass an exam to enter university.
3 ___ Pascal invented the programming language which has his own name.
4 ___ Madam Curie received two Nobel Prizes for different fields of science.
5 ___ The probability theory which Pascal invented is not in use nowadays.
6 ___ Einstein thought of himself as unimaginative and unable to deal with practical things.
7 ___ Pascal invented projective geometry when he was very young.
8 ___ Babbage designed various models of his Analytical Engine.
9 ___ *'Curie'* is the name given to a device for X-rays in medicine.
10 ___ Babbage could not finish his invention because of economic problems
11 ___ Einstein received the Nobel Prize for his Theory of Relativity.
12 ___ Babbage's daughter, Ada, helped him in the invention of his calculating machine.
13 ___ Madam Curie died of an illness caused by her handling of radioactive material.
14 ___ Babbage's first engine used gears, cogs and levers in its mechanism.
15 ___ Einstein never returned to Germany due to social and political problems.

Task 5 Where did these inventions appear first? Match the two columns and check your results with the information below.

A QUIZ

1 penicillin	a. ___ Germany
2 electric cell	b. ___ Spain
3 X-ray	c. ___ Argentina
4 pneumatic tyre	d. ___ Sweden
5 photocopier	e. ___ Italy
6 sign language	f. ___ England
7 dynamite	g. ___ Ireland
8 ball-point pen	h. ___ the USA

Answers:

1 In 1928 Alexander Fleming discovered penicillin while doing medical research in London. This discovery brought him the Nobel Prize for Medicine in 1945.

2 The electric cell first appeared in Italy in 1800. Alessandro Volta, a professor of physics, developed it. His name survives as the electrical measure *volt*.

3 X-rays were discovered in Germany in 1895 by Wilhem Rontgen applying the recent discovery of radium. He was awarded the Nobel Prize in 1901 for his work.

4 John Dunlop, a Scotsman, thought of making tyres filled with air for his son's bicycle. He produced the first tyres in 1888 in Belfast, Ireland. However, they were first used on cars by the Michelin brothers in France.

5 The first photocopier was invented in 1903 in the USA by an office worker named G. C. Beidler, but the machine became widely used only 60 years after.

6 Spain was the country where the first sign language alphabet was developed -as long ago as 1620. It was invented by J.P. Bonnet, a tutor at the Spanish court.

7 Alfred Nobel invented dynamite in Sweden in 1867. The money he made from it was left to the foundation which now awards the Nobel Prize.

8. The ball-point pen was the invention of a Hungarian artist and journalist, Laslo Biro. He invented the pen in the 1930s, but it was not produced until 1940 in Buenos Aires, Argentina, where Biro escaped from the Second World War.

Task 6 Here are some notes about the life and work of another well-known scientist, **Sir Isaac Newton**. Write sentences in the past using these notes and the readings in Task 1.

Name: Isaac Newton
1642 Born in Lincolnshire, England
1661 Begins studies at Cambridge University
1665 Develops ideas about optics and gravity
1667 Invents a new branch of mathematics, Calculus.
1669 Becomes Professor of mathematics at Cambridge.
1687 ***Principia***, his most important work is published. It contains his studies on the laws of motion, the theories of tides and gravitation.
1727 Dies at the age of 84.

- Hacer la biografia similar al de la tarea 6

Task 7 Is there a scientist who you admire for his or her achievements? What do you know about his or her personal life or scientific activity? Write a short biography of the 'pioneer' of your choice taking the sections above as a model for your task.

Language Focus: Noun + Noun Structure

When we use a **noun + noun structure**, the first noun is like an adjective, so it is normally singular but its meaning is often plural. For example, in a **book**shop there are hundreds of books, but we *do not* say books-shop. In the same way, we say:

a three-**hour** examination (*not hours*)
four 10-**year** old boys
a three-**month** English course
a four-**legged** robot
a five-hundred **page** book
a two-**door** car
a hundred-**dollar** note
a ten-**disk** pack

Task 8 What do you call these things? Write expressions like the above and check them with a partner or with the class.

Example: A process that takes two steps is... .....a two-step process.....

1. A book which contains twelve chapters is... .....
2. A holiday which lasts ten days is... .....
3. A word which contains four letters is... .....
4. A flight that takes six hours is... .....
5. A flat that has two bedrooms is... .....
6. A term that lasts three months is... .....
7. A play that has three acts is... .....
8. A girl who is ten years old is... .....

LESSON SUMMARY

Here are the things you studied in this lesson.

- Reporting some facts.
- Taking notes.
- Noun + noun structure

KEY WORDS

agree		award = prize	
assist		as well	
award		cogs	
deal with		disappointed	
handle		essay	
isolate		degree	
manage		feature = characteristic	
place bets		frame of reference	
realise		lack	
remain		levers	
resemble		likely	
run out		measurement	
seem		partner	
share		punched holes	
succeed / fail		remains	
		treatise	
		vacuum	
		weapons	
		wounded	

What other useful new words did you find in this lesson? Write them in the table at the end of this unit. Make sure you learn all these words. Remember, a good vocabulary is essential for reading.

LESSON EVALUATION How did you find this lesson? Tick the best answer.

Too easy ☹ About right ☺ Too difficult ☹

Interesting ☺ So-so 😐 Boring ☹

Would you like to read more about this topic?

Lesson 6

DIALOGUE IN CYBERSPACE

Task 1 You are going to read an imaginary dialogue between two famous people..

What do you know about ...

a) Johannes Gutenberg: What did he do? What is his nationality?

b) Bill Gates: Who is he? What nationality is he? How old is he? Why is he famous?

Compare your answers with other students, or check them in **Appendix A** (page 113).

Task 2

Match these words with their synonyms:

1 commodity	a __ criticised
2 devise	b __ luminous
3 speed	c __ precision
4 blamed	d __ design
5 shining	e __ produce
6 accuracy	f __ velocity
7 yield	g __ item of commerce

Task 3

Scan this page and find:

-The place above which the two spirits are floating.
-Gutenberg's former occupation.
-Two pieces of jewellery he used to make.
-The name of Gates' company.
-The first important book printed.
-What Microsoft produces.
-Three things used instead of ink.

Task 4

Read the dialogue, again. Find answers to these questions and underline them.

1 How are the two spirits described?
2 Why was it important to print a perfect Bible?
3 How does Gutenberg describe computers?
4 According to Gates, why are computer's circuits better than human brain's circuits?
5 Why was Gutenberg's invention censured?

Scene: *The spirit of printing pioneer Johannes Gutenberg and computer genius Bill Gates are floating over the Frankfurt Book Fair. Both are like bright balloons floating over a busy market - books, posters, stalls, even authors signing autographs.*

Gutenberg: (*Marvelling*) What a circus! This commodity must be as precious as gold!

Gates: Cheap and dirty, actually. And getting obsolete. It's called print. You invented it, or so history claims.

Gutenberg: Printing was one of my sidelines. I was a goldsmith by trade, you know. Such fine works I used to do! After the intricacies of designing rings and necklaces, the movable type seemed a game! But it was important that the letters be the same height and the same depth or else the inked impression would be irregular...

Gates: (*Impatient with this obsolete technology*) Yeah, yeah! I remember a similar problem when I was devising the first version of Microsoft Basic.

Gutenberg: (*Who is slightly deaf from all those years of gold hammering).* I wanted the first books to be beautiful just like the finest manuscripts which the monks used to make up. The Bible for example, had to reflect God's glory or else nobody would take it seriously. The idea of mass production came later.

Gates: Oh! I know what you mean! The information revolution. Microsoft had a big part in it.

Gutenberg: What is this Microsoft? A title of a novel? The angels tell me that, once people lost interest in religion, they began to read novels and all sort of devilish works for which my invention was blamed.

Gates: Microsoft is bigger than a book by a factor of billions. It is a company that makes programs. A program is the software and the hardware is those little boxes you see down there with their shining faces.

Gutenberg: Ah! I thought they were new species of human beings - heads without bodies. I see they are often consulted and the alphabets attached to them are often caressed.

Gates: They're better than heads, actually. Their circuits are more logical than a human brain's circuits. No anger, no sex, no feelings. Pure computing and memory. And communication, of course!

Gutenberg: (*Politely)* And what are they communicating?

Gates: Mmm... You know, information: bank statements, airline reservations, love letters. Not to mention the Internet, including business, virtual sex, whatever you want, but done in seconds! See that guy down there? He's sending a press release that in four seconds will be printed out in Singapore!

Gutenberg: (*Grasping at a familiar concept)* Printed, Ah. And on what sort of press?

Gates: No more presses. Mr G. Just the touch of light. No more leaking black ink. It's all bytes, pixels and lasers now. No human muscle needed!

Gutenberg: (*Astonished)* And those shining faces, What do you call them?

Gates: Computer screens.

Task 5

Before you read the second part, predict how you think the dialogue will develop. Choose three of these ideas.

a Gutenberg is enthusiastic about the new devices.

b Gates predicts that computer devices will replace books.

c Gates wants to know details about the printing revolution.

d Gutenberg sustains the everlasting value of books.

e Gates explains to him how the new technology works.

Task 6

Number these topics in the order in which they appear.

- The advantages of CD ROMs.
- The numerical base used by computers
- Advantages of books.
- The language of computers
- Examples of interfaces.

Task 7

Read the text carefully. Find answers to these questions. Underline and number the places you find the answers.

1 Which number system do computers use?
2 What is the printed page an interface for?
3 According to Gates, what did young people replace books with?
4 What are the things a CD ROM may contain?
5 According to Gutenberg, what is the main advantage of books over computers?

Gutenberg: And yet, they contain what seems to be letters, although very unbeautifully formed. How have letters survived your computer revolution?

Gates: Letters you say? They're just a human convenience. Computers do not use them, they talk to themselves in bits, the smallest possible unit of information, a pulse of electricity in an instant of time! It's hard to explain, you know. You can't see anything without a microscope, but believe me, it works!

Gutenberg: Excuse me. I am afraid I do not understand you.

Gates: It's easy. Just listen. When these machines do math, it is not like you and me doing math, they work on a sexadecimal base of sixteen instead of ten, but in the second before they flash the answer, they translate it back into ten-based numbers for our convenience. Letters and numbers are just an interface.

Gutenberg: Interface?

Gates: That's another concept for you: interface. It's like the Church in your day, it was an interface between men and God. Or the printed page which became an interface between one man's brain and another's voice; or the alphabet which was an interface between spoken language and the human eye. But, you know, now young people don't read. They absorb information from television and musical tapes. They seem to think that the printed page is an awful lot of work. Face it, friend, even at the height of your printing revolution, only very few people read.

Gutenberg: But... those people consulting their screens, are they not reading? What does the material that holds the letters matter? Whether it be stone, papyrus, paper or a plastic screen? Moreover, those words made of electric pulses, as you say, do they not need a source of electricity nearby to become visible? Even the smallest and most portable of your machines ...

Gates: Laptops, we call them.

Gutenberg: ... are not as light as a book, which requires no electricity and that can be entered...

Gates: Accessed.

Gutenberg: ... by simply opening it. How could information or intellectual adventure be more handy and nicely packed than in a book?

Gates: (*Holding up a small iridescent CD ROM*) In my hand I hold thousands of pages, reduced to magnetised digits. The books of entire libraries, the huge repositories of your revolution are contained in these disks, which with just a click, will yield information with illustrative, colourful pictures. 3-D diagrams, even music! No more dog-eared, forest-wasting page books! You had your day, old fellow, or your five centuries, I should say. That Fair below us is the end, just like your philosopher Nietzsche used to say: "Churches are the sepulchres of God".

Gutenberg: (*Hesitantly*) Perhaps the book, like God, is an idea that some men need. The revolution of print was like a river which flowed to its readers because it was cheap. This electronic flood you describe has no banks: it massively delivers, but what? To whom? There is something intrinsically small about its contents, compared to the genius of its workings. And, if I may point out a technical problem, its product has no autonomy from its source of energy, unlike a book which can stay unread for a century, and all that it needs to come to life is to be open and scanned by a literate brain. This CD ROM of yours - what machine will be able to read it in a hundred years from now? Each generation of these machines destroys the previous one. The same speed and accuracy of your revolution erode its contact with the earth. You speak of that global Internet as if it transcended the human brains; but man is still the measure of all things!

Gates: (*Collapsing with a hiss*) That can be fixed... eventually.

Task 8 Are these statements about the dialogue true (T) or false (F)? Discuss your answers with your partner and then check them in the text.

1 ___ The first printed books, especially the religious ones, had to be perfect.
2 ___ People have always needed reading and writing.
3 ___ Computers are so efficient because they do not have human weaknesses.
4 ___ One of the computer's advantages is that the latest devices make the former ones obsolete.
5 ___ The most sophisticated devices are now independent of any source of energy.
6 ___ Gutenberg's print was made responsible for people reading 'devilish novels' and abandoning religion.
7 ___ Gates says that young people like television and music more than books.
8 ___ Books do not need to be powered. They are independent and timeless.

Task 9 **Writing Summaries**

In groups of three, summarise in Spanish Gutenberg's arguments in favour of books and Gates' in favour of computers.

Gutenberg	Gates
*Los libros no dependen de ninguna fuente de energía para comunicar ideas.	*Los circuitos de la computadora son más lógicos que el cerebro humano.
*	*

Task 10 **Locating Information**

Read the following statements and identify them as expressed by either Gutenberg or Gates. Write one of the names next to each statement. Then, to support your answer, underline the part of the dialogue where the information appears.

Who said...?

1 _____ "Some people will always find books valuable and meaningful for their lives".
2 _____ "Computers do not need numbers or letters. They use bytes to talk to themselves and to each other".
3 _____ "In any case, people always need to read, even when they are using a computer".
4 _____ "Numbers and letters are merely a link between the user and his/her computer".
5 _____ "New CD ROMs can store the contents of thousands of books including beautiful pictures, graphics and even music".
6 _____ "Many trees are cut to make paper to be used in books".
7 _____ "Books can be read at any time. They only need an intelligent mind to absorb their content".
8 _____ "Computers need a source of energy to be used, without which they are completely useless.

Task 11 Working in your group, translate the last paragraph that begins with Gutenberg's saying *'Perhaps the book, like God...'*

Language Focus: COMPOUND NOUNS

Task 12 Match these definitions with the terms they refer to.
What do you call ...

A		B	
1.	the energy which comes from wind?	a 7	central processing unit
2.	the device used to play video cassettes?	b 3	photocopy paper
3.	paper used in a photocopier?	c 6	renewable energy source
4.	the plant where fuel is processed?	d 10	ocean energy converter
5.	the device that scans the inside of the human body?	e 9	paper cutter
6.	the source of energy which cannot be exhausted?	f 1	wind power
7.	part of the computer where the information is processed?	g 4	fuel processing plant
8.	air which is cooled until it becomes liquid?	h 2	video cassette player
9.	a machine used for cutting paper?	i 5	body scanner
10.	the device which converts the ocean's heat into thermal energy?	j 8	liquid air

The words in column B are called compound nouns because two or more nouns are put together to form a new noun, i.e. ***computer program***, ***computer programmer***. Compound nouns are very common in English, especially in the academic context, so it is important for the reader to be aware of their proper meaning, for example:

a race **horse** (is sort of horse trained for racing)
a horse **race** (is a sort of race)

The above terms are not interchangeable. The relationship between the words depends on the last word which says what the thing refers to, while the preceding word(s) describes the thing and functions as an adjective, so to understand and translate a compound noun we should start from the last word and go backwards.

Sometimes the first word tells us what the second word consists of, e.g.

metal bar **rubber string** **plastic toy** **glass jar** **steel tool**

In other cases the first word tells us what the second is used for, e.g.

accelerator pedal **load elevator** **body scanner** **life boat** **conveyor belt**

Task 13 What do you call these things and people? In pairs, write compound nouns for these definitions.

Example: A magazine about computers is ... ...a computer magazine.....

1 Somebody whose job is to operate a machine is .....
2 Research that explores underwater is ... .
3 The industry that makes cars is ... .
4 The power that comes from the sun is ... .
5 The technology that deals with robots is... .....
6 Someone who does scientific research is ... .
7 The device that filters water is ... .
8 A container made of plastic is ... .

Task 14 Select two words from the box to complete the definitions below.

telephone * water * newspaper * ozone * computer * virus * traffic * safety * video detector * helmet * games * headline * filter * keyboard * layer * lights * **card**

Example: You can use this to make a phone call. ....telephone card.....

1 It is a colourless gas which protects the Earth from the dangerous sun's rays. .....
2 Engineers wear this on their heads at work to prevent accidents. .....
3 They are red, green and yellow and they control cars and people in the street. .....
4 Children –and even many adults- love playing them, but they can be addictive. .....
5 It's a typewriter-like device used to enter information. .....
6 Computer utility which checks files for infections. .....
7 It gives you an idea of what the news you are going to read. is about. .....
8 It removes bacteria and pesticides which are dangerous to health. .....

LESSON SUMMARY

Here are the things you studied in this lesson.

- Summarising information.
- Predicting events.
- Translating.
- Using Compound nouns.

KEY WORDS

blame		accuracy	
devise		commodity	
erode		leaking	
flow		moreover	
hold		release	
make up		shining	
point out		sort	
shine		whatever	
yield		whether	

What other useful new words did you find in this lesson? Write them in the table at the end of this unit. Make sure you learn all these words. Remember, a good vocabulary is essential for reading.

LESSON EVALUATION How did you find this lesson? Tick the best answer.

Too easy ☹ About right ☺ Too difficult ☹

Interesting ☺ So-so 😐 Boring ☹

Would you like to read more about this topic?

UNIT 2 - VOCABULARY

Write down any important new words that you found in Unit 2 (lessons 4, 5, & 6). Write a definition, translation or example sentence for the new words in the spaces provided.

Review these words regularly, together with the lists of key words at the end of each lesson. Learn these words well - your teacher will test you on them! Remember, a good vocabulary is essential for reading.

New word or expression	Explanation (translation, definition, example sentence

III HOW THINGS WORK

7 Computers Today

8 Radio Telescopes

9 Suspension Bridges

Learning Goals:

In this unit you will read about how modern technology is applied to useful devices.

You will also:

- Learn to recognise contextual reference, i.e. how pronouns and other substitution words are used.
- Express similarities and differences between things.
- Expand your vocabulary through the use of prefixes and suffixes.

Lesson 7

COMPUTERS TODAY

Task 1. What do you know about computers capabilities and limitations? Read the following and tick the things which are best done by computers.

Work out complex math problems ✓
Store huge amounts of information
Understand spoken instructions
Translate languages
Think and take decisions
Compose music
Reproduce by themselves
Forecast the weather
Help disabled people to communicate

INFINIA 7200

Task 2. Read the article below and match these headings with each paragraph. Write its number on the space.

___ You get what you enter *___ Computers and Information* *___ Main computer features*
___ What computers are unable to do *___ What is a computer made of*

1. INFORMATION is very important in our modern life because our brains collect information all the time. As the modern world gets more complicated, a great deal of information needs to be processed and so computers are used for this task. Today many activities like space travel, bank accounts, or telecommunication would be almost impossible without them.

2. The main components of a computer are the hardware and the software. The former is the part of the computer that we can touch and handle. It includes the input devices (disk drives and keyboards), the CPU and the output devices (screens and printers). Software, on the other hand, is the name given to the actual programs (instructions given to the computer) that allow the computer to do a useful job. Without software, hardware is useless. To understand the difference between hardware and software, let us compare the hardware to a CD player and a blank disk because we can handle them. Then the music which we record on the disk would be the software.

3. Some characteristics of modern computers are their speed, accuracy and repetitive action. For instance, computers used by electricity companies can do 1 million calculations every second. They can also produce all the bills for their customers in a few hours. On the other hand, when we read newspaper headlines such as: "COMPUTER SENDS ONE MILLION DOLLAR ELECTRICITY BILL TO A HOUSEWIFE", although it is true, it is not the fault of the machine itself -they only do what they are told to do.

4. There is a saying in computing: *"garbage in, garbage out"* or GIGO for short; what it means is that if some information is put into the computer incorrectly, the computer will not consider it incorrect, so it will give out a strange answer. If the computer is given the right information, it will always come out with the right output.

5. Computers can work out calculations continuously, 24 hours a day. They do not need vacations as we do. So for some tasks computers are better than people. But there are, of course, many things that they cannot do; for example, they cannot replace a dentist or a teacher, they cannot think by themselves. And most important, they cannot create new, little computers!

Task 3. Scan the text above to find this information.

1 The two principal parts of a computer. .....Software and hardware.....
2 The main characteristics of computers. .....
3 What GIGO stands for. .....
4 The meaning of the newspaper headline. .....
5 The two hardware input devices. .....
6 The two output devices mentioned .....

Task 4. CONTEXTUAL REFERENCE. What do the words in italics refer to? Look back at the article to find out.

1 … and so computers are used for ***this task*** … (Line 6) .....To process information.....
2 … almost impossible without ***them***. (Line 9) .....
3 ***The former*** is the part of the computer … (Line 11) .....
4 … we can handle ***them*** … (Line 23) .....
5 … are ***their*** speed, accuracy and …(Line 26) .....
6 … all the bills for ***their*** customers …(Line 30) .....
7 It is not the fault of the machine ***itself*** … (Line 35) .....
8 … what ***it*** means is that … (Line 38) .....
9 … the computer will not consider ***it*** … (Line 40) .....
10 ***They*** do not need vacations … (Line 45) .....
11 … they cannot think by ***themselves.*** (Line 50) .....

Task 5. GUESSING NEW WORDS. Look up the English equivalents in the text for these Spanish words.

cerebros (Paragraph 1)	.....brains.....	permiten (Para. 2)	.....	cuentas (Para.3)	.....
casi (Para. 1)	.....	inútil (Para. 2)	.....	clientes (Para. 3)	.....
manipular (Para. 2)	.....	tocadiscos (Para. 2)	.....	titulares (Para. 3)	.....
por otra parte (Para. 2)	.....	precisión (Para. 3)	.....	basura (Para. 4)	.....
reales (Para. 2)	.....	por ejemplo (Para 3)	.....	reemplazar (Para. 5)	.....

Language Focus: PREFIXES

Look at these words:

inter**change**able
un**employ**ment
mis**understand**ing

A common way of forming new words in English is by adding a standard combination of letters to existing words, either at the beginning (**prefixes**) or at the end (**suffixes**). Some words may have both, a prefix and a suffix, like in the examples above.

Prefixes usually change the meaning of the word. For example, the prefix **'un'** changes a word to negative: **unknown** means 'not known'.

When you read, especially academic texts, you will frequently meet unfamiliar words of this type. Very often, you can guess or deduce the meaning of these terms if you understand the way in which the words are generally formed in English. Thus you can increase the number of words in your vocabulary.

Task 6 Form new words by joining a prefix to a base word. Do not repeat any item.

1. im	__ a direct
2. dis	__ b title
3. micro	__ c circle
4. in	__ d possible
5. sub	__ e magnetise
6. trans	__ f structure
7. semi	__ g charge
8. super	__ h port
9. de	__ i economics
10. infra	__ j sonic

As you see from the words you formed above, most English and Spanish prefixes have the same Latin origin. But the following need to be studied more carefully since they are not present in Spanish.

PREFIX	MEANING	EXAMPLE
un-	not	**un**certain **un** determined
under-	too little	**under**developed **under**estimate
over-	too much	**over**load **over**production
fore-	before	**fore**cast **fore**see
mis-	badly, wrongly	**mis**interpret **mis**calculate

Task 7 **a** Fill in the blanks with the appropriate prefix from the table.

un- over- bi- re- under- in- mis- multi- semi- fore- micro-

1 _____pedal robots are still very difficult to build.

2 _____conductor lasers are used for reading bar codes in the shops.

3 A _____user computer system allows access to more than one person simultaneously.

4 Investment is needed to reduce _____development in Latin America.

5 _____experienced people tend to _____use most of the computer's capabilities.

6 Scientists _____cast increasing problems in _____crowded cities.

7 Floppy disks were convenient storage devices because they were _____expensive and _____usable.

8 Computers became portable and cheaper due to the invention of _____chips.

b Now, among the words you formed above, find the ones that mean the same as:

cheap	.....	having two legs	.....
predict	.....	with too many people	.....
having little experience	.....	that may be used again	.....

LESSON SUMMARY

Here are the things you studied in this lesson:

- Scanning and skimming through a reading text.
- Improving vocabulary through the use of prefixes: ***under**developed*, ***mis**interpret*, etc.

KEY WORDS

allow	accuracy
come out	almost
forecast	although
handle	as
record	bill
work out	customer
	disabled
	feature = characteristic
	for instance
	former ≠ latter
	headline
	on the other hand
	screen
	with / without

What other useful new words did you find in this lesson? Write them in the table at the end of this unit. Make sure you learn all these words. Remember, a good vocabulary is essential for reading.

LESSON EVALUATION How did you find this lesson? Tick the best answer.

Too easy ☹ About right ☺ Too difficult ☹

Interesting ☺ So-so 😐 Boring ☹

Would you like to read more about this topic?

Lesson 8

THE RADIO TELESCOPE

Task 1 Look at the picture. Discuss in the class what a telescope like this can be used for.

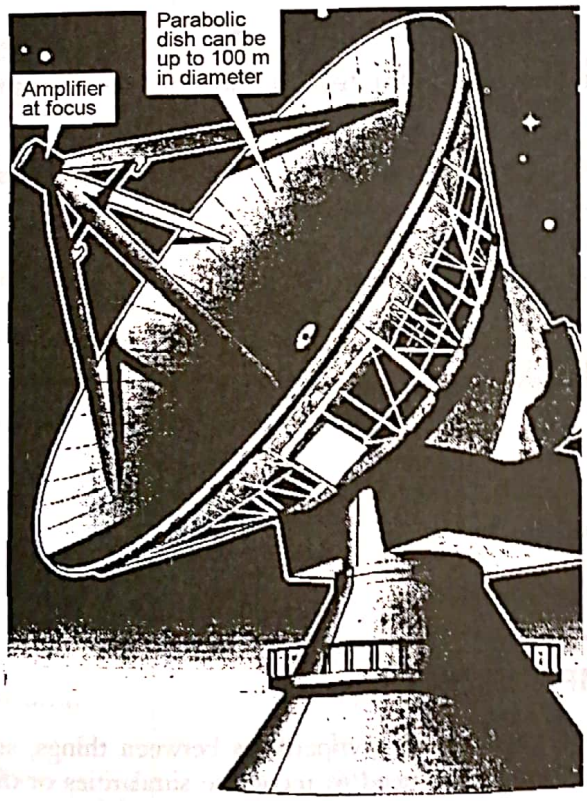
Task 2 Scan the text to find the following information.

1 Two things that stars and galaxies emit.
2 The types of telescopes mentioned in the text.
3 The diameter of a typical parabolic dish.
4 The temperature of the amplifier.

RADIO WAVES from space seem like they belong to science fiction. But galaxies and stars emit radio waves in much the same way as they emit light. Both are forms of electromagnetic radiation which can penetrate the Earth's atmosphere.

The radio telescope looks at the strength of radio waves from distant objects such as pulsars (dying stars), distant galaxies and quasars (quasi-stellar objects). It can also detect certain molecules in space from the frequency at which their atoms emit radio waves.

Visible light and radio waves are the only two parts of the electromagnetic spectrum which can penetrate the Earth's atmosphere. However, because visible light has much shorter wavelengths, it can produce much clearer images from similarly sized dishes.



A radio telescope is used, like an optical telescope, to gather information about our universe. But a radio telescope examines radio waves, rather than visible light, and does not produce "*pictures*".

All a radio telescope can do is measure the strength of a radio signal coming from a particular part of the sky. But this information helps astronomers "*see*" or sense things that emit no light.

The radio signals received from space are very weak - the energy received by all the radio telescopes over a decade would scarcely be enough to light a torch bulb for a second. So making good use of such fragile data requires very high standards of engineering.

A huge parabolic dish, typically 30 metres in diameter, can swivel to point anywhere in the sky. It reflects the very weak radio signals from the sky to a focus, where they are amplified thousands of times. The amplifier is cooled to –256°C to prevent the radio signals being masked by electronic noise from the circuitry itself and thus improve its performance.

The signals are passed to a control centre, which can monitor a radio source over a length of time by programming the dish to follow it through the sky. The data is recorded on tape and analysed later by computers.

The main limitation of a single radio telescope is the lack of "resolution", i.e. detection of fine detail. The best optical telescopes can distinguish between a pair of car head lamps 300km away; to achieve equivalent resolution, a radio telescope would need a dish over 40km in diameter (because radio waves have wavelengths many thousands of times longer than light waves). This problem is solved by linking radio telescopes electronically. Their signals can be combined to imitate a single dish with a diameter equivalent to the distance between them. For instance, two dishes 200km apart could combine their signals to produce the equivalent signal of a dish 200km in diameter.

Task 3 Read the text carefully and find the answers to these question:

1 Where do radio waves in space come from?
2 Why can light produce clearer images than radio waves?
3 What are the differences between an optical and a radio telescope?
4 Why is the amplifier cooled?
5 How can the problem of resolution be solved?

Task 4 Are these sentences true (T) or false (F)? Refer back to the text to support your answers.

___ 1 Radio telescopes are used to detect visible light from galaxies and stars.
___ 2 The radio signal from a star does not have enough energy to power an electric bulb.
___ 3 The parabolic dish is designed to turn round to explore the sky.
___ 4 The radio telescope has a fine resolution which allows it to detect details from 300km away.
___ 5 The biggest telescope in use is over 40km in diameter.
___ 6 To solve the problem of radio signals being confused with electronic noise from the amplifier, the amplifier must be cooled to -256°C.
___ 7 Radio waves and light are the only forms of electromagnetic radiation capable of entering the Earth's atmosphere.
___ 8 A radio telescope's lack of resolution is due to the fact that radio waves have shorter wavelengths than light waves.

Task 5 **Contextual Reference**

Using the line references given, look back in the text to find what the words in bold refer to.

Example: ... seem like **they** belong... (line 1) .....radio waves.....

1 ... in the same way as **they** emit light. (line 3) .....
2 **Both** are forms of ... (line 3) .....
3 ... from the frequency at which **their** atoms emit ... (line 8) .....
4 ... **it** can produce much clearer images ... (line 13) .....
5 **It** reflects the very weak radio signals ... (line 33) .....
6 ... from the circuitry **itself** ... (line 38) .....
7 ... and thus improve **its** performance. (line 38) .....
8 The signals are passed to a control centre, **which** can monitor..(line 40) .....
9 ... by programming the dish to follow **it** through the sky. (line 41) .....
10 ...could combine **their** signals ... (line 57) .....

Language Focus Expressing Similarity and Difference

COMPARISONS

One important feature in any language deals with establishing comparisons between things, and this is especially important in academic texts in English, where you need to recognise similarities or differences between elements, characteristics, processes, etc.

Study these examples:

Optical telescopes have **better** resolution **than** radio telescopes.

The largest parabolic dish will be 42 metres in diameter and will be placed in Arizona.

The following language forms are used to express comparisons:

A. EQUIVALENCE is used when we refer to people, things, actions or events that are similar or identical, or when they share certain characteristics.

Look at these expressions and examples:

like **similar** **both ... and** **the same ... as** **as ... as** **so ... as** **as much as** **as many as** **resemble ... in that**	• Computers, **like** printing in the Middle Ages, revolutionised communications and culture. • **Both** glass and metal recycling processes are **similar** in that they save raw materials and energy. • **Both** *'stone'* **and** *'kilogram'* are used as measures of weight. • Caterpillars have **as many** muscles **as** humans do. • The way in which ants and bees live **resembles** social communities **in that** there is a strict division of labour. • The moon may contain **as much** water **as** a large lake.

B NON-EQUIVALENCE is used to express inequality by focussing on the lower or the higher degree of a scale.

____er than **more ... than** **less ... than** **not the same ... as** **whereas** **rather than**	• In 1935 an Englishman Franc Whittle, invented the jet engine, which made aeroplanes fly **faster** and **more safely**. • Combustible substances burn much **better** in oxygen **than** they do in air. • Deadly bacteria can be 1000 times **smaller than** the human cells they attack. • The whole experiment lasted **less than** an hour. • Electronic scales take a **larger** load and are **more accurate** than mechanical ones. • European countries are increasing the production of alternative sources of energy **rather than** the energy derived from fossil fuels.

C THE SUPERLATIVE is used to express which one of a group is outstanding in a particular way.

the ____est **the most .....** **the least .....**	• Football's **most** prolific scorer is Pelé with 1,216 goals in 1,254 games. • Modern interactive museums now use **the latest** audio-visual technology. • In a *'slow bicycle race'* the winner is the person who travels **the least** distance in one minute without falling off or turning round. • Even the **best** computer needs to be programmed to do things.

D. PARALLEL INCREASE, also called double comparative, is used to say that two or more things change or vary together, or two variable quantities are systematically related.

- Spring balances are a very simple way of measuring force - **the bigger** the force, **the more** the spring stretches.
- **The smaller** the computer, **the more** sophisticated it can be.
- **The more dangerous** the sport, **the more** fans it has among young people.
- **The less** challenging your job, **the more** effort you will need to do it.
- **The more** educated the person, **the less** likely it is for him or her to be unemployed.

Task 6 Match these sentence halves. Then compare your results with a partner and practise translating the sentences.

1 The warmer the weather,	___ a the more electricity demand there is.
2 The younger the person,	___ b the less time you spend reading it.
3 The larger the population density,	___ c the better it is for most plants to grow.
4 The more interesting the book,	___ d the less oxygen there is.
5 The higher the place,	___ e the easier it is to learn.

Task 7 Read the following sentences, write the type of comparison and underline the word(s) expressing it.

Example: Non-Equivalence The supercar of the future will use carbon fibre instead of steel, which will make it **less expensive** and **more efficient.**

1. _____ The government should spend as much as necessary in health and education.
2. _____ English is probably one of the least difficult languages to learn.
3. _____ To play checkers we use the same board as in chess, but we only have twelve identical pieces.
4. _____ Some people think that death penalty would result in less crime and violence.
5. _____ King Khalid International Airport in Saudi Arabia is twice as big as Charles de Gaulle Airport in Paris.
6. _____ The sooner you quit smoking, the better you will feel.
7. _____ Even the best designed robot cannot compare to what Nature achieved over millions of years.
8. _____ The more renewable energy we use, the less dependant we will be on oil.
9. _____ Edison used cotton in his first light bulb; now the filament is made of tungsten, which glows much hotter and brighter.
10. _____ Iron was the most used metal in the early Greek period.

Task 8 Look back at the text **"The Radio Telescope"**, and underline at least ten expressions showing comparisons.

LESSON SUMMARY

Here are the things you studied in this lesson:

- Understanding contextual reference.
- Expressing similarity and difference using comparisons:
  The bigger *the optical telescope,* ***the clearer*** *images it will send.*
  A radio telescope, ***like*** *an optical telescope, is used to gather information about the universe.*
  Visible light that penetrates the Earth's atmosphere has a ***shorter*** *wavelength than radio waves.*

KEY WORDS

cool	dish
follow	noise
gather	performance
light	scarcely
link	strength
mask	torch bulb
measure	thus
place	wave(length)
swivel	weak

What other useful new words did you find in this lesson? Write them in the table at the end of this unit. Make sure you learn all these words. Remember, a good vocabulary is essential for reading.

LESSON EVALUATION How did you find this lesson? Tick the best answer.

Too easy ☹ About right ☺ Too difficult ☹

Interesting ☺ So-so 😐 Boring ☹

Would you like to read more about this topic?

Lesson 9

SUSPENSION BRIDGES

The suspension bridge represents the peak of civil engineering technology

Task 1 Read the text below to find this information and underline it on the text. If you are working alone, you will find the answers to these activities in **Appendix A.**

1 The advantages of a suspension bridge.
2 How calculations are done.
3 Why these bridges can cross wide distances.
4 The main function of the towers.
5 How and why the scale models are tested.
6 The reason for the aerodynamical design.

A SUSPENSION BRIDGE is the most effective way to span a deep channel or canyon, or cross a wide estuary which has a heavy boat traffic. Because the bridge's deck is suspended from above rather than supported from below, it can span much wider distances than other types of bridge.

The site for a suspension bridge is carefully chosen as the best crossing point where firm foundations can be built.

Computer simulations are used to calculate the forces acting on different parts of the bridge and to work out costs. An exact scale model of the bridge is made and tested in a wind tunnel to ensure the bridge will be safe under all conditions.

The Humber Bridge completed in 1981, has a central span of 1,410 metres and side spans which gives the bridge a total length of well over two kilometres.

High-performance materials such as new steels, concrete and carbon-fibre composites promise to extend bridge spans to five, even ten kilometres in the next century.

In the Humber bridge the main supporting structures are two, 155 metre-tall, reinforced concrete towers.

Two main cables are slung from here and they hang down in a natural curve. These cables run continuously from an anchorage - a huge concrete block sunk into the ground - on one side of the bridge, across the top of the two towers and then to an anchorage on the other side.

Most of the bridge's weight is transferred to the towers, via the cables. On the south bank of the Humber Bridge the anchorage alone weighs 300,000 tonnes. Each anchorage must withstand a pull of over 20,000 tonnes from each cable.

The bridge's deck or traffic way is made of 124 steel box sections welded together. Each section weighs 140 tonnes. These are dynamically shaped to allow moving air to pass easily around the bridge, rather than push against it. The deck is suspended by hangers from the two main cables.

Even without road traffic, the cables, hangers and deck weigh about 30,000 tonnes.

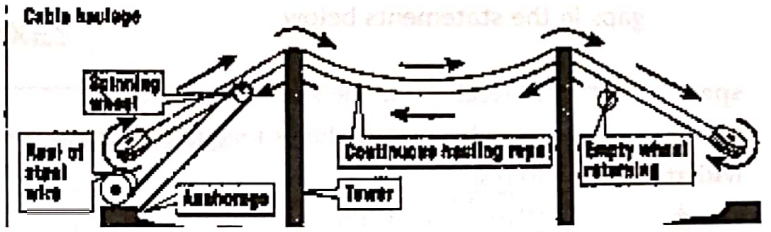
The Humber bridge, the longest single-span suspension bridge in the world, will soon be surpassed by newer bridges. Denmark's Great Belt East Bridge, completed in 1997, has a single span of 1,624 m. Japan's Akashi Kaikyo Bridge, planned for 1999, will have an overall length of 3,910 m and a central span of 1,910m.

Task 2 Read the text carefully and complete the chart below with information about the Humber Bridge.

Materials used:	.....
	.....
	.....
Weight	
south side anchorage:	.....
steel box section:	.....
cables, hangers, deck:	.....
Measurements	
central span:	.....
overall length:	.....

The **Humber Bridge**, completed in 1981, is currently the world's longest single-span bridge; it has a central span of 1,410 metres and side spans which give the bridge a total length of well over 2 kilometres.
High-performance materials such as new steels, concretes and carbon-fibre composites promise to extend bridge spans to five, even 10 kilometres in the next century.

The bridge is supported from above by cables and hangers and supported from below by the towers.
The arrows show how the cables are stretched and the towers compressed



Each main **cable** is assembled from 37 steel wires of **5mm diameter.** Each wire is fed out back and forth across the bridge by a rotating wheel. The wires are bundled together, and then compressed into a circular shape by a hydraulic squeezer. The final cables are 68cm in diameter, contain about 15,000 wires each, and weigh about 11,000 tonnes together. For protection against corrosion the wires are galvanised, the cable is coated with red lead paste and then wrapped around with steel galvanised wire.

The concrete foundations from the towers are built inside hollow reinforced concrete cylinders, sunk into the river bed from which the water is pumped out. The hollow towers contain lifts for maintenance access

The **deck** is made of steel box sections. These are floated out into position by barges and then hoisted by cranes. Each section is hung from the cables by hangers and then welded to the section alongside

Task 3

Read the captions to the pictures and find the answers to these questions.

1 How can workers get up the towers to carry out maintenance?
2 How are the steel boxes put together in the deck?
3 How is the Humber Bridge supported?
4 In which way are the cables protected from corrosion?

Task 4 Read these dictionary definitions of technical verbs. Then use them to fill in the gaps in the statements below.

span	to reach from one side to the other
bundle	to gather and tie things together; to fasten something.
withstand	to resist
slung	(Past tense of sling) to hang loosely.
weld	to join two pieces of metal together by heating the edges so that they cool and harden into one piece.
assemble	to collect or fit different parts of something together.

1 The galvanised cables are ..... over a very wide area and support heavy weights.
2 This machine has six parts, so we need to ..... it according to the instruction manual.
3 It is possible to ..... stainless steel to ordinary steel.
4 Travellers get to the other side by walking across the footbridge that ..... the narrow river.
5 The workers had to ..... all the electrical wires and leave them inside the building.
6 Steel cables are designed to ..... a pull force of many tonnes.

Language Focus: Suffixes - Part I

Task 5 Study this word family and complete each sentence below with one word of the group.

electricity electrical electrician electrically electrify electrified

a ..... can be obtained from many sources.
b It is necessary to ..... vast areas in the country, if we want economic improvement in Bolivia.
c ..... engineering is the field that deals with the generation and distribution of electricity.
d First computers had mechanic parts; today's computers are all ..... powered.

In the sentences completed above, the words you added have different endings or **suffixes** which change both the meaning and the function of the word from one part of speech to another. For example, 'er' added to the verb *read*, gives the noun **reader** (a person who reads).

Suffixes can form **nouns, adjectives, verbs** and **adverbs** when attached to a word. Knowing how suffixes work can expand considerably the amount of vocabulary you use.

In example **a**, *electricity* is a noun; in **b**, *electrify* is a verb; in **c**, *electrical* is an adjective; in **d**, *electrically* is an adverb.

Here is a list of useful suffixes:

A. NOUN-FORMING SUFFIXES

SUFFIX	BASE WORD	EXAMPLE
-ance	perform	perform**ance**
-ence	exist	exist**ence**
-er	work	work**er**
-or	operate	operat**or**
-ist/-yst	science, analysis	scient**ist,** anal**yst**
-ian	electric	electric**ian**
-tion	act	ac**tion**
-ness	good	good**ness**
-ing	meet	meet**ing**
-ment	measure	measure**ment**
-ity	flexible	flexibil**ity**
-ism	magnet	magnet**ism**
-ship	champion	champion**ship**

Task 6 Form new nouns joining the suffixes in the table with the words below. Do not repeat any item. Some words may need slight changes.

-ing	**-er**	**-ance**	**-ness**
-or	**-ment**	**-ist**	**-ity**

1 accumulate_____
2 achieve_____
3 biology _____
4 electric_____
5 mean_____
6 scan_____
7 maintain_____
8 soft_____

Check the words you formed with your partner and find more examples in your dictionary.

B. ADJECTIVE-FORMING SUFFIXES

SUFFIX	BASE WORD	EXAMPLE
-al	education	educationa**l**
-ar	rectangle	rectangul**ar**
-ic	science	scientif**ic**
-ical	logic	log**ical**
-able	read	read**able**
-ible	vision	vis**ible**
-ous	continue	continu**ous**
-ful	use	use**ful**
-less	count	count**less**
-ish	red	redd**ish**
-ed	amaze	amaz**ed**
-ive	effect	effect**ive**
-ing	grow	grow**ing**

Task 4 Read these dictionary definitions of technical verbs. Then use them to fill in the gaps in the statements below.

span	to reach from one side to the other
bundle	to gather and tie things together; to fasten something.
withstand	to resist
slung	(Past tense of sling) to hang loosely.
weld	to join two pieces of metal together by heating the edges so that they cool and harden into one piece.
assemble	to collect or fit different parts of something together.

1 The galvanised cables are ..... over a very wide area and support heavy weights.
2 This machine has six parts, so we need to ..... it according to the instruction manual.
3 It is possible to ..... stainless steel to ordinary steel.
4 Travellers get to the other side by walking across the footbridge that ..... the narrow river.
5 The workers had to ..... all the electrical wires and leave them inside the building.
6 Steel cables are designed to ..... a pull force of many tonnes.

Language Focus: Suffixes - Part I

Task 5 Study this word family and complete each sentence below with one word of the group.

electricity **electrical** **electrician** **electrically** **electrify** **electrified**

a ..... can be obtained from many sources.
b It is necessary to ..... vast areas in the country, if we want economic improvement in Bolivia.
c ..... engineering is the field that deals with the generation and distribution of electricity.
d First computers had mechanic parts; today's computers are all ..... powered.

In the sentences completed above, the words you added have different endings or **suffixes** which change both the meaning and the function of the word from one part of speech to another. For example, **'er'** added to the verb *read*, gives the noun **reader** (a person who reads).

Suffixes can form **nouns, adjectives, verbs** and **adverbs** when attached to a word. Knowing how suffixes work can expand considerably the amount of vocabulary you use.

In example **a**, *electricity* is a noun; in **b**, *electrify* is a verb; in **c**, *electrical* is an adjective; in **d**, *electrically* is an adverb.

Here is a list of useful suffixes:

A. NOUN-FORMING SUFFIXES

SUFFIX	BASE WORD	EXAMPLE
-ance	perform	perform**ance**
-ence	exist	exist**ence**
-er	work	work**er**
-or	operate	operat**or**
-ist/-yst	science, analysis	scient**ist,** anal**yst**
-ian	electric	electric**ian**
-tion	act	ac**tion**
-ness	good	good**ness**
-ing	meet	meet**ing**
-ment	measure	measure**ment**
-ity	flexible	flexibil**ity**
-ism	magnet	magnet**ism**
-ship	champion	champion**ship**

Task 6 Form new nouns joining the suffixes in the table with the words below. Do not repeat any item. Some words may need slight changes.

-ing	-er	-ance	-ness
-or	-ment	-ist	-ity

1 accumulate_____
2 achieve_____
3 biology _____
4 electric_____
5 mean_____
6 scan_____
7 maintain_____
8 soft_____

Check the words you formed with your partner and find more examples in your dictionary.

B. ADJECTIVE-FORMING SUFFIXES

SUFFIX	BASE WORD	EXAMPLE
-al	education	educationa**l**
-ar	rectangle	rectangul**ar**
-ic	science	scientif**ic**
-ical	logic	log**ical**
-able	read	read**able**
-ible	vision	vis**ible**
-ous	continue	continu**ous**
-ful	use	use**ful**
-less	count	count**less**
-ish	red	redd**ish**
-ed	amaze	amaz**ed**
-ive	effect	effect**ive**
-ing	grow	grow**ing**

Task 7

a Form new adjectives joining the suffixes in the table with the words below. Do not repeat any item.

-ish	-less	-ing	-ous	-ive	-ful	-able	-al

1 end_____
2 object_____
3 depend_____
4 danger_____
5 increase_____
6 use_____
7 mechanic_____
8 self_____

b From the words formed above, find antonyms, i.e. words meaning the opposite, for these words:

safe ..... unreliable .....
having a termination ..... worthless .....
reducing ..... generous .....

Task 8

Read the following text very carefully. Then underline all the noun and adjective-forming suffixes. Write **n.** (noun) or **adj.** (adjective) next to the underlined word. One has been done for you.

THE MIDDLE AGES

THE TIME which runs between the fall of the Roman Empire in the 5th Century and the beginning (**n.**) of the 16th Century is often considered an isolated and backward period from the point of view of technology. However, nothing is further than the truth.

Watermills, which were used to mill grain, helped food production and became a major energy source. Clocks and later watches, whose mechanism now worked day and night, made time keeping possible.

Also, the discovery of the magnetic compass and improved sail design opened the world to navigation and permitted longer trips and the discovery of new lands

Arabic numerals, which replaced Roman numerals, simplified the keeping of records and Islam spread throughout most of Middle East and transmitted many ideas from Asia to Europe including the production of silk, the use of gunpowder, and the making of paper and porcelain.

All these advances, which led to a reduced dependence on agricultural labour, enabled people to do other things, such as the building of the great Gothic cathedrals

But the most significant event occurred in the mid-15th Century, when Johannes Gutenberg invented the movable type printing press. The book eventually spread the written word beyond scholars, who had been in sole possession of science and culture and so education was made available for the emerging middle class. This event, which marks the end of the Middle Ages, changed human history forever

LESSON SUMMARY

Here are the things you studied in this lesson:

- Dictionary definitions.
- Word-building: suffixes that form nouns and adjectives.
  trainer, darkness, friendship, meaning, etc.
  magnetic, religious, childish, colourless, etc.

KEY WORDS

assemble	against
bundle	backward
carry out	compass
ensure	composite
hang (hang, hung)	foundation
last	gunpowder
push/pull	isolated
reinforce	maintenance
sink (sank, sunk)	overall
sling (slang, slung)	rather than
span	site
surpass	weight
weld	
withstand	
work out	

What other useful new words did you find in this lesson? Write them in the table at the end of this unit. Make sure you learn all these words. Remember, a good vocabulary is essential for reading.

LESSON EVALUATION How did you find this lesson? Tick the best answer.

Too easy ☹ About right ☺ Too difficult ☹

Interesting ☺ So-so 😐 Boring ☹

Would you like to read more about this topic?

UNIT 3 - VOCABULARY

Write down any new words that you found in Unit 3 (lessons 7, 8 & 9). Write a definition, translation or example sentence for the new words in the spaces provided.

Review these words regularly, together with the lists of key words at the end of each lesson. Learn these words well - your teacher will test you on them! Remember, a good vocabulary is essential for reading.

New word or expression	Explanation (translation, definition, example sentence

IV SOURCES OF ENERGY

10 Natural Resources

11 Energy From the Earth

12 Renewable and Non-renewable Energy Sources

Learning Goals:

In this unit, you will read about:

- How natural resources are used.
- Alternative sources of energy.

In this unit, you will practise:

- Studying diagrams and transferring this information into a paragraph.
- Labelling diagrams using information in a text.
- Expressing purpose.
- Using suffixes to expand vocabulary.

Lesson 10

NATURAL RESOURCES

Task 1 Read the introductory text below and select the statement which best summarises its content.

a. The need to find new sources of energy.
b. Positive and negative aspects of science and technology.
c. How to take advantage of natural resources.

Since the beginning of time man has explored, experimented and examined the world. Without his curiosity, we would still be living in caves. He took advantage of Nature in order to make things he needed, for example, a place to live and tools to use, and this is the origin of science and one of its branches, engineering. Simply said, engineering is inventing and optimising.

But there is a dark side to the idea of science and technological progress. Industry can kill plants and animals damaging our world by using up the supplies of raw materials. In the beginning, man had to dominate Nature in order to survive. During the Industrial Revolution, the idea was to exploit her resources as much as possible. But this point of view has changed drastically. Now we need to find ways to preserve and take care of our planet.

In this unit we will read about the ways in which people use natural resources including water, fossil fuels and the wind.

Task 2 Before reading the text, see what you already know about the topic. Read these statements and decide if they are true or false. Discuss your answers with the class.

1 ___ One person in the USA uses as much water as 46 people in a developing country.
2 ___ 97% of the water on earth is salty sea water.
3 ___ The ice at the North Pole and South Pole is all sea water.
4 ___ All tap water has been cleaned to make it safe to drink.
5 ___ Some chemicals such as chlorine are added to water to make it taste better.

WHERE DOES DRINKING WATER COME FROM?

IN THE PAST 50 YEARS the amount of water we use has increased three times. An American uses about 2,300 cubic metres per year. In contrast, one person in a developing country uses less than 50 cubic metres.

Did you know these facts?

- Almost three quarters of the Earth's surface is covered by water but only a tiny fraction of that (3 percent) is fresh water.
- More than three-quarters of that tiny fraction of fresh water is frozen at the poles.
- And half of the rest is hidden deep underground.

How much water is left for us?

The water that we drink comes from rivers and artificial lakes. Most of the rain that falls on the land evaporates into the sky again and the rest of it runs off the land into the sea. Dams and reservoirs help to *trap* some of the flow so that we can use it. Then water treatment plants filter the water to make it drinkable for us. Two common ways of filtering water are to make large particles *sink* to the bottom of sedimentation tanks or to trap them by *pumping* the water through sand. Then chlorine is added to kill germs and the water is stored in *huge* tanks.

Untreated water may cause killer *diseases* like cholera and there are still many places in the world where tap water is not *safe* to drink

Task 3 Find a word or words in the text that mean the same as:

a. A place where water is cleaned up and prepared for use. .....
b. Living organisms that cause diseases. .....
c. A type of disease carried by dirty water. .....
d. The substance added to water in order to kill germs. .....
e. A man-made lake. .....
f. Flow down. .....

Task 4 In pairs, look at the words in italics in the text and see if you can guess their meaning from the context. Underline one option and say which words helped you to work it out with the task.

Example: *trap* a. flow ***b. capture*** c. run (dams and reservoirs)

1 *sink*	a go up	b float	c go down	(.....)
2 *pumping*	a evaporating	b storing	c raising by pressure	(.....)
3 *huge*	a very large	b very clean	c very long	(.....)
4 *disease*	a bacteria	b sickness	c death	(.....)
5 *safe*	a healthy	b risky	c free from danger	(.....)

Task 5 Answer these questions according to the information in the text.

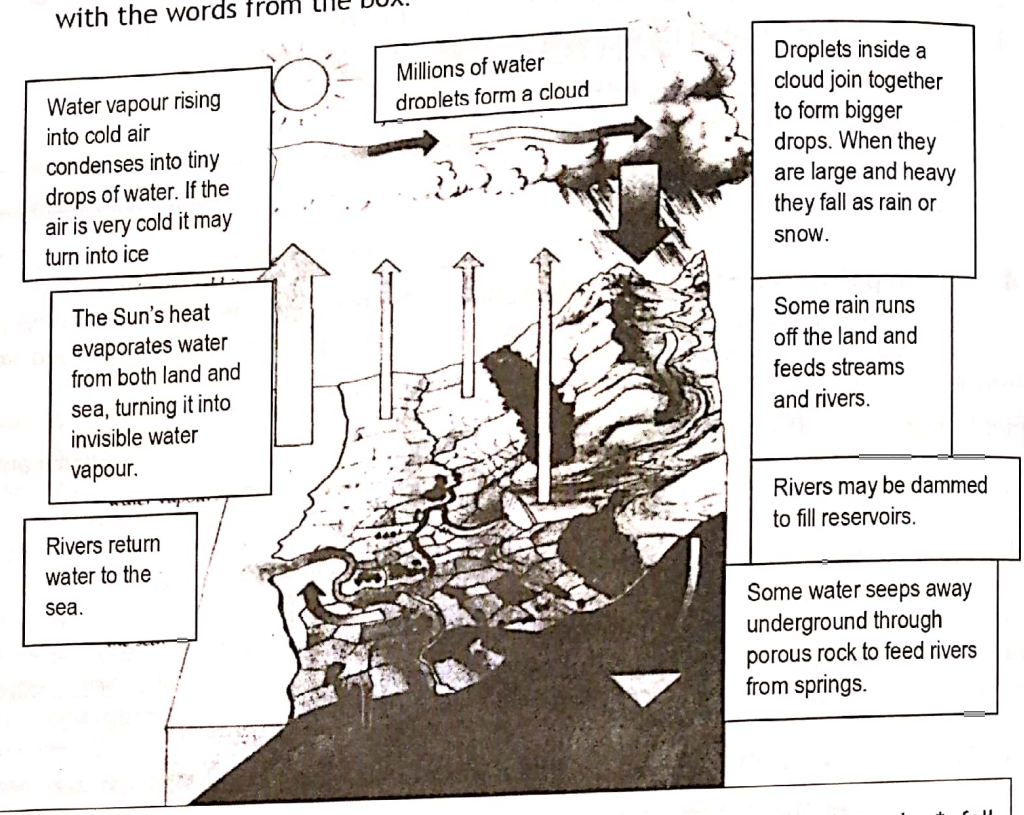
1 What happens to most rain water?

2 What kind of water is not safe to drink?

3 Name one of the two methods of filtering water.

4 What are reservoirs used for?

Task 6 Study the diagram showing the water cycle, then complete the paragraph below with the words from the box.



continuous * begins * circulating * carried * evaporates * cools * supply * fall

All the world's water is in the oceans, or frozen in the polar ice, or involved in a (1) .....continuous..... cycle, called the *hydrological cycle*. This means that water is forever (2) ..... between the sea and the sky. The water that is used in homes eventually ends up in rivers, lakes or the sea. From here, it (3) ..... in the heat of the sun to fill the lower layers of the atmosphere with invisible water vapour. A little of this vapour may be carried by air currents until it (4) ..... and turns into very small drops of water (or ice if the air is very cold). Once these drops are big enough, they (5) ..... back to the surface as rain and snow. Some water eventually runs down to the sea from rivers and lakes and some is (6) ..... to fill big reservoirs in order to (7) ..... homes. So the cycle (8) ..... all over again.

Language Focus: Expressing Purpose

Look at these examples:

Water has to be processed in a purifying plant **so as to** make it fit for drinking.

Chlorine must be added to water **to** purify it.

The car of the future will have a computerised route system **in order to** choose the quickest way from one place to another.

Water is pumped into reservoirs **so that** it can be stored until it is needed.

The words in bold above are used to give a purpose or to explain why something occurs. They are called **sentence connectors** or **linking words** because they connect or link two parts of the sentence (the thing done and the purpose for doing it in this case).

Task 7 Form sentences from this table using a suitable connector. Use the words in columns 1 and 3 once only.

1 Engineering developed	**in order to**	a ___ reduce wind resistance.
2 Hydroelectric stations use moving water	**so that**	b ___ cut almost any material.
3 Meteorologists observe the 'troposphere'	**to**	c ___ make it drinkable.
4 Chlorine is added to untreated water	**so as to**	d ___ make hundreds of useful articles.
5 Laser power is used		e ___ they can predict weather changes
6 Racing bicycles have special disc wheels		f ___ apply practical knowledge to scientific principles.
7 Thermoplastics can be moulded		g ___ turn turbines and generate electricity.

LESSON SUMMARY

Here are the things you studied in this lesson.

- Sentence connectors for giving reasons. e.g.
  Water has to be processed ***in order to*** *make it drinkable.*
  Chlorine must be added to water ***to*** *purify it.*

KEY WORDS

apply		amount	
damage		branch	
exploit		current	
filter		dam	
fill		droplet	
freeze (froze frozen)		enough	
hide (hid hidden)		germs	
lock up		in order to	
run off		raw material	
seep away		sand	
supply		spring	
survive		surface	
trap		tiny/huge	
turn (into)		treatment	

What other useful new words did you find in this lesson? Write them in the table at the end of this unit. Make sure you learn all these words. Remember, a good vocabulary is essential for reading.

LESSON EVALUATION How did you find this lesson? Tick the best answer.

Too easy ☹ About right ☺ Too difficult ☹

Interesting ☺ So-so 😐 Boring ☹

Would you like to read more about this topic?

Lesson 11

ENERGY FROM THE EARTH

Task 1 Answer the following questions and compare your answers with the class.

1 Where does oil (or petroleum) come from?
2 What is oil used for? Make a list of products derived from oil.
3 Which parts of Bolivia is oil found in?
4 It is assumed that we will run out of oil in 50 years. Do you agree with this?
5. What can we use instead of oil to produce electricity? to power our cars, trucks and buses?

Task 2 Read the text below to find more information about oil. Which paragraph has information about the following?

____ a Exploiting oil from the sea
__3__ b **How oil is found and extracted.**
____ c A huge increase in oil production.
____ d How microscopic organisms turned into oil and gas.
____ e The first oil well drillers.
____ f. The purpose of the valve fitted in the well head.
____ g. Possible problems for the present century.

1. Millions of years ago, the bodies of microscopic organisms that had lived in the sea sank *(went down)* to the seabed and became covered with layers *(coats)* of sand and fine sediment. This covering kept oxygen out and stopped the organism from decaying *(decomposing)* altogether. As more sediment piled up on top, its weight pressed the underlying layers into rock and trapped the oil under them. The weight of sediment and high temperatures changed the organisms into oil, natural gas and other chemicals, so very often pockets of natural gas are also found above oil fields. The oil stayed there until men learnt how to extract it by drilling *(perforating)* through the rocks.

2. The Chinese were probably the first people to drill for oil using bronze tubes and bamboo more than 2,000 years ago. But the world's first modern oil well was drilled in 1859 at Tutesville, Pennsylvania in the USA.

3. To find oil, geologists examine photographs of the ground taken from aeroplanes and satellites to look for the types and formation of rocks where oil is usually found. Then oil companies drill holes deep into these rocks to check the existence of oil. Then a drilling rig is set up *(installed)* over the rocks. A drill on the end of a long pipe cuts a hole hundreds, or even thousands, of metres down into the rock. A special kind of mud *(wet earth)* is pumped down through the pipe and this washes away pieces of rock that might jam *(block)* the drill.

4. When the oil is found inside the ground, the drill rotates and cuts through the rock, then a valve is fitted to the well head and this allows the oil to flow out under control.

5. A lot of oil is also buried deep under the seabed and there are different types of drilling equipment for reaching oil under the sea. Some production platforms float anchored to the seabed and others stand on steel legs *(supports)* in the water.

6. Between 1969 and 2000, oil production increased ten fold *(ten times)*, from 500 million tonnes per year to more than 5,000 million tonnes.

7. We are using up *(consuming)* our reserves of fossil fuels such as oil at an alarming rate *(speed)*, and we will probably run out of oil during the 21st century.

Task 3 Check your understanding of the article by filling the blanks with the words in the box below. Be careful, there are some extra words.

micro-organisms * geologists * drill * weight * decaying * valve seabed * used up * satellites * run out * take from * well

1 .....Micro-organisms..... were covered by sand and fine sediments which prevented them from ....

2 ..... take photographs of the ground which are examined by ..... to look for special rock formations.

3 When the geologist finds a place where oil might be trapped, a ..... is used to cut a hole through the rock. If oil is found, a ..... is fitted to the well head to control the oil flow.

4 It is probable that we will ..... of oil within some decades when the existing reserves are ..... .

Task 4 **Sequencing**

The diagram below shows the stages of oil formation. Working in pairs, put these sections in the right order according to the diagram. The first one is **f**.

__ a Oil is found deep in the earth or beneath the seabed. Millions of years ago, much of the land was covered by oceans.

__ b The oil became trapped with water and gas in porous layers of rock between non-porous ones.

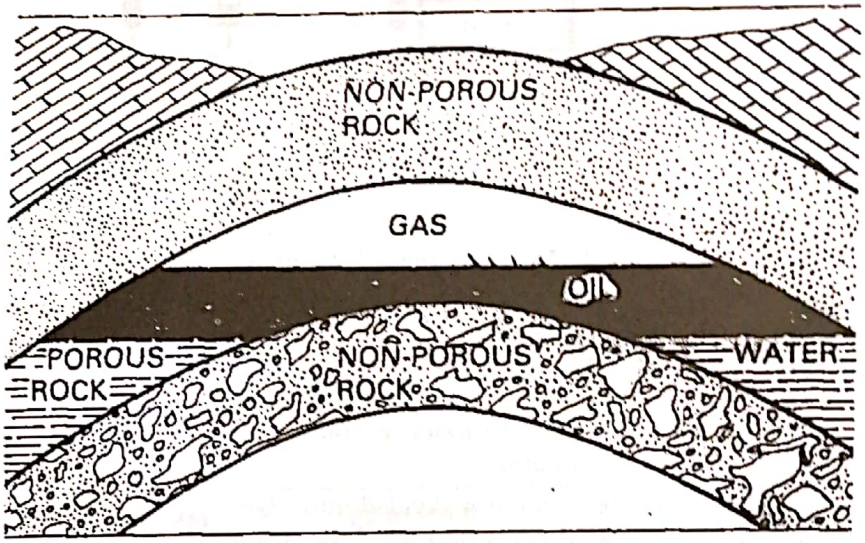
__ c The pressure of this weight at very high temperatures turned these remains into tiny drops of oil and chemicals rich in carbon and hydrogen.

__ d Rocks which trap oil in this way are called reservoir rocks.

__ e Tiny sea animals and plants died and sank to the bottom.

__ ***f How oil is formed.***

__ g Their remains became covered with thick layers of mud and sand which turned into rock



Task 5 Answer these questions with information from the article.

1 What is the process of oil formation? How long did it take to form oil?

2 How do geologists search for oil?

3 What is the purpose of pumping mud through pipes when drilling a well?

4 How did the Chinese drill oil for the first time?

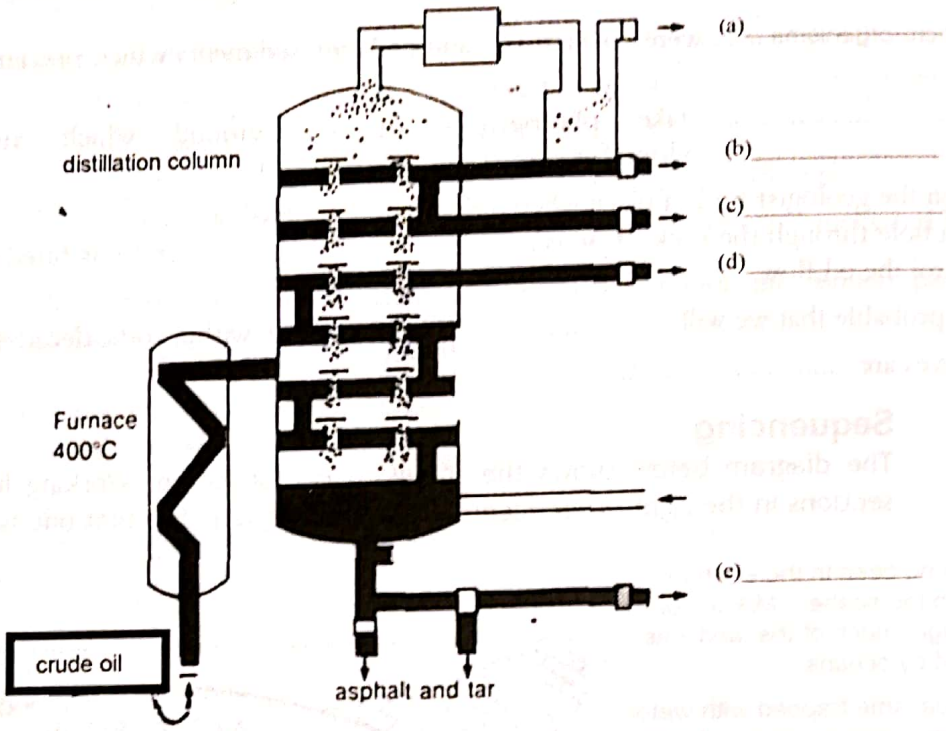
5. What is the function of aeroplanes and satellites in the search for oil?

6. What sort of equipment is used to extract oil from the sea?

Task 6 Labelling diagrams

Read through the passage below in order to complete the labels on the diagram.

Crude Oil Distillation



The physical method of separating the products contained in crude oil is called *distillation*. Crude oil is first heated in a furnace to a temperature of 400°C. This turns 75% of the oil into gas or vapour and the rest remains as heavy liquid. The vapour is passed through a pipe into a tall tower called a *distillation column* or a *fractionating tower*. The heaviest part of the oil, which does not turn into vapour, is collected at the bottom of the column.

The distillation column is divided into *'floors'* with several compartments on each floor. There are holes in the floor which allow vapour to pass through them. As the oil goes up the tower it gets cooler, because each floor is a bit cooler than the one below it.

Each of the substances in crude oil has a different boiling point and the substances can therefore be separated by heat. All the way up the column, liquids of different boiling points are collected at different levels. Asphalt and tar for road-making are at the lowest level, then lubricating oils, then diesel oil, then paraffin and jet fuel, then petrol and finally, at the top, refinery gas which is burned away in a flare.

Distillation produces more heavy oil than is needed and not enough of the lighter oils such as petrol (also called gasoline). A chemical method known as *catalytic cracking* is used to break down some of the heavy oils into lighter products.

Task 7 Reread the text and match these sentence halves.

1 The holes in the distillation column
2 Only 25% of the oil
3 Catalytic cracking is a chemical method
4 Distillation uses heat

a. ___ stays as heavy liquid after distillation.
b. ___ by which heavy oils are separated into lighter products.
c. ___ to break down the components in crude oil.
d. ___ allow vapour to pass through them.

Language Focus: Suffixes - Part II

We have already seen and practised noun and adjective-forming suffixes. The following lists complete the previous ones. Knowing how suffixes work will help you to expand your vocabulary considerably.

C. VERB-FORMING SUFFIXES

SUFFIX	BASE WORD	EXAMPLE
-ize/-ise	magnet	magnetize
	real	realise
-ate	active	activate
	motive	motivate
-ify	class	classify
	simple	simplify
-en	deep	deepen
	worse	worsen

Task 8 Form two verbs with each suffix. Remember that some base words will have to change slightly. Then complete the sentences below with some of these verbs.

-ate	-en	-ise/ize	-ify

1 weak _____
2 stimulus _____
3 specific _____
4 communication _____
5 example _____
6 familiar _____
7 short _____
8 summary _____

1 Corrosion tends to _____ the structure of a building.
2 You need to _____ yourself with words using suffixes.
3 Ancient Babylonians managed to _____ their ideas through cuneiform writing.
4 Modern computers allow you to _____ text fonts, size of graphics, etc.

D. ADVERB-FORMING SUFFIX

SUFFIX	BASE FORM	EXAMPLE
ly	slow	slowly
	clear	clearly
	easy	easily

Task 9 Write the correct word in the blanks.

1 print printer printing printed

a A laser _____ provides an excellent _____ quality.
b A special kind of device is needed to _____ on microfilms.

2 train trainer training trained trainee

a It takes a person two years of _____ to become a good computer programmer.
b A _____ is person employed at a junior level learning the skills needed for a job.
c It is essential to _____ new students to handle expensive equipment.

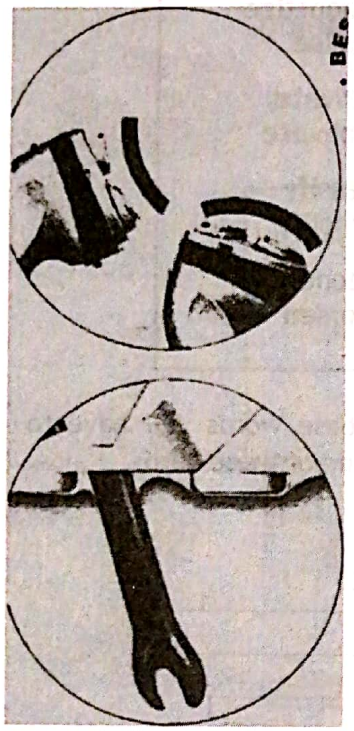
3 calculate calculation calculus calculating calculated

a _____ was invented by both Newton and Leibnitz working independently.

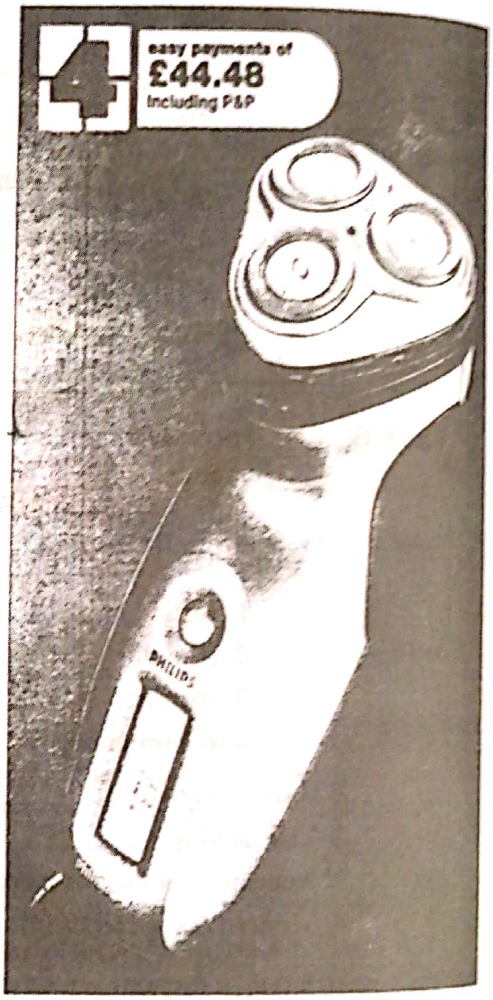
b Computers can do thousands of _____ in a second.

c Pascal's first _____ machine was called Pascaline.

Task 10 As you read the magazine advertisement below, underline the words which contain suffixes and sort them out in the table below according to their part of speech.



New from Philips, the reflex action shaving system



If there's a more effective and technically-advanced rechargeable electric razor than the Philishave Reflex Action, we've not seen it. New on the UK market, this top-of-the-range electronic razor contains an unprecedented number of special features. Primarily, of course, it shaves to perfection. The three reflex action 'lift-and-cut' heads precisely follow the contours of the face for the closest possible shave, with 9 personal comfort settings according to the sensitivity of your skin. The 45 razor-sharp rotary blades revolve at high speed with minimal noise or vibration, and all hairs are hygienically collected in a special chamber for later disposal. A pop-up trimmer also deals with the longer hair of moustaches and sideburns. When fully charged, the built-in nickel-hydride power pack gives 70 minutes' continuous operation around 3 weeks of shaves. A full mains recharge takes just 60 minutes while a 6-minute-quick-charge gives one cordless shave (razor can also be powered direct from the mains, automatically selecting voltage between 100-240V AC). Finally, the razor has a unique electronic LCD data display. It constantly calculates how many more shaves are available before recharging is required, reminds you to clean out the hairchamber (weekly) and (he shaving heads (every 2 months) and provides status reports on the recharging process. Razor comes with deluxe case, stand and wall holder, coiled cord, cleaning brush and head protection cap.

Philishave Reflex Action Razor £175.00 37053

NOUNS	ADJECTIVES	VERBS	ADVERBS
.....action.....	.....	.....	.....technically.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....		.....
.....	.....		.....
.....	.....		.....
.....	.....		.....
.....	.....		.....

LESSON SUMMARY

Here are the things you studied in this lesson.

- Sequencing
- Word –building: suffixes that form verbs and adverbs.
  shorten, calculate, specify, summarise
  constantly, finally, precisely, technically

KEY WORDS

allow		(ten) fold	
anchor		altogether	
break up (down)		boiling point	
burn away		flare	
decay		instead (of)	
heat		layer	
pile up		pipe	
pump		seabed	
use up		tar	
		thin/thick	
		top/bottom	
		valve	
		well	

What other useful new words did you find in this lesson? Write them in the table at the end of this unit. Make sure you learn all these words. Remember, a good vocabulary is essential for reading.

LESSON EVALUATION

How did you find this lesson? Tick the best answer.

Too easy ☹ About right ☺ Too difficult ☹

Interesting ☺ So-so 😐 Boring ☹

Would you like to read more about this topic?

Lesson 12

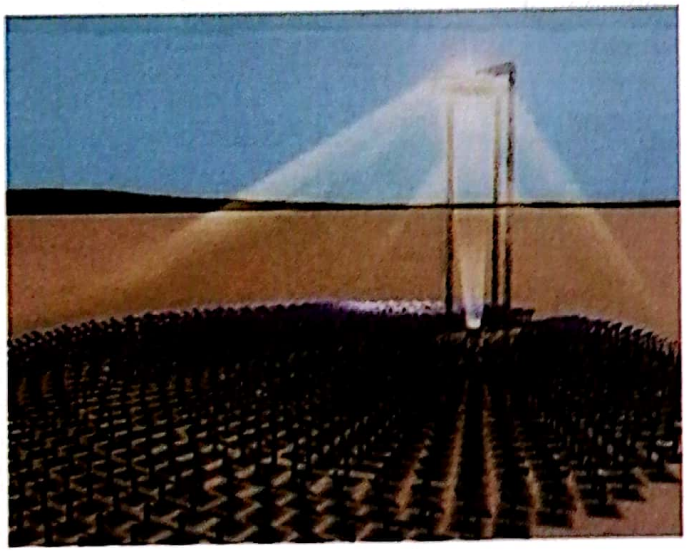
RENEWABLE AND NON-RENEWABLE ENERGY SOURCES.

Task 1 Look at the title and discuss in the class the differences between the two types of energy sources mentioned? Then sort out the following words into the two types.

wood * coal * petrol * uranium * wind * water * solar energy * biomass

Task 2 Look at the pictures and try to identify what sources of energy they refer to. Compare your answers with your partner, or check them in **Appendix A.**

A



B

C

D

Task 3 Scan the text to confirm your answers to Task 1. Then find the following information

1 The sources of energy mentioned in the text.
2 The name given to a large number of wind turbines working together in one place.
3 A kind of energy produced by water.
4 The name given to the mirrors used in solar power stations.

AS THE WORLD'S population increases and people use more machines, more energy is needed to power them. The demand for energy has increased by more than ten times since the beginning of the century. Today we depend very much on fossil fuels like oil.

Every day we burn oil that took nature one million years to make, and we are using it up much faster than it is being formed.

Some people see the use of nuclear power as a clean and safe alternative, but this produces waste products which affect people and the environment in a very dangerous way. Also, nuclear energy depends on supplies of uranium, which are expected to run out in the next 60 years.

So far we have mentioned non-renewable energy sources. However, there are different natural sources of energy all around us which will not run out, and if we find good ways of using them, we will have a power supply that is safe, cheap and clean.

How new are they? The power of rivers and the wind have been used by waterwheels and windmills for at least 1,500 years. For most of that time they were not *alternative* sources of energy, they were the *only* ones available. Another valuable source of energy is the sun which provides us with more than enough energy to survive.

Old windmills were large brick buildings because people worked inside them to grind wheat and to raise water from deep wells.

Modern wind generators are different: they turn wind into electricity and the towers that hold them are much thinner.

In recent years, new ways to capture the wind energy more efficiently have been found. For example, wind generators are designed so that they automatically turn into the wind if its direction changes. However, they can be damaged in very strong winds.

Wind turbines can supply the electric power for a single farm or house, or they may be connected to a grid for general use. To make enough electricity, wind turbines work together in groups as *windfarms*. One windfarm in California has 18,000 wind turbines. But the problem with large windfarms is that they look ugly and make a lot of noise. It is better to build them out at sea where they do not disturb animals and humans, although this alternative is very expensive.

As for water, it is a very important renewable source of energy because of its enormous amount of kinetic energy.

Nowadays more than a fifth of the world's electricity is generated from water in hydro-electric power plants. Usually, a dam is built across a river valley to control the flow of water and store up the energy. The water is then collected in a reservoir behind the dam. When electricity is needed, the water is allowed to rush through holes in the dam, turning turbines as it flows.

Hydroelectric plants provide a renewable energy source all over the world. However, they need to be carefully planned, since they can cause large areas of land to be flooded behind the dam. This can seriously damage the local environment in which plants, animals and humans live.

Solar power uses energy from the sun to make electricity. This energy reaches the Earth in the form of heat or light which can be collected and used to produce power by means of: **(a)** simple solar collectors (flat plates covered with glass); **(b)** solar ponds that use salty water, which is heavier than fresh water, and so reaches temperatures of 90°C; and **(c)** power stations which trap the sunlight using thousands of mirrors called *heliostats*.

When these forms of non-renewable sources of energy are fully implemented, we will be able to cut the burning of fossil fuels and switch to cleaner energy sources.

Task 4 Read the text again and answer these questions.

1 Earlier windmills were used to grind wheat. What do modern wind generators do?

2 How are modern wind generators designed differently?

3 Why is it better to build windfarms out at sea?

4 What are the three ways of trapping solar energy mentioned in the text?

5 Why do solar ponds use salty water?

6 These are the steps for producing electricity in a hydroelectric plant. Can you number them in the correct order?

___ The water is released in order to turn turbines.
___ A dam is built to control the flow of water.
___ The water is collected in a reservoir behind the dam.

Task 5 **Contextual Reference**

Using the line references given, look back at the text and find out what the words in bold typeface refer to. The first one has been done for you.

1. ... more energy is needed to power ***them*** ... (line. 3) .....machines.....
2. ... and we are using ***it*** up much faster than it is being formed. (l. 8) .....
3. ... ***this*** produces waste products ... (l. 11) .....
4. ... ***which*** are expected to run out in the next 60 years. (l. 15) .....
5. ... if we find good ways of using ***them***... (l. 21) .....
6. ... they were the only ***ones*** available. (l. 27) .....
7. ... they automatically turn into the wind if ***its*** direction changes (l. 41) .....
8. ... because of ***its*** enormous amount of kinetic energy .. (l. 56) .....
9. ... turning turbines as ***it*** flows. (l. 66) .....
10. However, ***they*** need to be carefully planned ... (l. 69) .....
11. ...in ***which*** plants, animals and humans live. (l. 72) .....
12. ... ***which*** is heavier than fresh water... (l. 80) .....

Task 6 To check your understanding of the text, choose the best option to complete the sentences, then compare your results with a partner.

1 Some people consider nuclear energy as a good alternative, but ...
- **a** it is not renewable.
- **b** it is bad for the environment.
- **c** its waste products are clean and safe.

2 Renewable energy sources like wind and water ...
- **a.** will run out in the present century.
- **b** are not available everywhere.
- **c** have been in use for hundreds of years.

3 Modern wind generators...
- **a** need very strong winds to function.
- **b** are used to grind wheat.
- **c** are designed to change direction according to variations in the wind.

4 The problem with windfarms is that...
- **a** they irritate people because they are noisy.
- **b** they do not produce enough energy for a whole town.
- **c** they occupy a lot of space.

5 Hydroelectric plants are built all over the world
- **a** but they are not planned very carefully.
- **b** but they may flood a lot of agricultural land.
- **c** because they can store large amounts of water

Language Focus: More Sentence Connectors

Look at these sentences:

CONTRAST

Nuclear power provides large quantities of energy. **However**, its waste products are very dangerous.
Nuclear power provides large quantities of energy, **but** its waste products are very dangerous.

CAUSE AND EFFECT

We are using up fossil fuels very fast, **therefore** / **so** they will run out in the next century.

TIME SEQUENCE

Earlier windmills were used to grind flour. **Nowadays** modern wind generators produce electricity

.The words in bold are used to connect ideas between two sentences, or between two parts of the same sentence in order to show the relationship of ideas so as to help the reader link these ideas logically. These linking words, as they are also called, can express contrast, add information, introduce examples, or show order, time sequence and cause and effect relationship. When you are reading, it is useful to recogruse their important function .within a written text. The examples above illustrate three types of connectors.

Task 7 There are more connective words in the reading text above. In pairs, look for them, identify their function and list them in the table below. The number indicates the line on which you will find them. One has been done for you as an example.

LINE	CAUSE AND EFFECT	CONTRAST	TIME SEQUENCE
5			today
11			
17			
18			
40			
41			
49			
53			
56			
58			
68			
69			
81			

Task 8. Link these sentence halves using the appropriate connector. Use Column 1 twice.

1. Science has resulted in progress for humanity	**However**	a. ___ the car industry is still manufacturing oil-powered vehicles.
2. It is better to build windfarms in the sea	**so**	b. ___ computers' development is a good example of this.
3. We are running out of fossil fuels	**but**	c. ___ they do not disturb people and animals with their noise.
	and	d. ___ it has also produced environmental problems.
		e. ___ this could cost a lot of money.
		f. ___ it is necessary to think of some alternatives.

LESSON SUMMARY

Here are the things you studied in this lesson.

- Sentence connectors showing: contrast, cause-effect, time sequence:
  Although *wind farms are expensive to build, they are cheap to maintain and run.*
  We must find alternatives to fossil fuels ***because*** *they cause pollution..*
  Before *waste material can be recycled it has to be sorted into different categories.*

KEY WORDS

build (built)		(non) renewable	
grind (ground)		at least	
sort out		available	
store		brick	
switch = change		environment	
		heat	
		kind/sort	
		mirror	
		solar pond	
		waterwheel	
		windmill	

What other useful new words did you find in this lesson? Write them in the table at the end of this unit. Make sure you learn all these words. Remember, a good vocabulary is essential for reading.

LESSON EVALUATION

How did you find this lesson? Tick the best answer.

Too easy ☹ About right ☺ Too difficult ☹

Interesting ☺ So-so 😐 Boring ☹

Would you like to read more about this topic?

UNIT 4 - VOCABULARY

Write down any new words that you found in Unit 4 (lessons 10, 11 & 12). Write a definition, translation or example sentence for the new words in the spaces provided.

Review these words regularly, together with the lists of key words at the end of each lesson. Learn these words well - your teacher will test you on them! Remember, a good vocabulary is essential for reading.

New word or expression	Explanation (translation, definition, example sentence

V FUTURE TRENDS IN SCIENCE

13 Future Foods

14 Lasers

15 Robotics

Learning Goals:

In this unit, you will read about:
- The *pros* and *cons* of genetic engineering.
- How lasers were discovered and their current and future uses.
- The history of robots and the things they can and cannot do.

In this unit, you will practise:
- Understanding the organisation of a written text.
- Finding main idea(s) and supporting details in a paragraph.
- Making use of sentence connectors.

Lesson 13

FUTURE TRENDS IN SCIENCE

In our modern world man's creativity and technology go hand in hand. Mobile phones, microwaves, x-ray cameras, and so on, are the fruits of scientific research which we can find everywhere.

In this unit we will take a look at some of the results of human inventiveness, namely, genetically modified foods, lasers and robots.

GENE FOODS

A look at genetically modified food

Task 1 These words are from the article you are going to read. How many of them do you know already? Match them to their Spanish meanings. Then compare your answers with a partner.

improve * modify * diseases * feed * grow * vaccine * crop * lack
range * despite * cells * weed * make up * prevent * losses

..... evitar	..... células	..... cosecha
..... enfermedades	..... alimentar	..... modificar
..... vacuna	..... falta	..... crecer
..... pérdidas	..... a pesar de	..... constituir
..... mala hierba	..... variedad	..... mejorar

Task 2 Before reading the article explore what you know about the following.

1. Look at these definitions of **organic** and **processed** food. Which is which?

   a *refers to frozen or canned food which is generally manufactured or pre-cooked.*

   b *refers to food which contains natural and healthy ingredients free from herbicides or additives for colour or size.*

2. Can you list more differences?

3. What kind is the most popular in Bolivia? Why?

4. Which one is healthier? Why?

Task 3 These are short summaries of the four sections of the text. Read each one carefully and match it with the corresponding summary writing the letter in the space.

1 New techniques will be applied to other fields such as health and clothing. Section ___

2 Research and experimentation on the structure of cells have made crops resistant to pests and diseases preventing huge economic losses. Section ___

3 A lot of the food we eat already contains ingredients of genetically processed crops in spite of some people's concern. Section ___

4 Some fruit and vegetables have already been improved with these new techniques. Section ___

A When we buy bread, cakes or margarine in a store or a super market, they probably contain products made from soya beans. In fact, 60 per cent of processed food contains soya.
The problem is that 5 % of soya bean crops have been genetically engineered by scientists. Many people and organisations all over the world are worried by this fact and they believe that we have the right to know if we are eating genetically engineered foods, or *gene foods* as they are also called.

B **What is *genetic engineering*?** All living creatures are made up of cells. The DNA (deoxyribonucleic acid) in the cells contains genes, which are the coded instructions that make things develop in a particular way. Through new techniques, scientists can now select a specific gene responsible for a particular characteristic and copy it into another life form. This is known as genetic engineering.
Around 40 per cent of the world's total crop production is lost due to pests and diseases despite the heavy use of pest-killing chemicals. Now genetic engineering techniques are being applied to the production of special herbicides, which eliminate the weeds but preserve the crops. By altering soya genes, food scientists make the plant stronger and resistant to herbicides and diseases as well.

C **Genetically improved food.** Other examples of these improved food products are the so-called *'designer foods'* -foods which are genetically modified or contain genetically modified ingredients. For example, potatoes and other vegetables and fruit normally go brown when their flesh is exposed to oxygen in the air. This problem causes millions of dollars in losses every year, which consumers pay for in the end. Scientists working on this problem have now found the gene that causes browning. By disrupting the gene, they have produced a low-browning potato, and apples are the next fruit on their list to be studied.
Foods can also be genetically modified to improve their nutritional value. For instance, tomatoes, carrots and peppers are all rich in caratenoids, which help prevent cancer and coronary heart disease. To make things easier for us, scientists have already succeeded in creating genetically improved tomatoes with increased carotenoid levels and more than three times the normal anti-cancer power.

D **Beyond food - What else can genetic modification do?**

Banana vaccines. Painful injections for children will soon be a thing of the past thanks to vaccinating bananas. Scientists at the Boyce Thompson Institute for Plant Research in New York, have already modified potatoes to carry a vaccine for hepatitis B. They plan to use the same technique to create other vaccines in bananas and they hope to extend their work to a whole range of different diseases such as diarrhoea, which causes many deaths in developing countries. Another advantage is that the new *'fruit-vaccine'* will cost a fraction of the price of the traditional vaccine.
Designer jeans Scientists at Monsanto, USA have inserted blue pigment genes into cotton to produce plants with naturally blue fibre. The idea is to use this cotton to make jeans naturally blue, saving at the same time all the environmental costs associated with the colouring process. In a few years time, you might not just be eating the latest in designer genes, but wearing them as well.
Too good to be true? Then why do other scientists disagree with genetic engineering? These questions need to be answered by the scientific world.

Task 4 Now read the text again to find the answers to these questions.

1 What do the words *genetically engineered food* mean?
2 What does DNA stand for? Where is it found in living organisms?
3 What causes some fruit to go brown?
4 What are the two advantages of fruit vaccines?
5 What would be the advantage of using natural blue cotton to make jeans

Task 5 Read the sentences below and decide if they are true (T) or false (F) according to the text. Be ready to support your answer.

1 __ Many people think we should know if the food we eat is genetically modified.
2 __ Scientists have already produced vegetables capable of curing serious illnesses like cancer.
3 __ New techniques based on genetic engineering may reduce economic losses with stronger crops that are more resistant to diseases.
4 __ Due to genetic modification, fruit can be made to contain more nutritional value.
5 __ All the scientific world supports the idea of applying genetic manipulations on living organisms.
6 __ Carotenoids, a substance contained in certain vegetables and fruit, may produce cancer and heart diseases.
7 __ Brown potatoes are an example of the new 'designer food'.
8 __ Very soon, we may have vaccines contained in the fruit we eat instead of the traditional injections.
9 __ Scientists have produced a colorant from a cotton plant which will give different colours to jeans.
10 __ Bananas have been modified to create new vaccines.

Task 6 People have different opinions about *gene food*. Classify their opinions in two groups writing **Pro** (in favour) or **Con** (against).

____ 1 Genetically modified plants and animals which eat them could have too much advantage over natural plants and animals and this may endanger nature's delicate balance and so agriculture, animals and the environment would be irreversibly altered.

____ 2 The technique is too 'new' to guarantee that problems will not occur in the future. Genetic pollution could occur and genes may spread uncontrollably throughout the environment with unwanted consequences.

____ 3 All genetically modified food has been rigorously assessed to satisfy strict safety regulations.

____ 4 Genetic modification is interfering with nature because it introduces genes taken from bacteria, viruses and even animals into plants, mixing genes from species that could never mix naturally. This will cause diseases resulting from genetic differences.

____ 5 We can have tastier, healthier and nutritionally improved food, as well as cheaper food, because genetic modification could help farmers to reduce economic losses. For example,. soft fruits can be made firmer to prevent damage during transportation.

____ 6 We can make better use of agricultural land because potentially modified crops could grow in hostile conditions, such as dry and cold lands, all of which would help to feed more people in poor regions of the world.

Task 7 Complete the table below establishing the cause or effect of the facts contained in the article you have just read. You may need to read it again to check some details.

CAUSE	EFFECT
Example: *.....By altering soya beans, ...*	scientists made the plant stronger against diseases.
•	cause 40% of the world crop losses.
• When a potato's flesh is exposed to oxygen from the air	.....
• If food production increases in hostile conditions	.....
•	may result in diseases created by genetic differences.
'Super' plants and genetically engineered animals	.....

Task 8 What is your criteria about the points in favour and/or against genetic engineering that you read about in this lesson? Do you know any other information which was not mentioned? Write a brief composition stating your point of view taking into account the following aspects.

environmental pollution	resistance to antibiotics	religious beliefs
scientific progress	ethical matters	safety controls
consumer's rights	plants immune to herbicides	health problems

LESSON SUMMARY

Here are the things you studied in this lesson.

- Cause-effect relationships:
  Poor land could be better used ***because*** *genetically modified crops would grow in hostile conditions.*
  Food can be genetically modified ***in order to*** *give it a longer shelf-life.*
- Matching summaries to texts for improving reading comprehension.

KEY WORDS

assess	canned
breed	cotton
disrupt	crops
endanger	despite
make up	diseases
prevent	flesh
thank	for instance
threaten = damage	inventiveness
save	level
succeed	namely
worry	painful
	tasty / tastier
	through
	throughout
	weed
	whole

What other useful new words did you find in this lesson? Write them in the table at the end of this unit. Make sure you learn all these words. Remember, a good vocabulary is essential for reading.

LESSON EVALUATION How did you find this lesson? Tick the best answer.

Too easy ☹ About right ☺ Too difficult ☹

Interesting ☺ So-so 😐 Boring ☹

Would you like to read more about this topic?

Lesson 14

LASERS

Task 1 In this lesson you are going to read about lasers. What do you already know about this topic? What would you like to find out? Write two sentences containing the things you know about lasers and two questions about things you would like to know about them. Then, compare your sentences and share information about the topic.

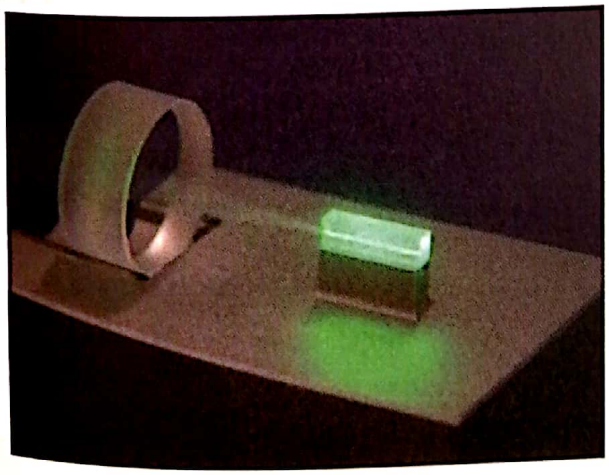
Task 2 The words on the left are from the text you will read. Match them with their definitions, then check your answers with a partner.

1	beam	___ a tejido orgánico saludable.
2	wavelength	___ b unir metales por medio de calor, soldar.
3	power range	___ c herramienta o instrumento útil para trabajar.
4	microwave	___ d radiación, rayo de energía enfocado en determinada dirección.
5	welding	___ e pegar o fijar dos o más objetos.
6	tool	___ f una pequeña porción de algo usada para un estudio, muestra.
7	melt	___ g distancia entre el mismo punto y dos ciclos adyacentes de energía.
8	to bond together	___ h cambiar un sólido a líquido por medio del calor, fundir
9	sample	___ i un tipo de radiación electromagnética
10	healthy tissue	___ j alcance o extensión de la energía.

Task 3 **Looking for Specific Information**
Scan the text quickly to find ...

1 The names of the scientists who first had the idea of lasers and the person who designed the first one.
2 The years in which the idea of lasers appeared and when the age of lasers began.
3 The number of different types of lasers mentioned.
4 The last paragraph is about the of lasers.
a. structure b. invention c. uses.

Laser Beams - An introduction. The word laser is an acronym for the phrase *Light Amplification by Simulated Emission of Radiation.* Thus a laser can be defined as a device for producing a type of light that is very different from ordinary visible light.
When lasers were first invented in 1960, it was said that they were a solution looking for a problem because no one knew what they could be used for. Now they have so many uses that it is hard to imagine the modern world without lasers.



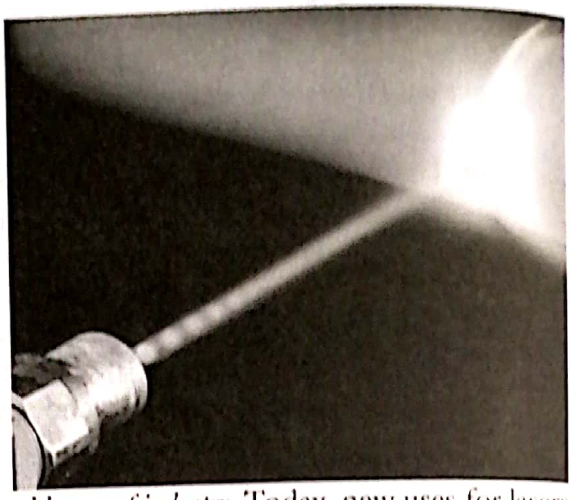
Laser Pioneers. Although the first laser beam did not shine until 1960, the development of lasers started a long time before that. In 1917 the famous scientist Albert Einstein had the idea that it should be possible to stimulate atoms to emit light. But his idea was difficult to prove and many years passed until 1957 when three US. scientists, Charles Townes, James Gordon and Herbert Zeiger found a way to make atoms emit not light, but microwaves, which is another form of electromagnetic radiation. In 1960, the American scientist Theodore Maiman produced the first laser beam and his work marked the start of the age of lasers.

Types of Lasers. Lasers emit different wavelengths of light and different power ranges which are suitable for particular jobs. Although there are hundreds of different types of lasers, there is not an all-purpose laser.

Here are some of the most important ones:

- Gas lasers are used in industry for cutting, welding and treating surfaces. They are also used in medicine along with carbon dioxide lasers which surgeons use to operate on patients.
- Excimer lasers emit ultraviolet rays which we cannot see because they last just a few nano-seconds (thousand-millionths of a second). They are important tools in the manufacture of very small objects. such as microchips.
- Semiconductor lasers consist of tiny particles of crystal which give out light when they are placed together. They are used in the scanners which read bar codes at supermarkets and in compact disk (CD) players.
- Pulsed lasers are the most powerful lasers in the world. They are mostly used to explore the structure of atoms and to study fusion. Pulsed lasers emit very powerful pulses of energy in the range of terawatts (million-million watts), but the pulses are very short, less than one picosecond (one million-millionth of a second).

What they can do. Since they were invented in the 1960s, lasers are doing things that ordinary tools cannot. Now they are known as the



workhorses of industry. Today, new uses for lasers are being developed all the time. These uses include cutting iron and steel by melting the metal, carbon monoxide lasers for working with plastics and ceramics, copper vapour lasers for working with aluminium, nickel and copper, and solid state lasers to bond together pieces of rubber and waterproof materials. In chemical laboratories, a pulse of light from a laser can vaporise a tiny sample of a substance to tell what it was made of. In medicine, lasers can be used to break up stones that grow in some organs or to remove cancerous tumours without damaging the surrounding healthy tissue. They can also help people with poor eyesight by changing the shape of the cornea.

So, the list of uses seems endless for the *"solution looking for a problem"*.

Task 4 Read the text more carefully to fill in the blanks with the missing information.

Example: *Laser* is an acronym for Light Amplification by Simulated Emission of Radiation.

1. When lasers appeared in the 1960s, they were considered to be a _____ looking for a _____.
2. Einstein thought that it was possible to _____ atoms to _____ light.
3. Lasers emit different _____ of light and _____ _____ which are appropriate for a variety of uses.
4. _____ lasers are used to manufacture tiny objects like _____ .
5. _____ lasers consist of very small particles of _____ which give out light when they are placed together.
6. Semiconductor lasers are used in the _____ which read bar codes and in _____ players.
7. Pulsed lasers are used to explore the structure of _____ and to study _____.
8. Lasers are so useful in many types of applications that they are called the _____ .

Task 5 Scan the information in the text to complete the table below.

USES OF LASERS

	TYPE	USED FOR:
Ex.	Gas Laser	*cutting and welding metals.*
	.....	medical operations.
	Excimer lasers	.....
	.....	scanners.
	.....	study of atoms and fusion.
	Carbon monoxide lasers	.....
	Copper vapour lasers	.....
	....	bonding of rubber and waterproof materials.

Language Focus: Describing Functions

These are two common ways to describe the functions of things:

A. Look at these examples:

used for + V ing	used to + V
Gas lasers are **used for** cutting and welding metal.	Gas lasers are **used to** cut and weld metal.
Carbon monoxide lasers are **used for** working with plastics.	Carbon monoxide lasers are **used to** work with plastics.

Now practise answering these questions in the two forms like in the examples above.

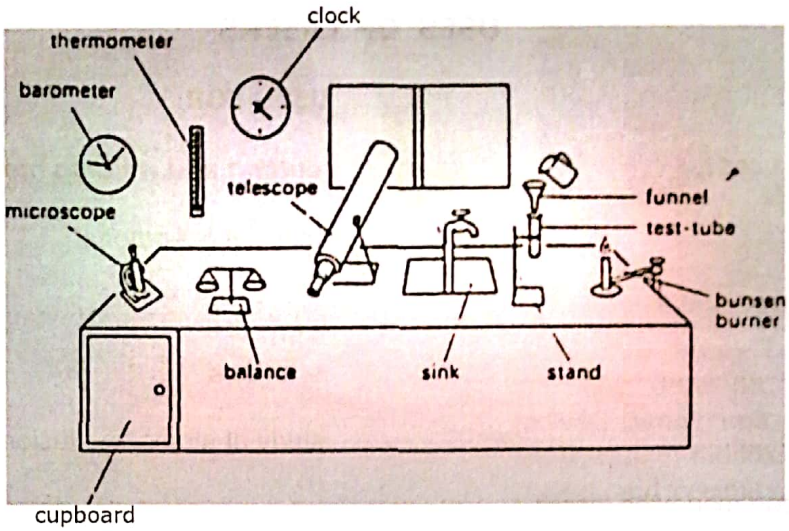
1 What are solid state lasers used for? (bond rubber materials)
'They are **used for** bonding rubber materials.
'They are **used to bond** rubber materials.

2 What are pulsed lasers used for? (study atoms)

3 What are excimer lasers used for? (manufacture microchips)

4 What are copper vapour lasers used for? (work with aluminium and copper)

B. Here are other examples of **for + V ing** forms. Look at the picture and complete the sentences below by adding the names of the objects in a laboratory.



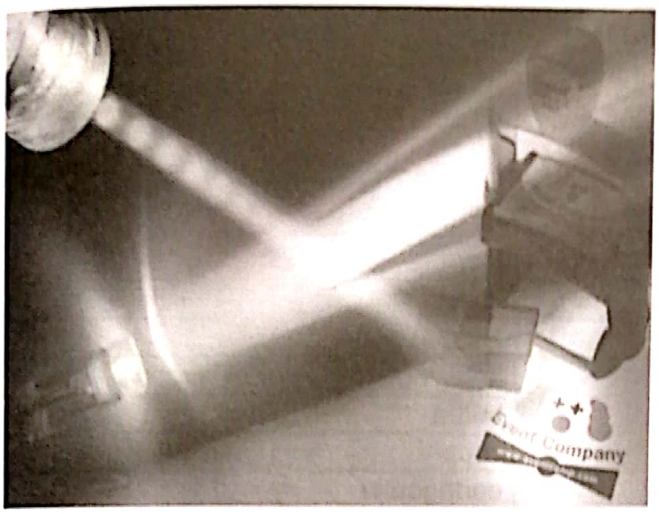
Example: A thermometer is used **for** measuring temperatures.

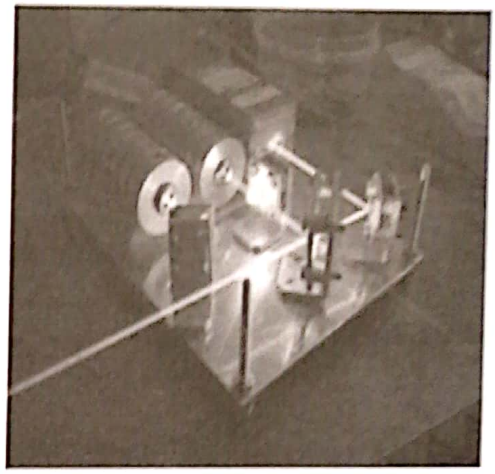
1 _____ is used for weighing things.
2 _____ is used for measuring time.
3 _____ is used for holding chemicals during experiments.
4 _____ is used for pouring liquids.
5 _____ is used for looking at distant objects.
6 _____ is used for supporting things during experiments.
7 _____ is used for washing things.
8 _____ is used for measuring atmospheric pressure.
9 _____ is used for storing things.
10 _____ is used for supplying heat.
11 _____ is used for looking at very small things.

C. Using the picture above, answer these questions about the functions of laboratory equipment.

1 What is a funnel used for? It is used for pouring liquids.
2 What do you use for pouring liquids? A funnel.
3 What is a balance used for? .....
4 What do you use for looking at very small things? .....
5 What is a bunsen burner used for? .....
6 What do you use a telescope for? .....
7 What do you use for measuring time? .....
8 What do you use for measuring atmospheric pression? .....

Task 5 Read the text ***Other Laser Applications*** and select a title for each section.





	OTHER LASER APPLICATIONS
	..... The first one was built in 1993. It contains no chips, instead it uses pulses of laser light to carry information.
Optical Computer	..... Used in telecommunication networks. Fibre optic cables carry signals in the form of pulses of different intensities of laser light. A single glass fibre can carry thousands of telephone calls at the same time.
An Eye in the Sky	..... Laser-based stations in Japan keep close watch on Earth movements bouncing lasers beams off satellites orbiting the air. They hope this technique will help them to predict when an earthquake will occur or a volcano will erupt.
Measuring with Light	..... Scientists are mapping out areas of pollution from satellites by using laser beams to detect chemicals and other pollutants absorbed in the air.
Watching the Earth Move	..... Laser instruments use a microchip to record the time it takes for the laser beam to reach a target, and they can provide a straight line over a very long distance to guide engineers when they are digging tunnels. Lasers were used to dig tunnels through the Alps and under the waters of the English Channel with amazing accuracy.
Optical Fibres	

LESSON SUMMARY

Here are the things you studied in this lesson.

- Transferring information to a table.
- Describing functions: use for + ing; use to + verb.
  *A funnel is **used for** pouring liquids.*
  *A funnel is **used to** pour liquids.*

KEY WORDS

bond (bind)	accuracy
bounce	although
break up	amazing
carry	beam
dig	copper
fix	earthquake
give out	endless
grow	eyesight
map out	iron
melt	rubber
seem	sample
shine	steel
	suitable
	target
	tissue
	tool
	waterproof

What other useful new words did you find in this lesson? Write them in the table at the end of this unit. Make sure you learn all these words. Remember, a good vocabulary is essential for reading.

LESSON EVALUATION How did you find this lesson? Tick the best answer.

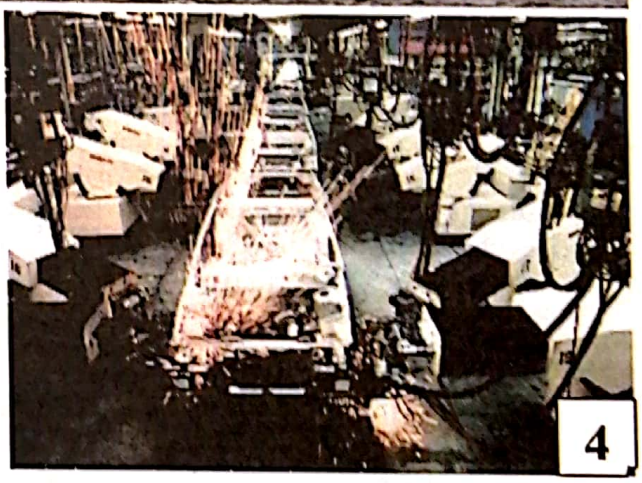
Too easy ☹ About right ☺ Too difficult ☹

Interesting ☺ So-so 😐 Boring ☹

Would you like to read more about this topic?

Lesson 15

ROBOTICS



3

Task 1 Can you tell from the pictures what these robots are used for?. Compare your ideas with a partner.

Task 2 Look at these activities and tick the ones that could be better performed by a robot, then explain the reason for your selection.

performing underwater research ✓
finding solutions to unexpected problems
working inside nuclear power stations
carrying out experiments in space
managing a company
teaching a language
assembling car parts
lifting heavy weights
flying an aeroplane
filling in a tooth
taking care of a child
falling in love

Task 3 Read through the text quickly and see which section is about...

__ The origin of the word *robot*.
__ The reasons for automation.
__ Robots now and in the future.
__ Tasks that are better done by robots.
__ The development of robots.

Check your answers in the class, or if you are working alone, check your answers in **Appendix A.**

A ROBOT can be defined as a machine which is programmed to move and perform certain tasks automatically. Today robots are not science fiction, they are science fact because they have become essential to many laboratory procedures and their use is increasing due to automation of factories.

1 Robots have many advantages over human beings. For instance, they can do repetitive jobs without making mistakes on an assembly line in the car industry, or installing chips in printed circuit boards for computers. Robots can also do jobs which would be dangerous or impossible for human workers such as underwater exploration or spray painting since they do not breathe in the poisonous fumes.

Another advantage of robots is that they can do jobs that require great strength, for example, handling a 50 kg welding tool, or moving heavy parts in assembly lines.

2 People have always tried to create a mechanical substitute to assist them with hard and difficult tasks. Ancient myths tell us about mechanical beings brought to life. These so-called *'automata'* can still be seen in the clockwork figures of medieval churches.

The word *'robot'* derives from the Czech word *robota* which means 'work'. In the play "*Rossum Universal Robots*" which was first performed in London in 1921, the Czech author Karel Capek, presented robots which became so intelligent that they rebelled against their human masters, destroyed them and created a new world inhabited only by robots. Since then, the rebellion of robots has been a recurrent theme in science fiction.

3 In real life, the route of robot development began with the effort to automate some or all of the work required in the factory.

During the Industrial Revolution, factories tried to bring a greater degree of automation to repeated processes, but true robots did not become possible until the invention of computers in the 1940s and the miniaturisation of computer parts.

4 In the late 1960s, scientists at the Stanford Research Institute in the USA developed a robot with wheels named *Shakey*, which was fitted with bump detectors, a television camera as a visual sensor and a small computer for the processing of the information. Shakey could move freely and avoid obstacles. However, at the time, Shakey was considered a failure because it depended on a separate computer.

Later on, engineers tried to adapt robot-like devices to useful tasks. In the mid 1970s, General Motors financed a development program in which Victor Scheinman, a researcher from the Massachusetts Institute of Technology (MIT), invented a motor-driven 'arm' to produce the *'Programmable Universal Manipulator for Assembly'* or PUMA which marked the beginning of the age of robots.

In 1983, a six-legged robot was developed by Odetics Incorporated for commercial production. A battery-powered model, *Odex I*, used a radio channel for leg control and a video link for conveying images. It could walk over obstacles and lift loads several times its own weight.

5 Robots today are equipped with small microprocessors which handle the data about the surrounding terrain sent by various sensors, so they can change direction. They also have other sensing devices that can detect heat, texture, sound and size. But the challenge of equipping robots with skills to operate independently must be left to the future of artificial intelligence.

Up until now, nothing that robots do can compare to what biological evolution has achieved over the course of millions of years. Even simple acts such as bipedal walking has proved enormously difficult for robot technology to copy.

Task 4 Read the text again to find information for these questions.

1 Where does the word *robot* come from? Who invented this term?

2 What robot characteristics are useful for assembling parts in a car industry?

3 Why were there no real robots before the 1960s?

4 What does PUMA stand for? What is it?

5 Which area of technology will help develop the robots of the future?

Task 5 Are these statements true (T) or false (F) according to the text?

F 1 Robots are unable to work in contaminated areas.
___ 2 It is impossible to compare what robots can do with what evolution has managed in millions of years.
___ 3 Automation means to install machines which can do work instead of people.
___ 4 There are old legends which tell about robots that came to life.
___ 5 The age of robots began when Odex I was introduced.
___ 6 The first robots were built in London in 1921.
___ 7 Robots were developed because they can save people from having to do repetitive or boring tasks.
___ 8 Artificial intelligence allows robots to take decisions and work autonomously.
___ 9 PUMA was one of the earliest robots which was developed at the Massachusetts Institute of Technology.
___ 10 Modern robots have microprocessors that receive information about the nearby site.

Compare your answers with a partner. If you are working alone, check your answers in **Appendix A.**

Task 6 *Shakey* and *Odex I* are examples of the first robots. Compare them by completing the missing information in the table below.

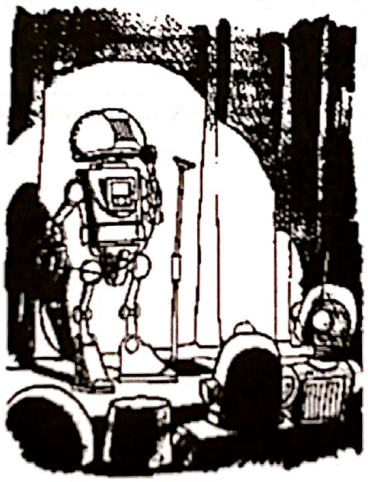
SHAKEY

Features:

- bump detectors
- .....

Abilities:

- .....
- avoid obstacles



ODEX I

Features:

- battery powered
- six legs
- .....
- .....

Abilities:

- walk over obstacles
- .....

Task 7 Research

Check in the Internet an up-to-date article in English about modern robots. Then write a summary containing their characteristics, and what they are used for.

Language Focus: Finding Main Ideas and Supporting Details.

A reading text is made up of several paragraphs which develop a topic. A paragraph, in turn, is made up of interconnected sentences which express ideas. However, not all the ideas have the same importance. When you read, it is essential to identify the main idea from the details within the paragraph. Very often, the main idea is found at the beginning of the paragraph. It is also important (especially when you are studying), to grasp the supporting details or minor ideas which say something more about the main idea, clarifying concepts or illustrating them through examples.

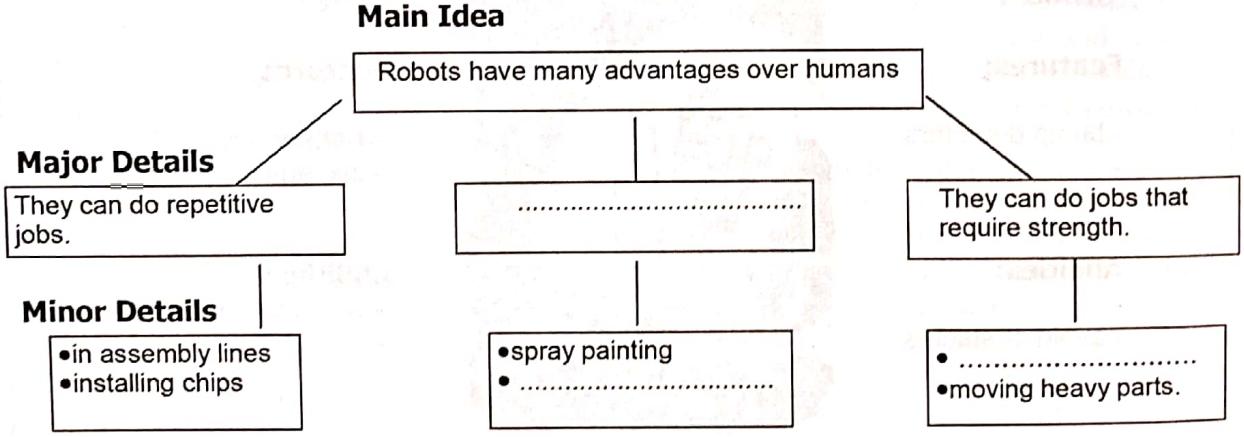
Breaking down a paragraph into its components: main idea, major and minor details can be a very useful technique to improve your reading skills.

Task 8 This paragraph is taken from Part 1 of *ROBOTICS*. It has been broken down into its components. Read the paragraph below and complete the diagram. Write only the key words.

The Advantages of Robots

Robots have many advantages over human beings. For instance, they can do repetitive jobs without making mistakes on an assembly line in the car industry, or installing chips in printed circuit boards for computers. Robots can also do jobs which would be dangerous or impossible for human workers such as underwater exploration or spray painting since they do not breathe in the poisonous fumes.

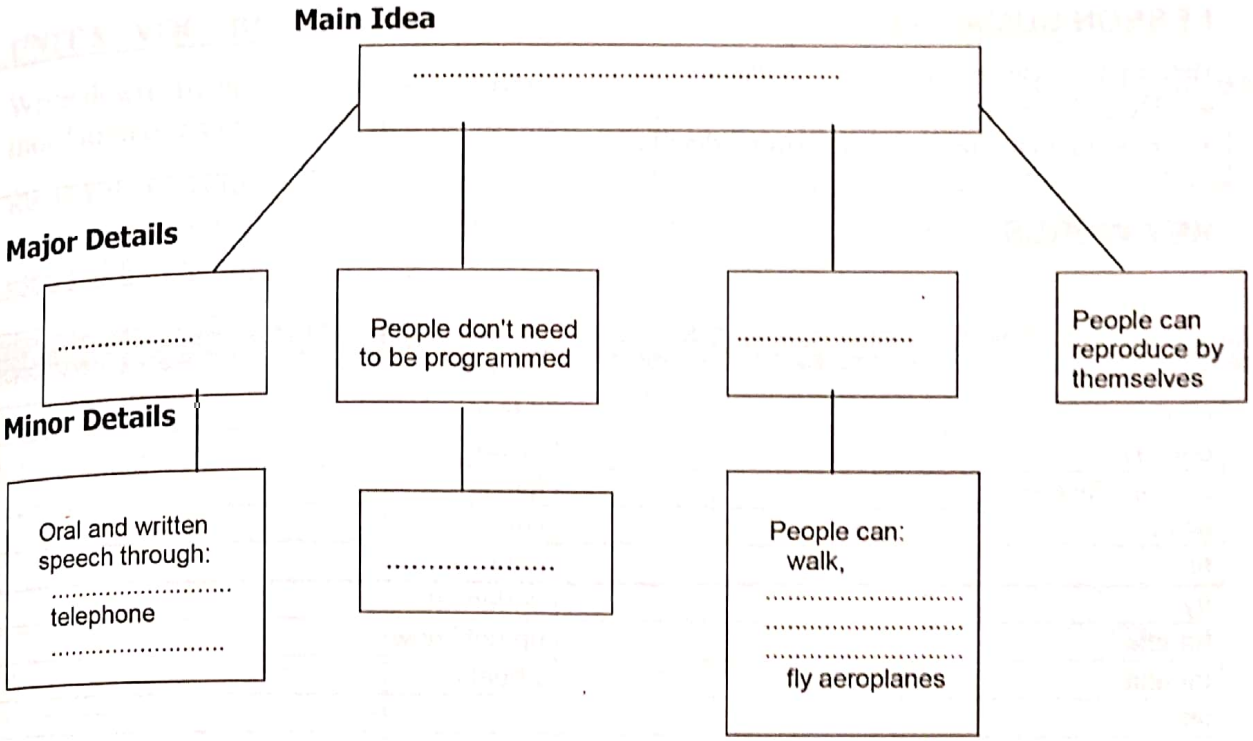
Another advantage of robots is that they can do jobs that require great strength, for example, handling a 50 kg welding tool, or moving heavy parts in assembly lines.



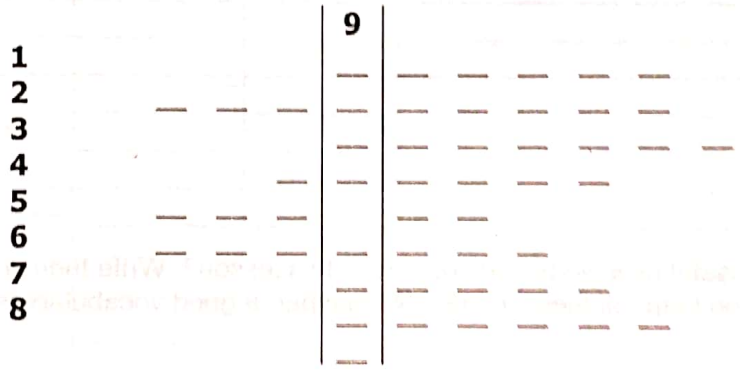
Task 9 Practise finding main ideas and supporting details in the paragraph below. Remember not to write all the words, but to summarise the information.

The Limitations of Robots

Although it is true that robots have some advantages over people, there are many things that only human beings can do. For instance, people can communicate easily with each other: they are able to understand oral and written speech through devices like radio, telephone, e-mail, and so on. People can also carry out tasks without having to be told exactly how to do them, in an exact sequence, - in other words, they don't have to be programmed. For example, when you are driving, you may change the route as you like to reach a point. Also, humans can move freely from place to place, they can walk, run, swim, drive cars, fly aeroplanes, etc. but robots are usually fixed in one place or they can move only in a very limited way. But most importantly, humans can produce new little humans by themselves!



Task 10 Complete this puzzle and find the keyword in 9 down.



Across

1 Czech word for work.
2 Mechanical figure that can move automatically.
3 Odex I runs on this.
4 "*Rossum Universal Robots*" was presented here in 1921.
5 First name of the inventor of PUMA
6 The company which produced Odex I.
7 Surname of the man who invented the word robot.
8 It was created at the Stanford Research Institute

Down

9 The science of developing robots.