

YEREVAN STATE  
UNIVERSITY

Elizabeth Margaryan

# English in Science

**YEREVAN STATE UNIVERSITY**

**Elizabeth Margaryan**

**ENGLISH  
in  
SCIENCE**

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The aim of the textbook is to present the basic principles of how English in Science works for general academic purposes. It is designed for classroom use with intermediate and advanced students of English.

The book provides an opportunity for oral practice, the pattern of the exercises is designed to develop the learners’ reading and writing skills. Students have time to analyze, discuss, make class presentations applying to their oral and written English.

The book presents the widely used patterns of English for intermediate and advanced students enhancing the improvement of their language competences.

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## INTRODUCTION

This book is aimed at developing reading and writing skills for English students of intermediate and advanced level. It consists of two parts.

Part I contains eight glossed readings.

**Focusing on reading and writing** in this part, discussion is designed to create additional opportunities and stimuli for students to express their own points of view on matters of general interest or on the issues raised in various readings. **Reading and writing** are presented as enjoyable activities and students are encouraged to move on from the readings in the book to look for their own reading material outside the classroom.

Part II “**A Guide to Science**” is divided into ten units. Each of the ten units contains passages for reading comprehension with accompanying sets of exercises and activities which are designed to develop and improve the basic skills necessary for efficient reading and writing. The authentic material in each unit is to exemplify a particular type of writing and to provide a suitable basis for practising reading skills.

In each unit there are exercises and activities (reading comprehension, speaking, use of English, writing) which aim to guide students to adhere to the order of presentation and to give them practice in choosing and applying appropriate reading strategies. The purpose of the exercises on words and word combinations is to create situational reinforcement via providing situations in which the words and word combinations can naturally be used. Other activities focus closely on features of the written texts such as the organization and presentation of ideas, use of linking words and the choice of vocabulary. In addition, all the units contain practical tasks often involving pair or group work.

## **Notes for Teachers**

### ***General Comments***

There has been no attempt to grade the reading texts according to linguistic content. The progression of the units is based partly on an assessment of the overall accessibility of the texts. (Are students likely to be familiar with the subject matter?), and partly on the type of the reading task required.

A dictionary is a valuable tool for the language learner. Many activities in this book require students' work without a dictionary in order to develop and practise alternative strategies for dealing with new vocabulary. It is hoped that in this way they will acquire confidence of reading more fluently.

### ***Pair and Group Work***

Pair and group work involved in the course discussions, class presentations provide the opportunity for students to share and discuss (with fellow learners) both their ideas and their methods of working. There are no right or wrong answers to the questions in this book, so the value of these activities lies as much in the discussions themselves as in the finding of correct answers. Students should be encouraged to share their knowledge, and in certain cases teachers may wish to complete the picture with information of their own.

Care has been taken to provide as wide a range of material as possible within the scope of the book. However, the best way to learn to read is by reading, and students will need more practice in the basic skills than can be offered here. Ideally, the exercises and activities presented here will be developed and extended beyond the "core" material of this book, to be used with new texts selected by teachers and the students themselves.

In particular, teachers working with lower intermediate groups will probably wish to take more time over the presentation and practice of new reading skills, and might like to build up a set of parallel material for this purpose, choosing texts and preparing activities to complement those in the units.

# **PART I**

## **FOCUSING on READING and WRITING**



## Reading 1

### **Before you read**

*Discuss these questions with your partner*



**What do you prefer? To receive a personal, carefully chosen gift, small and inexpensive or a big expensive gift or simply the gift of money.**



**Can you describe an object that you had always wanted as a child?**



**Explain, whether you eventually got it, and how, and what the significance of it is for you now.**

### **1. The surprise \***

*By Russell Baker*

[My mother] was a magician at stretching a dollar. That December, with Christmas approaching, she was out to work and [my sister] Doris was in the kitchen when I barged into her bedroom one afternoon in search of a safety pin. Since her bedroom opened onto a community hallway, she kept the door locked, but needing the pin, I took the key from its hiding place, unlocked the door, and stepped in. Standing against the wall was a big, black bicycle with balloon tires. I recognized it instantly. It was the same second-hand bike I'd been admiring in a Baltimore shop window. I'd even asked about the price. It was horrendous. Something like \$15. Somehow my mother had scraped together enough for a down payment and meant to surprise me with the bicycle on Christmas morning.

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\* Excerpt from "Growing Up" by Russel Baker. © 1982.

I was overwhelmed by the discovery that she had squandered such money on me and sickened by the knowledge that, bursting into her room like this, I had robbed her of the pleasure of seeing me astonished and delighted on Christmas day. I hadn't wanted to know her lovely secret; still, stumbling upon it like this made me feel as though I'd struck a blow against her happiness. I backed out, put the key back in its hiding place, and brooded privately.

I resolved that between now and Christmas I must do nothing, absolutely nothing, to reveal the slightest hint of my terrible knowledge. I must avoid the least word, the faintest intonation, the weakest gesture that might reveal my possession of her secret. Nothing must deny her the happiness of seeing me stunned with amazement on Christmas day.

**After you read**

***Time to Remember and Reflect***



**What did Baker's mother hope to achieve by hiding the bicycle?**



**How do you think Baker planned to show that he was stunned with amazement on Christmas day?**



**What did he have to avoid doing so as not to spoil his mother's secret?**

- a. What is someone in your family a magician at doing?
- b. How are you accustomed to celebrating holidays?
- c. What are you looking forward to owing at some time in the future.



### 1. Expanding your vocabulary

*Match the words in Column A with the words in Column B*

**A**

1. stretching a dollar
2. barged
3. scraped together
4. squandered
5. stumbling
6. brooded
7. reveal
8. intonation

**B**

- a. saved
- b. thought deeply
- c. rushed, intruded
- d. pitch of voice
- e. making a dollar
- f. to walk unsteadily
- g. wasted
- h. to make known

### 2. Tell about a surprise that you once had or one that you prepared for somebody else.

- ◇ Can you express the feelings and the emotions of the event?
- ◇ Try to explain the situation first and lead up to the surprise, making it interesting and enjoyable.

### 3. Imagine that you are writing a part of your autobiography. Tell readers about yourself and your characteristics. Try using some of the following expressions. Remember that these expressions are usually followed by a noun phrase, but the use of a verbal is also possible.

can't help doing

be afraid of

look forward to

enjoy

dislike

love

avoid

delay

worry about

have difficulty

get excited about

be good at

be proud of

give up

ashamed of

be (or get) used

(or accustomed) to

When you have written as much as you can, show your text to your friend who will ask questions about you and briefly summarize your character. Give a title to your friend's summary.

Then write a paragraph about yourself that begins by summarizing the type of person you think you are. Then by supplying details tell the reader how you have reached the conclusion.

**4. Stretch your imagination!** Complete the following with the most outrageous exaggerations you can think of:

1. It was so hot that ...
2. Mike is so greedy that ...
3. I never come late but today ...
4. My neighbour is so strange that ...

**5. Improve your spelling:**

For a word with **ie** or **ei**

**For example**

**i** before **e** except after **c** or when sounded like **[eɪ]**

believe receive vein

relief ceiling reign

niece

## Reading 2

### **Before you read**

*Discuss these questions with your partner*



**Do you know either a famous person in your country or a person you know personally who should have been successful but hasn't?**



**Do you like to go to the museums?**



**Speak about your emotions and impressions about it.**

## **Vincent van Gogh\***

***By E.H. Gombrich***

In the winter of 1888, while Seurat was attracting attention in Paris and Cézanne was working in his seclusion in Aix, a young earnest Dutchman left Paris for southern France in search of the intense light and colour of the south. He was Vincent van Gogh. Van Gogh was born in Holland in 1853, the son of a vicar. He was a deeply religious man who had worked as a lay preacher in England and among Belgian miners. He had been deeply impressed by the art of Millet and its social message, and decided to become a painter himself. A younger brother, Theo, who worked in an art-dealer's shop, introduced him to Impressionist painters. This brother was a remarkable man. Though he was poor himself, he always gave ungrudgingly to the older Vincent and even financed his journey to Arles in southern France. Vincent hoped that if he could work there undisturbed for a number of years he

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\* From "The Complete Letters of Vincent van Gogh." "The Artist's Room in Arles." (1989). Musée du Louvre, Paris.

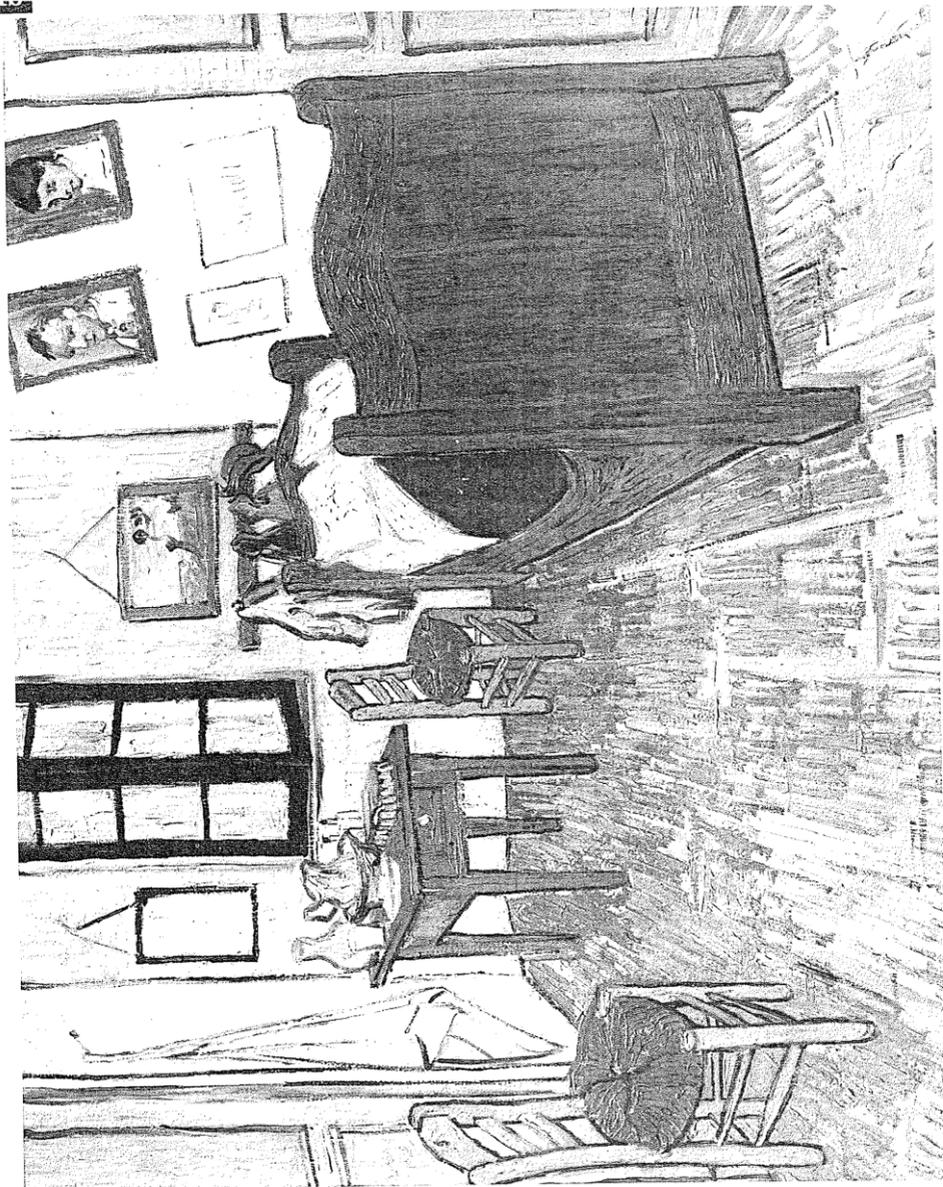
might be able one day to sell his pictures and repay his generous brother. In his self-chosen solitude in Arles, Vincent set down all his ideas and hopes in his letters to Theo, which read like a continuous diary. These letters, by a humble and almost self-taught artist who had no idea of the fame he was to achieve, are among the most moving and exciting in all literature. In them we can feel the artist's sense of mission, his struggle and triumphs, his desperate loneliness and longing for companionship, and we become aware of the immense strain under which he worked with feverish energy. After less than a year, in December 1888, he broke down and had an attack of insanity. In May 1889 he went into a mental asylum, but he still had lucid intervals during which he continued to paint. The agony lasted for another fourteen months. In July 1890 van Gogh put an end to his life - he was thirty-seven like Raphael, and his career as a painter had not lasted more than ten years; the paintings on which his fame rests were all painted during three years which were interrupted by crises and despair. Most people nowadays know some of these paintings: the sunflowers, the empty chair, the cypresses and some of the portraits have become popular in coloured reproductions and can be seen in many a simple room. That is exactly what van Gogh wanted.

**Pronunciation guide**

ungrudgingly - [ʌn'grʌdʒɪŋli]

asylum - [ə'saɪləm]

cypress - ['saɪprəs]



*The Artist's Room in Arles*, VINCENT VAN GOGH (1889)



**After you read**

*Time to Remember and Reflect*



**Look at Van Gogh's painting of his own room in Arles.  
Can you give a description of it?**



**Judging from the letters that the artist wrote to his  
brother, Teo, decide how Van Gogh expressed his feelings  
in the paintings?**



**Speak about your feelings while reading the article. Are  
you really impressed? Tell about why you like it and  
what are the associations that arise?**



**1. Expanding your vocabulary**

*Match the words in Column A with the words in Column B*

- |                  |  |
|------------------|--|
| 1. in seclusion  | a. generously  |
| 2. earnest       | b. priest of a Church of England parish                |
| 3. vicar         | c. alone   |
| 4. lay           | d. not part of the clergy                              |
| 5. impressionist | e. sane, rational                                      |
| 6. ungrudgingly  | f. type of tree  |
| 7. insanity      | g. madness   |
| 8. asylum        | h. hospital  |
| 9. lucid         | i. style of painting popular<br>in the 1870s in France |
| 10. cypresses    | j. serious   |

## 2. Speak about the life of someone you admire or about a famous person in your country. Choose someone who is still alive.

- ◇ First tell about this person's accomplishments in the past and what made this person interesting to you.
- ◇ Tell about this person's life at present: (home, family, lifestyle, work, reputation and so on).

## 3. A piece of advice

- Go to a library and look through a book on Van Gogh, or look up Van Gogh in an encyclopedia.
- Choose one that has illustrations.
- Choose the painting you like best.

## 4. Memorize the Idioms below

on the warpath – in a hostile mood

carry the day – win

red-letter day – day of happiness

go against the grain – contradict, hurt, irritate

thumbs down – show disapproval

loaded for bear – well prepared

hot and heavy – full of passion

without rhyme nor reason – senseless

keep the pot boiling – maintain interest, keep the argument alive

## 5. Improve your spelling

a. Only four words end in - **efy**

liquefy – rarefy

putrefy – stupefy

Use – **ify** in all other words with this ending.

b. When you add – **ment** to a word with a final silent **e**, retain the **e**

require – requirement

**exceptions**

acknowledge – acknowledgment

argue – argument

judge – judgment

c. “Spelling demons” causes confusion. Beware of them

accept	cloth (pl.=cloths)	quite
except	clothes	real
site	custom	really
believe (v)	costume	taught
belief (n) (pl.=beliefs)	fell	thought
cite	felt	until
sight	loose	till
affect	lose	weather
	passed	whether
	past	

## Reading 3

### **Before you read**

*Discuss these questions with your partner*



**Have you seen advances in technology?**



**What can you tell about the objects that were not available just a few years earlier?**

## **Portable Computers\***

*By Alexander Taffel*

The first digital computer was built in 1946 at the University of Pennsylvania. It weighed 30 tons and filled a large room. It was called ENIAC. In its early days it required 18,500 vacuum tubes to store information. Obviously, a 30-ton computer had its limitations. Scientists and engineers worked to make it better. The use of transistors as small amplifiers in place of the large vacuum tubes reduced the size and cost of computers. Smaller was better.

In the early 1960s, the first minicomputers were made commercially. They were the size of a two-drawer file cabinet. The revolution was on. Less than a decade later, the microcomputer was invented. The basic unit of the microcomputer is a tiny silicon chip less than 1 cm on a side. Each chip is a miniature electronic circuit that serves the different computer functions. Amazingly, each circuit contains thousands of elements.

The great advances in microelectronics have helped to achieve the moon landing, satellites, digital watches, computer games, and even

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\* "Physics: Its Methods and Meanings," 5<sup>th</sup> Ed. Newton, 1986, p.477.

computer-controlled automobile engines. Still the computer continues to evolve. One of the latest developments is bubble memory. In bubble memory, the information is stored in tiny magnetic spots or islands that look like bubbles floating on the chip. One great advantage of bubble memory is that it does not lose stored information when the power is turned off.

Portable computers, ranging from briefcase size down to hand-helds, are the latest innovation. In the smallest of the portables, the cathode ray tube has been replaced by a flat electroluminescent display and the disk drives by bubble memory chips. In these computers, information is stored on the road, in the classroom, at conferences, at the library, or elsewhere, and then transferred to print or conventional disk drive memory later.

Hand-held computers are very light in weight and sit in the palm of one's hand. These miniature computers will prove useful for some situations, but there are drawbacks. The displays are rarely more than a single short line in length, and the keyboard is so small the user has to peck rather than type.

The computer revolution moves on. In the future, look for tiny chips controlling the functions of stereos, typewriters, telephones, and other appliances, as well as additional advances in the computing industry itself.

**After you read**

***Time to Remember and Reflect***

- a. Analyze how the world (and this generation's life) has been changed by computers.
- b. Where were you and what were you doing when you were first introduced to something new in technology?
- c. What difference did it make to you and the people around you?
- d. You might want to include for example information what skills have been gained (and lost) what work procedures have been replaced, what new possibilities are being developed?



**Expanding your Vocabulary**

*Match the words in Column A with the words in Column B.*

**A**

1. amplifiers
2. silicon
3. miniature
4. portable
5. innovation
6. drawbacks
7. peck

**B**

- a. typewrite with only one finger
- b. disadvantages
- c. new invitation
- d. able to be carried
- e. very small
- f. semiconducting
- g. boosters

2.
  - a. Most of us have seen advances in technology and have used objects that were not available just a few years earlier.
  - b. People you know probably remember their family's first television-set, their first ball-point pen, their first jet flight, their first video game, and their first use of a computer.

**3.** Write a narrative of 200 words using some of the sentences, patterns discussed in this chapter:

1. made commercially
2. vacuum tubes to store information
3. transistors as small amplifiers
4. great advances in microelectronics
5. the great advantage of bubble memory
6. hand-held computers
7. later-model computers.

**4. Improve your spelling:**

Differences exist between British and American spelling.

Study the words below and memorize them.

Adapt your spelling to your students and recognize these differences when reading British materials.

**American British**

- or color - our colour
- ed learned - t learnt
- led traveled - lled travelled
- er theater - re theatre

## Reading 4

### **Before you read**

***Discuss these questions with your partner***



**What benefits have computers contributed to society?**



**Describe two things that you think computers do better than any other means.**



**Ground your opinion and illustrate it with examples**

## **Artificial Intelligence\***

***By Philip J. Hilts***

Eventually I got the chance to go to California and to visit the Stanford Artificial Intelligence Laboratory. On a hot June afternoon I met the lab's director, John McCarthy. I had driven up from the main campus of Stanford University to his outpost in the hills. He was late, so I waited in his office. It was the head of a long snake of a building which sat coiled on the hot hilltop. Two walls of the office were glass, and through them I could see the hills outside, which were the color of straw. The short, yellow bristles of grass made the hills look like the scalp of a marine recruit. With the wiry dark hair of bushes and trees shaved off, the bumps and scars of contour were visible. The few trees out the window were eucalyptus, and they looked dusty and dry as fence posts.

---

\* "Artificial Intelligence" from *Scientific Temperaments: Three Lives in Contemporary Science*. New York. Touchstone Books, 1984.

John McCarthy's appearance, when he finally strode into the office, struck me as extraordinary. He is about average height, five feet nine inches. His build is average, with a little age trying to collect itself around his middle. But his hair encircles his head and his face with a great cloud of silver needles. Amid this prickly gray mist his eyes are two dark rocks.

Our first meeting actually consisted of several conversations, between his bouts of work. I remember most clearly one moment, a pause between talks. There is a long wooden table in his office, and I recall the form of Professor McCarthy seated before it. His body was hunched slightly in the shoulders, held motionless, and his eyes were rapt. A small screen and keyboard were in front of him. The machine was in a little clearing amidst a jungle of papers and ragged envelopes. I had come in and sat down, but for a moment my presence was immaterial, a shade at the rim of his consciousness. He continued staring into the screen. I recognized this sort of catatonia. Scientists (as do writers and artists) wander into the paths in the background of their work and cannot find their way back immediately. I didn't interrupt him....

There are about three million computers in use in the world now. But not millions or thousands, or even hundreds of them, are dedicated to the sophisticated work of artificial intelligence. Though there has been much celebration of the coming of the computer revolution, it can hardly be said to apply to our current use of these machines. They do little beyond arithmetic and alphabetical sorting. In practice they are no more than automated filing systems with central controls, and still the chief task they are assigned around the world is to keep track of company payrolls. The promise of computing – “the steam engine applied to the mind” as one professor of computing put it - still remains largely unrealized.

The one tiny academic discipline in which the limits of computers are being tested is the field of artificial or machine intelligence. Of the hundreds of thousands of computer programmers in the nation, only a

few hundred have devoted themselves to the question of what computers are finally capable of, asking whether the old science fiction saw about brains and computers being equivalent is, in fact, actually true. It has been said for fifty years that computers are "giant brains" and that the human mind is merely a "meat computer". In a slightly different form, the same idea has been expressed for more than two thousand years in the construction of automatons that imitate human and animal behavior. It is only in the past twenty-five years, however, that the questions - what is intelligence and how can it be made mechanical? - have actually been raised to the level of serious academic questions.

Within this small, exotic field, John McCarthy is one of the three or four people who have contributed most. As I sat waiting for McCarthy to finish, I could see him blink a few times and retrieve his thought from the screen before him. I could see he was beginning to recover. He rubbed his eyes beneath black frame glasses.

He began by saying that in artificial intelligence the object is to find out what intellectual activities computers can be made to carry out. He is rather certain that an intelligence smarter than a human being can be built. From time to time, journalists who discover the existence of his laboratory call up McCarthy to ask him about such robots, "Can they be as smart as people?" McCarthy smiles, "No. That is one of the science fiction fantasies, that robots will be just as smart as humans, but no smarter. Robots will be smarter, because all you have to do is get the next-generation computer, build it twice as big, run it a hundred times as fast, and then it won't be just as smart anymore. ...." The field of artificial intelligence is a collective attempt to create such machines. There are now about three hundred souls in the United States and perhaps another two hundred in the rest of the world working to make them.

**After you read**

***Time to Remember and Reflect***

1. What does Ph. J. Hilts tell us about a famous scientist and introduce him by showing us where he works and what he looks like.
2. He gives us the human side of the man as well as the scientific professional side, doesn't he?



**1. Expanding your Vocabulary**

***Match the words in Column A with the words in Column B.***

- |                |   |
|----------------|---|
| 1. outpost     | a. people                                 |
| 2. coiled      | b. aim, goal                              |
| 3. bristles    | c. unusual and unfamiliar                 |
| 4. scalp       | d. robots                                 |
| 5. recruit     | e. saying                                 |
| 6. contour     | f. record keeping                         |
| 7. strode      | g. paralysis                              |
| 8. bouts       | h. edge                                   |
| 9. hunched     | i. unimportant                            |
| 10. rapt       | j. torn                                   |
| 11. amidst     | k. in the middle of                       |
| 12. ragged     | l. attentive                              |
| 13. immaterial | m. bent forward                           |
| 14. rim        | n. periods                                |
| 15. catatonia  | o. walked briskly                         |
| 16. filing     | p. outline                                |
| 17. saw        | q. new member                             |
| 18. automatons | r. top of the head                        |
| 19. exotic     | s. short, stiff blades                    |
| 20. object     | t. in a spiral                            |
| 21. souls      | u. building separated from main buildings |

**2. Write about a person you know?**

Who is good in his or her chosen line of work?

Tell how that person feels about the job.

- a. Describe what his work entails.
- b. First give the reader details about what the person looks like and what his workplace is like.

**3. Paraphrase the following uses of language**

**A.** Generally, the simplest language is the most effective language. The following similes and metaphors occur in the opening passage of this reading.

1. It was the head of a long snake of a building.
2. The short yellow bristles of glass made the hills look like the scalp of a marise recruit.
3. With the wiry dark hair of bushes and trees shared off, the bumps and scars of contour were visible.
4. The few trees ... looked dusty and dry as Fence posts.
5. His hair encircles his head and his face with a great cloud of silver needles. Amid this prichly glay mist his eyes are two dark rocks.

What comparisons are being made in each statement?

What can you say about how the comparisons help your understanding of the image the writer wants to cowey to the reader?

**B.** Look around your classroom and describe three different people (students or teacher).

Use metaphor to help you describe the person's appearance. Then show your description to another student who will try to figure out which three people you have chosen.

#### 4. Write a short essay

Describe your favourite teacher's methods of teaching.

**The following phrases can help you:**

It goes without saying that...

As a matter of fact...

In my opinion...

I've got some reasons (arguments)...

I agree with you...

First of all...

## Reading 5

### **Before you read**

***Discuss these questions with your partner***



**Why do you think an ant to be an important insect in nature?**



**Now, think about what kind of perspective an ant would have on human life.**



**What would you have to say about human beings and their environment if you were an ant?**

## **Sizing Up Human Intelligence\***

***By Stephen Jay Gould***

In this age of the transistor, we can put radios in watchcases and bug telephones with minute electronic packages. Such miniaturization might lead us to the false belief that absolute size is irrelevant to the operation of complex machinery. But nature does not miniaturize neurons (or other cells for that matter). The range of cell size among organisms is incomparably smaller than the range in body size. Small animals simply have far fewer cells than large animals. The human brain contains several billion neurons; an ant is constrained by its small size to have many hundreds of times fewer neurons.

There is, to be sure, no established relationship between brain size and intelligence among humans (the tale of Anatole France with a brain of less than 1,000 cubic centimeters vs. Oliver Cromwell with well over

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\* Reflections in Natural History by Stephen Jay Gould. © 1977. Ed. Deutsch Ltd.

2,000 is often cited). But this observation cannot be extended to differences between species and certainly not to ranges of sizes separating ants and humans. An efficient computer needs billions of circuits and an ant simply cannot contain enough of them because the relative constancy of cell size requires that small brains contain few neurons. Thus, our large body size served as a prerequisite for self-conscious intelligence.

We can make a stronger argument and claim that humans have to be just about the size they are in order to function as they do. In an amusing and provocative article (*American Scientist*, 1968), F. W. Went explored the impossibility of human life, as we know it, at ant dimensions (assuming for the moment that we could circumvent-which we cannot - the problem of intelligence and small brain size). Since weight increases so much faster than surface area as an object gets larger, small animals have very high ratios of surface to volume: they live in a world dominated by surface forces that affect us scarcely at all.

An ant-sized man might dono some clothing, but forces of surface adhesion would preclude its removal. The lower limit of drop size would ake showering impossible; each drop would hit with the force of a large boulder. If our homunculus managed to get wet and tried to dry off with a towel, he would be stuck to it for life. He could pour no liquid, light no fire (since a stable flame must be several millimeters in length). He might pound gold leaf thin enough to construct a book for his size; but surface adhesion would prevent the turning of pages.

Our skills and behavior are finely attuned to our size. We could not be twice as tall as we are, for the kinetic energy of a fall would then be 16 to 32 times as great, and our sheer weight (increased eightfold) would be more than our legs could support. Human giants of eight to nine feet have either died young or been crippled early by failure of joints and bones. At half oursize, we could not wield a club with sufficient force to hunt large animals (for kinetic energy would decrease 16 to 32-fold); we could not impart sufficient momentum to spears and arrows; we could not cut or split wood with primitive tools or mine

minerals with picks and chisels. Since these were essential activities in our historical development, we must conclude that the path of our evolution could only have been followed by a creature very close to our size. I do not argue that we inhabit the best of all possible worlds, only that our size has limited our activities and, to a great extent, shaped our evolution.

**After you read**

***Time to Remember and Reflect***

- a. **What do you think of Went's explorations concerning an ant-sized man?**
- b. **How does Stephan Gould summarize the point about the size of human beings determining their activities and evolution?**
- c. **Think about what kind of perspective an ant would have on human life.**
- d. **How would your daily life be affected if you were 6 inches shorter or taller than you are now?**



**1. Expanding your Vocabulary**

***Match the words in Column A with the words in Column B.***

**A**

**B**

- |                 |                                  |
|-----------------|----------------------------------|
| 1. bug          | a. give                          |
| 2. minute       | b. club                          |
| 3. irrelevant   | c. wield                         |
| 4. neurons      | d. energy associated with nation |
| 5. constricted  | e. adapted                       |
| 6. cited        | f. hammer                        |
| 7. constancy    | g. little man                    |
| 8. prerequisite | h. rock                          |
| 9. provocative  | i. make impossible               |
| 10. circumvent  | j. sticking                      |

- |                    |                                  |
|--------------------|----------------------------------|
| 11. don            | k. put on                        |
| 12. adhesion       | l. avoid                         |
| 13. preclude       | m. interesting                   |
| 14. boulder        | n. requirement                   |
| 15. bug            | o. give                          |
| 16. minute         | p. club                          |
| 17. irrelevant     | q. wield                         |
| 18. neurons        | r. energy associated with nation |
| 19. constricted    | s. adapted                       |
| 20. cited          | t. hammer                        |
| 21. constancy      | u. little man                    |
| 22. prerequisite   | v. rock                          |
| 23. provocative    | w. make impossible               |
| 24. circumvent     | x. sticking                      |
| 25. don            | y. put on                        |
| 26. adhesion       | z. avoid                         |
| 27. preclude       | aa. interesting                  |
| 28. boulder        | bb. requirement                  |
| 29. homunculus     | cc. lack of variation            |
| 30. pound          | dd. quoted                       |
| 31. attuned        | ee. forced                       |
| 32. kinetic energy | ff. nerve cells                  |
| 33. wield          | gg. unimportant                  |
| 34. club           | hh. tiny                         |
| 35. impart         | ii. tap                          |

## **2. Analyze.**

- a. Underline any parts of the reading where the writer makes a comparison involving two people, things or concepts.
  - b. Discuss with other students how a small creature such as a 3 year-old child sees.
  - c. What would happen to us and our environment if we were all child size?
3. Write an essay about the perspective on the world experienced by a 3 year-old child and comment on how it differs from an adult's perspective.

## **4. Comment and memorize the following comparative idioms.**

1. high as an elephant's eye
2. silent as the tomb
3. chattering like a wilderness of monkeys
4. strong as a tower of Yello.

## **5. Improve your spelling.**

- a. For a verb ending in a consonant + e, drop the **e** when adding **-ing**.

hope – hoping

lose – losing

write – writing

come – coming

- b. doubling a consonant signals a short vowel

write – writing but written

hide – hiding hidden

## Reading 6

### **Before you read**

***Discuss these questions with your partner***



**What do you think about the patients who are eager to know the truth about the state of their health?**



**Do you think that sometimes lies are helpful?**



**Why do people tell white lies?**

### **White Lies\***

***By Ronald B. Adler, Lawrence N. Rosenfeld and Neil Towne***

Although most people would agree that lying to gain advantage over an unknowing subject is wrong, another kind of mistruth - the “white lie”- is both a popular and often acceptable type of communication. White lies are defined (at least by those who tell them) as being unmalicious, or even helpful.

Whether or not they are benign, white lies are certainly common. In one study (Turner, Edgely, and Olmstead, 1975), 130 subjects were asked to keep track of the truthfulness of their everyday conversational statements. Only 38.5 percent of these statements-slightly more than a third-proved to be totally honest. What reasons do people give for being deceitful so often?.

When subjects in the study by Turner and his associates were asked to give a lie-by-lie account of their motives for concealing or distorting

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\* Excerpts from *Interplay. The Process of Interpersonal Communication*, Third Edition, © 1985

the truth, five major reasons emerged. The most frequent motive (occurring in 55.2 percent of the lies) was to save face. Lying of this sort is often given the approving label of “tact”, and is used “when it would be unkind to be honest but dishonest to be kind” (Bavelas, 1983, p. 132). Sometimes a face-saving lie prevents embarrassment for the recipient, as when you pretend to remember someone at a party whom you really don’t recall ever having seen before. In other cases a lie protects the teller from embarrassment. You might, for example, cover up your mistakes by blaming them on outside forces: “You didn’t receive the check? It must have been delayed in the mail.”

The second most frequent motivation for lying was to avoid tension or conflict (22.2 percent). Sometimes it seems worthwhile to tell a little lie to prevent a large conflict. You might, for example, compliment a friend’s bad work, not so much for your friend’s sake but to prevent the hassle that would result if you told the truth. Likewise, you might hide feelings of irritation to avoid a fight: “I’m not mad at you; it’s just been a tough day.” The motive for this sort of lying can be charitably described as promoting relational stability” (Camden, Motley, and Wilson, 1984).

A third motive for lying (given 9.9 percent of the time) is to guide social interaction. You might, for instance, pretend to be glad to see someone you actually dislike or fake interest in a dinner companion’s boring stories to make a social event pass quickly. Children who aren’t skilled or interested in these social lies are often a source of embarrassment for their parents.

Affecting interpersonal relationships was a fourth motive for lying, offered as a reason by the experimental subjects 9.6 percent of the time. Some lies in this category are attempts to expand the relationship: “I’m headed that way. Can I give you a ride?” “I like science fiction too. What have you read lately?” Lies to make yourself look good also fall into this category, such as calling yourself a “management trainee” when you really are a clerk who might someday be promoted. Other relational lies are attempts to reduce interaction. Sometimes we lie to

escape an unpleasant situation: “I really have to go. I should be studying for a test tomorrow.” In other cases people lie to end an entire relationship: “You’re too good for me. I don’t deserve a wonderful person like you.”

The fifth and last motive revealed by 3.2 percent of the subjects was to achieve personal power. Turning down a last-minute request for a date by claiming you're busy can be one way to put yourself in a one-up position, saying in effect, “Don’t expect me to sit around waiting for you to call.” Lying to get confidential secret confidential information-even for a good cause-also falls into the category so of achieving power.

**Pronunciation guide**

unmalicious - [ˌʌnməˈlɪʃəs]

recipient - [rɪˈsɪpiənt]

hassle - [ˈhæsl]

**After you read**

***Time to Remember and Reflect***

- 1. Do you believe that people sometimes should lie not only for their own sake but also for others?**
- 2. White lies are not as bad as some people think, are they?**

**Tell the reasons for your opinion, and support it with examples from your own experience.**



## 1. Expanding your Vocabulary

*Match the words in Column A with the words in Column B.*

A	B
1. unmalicious	a. secret
2. benign	b. pretend
3. distorting	c. security, solidity
4. recipient	d. complications
5. worthwhile	e. advantageous
6. hassle (colloquial)	f. receiver
7. charitably	g. changing the shape of
8. stability	h. kindly
9. fake	i. harmless
10. confidential	j. not with bad intention

## 2. Your decision:

- There are many instances in our life, when lies are helpful.
- Some people think that it is never justifiable to tell a lie of any kind, even a white one.
- What do you think? For example, someone is sick, you have to do something to make that person feel more cheerful. A few lies about how well he looks and how brilliantly he will play football next week could really help, couldn't it?
- White lies are not as bad as some people think, are they? We use them when we expect keeping a friend or a job, or simply we may cheer people up when they most need it.

## 3. Write a brief essay:

- Tell about a time when you or someone you know told a lie. Give all the details of the situation and the people involved. Try to explain the background for the lie and the motive behind it.

2. Which of the five motives for White lies would be the most acceptable to you and why?

- to save face
- to avoid conflict
- to guide social interaction
- to affect interpersonal relationships
- to achieve personal power

Do you find the least acceptable. Why?

*Using the following expressions below*

It is known.....

Today people think...

It is shown that...

The main advantage is...

Lying to get confidential information...

Attention is drawn to...

... is dealt with

Some people say we live. ..

I assume...

It's worth (it's not worth)

Never take anything granted ...

**4. To improve your spelling, it's wise to read a lot and use a dictionary. Form the past tense of the verbs**

a) ending in a consonant + y → **-ied**

try – tried

cry – cried

fry –fried

dry –dried

b) ending in a vowel + y simply add **-ed**

play – played

pray – prayed

*Remember the exceptions:*

pay - paid

say - said

## Reading 7

### **Before you read**

***Discuss these questions with your partner***



**If you could design a classroom or a restaurant, what would it look like? Describe it in detail.**



**Can you describe the design of the local supermarket or store that you use regularly?**

### **The Effects of Our Environment\***

***Ronald B. Adler, Lawrence B. Rosenfeld, and Neil Towne***

Physical settings, architecture, and interior design affect our communication. [Recall] for a moment the different homes you've visited lately. Were some of these homes more comfortable to be in than others? Certainly a lot of these kinds of feelings are shaped by the people you were with, but there are some houses where it seems impossible to relax, no matter how friendly the hosts. We've spent what seemed like endless evenings in what Mark Knapp (1978) calls "unliving rooms," where the spotless ashtrays, furniture coverings, and plastic lamp covers seemed to send nonverbal messages telling us not to touch anything, not to put our feet up, and not to be comfortable. People who live in houses like this probably wonder why nobody ever seems to relax and enjoy themselves at their parties. One thing is quite certain: They don't understand that the environment they have created can communicate discomfort to their guests.

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\* "Effects of Aesthetic Surroundings upon Perceiving 'Energy' and 'Well-being' in Faces." *Journal of Psychology* 41 (1956):247-254.

There's a large amount of research that shows how the design of an environment can shape the kind of communication that takes place in it. In one experiment at Brandeis University, Maslow and Mintz (1956) found that the attractiveness of a room influenced the happiness and energy of people working in it. The experimenters set up three rooms: an "ugly" one, which resembled a janitor's closet in the basement of a campus building; an "average" room, which was a professor's office; and a "beautiful" room, which was furnished with carpeting, drapes, and comfortable furniture. The subjects in the experiment were asked to rate a series of pictures as a way of measuring their energy and feelings of well-being while at work. Results of the experiment showed that while in the ugly room, the subjects became tired and bored more quickly and took longer to complete their task. Subjects who were in the beautiful room, however, rated the faces they were judging more positively, showed a greater desire to work, and expressed feelings of importance, comfort, and enjoyment. The results teach a lesson that isn't surprising: Workers generally feel better and do a better job when they're in an attractive environment.

Many business people show an understanding of how environment can influence communication. Robert Sommer, a leading environmental psychologist, described several such cases. In *Personal Space: The Behavioral Basis of Design* (1969), he points out that dim lighting, subdued noise levels, and comfortable seats encourage people to spend more time in a restaurant or bar. Knowing this fact, the management can control the amount of customer turnover. If the goal is to run a high-volume business that tries to move people in and out quickly, it's necessary to keep the lights shining brightly and not worry too much about soundproofing. On the other hand, if the goal is to keep customers in a bar or restaurant for a long time, the proper technique is to lower the lighting and use absorbent building materials that will keep down the noise level.

Furniture design also affects the amount of time a person spends in an environment. From this knowledge came the Larsen chair, which

was designed for Copenhagen restaurant owners who felt their customers were occupying their seats too long without spending enough money. The chair is constructed to put an uncomfortable pressure on the sitter's back if occupied for more than a few minutes. (We suspect that many people who are careless in buying furniture for their homes get much the same result without trying. One environmental psychologist we know refuses to buy a chair or couch without sitting in it for at least half an hour to test the comfort.)

Sommer also describes how airports are designed to discourage people from spending too much time in waiting areas. The uncomfortable chairs, bolted" shoulder to shoulder in rows facing outward, make conversation and relaxation next to impossible. Faced with this situation, travelers are forced to move to restaurants and bars in the terminal, where they're not only more comfortable but also more likely to spend money.

Casino owners in places such as Las Vegas also know how to use the environment to control behavior. To keep gamblers from noticing how long they've been shooting craps, playing roulette and blackjack, and feeding slot machines, they build their casinos without windows or clocks. Unless wearing a wristwatch, customers have no way of knowing how long they have been gambling or, for that matter, whether it's day or night.

In a more therapeutic and less commercial way physicians have also shaped environments to improve communications. One study showed that simply removing a doctor's desk made patients feel almost five times more at ease during office visits. Sommer found that redesigning a convalescent ward of a hospital greatly increased the interaction between patients. In the old design seats were placed shoulder to shoulder around the edges of the ward. By grouping the chairs around small tables so that patients faced each other at a comfortable distance, the amount of conversations doubled.

Even the design of an entire building can shape communication among its users. Architects have learned that the way housing projects

are designed controls to a great extent the contact neighbors have with each other. People who live in apartments near stairways and mailboxes have many more neighbor contacts than do those living in less heavily traveled parts of the building, and tenants generally have more contacts with immediate neighbors than with people even a few doors away. Architects now use this information to design buildings that either encourage communication or increase privacy, and house hunters can use the same knowledge to choose a home that gives them the neighborhood relationships they want.

So far we've talked about how designing an environment can shape communication, but there's another side to consider. Watching how people use an already existing environment can be a way of telling what kind of relationships they want. For example, Sommer watched students in a college library and found that there's a definite pattern for people who want to study alone. While the library was uncrowded, students almost always chose corner seats at one of the empty rectangular tables. After each table was occupied by one reader, new readers would choose a seat on the opposite side and at the far end, thus keeping the maximum distance between themselves and the other readers. One of Sommer's associates tried violating these "rules" by sitting next to and across from other female readers when more distant seats were available. She found that the approached women reacted defensively, signaling their discomfort through shifts in posture, gesturing, or eventually moving away.

Research on classroom environments is extensive. Probably the most detailed study was conducted by Raymond Adams and Bruce Biddle (1970). Observing a variety of classes from grades one, six, and eleven, they found that the main determinant of whether a student was actively and directly engaged in the process of classroom communication was that student's seating position. This finding held even when students were assigned seats, indicating that location, and not personal preferences, determined interaction.

Other studies by Robert Sommer and his colleagues (1978) found that students who sit opposite the teacher talk more, and those next to the teacher avoid talking at all. Also, the middle of the first row contains the students who interact most, and as we move back and to the sides of the classroom, interaction decreases markedly.

With an overwhelming lack of imagination we perpetuate a seating arrangement reminiscent of a military cemetery. This type of environment communicates to students that the teacher, who can move about freely while they can't, is the one who is important in the room, is the only one to whom anyone should speak, and is the person who has all the information. The most advanced curriculum has little chance of surviving without a physical environment that supports it.

**Pronunciation guide**

therapeutic - [ˌθerəˈpi:ʊtɪk]

perpetuate - [pəˈpetʃueɪt]

**After you read**

***Time to Remember and Reflect***

- 1. Do you think that some homes are more comfortable to be in than others?**
- 2. Try to comment on rooms described as "unliving" by the author.**
- 3. How can environment influence communication?**
- 4. Furniture design also affects the amount of time a person spends in an environment. What is your opinion?**



## 1. Expanding your Vocabulary

*Match the words in Column A with the words in Column B.*

<b>A</b>	<b>B</b>
1. spotless	a. burial ground
2. nonverbal	b. recalling
3. resembled	c. make permanent
4. janitor drapes	d. absence
5. drapes	e. clearly
6. rate	f. position, place
7. dim	g. change
8. subdued	h. breaking
9. soundproofing	i. recovery after illness
10. bolted	j. healing
11. craps	k. card game, also known as 21 gambling
12. roulette	l. game with spinning wheel and numbers
13. blackjack	m. connected
14. blackjack	n. keeping sound out
15. convalescent	o. lowered
16. violating	p. judge the value of
17. shifts	q. curtains
18. location	r. caretaker
19. markedly	s. looked like
20. lack	t. not spoken
21. Perpetuate	u. very clean
22. reminiscent of	v. not bright
23. cemetery	w. gambling game with dice

## **2. Discuss the following topic with other students:**

- a. “In what ways do you think that physical settings, architecture, and interior design affect our feelings and our communication?”
- b. Make notes of ideas and examples that other students provide. Organize your notes and make a rough plan for an essay to express your own point of view and support it with evidence from the events you have experienced or heard or read about.

## **3. Think.**

1. Working with other students, describe the classroom that you are in now, referring to the size, colour, furniture, other details and comment on the choice of your seat.
2. Tell about some things in your class that you are temporarily involved with. Then speculate about what your life will be like in ten years’ time, using the following words and expressions:  
currently more likely  
at present moving away  
in personal space faced with the situation  
knowing this fact for that matter  
chance of surviving designing an environment

## **4. Improve your spelling:**

- a. Monosyllabic verbs ending in a consonant following a short vowel:  
step - stepping - stepped  
rob – robbing – robbed  
chat – chatting – chatted
- b. Two-syllabic verbs with the stress on the second syllable, ending in a consonant:  
refer – referring – referred  
control – controlling – controlled  
begin – beginning

## Reading 8

### **Before you read**

***Discuss these questions with your partner***



**What's your opinion? Should doctors tell the truth to patients in any situation?**



**Don't you think that those who try to control your life by not telling you the truth are committing a crime?**

### **The Doctors' Dilemma\***

***Sissela Bok***

Should doctors ever lie to benefit their patients - to speed recovery or to conceal the approach of death? In medicine as in law, government, and other lines of work, the requirements of honesty often seem dwarfed by greater needs: the need to shelter from brutal news or to uphold a promise of secrecy: to expose corruption or to promote the public interest.

What should doctors say, for example, to a 46-year-old man coming in for a routine physical checkup just before going on vacation with his family who, though he feels in perfect health, is found to have a form of cancer that will cause him to die within six months? Is it best to tell him the truth? If he asks, should the doctors deny that he is ill, or

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\* "The Doctor's Dilemma". "The Massachusetts Medical Society." Originally published in the New England Journal of Medicine. April 18, 1978.

minimize the gravity of the prognosis? Should they at least conceal the truth until after the family vacation?

Doctors confront such choices often and urgently. At times, they see important reasons to lie for the patient's own sake; in their eyes, such lies differ sharply from self-serving ones.

Studies show that most doctors sincerely believe that the seriously ill do not want to know the truth about their condition, and that informing them risks destroying their hope, so that they may recover more slowly, or deteriorate faster, perhaps even commit suicide. As one physician wrote: "Ours is a profession which traditionally has been guided by a precept that transcends" the virtue of uttering the truth for truth's sake, and that is 'as far as possible do no harm'."

Armed with such a precept, a number of doctors may slip into deceptive practices that they assume will "do no harm" and may well help their patients. They may prescribe innumerable placebos, sound more encouraging than the facts warrant, and distort grave news, especially to the incurably ill and the dying.

But the illusory nature of the benefits such deception is meant to bestow is now coming to be documented. Studies show that, contrary to the belief of many physicians, an overwhelming majority of patients do want to be told the truth, even about grave illness, and feel betrayed when they learn that they have been misled. We are also learning that truthful information, humanely conveyed, helps patients cope with illness: helps them tolerate pain better, need less medication, and even recover faster after surgery.

Not only do lies not provide the "help" hoped for by advocates of benevolent deception; they invade the autonomy of patients and render them unable to make informed choices concerning their own health, including the choice of whether to be a patient in the first place. We are becoming increasingly aware of all that can befall patients in the course of their illness when information is denied or distorted.

Dying patients especially - who are easiest to mislead and most often kept in the dark - can then not make decisions about the end of life: about whether or not to enter a hospital, or to have surgery; about where and with whom to spend their remaining time; about how to bring their affairs to a close and take leave.

Lies also do harm to those who tell them: harm to their integrity and in the long run, to their credibility. Lies hurt their colleagues as well. The suspicion of deceit undercuts the work of the many doctors who are scrupulously honest with their patients; it contributes to the spiral of litigation and of "defensive medicine," and thus it injures, in turn, the entire medical profession.

Sharp conflicts are now arising. Patients are learning to press for answers. Patients' bills of rights require that they be informed about their condition and about alternatives for treatment. Many doctors go to great lengths to provide such information. Yet even in hospitals with the most eloquent bill of rights, believers in benevolent deception continue their age - old practices. Colleagues may disapprove but refrain from remonstrating. Nurses may bitterly resent having to take part, day after day, in deceiving patients, but feel powerless to take a stand.

There is urgent need to debate this issue openly. Not only in medicine, but in other professions as well, practitioners may find themselves repeatedly in straits where serious consequence seem avoidable only through deception. Yet the public has every reason to be wary of professional deception, for such practices are peculiarly likely to become ingrained, to spread, and to erode trust. Neither in medicine, nor in law, government, or the social sciences can there be comfort in the old saw. "What you don't know can't hurt you."

***Pronunciation guide***

scrupulously - ['skru:pjuləsli]

wary - ['weəri]

**After you read**

***Time to Remember and Reflect***

- 1. Somebody is going to die soon and his doctor doesn't tell him the truth, because he thinks that he may annoy the patient. Do you approve this?**
- 2. In our society, some people believe that doctors should tell the truth to patients in any situation. What is your opinion?**
- 3. What is the wayout when the situation is hopeless?**



## 1. Expanding your Vocabulary

*Match the words in Column A with the words in Column B.*

### A

1. conceal
2. dwarfed
3. brutal
4. uphold
5. corruption
6. gravity
7. prognosis
  
8. deteriorate
9. precept
10. transcends
11. innumerable
12. placebos
  
13. warrant
14. distort
15. illusory
16. bestow
17. betrayed
18. advocates
19. benevolent
20. autonomy
21. credibility
22. scrupulously
23. litigation
24. remonstrating
25. straits
26. wary
27. erode

### B

- a. hide
- b. made to look smaller
- c. cruel
- d. keep
- e. dishonesty
- f. seriousness
- g. prediction about what will happen
- h. get worse
- i. principle rule
- j. goes beyond
- k. countless, very many
- l. prescribed remedy with no actual medication
- m. demand
- n. alter
- o. erroneouse, deceptive
- p. give
- q. deceived
- r. supporters
- s. wellmeaning, well-intentioned
- t. independence
- u. reliability
- v. totally
- w. lawsuits
- x. objecting, criticizing
- y. difficult circumstances
- z. careful
- aa. wear away, destroy

2. a) Write an issue that you care about deeply. Make sure that you express your point of view clearly and support it with examples to make the issue come alive for your readers.
- b) What do you view as the main problems people face while they are sick or old? How are these problems handled in your country?
- c) What would you do if you were a doctor facing the dilemma described in this article and why? Justify the reasons for your decision. Try to explain them to your classmates who hold the opposite point of view.

You may use the following paired constructions in your writing.

- a. not only ... but
- b. the less ... the poorer
- c. if not ... at least
- d. not so ... nor as
- e. just as ... so

### 3. Improve your spelling:

- a) More words end in the suffix -able than the suffix -ible.

**Learn -ible words:**

forcible  
horrible  
permissible  
responsible  
terrible

- b) When you add -ment to a word with a final silent g retain the g.  
require - requirement

**Exceptions:**

acknowledge – acknowledgment  
argue – argument  
judge - judgment

**PART II**

**A GUIDE**

**TO**

**SCIENCE**



## UNIT ONE

### Computers\*

#### FROM THE HISTORY OF COMPUTERS

Computer systems have been classed into three generations. The first generation consisted of vacuum-tube-based machines. They used magnetic drums for internal storage and magnetic tape for external storage. These computers were slow compared to modern machines and required data to be brought to them.

Second-generation computers using transistors began to appear in 1959. The internal storage used magnetic cores, with magnetic material wired into frames that were stacked into large cores. This form of storage represented a tremendous increase in speed and reduction in bulk over previous storage methods. The external storage in second-generation computers used magnetic disks. This form of storage also added increased speed and greater “online” capability as compared to magnetic tape systems.

Since 1964, a third generation of computers has begun to emerge. These computers utilized integrated circuits to increase capability and decrease size, while integrated technology also provided improved internal storage capability. Solid-state memory, being now totally electronic, greatly increased the speed and capacity of the internal memory while decreasing its cost and complexity. External memory continued to use magnetic disks, which became larger and faster.

It was stated that early computers required data to be brought to them. This data was usually prepared by using punched cards or magnetic tape. The cards or tapes would then be carried to the computer where they would be processed. The transfer of data in this fashion was

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\* The author’s reviews from various sources.

called batch processing. As each batch of data was received, it was placed into line with other batches of data which were processed one after another. Reports were generated, files were updated, new tapes were made and the revised data was routed to appropriate locations in the form of punched cards or magnetic tape. The inefficiency of such a system is easily seen in retrospect.

Later-model computers are provided with the capability of handling numerous input devices directly. These multitask computers treat the incoming data in much the same way as the earlier computers did. Incoming data is received from the various input devices and is lined up, or queued by the computer. The computer will then process the incoming data according to internal procedures. The modern computers are so fast in their operation that they can handle many users without the users even being aware that others are on the system.

## **1. Reading Comprehension**

**I. Read the article about computers. Write true (T) or false (F) for each of the sentences below, according to the information given.**

1. Solid-state memory resulted in decrease of the internal memory cost and complexity.
2. The internal storage of the second-generation computers represented a slight increase in speed and reduction in bulk over previous storage methods.
3. The modern computers are so fast in their operation that they can handle only a few users simultaneously.
4. Multitask computers treat the incoming data similarly to the earlier computers.
5. Magnetic discs were used in first-generation computers for the external storage.

## II. Choose the right continuation of the sentence.

- |  |  |
|--|--|
| 1. The third-generation computers                      | a. used magnetic discs.  |
| 2. Later-model computers                               | b. prepared by using punch cards or magnetic tape.   |
| 3. The modern computers are so fast in their operation | c. that they can handle many users without the users even being aware that others are on the system. |
| 4. Second-generation computers                         | d. the incoming data according to internal procedures.   |
| 5. The first-generation computers                      | e. are provided with the capability of handling numerous input devices directly.                     |
| 6. Early computers required data                       | f. utilized integrated circuits to increase capability and decrease size.                            |
| 7. These computers were                                | g. used magnetic tape for external storage.  |
| 8. These multitask computers process                   | h. slow compared to modern machines  |

## III. Choose the best answer.

1. The first generation computers comprised
  - a. arrays of integrated circuits;
  - b. vacuum valves;
  - c. magnetic disks.
2. second-generation computers used
  - a. transistors;
  - b. magnetic tape systems;
  - c. totally-electronic solid-state memory.

3. A third generation of computers provided
  - a. greater “online” capability as compared to magnetic tape systems;
  - b. improved internal storage capability;
  - c. increase in speed and capacity of internal memory.
4. Modern computers handle
  - a. punched cards;
  - b. magnetic tapes;
  - c. input devices directly.

**IV. Guess the meaning of the underlined words using the context.  
Choose one of the options.**

1. Computer systems have been classed into three generations.
  - a. the period of time (30 or 33 years)
  - b. age
  - c. step
  - d. level
2. These computers required data to be brought to them.
  - a. facts
  - b. the day of the week
  - c. information
  - d. news
3. The internal storage used magnetic cores.
  - a. heart
  - b. centre
  - c. central part
  - d. the bar of soft iron forming the centre
4. Later-model computers are provided with the capability of handling numerous input devices directly.
  - a. treating
  - b. processing
  - c. controlling
  - d. dealing with

5. The ability of the computer to service many input-output devices simultaneously has made data communications essential.
  - a. at the same time
  - b. totally
  - c. similarly
  - d. correspondingly
6. The computer will process another batch.
  - a. number
  - b. group
  - c. portion
  - d. quantity

**V. Read the following paragraph about the invention of computers. Every seventh word is missing. Write the correct word in each blank.**

The electronic computer is the most <sup>1</sup>significant invention since the steam engine. While <sup>2</sup>\_\_\_\_\_ Industrial Revolution previously changed the nature <sup>3</sup>\_\_\_\_\_ manual work, the computer revolution is <sup>4</sup>\_\_\_\_\_ changing the work done by the <sup>5</sup>\_\_\_\_\_. Nowadays micro-computers are manufactured in hundreds <sup>6</sup> \_\_\_\_\_ thousands and are constantly being equipped <sup>7</sup> \_\_\_\_\_ more and more ingenious devices. Contrary <sup>8</sup> \_\_\_\_\_ popular belief, computers themselves cannot make <sup>9</sup> \_\_\_\_\_. The answer will always be correct <sup>10</sup> \_\_\_\_\_ the programme fed into the computer <sup>11</sup> \_\_\_\_\_ correct.

## 2. USE OF ENGLISH

### I. Choose the suitable question to the following sentences

1. All computers have three basic capabilities.
2. The fundamental job of a computer is processing information.
3. The memory is used for storing information.
4. Charles Babbage, an Englishman, could be called the father of computers.
5. Some of the most common methods of inputting information are to use punched cards, magnetic tapes, discs and terminals.
6. Punched cards were used before 1960.
7. Computers are machines capable of processing and outputting data.
8. The computed results have been printed in tables.
9. Yes, the name "computer" covers many different types of machine.
- 10.No, all computers are basically the same.

### II. Change the following sentences from active into passive or from passive into active.

Active	Passive
a. Transistors replaced vacuum tubes.	Vacuum tubes _____ by transistors.
b. A programmer _____ instructions and data to the computer.	Instructions and data are given to the computer by a programmer.
c. Computers have decreased man's workload.	Man's workload _____ by computers.
d. Nowadays we are constantly using	Nowadays microcomputers _____ in everyday life.

microcomputers in everyday life.

Results can be produced quickly and accurately by computers.

e. Computers \_\_\_\_\_ results quickly and accurately.

This information \_\_\_\_\_ very rapidly by a computer.

f. A computer will process this information very rapidly.

A computer is limited in its ability by the imagination of man.

g. The imagination of man \_\_\_\_\_ a computer in its ability.

Computers \_\_\_\_\_ as large adding machines.

h. We often thought of computers as large adding machines.

Computers have been further changed by integrated circuits.

i. Integrated circuits \_\_\_\_\_ computers.

New computer technology \_\_\_\_\_ by scientists.

j. The scientists are developing new computer technology.

**III. Circle the appropriate form of the words to complete the sentence.**

1. reliable, rely on, reliably

Computers are machines.

2. capability, capable, capably

A computer is of performing operations very rapidly.

3. creation, created, creative

A programmer usually has a \_\_\_\_\_ as well as logical mind.

4. simple, simply simpler

Microcomputers are usually \_\_\_\_\_ to operate.

5. technology, technological, technologist  
The \_\_\_\_\_ improvements of computers have decreased man's workload.
6. accuracy, accurate, accurately  
\_\_\_\_\_ is one of the advantages of using computers.
7. permission, permit, permissible  
Computers \_\_\_\_\_ people to use their time more effectively.
8. associate, associated, association  
Computers are \_\_\_\_\_ with speed and accuracy.
9. changeably, changing, changeable  
Memory and primary storage can be used inter \_\_\_\_\_.
10. education, educated, educational  
There are many \_\_\_\_\_ institutions that teach computer programming.

**IV. Fill in each gap with a preposition from the box. Some are used more than once.**

of, on, with, for, of, to, in

1. Many people think \_\_\_\_\_ computers as almost human machines with brains.
2. In fact, computers do not have brains and cannot really think \_\_\_\_\_ themselves.
3. Each type of machine has its own variations depending \_\_ the work it will have to do.
4. A computer system consists \_\_\_\_\_ a number of different units.
5. A computer can deal \_\_\_\_\_ the vast mass of data.
6. The basic concepts of data processing are restricted \_\_\_\_\_ computers alone.
7. People can refer \_\_\_\_\_ books of various kind to find the information they need.

8. Computers are capable of communicating \_\_\_\_\_ the user.
9. Data or programmes are stored \_\_\_\_\_ various storage devices such as magnetic tapes or magnetic discs.
10. There are three steps that are involved \_\_\_\_\_ this process.

**V. In the following pairs of sentences only one is correct. Tick (✓) the correct one.**

1. a) Computer technology is the fastest growing technology in the world today.  
b) Computer technology is the most fast growing technology in the world today.
2. a) Ten years ago there were less computers in use then today.  
b) Ten years ago there were fewer computers in use than today.
3. a) Second-generation computers were smaller, faster and more dependable than first-generation computers.  
b) Second-generation computers were smaller, more fast and more dependable than first-generation computers.
4. a) Basic is probably the least difficult language to learn.  
b) Basic is probably the less difficult language to learn.
5. a) The integrated circuits are much smaller than before.  
b) The integrated circuits are much more small than before.

### 3. Speaking

- I. There are two types of people in the world: those who believe and those who do not. But when it comes to attitude to computers and new technology, adults appear to fall into two dramatically opposite groups. What type of people do you belong to? Answer the questions and prove your point of view using the following words and expressions:**

What would you prefer (what would you rather do):

- a) communicate with a person or a computer?

- b) learn a foreign language with the help of a computer or a teacher?
- c) have a diagnosis stated by a computer or a doctor?
- d) have your marriage arranged by your friend or a computer?
- e) play chess (games) with a person or a computer?  
 (technophobes, technophiles, to advocate the use of old technology, to be against new technology, to increase unemployment, to accept the inevitability of new technology, advantages, drawbacks, to become computer literate, to fear the new technology, heartless, unfeeling, soulless, indifferent, liable to error/object to error, inhuman, it depends, to provide a tremendous variety of choice, to reduce the element of risk)

**II. At the university you have a special subject – computer science – where you learn to use computers properly. You also use computers studying other subjects. Speak on the computers you work on:**

- the make and model of the computer you use
- the type and number of disks it has
- the volume of memory
- the type of extras
- the kind of monitor
- what machines it is compatible with
- what programmes you can use with it
- the advantages and disadvantages this computer has

**III. More and more people begin using computers in their work. Some of them cannot imagine their life without this invention of the 20<sup>th</sup> century. Children find computer games very interesting. Are computers one of the greatest or the most dangerous inventions? Say whether you use a computer in your work or for playing computer games. Do you use your**

**computer in any other way or for other purposes? Read the following arguments. Think of some more.**

Computers are one of the greatest inventions	Computers are one of the most dangerous inventions
1. They save a lot of time.	1. They are dangerous for your health.
2. They can do calculations and other things which are not interesting for people to do.	2. People waste a lot of time playing computer games.
3. They help you to process information.	3. You can lose the results of your work if something goes wrong with the computer.
4. You can learn many things using a computer as a tutor.	4. Some people live in a virtual reality not in the real world.
5. You can relax playing computer games.	5. Children cannot do the simplest arithmetic sums because they rely on computers.

**Discuss the problem in groups of 3-5 students in order to make a decision.**

## UNIT TWO

### Robots\*

#### WHAT IS A ROBOT?

What is a robot? A lot of people think of robots as machines that both do the work of humans and look like them. Strictly speaking, these devices should be termed androids, from the Greek “andros” meaning “of man” and “aidos” meaning “form”. A number of androids have indeed been created; but they have been mostly for amusement value.

So how should we define a robot? A robot is a gadget which wholly or in part imitates man – sometimes in appearance and sometimes in action. Thus a machine which simulates, say, the action of a person’s limb can be called a robot. Likewise a machine that walks up and down and gives a passable impression of smoking a cigarette can also be bracketed in this category.

There are few microelectronic applications more likely to raise fears regarding future employment opportunities than robots for the very obvious reason that such machines directly replace human labour. The emotive nature of the subject inevitably gives rise to misapprehensions.

It is necessary first to define an industrial robot. Alternative definitions and classifications abound but basically a robot is a machine which moves, manipulates, joins or processes components in the same way as human hand or arm. It consists basically of three elements: the mechanical structure (including the artificial wrist and gripper), the power unit (hydraulic, pneumatic or, increasingly, electrical) and the control system (increasingly minicomputers and microprocessors). However, the essential characteristic of a robot is that it can be

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\* The author’s reviews reproduced from different sources

programmed. Thus many devices (often called robots) would be better termed “numerically-controlled arms”, since they are mechanical arms controlled by simple (non-computer) software and as such are not radically different to much existing automation equipment. There are reported about 20000 of the latter in use in Japan, and perhaps several thousand in the United Kingdom. A robot, however, is here defined as a hybrid of mechanical, electrical and computing engineering.

## 1. Reading Comprehension

### I. Read the text and choose the right continuation of the sentences.

- |   |  |
|---|--|
| 1. Robots should be termed  | a. as machines that both do the work of humans and look like them.                                     |
| 2. A robot consists basically of three elements:                            | b. androids from the Greek “andros” meaning “of man” and “aidos” meaning “form”.                       |
| 3. A number of androids have indeed been created, but they have been mostly | c. a machine “which wholly or in part imitates man – sometimes in appearance and sometimes in action”. |
| 4. A robot is   | d. for amusement value.  |
| 5. A lot of people think of robots  | e. the mechanical structure, the power unit and the control unit.                                      |
| 6. A machine which simulates the action of a person’s limb can be called    | f. a robot.  |

**II. Read the text “WHAT IS A ROBOT”, write true (T) or false (F) for each of the sentences below, according to the information given.**

1. A gadget that walks up and down simulating the action of a person’s limb with a cigarette can be called a robot.
2. Very few of the first androids did any serious work.
3. Industrial robots are not very popular in Britain.
4. Some people misapprehend the role of robots in replacing human labour in future.
5. An industrial robot involves three elements: the mechanical structure, the power unit and the control system, however its essential characteristic is that it cannot be programmed.

**III. Read the following paragraph about the inventions of robots. Every seventh word is missing. Write the correct word in each blank.**

When robots are widely used in the home, they will probably be used to do cleaning, table-laying, scrubbing and washing-up, but it is considered unlikely that they will be used to do the cooking – at least, not in the near future.

In factories, mobile robots are already <sup>1</sup>used to carry out a large number <sup>2</sup>\_\_\_\_\_ the distribution and assembly tasks while <sup>3</sup>\_\_\_\_\_ beings carry out research and produce <sup>4</sup>\_\_\_\_\_ for new products. Amongst the numerous <sup>5</sup>\_\_\_\_\_ on the farm, robots will drive <sup>6</sup>\_\_\_\_\_, keeping their eyes on the ground \_\_\_\_\_ front to guide the tractor along <sup>7</sup>\_\_\_\_\_ straight line.

The majority of the <sup>8</sup>\_\_\_\_\_ used at present do not look <sup>9</sup>\_\_\_\_\_ human beings at all because their <sup>10</sup>\_\_\_\_\_ is chiefly functional.

**IV. Read the text “WHAT IS A ROBOT?” and decide which of the following sentences summarizes the idea of each paragraph better.**

1. **A.** A robot is a machine that does the work of humans and looks like them.  
**B.** A robot is a machine which wholly or in part imitates man.  
**C.** A robot is a machine that replaces human labour.
2. **A.** A robot is a machine which moves, manipulates, joins or processes components in the same way as human hand or arm.  
**B.** The essential characteristic of a robot is that it can be programmed.  
**C.** There are many devices that may be termed “numerically-controlled arms”.
3. **A.** People fear that robots will result in unemployment rise in future.  
**B.** Robots are likely to replace human labour in future.  
**C.** People underestimate the role of robots in future.
4. **A.** Britain made a surprisingly good start in robots-but then fell away.  
**B.** Robots are not very popular in Britain.  
**C.** Japan outstrips Britain in robot usage.

**V. Choose the correct answer to the following questions.**

1. How should we define a robot?
  - a. robots are machines that both do the work of humans and look like them;
  - b. the devices that should be termed androids;
  - c. a robot is a machine which wholly or in part imitates man.
2. What are the three basic elements of a robot?
  - a. the mechanical structure, the power unit, the control system;
  - b. the power unit, software, automation equipment;
  - c. the mechanical structure, hydraulic power unit, microprocessor.

3. What is the most significant manifestation of “flexible” automation?
  - a. minicomputer;
  - b. hardware;
  - c. industrial robot.
4. What are the tasks most robots in current use handle?
  - a. controlling;
  - b. welding, paint spraying, machine loading;
  - c. solving mathematical problems.
5. What industries are the biggest users of robots?
  - a. machine-building and metal working industries;
  - b. architecture and civil engineering;
  - c. metal working and automobile industries.
6. What are the reasons for the introduction of robots into the work place?
  - a. improvement of working conditions;
  - b. low price;
  - c. availability of robots.
7. What are the factors limiting the spread of robots?
  - a. hardware and software problems;
  - b. improved flexibility of production systems;
  - c. high price.

**VI. Read the text and choose the correct question to the statements.**

1. A lot of people think of robots as machines that both do the work of humans and look like them.
  - a. What do people think of robots?
  - b. Why do people think of robots?
  - c. Why do you think of robots?
2. A robot is a machine which wholly or in part imitates man – sometimes in appearance and sometimes in action.
  - a. Why can robot imitate a man?
  - b. How can robot imitate a man?
  - c. What is a robot?

3. A robot consists basically of three elements: the mechanical structure, the power unit and the control system.
  - a. What elements does a robot basically consist of?
  - b. What are the basic elements of a robot?
  - c. A robot consists basically of four elements, doesn't it?
4. The essential characteristic of a robot is that it can be programmed.
  - a. Why must a robot be programmed?
  - b. Where can a robot be programmed?
  - c. What is the essential characteristic of a robot?

## 2. Use of English

### I. Put the suitable question to the following sentences.

1. The word "robot" comes from Old Slav word "robu" which means a servant.
2. Today's robot has very little resemblance to the historical "mechanical man".
3. A robot can be called a programmable device.
4. Robots work with the speed and efficiency of an automation unit built for a specific task.
5. All robots have the mechanical part, the power unit and the control system.
6. The mechanical part includes the artificial wrist and gripper.

### II. Fill in each gap with a modal verb from the box.

has to, could, is able, might, must, can, should,  
were allowed, may, were to

1. A robot \_\_\_\_\_ not be too big, too heavy or too expensive.
2. A robot \_\_\_\_\_ be reliable, and capable of doing its job hour after hour.
3. 30 years ago these requirements \_\_\_\_\_ not have been met.

4. The simplest control system \_\_\_\_\_ consist of a series of mechanical stops.
5. This type of robot \_\_\_\_\_ to remember a large number of steps due to its memory unit.
6. A robot \_\_\_\_\_ have automatic means for controlling the limb from the memory.
7. The controller then \_\_\_\_\_ order another change.
8. Robots \_\_\_\_\_ be reprogrammed to perform another job.
9. The students \_\_\_\_\_ to watch a new robot model in operation.
10. They \_\_\_\_\_ meet at the educational robotics centre at 5 p. m.

**III. In the following sentences choose the right variant.**

1. There are different terms which can be (application, applied) to robots.
2. In the play a robot was a (creative, creation) of Rossum and his son.
3. A robot must (imitation, imitate) the manual actions of human beings.
4. These devices though (differ, different) in shape are of the same type.
5. The power unit is a (type, typical) feature of robots.
6. Although robots vary (wide, widely) in shape, size and (capable, capability), they are made up of several (basic, basically) components.
7. A robot can be called a (programming, programmable) device.

**IV. Match a line in A with a line in B and put a new word combination into each gap.**

<b>A</b>	<b>B</b>
labour	safety
human	purposes
power	design
control	productivity
drive	elements
hand	mechanism
production	capacity
worker	unit
robot	system
memory	operator

1. A mistake of a \_\_\_\_ may result in lost production.
2. Robots can solve the problem of \_\_\_\_\_.
3. The \_\_\_\_\_ is complementary to the moving robot system.
4. Most robots of this type are small and are used for definite\_.
5. \_\_\_\_\_ should include certain human characteristics.
6. The function of the \_\_\_\_\_ is to provide energy to the robot actuators to produce motion.
7. Robots were invented to increase \_\_\_\_\_ and reduce production costs.
8. The \_\_\_\_\_ of a new robot is sufficiently large.
9. The arm, wrist and \_\_\_\_\_ are the most obvious parts to an outside observer.
10. Most types of grippers also need a \_\_\_\_\_ for the functions of holding and releasing.

**V. Fill in each gap with a preposition. Some are used more than once.**

in, from, of, to, for, according to, with, by

1. Robots are best understood \_\_\_\_\_ terms of their capabilities.
2. There are numbers of characteristics essential \_\_\_\_\_ any robot.
3. Robot capabilities range \_\_\_\_\_ very simple motions \_\_\_\_\_ extremely complex movements.
4. A hand is attached \_\_\_\_\_ the wrist capable \_\_\_\_\_ grasping a workpiece.
5. A power unit is required \_\_\_\_\_ each robot articulation.
6. Industrial robots differ \_\_\_\_\_ other automatic machines.
7. Industrial robots are made \_\_\_\_\_ the following basic elements: the manipulator, the power unit and the control system.
8. Robots move \_\_\_\_\_ four basic design variations.
9. Robots are used to load and unload parts \_\_\_\_\_ connection \_\_\_\_\_ other machines.
10. Robots perform operations analogous \_\_\_\_\_ those carried out \_\_\_\_\_ human arms.

**VI. Read the text below and decide which answer A, B, C or D best fits each space.**

Almost <sup>1</sup> \_\_\_\_\_ is familiar<sup>2</sup> \_\_\_\_\_ the word “robot” in our civilized society. It <sup>3</sup> \_\_\_\_\_ for the first time in the drama title “Rossum’s Universal Robots” which Karel Capek<sup>4</sup> \_\_\_\_\_ in 1920. The word <sup>5</sup> \_\_\_\_\_ from “robota” which<sup>6</sup> \_\_\_\_\_ to work or <sup>7</sup> \_\_\_\_\_. Hence a robot is a <sup>8</sup> \_\_\_\_\_ man <sup>9</sup> \_\_\_\_\_ works <sup>10</sup> \_\_\_\_\_ a human being and serves <sup>11</sup> \_\_\_\_\_.

Today’s robots <sup>12</sup> \_\_\_\_\_ be defined as a machine which <sup>13</sup> \_\_\_\_\_ be programmed to carry out and repeat a series <sup>14</sup> operations. <sup>15</sup>

\_\_\_\_\_ gripping device is moved <sup>16</sup> \_\_\_\_\_ the control of a man <sup>17</sup> \_\_\_\_\_ a series of movements of grasping, positioning and orienting. It <sup>18</sup> \_\_\_\_\_ the information in a computer or \_\_\_\_\_ <sup>19</sup> mechanical storage system and <sup>20</sup> these movements over and over again.

- |               |                |                |                |
|---------------|----------------|----------------|----------------|
| 1. A some     | B everyone     | C any          | D anyone       |
| 2. A with     | B to           | C of           | D in           |
| 3. A is used  | B are used     | C was used     | D were used    |
| 4. A produced | B was produced | C has produced | D had produced |
| 5. A coined   | B coins        | C was coined   | D has coined   |
| 6. A means    | B meant        | C mean         | D has meant    |
| 7. A serf     | B service      | C servant      | D services     |
| 8. A made     | B man-made     | C man's        | D make         |
| 9. A who      | B whom         | C which        | D whose        |
| 10. A for     | B instead      | C instead of   | D at           |
| 11. A his     | B him          | C her          | D them         |
| 12. A can     | B might        | C must         | D day          |
| 13. A must    | B can          | C may          | D should       |
| 14. A in      | B from         | C of           | D at           |
| 15. A its     | B his          | C it's         | D her          |
| 16. A during  | B at           | C under        | D in           |
| 17. A through | B though       | C under        | D over         |
| 18. A stored  | B stores       | C is stored    | D has stored   |
| 19. A others  | B any          | C other        | D another      |
| 20. A repeats | B repeated     | C is repeating | D repeat       |

### 3. Speaking

#### I. In what situations were the following words and word combinations used? Reproduce them.

1. to look like smb, to do the work of smb (to do smb's work), to be termed, a number of, amusement value.
2. to imitate smb, to simulate smth, to give an impression of doing smth, to raise fears, to replace smb/smth, to give rise to misapprehensions.
3. essential characteristic, to be controlled by, software, automatic equipment, to be in use, to be defined as.

#### II. We are studying the benefits of replacing people with robots in the office. What are the positive and negative aspects of the policy? The following phrases can help you:

First of all.....

It goes without saying that.....

I agree with you.....

I'm afraid I don't agree with you

As a matter of fact.....

I see your point but.....

I've got some reasons (arguments) to disagree (oppose).....

Well, I'm not so sure.....

To some extent.....

#### III. Read the statement below. Which do you agree with more? Why?

1. I get annoyed when I hear people comparing robots with human beings.
2. Life and work of human beings may become easy and cloudless if robots replace them at their work.

**IV. Discuss the following question:**

Ignorance is not bliss but at least it keeps off from risky knowledge. Can the robot be dangerous?

**V. You are a participant of an international conference and represent your country (Armenia). Prepare your speech:**

Greet the audience, introduce yourself and give the target of your report. Don't forget to give its title "Will Robots Help or Hinder People in Real Life".

Your task is to make a report giving your opinion about the use of robots at work and at home. You are to propose an opinion on a subject and present reasons that will convince listeners to agree with that opinion.

**While speaking use the following phrases:**

My goal today is to analyse (to present)...

The goal of my report is to inform (review, consider, identify)...

Besides, I am going to ...

I would like to ...

I'm here to ...

I've divided my report into (3) parts.

I'll be developing the following problems in my report...

If you have any questions, I'll be glad to answer them at the end of my report.

If there is anything not quite clear, please stop me.

Thank you for your attention.

You are welcome to ask questions.

Do not hesitate to address me with any questions.

## **4. Reading and Writing**

### **1. Read a short extract from the article “Minimal Access Surgery a Real Breakthrough”:**

... Surgeons hope that miniaturisation will make it possible for patients to have their operations performed by robots small enough to crawl through the patient’s body. Despite the fact that, until now, even the smallest robots have been too large to be exploited in endoscopic surgery, in Massachusetts the Institute of Technology’s Artificial Intelligence and Robotics Laboratory is working on ever-smaller miniature and microrobots. These robots could be used for filming, taking biopsy specimens or analysis...

**Write a short essay evaluating the importance of the use of robots in the field of medicine. Will robots be able to replace human surgeons after all?**

## **UNIT THREE**

### **An Automobile**

#### **THE EARLY DAYS OF THE AUTOMOBILE**

One of the earliest attempts to propel a vehicle by mechanical power was suggested by Isaac Newton.

But the first self-propelled vehicle was constructed by the French military engineer Cugnot in 1763. He built a steam-driven engine which had three wheels, carried two passengers and ran at maximum speed of four miles. The carriage was a great achievement but it was far from perfect and extremely inefficient. The supply of steam lasted only 15 minutes and the carriage had to stop every 100 yards to make more steam.

In 1825 a steam engine was built in Great Britain. The vehicle carried 18 passengers and covered 8 miles in 45 minutes. However, the progress of motor cars met the great opposition in Great Britain. Further development of the motor car lagged because of the restrictions resulting from legislative acts. The most famous of these acts was the Red Flag Act of 1865, according to which the speed of the steam-driven vehicles was limited to 4 miles per hour and a man with a red flag had to walk in front of it.

But there was a great need for a more efficient engine than the steam engine, for one without a huge boiler an engine that could quickly be started and stopped. This problem was solved by the invention of the internal combustion engine.

The first practical internal combustion engine was introduced in the form of a gas engine by the German engineer N. Otto in 1876. He introduced the four-stroke cycle of operations.

In 1896 a procession of motor cars took place from London to Brighton to show how reliable the new vehicles were. In fact, many of the cars broke, for the transmissions were still unreliable and constantly gave trouble.

The cars of that time were very small, two-seated cars with no roof, driven by an engine placed under the seat. Motorists had to carry large cans of fuel and separate spare types, for there were no repair or filling stations to serve them.

Constant efforts were made to standardize common components. Multi-cylinder engines came into use, most commonly used are four-cylinder engines. The motor-cycles steadily increased in popularity as engines and types became more reliable and roads improved.

Like most other great human achievements, motor car is not the product of any single inventor. Gradually the development of vehicles driven by internal combustion engine-cars as they had come to be known, led to the abolition of earlier restrictions. Huge capital began to flow into the automobile industry.

## **1. Reading comprehension**

**I. Read about the early days of the automobile. Using the context guess the meaning of the underlined words. Choose one of the options.**

1. One of the earliest attempts to propel a vehicle by mechanical power was suggested by I. Newton.
  - A. to push forward;
  - B. to drive forward;
  - C. to pull;
  - D. to rotate.
2. But the first self-propelled vehicle was constructed by the French military engineer Cugnot in 1763.
  - A. bicycle;
  - B. lorry;
  - C. motor-car;
  - D. carriage.

3. Further development of the motor car lagged because of the restrictions resulting from legislative acts.
  - A. moved too slowly;
  - B. moved too fast;
  - C. was absent;
  - D. progressed.
4. N. Otto introduced the four-stroke cycle of operation.
  - A. brought into operation;
  - B. showed;
  - C. demonstrated;
  - D. invented.
5. Gradually the development of vehicles driven by internal combustion engines led to the abolition of earlier restrictions.
  - A. refusal;
  - B. cancellation;
  - C. introduction;
  - D. growth.
6. Many of the cars broke for the transmissions were still unreliable and constantly gave trouble.
  - A. trustworthy;
  - B. poor;
  - C. of high quality;
  - D. of low quality.
7. Huge capital began to flow into the automobile industry.
  - A. to run;
  - B. to move;
  - C. to supply;
  - D. to go.

**II. Number the boxes according to the order in which information is mentioned in the text.**

- A.  The motor cars which took part in a procession from London to Brighton failed to show their reliability.
- B.  The cars of that time were without any roofs.
- C.  The first practical internal combustion engine was a four-cycle engine.
- D.  The first self-driven vehicle was constructed in 1763.
- E.  The maximum speed of the steam-driven engine was as high as four miles per hour.
- F.  The car engineers did their best to standardize common components of engines.
- G.  The gradual development of vehicles driven by internal combustion engines resulted in the flow of huge capital into the automobile industry.
- H.  The internal combustion engine was more efficient than the steam engine.

**III. Choose the right continuation of the sentences.**

- |   |   |
|---|---|
| 1. The progress of motor cars                   | A. came into use.   |
| 2. Many of the cars broke for the transmissions | B. could quickly be started and stopped                           |
| 3. Multi-cylinder engines                       | C. were very small, two-seated cars with no roof                  |
| 4. The most famous of these acts                | D. met the great opposition in Great Britain                      |
| 5. Cugnot built a steam-driven engine which     | E. was solved by the invention of the internal combustion engine. |

- |   |   |
|---|---|
| 6. There was a great need for the engine that | F. was the Red Flag Act of 1865.                      |
| 7. The problem of a more efficient engine     | G. were still unreliable and constantly gave trouble. |
| 8. The cars of that time                      | H. ran at maximum speed of four miles.                |

**IV. Write true (T) or false (F) for each of the sentences below, according to the information given. If the information is not given, put a question mark (?).**

1. The steam engine was invented in 1765 by James Watt.
2. After the abolition of the Red Flag Act motoring started in Great Britain.
3. A procession of motor cars which took place in 1896 showed how reliable the new cars were.
4. Many inventors from different countries contributed to the creation of a car.
5. With the invention of the steam engine the problem of engine efficiency was solved.

**V. Choose the correct question to the corresponding statement.**

1. The carriage was a great achievement but it was far from perfect and extremely inefficient.
  - A. What was a great achievement?
  - B. Why was the carriage far from perfect and extremely inefficient?
  - C. What was characteristic of the carriage?
2. The vehicle carried 18 passengers and covered 8 miles in 45 minutes.
  - A. Did the vehicle carry 18 or 4 passengers?
  - B. What were the vehicle's capacity and speed?
  - C. How many passengers could the vehicle carry?

3. There was a great need for a more efficient engine than the steam engine
  - A. There was a great need for a more efficient engine, wasn't there?
  - B. Why was there a great need for a more efficient engine than the steam one?
  - C. Was there a great need for a more efficient or more reliable engine than the steam one?
4. In 1896 a procession of motor cars took place from London to Brighton to show how reliable the new vehicles were.
  - A. What kind of a procession took place from London to Brighton in 1896?
  - B. Why did the motor cars drive from London to Brighton in 1896?
  - C. When, where and why did the procession of motor cars take place?

**VI. Read the following account of an accident. Fill in each gap with the appropriate word given in the box.**

compensation, insured, first aid, wounded, witnesses, casualty, shock, bystanders, wreckage, wrecked

There was a nasty accident at Newton crossroads yesterday morning. A bus overturned, and some of the passengers were badly \_\_\_\_\_. Several \_\_\_\_\_ helped to pull people out of the \_\_\_\_\_ and give them \_\_\_\_\_ until help arrived. Soon the injured were taken to the nearest hospital by ambulance, but there were so many that the \_\_\_\_\_ department there had difficulty in treating them all. Most of the passengers were found to be suffering from severe \_\_\_\_\_. The bus had crashed into a brand new car and had completely \_\_\_\_\_ it, although fortunately there was no one in the car. Moreover, the new car was fully \_\_\_\_\_. The police took the names and addresses of as many \_\_\_\_\_ as possible. It is believed that the injured passengers have the right to claim \_\_\_\_\_.

## 2. Use of English

### I. Choose the suitable question to the following sentences

1. It was constructed by the French engineer Cugnot in 1763.
2. It was a steam-driven engine which had three wheels and carried two passengers.
3. A steam engine was built in 1825.
4. Yes, the progress of motor cars met with great opposition in Great Britain.
5. The first internal combustion engine was introduced in the form of a gas engine.
6. They were very small, with no roof driven by an engine placed under the seat.

### II. Fill in the gaps with the suitable derivative of the word given in capitals on the right.

1. People experienced the same feeling after the \_\_\_\_\_ of the steam engine.  
**invent**
2. In the 20<sup>th</sup> century \_\_\_\_\_ petrol engines became available.  
**rely**
3. There were some \_\_\_\_\_ for using motor cars.  
**restrict**
4. The motor car is one of the great human \_\_\_\_\_. **achieve**
5. Modern cars need servicing \_\_\_\_\_. **constant**
6. Many designers were involved in the \_\_\_\_\_ of electric vehicles. **develop**
7. A \_\_\_\_\_ to this problem might be an electrically driven car or a taxi. **solve**
8. This problem was solved by the \_\_\_\_\_ of a new three-wheel car in Britain. **introduce**

**III. There is one mistake in each of the following sentences. Find it and correct it.**

1. The first internal combustion engine has been introduced in 1876.
2. That engine could quick be started and stopped.
3. The reaction of the people in the invention of the steam engine was positive.
4. This two types of transport have something in common.
5. The new motor buses were fast replacing with horse-driven buses.
6. It is a four-cylinders petrol engine mounted behind the single front wheel.
7. Since the 1930s diesel-engine lorries became general.
8. In fact any electric cars are already in everyday use.
9. According with the legislative acts the speed of the steam driven vehicle was limited.
10. The French word omnibus obtained from the Latin word meaning "for all".

**IV. Read the text below and decide which answer A,B,C or D best fits each space.**

All <sup>1</sup> \_\_\_\_\_ the world people <sup>2</sup> \_\_\_\_\_ from the country to live <sup>3</sup> \_\_\_\_\_ or near towns and cities. <sup>4</sup> \_\_\_\_\_ of us who already <sup>5</sup> \_\_\_\_\_ in cities know how it <sup>6</sup> \_\_\_\_\_ to live surrounded <sup>7</sup> \_\_\_\_\_ the noise and fumes of traffic city. It is not pleasant. But <sup>8</sup> \_\_\_\_\_ than that, the increasing amount of combustion traffic <sup>9</sup> \_\_\_\_\_ costly in terms of human <sup>10</sup> \_\_\_\_\_ and fuel resources. In the area known <sup>11</sup> \_\_\_\_\_ Greater London, over 70% of this traffic <sup>12</sup> \_\_\_\_\_ of private cars. Many of <sup>13</sup> \_\_\_\_\_ cars transport only one <sup>14</sup> \_\_\_\_\_ and most of the cars are <sup>15</sup> \_\_\_\_\_ use for only <sup>16</sup> \_\_\_\_\_ hours each day. <sup>17</sup> \_\_\_\_\_ of the time, they simply <sup>18</sup> \_\_\_\_\_ space, a very <sup>19</sup> \_\_\_\_\_ thing <sup>20</sup> \_\_\_\_\_ the centre of the city.

1. A in                    B over                    C through                D by
2. A are moving        B move                    C has moved            D has been moving
3. A to                    B at                        C in                        D by
4. A those                B these                    C this                    D that
5. A lived                B live                      C has lived              D had lived
6. A felt                 B feel                      C feels                    D has felt
7. A in                    B by                        C at                        D through
8. A more                B much                    C a lot                    D lots of
9. A was                 B is                        C were                    D are
10. A life                B live                      C lived                    D lives
11. A as                  B by                        C of                        D to
12. A consist            B consisting            C consists                D consisted
13. A this                B those                    C these                    D that
14. A individual        B individuals            C people                 D men
15. A at                  B in                        C of                        D to
16. A a few              B few                      C little                    D a little
17. A rest                B rests                    C a rest                    D the rest
18. A occupy            B occupies                C has occupied         D occupied
19. A value              B valueable              C valuable                D valuation
20. A in                  B at                        C of                        D to

### 3. Speaking

#### I. Have a look at the following list of words and expressions:

self – propelled	multy-cylinder
gasoline	internal combustion
(un) reliable	(in) efficient
Four-stroke	stream

**Which of these words can be used to describe**

- a) a vehicle
- b) an engine

Think of a situation in which you can use the above mentioned words. Choose one situation you like best and present it to the group.

**II. Divide into two teams. Imagine that you are in the Great Britain of 1825. One team is for the wide use of motor cars and the other is in opposition and suggests to prohibit the use of motor cars in Great Britain. Think and give as many arguments as possible to support your team's point of view. The team which provides more arguments is the winner.**

**III. In this text the early days of the automobile are described. Please present to your groupmates a short story about a modern car; its outlook, role in everyday life, development in the near future.**

You may base your answer on the following plan:

- the role of a car in everyday life
- pros and cons of driving a car in a big city
- car manufacturers widely known in your country
- the most popular modern car
- describe its outlook (make, peculiarities)
- say a few words about its engine
- car technology is changing very quickly, isn't it? Explain why or why not.
- Your point of view on a car of the 21<sup>st</sup> century. Are there any future prospects for cars or will they be replaced by other advanced means of transport?

**IV. Some people treat cars as human beings and not just inanimate objects, used for driving from one place to the other. They give them nicknames and spend all their free time in the garage. Are you of the same kind? Ask your groupmate about these things and find out to which category he/she belongs.**

**V. Imagine that you have an opportunity to buy a car. Which type of engine would you choose? Give at least 5 advantages of this type to prove your point of view. You may use the following list of adjectives:**

revolutionary	positive
(un) important	original
reliable	comfortable
durable	successful
interesting	famous

#### **4. Writing**

##### **Writing task.**

The publishers of a guide book on the USA have asked you to write an entry about the city of Detroit. The entry should give tourists information about the city of cars. Below please find the details, which will help you in writing the entry:

- the centre of the American automobile industry (34,000 cars a day);
- automobile industry was begun by Henry Ford;
- 60 percent of population is black; during early the 1900s many blacks from the South came here to find work in automobile industry;
- Today the city suffers from unemployment, pollution and crime.

## UNIT FOUR

### Lasers\*

#### LASER – TECHNOLOGY FOR THE FUTURE

Lasers are devices which produce pure, intense beams of light or radiation. When they were first invented in 1960, nobody quite knew what to do with them. Though they seem likely to be useful, they were for a while called “a solution waiting for a problem”.

The beam of a laser can be focused very precisely, which means that it can be used in tasks as simple as cutting cloth and piercing leather and as delicate and sensitive as destroying a single cell of living tissue. This means that it has great potential in the treatment of cancer.

The strength of the laser is such that it can pierce very hard substances such as diamonds and metals. It is now used in precision welding. A CO<sub>2</sub> gas laser can cut through brick or granite at a temperature of 1500 °C.

Given such strength, it is hardly surprising people see the laser as a death ray, and its military potential is being exploited, particularly in guiding missiles and in range-finding for gunners. Its accuracy as a means of measurement has helped scientists to calculate the speed of light more precisely than ever before (186282397 mps) and, with the help of laser reflectors placed on the moon by American astronauts, to determine its exact distance from earth. Lasers are also now used to measure the size of pollutant particles in the air. Surgeons performing operations have found the laser as a surgical knife, able to make bloodless incisions, and it is proving invaluable in delicate eye surgery, particularly on the retina. Skin blemishes can also be removed by means of a laser.

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\* The author’s reviews reproduced from various technical sources.

There are suggestions that laser beams may ultimately replace cables in telecommunications.

One of the most interesting uses is in the world of newspapers. The Los Angeles Times is “written” by a helium/neon laser and “proof-read” by an argon laser. Finally, a whole new area of optics is being opened by lasers.

## 1. Reading Comprehension

### I. Read the article about laser technology. Choose the appropriate continuation of the sentence.

- |   |   |
|---|---|
| 1. Lasers are                             | A. called “a solution waiting for a problem”.                       |
| 2. A CO <sub>2</sub> gas laser can        | B. to calculate the speed of light more precisely than ever before. |
| 3. Lasers were                            | C. devices which produce pure, intense beams of light or radiation. |
| 4. A new area of optics is being          | D. opened by lasers.  |
| 5. Laser’s accuracy has helped scientists | E. in precision welding.  |
| 6. Laser can                              | F. pierce very hard substances such as diamonds and metals.         |
| 7. Laser is now used                      | G. to measure the size of pollutant particles in the air.           |
| 8. Lasers are also now used               | H. cut through brick or granite at a temperature of 1500° C.        |

## II. Choose the best answer.

1. When lasers were first invented in 1960
  - a. the thought of completely new applications has generated the excitement over the laser;
  - b. nobody knew the limits to which these devices would be used;
  - c. nobody knew quite well what to do with them.
  
2. The beam of a laser can be focused very precisely which means
  - a. that it can be used for spot welding;
  - b. that it can be used for cutting cloth;
  - c. that it can be used in treatment of cancer.
  
3. Laser is now used
  - a. in range-finding for gunners;
  - b. in welding transistor junctions, thermocouples and electronic micromodules;
  - c. in punching holes in sheets of metal.
  
4. It is hardly surprising people see the laser as
  - a. An optical knife which would be more accurate, less painful and faster than the scalpel;
  - b. a surgical knife able to “spot-weld” the retina in place;
  - c. a death ray able to be exploited in guiding missiles.
  
5. There are suggestions that laser beams
  - a. can flip a plane and toss it out of control;
  - b. can replace cables in telecommunications;
  - c. can pass through a lens system.
  
6. One of the most interesting uses of a laser is
  - a. in tooth drilling;
  - b. in the world of newspapers;
  - c. in cutting holes in diamonds.

**III. Write true (T) or false (F) for each of the sentences below, according to the information given. If the information is not given, put a question mark (?).**

1. Very hard substances such as diamonds and metals can be pierced by a laser due to its strength.
2. By passing the laser beam through a lens system, an extremely high energy density can be focused in a very small area.
3. Laser beams are likely to succeed in treating cancer.
4. Laser coolers are expected to be widely used on the moon by American astronauts to determine its exact distance from earth.
5. The electrons of a molecule become excited when it absorbs light.
6. Lasers for a while were called a solution waiting for a problem as nobody quite knew what to do with them.
7. The word "laser" is an acronym formed from Light Amplification by Stimulated Emission of Radiation.
8. A laser has been applied in many fields including the following: surgery, metal cutting and welding, telecommunications, optics.

**IV. Read the text about laser technology and choose the correct answer to the following questions.**

1. What is a laser?
  - A. It is a device which converts one form of energy into another.
  - B. It is a device which produces pure, intense beams of light or radiation.
  - C. It is a device which transmits electrical energy.
2. Where can a laser beam be used?
  - A. in cutting cloth and piercing leather;
  - B. in cooking meals;
  - C. in medicine;
  - D. in education;
  - E. in precision welding.

3. What quality of a laser is being exploited as its military potential/?
  - A. accuracy;
  - B. strength;
  - C. sensitivity.

**V. Choose the correct question to the statement.**

1. Lasers are devices which produce pure, intense beams of light or radiation.
  - A. What is light?
  - B. What are lasers?
  - C. What is radiation?
2. Though they seem likely to be useful, they were for a while called “a solution waiting for a problem”.
  - A. Who called lasers for a while so?
  - B. Why were lasers for a while called so?
  - C. What were lasers for a while called?
3. The strength of a laser is such that it can pierce very hard substances such as diamonds and metals.
  - A. What is the strength of a laser?
  - B. Why can a laser pierce very hard substances?
  - C. What substances can a laser pierce?
4. Lasers are also now used to measure the size of pollutant particles in the air.
  - A. Are pollutant particles measure by lasers?
  - B. What are lasers also now used for?
  - C. How can the size of pollutant particles be measured?
5. Surgeons performing operations have found the laser as a surgical knife, able to make bloodless incisions.
  - A. What can be used as a surgical knife?
  - B. Why can laser be used as a surgical knife?
  - C. What have surgeons performing operations found?

6. One of the most interesting uses of lasers is in the world of newspapers.
- A. How can lasers be used in the world of newspapers?
  - B. What newspapers use lasers?
  - C. What is one of the most interesting uses of lasers?

**VI. Read the following paragraph about the use of lasers. Every ninth word is missing. Fill in each blank with a suitable word from the box.**

working, in, a, the, its, operated, over, spectrum, be, it

A laser operates in the light region of the \_\_\_\_\_ where no similar or competing devices have previously \_\_\_\_\_. So, the discovery of the laser opens up \_\_\_\_\_ completely new frequency territory to be explored. Besides \_\_\_\_\_ operating frequency, other features of the laser make \_\_\_\_\_ a field where many scientists and engineers are \_\_\_\_\_ on ideas and applications that just could not \_\_\_\_\_ previously attempted, or even conceived, in some cases. \_\_\_\_\_ thought of completely new applications, along with improvements \_\_\_\_\_ other applications, is what has generated the excitement \_\_\_\_\_ the laser.

**2. Use of English**

**I. Choose the suitable question to the following sentences**

1. Lasers can be considered as amplifiers or generators of energy.
2. Lasers use the properties of bound electrons rather than free electrons.
3. The bound electrons need a stimulus to produce the emission of energy.
4. The essential between the maser and the laser is the frequency region of operation.

5. This laser is known as a solid-state device.
6. ... because the material used is a gas.
7. The laser beam can be focused very precisely in a very small area.
8. The laser has also succeeded in cutting holes in diamonds.
9. The powerful laser beam shows promise in a whole new area of optics.
10. Yes, new areas of applications are being opened by lasers.

**II. Arrange the words according to the table and then fill in each gap with the suitable word.**

atomic, actually, optical, successfully, frequency, connection, suitable, considerably, purity, application, detectable

Noun	Adjective	Adverb

1. Lasers were \_\_\_\_\_ first called optical masers.
2. Lasers are more \_\_\_\_\_ for generation of energy.
3. A precise \_\_\_\_\_ is natural for the laser.
4. The \_\_\_\_\_ of the laser can be increased \_\_\_\_\_.
5. Lasers can operate in a very high \_\_\_\_\_ region.
6. The secret of their success was the high \_\_\_\_\_ of the glass used.
7. There are pollutant particles in the air that might be \_\_\_\_\_ by a laser beam.
8. In most of the medical applications the laser is like an \_\_\_\_\_ knife.
9. This method has been used \_\_\_\_\_ on human eyes.
10. The scientists chose this material for its simple \_\_\_\_\_ structure.

**III. Fill in each gap with a suitable word from the box. Some words can be used more than once.**

both, because of (X2), as, rather than, regardless, both ... and, since (X2), because

1. Lasers use the properties of bound electrons \_\_\_\_\_ free electrons.
2. However \_\_\_\_\_ lasers operate on the same principle.
3. The principle of operation is the same for \_\_\_\_\_ masers \_\_\_\_\_ lasers.
4. A laser is unsuitable for amplification of energy \_\_\_\_\_ its relatively high noise level.
5. They work the same in principle, \_\_\_\_\_ of the material used.
6. A laser beam, \_\_\_\_\_ its highly directional nature, can be focused very precisely.
7. Lasers can be used in such fields \_\_\_\_\_ tooth drilling, eye surgery, cancer treatment.
8. The scientists have \_\_\_\_\_ improved their technique.
9. \_\_\_\_\_ the essential difference is the frequency region of operation, different techniques and design schemes are employed.
10. \_\_\_\_\_ a laser can produce a powerful beam of light, the scientists and engineers are working on its further useful applications.

**IV. Complete the dialogue using the words given below.**

the, in, how, operation, it, at, are based, on, does, did, one can

**Mr. Brain:** Today, I'm going to show you a laser in \_\_\_\_\_.

**Paul:** What \_\_\_\_\_ the word "laser" mean?

**Mr. Brain:** \_\_\_\_\_denotes “Light Amplification of Emission of Radiation”. Looking \_\_\_\_\_operating laser \_\_\_\_\_ see that it produces a very powerful beam of light.

**Paul:** When \_\_\_\_\_ the first lasers appear?

**Mr. Brain:** In \_\_\_\_1960s.

**Paul:** \_\_\_\_do lasers work?

**Mr. Brain:** They \_\_\_\_\_ on the principle of amplifying the light of a certain wavelength.

**Paul:** I’m rather interested \_\_\_\_\_ making experiments with laser beams.

**Mr. Brain:** Then come \_\_\_\_\_.

**V. There is one mistake in each of the following sentences. Find it and correct it.**

1. Lasers have been invented in 1960.
2. It is possibly to produce a powerful beam of light with the help of a laser.
3. Having invented a laser man opened his possibilities.
4. To recognize a problem is a first step to its solution.
5. There is not just one type of maser or laser but the whole family of them.
6. The scientists thought of complete new applications of lasers.
7. A laser can be used as a mean of cancer treatment.
8. Lasers used in making holograms.
9. A laser can to operate in a very high frequency region.
10. Applications in this region are being well explored in the past twenty years.

**3. Speaking**

**I. Look at the following words and word combinations. Think of the situation in which you can use them. Present the situation to your groupmates.**

- to be useful

- a solution waiting for a problem
- living tissue
- to determine
- invaluable
- to be focused precisely
- treatment of cancer

**II. Look through the text once again. Make up a short summary, in which the main fields of laser application will be mentioned. Please list them in order of their importance for you. Present your list to your neighbor and find out if there is any difference between your and his/her list.**

**III. As you may see from the text, the author mostly analyzed those applications of the laser, which are positive in their nature: in surgery, cancer treatment, publishing, precision welding.**

**He briefly mentions the laser’s military potential. Please present your point of view on this issue. Do you think the laser can be dangerous? How can you prove it?**

You may make use of the following statements:

To start/to begin with...

I strongly disagree...

I guess...

Most likely...

If I’m not mistaken...

In fact...

**IV. Role-play. Students are divided into two groups.**

Group 1: You think that lasers have become an essential part of an industrial process and medicine. They must be further perfected and spread and finally penetrate into every field of human activity.

Group 2: You are of opinion that, though lasers can and must be used in some spheres where they are necessary, one shouldn't forget that they are extremely dangerous. Moreover, lasers are very expensive and those industries that use lasers are likely to encounter some software and hardware problems.

These are some hints. Think of some other pros and cons of using lasers.

#### **4. Reading and Writing**

##### **1. Read the following extract about lasers.**

There are many different types of lasers. The laser medium can be a solid, gas, liquid or semiconductor.

The first type of laser is a solid-state laser which emits at a wavelength of 694 nm. Other lasing mediums can be selected on the desired emission wavelength, power needed and pulse duration. Some lasers are very powerful, such as the CO<sub>2</sub> laser, which can cut through steel. The reason that the CO<sub>2</sub> laser is so dangerous is because it emits laser light in the infrared and microwave region of the spectrum. Infrared radiation is heat, and this laser basically melts through whatever it is focused upon.

Other lasers, such as diode lasers, are very weak and are used in today's red pocket lasers that are used to point at things. These lasers typically emit a red beam of light that has a wavelength between 630 nm and 680 nm. Lasers are used in industry and research to do many things, including using the intense laser light to excite other molecules to observe what happens to them.

In the extract above only a few possible laser applications were mentioned. Extend the article and outline the use of lasers in the following spheres:

- welding and cutting;
- surface treatment;
- laser printers;
- ophthalmic surgery.

In your part of the article concentrate not on the scientific aspects, but on the benefits one can get from the use of lasers. Express your point of view: if lasers can be dangerous and what the possible ways of reducing the danger are.

**Here are some possible beginning for the other passages:**

- Nowadays major advances are made in computer technology. You can hardly imagine modern life without this device. If you work in the office or use your computer at home, you'll surely need a printer from time to time. Most probably it will be a ... because it is ...
- Many people are suffering from ophthalmic disorders which can only be cured in a very delicate way. For this purpose ... are employed.
- Another type of lasers is widely used in industry, especially in cutting and welding. They are used to ...

## UNIT FIVE

### Engineering

#### WHAT IS ENGINEERING?

Engineering is putting knowledge of Nature to practical use. The end result of engineering is some physical thing: a machine, a tool, a gadget. Engineering is solving problems. It's convenient to discuss engineering projects within the framework of five steps for solving problems:

Define the problem. Defining the problem often means distinguishing the perceived need from the real need. The fact that engineering results in something of practical use implies the existence of a user – a customer. The problem you're solving had better be a customer's point of view.

Identify possible solutions. Engineering is synthesis – putting together various parts in a new way to create value. Bring the problem into a familiar medium. If you're a mechanical engineer designing an electrical circuit, you can think in terms of a mechanical analogy, such as water flowing in pipes. Do whatever it takes to let your intuition start working. Conscious thought, intuition, passion, emotion, sight, hearing, touch – even taste and smell – can help. With a little practice, you can smell the difference between numerous metals, and your unaided eye can distinguish between lights flashing at 100 Hz and 500 Hz. Part of engineering discipline is paying attention to things around you to see how they work. In many situations, the human system is more powerful than any sensor. You can see a lot just by observing.

Select a solution. The objective is to select from many possible solutions the one that gives you the “best” results. Engineering is seeking the best compromise between a whole bunch of conflicting demands. Engineering is optimizing.

Implement the solution. Most engineers don't succeed because they don't take enough initiative. The most important thing is to act. Take responsibility for achieving the goal, for contributing to each aspect of it, for getting pieces of it done. Young engineers are accustomed to dealing with textbooks with nicely formulated problems that contain one or two variables applicable to the particular class, and everything else is assumed to be nominal. But in almost every real-world situation, it's the assumptions that get you, not the state questions.

Verify the solution. Turn the product on. Watch it work. Use it as a customer would. Listen to customers who use it. Two things will happen. You will learn whether the product is what you said it would be, and you will discover other uses and opportunities for improvement that may not have been apparent at the beginning. You will often see the original problem in a new perspective once a solution has been implemented.

The way we follow these five steps determines the success or failure of our products – and our careers.

## **1. Reading Comprehension**

### **I. Read the article right through and then choose the best continuation for each of the following.**

1. The end result of engineering is
  - a. some physical thing: a machine, a tool, a gadget;
  - b. some imaginary thing: an idea, an opportunity, an objective;
  - c. some valuable thing: career, money, power.
2. Defining the engineering problem often means
  - a. bringing the problem into a familiar medium;
  - b. putting yourself in the shoes of a potential customer;
  - c. distinguishing the perceived need from the real need.

3. Part of engineering discipline is
  - a. developing the problem-solving skills;
  - b. paying attention to things around you to see how they work;
  - c. examining yourself carefully and honestly trying to understand your limitations.
4. Most engineers don't succeed
  - a. because they tend to be isolated from the reality;
  - b. because they don't develop practical hands-on skills;
  - c. because they don't have enough initiative.
5. Young engineers are accustomed to
  - a. studying textbooks with nicely formulated problems;
  - b. relying on other people in solving problems;
  - c. having a strong motivation to become first-rate engineers.

**II. Match each underlined word in column A with its probable meaning in column B. Be careful, there are some extra meanings in column B.**

**Column A**

1. The end result of engineering is: a machine, a tool, a gadget.
2. Defining the problem often means distinguishing the perceived need...
3. ... your unaided eye can...
4. ... can distinguish between...
5. ... between a whole bunch of conflicting demands

**Column B**

- a. quantities that can be changed
- b. not receiving help of a magnifying glass
- c. bundle
- d. convenient, small mechanical device
- e. slight contact
- f. claiming too much
- g. a collection of things of the same kind placed together

- |   |  |
|---|--|
| 6. ... sight, hearing, <u>touch</u> -even...          | <b>h.</b> see the difference   |
| 7. <u>Implement</u> the solution                      | <b>i.</b> connection   |
| 8. <u>Verify</u> the solution                         | <b>j.</b> prove  |
| 9. ... it's the <u>assumptions</u> that get you       | <b>k.</b> that can be understood by mind or senses   |
| 10. ... one or two <u>variables</u> applicable to ... | <b>l.</b> ensure realization<br><b>m.</b> things that are supposed to be true but have not been proved<br><b>n.</b> lens |

**III. Write true (T) or false (F) for each of the sentences below, according to the information given. If the information is not given, put a question mark (?).**

1. Engineering is putting together various parts in a new way to create value.
2. It is not recommended for an engineer to trust his intuition and check assumptions.
3. Whenever possible put yourself into situations where you have to solve problems on your own, give up the habit of dealing with textbooks only.
4. Any sensor is more powerful than the human system in many situations.
5. Any engineering idea should be verified in practice.
6. There shouldn't be any feedback between an engineer and a customer.

**IV. Match parts of the sentences in columns A and B.**

**Column A**

1. The problem you're solving had better be
2. The aim is to select from many possible solutions the one
3. The way an engineer follows five steps for solving problems determines
4. An engineer will learn whether the product is
5. A product may never be manufactured
6. It is challenging to build an engineering career
7. Universities seldom attempt to teach students
8. Many of the most important problems that a technical specialist must address
9. As your career and life progress
10. A major difference between a seasoned engineer and a starting engineer is their relative abilities.

**Column B**

- a. in this era of rapid technological, industrial and economic change.
- b. left in the hands of the purely engineering-minded persons.
- c. a customer's point of view.
- d. what it takes to have a successful engineering career.
- e. to identify the problems and details that need work and those that don't.
- f. are non-technical in nature.
- g. what you said it would be.
- h. the success or failure of his career
- i. that gives you the best results.
- j. there will be less and less time available for classes and training

**V. Read the text “What is Engineering?”. Which of the following sentences summarizes the idea of each paragraph better? Circle the letter of the correct statement.**

1. **A.** Engineering is solving problems and then documenting what you have done.  
**B.** Engineering is putting knowledge of Nature to practical use.  
**C.** Engineering is the science of building and controlling machines, ships, roads, etc.
2. **A.** The problem an engineer is solving should be defined from the customer’s point of view.  
**B.** Solving problems is an intuitive process.  
**C.** The problem an engineer is solving will probably not be a design problem but a manufacturing problem, a vendor supply problem, a quality problem, even a sales problem.
3. **A.** Do whatever it takes to let your intuition start working.  
**B.** There are parts of solutions everywhere: all you have to do is to find them and put them together.  
**C.** When you feel puzzled, one way to jump-start your intuition is to consider the problem on a scale you are comfortable with.
4. **A.** The best solution is the one that literally looks good.  
**B.** Starting the problem so that the solution is logical and desirable is likely to be as difficult as solving the problem.  
**C.** The aim is to select from many possible solutions the one that gives you the best result, the latter depending on what is most important in a given situation.
5. **A.** The best ideas have no value if you can’t effectively communicate them and sell them to a manufacturer.  
**B.** Few problems in the real world are as clean as those presented in textbooks.  
**C.** Most engineers don’t succeed because they don’t take enough initiative.

6. **A.** If an engineer pays attention to customers and incorporates their recommendations, he'll have a better product.
- B.** A guiding principle of an engineer may be "If you don't like the results you are getting, ask better questions and listen to what people say about your product."
- C.** An engineer will often see the original problem in a new perspective once a solution has been implemented.

**VI. Read the following paragraph about our rapidly evolving world. Fill in each blank with a suitable word from the box.**

industries, career, change (X2), fewer, introduction, progressed, compressing, skills, transition
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We live in a time of rapid change, and the rate of \_\_\_\_\_ is not likely to decrease. Fax machines, cellular phones, home offices and worldwide communications are \_\_\_\_\_ the time scales on which engineers work. Over the past five years, tens of thousands of technical people have made a \_\_\_\_\_ from the defense industry to the commercial sector, where the growth opportunities require a distinctly different set of \_\_\_\_\_. Over the past 20 years, students have \_\_\_\_\_ from slide rules to calculators, to computers, to engineering workstations. An engineer now approaching retirement age probably began his \_\_\_\_\_ about 44 year ago, when the number of computers in the world was \_\_\_\_\_ than 100. The semiconductor and optical \_\_\_\_\_ were in their infancies. During his career this person has seen the \_\_\_\_\_ of the laser, the proliferation of calculators and computers and a revolution in the telecommunication industry.

## 2. Use of English

### I. Match a line in A with the line in B to complete a sentence.

- | <b>A</b>   | <b>B</b>  |
|--|---|
| 1. Engineering is the process                      | <b>a.</b> on information that depended on observation.                          |
| 2. Our task consisted                              | <b>b.</b> to distinguish the real need from the perceived one.                  |
| 3. The purpose of engineering is                   | <b>c.</b> putting various parts in a new way to create value.                   |
| 4. Early branches of engineering were              | <b>d.</b> of using the forces and based materials of nature for the use of man. |
| 5. An engineer may use his know how                | <b>e.</b> to find practical application of scientific knowledge.                |
| 6. To define the problem is                        | <b>f.</b> solve the problem.  |
| 7. Even your intuition can help you                | <b>g.</b> in determining the solution that could give us the best results.      |
| 8. The engineer can solve many particular problems | <b>h.</b> in determining the best processes and equipment.                      |
| 9. Synthesis is                                    | <b>i.</b> take some initiative to implement the solution.                       |
| 10. If you want to succeed                         | <b>j.</b> by applying special problem solving methods.                          |

**II. Distribute the following words into nouns, adjective and adverbs and then fill in each gap with the suitable word.**

convenient, solution, responsibility, differently, applicable,  
discovery, constantly, assumption, practical, failure

Noun	Adjective	Adverb

1. Don't rely on this information, as it is pure \_\_\_\_\_.
2. The engineers have to study new developments in engineering \_\_\_\_\_.
3. It was a very \_\_\_\_\_ moment to discuss a new project.
4. New scientific \_\_\_\_\_ make work easier to do.
5. There were no simple \_\_\_\_\_ to this engineering problem.
6. Engineering education developed very \_\_\_\_\_ in Europe and the UK.
7. The previous solution is not \_\_\_\_\_ to this particular product itself.
8. An engineer has to take \_\_\_\_\_ for designing the product itself.
9. That new engineering project was a complete \_\_\_\_\_.
10. These results are of \_\_\_\_\_ use.

**III. Put the words in brackets into correct tense-forms.**

**John:** Mr. Smith, you \_\_\_\_\_ (be interested) in buying new equipment for our laboratory, \_\_\_\_\_ you?

**Mr. Smith:** Yes, I \_\_\_\_\_ (think) installing new equipment \_\_\_\_\_ (make) profit.

- John:** (be) it worth buying fully automatic equipment?
- Mr. Smith:** I am sure it is.
- John:** Well, I \_\_\_\_\_ (have) a happy chance to see the latest achievements in mechanical engineering.
- Mr. Smith:** Where \_\_\_\_\_ you \_\_\_\_\_ (see) them?
- John:** I \_\_\_\_\_ (visit) an exhibition which \_\_\_\_\_ (hold) last week and \_\_\_\_\_ (see) a new robot model in operation.
- Mr. Smith:** So I \_\_\_\_\_ (not be surprised) you (get interested) in it.
- John:** Yes, I \_\_\_\_\_ (impress) by its design. It \_\_\_\_\_ (introduce) into the market a year ago and since then it \_\_\_\_\_ (be) a great success.
- Mr. Smith:** What about installing?
- John:** I \_\_\_\_\_ (suppose) it \_\_\_\_\_ (not take) more than one week.

**IV. There is a mistake in each of the sentences. Find it and correct it.**

1. Some opportunities for improvement may not have been apparent in the beginning.
2. Young engineers are not accustom to real-world situations.
3. To find a proper way of solve an engineering problem you should know the customer's point of view.
4. You had better to bring a problem into a familiar medium.
5. The main objective is select the best solution from possible solutions.
6. It is very important to pay attention to things to see how do they work.
7. Try to do your contribution to achieving the goal.

**V. Read the text below and decide which answer A, B, C or D best fits each space.**

We <sup>1</sup> \_\_\_\_\_ define engineering <sup>2</sup> \_\_\_\_\_ the process of <sup>3</sup> \_\_\_\_\_ the forces and materials of nature <sup>4</sup> \_\_\_\_\_ certain practical results. This simple definition <sup>5</sup> \_\_\_\_\_ points out the difference <sup>6</sup> \_\_\_\_\_ science and engineering. “Engineering” <sup>7</sup> \_\_\_\_\_ from a Latin word <sup>8</sup> \_\_\_\_\_ “to produce”, later it <sup>9</sup> \_\_\_\_\_ to mean “to invent” and “skill”.

“Science” <sup>10</sup> \_\_\_\_\_ from Latin <sup>11</sup> \_\_\_\_\_, from a root meaning <sup>12</sup> \_\_\_\_\_.

The work of science is <sup>13</sup> \_\_\_\_\_ the boundaries of our <sup>14</sup> \_\_\_\_\_ of the laws of nature. The work of engineering is to find <sup>15</sup> \_\_\_\_\_ and <sup>16</sup> \_\_\_\_\_ applications <sup>17</sup> \_\_\_\_\_ that scientific knowledge <sup>18</sup> \_\_\_\_\_ the <sup>19</sup> \_\_\_\_\_ of <sup>20</sup> \_\_\_\_\_ welfare.

- |                 |               |              |               |
|-----------------|---------------|--------------|---------------|
| 1. A may        | B might       | C can        | D could       |
| 2. A as         | B to as       | C as to      | D as well as  |
| 3. A direction  | B directing   | C direct     | D directly    |
| 4. A achieving  | B achievement | C achieve    | D to achieve  |
| 5. A clear      | B clearly     | C clean      | D cleanly     |
| 6. A between    | B among       | C for        | D in          |
| 7. A derived    | B derive      | C is derived | D is deriving |
| 8. A meaning    | B means       | C mean       | D meant       |
| 9. A come       | B came        | C comes      | D is coming   |
| 10. A come into | B came from   | C come in    | D came in     |
| 11. A also      | B too         | C as well    | D as well as  |
| 12. A know      | B knowing     | C “to know”  | D known       |
| 13. A expend    | B to expand   | C to expend  | D expand      |
| 14. A knowledge | B knowleges   | C knowlege   | D knowledges  |
| 15. A useless   | B useful      | C use        | D used        |
| 16. A practice  | B practicable | C practical  | D practically |

17. A for            B in            C to            D at  
 18. A in            B for            C to            D at  
 19. A improvement B improving    C improving D improvement  
 20. A men's        B man's        C men        D man

### 3. Speaking

**I. Complete the following sentences using the ideas from the text:**

Engineering is ...

When solving a problem a person is supposed to ...

Defining the problem seems ...

The next step in problem solving is ...

Then you must select from many possible ...

The most important thing is ...

To verify the solution one must ...

The way we follow these five steps ...

**II. Retell the text. Choose 7-8 sentences which convey the main ideas of the text. While speaking use the following expressions:**

as has been said

in the same way

on the contrary

I can't agree with it

I quite agree

first of all

however

then

therefore

finally

**III. Discuss the motives and stimuli which make people work better.**

**a) Motives**

- the realization of a gap between the perceived need and the real need
- awareness of the unsatisfactory state of knowledge in the field of engineering

- wish to select from many possible solutions the best one and to find the best compromise between a whole bunch of conflicting demands
- desire to implement the solution: to act, to take responsibility for achieving the goal, for contributing to each aspect of it

**b) stimuli**

- praise
- a bonus payment
- a reward
- the feeling of satisfaction that one is doing something useful

**IV. Comment on the following:**

- The brain is a wonderful organ: it starts working the moment you get up in the morning and does not stop until you get into the office.
- Never take anything for granted.
- Nothing is so firmly believed as what we least know.
- All men are liable to error.
- Important principles may and must be flexible.
- Experience is the child of Thought and Thought is the child of Action.

## UNIT SIX

### Communicating with Media\*

#### COMMUNICATION TECHNOLOGIES

We are living in the age of swiftly changing and developing communication technology. Among these changes is an increasing use of rapid communication devices for both interpersonal and public communication.

New media of communication alter the communication process itself. Each new medium imposes special requirements on the ways in which messages are formulated; it controls the speed and convenience with which information is transmitted or recorded; and it influences ways in which receivers reconstruct meanings from the messages they receive. New media also lead to significant changes in the social, economic, and cultural features of society.

The telephone, along with associated devices such as answering machines and voice-mail networks, continues to be one of the most widely used and important media in our society. It is so familiar that people often fail to follow appropriate norms of usage – procedures that can make it a more effective means of communication. An old medium (fax) using long-distance lines has gained in popularity as a means of transmitting written messages quickly and inexpensively.

Increasing use is being made of computer networks of various sizes and complexities for the transmission of many categories of information. Electronic mail is typed into a sender's computer to be read on screen at his or her convenience. E-mail is very fast and convenient, and it is replacing slower, paper media for many purposes.

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\* Compiled from different sources.

Larger networks of computers linked together in local, national and international systems become now available and they are creating a quiet but profound communication revolution. It has already brought remarkable modifications in the ways by which people communicate in our society. An example is Internet which brings together 2000 other networks in 35 countries. People are able to exchange written messages more rapidly on a worldwide basis. With a 10-cm movement of your mouse and a click of a button you can jump from Australia to Europe in less time than it takes to read this paragraph.

With the various media by which we can communicate quickly and over large distances we must ask how these will have an influence on the human condition.

Will we be brought closer together or will the new communication technologies enable a minority of human beings to become information rich while the vast majority remains outside these systems and information poor?

## **1. Reading comprehension**

### **I. Read the text and write true (T) or false (F) for each of the sentences below according to the information given.**

1. One of the most widely used and important media in our society is a computer.
2. We live in a time of rapid change and revolution in communication technologies.
3. New communication media result in insignificant changes in the social, economic and cultural features of society.
4. Due to Internet people are provided with a point-and click connection to computer systems throughout the world.
5. The popularity of fax machines as a means of transmitting oral messages quickly and expensively has increased greatly over the past years.

6. Electronic mail is faster and more convenient than traditional slow paper media and is beginning to replace them.
7. New communication technologies will enable a lot of people to become information rich
8. Computer networks of various sizes and complexities for the transmission of many categories of information are being widely used nowadays.

**II. Match each underlined word in column A with its probable meaning in column B.**

**Be careful, there are some extra meanings in column B.**

**Column A**

**Column B**

- |  |                                  |
|--|----------------------------------|
| 1. We are living in an age of <u>swiftly</u> changing technologies.        | a. moderate                      |
| 2. New media of communication <u>alter</u> the communication process.      | b. method for giving information |
| 3. Each new medium <u>imposes</u> special part of requirements.            | c. increased                     |
| 4. ... in which <u>messages</u> are formulated.                            | d. quickly                       |
| 5. An old <u>medium</u> (fax) using... number or part of                   | e. the great number or           |
| 6. ... has <u>gained</u> in popularity...                                  | f. slowly                        |
| 7. They are creating a quiet but <u>Profound</u> communication revolution. | g. puts obligations on smth      |
| 8. With a <u>click</u> of a button you can jump.                           | h. the smaller                   |
| 9. ... technologies enable a <u>minority</u> of human beings to become...  | i. bits of information           |
| 10.... while the vast <u>majority</u> remains...                           | j. very deep                     |
|  | k. bang                          |
|  | l. slight short sound            |
|  | m. great                         |
|  | n. not extreme                   |
|  | o. change                        |

**III. Read the passage right through and then choose the best continuation for each of the following.**

1. We are living in an age
  - a. of fax machines, cellular phones, home offices and worldwide communications;
  - b. of quickly changing and developing communication technologies;
  - c. of transition from the defense industry to the commercial sector.
2. Telephone is an instrument
  - a. of transmitting the sound of the voice by electricity;
  - b. for making copies of documents and sending them down telephone lines to another place;
  - c. for sending information from one computer down telephone lines to another computer.
3. New media of communication lead to
  - a. Translation from visual language into a verbal language, much as a foreign-born person thinks in his native tongue and then translates in his mind before speaking in English;
  - b. Significant changes in the social, economic and cultural features of society;
  - c. a quiet but profound communication revolution.
4. Fax machine is a means of
  - a. transmitting written messages quickly and inexpensively;
  - b. copying documents and sending them down telephone lines to another place;
  - c. recording moving pictures and sound.
5. Electronic mail is
  - a. typed into a sender's computer to be read on screen at his or her convenience;
  - b. the government system of carrying and delivering letters;
  - c. beginning to replace paper media as it is very fast and more convenient.

6. With the various media
  - a. we can communicate quickly and over large distances;
  - b. a minority of people is sure to become information rich;
  - c. a majority of people is certain to become information poor.

**IV. Which of the following sentences summarizes the idea of the paragraph better. Choose the correct statement.**

1.
  - a. Rapid change in communication technologies brings about unlimited opportunities for people.
  - b. An increasing use of rapid communication devices for both interpersonal and public communication is a vivid manifestation of communication technology progress.
  - c. We live in a time of rapid technological, industrial and economic changes.
2.
  - a. The telecommunication industry provides the equipment needed for sending messages by radio, telegraph, cable and telephone.
  - b. New media of communication change the communication progress itself.
  - c. New media of communication result in significant changes in the social, economic and cultural features of society.
3.
  - a. The telephone together with associated devices such as answering machines and cellular phones, faxes and modems continues to be one of the most widely used and important media in our society.
  - b. Fax machines and pagers are more effective means of communication than a telephone.
  - c. Fax is an extremely popular machine nowadays as it makes copies of documents and sends them down telephone lines to another place quickly and inexpensively.
4.
  - a. Computer networks of various sizes and complexities reach very large numbers of people at present.

- b. Due to the advantage of E-mail, it is beginning to replace the traditional slower media of information transmission.
- c. Computer networks are being widely used for the transmission of many categories of information.

**V. Read the paragraph about computers – one of the most important means of communication. Fill in each gap with the appropriate word given in the box.**

hands, tubes, kinds, development, replaced, due, calculations, computer, devices, today, boom, faster, example, had, known, these

Computers may have a short history but prior to their \_\_\_\_\_, there were many other ways of doing \_\_\_\_\_. these calculations were done using \_\_\_\_\_ that are still used \_\_\_\_\_; the slide rule being a perfect \_\_\_\_\_, not to mention the ten fingers of the \_\_\_\_\_. These machines, unlike computers, are non-electronic and were \_\_\_\_\_ by faster calculating devices. It wasn't until the mid-1940s that the first digital \_\_\_\_\_ was built. The post-war industrial \_\_\_\_\_ saw the development of computers take shape. By the 1960s, computers were \_\_\_\_\_ than their predecessors and semiconductors \_\_\_\_\_ replaced vacuum \_\_\_\_\_ which were replaced in a few years by tiny integrated circuit boards. \_\_\_\_\_ To microminiaturization in the 1970s, \_\_\_\_\_ circuits were etched onto wafer-thin rectangular pieces of silicon. This integrated circuitry is \_\_\_\_\_ as a chip and is used in microcomputers of all \_\_\_\_\_.

## 2. Use of English

Match the line in A with a line in B from word combinations and use them in sentences below.

A	B
telephone	communication
storage	media
computer	journalists
information	transmissions
communication	systems
message	society
long-distance	talkers
on-line information	networks
face-to-face	services
broadcast	lines

1. Now we are evolving from an industrial society to an \_\_\_\_\_.
2. Today we have become a nation of very frequent \_\_\_\_\_.
3. The analysts of the new \_\_\_\_\_ saw that the world was becoming what they called a “global village”.
4. Letters still remain the medium of choice for many kinds of \_\_\_\_\_.
5. Today people use vast \_\_\_\_\_ to communicate back and forth at speeds 20 times faster than the original system.
6. The telephone \_\_\_\_\_ are one of our most important media.
7. Of increasing importance are various \_\_\_\_\_ provided for organizations and individuals by some firms.
8. These \_\_\_\_\_ replace the old idea of file cabinets with folders of correspondence.
9. Video conferencing provides the closest approximation to \_\_\_\_\_.
10. These \_\_\_\_\_ frequently present groups of several individuals discussing a current issue.

**I. Complete the sentences using appropriate conjunctions or prepositions from the box.**

either...or, without, through, because of, since, both...and, although, via, despite, from
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1. Information is passed \_\_\_\_\_ the network in “packets”.
2. \_\_\_\_\_ their obvious advantages sometimes things go wrong with super networks.
3. \_\_\_\_\_ these characteristics it can be seen that e-mail has great advantages.
4. Even a photograph can be sent \_\_\_\_\_ phone lines.
5. \_\_\_\_\_ computers and software are not cheap, network e-mail saves labour cost.
6. Now we can dial directly \_\_\_\_\_ being connected to a wire system.
7. This technology has come into very wide use \_\_\_\_\_ 1999.
8. \_\_\_\_\_ these speed and cost advantages fax is the most effective way of transmitting printed messages
9. \_\_\_\_\_ the telegraph \_\_\_\_\_ the telephone changed many features of communication process.
10. Electronic mail can \_\_\_\_\_ be read immediately \_\_\_\_\_ stored in a computer.

**II. There is a mistake in each of the sentences. Find it and correct it.**

1. Networks obviously vary greatly in size and complex.
2. Almost all will be affect by the communication technologies in the future.
3. Answering machines are becoming increasing adopted for both business and home use.
4. The new mean of communication served many users.

5. The basic instrument and technology by which we telephone each other has been invented in 1875.
6. Only one addition step was needed to create a new medium of communication.
7. One of the most commonly using applications is electronic mail.
8. They include not only tradition written media but modern electronic systems.
9. People which use electronic mail sometimes assume their messages can be carelessly composed.
10. Another problem with this media is that it is not total private.

**III. Read the text below and decide which answer best fits each space. Choose your answer.**

What lessons <sup>1</sup> \_\_\_\_\_ by our brief look back <sup>2</sup> \_\_\_\_\_ that history? We <sup>3</sup> \_\_\_ now in a period of accelerating change <sup>4</sup> \_\_\_\_\_ communication media. It <sup>5</sup> \_\_\_\_\_ changes ever <sup>6</sup> \_\_\_\_\_ sweeping <sup>7</sup> \_\_\_\_\_ those of <sup>8</sup> \_\_\_\_\_ 19<sup>th</sup> century. <sup>9</sup> \_\_\_\_\_ the 21<sup>st</sup> century our ability <sup>10</sup> \_\_\_ with each other <sup>11</sup> \_\_\_\_\_ to a degree that <sup>12</sup> \_\_. The specific ways <sup>13</sup> \_\_\_ which this <sup>14</sup> \_\_\_\_\_ all of us, both <sup>15</sup> \_\_\_\_\_ and <sup>16</sup> \_\_\_\_\_ are difficult <sup>17</sup> \_\_\_\_\_. But <sup>18</sup> \_\_\_\_\_ thing is certain: our <sup>19</sup> \_\_\_\_\_ will be different than <sup>20</sup> \_\_\_\_\_ are now.

- |                       |                 |                   |                   |
|-----------------------|-----------------|-------------------|-------------------|
| 1. A can be           | B is drawn      | C can to be       | D can drawn drawn |
| 2. A to               | B at            | C in              | D through         |
| 3. A live             | B is living     | C are living      | D lived           |
| 4. A at               | B of            | C in              | D to              |
| 5. A will bring about | B will bring to | C will bring back | D will bring down |
| 6. A much             | B less          | C more            | D many            |
| 7. A then             | B than          | C to              | D through         |

- |                         |                       |                      |                            |
|-------------------------|-----------------------|----------------------|----------------------------|
| 8. A a                  | B the                 | C an                 | D –                        |
| 9. A for                | B through             | C since              | D during                   |
| 10. A commu-<br>nicate  | B to commu-<br>nicate | C communi-<br>cating | D communi-<br>cation       |
| 11. A grow              | B grows               | C is growing         | D will grow                |
| 12. A has               | B has never           | C has before         | D has never                |
| 13. experienced         | experienced           | experienced          | before been<br>experienced |
| 14. A in                | B to                  | C of                 | D at                       |
| 15. A will be           | B influence           | C will               | D influenced               |
| 16. influenced          |                       | influence            |                            |
| 17. A collective-<br>ly | B colectively         | C collective         | D collectives              |
| 18. A individual        | B individually        | C                    | D individuals              |
|                         |                       | individually         |                            |
| 19. A forecast          | B forecasting         | C to forecast        | D to forcast               |
| 20. A one               | B first               | C a                  | D the                      |
| 21. A life              | B lives               | C live               | D lifes                    |
| 22. A they              | B them                | C their              | D theirs                   |

### 3. Speaking

I. Look at the following adjectives. Use as many of them as possible to describe these means of communication:

- a) e-mail
- b) cellular phone
- c) fax

(in)convenient	modern	practical
dangerous	harmful	casual
annoying	expensive	fashionable
reliable	posh	unpleasant
fast	ordinary	loud
safe	cheap	international

**Make up a short description (5-6 sentences) of each of the above mentioned inventions.**

II. Discuss with your friend the most widely used means of communication. When making up a conversation you may use these questions as starting points:

- a) Which means of communication do you frequently use and why?
- b) Which means of communication would you like to have?
- c) Which do you think is the most convenient and reliable?
- d) What means of communication will prevail in the 21<sup>st</sup> century? Which one will be of primary importance? What is your point of view?

**III. Divide into two groups. The item under discussion is: “Should cellular phones be banned in public places?” Each group has an opposite point of view on the problem discussed. In the table below you may find some hints to support different points of view. Each group should present as many arguments as possible in order to confirm their point:**

FOR	AGAINST
<ol style="list-style-type: none"> <li>1. a great opportunity to get urgent information</li> <li>2. with a cell phone one looks posh and up-to-date</li> <li>3. cell phone is the main means of communication in the 21<sup>st</sup> century</li> </ol>	<ol style="list-style-type: none"> <li>1. cell phones are harmful for health (they influence brain cells)</li> <li>2. it is unpleasant to sit in a public place and listen to other people’s phone calls</li> <li>3. it’s irritating to hear ringing all the time</li> </ol>

### **3. Reading and Writing**

#### **1. Read the text.**

Teleworking includes the whole range of work activities, all of which mean working remotely from an employer or normally expected place of work. Such work generally includes the electronic processing of information, the results of which are sent to the employer, usually by a telecommunications link.

The advances in the computer technology since the early 1960s gave a lot of opportunities for people working in this field. They are typically computer professionals, such as system analysts and programmers, who can work at home. And teleworking is perfect for them. Some parts of Britain are isolated from the rest of the country and teleworking was introduced in order to overcome the problem of rural isolation. British Telecom is supporting the development of such

telecommunication centers in Derbyshire and the Highlands and islands of Scotland.

Not all jobs are suitable for teleworking. The jobs that depend on personal 'face-to-face' contact or need 'hands on' operation cannot be done by a teleworker. This includes jobs such as receptionist, counter clerk and makers of goods that require complex machinery to produce. Jobs suitable for teleworking are mostly those that are connected with the handling, processing and transforming of information. In Britain the number of people employed in this type of information intensive job is growing significantly from day to day.

The main advantage to teleworkers is that less time, money and effort are spent on travelling to and from the workplace. It provides a wider choice of areas to live if the job is not connected with a certain geographical area. The flexibility that teleworking will give you with working hours is a great advantage for parents with young children. It can also be attractive for those who care for elderly or disabled relatives. Retired people may also use teleworking as a way of working part-time.

**You've just read about teleworking. Please write a short essay, expressing your personal opinion about the phenomenon of teleworking. Is it widely spread in your country? Do you think you will be teleworking in future? Why/why not?**

## UNIT SEVEN

### Domestic Buildings\*

#### THE HOUSE

Man has always been a builder. The kind of house he built depended upon the climate, upon his enemies, and upon the building materials at hand. The first houses in many parts of the world were made of wood. Men tied together the tops of several trees and covered them with the skins of animals or with leaves and grass.

In other regions the most convenient building material was stone. Men began building houses out of stone very long ago. Although they were built without cement, the remains of a few of them still exist.

The ancient Egyptians built very simple houses by present standards. Having dried the bricks in the sun, they put up four walls, and above these they placed a flat roof. The roof was flat because there was very little rain in Egypt. Although their buildings were simple in construction, the Egyptian art of building was very beautiful. An important part in the history of building has been played by the column, and it was ancient Egypt that gave the world its first lessons in the art of making columns.

The Greeks learned much from Egypt. But they did not borrow the flat roof. They built a slanting roof because there was much rain in their country. They also improved on Egypt's columns and soon became the teachers of the world in column making.

The Romans, in turn, learned much from the Greeks. First of all they borrowed the slanting roof and the columns. But they added the arch, thus adding much strength and beauty to their buildings.

In the Middle Ages many monarchs and nobles built castles as a form of defence. Those castles had very strong walls, narrow windows and projecting fortifications.

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\* Compiled from different sources.

During the Renaissance arts and sciences underwent great changes. In architecture these changes were marked by a return to classical forms and proportions of ancient Roman buildings.

The buildings of the 19<sup>th</sup> century are characterized by the use of new materials and by a great diversity of architectural styles. From the end of the 18<sup>th</sup> century iron and steel became widely used as alternatives to wood, for by that time many countries experienced shortage of this material.

The 20<sup>th</sup> century is notable for widespread use of steel-reinforced concrete. Huge reinforced concrete units are brought to the site which becomes something like an assembly shop. This technique has many advantages over other building methods. It cuts the labour needed for building by 60 to 70% and extends the building season.

The architecture of the 20<sup>th</sup> century is characterized by very high buildings – particularly skyscrapers – and by great diversity of styles which completely differ from those of the past.

## 1. Reading Comprehension

**I. Read the text attentively. There are 10 paragraphs in it. Match an appropriate title with the corresponding paragraph and write the correct number in each box. One title is an odd one.**

- A.  New methods and new materials
- B.  Iron and steel as alternatives to wood
- C.  Egyptian pyramids
- D.  Stone as a building material
- E.  Variety of styles in architecture
- F.  The slanting roof
- G.  Houses of primitive people
- H.  Ancient Egypt
- I.  Return to classical forms and proportions
- J.  The followers in column making
- K.  Castles as a form of defence

**II. Read the text and choose the right continuation of the sentences.**

- |   |   |
|---|---|
| 1. The roof was flat  | a. by a great diversity of styles in architecture.                            |
| 2. Castles had very strong walls, narrow windows and projecting fortifications    | b. because there was much rain in Greece.                                     |
| 3. They built a slanting roof   | c. because many countries experienced shortage of wood.                       |
| 4. From the end of the 18 <sup>th</sup> century iron and steel became widely used | d. for reducing the labour needed for building by 60 to 70%                   |
| 5. The 20 <sup>th</sup> century is notable  | e. because there was very little rain in Egypt.                               |
| 6. Great changes in architecture were marked                                      | f. for widespread use of reinforced concrete.                                 |
| 7. This technique has many advantages over other building methods                 | g. as they were built as a form of defence.                                   |
| 8. Buildings of the 19 <sup>th</sup> century are characterized                    | h. by a return to classical forms and proportions of ancient Roman buildings. |

### **III. Choose the correct answer to the following questions.**

- 1.** What were the first primitive houses made of?
  - a.** They were made of tied together tops of several trees, covered with the skins of animals or with leaves and grass.
  - b.** They were made of stone without cement.
  - c.** They were made of the building materials at hand.
- 2.** What were the method of house building in ancient Egypt?
  - a.** The Egyptian art of building was very beautiful.
  - b.** The Egyptian method of house building involved drying of bricks in the sun, putting up four walls and covering them with a flat roof.
  - c.** The ancient Egyptians built very simple houses by present standards.
- 3.** The builders of what country were the world teachers in column making?
  - a.** The Egyptians gave the world the first lessons in the art of making columns.
  - b.** The Romans added much strength and beauty to the building of columns.
  - c.** The Greeks were the teachers of the world in column making.
- 4.** What period in European history was marked by a return to Roman architecture?
  - a.** The Renaissance was characterized by a return to classical forms and proportions of ancient Roman architecture.
  - b.** The Middle Ages were marked by the necessity of building castles as a form of defence.
  - c.** The period of the Industrial Revolution was marked by the usage of new materials and a great variety of architectural styles.
- 5.** What was the 20<sup>th</sup> century remarkable for?
  - a.** It was remarkable for widespread use of reinforced concrete.



- b. When did arts and sciences undergo great changes?
  - c. Why did arts and sciences undergo great changes during the Renaissance?
4. The Romans invented the arch thus adding much strength and beauty to their buildings.
- a. What architectural detail brought more strength and beauty to their buildings of the Romans?
  - b. What did the Romans invent to add more strength and beauty to their buildings?
  - c. Did the arch add much strength and beauty to the Roman buildings?
5. The architecture of the 20<sup>th</sup> century is marked by great diversity of styles different from those of the past.
- a. What is the architecture of the 20<sup>th</sup> century marked by?
  - b. Why is the architecture of the 20<sup>th</sup> century different from that of the previous centuries?
  - c. What makes the architecture of the 20<sup>th</sup> century look different from that of the previous centuries?
6. Many monarchs and nobles built castles as a form of defence.
- a. What were the castles built for in the Middle Ages?
  - b. Why did many monarchs and nobles build castles?
  - c. Did the rich people build castles as a form of defence or attack?

**V. Read the following paragraphs about the stones of pyramids. Fill in each blank with a suitable word from the box.**

need, hours, construction (x2), took, equipment,  
Egyptians, cut, made, stones

The Egyptians pyramids are huge structures which are almost 4600 years old. The Pyramid of Cheops consists of 2300000 stones. Each of the \_\_\_\_\_ weighs 2.5 tonnes.

According to the usual explanation large blocks of stone were \_\_\_\_\_ in the mountains and then transported with the help of the most primitive \_\_\_\_\_. So about 100 thousand people had to take part in the \_\_\_\_\_.

But the modern experiments show that the stones of pyramids were \_\_\_\_\_ synthetically. The \_\_\_\_\_ produced some special solution. Later they mixed it with one of the minerals. It \_\_\_\_\_ them several \_\_\_\_\_ to transform this mixture into very hard rock. This rock was produced just on the \_\_\_\_\_ sites and so there was no \_\_\_\_\_ of transporting heavy stones.

**VI. Read the following passage about the house. Write true (T) or (F) for each sentence, according to the information given. If the information is not given, put a question mark?**

1.  Wood and stone were the most popular and convenient building materials in the ancient time.
2.  Castles defended their inhabitants as they had very strong walls, narrow windows and projecting fortifications.
3.  The experiments show that the stones of pyramids were not transported to the construction sites.
4.  Egypt was rich in stone, brick, wood, steel and concrete.
5.  The Greeks preferred building a slanting roof to a flat one because of the rainy weather in their country.
6.  The building process becomes less expensive and laborous due to the usage of reinforced concrete units being assembled at a site.
7.  Skyscrapers can be called one of the symbols of the 20<sup>th</sup> century architecture.
8.  There have been few architectural styles in the past and there are even less today.

## 2. Use of English

### I. Match a part in A with a part in B to complete the sentences.

#### A

1. The best properties of concrete and steel combined together
2. Stone and wood were the first building materials
3. Being rich in hard and durable stone
4. Designing a building an architect
5. The column improved by the Greeks
6. Having added an arch to the slanting roof the columns
7. The slaves were erecting monuments, sphinxes and palaces
8. The results received
9. The new technique developed
10. The 20<sup>th</sup> century is notable

#### B

- a. using the most primitive equipment and working for thirty or forty years.
- b. made the building process less expensive.
- c. result in reinforced concrete.
- d. changed with the materials used.
- e. used by man.
- f. for its very high buildings made of reinforced concrete.
- g. became the principal element of a building.
- h. should be aware of its function.
- i. the Romans strengthened the building.
- j. Egypt used it as the main construction material.

**III. Complete the sentences using the prepositions from the box**

for, among, because of, to, since, from, of,  
during, into, through

1. \_\_\_\_\_ the beginning of use of concrete designers tried to increase its strength.
2. The problem of transportation is the most important one \_\_\_\_\_ the whole period of construction.
3. It takes some months to build a structure \_\_\_\_\_ prefabricated elements.
4. The concrete quality was unsatisfactory \_\_\_\_\_ great amount of water.
5. Many of today's structures have been made possible \_\_\_\_\_ new developments in building materials and methods.
6. There are no structural limits \_\_\_\_\_ the potential height of buildings.
7. The new material is unique \_\_\_\_\_ all buildings materials.
8. Modern buildings can be divided \_\_\_\_\_ some types.
9. The whole structure was made \_\_\_\_\_ reinforced concrete.
10. This system was selected \_\_\_\_\_ the main concreting works.

**IV. Fill in the gaps with ten suitable derivatives of the word given on the right.**

1. The \_\_\_\_\_ of modern structures is changing.      appear
2. The quality of concrete has increased \_\_\_\_\_ in the last decade.      consider
3. Concrete strength is connected with its \_\_\_\_\_.      durable
4. The first houses were made \_\_\_\_\_ of wood.      particular

5. These columns formed a single \_\_\_\_\_ shape.      cylinder
6. Light-weight concrete occupied an important role      structure  
in \_\_\_\_\_ engineering.
7. Plastics are used for the \_\_\_\_\_ of entirely      develop  
new uses.
8. A \_\_\_\_\_ uses a number of standardized      build  
concrete units to save time.
9. Several materials were used as \_\_\_\_\_.      reinforce
10. This new technique should be very \_\_\_\_\_.      advantage

**V. There is one mistake in each of the sentences. Find it and correct it.**

1. The main building material are wood, stone, concrete and reinforced concrete.
2. On of the essential property of concrete is its strength.
3. They used a concrete beam instead a wooden one.
4. Great attention is given prefabrication at present.
5. If steel introduced into concrete, it changes its properties.
6. Have a high compressive strength concrete is a very important building material.
7. Properly using these plastics can give an interesting decorative effect.
8. These operations are carried out simultaneous.
9. Beams measurements had be taken immediately.
10. Properties of concrete is greatly affected by temperature.

**VI. Read the text below and decide which answer A, B, C or D best fits each space.**

Concrete is the name of artificial stone. The materials from which concrete <sup>1</sup> \_\_\_\_\_ are sand, pieces of <sup>2</sup> \_\_\_\_\_ stone and cement <sup>3</sup> \_\_\_\_\_ with water in <sup>4</sup> \_\_\_\_\_ proportions. These materials <sup>5</sup> \_\_\_\_\_ called ingredients of concrete. The sand and broken stone <sup>6</sup> \_\_\_\_\_ the skeleton of concrete. Dry cement is an inert powder, but <sup>7</sup> \_\_\_\_\_ the addition of water a chemical reaction <sup>8</sup> \_\_\_\_\_.

This causes the whole mix <sup>9</sup> \_\_\_\_\_ and harden <sup>10</sup> \_\_\_\_\_ a solid mix.

Water <sup>11</sup> \_\_\_\_\_ in concrete mix is ordinary drinking water. It <sup>12</sup> \_\_\_\_\_ be free from <sup>13</sup> \_\_\_\_\_ impurities. The amount of water <sup>14</sup> \_\_\_\_\_ influences the properties of concrete. Concrete products must be manufactured <sup>15</sup> \_\_\_\_\_ existing standards. <sup>16</sup> \_\_\_\_\_ component materials builders must be <sup>17</sup> \_\_\_\_\_ familiar <sup>18</sup> \_\_\_\_\_ technology of concrete and use <sup>19</sup> \_\_\_\_\_ in <sup>20</sup> \_\_\_\_\_ proportions.

- |                |            |                |              |
|----------------|------------|----------------|--------------|
| 1. A is formed | B formed   | C forming      | D has formed |
| 2. A broke     | B broken   | C being broken | D breaking   |
| 3. A mixed     | B mixing   | C being mixed  | D have mixed |
| 4. A suit      | B suitable | C suitably     | D suiting    |
| 5. A is        | B was      | C are          | D were       |
| 6. A form      | B forms    | C formed       | D has formed |
| 7. A in        | B at       | C on           | D upon       |

8. A takes place    B take place    C is taking place    D has taken place
9. A set    B setting    C to set    D to sit
10. A formed    B forming    C being formed    D having formed
11. A used    B using    C being used    D having used
12. A can    B must    C has    D should
13. A any    B some    C no    D many
14. A adding    B added    C being added    D having added
15. A in accordance with    B in accordance    C according    D accordance with
16. A chosen    B having chosen    C choosing    D being chosen
17. A well    B good    C better    D best
18. A to    B with    C in    D of
19. A them    B it    C its    D their
20. A correctly    B corect    C correct    D correcting

### 3. Speaking

**I. Which of the following adjectives can be used to describe a) a skyscraper; b) an ancient castle; c) a fortress; d) a cathedral.**

tall	simple	old-fashioned
modern	unique	narrow
tiny	mighty	firm
impressive	classical	mediocre
exciting	urban	bright
straight	ordinary	outstanding

Choose any 5 of the adjectives from this list and make up a short (5-6 sentences) story about one of the following houses using the adjectives you've just chosen:

- 1) The Louvre in Paris
- 2) The White House in Washington DC
- 3) Buckingham Palace in London
- 4) The pyramids of Egypt in Giza
- 5) Reichstag in Berlin

**II. Explain the difference between:**

- 1) a hut and a tent;
- 2) a castle and a palace;
- 3) a skyscraper and a house;
- 4) an apartment and a villa.

**III. Divide into two groups. One group is for living in flats or apartments in the city, and the other – for living in a private house out of the city. Please, try to provide as many advantages of living in this or that place, as possible. These hints may help you:**

<b>Advantages of living in the apartment</b>	<b>Advantages of living in the house</b>
1) all modern conveniences and comfort	1) fresh air and quietness
2) not too much space – can spend less time cleaning	2) more space – you don't feel suppressed by four walls
3) everything is near the house: multiple service establishments, places of entertainment, etc.	3) you can enjoy spending time in your town garden or by the pool

#### **4. Reading and Writing**

##### **1. Read the following passage from a newspaper article.**

(...) Japanese architects are working on cities where everyone will live below the ground in the light of day. Sunlight will be collected and piped to where it is needed. This is already available in some office buildings in Tokyo but workers find the rooms boring, because they have no view. The people living in a two-kilometre-high city, like the 500-storey buildings which is planned for the centre of Tokyo, will have a view. They will also have parks and recreation areas, as well as super-fast lifts to take them above the clouds (...).

**Write a short composition entitled “My life in the 21<sup>st</sup> century”. Pay special attention to the building you are going to live/work in.**

## **UNIT EIGHT**

### **Metals**

#### **METALS IN PERSPECTIVE**

Man has always tried to improve his standard of living by changing his surroundings and by making tools to simplify the everyday tasks necessary for his existence. At first, the only materials he could use were those he could see around him - stone, wood and so on. He survived in competition with other animals because of his abilities with his hands and their coordination with his brain. Because he did not have the strength and speed of some animals, his survival depended on his skilful use of tools to get food and to keep him warm and safe.

Since the Stone Age, man has found many more materials that he can work with to his advantage. His ingenuity has led him to discover the potential of many natural products. However, the materials that helped him most to develop were the metals. Their characteristics of strength coupled with the ease with which they can be shaped made metals of vital importance in the technology of the past. The exploitation of other properties, such as electrical and thermal conductivity, made it possible to develop high technologies appropriate to the fields of space travel, communications and nuclear engineering.

The first metals which man discovered were copper and gold, because they occur naturally in the pure state. They were used because they could be shaped easily, gold being specially soft. The discovery that copper could be obtained in sufficient quantities for beating into vessels and weapons was an important step in the use of metals, but the discovery that copper ore would produce copper was probably accidental. Perhaps a block of ore was used in a pottery kiln, and the metal was found after the fire had cooled.

Copper had been smelted and used for two thousand years before the potential of iron became evident. In the course of smelting activities, no doubt iron ores and the substance resulting from smelting them were encountered.

## 1. Reading Comprehension

### I. Read about metals and choose the right continuation of the sentences.

- |  |  |
|--|--|
| 1. The usage of metal properties such as electrical and thermal conductivity | a. to discover that copper could be obtained in quantities sufficient for the production of goods and weapons. |
| 2. Man's inventiveness has led him   | b. the metal being found after the fire had cooled.  |
| 3. Strength coupled with the simplicity with which metal can be shaped       | c. made it possible to develop high technologies.  |
| 4. An important step in the use of metals was gained with the opportunity    | d. made metals important for the technology of the past.   |
| 5. A block of copper ore might be used in a pottery kiln,                    | e. by making tools to simplify the everyday tasks necessary for his existence.                                 |
| 6. Iron ore is sure to produce iron  | f. the latter being specially soft.  |
| 7. Copper and gold could be shaped,  | g. to discover the potential of many natural products.   |
| 8. Man has always tried to improve his way of living                         | h. in the course of smelting, activities.  |

**II. Read the text about metals and guess the meaning of unknown words. Match each underlined word in column A with its probable meaning in column B. Be careful, there are some extra meanings in column B.**

**Column A**

**Column B**

- |   |                         |
|---|-------------------------|
| 1. Man <u>survived</u> in competition with other animals...   | a. helpful              |
| 2. His survival depended on his <u>skilful</u> use of tools.  | b. clever               |
| 3. His <u>ingenuity</u> has led him to discover the potential of many natural products.                       | c. ignorance            |
| 4. The exploitation ... made it possible to develop high technologies <u>appropriate</u> to the fields of ... | d. to meet face to face |
| 5. The discovery that copper could be obtained in <u>sufficient</u> quantities was an important step...       | e. remained alive       |
| 6. Perhaps a block of ore was used in a pottery <u>kiln</u> .   | f. melted               |
| 7. Copper has been <u>smelted</u> and used ...  | g. to run across        |
| 8. ... iron ores and the substance resulting from smelting them were <u>encountered</u>                       | h. to separate          |
|   | i. corresponding        |
|   | j. suitable             |
|   | k. furnace for burning  |
|   | l. cleverness and skill |
|   | m. enough               |
|   | n. met unexpectedly     |

**III. Choose an appropriate question to the corresponding statement. Circle the correct answer.**

1. Man has always tried to improve his standard of living by making tools.
  - A. Who has always tried to improve his standard of living?
  - B. Why has man always tried to improve his standard of living?
  - C. How has man always tried to improve his standard of living?
2. Man survived in competition with other animals because of his physical and mental abilities.
  - A. What helped man to survive in competition with other animals?
  - B. Did man survive in competition with other animals because of his physical or mental abilities?
  - C. Why did man survive in competition with other animals?
3. Since the Stone Age man has found many materials that he can work with to his advantage.
  - A. Since when has man found many materials that he can work with to his advantage?
  - B. What was the number of materials man has found since the Stone Age?
  - C. What sort of materials has man found since the Stone Age?
4. The exploitation of metal properties such as electrical and thermal conductivity made it possible to develop high technologies.
  - A. Did the exploitation of metal properties make it possible to develop high technologies?
  - B. Which metal properties permitted to develop high technologies?
  - C. How did the exploitation of metal properties promote the development of high technologies?

5. Copper and gold occur naturally in the pure state.
  - A. In what state do copper and gold occur in nature?
  - B. What metals occur naturally in the pure state?
  - C. Do copper and gold occur in the ores or in the pure state?
6. The discovery that copper ore would produce copper was probably accidental.
  - A. What kind of discovery was probably accidental?
  - B. Was the discovery that copper ore would produce copper accidental or not?
  - C. Why was the discovery that copper ore would produce copper accidental?

**IV. Choose the correct answers to the following questions.**

1. How did people of the Stone Age manage to survive?
  - A. They survived in competition with other animals.
  - B. They survived due to the skilful use of tools to get food and to keep them warm and safe.
  - C. They survived because of their mental and physical superiority over other animals.
2. What were the materials that helped people of the Stone Age most to develop?.
  - A. The only materials that helped them were those they could see around them - stone, wood and so on.
  - B. The materials that helped them most to develop were the metals.
  - C. The materials that helped them were those they could work with to their advantage.
3. What properties of metals were very important for the technology of the past?
  - A. Strength and toughness of metals were very important for the technology of the past.
  - B. Strength and fluidity of metals were very important for the technology of the past.
  - C. Hardness and corrosion resistance of metals were of vital importance in the technology of the past.

4. Why did man pay particular attention to copper and gold in the past?
  - A. Because other metals could be rarely found in the pure state in nature.
  - B. Because they could be found in the pure state in nature.
  - C. Because copper is the only red metal and gold is the only yellow one as compared to most of the metals which are silvery white or grey in colour.
5. Why is it sometimes an advantage for metal to be soft?
  - A. It can be shaped easily.
  - B. It can be machined more easily.
  - C. It can withstand high temperatures.
6. When did the potential of iron become evident to people?
  - A. It became evident when people discovered iron ores and ways of producing iron.
  - B. It became evident long after copper had been smelted and used.
  - C. It became evident when people realized how to extract, produce and treat it at their advantage.

**V. Write true (T) or false (F) for each of the sentences below, according to the information given. If the information is not given, put a question mark (?).**

1.  Due to his mental and physical abilities man could survive: in competition with other animals.
2.  Man was very inventive in discovering the materials which could help him to develop.
3.  The main advantage of metals was their strength and toughness.
4.  Methods of extracting, producing and treating metals are being developed all the time to meet engineering requirements.
5.  Pure metals can never be found in nature.

6.  Natural combinations of metals containing various impurities are known as ores.
7.  Metallic ores can be recovered from the earth in many ways.
8.  Pig iron is smelted from iron ores in blast furnaces.
9.  The discovery that copper ore would produce copper was probably unexpected.
10.  Both pure metals and their alloys are produced from ores at metallurgical plants.

**VI. Read the following paragraph about the improvement of metal properties. Fill in each gap with the appropriate word given in the box.**

treatment, temperature, brittle, kind, harder, the, are, example, materials, to, cooling, metal, which, obtain, machined

The properties of a metal can be further improved by use of heat \_\_\_\_\_. Heat treatment is the term given \_\_\_\_\_ a number of different procedures in \_\_\_\_\_ the properties of metals and alloys \_\_\_\_\_ changed. It usually consists of heating \_\_\_\_\_ metal or alloy to a selected \_\_\_\_\_ below its melting point and then it at a certain rate to \_\_\_\_\_ those properties which are required. For \_\_\_\_\_, hardening is used to make metals \_\_\_\_\_. Tempering makes them softer and less \_\_\_\_\_. Annealing is carried out to make a \_\_\_\_\_ soft so that it can be \_\_\_\_\_ more easily. In this way, metallic \_\_\_\_\_ can be produced to meet every \_\_\_\_\_ of engineering specification and requirement.

## 2. Use of English

### I. Choose the suitable question to the following sentences.

1. The main advantage of metals is their strength and toughness.
2. Copper can be easily pressed into a new shape.
3. Because they offer the required strength and other properties.
4. The properties of a metal can be further improved by using different methods of treatment.
5. Hardening is used to make metals harder.
6. Copper is a very good conductor of electricity.
7. There are two kinds of engineering materials: metals and non-metals.
8. Copper and gold are examples of metals and plastics and ceramics are examples of non-metals.
9. Different engineering products are made of both metals and non-metals.
10. Material engineering refers to designing and making new materials.

### II. Match the parts in A with the parts in B to complete the sentences.

- | A  | B   |
|--|---|
| 1. We know new materials                 | a. to paint metals.   |
| 2. The dissimilar metals are not allowed | b. to be widely used in industry.                                 |
| 3. The properties of steel enable us     | c. to produce complex shapes.                                     |
| 4. One of the most common methods is     | d. to have a profound effect on engineering.                      |
| 5. This causes the metal                 | e. to offer particular promise for a wide variety of applications |

- |  |  |
|--|--|
| 6. The specialists expect plastics                         | f. to obtain new data.                                   |
| 7. This new material seems                                 | g. to touch each other.                                  |
| 8. An engineer must understand the properties of materials | h. to use it in manufacturing many engineering products. |
| 9. These processes allow the manufacturers                 | i. to become softer than before.                         |
| 10. The analysis permitted them                            | j. to utilize them properly                              |

**III. Fill in the gaps using comparative or superlative forms of the adjectives given in brackets.**

Steel, copper and aluminium are used in making engineering products.

Steel is a grey plastic material. It is \_\_\_\_\_ (heavy) than aluminium but it is \_\_\_\_\_ (hard) and \_\_\_\_\_ (strong) of these three metals.

Copper is a red metal. It is \_\_\_\_\_ (hard) and \_\_\_\_\_ (strong) than aluminium and \_\_\_\_\_ (flexible) than steel. But copper is \_\_\_\_\_ (heavy) and \_\_\_\_\_ (expensive) metal.

\_\_\_\_\_ (light) and \_\_\_\_\_ (flexible) of these materials is aluminium. It is a white hard metal.

**IV. There is one mistake in each sentence. Find it and correct it.**

1. Much of the metals are silvery, white or grey in colour.
2. Copper is soft and easy worked.
3. The changes in material technology are not only quantity.
4. The conductivity of copper is a few lower than that of silver.
5. Certain elements can to improve the properties of steel.
6. Metallic fillers in plastics can make them electrical conductive.
7. The main advantage of metals are their strength and toughness.
8. Both of this are examples of engineering materials .
9. Corrosion attack all engineering materials, especially metals.
10. Material engineering are constantly developing.

**IV. Read the text below and decide which answer A, B, C or D best fits each space. Circle your answer.**

We use metals <sup>1</sup> \_\_\_\_\_ a variety of engineering purposes.<sup>2</sup>  
 \_\_\_\_\_ metals have ductile properties.<sup>3</sup> \_\_\_\_\_ a metal is  
 ductile, it can <sup>4</sup> \_\_\_\_\_ <sup>5</sup> \_\_\_\_\_ a new shape. Copper is an  
 example of this.<sup>6</sup> \_\_\_\_\_ is a ductile metal <sup>7</sup> \_\_\_\_\_ it <sup>8</sup>  
 \_\_\_\_\_ be stretched into <sup>9</sup> \_\_\_\_\_ shape. Lead can <sup>10</sup>  
 \_\_\_\_\_ into a new shape.

Copper is a good <sup>n</sup> \_\_\_\_\_ of electricity. We often use <sup>12</sup>  
 \_\_\_\_\_ for <sup>13</sup> \_\_\_\_\_ conductors. <sup>14</sup>  
 \_\_\_\_\_ lead <sup>15</sup> \_\_\_\_\_ be used for electrical cables <sup>16</sup>  
 \_\_\_\_\_ it<sup>17</sup> \_\_\_\_\_ corrosion.

Cast iron is <sup>18</sup> \_\_\_\_\_ copper and lead. <sup>19</sup> \_\_\_\_\_  
 shape cannot be altered and it <sup>20</sup> \_\_\_\_\_ to resist corrosion.

- |                          |                         |                       |                          |
|--------------------------|-------------------------|-----------------------|--------------------------|
| 1. A for                 | B of                    | C in                  | D on                     |
| 2. A any                 | B some                  | C other               | D another                |
| 3. A when                | B why                   | C if                  | D because                |
| 4. A to be pressed       | B press                 | C be pressing         | D be pressed             |
| 5. A into                | B to                    | C in                  | D at                     |
| 6. A it                  | B its                   | C this                | D that                   |
| 7. so                    | B because               | C therefore           | D because of             |
| 8. A can                 | B could                 | C is to               | D have to                |
| 9. A other               | B another               | C the other           | D any                    |
| 10. A be also<br>pressed | B to be also<br>pressed | C be also<br>pressing | D to be also<br>pressing |
| 11. A conducting         | B conductivity          | C conductor           | D conductor              |
| 12. A it                 | B her                   | C him                 | D his                    |

- |                   |                    |                   |                 |
|-------------------|--------------------|-------------------|-----------------|
| 13. A electricity | B electrical       | C electrically    | D electrician   |
| 14. A and         | B but              | C so              | D therefore     |
| 15. A can         | B could            | C be able         | D is able       |
| 16. A if          | B because          | C so              | D therefore     |
| 17. A resist      | B resisted         | C resists         | D have resisted |
| 18. A like        | B unlike           | C similar         | D likely        |
| 19. A its         | B it's             | C her             | D his           |
| 20. A is not able | B will not be able | C was not be able | D won't be able |

### 3. Speaking

- I. Look through the following list. Which elements do not belong to the group of metals? Which metals from this list were mentioned in the text? Try to recall their characteristics from the text.**

silver	oxygen	caesium
titanium	sulphur	iron
copper	nickel	nitrogen
helium	gold	strontium

- IV. A. You are a manager at the metallurgical works. Your plant has got sufficient financial support from one of the most influential metallurgical corporations of the European Union. You need to replace industrial equipment and buy e.g. an air furnace, a blast furnace, a boiler, etc. Prepare a list of questions to the manufacturer of this equipment. Ask such**

**questions, which will help you to find out as many useful details as possible. Try to cover the following fields:**

- price
- warranty period
- service opportunities
- transportation from the manufacturer to your site
- technical information

**B. Make up a dialogue using the list you have prepared.**

Student A: a manager at the metallurgical works looking for opportunities of buying and installing new equipment.

Student B: international sales manager (at the company producing various kinds of equipment for metallurgy).

**III. Pair work. Your friend is writing a course project on physical metallurgy. Give your friend a piece of advice where he/she can find information for his/ her project (e.g. library, reading-hall, scientific articles, Internet). The following conversational formulas may help you:**

- It's worth (It's not worth) ...
- There is no use in ...
- I have no idea ...
- I am not sure ...
- I assume ...
- I suppose ...

**IV. You are invited to the international conference. Its title is: “Ways of reducing heavy metals contamination”. Here is some information on heavy metals.**

1. Heavy metals (hm):

zinc, copper, lead, cadmium, nickel etc.

2. Characteristics:

all heavy metals are toxic and dangerous for man's health.

3. Main sources of hm contamination:

- metallurgy
- car exhausts
- fertilizers
- burning of all kinds of fuel

4. What is contaminated by hm?

- soil
- water
- air
- plants

5. What is the problem?

Heavy metals are accumulated in plants and therefore get into food chain and directly into human organism. It causes numerous diseases.

6. How to solve the problem?

- a) It's necessary to reduce hm transfer from soil to plants.  
[Liming is the most efficient way.]
- b) One has to pay attention to the problem of car exhausts,  
[new kinds of fuel]
- c) It's necessary to develop the new generation of protective filters for all branches of industry which pollute the environment.

**In paragraph 6 you have found general information on the ways of solving the problem of hm contamination. Your task is to present this information in the form of a short report. Add as many details as possible. Think of some other ways of solving the problem of hm contamination.**

## UNIT NINE

### Discoveries and Inventions

#### INVENTORS AND THEIR INVENTIONS

Over the centuries man's way of life was changed by a relatively small number of discoveries and inventions. But changes have come more and more often since the steam engine was invented in 1765 by James Watt. In just two hundred years, man advanced from horse power and candle light to aeroplanes and neon lamps. Our ideas about travel have changed completely since Gotlif Daimler and Charles Benz built their first petrol engine in 1885 and the Wright Brothers made the first flight in 1903.

In 1897 Rudolf Diesel invented a new internal combustion engine. It is known as a diesel and it began a transport revolution in cars, lorries, trains and ships. The main advantage of diesels is that they run on rather cheap fuel.

Charles Rolls was a British aristocrat and businessman, who was especially interested in cars. Once he met another enthusiast of cars Henry Royce, a famous car engineer. They decided to design the most comfortable and reliable car. At the beginning of the 20th century it seemed to be a fantasy. But in 1907 they managed to create the world-famous Rolls-Royce car. It was so comfortable and reliable that one of the models «Silver Ghost» hadn't changed greatly for 20 years since 1907.

Samuel Colt, who was an American, designed and patented a pistol in 1836. It had a revolving barrel and could fire 6 bullets one after the other. It was the first pistol of its kind. Later there came many other pistols with 6 bullets.

Samuel Finley Morse was a portrait painter, who became an inventor. For 12 years he tried to perfect the telegraph and succeeded in inventing the telegraphic dot-and-dash alphabet, now known as Morse code. Though there were some other codes in America in the 19th century, Morse code is used nowadays all over the world.

Charles Makintosh was a chemist by profession. He worked in a textile industry and in 1823 he developed a rubber solution used for raincoat production. Raincoats with this rubber solution didn't allow water to penetrate. These raincoats were called makintoshes and people use them in rainy weather.

Some people say we live in the age of computers; but it is also correctly described as the atomic age or the space age. Today, a journey from London to Cairo takes hours. Only a hundred years ago it took weeks. Today, men think seriously of going to Mars. 50 years ago they only dreamt about it. Today we produce energy by splitting the atom. A century ago, no one believed it could be split. Due to inventions technology has advanced so quickly that cars and televisions are out of date only a few years after they were made.

## 1. Reading Comprehension

### I. Choose the right continuation of the following sentences.

- |   |   |
|---|---|
| 1. A steam engine                                   | a. very popular even nowadays.                |
| 2. A new internal combustion engine                 | b. was the most comfortable and reliable car. |
| 3. The main advantage of diesels is                 | c. was invented by Rudolf Diesel.             |
| 4. The world-famous Rolls-Royce car                 | d. was invented by James Watt.                |
| 5. All the cars produced by the firm "Daimler-Benz" | e. was a car engineer by profession.          |
| 6. Henry Royce                                      | f. were called "Mercedes-Benz".               |

7. A German engineer Rudolf Diesel **g.** made his famous invention in 1897.
8. Morse code is **h.** that they run on rather cheap fuel.

**II. Find the right continuation to the given sentences.**

1. Changes in the man's way of life have become more evident since
- A. the discovery of a pistol with 6 bullets;
  - 2. 1765;
  - 3. the birth of Edison, one of the greatest inventors;
  - 4. the first patented invention was registered.
- a. An invention is
- A. the case of finding something which existed before but was not known to people. It is often a place or a scientific fact;
  - B. a difficulty that needs attention and thought in order to solve it;
  - C. something that is finished or gained through skill or hard work;
  - D. a useful thing or idea which is produced by scientists for the first time.
- b. The "Silver Ghost" model was
- A. famous for its reliability and comfort;
  - B. created by Wright brothers;
  - C. one of the best racing cars at the beginning of the 20<sup>th</sup> century;
  - D. named after its creator Tom Silver.
- c. Due to the development of a rubber solution
- A. raincoats were called makintoshes;
  - B. a transport revolution began;
  - C. the production of waterproof raincoats was quite successful;
  - D. raincoats became very popular.

**III. Put all the sentences in chronological order. Write 1-7 in the correct boxes.**

- A.  These two inventors managed to design the most reliable and comfortable car for the beginning of the last century.
- B.  He invented the first gun with 6 bullets.
- C.  This invention got its name after the inventor and is used in rainy weather.
- D.  The invention of this engine gave birth to a large number of other discoveries and inventions.
- E.  This invention is used nowadays all over the world though there were some other inventions on analogy in the 19<sup>th</sup> century.
- F.  Last century was remarkable for the introduction of the laser, the proliferation of calculators and computers and a revolution in the telecommunication industry.
- G.  The main advantage of that invention was that it used rather cheap fuel.

**IV. Write true (T) or false (F) for each of the sentences below, according to the information given. If the information is not given, put a question mark (?).**

- 1. Morse code was not only one in America of that time.
- 2. Now people all over the world use these raincoats in spring and in autumn.
- 3. An invention is a useful thing or idea, which is produced by scientists for the first time.
- 4. One of the models of Rolls-Royce cars “Steel Ghost” hadn't changed greatly for 40 years since 1907.
- 5. Rudolf Diesel was a German engineer, who was born in 1858 and died in 1913.
- 6. Nowadays energy is produced by splitting the atom.
- 7. Daimler and Benz built their first steam engine in 1885.
- 8. Since the beginning of the 20<sup>th</sup> century all the cars produced by the firm “Daimler-Benz” have been called “Mercedes-Benz”.

**V. Read the following passage about the invention of a steam engine. Every 6<sup>th</sup> word is missing. Fill in the blanks with suitable words from the box.**

Watt, interesting, is, was, the, nothing, kettle, engine, do, true, steam

The popular notion of the <sup>1</sup> development of the steam engine includes <sup>2</sup> \_\_\_\_\_ story of how James Watt <sup>3</sup> \_\_\_\_\_ in his mother's kitchen, the <sup>4</sup> \_\_\_\_\_ boiled, steam came out, and <sup>5</sup> \_\_\_\_\_ realized the tremendous power of <sup>6</sup> \_\_\_\_\_ and later invented the steam <sup>7</sup> \_\_\_\_\_. The story has nothing to <sup>8</sup> \_\_\_\_\_ with reality, and Watt had <sup>9</sup> \_\_\_\_\_ to do with kettles. The <sup>10</sup> \_\_\_\_\_ origin of the steam engine <sup>11</sup> \_\_\_\_\_ very different and much more <sup>12</sup> \_\_\_\_\_.

**2. Use of English**

**I. In the following conversation put the verb in brackets into the correct tense.**

One day, as the Wright brothers were working on their bike, Orville exclaimed, "I <sup>a</sup> \_\_\_\_\_ (get) an idea!"

"You always <sup>b</sup> \_\_\_\_\_ (get) ideas," laughed Wilbur.

"I <sup>c</sup> \_\_\_\_\_ (try) this bike of ours," Orville said, "it <sup>d</sup> \_\_\_\_\_ (be) faster than any of other bikes around, even the new ones, because we <sup>e</sup> \_\_\_\_\_ (take) our bike apart and <sup>f</sup> \_\_\_\_\_ (clean) every bit of it. Then we <sup>g</sup> \_\_\_\_\_ (add) the new parts. That is why there <sup>h</sup> \_\_\_\_\_ (be) less friction and you can <sup>i</sup> \_\_\_\_\_ (travel) faster." "What of it?" Wilbur asked. "So let's <sup>j</sup> \_\_\_\_\_ (have) a race. If I <sup>k</sup> (win), the fellows <sup>l</sup> \_\_\_\_\_ all (want) bikes like mine. We <sup>m</sup> \_\_\_\_\_ (sell) bikes!"

"Not a bad idea. But first you <sup>n</sup> \_\_\_\_\_ (have) to win some races."

So Orville started training.

**II. Fill in the gaps with the suitable derivative of the word given on the right.**

- a) His \_\_\_\_\_ could now be used to protect tall buildings during a storm. **discover**
- b) This became very popular because it gave off much heat. **invent**
- c) He persuaded the to try locomotives. **direct**
- d) The \_\_\_\_\_ of the colliery bought some engines and began to experiment for himself. **own**
- e) Samuel Morse was the pioneer of the most widely used electrical \_\_\_\_\_ in the world today. **communicate**
- f) What he needed was a lamp. **safe**
- g) Franklin's \_\_\_\_\_ about natural phenomena can be observed from his boyhood. **curious**
- h) At that time people were \_\_\_\_\_ afraid of lightning **terrible**
- i) Edison did not tell the public about his lamp until four days before Christmas. **success**
- j) One day he brought a new \_\_\_\_\_ to the laboratory. **transmit**
- \_\_\_\_\_

**III. Match a line in A with a line in B to make a new word combination. Put these new words in the sentences below.**

<b>A</b>	<b>B</b>
lightning	service
metal	power
steam	lines
railroad	lamps
coal	conductor
telegraph	light

horse

locomotive

passenger

gas

oil

engine

candle

key

- a) Several attempts were made to design a \_\_\_\_\_ .
- b) It was the first successful \_\_\_\_\_ to haul cars with coal.
- c) \_\_\_\_\_ caused many terrible explosions in the mines.
- d) At that time people outside of big cities worked and lived by or \_\_\_\_\_ .
- e) The result of his experiment was the used all over the world.
- f) \_\_\_\_\_ began to go up all over the world.
- g) Near the other side of the string he attached \_\_\_\_\_ .
- h) Unfortunately this engine cost as much as and was just as slow.
- i) In a few months a regular had been opened between Stockton and Darlington.

#### IV. Use the prepositions from the box to fill each

on, to, at, in (x7), of (x3), from, for, after (x2)
---

Perhaps the man who did most to make everyday life what it is today was Thomas Alva Edison. He was born <sup>a</sup> Milan, Ohio, <sup>b</sup> February 11, 1847. Edison's education was limited <sup>c</sup> \_\_\_\_\_ three months <sup>d</sup> \_\_\_\_\_ the public school <sup>e</sup> \_\_\_\_\_ Port Huron, Michigan. <sup>f</sup> \_\_\_\_\_ 12 he became a railroad newsboy and <sup>g</sup> \_\_\_\_\_ 15 he earned his living as a telegraph operator <sup>h</sup> \_\_\_\_\_ various cities.

<sup>i</sup> \_\_\_\_\_ long experiments he succeeded <sup>j</sup> \_\_\_\_\_ making an incandescent lamp <sup>m</sup> which a loop <sup>n</sup> \_\_\_\_\_ carbonized cotton thread glowed <sup>o</sup> vacuum <sup>p</sup> \_\_\_\_\_ more than 40 hours.

<sup>r</sup> \_\_\_\_\_ 1885 he patented a method <sup>s</sup> \_\_\_\_\_ transmitting telegraphic signals <sup>t</sup> \_\_\_\_\_ moving trains.

**V. In the following pairs of sentences only one is correct. Tick (✓) the correct one.**

1. a) He invented many of the terms which are still used in electricity,  
b) He invented much of the terms which are still used in electricity.
2. a) The electricity passed into the earth without doing some damage.  
b) The electricity passed into the earth without doing any damage.
3. a) Franklin was a man who liked a joke better than anything.  
b) Franklin was a man who liked a joke better than something.
4. a) This was something no scientist had ever done.  
b) This was anything no scientist had ever done.
5. a) He never took any money for his invention.  
b) He never took some money for his invention.
6. a) A lot of sand was drawn into the pumps with the water.  
b) Much sand was drawn into the pumps with the water.
7. a) He was an artist and knew little about science.  
b) He was an artist and knew few about science.
8. a) There was anything else for him to do.  
b) There was nothing else for him to do.
9. a) Electric lights were used everywhere at the party.  
b) Electric lights were used anywhere at the party.
10. a) They had plenty of tools and a lot of spare parts.  
b) They had many tools and much spare parts.

**VI. Read the text below and decide which answer A, B, C or D best fits each space. Circle your answers.**

One day James Watt <sup>1</sup> \_\_\_\_\_ so <sup>2</sup> \_\_\_\_\_ the lid of the kettle which <sup>3</sup> on the stove that he <sup>4</sup> a word his mother and aunt <sup>5</sup> \_\_\_\_\_ to him. It <sup>6</sup> his aunt <sup>7</sup> \_\_\_\_\_ that she <sup>8</sup> \_\_\_\_\_ <sup>9</sup>

\_\_\_\_\_ sharply to him, “I never <sup>10</sup> \_\_\_\_\_ such <sup>11</sup>  
 \_\_\_\_\_ idle boy! <sup>12</sup> \_\_\_\_\_ the last hour you <sup>13</sup>  
 \_\_\_\_\_ a word. Instead you <sup>14</sup> \_\_\_\_\_ the lid of that kettle and  
<sup>15</sup> \_\_\_\_\_ it again, holding now a cup and a silver spoon <sup>16</sup>  
 \_\_\_\_\_ the steam, watching how it <sup>17</sup> \_\_\_\_\_. Are you not  
 ashamed of spending your time <sup>18</sup> \_\_\_\_\_ this way?” she <sup>19</sup>  
 \_\_\_\_\_ him.

- |                   |                  |                    |                   |
|-------------------|------------------|--------------------|-------------------|
| A was watching    | B saw            | C watched          | D has seen        |
| A careful         | B attentively    | C carefully        | D carelessly      |
| A boiled          | B was boiling    | C boils            | D is boiling      |
| A did not hear    | B has not heard  | C had not listened | D did not listen  |
| A were talking    | B were saying    | C were speaking    | D were telling    |
| A irritated       | B was irritating | C has irritated    | D had irritated   |
| A very            | B so             | C much             | D very much       |
| A spoke           | B told           | C said             | D talked          |
| A quite           | B quiet          | C very much        | D much            |
| A have seen       | B see            | C saw              | D had seen        |
| A the             | B an             | C a                | D -               |
| A during          | B for            | C in               | D since           |
| A have not spoken | B have not said  | C have not told    | D have not talked |
| A had taken       | B did take off   | C have taken off   | D has taken off   |

A put on away	B put in	C put down	D put
A in	B over	C on	D -
A raises	B rises	C is rising	D raised
A in	B by	C on	D with
A told	B asked	C said	D spoke

### 3. Speaking

**J. Complete the following sentences using the ideas from the text:**

- Changes have come more and more often since...
- The main advantage of diesels is...
- Charles Rolls was a British aristocrat and businessman...
- Some people say we live...
- Today men think...
- Due to inventions...

**V. Retell the text. Choose the sentences which convey the main ideas of the text. While speaking use the following expressions:**

- Data are given about...
- It is shown that...
- ... is dealt with...
- ... is formulated...
- Attention is drawn to...
- ... is described in short...
- It is known...
- Attempts are made to analyze...

**IV. A lot of new inventions appear every day to make our lives easier, longer, warmer, speedier. But only a few inventors design a new machine or product that becomes so well-known that it is named after its creator. Read the names of the inventors and name the things they created:**

1. R. Diesel
2. S. Colt
3. Rolls
4. C.Makintosh
5. S. Morse
6. Benz

**IV. What do you know about inventors and their inventions? Read the statements given below and if you think the statement is true agree to it saying «That's right». If you think it is not true, disagree saying «I'm afraid», «That's wrong» and make the necessary corrections.**

1. Charles Rolls was a British aristocrat and businessman, who was especially interested in trade.
2. In 1897 Samuel Colt invented a new internal combustion engine.
3. In 1907 Charles Rolls and Henry Royce managed to create the world-famous Rolls-Royce car.
4. The main disadvantage of diesels is that they run on rather expensive fuel.
5. Charles Makintosh was a physicist by profession.
6. Now we live in the age of steel, or in the electronic age.

## 4. Writing

**While writing remember this checklist:**

**W** Who for?

**R** Register?

**I** Include...

**T** Text type

**E** Edit!

### **Writing task**

You are to write a short article about James Watt. As you already know from the text, he invented the steam engine in 1756. Below you will find some more information about this prominent inventor. Using the given information write an article for the scientific periodical outlining life and work of Watt.

- James Watt (1736-1819);
- born in Scotland, not far from Glasgow;
- spent much time in his father's workshop;
- studied mechanics in Glasgow and London;
- in 1756 invented the steam engine;
- in 1774 Bolton (a well-known English manufacturer) invested money into Watt's invention; the steam engine was produced and successfully tested;
- in 1784 Watt invented the first double-action steam engine;
- Watt also invented the steam heating, several kinds of calculating machines, a copying machine.

Below please find some time relators which may help you in arranging the given information:

In the beginning ...

Long ago ...

Originally ...

At present...  
At the same time .../ At that time ...  
Meanwhile ...  
Simultaneously ...  
After that ...  
Afterwards ...  
Later ...  
Eventually ...  
Since...  
Soon .../ By the time ...

## **UNIT TEN**

### **Machining Operations**

#### **MACHINE-TOOLS**

Machine-tools are machines designed for cutting metal parts by means of a cutting tool. The machine-tool comprises the principle manufacturing equipment in a machine shop. It is the original source of every manufactured article we use or touch. It can not only reproduce itself but it is the only machine which can create other machines.

Without a machine-tool the engineer would be stripped of his power and opportunities. Every tool, machine and material stems directly from machine- tools or was evolved from machines which themselves were produced by machine-tools.

Machining operations, or metal-cutting processes, lie at the basis of all modern industrial production.

The general term «machine-tool» is applied to various classes of power-driven metal-cutting machines employed in the machine shop for the purpose of shaping many commercial products.

The function of machine-tools is to hold both the work and a cutting tool or tools and move them relative to each other to obtain the proper cutting action and at an economic speed.

The part of the machine-tool which removes the metal during a metal-cutting process is called a cutting tool. Cutting tools used for various metal-cutting operations may be different and the type depends on the work which is performed and on the material. The main types of machine-tools used for industrial production are lathes, drilling machines, milling machines, etc.

The lathe is a machine-tool in which work is held so that it can be rotated about an axis. The cutting tool is traversed past the work from one end to the other. It is designed primarily for turning and boring operations. However, in addition to turning and boring, many other operations may also be performed on a lathe. The lathe is considered to be the oldest but still the most important of all machine-tools. Any shop, containing machines or machine-tools, contains a lathe.

Lathes used in shop practice can be of different designs and sizes. These lathes fall into various types, either according to their characteristic constructional features, or according to the work for which they are designed.

## **1. Reading Comprehension**

### **I. Read the article right through and decide which of the following sentences summarizes the idea of the paragraph better.**

1. a. The machine-tool is the only machine which can create other machines.  
b. The machine-tool can reproduce itself.  
c. In every machine-shop you may find many machines for working metal parts.
2. a. Machine-tools are extensively needed in many branches of engineering.  
b. The modern engineer cannot do without a machine-tool.  
c. Present-day engineering is defined by the fact that its products - machine- tools - are produced for a very short period of time.
3. a. Machining operations are performed on various machine-tools.  
b. Machining operations lie at the basis of all modern industrial production.  
c. Metal-cutting processes consist of removing metal chips and obtaining smooth surfaces.

4. a. The term “machine-tool” is applied to a machine used in making machinery.
- b. The term “machine-tool” is applied to various classes of power-driven metal-cutting machines employed for shaping many commercial products.
- c. Machine-tool, generally speaking, serves for various metal-cutting operations.
3. a. The function of machine-tools used in engineering is to shape metals and other materials.
- b. The function of machine-tools is to hold both the work and a cutting tool moving them relative to each other to obtain the proper cutting action and at an economic speed.
- c. Machine-tools do the same jobs as the hammer, the chisel and the file, but much more quickly and efficiently and with much wider range of application.
4. a. The cutting tool is the part of the machine removing the metal.
- b. The type of cutting tools depends on the work they perform and the material they use.
- c. Cutting tools are used for various metal-cutting operations.
7. a. The most useful and versatile machine in the workshop is a turning machine.
- b. The lathe is used for turning different objects and parts.
- c. Many operations can be performed on a lathe, such as turning, drilling, milling and grinding.
8. a. There are many types of lathes either according to their basic constructional features or to the work they are designed for.
- b. There are many types of lathes but all of them operate on the same basic principle: the workpiece is revolved by power and a cutting tool is brought against it, removing metal in the form of chips.
- c. Any shop containing machine-tools contains a lathe.

**II. Choose the appropriate continuation of the following sentences.**

- |  |   |
|--|---|
| <b>1.</b> Machining operations lie at the basis of                       | <b>a.</b> the work they are designed for.                     |
| <b>2.</b> Machining operations are applied for the purpose of            | <b>b.</b> to obtain the proper cutting action.                |
| <b>3.</b> The work and the cutting tool are moved relative to each other | <b>c.</b> shaping many commercial products.                   |
| <b>4.</b> A cutting tool is the part of the machine-tool which           | <b>d.</b> all modern industrial production.                   |
| <b>5.</b> The type of the cutting tool depends on                        | <b>e.</b> for cutting metal parts by means of a cutting tool. |
| <b>6.</b> Machine-tools are designed                                     | <b>f.</b> for turning and boring operations.                  |
| <b>7.</b> The cutting tool is designed primarily                         | <b>g.</b> removes the metal during a metal-cutting process,   |
| <b>8.</b> Lathes fall into various types according to                    | <b>h.</b> the work which is performed and on the material.    |

**VI. Match each underlined word in column A with its probable meaning in column B. Be careful, there are some extra meanings in column B.**

**Column A**

1. The machine-tool comprises the principle...
2. It is the original source of every manufactured article we use...
3. ... the engineer would be stripped of his power and opportunities.
4. Every tool, machine and material stems directly from machine-tools...
5. ... or was evolved from machines.
6. ... for the purpose of shaping many commercial products.
7. The main types of machine-tools ... are milling machines, etc.
8. The cutting tool is traversed past the work...
9. It is designed for turning operations...
10. In addition to boring, many other operations...

**Column B**

1. making a long, round hole or passage
2. machines for cutting steel into bars
3. a separate thing
4. consists of
5. particular object
6. became developed gradually
7. passed across
- h. shaping or forming
- i. use
- j. arises from
- k. made bare
- l. not by accident
- m. torn out
- n. lose

**IV. Read the article right through and then choose the best answer for each of the following.**

1. Machine-tools are machines designed
  - a. for reproducing themselves;
  - b. for shaping many commercial products;
  - c. for cutting metal parts by means of a cutting tool.
2. The term “machine-tool” is
  - a. applied to various classes of power-driven metal-cutting machines employed in a machine shop;
  - b. applied to an apparatus for using mechanical power (steam, electricity, etc.);
  - c. applied to a mechanical device for doing work.
3. The function of machine-tools is
  - a. to produce symmetrical shapes with smooth surfaces and dimensional accuracies not generally attainable by most fabrication methods;
  - b. to perform a lot of machining operations on a wide variety of workpieces;
  - c. to hold both the work and cutting tools and move them relative to each other to obtain the proper cutting action.
4. The main types of machine-tools used for industrial production are
  - a. lathes, drilling machines, milling machines, grinding machines, etc.;
  - b. shapers, planers;
  - c. turning machines, boring machines.
5. The lathe is designed for
  - a. boring and turning operations;
  - b. drilling, threading, tapping, milling;
  - c. grinding.

6. Lathes can be
  - a. of different designs and sizes;
  - b. used primarily for machining the work revolving around its axis;
  - c. considered to be the oldest but still the most important of all machine-tools.
7. A cutting tool is
  - a. the part of the machine-tool which removes the metal during a metal-cutting process;
  - b. an instrument used in doing work, especially with the hand, as a saw, hammer, chisel, screwdriver, etc.;
  - c. a device which can be automatically selected and placed in the spindle
8. Metal-cutting process is certain
  - a. to be not found possible until the 18<sup>th</sup> century;
  - b. to lie at the basis of all modern industrial production;
  - c. to be studied in detail about a hundred years ago.

**V. For each sentence mark T if it is true and F if it is false according to the text, and DS if the text doesn't say.**

1. The cutting tool is the part of the machine removing the metal.
2. Every machine tool used in a machine shop is designed for a special machining operation.
3. The life of the machine tool depends on the care given to it.
4. The lathe is a machine-tool which is traversed past the work from one end to the other.
5. The lathe is considered to be the oldest and therefore an out-of-date machine-tool.
6. The cutting tool is designed primarily for turning and boring operations.
7. Lathes of comparatively small size mounted on a bench are termed bench lathes.

8. Lathes, drilling and milling machines belong to the main types of machine-tools used for industrial production.
9. The only thing that the machine-tool cannot do is to reproduce itself.
10. Machine-tools are arranged ordinarily for regulation the cutting speed and the feeding movement between the tool and the work.

**VI. Read the passage below and fill in each gap with the appropriate word given in the box.**

cut, forces, metal, tool (x2), movement, force,  
convenience, determines, face

The cutting action of a metal <sup>1</sup>cutting tool may be described as follows. When a tool cuts a <sup>2</sup> \_\_\_\_\_ a force is exerted on its face by the material pushed ahead, and a friction <sup>3</sup> \_\_\_\_\_ is set up along the <sup>4</sup> \_\_\_\_\_ of the tool by a sliding chip. These <sup>5</sup> \_\_\_\_\_ have a resultant, and an equal and opposite force must be applied to the tool to make it <sup>6</sup> \_\_\_\_\_. The driving force on the tool may be resolved into two components for <sup>7</sup> \_\_\_\_\_. One is parallel to the axis of the <sup>8</sup> \_\_\_\_\_, and the other acts in the direction of the <sup>9</sup> \_\_\_\_\_ of the tool. The second one <sup>10</sup> \_\_\_\_\_ the power required because it is in line with, the <sup>11</sup> \_\_\_\_\_ movement.

## 2. Use of English

### I. Write questions for the answers.

1. What machine \_\_\_\_\_ a machine tool?  
It is a machine which is used for cutting metal parts.
2. Where \_\_\_\_\_ the machine tools \_\_\_\_\_ ?  
They are used in a machine shop
3. Which purpose \_\_\_\_\_ the machining operations applied \_\_\_\_\_ ?  
They are applied for the purpose of shaping many products.
4. What \_\_\_\_\_ we the part of a machine-tool removing the metal?  
We call it a cutting tool.
5. \_\_\_\_\_ cutting tools \_\_\_\_\_ in shape and size?  
Yes, they do. They differ in shape and size.
6. What \_\_\_\_\_ the type of a cutting tool depend \_\_\_\_\_ ?  
It depends on the work performed and on the material.
7. How \_\_\_\_\_ the cutting tool and the work \_\_\_\_\_ ?  
They have to move relative to each other.
8. What \_\_\_\_\_ the main types of machine-tools?  
They are lathes, drilling machines, milling machines, etc.
9. What kind of operations \_\_\_\_\_ the lathe primarily designed?  
It is designed for turning and boring operations.
10. How \_\_\_\_\_ long \_\_\_\_\_ been in operation?  
This lathe has been in operation for 5 years.

### II. Use the correct form of the verbs.

John: Pete, \_\_\_\_\_ you \_\_\_\_\_ any idea where

\_\_\_\_\_ the information on the recent machine-tool \_\_\_\_\_ ?

**have**

**be**

Pete: No, I \_\_\_\_\_ for it myself.

**look**

John: The card index system we \_\_\_\_\_ now **use, be**  
\_\_\_\_\_ absolutely useless.

Pete: Yes. It is soon. **change**

John: What \_\_\_\_\_ you? **mean**

Pete: Well actually, I \_\_\_\_\_ the company \_\_\_\_\_ **hear, plan**  
to computerize the whole system in the very near future.

John: Really?

Pete: And don't \_\_\_\_\_ me, \_\_\_\_\_ you? **quote**

John: Not a word. By the way, it \_\_\_\_\_ not be, only the  
information on the machine-tool **want**

I \_\_\_\_\_. I \_\_\_\_\_ the latest copy of "Machinery and  
Production Engineering" yet. **not see**

### III. Fill in the gaps with suitable prepositions or conjunctions given in the box.

owing to, in spite of, according to, both ... and, due to, either ... or, by means of, neither ... nor, the ... the, in addition
--

1. The lathes can be classified \_\_\_\_\_ some parameters.
2. This machine-tool can perform \_\_\_\_\_ simple \_\_\_\_\_ complex operations.
3. Machining is carried out \_\_\_\_\_ some tools.
4. \_\_\_\_\_ this machine-tool \_\_\_\_\_ the new one offers an ideal solution.
5. \_\_\_\_\_, many other operations may be performed on a lathe.
6. \_\_\_\_\_ more accurate the design, \_\_\_\_\_ more reliable the machine.
7. This was mainly \_\_\_\_\_ the length of time.
8. Some of the operations could be performed \_\_\_\_\_  
\_\_\_\_\_ manual  
ly \_\_\_\_\_ automatically.

9. \_\_\_\_\_ all improvements the efficiency of the lathe remained low.
10. \_\_\_\_\_ progress in the development of engineering materials, the life of the cutting tool increased.

**IV. There is a mistake in each of the sentences. Find it and correct it.**

1. The lathe is running on a high speed.
2. Cutting tools made of strong metals.
3. We removed the work by mean of a special mechanism.
4. The lathe is the most oldest and the most important machine in industry.
5. We have improved our methods of work used the new machine.
6. Lathes using in machine shops are of different designs and sizes.
7. They machined the work with a correct selected cutting tool.
8. The new equipment is a much spoken about.
9. Many operations are required to produce a giving shape.
10. These machine are generally employed for cutting metal parts.

**V. Read the text below and decide which answer A, B, C or D best fits each space.**

Many people <sup>1</sup> \_\_\_\_\_ just from an enjoyable holiday in the South West of England. But <sup>2</sup> \_\_\_\_\_ being a major tourist attraction, this region also <sup>3</sup> \_\_\_\_\_ a healthy industry <sup>4</sup> \_\_\_\_\_ provides a wide range <sup>5</sup> \_\_\_\_\_ machining services.

The company <sup>6</sup> \_\_\_\_\_ in 1999 is a family - run business. It <sup>7</sup> \_\_\_\_\_ in the machining of various <sup>8</sup> \_\_\_\_\_ parts.

Two years ago the company <sup>9</sup> \_\_\_\_\_ a new machining centre. “ <sup>10</sup> \_\_\_\_\_ of our work involves <sup>11</sup> \_\_\_\_\_ different sizes of parts and <sup>12</sup> \_\_\_\_\_ large numbers of holes ”, <sup>13</sup> \_\_\_\_\_ the managing director. “ This machine centre

<sup>14</sup> \_\_\_\_\_ us become <sup>15</sup> \_\_\_\_\_ efficient and <sup>16</sup> \_\_\_\_\_  
 the level of skill <sup>17</sup> \_\_\_\_\_ for certain key <sup>18</sup>  
 \_\_\_\_\_”.

- |                         |               |                   |                        |
|-------------------------|---------------|-------------------|------------------------|
| 1. A will have returned | B will return | C have returned   | D are returning        |
| 2. A as ... as          | B well        | C as well         | D as well as           |
| 3. A contain            | B contains    | C contained       | D has contained        |
| 4. A which              | B that        | C who             | D where                |
| 5. A in                 | B of          | C at              | D from                 |
| 6. A set-up             | B was set-up  | C setting-up      | D is set-up            |
| 7. A specialized        | B specializes | C has specialized | D has been specialized |
| 8. A precision          | B precise     | C presise         | D precisely            |
| 9. A buys               | B bought      | C is buying       | D brought              |
| 10. A many              | B few         | C much            | D little               |
| 11. A machining         | B machined    | C machinery       | D machine              |
| 12. A producing         | B produced    | C production      | D produce              |
| 13. A said              | B says        | C have said       | D has said             |
| 14. A will help         | B help        | C helped          | D helping              |
| 15. A much              | B more        | C less            | D least                |
| 16. A reduce            | B reducing    | C reduction       | D reduced              |
| 17. A require           | B required    | C requiring       | D requirement          |
| 18. A operations        | B operating   | C operation       | D operators            |

### 3. Speaking

#### I. Look through the following word combinations and say which of them you didn't encounter in the text.

to cut metal

to have great success

to enjoy popularity

a manufactured article  
to stem from smth  
chemical industry  
atomic reactor  
industrial production  
solar energy  
a cutting tool  
characteristic features  
petrol engine

**Think of situations in which you can use each word combination.  
Choose the best situation and get ready to present it to the group.**

**II. Together with your groupmate look through the text once again and make up a list of the advantages of the machine-tools. These statements may form the beginning of your list:**

- Machine tools are the original source of every manufactured article we use or touch.
- It can reproduce itself and create other machines.
- It gives the engineer much power and many opportunities.

**IV. Based on the text make up a story about machine-tools and the role they play in industrial production. Say if their importance is really so great or it is overestimated. The following beginnings of the sentences may help you to organize your arguments and make up a story:**

Machine-tools are machines, that...  
Without a machine-tool the engineer...  
The function of machine-tools is...  
The main types of machine-tools are...  
They are mostly used for...  
The lathe is a machine-tool which...  
Lathes can be of different...

## **4. Writing**

### **Writing task**

You are currently working in «Valkern Pro», which is a big industrial corporation. In order to increase production quantities, you need new automatic lathes. «Willson Lathes» is a leader in the market of manufacturing automatic lathes. Write a letter to «Willson Lathes» asking for all relevant information regarding the purchase of the new equipment. Don't forget to mention the following items: models, prices, terms of payment and delivery, warranty period.

## Appendix A

### Irregular Verbs

<b>INFINITIVE</b>	<b>PAST INDEFINITE (SIMPLE)</b>	<b>PAST PARTICIPLE</b>	<b>PRESENT PARTICIPLE</b>
arise	arose	arisen	arising
be	was, were	been	being
beat	beat	beaten	beating
become	became	become	becoming
begin	began	begun	beginning
bend	bent	bent	bending
bet	bet	bet	betting
bind	bound	bound	binding
bite	bit	bitten	biting
bleed	bled	bled	bleeding
blow	blew	blown	blowing
break	broke	broken	breaking
breed	bred	bred	breeding
bring	brought	brought	bringing
build	built	built	building
burst	burst	burst	bursting
buy	bought	bought	buying
catch	caught	caught	catching
choose	chose	chosen	choosing
cling	clung	clung	clinging
come	came	come	coming
cost	cost	cost	costing
creep	crept	crept	creeping
cut	cut	cut	cutting
deal	dealt	dealt	dealing
dig	dug	dug	digging
do	did	done	doing
draw	drew	drawn	drawing
drink	drank	drunk	drinking
drive	drove	driven	driving

eat	ate	eaten	eating
fall	fell	fallen	falling
feed	fed	fed	feeding
feel	felt	felt	feeling
fight	fought	fought	fighting
find	found	found	finding
flee	fled	fled	fleeing
fly	flew	flown	flying
forbid	forbad(e)	forbidden	forbidding
forget	forgot	forgotten	forgetting
forgive	forgave	forgiven	forgiving
freeze	froze	frozen	freezing
get	got	gotten, got (outside U.S.)	getting
give	gave	given	giving
go	went	gone	going
grind	ground	ground	grinding
grow	grew	grown	growing
hang	hung	hung	hanging
have	had	had	having
hear	heard	heard	hearing
hide	hid	hidden	hiding
hit	hit	hit	hitting
hold	held	held	holding
hurt	hurt	hurt	hurting
keep	kept	kept	keeping
know	knew	known	knowing
lay	laid	laid	laying
lead	led	led	leading
leave	left	left	leaving
lend	lent	lent	lending
let	let	let	letting
lie	lay	lain	lying
light	lit, lighted	lit, lighted	lighting
lose	lost	lost	losing
make	made	made	making

mean	meant	meant	meaning
meet	met	met	meeting
pay	paid	paid	paying
put	put	put	putting
quit	quit	quit	quitting
read	read	read	reading
ride	rode	ridden	riding
ring	rang	rung	ringing
rise	rose	risen	rising
run	ran	run	running
say	said	said	saying
see	saw	seen	seeing
seek	sought	sought	seeking
sell	sold	sold	selling
send	sent	sent	sending
set	set	set	setting
shake	shook	shaken	shaking
shine	shone	shone	shining
shoot	shot	shot	shooting
show	showed	shown, showed	showing
shrink	shrank	(rare) shrunk	shrinking
shut	shut	shut	shutting
sing	sang	sung	singing
sink	sank	sunk	sinking
sit	sat	sat	sitting
sleep	slept	slept	sleeping
slide	slid	slid	sliding
slit	slit	slit	slitting
speak	spoke	spoken	speaking
spend	spent	spent	spending
spin	spun	spun	spinning
spit	spit	spit	spitting
split	split	split	splitting
spread	spread	spread	spreading
spring	sprung	sprung	springing
stand	stood	stood	standing

steal	stole	stolen	stealing
stick	stuck	stuck	striking
sting	stung	stung	stinging
stink	stank	stunk	stinking
strike	struck	struck	striking
swear	swore	sworn	swearing
sweep	swept	swept	sweeping
swim	swam	swum	swimming
swing	swung	swung	swinging
take	took	taken	taking
teach	taught	taught	teaching
tear	tore	torn	tearing
tell	told	told	telling
think	thought	thought	thinking
throw	threw	thrown	throwing
tread	trod	trodden, trod	treading
understand	understood	understood	understanding
upset	upset	upset	upsetting
wake	woke	waked, woken	waking
wear	wore	worn	wearing
weave	wove	woven	weaving
weep	wept	wept	weeping
win	won	won	winning
wind	wound	wound	winding
withdraw	withdrew	withdrawn	withdrawing
wring	wrung	wrung	wringing
write	wrote	written	writing

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