

Документ подписан простой электронной подписью
Информация о владельце:
ФИО: Локтионова Оксана Геннадьевна
Должность: проректор по учебной работе
Дата подписания: 01.11.2022 20:56:50
Уникальный программный ключ:
0b817ca911e6668abb13a5d426d39e5f1c11eabbf73e943df4a4851fda56d089

МИНОБРНАУКИ РОССИИ

Федеральное государственное бюджетное образовательное
учреждения высшего образования
«Юго-Западный государственный университет»
(ЮЗГУ)

Кафедра иностранных языков

УТВЕРЖДАЮ

Проректор по учебной работе

О.Г. Локтионова

« 25 » 10

2022 г.



ENGLISH FOR ENGINEERS. PART 1

Методические указания для самостоятельной работы
по дисциплине «Иностранный язык» для обучающихся на
механико-технологическом факультете
по направлениям подготовки:
23.03.01, 23.03.03, 15.03.05, 15.03.01, 29.03.05, 20.03.01

Курск 2022

УДК 811.111(075.8)

Составитель: Е.А. Таныгина, А.Б. Ставинская

Рецензент

Кандидат филологических наук, доцент

А.В. Анненкова

English For Engineers. Part 1 [Текст] : Методические указания для самостоятельной работы по дисциплине «Иностранный язык» для обучающихся на механико-технологическом факультете по направлениям подготовки: 23.03.01, 23.03.03, 15.03.05, 15.03.01, 29.03.05, 20.03.01 / Юго-Зап. Гос. Ун-т; сост.: Е.А. Таныгина, А.Б. Ставинская. – Курск, 2022. – 60 с. – Библиогр.: с. 60.

Методические указания для самостоятельной работы по иностранному языку для обучающихся на механико-технологическом факультете по направлениям подготовки: 23.03.01 Технология транспортных процессов, 23.03.03 Эксплуатация транспортно-технологических машин и комплексов, 15.03.05 Конструкторско-технологическое обеспечение машиностроительных производств, 15.03.01 Машиностроение, 29.03.05 Конструирование изделий лёгкой промышленности, 20.03.01 Техносферная безопасность соответствуют федеральному государственному образовательному стандарту высшего образования.

Цель методических указаний – усвоение необходимого минимума словарного состава текстов по техническим специальностям, включая общенаучную, терминологическую, служебную лексику, и включают в себя тексты для чтения, лексико-грамматические упражнения и тесты. Данное пособие также способствует формированию навыков перевода текста.

Текст печатается в авторской редакции

Подписано в печать .Формат 60x84 1/16.
Усл.печ. л. . Уч.-изд. Л. Тираж 100 экз. Заказ. Бесплатно. 2/142
Юго-Западный государственный университет.

Module 1. INTRODUCTION COURSE

Exercises

(transformation of the sentences according to the models)

1. Replace with the pronouns.

My father is a teacher. - He is a teacher.

My mother is a teacher. - She is a teacher.

My parents are teachers. - They are teachers.

1. Your sister is a journalist. 2. His brother is a driver. 3. His mother and father are doctors. 4. Her grandfather is a scientist. 5. Their grandparents are pensioners. 6. My mother is a dentist. 7. Our parents are artists. 8. Your cousin is a student. 9. Her grandmother is a pensioner. 10. Your brother is a manager.

2. Open the brackets.

I (to be) a student. He (to be) a student. She (to be) a student.

I am a student. He is a student. She is a student.

We (to be) students. You (to be) students. They (to be) students.

We are students. You are students. They are students.

1. I (to be) a pupil. 2. He (to be) a worker. 3. He (to be) an employee. 4. They (to be) teachers. 5. We (to be) journalists. 6. You (to be) fitters. 7. They (to be) engineers. 8. She (to be) an actress. 9. I (to be) a doctor. 10. We (to be) scientists.

3. Transform into the plural.

This is a book. - These are books.

That is a book. - Those are books.

1. This is a notebook. 2. This is a clip. 3. That is a pen. 4. This is an article. 5. That is a ruler. 6. This is a composition. 7. That is a pin. 8. This is a journal. 9. That is a disc. 10. This is a cassette.

4. Replace with the absolute forms of the pronouns.

This is my book. *This is her book.* *This is his book.*
This is mine. *This is hers.* *This is his.*
This is your book. *This is our book.* *This is their book.*
This is yours. *This is ours.* *This is theirs.*

1. This is my pen. 2. This is her pencil. 3. This is your dictionary. 4. This is our magazine. 5. This is his newspaper. 6. This is their journal. 7. This is my disc. 8. This is her cassette. 9. This is your composition. 10. This is our ruler.

5. Translate into English.

Он учитель. - *He is a teacher.*

Он был учителем. - *He was a teacher.*

Они были учителями. - *They were teachers.*

1. Он врач. 2. Его жена — учитель. 3. Их сын — бизнесмен. 4. Их дочь — студентка. 5. Мой папа — юрист. 6. Его брат был музыкантом. 7. Они были музыкантами. 8. Он был студентом. 9. Мои бабушка и дедушка — пенсионеры. 10. Мы были студентами.

6. Open the brackets.

I (to have) a book. *He (to have) a book.* *She (to have) a book.*

I have a book. *He has a book.* *She has a book.*

We (to have) a book. *You (to have) a book.* *They (to have) a book.*

We have a book. *You have a book.* *They have a book.*

1. I (to have) a disc. 2. You (to have) a cassette. 3. They (to have) a newspaper. 4. We (to have) a magazine. 5. He (to have) a notebook. 6. She (to have) an eraser. 7. She (to have) a ruler. 8. I (to have) a clip. 9. You (to have) a composition. 10. He (to have) an article.

7. Open the brackets.

*My sister (to have) a book. - My sister **has** a book.*

*Our students (to have) books. - Our students **have** books.*

1. His cousin (to have) a composition. 2. Your pupils (to have) rulers. 3. Our parents (to have) magazines. 4. Her mother (to have) journals. 5. My teacher (to have) pencils. 6. My grandparents (to have) newspapers. 7. Their parents (to have) notebooks. 8. My pupils (to have) compositions. 9. Our students (to have) marks. 10. Our sister (to have) discs.

8. Translate into English.

1. У меня есть сочинение. 2. У них есть журналы. 3. У нее есть линейка. 4. У нас есть газеты. 5. У него есть диски. 6. У них есть кассеты. 7. У вас есть карандаши. 8. У меня есть словарь. 9. У нас есть кнопки. 10. У них есть книги.

9. Translate into English.

1. У меня был этот диск. 2. У них были эти кассеты. 3. У нее была эта линейка. 4. У него был этот журнал. 5. У вас были эти сочинения. 6. У нас были эти газеты. 7. У нее был этот блокнот. 8. У него был этот карандаш. 9. У них были эти ручки. 10. У меня были эти булавки.

10. Transform according to the model.

*As a rule, my mother **knits** sweaters on weekends.*

*Yesterday my mother **knit** a sweater.*

1. My friend usually reads books on weekends. 2. Sometimes he meets her after classes near the school. 3. She cleans windows on weekends every month. 4. My father always buys magazines after work. 5. As a rule, he translates texts after classes.

11. Transform according to the model.

*As a rule, my father **reads** newspapers.*

*Tomorrow my father **will read** newspapers.*

1. My brother's girlfriend often spends much time in the garden. 2. My sister's boyfriend seldom writes letters (will not). 3. My sister's boyfriend usually calls her after classes. 4. He always brings textbooks from the library of our university. 5. On Mondays he reads newspapers

in the reading hall of our university.

12. Open the brackets.

In two days they (to buy) a TV set.

In two days they will buy a TV set.

1. In a year my friends (to leave) our city. 2. Next summer they (to swim) in this river. 3. Tomorrow I (to find) my brother's disc. 4. Next Thursday I (to bring) my brother's disc. 5. In a week my parents (to buy) a computer.

13. Open the brackets.

*They (to watch) TV yesterday. - They **watched** TV yesterday.*

*They (to see) this film yesterday. - They **saw** this film yesterday.*

1. Last year the students (to study) many subjects. 2. Last year she (to teach) many subjects. 3. Yesterday my mother (to wash) windows of our flat. 4. Yesterday his brother (to write) a composition. 5. A week ago we (to catch) a mouse.

14. Translate into English.

1. Как правило, они работают в офисе моего дяди. 2. Они всегда гуляют в парке нашего района. 3. Вчера мои родители купили картину известного художника. 4. На прошлой неделе мы плавали в бассейне нашего университета. 5. Они часто продают книги известных авторов.

15. Translate into English.

1. Его сын всегда получает хорошие оценки в школе. 2. Они всегда работают в саду по воскресеньям. 3. Мои дедушка и бабушка часто покупают газеты. 4. Наш преподаватель обычно задаёт много вопросов. 5. Эта девочка редко помогает мне.

16. Open the brackets.

The composition(s) about holidays always (to write) by the pupils.

The composition(s) about holidays is (are) always written by the pupils.

1. The letters often (to write) by him with the pencil. 2. The questions always (to ask) by the teacher. 3. This text usually (to translate) by the students with the teacher's help. 4. As a rule, this journal (to read) by my

sister. 5. This newspaper rarely (to buy) by my father.

17. Open the brackets.

The composition(s) about holidays (to write) yesterday.

*The composition(s) about holidays **was (were) written yesterday.***

1. The letters (to write) by him with the pencil last week. 2. The questions (to ask) by the teacher last Thursday. 3. Yesterday this text (to translate) by the students with the teacher's help. 4. This journal (to read) by my sister last Sunday. 5. A day ago that newspaper (to buy) by my father.

18. Open the brackets.

The composition(s) about holidays (to write) by the pupils next week.

*The composition(s) about holidays **will be written** by the pupils **next week.***

1. The letters (to write) by him in a month. 2. The questions (to ask) by the teacher next Thursday. 3. In a week this text (to translate) by the students with the teacher's help. 4. This journal (to read) by my sister next Sunday. 5. Tomorrow that newspaper (to buy) by my father.

19. Translate into English.

1. Лимоны купили вчера. 2. Овощи принесли вчера. 3. Арбуз был съеден час назад. 4. Кашу давно съели. 5. Сок был выпит час назад.

20. Translate into English.

1. Виноград будет выращен в следующем году моим дедушкой. Мясо будет куплено им через час. 3. Свитер будет связан мамой весной. 4. Молоко будет выпито маленьким ребенком ночью. 5. Сметана будет куплена ею в субботу.

21. Translate into English.

1. Как правило, хлеб покупается нашей бабушкой. 2. Обувь обычно моется мною. 3. Свитер обычно вяжется моей мамой. 4. Кофе часто выбирается моим отцом. 5. Этот журнал, как правило, читается моей сестрой.

A. Replace with the pronouns.

1. *My uncle* is a carpenter.

- a) She
- b) I
- c) He
- d) His

2. *His daughter* is a musician.

- a) She
- b) He
- c) Hers
- d) It

3. *Their aunt* is a manager.

- a) He
- b) She
- c) They
- d) Her

4. *Our parents* are physicians.

- a) He
- b) We
- c) They
- d) Our

5. *My grandfather and grandmother* are pensioners.

- a) My
- b) They
- c) She
- d) He

B. Choose the suitable forms of the verbs.

1. His uncle (to be) a fitter.

- a) are
- b) is
- c) am
- d) to be

2. My aunt (to have) those books.

- a) have
- b) to have
- c) has

3. I (to be) his cousin.

- a) is
 - b) are
 - c) am
 - d) to be
4. Their friends (to be) students.
- a) is
 - b) are
 - c) to be
 - d) am
5. His son (to have) this article.
- a) has
 - b) have
 - c) to have
6. This is my notebook, and that is
- a) hers
 - b) your
 - c) you
 - d) me
7. ... grandparents are pensioners.
- a) Me
 - b) Mine
 - c) My
 - d) Hers
8. ... are my pencils.
- a) That
 - b) These
 - c) This
 - d) We

C. Choose the correct sentences.

1. Two years ago my father (to work) in the office of that joint venture.
- a) Two years ago my father work in the office of that joint venture.
 - b) Two years ago my father works in the office of that joint venture.
 - c) Two years ago my father worked in the office of that joint

venture.

d) Two years ago my father will work in the office of that joint venture.

2. Next year we (to build) a house.

a) Next year we be build a house.

b) Next year we build a house.

c) Next year we built a house.

d) Next year we will build a house.

3. The friend of my sister seldom (to write) letters.

a) The friend of my sister seldom write letters.

b) The friend of my sister seldom writes letters.

c) The friend of my sister seldom writed letters.

d) The friend of my sister seldom shall write letters.

4. In four days he (to take) these books from the library.

a) In four days he will take these books from the library.

b) In four days he shall take these books from the library.

c) In four days he take these books from the library.

d) In four days he taked these books from the library.

5. Last Thursday I (to spend) much time in the park.

a) Last Thursday I spend much time in the park.

b) Last Thursday I will spend much time in the park.

c) Last Thursday I spent much time in the park.

d) Last Thursday I shall spend much time in the park.

D. Choose the suitable translation of the sentences.

1. Вчера он положил этот журнал в книжный шкаф.

a) Yesterday he put this magazine into the bookcase.

b) Yesterday he putted this magazine into the bookcase.

c) Yesterday he will put this magazine into the bookcase.

d) Yesterday he puts this magazine into the bookcase.

2. Три дня назад она получила письмо от своего друга.

a) Three days ago she get the letter from her friend.

b) Three days ago she got the letter from her friend.

c) Three days ago she will get the letter from her friend.

- d) Three days ago she shall get the letter from her friend.
3. Через месяц они покинут этот район нашего города.
- a) In a month they will left this district of our city.
 - b) In a month they left this district of our city.
 - c) In a month they will leave this district of our city.
 - d) In a month they shall leave this district of our city.
4. Предложения будут переведены с русского языка на английский.
- a) The sentences will be translated from Russian into English.
 - b) The sentences will translated from Russian into English.
 - c) The sentences be translated from Russian into English.
 - d) The sentences shall be translated from Russian into English.
5. Задача была выполнена им.
- a) The task was performed by him.
 - b) The task will be performed by him.
 - c) The task is performed by him.
 - d) The task performed by him.

Module 2. DIFFERENT TYPES OF EDUCATION

KEY VOCABULARY

Exercise 1. Read and guess the meanings of the new words.

- 1) *learning experiences*. Education includes different kinds of learning experiences.
- 2) *in the broadest sense*. In its broadest sense, education is the ways in which people get knowledge and understanding about the world and about themselves.
- 3) *to learn skills*. Pupils learn different skills.
- 4) *to gain knowledge*. People gain knowledge about the world.
- 5) *scheme*. We'll use this scheme when we discuss the problem.
- 6) *formal, informal*. We'll discuss formal and informal education.
- 7) *daily life*. People are involved in learning during their daily life.
- 8) *with good manners*. Children are taught to eat with good manners.
- 9) *to ride a bicycle*. Children learn to ride a bicycle.
- 10) *to take an exam*. He has to take different kinds of exams at the university.

- 11) *to be in charge of*. The Minister of Education is in charge of education at all the levels.
- 12) *to expect*. I expect she will pass the exam.
- 13) *both ... and ...*. Education includes both informal and formal ways of learning.
- 14) *vocational education*. School systems provide both general and vocational education.
- 15) *gifted, physically or mentally handicapped*. Most countries provide education both for gifted and for physically or mentally handicapped children.
- 16) *adult*. The country provides education both for children and for adults.
- 17) *aim*. The aim of vocational education is to prepare students for a job.
- 18) *intelligent*. She is a very intelligent student.
- 19) *responsible*. The Minister of Education is responsible for education at different levels.
- 20) *to transmit*. The information is transmitted from one computer to another through a telephone line.
- 21) *cultural heritage*. The aim of general education is to transmit a common cultural heritage.
- 22) *carpentry*. Students are taught carpentry, metalwork and electronics at technical schools.
- 23) *further education*. After leaving school adults may take up further education.
- 24) *compulsory*. Primary and secondary education is compulsory in most countries.
- 25) *beyond*. The pupils who stay in school at the age of 16 and beyond this age will prepare for the General Certificate of Education examination at Advanced Level.
- 26) *to support*. The higher schools in the UK are mainly supported by public funds.
- 27) *by correspondence*. The Open University in the UK provides degree courses by correspondence.
- 28) *instead*. It's too wet to go for a walk, let's go to the swimming pool instead.
- 29) *junior, senior*. High schools in the USA may be junior and senior.

30) *to earn*. He earns much money.

Exercise 2. Try to enrich your vocabulary:

a) **analyse the following words with different suffixes and divide them into two groups — nouns and adjectives:**

informal, formal, education, different, experience, useful, language, teacher, television, instruction, childhood, learner, nation, general, vocational, special, intelligent, cultural, heritage, specialist, technical, professional, agriculture, architecture, pleasure, educational, public, independent, corporation, correspondence, assistance, Russian, American, conversation, national, attendance;

b) **make up as many words as you can by combining different parts of the words:**

| | | |
|-----|---------|------|
| in- | differ | -ent |
| | use | -ful |
| | teach | -er |
| | learn | -ist |
| | special | |
| | depend | |

Exercise 3. Divide the following words and word combinations into two groups, those which describe a) informal education; b) formal education.

Library, museum, teacher, schools, colleges, universities, television programme, informal manner, to pass exams, certificate, diploma, degree, general education, vocational education, radio programme.

Exercise 4. Think over the definitions of the words and then:

a) ***agree or disagree with the following definitions***

1. *Skill* is a special ability to do something well, especially as gained by learning and practice.
2. *Sense* is good and especially practical understanding.
3. *Manner* is the way or method in which something is done or happens.
4. *Adult* is a fully grown person, especially a person over an age stated by law, usually 18 or 21.
5. *Heritage* is an object, custom, or quality which is passed down

over many years within a nation, social group, or family, and is thought of as some- thing valuable and important which belongs to all its members.

b) **match each word with its correct definition**

carpentry, to transmit, experience, to gain, intelligent

1. The art of work of a person who is skilled at making and repairing wooden objects, especially one who does this as a job.
2. Having or showing powers of learning, reasoning or understanding.
3. To send or pass from one person, place, thing to another.
4. Knowledge or skill which comes from practice in an activity or doing something for a long time, rather than from books.
5. To get something useful, wanted.

EXPLORING GRAMMAR

Exercise 1. Read the sentences, point out the Continuous Tenses. Give the Russian equivalents.

1. We use this scheme when we are discussing the problem.
2. Now he is sitting at the lesson.
3. These learners are working now at about the same speed as their classmates.
4. At 10 o'clock tomorrow he will be taking the exam.
5. He is watching TV at the moment.
6. Primary school pupils are being taught such skills as reading, writing, and arithmetic.
7. They were receiving instructions in different subjects the whole month.
8. At the moment the pictures are being described by the pupils.
9. He was visiting the museum from 4 till 6 o'clock yesterday.
10. The classes are being attended by the students all the term.

Exercise 2. Make up your own sentences according to the models.

Model A: *He was visiting the exhibition the whole morning yesterday.*

The exhibition was being visited by him the whole morning yesterday.

1. The family was watching TV from 9 till 11 o'clock yesterday.
2. The whole morning yesterday she was translating the article.
3. Last morning at 10 o'clock he was buying a newspaper at that newsstand.
4. The student was reading the book all evening yesterday.
5. She was writing an article during 3 hours yesterday.

Model B: *She is writing a composition at the moment.*

She will be writing a composition at 9 o'clock tomorrow.

1. He is speaking English now. 2. The student is answering questions at the moment. 3. At present she is attending English classes. 4. He is writing a composition now. 5. The teacher is solving the problem together with his students now.

Exercise 3. Fill in the blanks to streamline the use of the Continuous Tenses. The words in brackets are given to help you.

1. At the moment he ... the street (to cross). 2. Tomorrow at 9 o'clock they ... a composition (to write). 3. The composition ... by him now (to write). 4. Her daughter ... the text from 5 till 6 o'clock yesterday (to translate). 5. The children ... TV now (to watch). 6. At present the students ... the material about the educational system in the country (to study). 7. The material about the educational system ... by the students now (to study). 8. At the moment Mary ... the book into the bookcase (to put). 9. He ... the exam at 10 o'clock tomorrow (to take). 10. The students ... texts during the English classes tomorrow (to translate).

Exercise 4. Make up sentences according to the models to practise the use of the Continuous Tenses.

Model A: *Они пишут сочинение сейчас.*

They are writing a composition now.

1. Они посещают музей сейчас. 2. Студенты посещают лекции на протяжении всего семестра. 3. В данный момент они отвечают на вопросы. 4. В настоящее время обучающиеся сдают экзамены. 5. Они переводят текст сейчас.

Model B: *Он переводил статью вчера весь вечер.*

He was translating an article the whole evening yesterday.

1. Он отвечал на вопросы вчера в течение двух часов. 2. Студент готовился к занятиям весь вечер вчера. 3. Она посещала занятия по английскому языку в течение нескольких месяцев в прошлом году. 4. Преподаватель проверял тесты студентов вчера с 15.00 до 17.00. 5. Он читал газету вчера все утро.

READING

Exercise 1. Read the text.

DIFFERENT TYPES OF EDUCATION

Education includes different kinds of learning experiences. In its broadest sense, education is the ways in which people learn skills, gain knowledge and understanding about the world and themselves. A useful scheme for discussing education is to divide these ways of learning into two types: informal and formal.

Informal education involves people in learning during their daily life. For example, children learn their language simply when they listen to others and try to speak themselves. In the same informal manner, they learn to dress themselves, to eat with good manners, to ride a bicycle, or to make a telephone call. Education is also informal when people try to get information or to learn skills on their own initiative without a teacher. They may visit a book shop, library or museum. They may watch TV or listen to the radio. A lot of documentary and educational films and programmes can be watched in the Internet. People do not have to take tests or exams getting informal education.

The learners get formal education at different kinds of schools, colleges, universities. In most countries, people enter a system of formal education during their early childhood. In this type of education, people who are in charge of education decide what to teach. Then learners are studying these things with the teachers' help. Learners should come to school regularly and on time and try to work at about the same speed as their classmates. Learners have to take tests and exams. At the end of their learning, learners may earn a diploma, a certificate, or a degree as a mark of their success over the years.

The school systems of all modern nations provide both general and vocational education. Most countries also offer special education programs for gifted and for physically or mentally handicapped children. Adult education programs are provided for people who wish to take up their education after leaving school. Most countries are spending a large amount of time and money for formal education of their citizens.

The aim of general education is to make children intelligent, responsible, well-informed citizens. It is designed to transmit a common cultural heritage rather than to develop trained specialists.

Almost all elementary education is general education. In every country, primary school pupils are being taught skills they will use throughout their life, such as reading, writing, and arithmetic. They also receive instruction in different subjects, such as geography, history, etc. In most countries almost all young people continue their general education in secondary schools.

The aim of vocational education is primarily to prepare students for a job. Some secondary schools specialize in vocational programs. Technical schools are vocational secondary schools, where students are being taught more technical subjects, such as carpentry, metalwork, and electronics. Technical school students take some general education courses and vocational training. Universities and separate professional schools are preparing students for careers in such fields as agriculture, architecture, business, engineering, law, medicine, music, teaching, etc.

Exercise 2. Agree or disagree with the following statements.

1. There are two types of education. 2. A useful scheme for discussing education is to divide the ways of learning into two types. 3. Informal education involves people in learning during their daily life. 4. Formal education is given at different kinds of colleges. 5. General education is designed to develop trained specialists.

KEY VOCABULARY DEVELOPMENT

Exercise 1. Match the adjectives in column A with the nouns in column B to form meaningful phrases and then identify them at the sentence level in the text. It will help you understand the text in detail.

| A | B |
|----------------|--------------|
| 1) different | a) childhood |
| 2) formal | b) scheme |
| 3) useful | c) amount |
| 4) large | d) education |
| 5) intelligent | e) subjects |
| 6) young | f) heritage |
| 7) good | g) manners |
| 8) early | h) schools |
| 9) cultural | i) citizens |

- 10) technical j) people

Exercise 2. Decide which of the verbs on the left collocate with the nouns on the right and then identify the word combinations at the sentence level in the text. It will help you understand the text precisely.

- | | |
|---------------|-------------------|
| 1) to include | a) subjects |
| 2) to involve | b) knowledge |
| 3) to learn | c) a call |
| 4) to gain | d) a show |
| 5) to ride | e) exams |
| 6) to make | f) a bicycle |
| 7) to get | g) people |
| 8) to enter | h) skills |
| 9) to watch | i) information |
| 10) to pass | j) the university |

Exercise 3. Try to enrich your vocabulary:

a) **find words in the text which have the same meanings as the following words:**

to contain, to believe, the means, to study, to get, a kind, to talk, data, various, to be responsible for, a diploma, to want, to continue;

b) **find words in the text whose meanings are opposite to the meanings of the following words:**

informal, narrow, bad, different, the beginning, old, to give up, small, before;

c) **replace the words in italics with the words with similar and opposite meanings:**

1. This road is rather *broad*. 2. They study *different* subjects. 3. They want *to continue* their education. 4. The children are eating with *good* manners. 5. They were reading the text at *the beginning* of the lesson.

Exercise 4. Complete the sentences: change the word in capitals at the end of each sentence to form a word that fits suitably in the blank space.

1. The British universities are ... on the public system of education
DEPEND.

2. ... expects students to pass the exam TEACH.
3. Students should come to college ... REGULAR.
4. Pupils are taught ... subjects DIFFER.
5. ... study various subjects with the teacher at the head LEARN.

Exercise 5. Insert the words at the sentence level: fill in the blanks with the missing words (the first letter of each word is given).

1. T... their life people are learning different kinds of skills. 2. They g... knowledge about the world. 3. We'll discuss the education using one useful s... 4. Children learn to r... a bicycle. 5. On their own i..., people may visit a museum. 6. The students have to p... exams. 7. They are in c... of education. 8. The students are working at about the same s... 9. Learners may e... a degree. 10. His certificate is a m... of his success over the years.

TEST 2

1. Choose the proper words and fill in the blanks.

1. When we were discussing educational systems of different countries we used

- A. skills
- B. scheme
- C. the ways
- D. types

2. It is not difficult to use good ... when you are eating.

- A. manners
- B. children
- C. schemes
- D. speed

3. People ... knowledge about the world.

- A. pass
- B. gain
- C. expect
- D. support

4. To transmit common cultural heritage is ... of general education.

- A. made
- B. received
- C. the aim

D. the design

5. *The children are taught skills they will use ... their life.*

A. above

B. throughout

C. though

D. thought

6. *In most countries almost all young people ... their general education in secondary schools.*

A. continue

B. offer

C. include

D. specialize

7. *The system of education in Britain is divided into three stages: ..., secondary, and further education.*

A. vocational

B. general

C. primary

D. special

8. *British universities are ... corporations, but they are mainly supported by public funds.*

A. independent

B. different

C. various

D. unique

9. *Each state in the USA is in ... of organizing and regulating its own system of education.*

A. responsible

B. nation

C. charge

D. system

10. *High schools, ... and senior, provide secondary education in the USA.*

A. primary

B. elementary

C. junior

D. vocational

2. **The text contains different mistakes: 2 — in spelling, 5 — in grammar. Correct the mistakes and rewrite the text.**

In most western nations, advanced general education is often called liberal education, which aim at broad mentall development, and teach learners to study a problem from diferent sides. The branches of learning that help in these development are called liberal arts. This branches includes the humanities, mathematics, and the biological, physical, and social sciences.

Module 3. SCIENCE AND TECHNOLOGY

KEY VOCABULARY

Exercise 1. Read and guess the meanings of the new words.

- 1) *science, scientist, scientific.* Science deals with facts and relationships among these facts. Scientists may try to solve difficult mathematical problems. They use different scientific methods.
- 2) *to search, researcher.* Some scientists search for clues to the origin of the universe. Researchers have examined this problem.
- 3) *to investigate.* Some researchers investigate why we act the way we do.
- 4) *to unify.* Scientists develop theories that help them order and unify the facts.
- 5) *to attempt.* Scientists attempt to solve mathematical problems.
- 6) *to explain.* Scientists try to explain different phenomena.
- 7) *to prove.* A theory becomes a part of scientific knowledge if it has been tested experimentally and proved to be true.
- 8) *complicated.* The theory is complicated and hard to comprehend.
- 9) *to appear.* Many new fields of science have appeared.
- 10) *boundary.* The boundaries between scientific fields have become less clear.
- 11) *to interconnect.* All sciences are closely interconnected.
- 12) *tool.* Different kinds of tools and machines make our life easier.
- 13) *discovery, invention.* Discoveries and inventions made by scientists help shape our views about ourselves and our place in the universe.
- 14) *to satisfy.* Technology means the use of people's inventions and

discoveries to satisfy their needs.

- 15) *shelter*. Since people have appeared on the earth, they have had to get food, clothes, and shelter.
- 16) *steam engine*. Industrial technology began to develop with the invention of the steam engine, the growth of factories, and the mass production of goods.
- 17) *to contribute*. Science has contributed much to modern technology.
- 18) *nuclear power*. Some modern technologies, such as nuclear power production and space travel, depend heavily on science.

Exercise 2. Read the international words, mind the stress.

Fact, structure, mathematical, problem, systematic, method, theory, principle, test, group, natural, social, technical, basis, technology, machine, material, industrial, aspect, radio, television, telephone, communication, object, metal.

Exercise 3. Try to enrich your vocabulary:

- a) **analyse the following words with different suffixes and divide them into two groups — nouns and adjectives:**

relationship, scientist, structure, researcher, mathematical, systematic, observation, general, scientific, natural, social, technical, numerous, influence, invention, industrial, development, production, different, television, communication;

- b) **make up as many words as you can by combining different parts of the words:**

| | | |
|--------|------------|------|
| re- | search | -er |
| inter- | experiment | -al |
| | close | -ion |
| | invent | - |
| | | ment |
| | general | -ent |
| | develop | |
| | connect | |
| | product | |
| | differ | |
| | nation | |

Exercise 4. Divide the following words into two groups, those which describe

a) science; b) technology.

Tools, steam engine, knowledge, systematic methods, theory, natural sciences, technical sciences, discoveries, to explain, television, radio, numbers, researchers, scientists, social sciences.

Exercise 5. Think over the definitions of the words and then

a) agree or disagree with the following definitions:

1. *Science* is the study of knowledge which can be turned into a system, and which usually depends on seeing and testing facts and stating general natural laws.

2. *Technology* is a branch of knowledge dealing with scientific and industrial methods and their practical use in industry.

3. *Research* is a serious and detailed study of a subject that is aimed at learning new facts, scientific laws, testing ideas, etc.

4. *Tool* is a piece of equipment that is designed to do a particular type of work.

5. *Shelter* is a building or something of the kind that gives protection.

b) match each word with its correct definition:

to prove, to search, to unify, to explain, to appear

1. To combine parts of something to form a single whole.

2. To make clear or easy to understand, usually by speaking or writing.

3. To become able to be seen, to come into sight.

4. To show to be true by means of facts, documents, information, etc.

5. To try to find something or someone by looking carefully.

EXPLORING GRAMMAR

Exercise 1. Read the sentences, point out the Perfect Tenses. Give the Russian equivalents.

1. The boundaries between scientific fields have become less clear. 2. Has he ever researched this problem? 3. Scientific theories consist of general principles or laws that attempt to explain how and why something happens or has happened. 4. They will have translated the text by the end of the lesson. 5. The window had already been opened

when they entered the room. 6. The scientific article has been recently written by him. 7. He has never told the truth. 8. He has found shelter in a small village. 9. Many fields of science have appeared. 10. Scientific knowledge has grown and become more complicated.

Exercise 2. Make up your own sentences according to the models.

Model A: *He entered the university last year.*

He has already entered the university.

1. He tested it experimentally two days ago. 2. Yesterday he translated the scientific article. 3. They solved complicated mathematical problems not long ago. 4. She read this book last week. 5. She wrote her composition yesterday.

Model B: *She didn't write an article.*

She hasn't written an article yet.

1. He didn't pass the exam. 2. The scientists didn't test this phenomenon experimentally. 3. They didn't solve the problem. 4. She didn't read the article.

5. He didn't explain why it happens.

Exercise 3. Fill in the blanks to streamline the use of the Perfect Tenses. The words in brackets are given to help you.

1. He ... already ... this experiment (to do). 2. He ... just ... the exam (to pass). 3. ... you ever ... this book (to read)? 4. The article ... just ... by the students (to translate). 5. The scientific conference yet (to start).

Exercise 4. Make up sentences according to the models to practise the use of the Perfect Tenses.

Model A: *Они уже исследовали эту проблему.*

They have already investigated this problem.

1. Он только что доказал это экспериментально. 2. Она уже написала статью. 3. Он только что объяснил, почему это происходит. 4. Они уже доказали, что это правильно. 5. Он уже внес большой вклад в развитие науки.

Model B: *К десяти часам они завершат этот эксперимент. Ву 10 o'clock they will have finished this experiment.*

1. К понедельнику она напишет статью. 2. К следующей неделе он докажет это экспериментально. 3. К двум часам они переведут этот

текст. 4. К следующему году он завершит исследование. 5. Научная конференция закончится к пяти часам.

READING

Exercise 1. Read the text, try to focus on its essential facts.

SCIENCE AND TECHNOLOGY

The word “science” comes from the Latin word “scientia” which means “knowledge”. Science covers the broad field of knowledge that deals with facts and relationships among these facts.

Scientists study a wide variety of subjects. Some scientists search for clues to the origin of the universe and examine the structure of the cells of plants and animals. Other researchers investigate why we act the way we do or try to solve complicated mathematical problems.

Scientists use systematic methods of study to make observations and collect facts. They develop theories that help them order and unify facts. Scientific theories consist of general principles or laws that attempt to explain how and why something happens or has happened. A theory becomes a part of scientific knowledge if it has been tested experimentally and proved to be true.

Scientific study can be divided into three major groups: natural, social, and technical sciences. As scientific knowledge has grown and become more complicated, many new fields of science have appeared. At the same time, the boundaries between scientific fields have become less clear. Numerous areas of science overlap and it is often hard to tell where one science ends and other begins. All sciences are closely interconnected.

Science has great influence on our lives. It provides the basis of modern technology — the tools and machines that make our life and work easier.

The discoveries and inventions made by scientists also help shape our view about ourselves and our place in the universe.

Technology means the use of people’s inventions and discoveries to satisfy their needs. Since people appeared on the earth, they had to get food, clothes, and shelter. Through the ages, people invented tools, machines, and materials to make work easier. Nowadays, when people speak of technology, they generally mean industrial technology. Industrial technology began to develop about 200 years ago with the

invention of the steam engine, the growth of factories, and the mass production of goods. It influenced different aspects of people's lives. The development of the car influenced the way people lived and worked. Radio and television changed their leisure time. The telephone revolutionized communication.

Science has contributed much to modern technology. Science attempts to explain how and why things happen. Technology makes things happen. But not all technology is based on science. For example, people had made different objects from iron for centuries before they learnt the structure of the metal. But some modern technologies, such as nuclear power production and space travel, depend heavily on science.

Exercise 2. Agree or disagree with the following statements.

1. Scientists make observations and collect facts. 2. The boundaries between scientific fields have become less clear. 3. It is easy to tell where one science ends and other begins. 4. Science provides the basis of modern technology. 5. All modern technologies depend on science.

KEY VOCABULARY DEVELOPMENT

Exercise 1. Match the adjectives in column A with the nouns in column B to form meaningful phrases and then identify them at the sentence level in the text. It will help you understand the text in detail.

| A | B |
|------------------|---------------|
| 1) broad | a) word |
| 2) systematic | b) problem |
| 3) natural | c) theory |
| 4) Latin | d) principle |
| 5) different | e) groups |
| 6) general | f) methods |
| 7) major | g) field |
| 8) industrial | h) objects |
| 9) scientific | i) technology |
| 10) mathematical | j) sciences |

Exercise 2. Decide which of the verbs on the left collocate with the

nouns on the right and then identify the word combinations at the sentence level in the text. It will help you understand the text precisely.

- | | |
|-------------------|-------------|
| 1) to cover | a) clues |
| 2) to deal with | b) cells |
| 3) to come from | c) problems |
| 4) to search for | d) tools |
| 5) to examine | e) fields |
| 6) to investigate | f) facts |
| 7) to develop | g) word |
| 8) to divide into | h) theory |
| 9) to provide | i) groups |
| 10) to shape | j) basis |
| 11) to invent | k) views |

Exercise 3. Try to enrich your vocabulary:

a) **find words in the text which have the same meanings as the following words:**

wide, to research, to attempt, to examine, main, complex, difficult, to start, big, a motor, various, to study;

b) **find words in the text whose meanings are opposite to the meanings of the following words:**

narrow, easy, practice, artificial, old, more, to begin, small, little;

c) **replace the words in italics with the words with similar and opposite meanings:**

1. He happened to meet her in that *broad* street. 2. They are investigating *complex* problems. 3. It was a very *difficult* experiment. 4. They *started* researching this problem. 5. It was a *big* contribution.

Exercise 4. Complete the sentences: change the word in capitals at the end of each sentence to form a word that fits suitably in the blank space.

1. ... examine the structure of the cells SEARCH.
2. The ... of radio and television changed our leisure time INVENT.
3. This theory was ... proved EXPERIMENT.
4. He has won a prize at the ... conference NATION.
5. There are ... scientific fields DIFFER.

Exercise 5. Insert the words at the sentence level: fill in the blanks with the missing words (the first letter of each word is given).

1. Science d... with a variety of subjects. 2. Scientists s... for the answers to the different questions. 3. The structure of the cells is e... by scientists. 4. Different theories u... the facts. 5. The b... of some scientific fields are not clear. 6. Natural, social and technical sciences are closely i... 7. T... the ages, people have invented tools, machines, and materials to make work easier. 8. Science c... much to modern technology. 9. Some modern technologies d... on science. 10. During our l... time we watch TV.

TEST 3

1. Choose the proper words and fill in the blanks.

1. *Scientists solve a ... of complicated mathematical problems.*
 - A. origin
 - B. variety
 - C. universe
 - D. cell
2. *The researchers always try to ... the facts.*
 - A. refer
 - B. measure
 - C. satisfy
 - D. unify
3. *When people speak of technology they usually mean ... technology.*
 - A. medical
 - B. nuclear
 - C. educational
 - D. industrial
4. *... make our life and work easier.*
 - A. Principles
 - B. Laws
 - C. Tools
 - D. Facts
5. *People had to get food, clothes and*
 - A. shelter
 - B. machines

- C. cars
- D. technologies
- 6. *Science is ... much to modern technology.*
 - A. doing
 - B. making
 - C. contributing
 - D. explaining
- 7. *Science has great ... on our lives.*
 - A. attempt
 - B. influence
 - C. boundary
 - D. discovery
- 8. *Industrial technology began to develop with the ... of the steam engine.*
 - A. technology
 - B. discovery
 - C. invention
 - D. structure
- 9. *The boundaries between scientific fields have become ... clear.*
 - A. less
 - B. more
 - C. most
 - D. almost
- 10. *All sciences are closely*
 - A. investigated
 - B. unified
 - C. explained
 - D. interconnected

2. The text contains different mistakes: 2 - in spelling, 5 - in grammar. Correct the mistakes and rewrite the text.

Computers has changed the way people work. Many tasks which was performed by a large number of people is done now by computers. They provide scintists with understanding of nature. Computers produces new information so quikly that they have change people's views on the world.

Module 4. ENGINEERING IN THE 21st CENTURY

KEY VOCABULARY

Exercise 1. Read and guess the meanings of the new words.

- 1) *to design*. Engineers design structures, machines, apparatus, or manufacturing processes.
- 2) *cognizance*. They construct machines with full cognizance of their design.
- 3) *to utilize, utilization*. Utilization of advanced systems and devices simplify our life.
- 4) *to encompass*. Engineering encompasses chemical, electrical, civil engineering, and mechanical engineering.
- 5) *predecessor*. This society was a predecessor of that one.
- 6) *processing*. Chemical engineering covers areas from biotechnology and nanotechnology to mineral processing.
- 7) *to overlap*. In each new field, considerable overlap takes place.
- 8) *core concepts*. Engineering applies the core concepts of mechanics, kinematics, material science, structural analysis to mechanical systems.
- 9) *to maintain*. Mechanical engineering tries to apply the core concepts of different sciences to design, manufacture and maintain mechanical systems.
- 10) *computer-aided engineering, product lifecycle management*. These tools include both computer-aided engineering and product lifecycle management to design manufacturing plants.
- 11) *heating and cooling systems, robotics*. They design heating and cooling systems, robotics and medical devices.
- 12) *to emerge*. Mechanical engineering emerged as a field during the industrial revolution in Europe.
- 13) *to incorporate advancement*. Mechanical engineering incorporates advancements in technology.
- 14) *to pursue*. Mechanical engineers pursue developments in technology.
- 15) *to proceed*. They proceed to work on both power-producing and power-using machines.
- 16) *internal combustion engines*. Mechanical engineers work with power-producing machines such as electric generators, internal

combustion engines, steam and gas turbines.

17) *material handling systems*. Material handling systems and robotics are used in manufacturing.

18) *artificial joints, heart valves*. Engineers should design products that are both challenging and exciting, for example, artificial joints and heart valves just to name a few.

19) *tough, flexible, responsive, smart*. Engineers can make materials that are not just lighter, tougher and more flexible but also responsive and smart.

20) *tiny*. They manufacture complex nanocomponents from these materials in order to create tiny machines.

21) *to cope with*. The student has managed to cope with his task.

Exercise 2. Read the international words, mind the stress.

Civilization, process, visualize, robotics, thermodynamics, structural analysis, architect, mechanical, electronic, protect, zone, vibroacoustic, information technology, automatically operated system, logical problem, reduce, optimum design, dynamics, machine.

Exercise 3. Try to enrich your vocabulary:

a) **analyse the following words with different suffixes and divide them into two groups — nouns and adjectives:**

combination, safety, energy, scientific, difference, mechanical, chemical, automation, engineering, pollution, consumption, considerable, structural, production, operation, different, industrial, advancement, development, generator;

b) **make up as many words as you can by combining different parts of the words:**

| | | |
|-------|------------|-------|
| auto- | technology | -er |
| re- | design | -ance |
| mis- | vision | -al |
| nano- | structure | |

Exercise 4. Divide the following terms into two groups, those which describe

a) **engineering;** b) **mechanical engineering.**

Chemical engineering, to maintain mechanical systems, electrical engineering, machinery, mechanical power, civil engineering, mechanical engineers, to test tools, engines, mechanical devices, internal combustion engines.

Exercise 5. Think over the definitions of the words and then:

a) **agree or disagree with the following definitions**

1. *Engineering* is application of scientific principles aiming at designing and developing structures, machines, and manufacturing processes.
2. *Mechanical engineering* is the science or profession dealing with studying, designing, or building machines.
3. *Biotechnology* is the use of bacteria and plant/animal cells for industrial or scientific purposes.
4. *Valve* is the part of a machine or piece of equipment that opens and closes in order to control the flow of air or liquid.
5. *Automation* is the process easing working environment.

b) **match each word with its correct definition**

competence, CAD (computer-aided design), cognizance, tool, concept

1. The process by which you recognize and understand something.
2. A piece of equipment that is designed to do a particular type of work.
3. The process of using drawings made by a computer to design machines, building, etc.
4. Skills, knowledge and suitable experience.
5. The idea of something that exists.

EXPLORING GRAMMAR

Exercise 1. Read the sentences, point out the infinitive. Give the Russian equivalents.

1. They decided to design advanced machines.
2. To utilize these principles is not easy.
3. Some companies hope to create streamlined, in terms of efficiency, safety devices.
4. To reduce hard physical labour engineers should design and develop smart machines.
5. Mechanical engineers plan to use highly energy-efficient machines.
6. The programme targeted on assisting with the design and manufacture of any kind of vehicles.
7. It is our plan to maximize the performance of the

car. 8. They have to work together. 9. They should work hard to make a good progress. 10. It is a good question to be discussed.

Exercise 2. Make up your own sentences according to the models.

Model A: *To employ advanced technologies is our target.*

Our target is to employ advanced technologies.

1. To develop machines on the base of advanced materials is a completely new model. 2. To maintain performance excellence is a new concept. 3. To process all parts according to the design is an integral part of modern requirements. 4. To rely on old tools is quite a wrong approach. 5. To gain the lead in many technical fields is our plan.

Model B: *They decided to work on the structural integrity of the vehicle. They did not decide to work on the structural integrity of the vehicle.*

1. They agreed to use those machines. 2. They wanted to work on power-producing machines. 3. They planned to apply those tools. 4. We advised to test other devices. 5. He wanted to produce all the components.

Exercise 3. Fill in the blanks to streamline the use of the infinitive. The words in brackets are given to help you.

1. At the moment the engineers should ... new methods in their fields (ИСПОЛЬЗОВАТЬ). 2. They have decided ... tools (ПРОЕКТИРОВАТЬ). 3. We need ... a completely new model (ИСПЫТАТЬ). 4. Nowadays mechanical engineers have ... developments in such fields as mechatronics and nanotechnology (ПРОДОЛЖАТЬ). 5. The engineers have managed ... more efficient machines (КОНСТРУИРОВАТЬ).

Exercise 4. Make up sentences according to the models to practise the use of the infinitive.

Model A: *The device which we should use is very complex.*

The device to be used is very complex.

1. The proposal which they should discuss is wrong. 2. The progress that she should make is pretty tough. 3. The way which we should choose is the right one. 4. The idea which they should come up with is too promising. 5. The project which we should sign is very profitable.

Model B: *Чтобы подготовить этот доклад, вы должны пойти в библиотеку.*

To prepare this report you should go to the library.

1. Чтобы использовать новые материалы, вы должны установить новое оборудование. 2. Чтобы продвигаться успешно, мы должны провести эксперимент вовремя. 3. Чтобы сконструировать эту модель, вы должны много работать. 4. Чтобы использовать эти машины, их нужно испытать. 5. Чтобы исследовать эту проблему, они должны использовать новые приборы.

READING

Exercise 1. Read the text, try to focus on its essential facts.

ENGINEERING

Engineering is “*the creative application of scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design; or to forecast their behavior under specific operating conditions; all as respects an intended function, economics of operation or safety to life and property. One who practices engineering is called an engineer, and those licensed to do so may have more formal designations such as Professional Engineer, Chartered Engineer. The broad discipline of engineering encompasses a range of more specialized subdisciplines, each with a more specific emphasis on certain fields of application and particular areas of technology*”. The American Engineers’ Council for Professional Development (ECPD), the predecessor of ABET (Accreditation Board for Engineering and Technology).

Engineering has the following branches: chemical engineering (covering areas from biotechnology and nanotechnology to mineral processing), electrical engineering, civil engineering, mechanical engineering. Beyond these four, historically, naval engineering and mining engineering claim on being major branches as well as aerospace, petroleum, biosystems, biomedical, industrial, and nuclear engineering. New fields are combined with the traditional fields and then form new branches, for example, Earth Systems Engineering and Management that involve such subject areas as anthropology, engineering, environment science, ethics, and philosophy. In each new field, considerable overlap takes place, especially in the areas of application of science to such disciplines as physics, chemistry, and mathematics.

Within our interests lies mechanical engineering. **Mechanical engineering** is known as a branch of engineering that tries to apply the core concepts of physics, mechanics, kinematics, thermodynamics, materials science, structural analysis, materials science to the analysis, design, manufacture, and maintenance of mechanical systems. It is a well-known fact that mechanical engineering involves production and usage of heat and mechanical power for design, production, and operation of machines and tools. To use these core concepts along with different tools, mechanical engineers use both computer-aided engineering and product lifecycle management to design and analyze manufacturing plants. They use them in industrial equipment and machinery, heating and cooling systems, transport systems, aircraft, watercraft, robotics, medical devices, etc.

Mechanical engineering emerged as a field during the industrial revolution in Europe in the 18th century. As for mechanical engineering science, it emerged in the 19th century as a result of developments in the field of physics. Mechanical engineering has managed to incorporate advancements in technology. As a result, today mechanical engineers pursue developments in such fields as composites, mechatronics, and nanotechnology. Mechanical engineering manages to overlap with aerospace engineering, civil engineering, electrical engineering, petroleum engineering, and chemical engineering to various extents. Mechanical engineers' tasks are to research, design, develop, manufacture and to test tools, engines, machines, and other mechanical devices. They proceed to be working on both power-producing machines such as electric generators, internal combustion engines, steam and gas turbines and on power-using machines such as refrigeration and air-conditioning equipment, machine tools, material handling systems, elevators and escalators, industrial production equipment, and robots used in manufacturing. Mechanical engineers also seek to design tools that other engineers need for their work.

Exercise 2. Agree or disagree with the following statements.

1. Engineering encompasses only chemical, electrical, and civil engineering. 2. Mechanical engineering applies core concepts of physics, mechanics, materials science to the design, manufacture, and maintenance of mechanical systems. 3. Mechanical engineers use these

core concepts along with different tools. 4. Mechanical engineering emerged in the 17th century. 5. Mechanical engineering overlaps with aerospace engineering, mechatronics, and nanotechnology.

KEY VOCABULARY DEVELOPMENT

Exercise 1. Match the words in column A with the words in column B to form meaningful phrases and then identify them at the sentence level in the text. It will help you understand the text in detail.

A

- 1) scientific
- 2) manufacturing
- 3) power-using
- 4) material
- 5) forecast
- 6) computer-aided
- 7) product lifecycle
- 8) advanced
- 9) incorporate

B

- a) advancements
- b) principle
- c) science
- d) machines
- e) behaviour
- f) product
- g) management
- h) structures
- i) knowledge

Exercise 2. Decide which of the verbs on the left collocate with the nouns on the right and then identify the word combinations at the sentence level in the text.

- | | |
|-----------------|-------------------|
| 1) to utilize | a) apparatus |
| 2) to design | b) structures |
| 3) to forecast | c) behaviour |
| 4) to encompass | d) machines |
| 5) to create | e) areas |
| 6) to cover | f) subdisciplines |
| 7) to overlap | g) concepts |
| 8) to apply | h) physics |
| 9) to maintain | i) systems |

Exercise 3. Try to enrich your vocabulary:

a) **find words in the text which have the same meanings as the following words:**

use, to use, main, to construct, predict, wide, to embrace, field, to produce, various, to investigate, job, to look for;

b) **find words in the text whose meanings are opposite to the meanings of the following words:**

less, within, old, external, to lose, narrow, the same, unknown;

c) **replace the words in italics with the words with similar meanings:**

1. Engineering is the creative use of scientific principles *to construct* structures. 2. They planned *to use* those machines. 3. Engineering *embraces* some *fields*. 4. Mechanical engineers *produce* and maintain mechanical systems. 5. Mechanical engineers' tasks are *to investigate*, design, develop, manufacture, and to test tools.

Exercise 4. Complete the sentences: change the word in capitals at the end of each sentence to form a word that fits suitably in the blank space.

1. Many ... do their best to produce advanced machines
MANUFACTURE.

2. Social and ... damage is also caused by the growing discrepancy between technical competences in different regions
ECONOMY.

3. Very small machines, gears, and robots will be applied ... in medicine
BROAD.

4. A number of problems in different areas will have to be solved within mechanical engineering to turn these still-visionary concepts into ...
REAL.

5. Mechanical engineering maintains its predominant role thanks to the ... and use of new materials and advanced technologies
DEVELOP.

Exercise 5. Insert the words at the sentence level: fill in the blanks with the missing words (the first letter of each word is given).

1. It is the branch of e... that involves the production and usage of heat and mechanical power for the design, production, and operation of machines and t... . 2. Mechanical engineering has managed to incorporate a... in technology. 3. Mechanical engineers are pursuing developments in such fields as composites, mechatronics, and n... . 4. Considerable o... exists in each new field. 5. Mechanical engineering tries to apply the c... c... of different sciences. 6. Mechanical engineers design, manufacture and m... mechanical systems. 7. This field e... in the 19th century. 8. They usually use i... c... engines.

TEST 4

1. Choose the proper words and fill in the blanks.

1. *... is the creative application of scientific principles to particular branch.*
 - A. engineering
 - B. aerospace
 - C. civil engineering
 - D. petroleum
2. *One who practices engineering is called*
 - A. a chartered engineer
 - B. an engineer
 - C. a professional engineer
 - D. a respected engineer
3. *Engineering encompasses ... branches.*
 - A. two
 - B. four
 - C. three
 - D. four main and other branches
4. *New fields are combined together with the traditional ones*
 - A. to form new branches
 - B. to use new concepts
 - C. to advance existing
 - D. to overlap
5. *In each new field, considerable ... exists.*
 - A. overlap
 - B. breakthrough
 - C. gap
 - D. cover
6. *Mechanical engineering is known as a branch of... .*
 - A. engineering
 - B. aerospace
 - C. civil engineering
 - D. industrial engineering
7. *Mechanical engineering uses core concepts for the entire life cycle of*
 - A. mechanical systems
 - B. equipment
 - C. tools

- D. transport system
- 8. *Mechanical engineers pursue developments in such fields as*
 - A. composites
 - B. nanotechnology
 - C. chemistry
 - D. composites, mechatronics, nanotechnology
- 9. *Mechanical engineers design tools that other ... need for the work.*
 - A. engineers
 - B. scientists
 - C. managers
 - D. devices
- 10. *Mechanical engineers design, manufacture, and ... mechanical systems.*
 - A. respect
 - B. heat
 - C. combine
 - D. maintain

2. **The text contains different mistakes: 4 — in spelling, 3 — in grammar. Correct the mistakes and rewrite the text.**

Mechanical engineering are a scientific and technical basis for machinery advansemments. It is due to the fact that it use new materials and enhanced tehnologies. The main goals of engineering is to streamline mashines in terms of efficiency, safety, reliability and ecological performance.

Module 5. FLEXIBLE MANUFACTURING SYSTEMS

KEY VOCABULARY

Exercise 1. Read and guess the meanings of the new words.

- 1) *flexible manufacturing system (FMS)*. FMS is a manufacturing technology.
- 2) *to incorporate*. FMS incorporates a system view of manufacturing.
- 3) *to evolve*. The concept of FMSs went on evolving at that time.
- 4) *to succeed in*. Computerized numerical controls succeeded in

bringing a controlled environment to the factory floor.

5) *numerically controlled, direct-numerically-controlled machines.* They managed to control the manufacture using numerically-controlled and direct-numerically-controlled machines.

6) *sophisticated material-handling systems.* Early FMSs contained sophisticated material-handling systems.

7) *incredibly.* Early FMSs were controlled by incredibly complex soft- ware.

8) *flexible cell.* The trend in FMS is towards small versions of the traditional FMS called flexible manufacturing cells (FMC).

9) *to introduce a wide scale automation.* The progress of computing machines allowed introducing a wide scale automation of all branches of industry.

10) *independent development.* The progress of computing machines led to independent development of automation process.

11) *computer-aided designing (CAD).* Automated data processing includes automated control systems and computer-aided designing.

12) *computer-aided manufacturing (CAM).* Automation of production technology includes numerically-controlled equipment, computer- aided manufacturing, and industrial robots.

13) *to be interconnected.* The various cells for machining are interconnected by an automated transport system.

14) *loading, unloading stations.* The various machining cells are interconnected via loading or unloading stations by an automated transport system.

15) *possibility.* This prospect of automation and flexibility presents the possibility of producing non-standard parts.

16) *competitive advantage.* They employ different competitive advantages to maintain a lead in this industry.

17) *to approach.* The general objectives of FMS are to approach the efficiencies and economies of mass production.

18) *small- and medium-lot-size production.* FMS maintains the flexibility required for small- and medium-lot-size production of variety of parts.

19) *to fall within.* Two kinds of systems for manufacturing fall within the FMS spectrum.

20) *generic.* A generic FMS consists of some components.

- 21) *set-up time, change-over.* A set of stations do not require significant set-up time or change-over between successive jobs.
- 22) *milling, boring, drilling.* These machines perform operations of milling, boring, drilling, etc.
- 23) *routing.* Computers direct the routing of jobs through the system.
- 24) *to be capable of.* Computers are capable of performing complex tasks.
- 25) *to track.* Computers track the status of all jobs in progress.
- 26) *to ensure.* A network of supervisory computers and microprocessors is to ensure that the right tools are available for the job.
- 27) *to provide the monitoring.* Computers provide the monitoring of correct performance of operations.
- 28) *to require attention.* Computers signal problems requiring attention.
- 29) *to make customizations.* Machines can be used to assemble different parts and to make customizations.
- 30) *to implement.* Several companies decided to implement flexible manufacturing systems.
- 31) *agility.* The common word for today's manufacturer is agility.

Exercise 2. Read the international words, mind the stress.

Computer, control, technology, philosophy, concept, system, version, machine, group, product, problem, central, component, operation, result, cooperation, material, final, automation, complex, instruction, signal.

Exercise 3. Try to enrich your vocabulary:

a) **analyse the following words with different suffixes and divide them into two groups — nouns and adjectives:**

numerical, technological, automation, operation, flexibility, possibility, arrangement, conversion, requirement, different, flexible, numerical, environment, expensive, version, traditional, development, industrial, various, famous, production, significant, computer, instruction, station, performance;

b) **make up as many words as you can by combining different parts of the words:**

| | | | |
|-----|---------|--------|-----|
| | move | -or/er | |
| re- | operate | -ance | -ly |

| | |
|-----------|-------|
| perform | -tion |
| tradition | -al |
| develop | -ment |

Exercise 4. Divide the following words into two groups, those which belong to

a) automated data processing; b) automation of production technology.

Computer-aided manufacturing, industrial robots, automated control systems, CAM, computer-aided design, numerically-controlled equipment, CAD.

Exercise 5. Think over the definitions of the words which appear in the texts and dialogues and then:

a) agree or disagree with the following definitions

1. *FMS (flexible manufacturing system)* is a manufacturing system in which there is some amount of flexibility that allows the system to react in the case of changes, whether predicted or unpredicted.
2. *CNC (computer numerical control)* is the method of controlling machines by the application of digital electronic computers and circuitry (design or de-tailed plan for an electric circuit).
3. *Agile manufacturing* is the manufacturing that has created the processes, tools, to respond quickly to customers' needs and market changes while still controlling costs and quality.
4. *Flexible* means able to make changes or to deal with the situation that is changing.
5. *A network* is a set of computers that are connected to each other so that each computer can send and receive information to and from other computers.

b) match each word with its correct definition

scale, system, manufacture, robot, component

1. A machine that can do work by itself.
2. One of the different parts that a machine or piece of equipment consists of.
3. A set of connected things that work together for a particular purpose.
4. The size of something, especially when it is big.

5. The process of making goods in large quantities in a factory.

EXPLORING GRAMMAR

Exercise 1. Read the sentences, point out the gerund. Give the Russian equivalents.

1. By changing the speed of machining they significantly increased the performance. 2. We apply different technologies for performing two or more functions simultaneously. 3. They have to analyse manufacturing of automobiles. 4. You may use these technologies for maximizing the performance of the machines. 5. We are interested in producing non-standard parts. 6. It is worth installing new machinery. 7. On checking the set of work stations we found the reason of their failure. 8. Providing monitoring of operations we identified the problems requiring special attention. 9. They are thinking of saving huge amounts of money by switching to flexible manufacturing systems. 10. They missed the opportunity of producing low quality products.

Exercise 2. Make up your own sentences according to the models.

Model A: *They designed that model. They did not use the computer.*

They designed that model without using the computer.

1. They assembled the car parts. They did not use FMS. 2. They improved the processes. They did not increase the price. 3. They performed different operations. They did not make production more flexible. 4. They controlled the production. They did not apply incredibly complex software. 5. They tried to attach doors to the car. They did not use special equipment.

Model B: *When they introduced wide scale automation, independent automation processes began to develop.*

On introducing wide scale automation, independent automation processes began to develop.

1. When we came to the plant, we installed new machinery. 2. When they returned to the workshop, they installed the necessary equipment. 3. When the idea of FMS was proposed, computerized numerical controls succeeded in bringing a controlled environment to the factory floor. 4. When they started to use FMS, they increased the number of units produced per hour. 5. When they completed the manufacturing, they faced many problems.

Exercise 3. Fill in the blanks to streamline the use of the gerund. The words in brackets are given to help you.

1. The microprocessors are capable of ... several functions (to perform).
2. FMS is famous for ... a manufacturing technology (to be).
3. FMS incorporates a system view of ... (to manufacture).
4. The concept of FMS continued ... (to evolve).
5. ... the monitoring of operations is very important (to provide).

Exercise 4. Make up sentences according to the model to practise the use of the gerund.

Model: *Прочитав эти данные, они рассмотрели вопрос о совершенствовании системы.*

After reading these data they decided to upgrade this system.

1. Изучив данные о применении нового оборудования, производители решили установить новые станки с числовым управлением на все производственные линии.
2. Прочитав информацию о ГАП (гибкое автоматизированное производство), они изменили свое решение.
3. После того как идея ГАП была представлена, она продолжала развиваться.
4. После того как производители изучили все недостатки и преимущества этой системы, они были готовы поддержать новый проект.
5. После того как он рассмотрел схему, он мог назвать компоненты этой системы.

READING

Exercise 1. Read the text, try to focus on its essential facts.

FLEXIBLE MANUFACTURING SYSTEM

Flexible Manufacturing System (FMS) is famous for being both a manufacturing technology and a philosophy. "System" is the key word for a flexible manufacturing system. FMS incorporates a system view of manufacturing. The FMS idea was proposed in England (1960s) under the name "System 24". It was a flexible machining system that could operate without human operators 24 hours a day but being controlled by a computer.

The concept of flexible manufacturing systems went on evolving at that time when robots, programmable controllers, and computerized numerical controls succeeded in bringing a controlled environment to

the factory floor in the form of numerically-controlled and direct-numerically-controlled machines. Early FMSs were large and very complex, consisting of dozens of Computer Numerical Controlled machines (CNC) and sophisticated material-handling systems. They were too expensive and they were controlled by incredibly complex software.

Currently, the trend in FMS is towards small versions of the traditional FMS, called flexible manufacturing cells (FMC). Today two or more CNC machines are considered a flexible cell and two or more cells — a flexible manufacturing system. The progress of computing machines allowed to introduce a wide scale automation of all branches of industry and led to independent development of automation processes:

- Automated Data Processing: the appearance of Automated Control Systems and Computer-Aided Designing (CAD);
- Automation of Production Technology: the appearance of Numerically-Controlled Equipment, Computer-Aided Manufacturing (CAM) and Industrial Robots.

Thus, a flexible manufacturing system is a group of numerically-controlled machine tools, interconnected by a central control system. The various cells for machining are interconnected via loading and unloading stations by an automated transport system. Simply defined, it is an automated production system that produces one or more families of parts in a flexible manner. Today, this prospect of automation and flexibility presents the possibility of producing non-standard parts to create a competitive advantage. Stated formally, the general objectives of FMS are to approach the efficiencies and economies of mass production, and to maintain the flexibility required for small- and medium-lot-size production of a variety of parts. Two kinds of systems for manufacturing fall within the FMS spectrum: assembly systems for assembling components into final products and systems of forming, which actually form components or final products.

A generic FMS consists of the following components:

- a set of work stations which contain machine tools that do not require significant set-up time or change-over between successive jobs; typically, these machines perform operations of milling, boring, drilling, etc.;
- a material-handling system allowing to move between any pair of

machines so that any job routing can be followed;

- a network of supervisory computers and microprocessors which are capable of performing some or all of the following tasks: directing the routing of jobs through the system; tracking the status of all jobs in progress so it is known where each job is to go next; passing instructions for the processing of the operation to the station; ensuring that the right tools are available for the job; and providing the monitoring of correct performance of operations and signaling problems requiring attention;
- a storage, locally at the work stations, and (or) centrally at the system level.

Exercise 2. Agree or disagree with the following statements.

1. FMS is both a manufacturing process and a philosophy. 2. Early FMSs were small with several CNC machines. 3. Today two or more CNC machines are thought of being a flexible cell and two or more cells make up a flexible manufacturing system. 4. FMS is a group of numerically-controlled machine tools interconnected by a central control system. 5. The main components of FMS are: a set of workstations with machine tools, a material-handling system, a network of supervisory computers and storage.

KEY VOCABULARY DEVELOPMENT

Exercise 1. Match the words in column A with the words in column B to form meaningful phrases and then identify them at the sentence level in the text. It will help you understand the text in detail.

A

- 1) controlled
- 2) various
- 3) sophisticated
- 4) wide
- 5) flexible
- 6) programmable
- 7) human
- 8) numerical
- 9) manufacturing
- 10) industrial

B

- a) software
- b) system
- c) scale
- d) environment
- e) controllers
- f) robots
- g) controls
- h) operator
- i) technology
- j) cells

Exercise 2. Decide which of the verbs on the left collocate with the nouns on the right and then identify the word combinations at the sentence level in the text. It will help you understand the text precisely.

- | | |
|--------------------|----------------|
| 1) to incorporate | a) system |
| 2) to propose | b) changes |
| 3) to assemble | c) tools |
| 4) to require | d) functions |
| 5) to perform | e) change-over |
| 6) to interconnect | f) idea |
| 7) to respond to | g) parts |
| 8) to present | h) components |
| 9) to provide | i) environment |
| 10) to produce | j) possibility |

Exercise 3. Try to enrich your vocabulary:

a) **find words in the text which have the same meanings as the following words:**

main, to continue, to develop, complex, nowadays, adaptable, information, different, manufacture, purpose, type, to include, to fulfil, through, work, considerable;

b) **find words in the text whose meanings are opposite to the meanings of the following words:**

unknown, indirect, modern, simple, cheap, less, standard, beyond, disadvantage;

c) **replace the words in italics with the words with similar meanings:**

1. We are to install a set of work stations containing machine tools which do not require *considerable* set-up time or change-over between successive jobs. 2. They were automated, too expensive and controlled by incredibly *complex* software. 3. They *continue* installing the equipment. 4. There are *different* tools in the workshop. 5. The system *includes* some components.

Exercise 4. Complete the sentences: change the word in capitals at the end of each sentence to form a word that fits suitably in the blank space.

1. The general objectives of FMS are to approach the ... and economies of mass production and to maintain the flexibility required for small- and medium-lot-size production of a variety of parts EFFICIENT.
2. It provides essential monitoring of correct ... of operations and signals problems which require attention PERFORM.
3. It led to ... development of automation processes DEPEND.
4. FMS is an automated ... system PRODUCT.
5. It led to the ... of automated control systems APPEAR.

Exercise 5. Insert the words at the sentence level: fill in the blanks with the missing words (the first letter of each word is given).

1. Early FMSs were large and very complex, consisting of dozens of C... N... C... machines (CNC) and s... material-handling systems. 2. A material- handling system is automated and f... . 3. Supervisory computers and microprocessors p... different tasks. 4. FMS i... a system view of manufacturing. 5. The concept of FMS went on e... . 6. Computerized numerical controls s... in bringing a controlled environment to the factory floor. 7. Early FMSs were controlled by i... complex software. 8. The progress of computing machines allowed introducing a wide s... automation of all branches of industry. 9. Flexibility presents the p... of producing non-standard parts. 10. Two kinds of systems for manufacturing fall w... the FMS spectrum.

TEST 5

1. Choose the proper words and fill in the blanks.

1. *FMS is*
 - A. a technology
 - B. a cell
 - C. an idea
 - D. a manufacturing technology and a philosophy
2. *The idea of FMS was proposed under the name*
 - A. "system 24"
 - B. "system 01"
 - C. "system 12"
 - D. "system 007"
3. *Early FMSs were... .*

- A. internal
 - B. chemical
 - C. electrical
 - D. large and very complex
4. *Two or more CNC machines are... .*
- A. a flexible cell
 - B. FMS
 - C. a flexible element
 - D. a set of CNC
5. *Two or more cells are*
- A. FMS
 - B. a control system
 - C. a set of cells
 - D. a handling system
6. *FMS is a group of*
- A. NC machine tools
 - B. control system
 - C. CNC
 - D. automated controllers
7. *The prospect of flexibility is to produce*
- A. non-standard parts
 - B. spare parts
 - C. defective parts
 - D. units
8. *Supervisory computers signal about*
- A. problems
 - B. shortage
 - C. assessment
 - D. report
9. *An agile manufacturer is ... manufacturer on the market.*
- A. the fastest
 - B. the slowest
 - C. the shortest
 - D. the lowest
10. FMS allows to achieve
- A. agility
 - B. barriers

- C. obstacles
- D. labour force

2. **The text contains different mistakes: 2 — in spelling, 4 — in grammar. Correct the mistakes and rewrite the text.**

One of the ideas behind FMS are allowing the business to foresee and to prioritize the goals of innovations in technology. Technological barriers are involve in slowing the efforts of be more adaptable. It require additional planning to cope with these obstacles.

Module 6. COMPUTERS

KEY VOCABULARY

Exercise 1. Read and guess the meanings of the new words.

- 1) *to embed*. Computers have deeply embedded in our lives.
- 2) *analog computer, digital computer*. We can speak about analog computers and digital computers.
- 3) *to measure a quantity*. Analog computers worked with physical quantities, such as weight, speed, temperature. They solve problems by measuring a quantity in terms of another quantity.
- 4) *to deal with numbers*. Digital computers deal with numbers.
- 5) *at the appropriate time*. A memory unit stores information and makes it available at the appropriate time.
- 6) *random-access memory (RAM), read-only memory (ROM)*. The memory consists of the two main parts called the primary memory — RAM and the secondary memory — ROM.
- 7) *to perform calculations*. An arithmetic-logical unit performs calculations.
- 8) *processing unit*. The term “computer” refers to the central processing unit (CPU).
- 9) *to issue commands*. The central processing unit issues commands to other parts of the system.
- 10) *to be termed*. An input/output unit is collectively termed I/O.
- 11) *to insert, to remove*. An input/output unit inserts data into a machine and removes data from it.
- 12) *hardware*. The visible units are physical components of a data processing system, or hardware.
- 13) *to house the motherboard*. The case or chassis houses the

motherboard.

14) *systems software, application software*. Software programmes are of two types: system software and application software.

15) *indispensable, irreplaceable*. Computers have become indispensable and irreplaceable in many spheres of our life.

Exercise 2. Read the international words, mind the stress.

Modern, manual, computer, idea, calculate, mathematician, automatic, control, progress, electronics, commercial, terminal, instruction, winchester, disc, result, component, industry, business, scanner, service, voicemail, machine, automatic, system, analog, communication, operation, primitive, data.

Exercise 3. Try to enrich your vocabulary:

a) **analyse the following words with different suffixes and divide them into two groups — nouns and adjectives:**

specialist, general, important, memory, advantage, regular, digital, calculation, available, additional, electronic, visible, processor, communication, basic, numerical, information, computation, initial, likeness, performance, visual, magnetic, arithmetic, general, logical, storage, solution, environment, scanner, adaptable, printer;

b) **make up as many words as you can by combining different parts of the words:**

| | | | |
|------|----------|-------|---------|
| non- | digit | -ize | -er/-or |
| un- | adapt | -al | -tion |
| ir- | standard | -able | |
| in- | replace | -ive | |
| | put | | |

Exercise 4. Divide the following words into two groups, those which describe

a) **computer systems; b) functional units of the computer.**

Analog, input/output devices, control unit, measurement, application software, digital, software, arithmetic-logical unit, programmes, system programmes, memory, pocket computer, notebook, central processing unit.

Exercise 5. Think over the definitions of the words and then:

a) **agree or disagree with the following definitions**

1. *Computer* is a programmable machine that can store, retrieve, and process data.
2. *Memory* is a physical device to store such information as data or programmes on a temporary or permanent basis.
3. *Hardware* is mechanical and electronic parts that constitute a computer system, as distinguished from the computer programmes that drive the system.
4. *CPU (central processing unit)* is a principal part of any digital computer system, generally composed of the main memory, a control unit and an arithmetic-logical unit.
5. *Data processing* is manipulation of data by a computer.

b) **match each word with its correct definition**

character, data, to feed, random, to house

1. Information given in the form of characters.
2. A written language symbol.
3. To place, to locate something.
4. To insert information into the computer.
5. Chosen or happening without any particular method, pattern or purpose.

EXPLORING GRAMMAR

Exercise 1. Read the sentences, point out Participle I and Participle II. Give the Russian equivalents.

1. When entering the Internet, I always find the required information.
2. If compared with the analog computer, digital computers have other functions.
3. When used, voltage represents other physical quantities in analog computers.
4. While dealing with discrete quantities, digital computers count rather than measure.
5. At the moment our computer systems are inputting, storing, processing, controlling, and outputting data.
6. Combined capabilities of both analog and digital computers belong to hybrid computers.
7. Having finished the research, they analysed the data obtained.
8. Having translated the programme into the machine language, he put it into a computer.
9. Having been well prepared for the test, postgraduates managed to answer all the questions

the tutor asked them. 10. When entering data correctly into the computer system, they avoid the need for further adjustments by a person.

Exercise 2. Make up your own sentences according to the models.

Model A: *When properly programmed, computers don't err.*

Having been properly programmed, computers don't err.

1. When well regulated, the equipment operates well. 2. When documents correctly filled in, they don't need extra checks. 3. When loaded, the numbers are stored on the platforms of storage. 4. When loaded with cargo, cars can move between stations. 5. When moved, the ball located on the bottom side of the mouse turns rollers.

Model B: *A smartphone is a mobile phone that offers a more advanced computing ability.*

A smartphone is a mobile phone offering a more advanced computing ability.

1. A smartbook is a concept of a mobile device that falls between smartphones and netbooks. 2. A smartbook is a gadget that delivers features found in smartphones. 3. BlackBerry is a line of mobile e-mail that functions as a Personal Digital Assistant (PDA). 4. Twitter is a social and micro blogging service that enables users to send and read other users' messages called tweets. 5. An iPhone is a camera phone that includes text messages, visual voicemail, a portable media player, and web browsing facilities.

Exercise 3. Fill in the blanks to streamline the use of the Participle I and Participle II. The words in brackets are given to help you.

1. A computer is ... numbers and orders into memory (to insert). 2. An electronic digital computer is a system ... and ... a very large amount of data (to process, to store). 3. The computer is a system ... numerical computations (to perform). 4. The computer is a device ... instructions with extreme speed (to follow). 5. The numbers and the instructions are ... in the computer memory (to store). 6. The arithmetic-logical unit is a device ... circuits ... the arithmetic computations (to contain, to perform). 7. The codes ... by computer designers are ... on number of systems (to use, to base). 8. Having been coded the instruction to the central processing unit (to be transmitted). 9. ... the functions of storage units, we controlled the processing unit (to discuss). 10. ... to the

CPU, the instructions made an arithmetic-logical unit perform some operations (to deliver).

Exercise 4. Make up sentences according to the models to practise the use of the verbals.

Model A: *Вам следовало бы прочитать об удивительных свойствах компьютера раньше.*

You should have read about wonderful features of computers earlier.

1. Вам следовало бы заказать эти устройства раньше. 2. Ему следовало бы ввести данные в запоминающее устройство раньше. 3. Вам следовало бы раньше рассмотреть эту систему как крупномасштабную цифровую систему. 4. Вам следовало бы знать об этом устройстве раньше. 5. Вам следовало бы выполнить вычисления раньше.

Model B: *Для того чтобы выполнять тысячи вычислительных действий в минуту, были разработаны компьютеры.*

To perform thousands of computations per second computers were designed.

1. Использовались транзисторы для того, чтобы сделать компьютеры более надежными. 2. Для того чтобы сократить время для вычисления, были применены эти устройства. 3. Аналитический двигатель был изобретен для того, чтобы хранить данные. 4. Для того чтобы интегрировать большое количество элементов электронной цепи в маленький чип, транзисторы были уменьшены в размерах. 5. Прикладное программное обеспечение используется для того, чтобы разрешить специальные проблемы, связанные с обработкой различных данных.

READING

Exercise 1. Read the text, try to focus on its essential facts.

COMPUTER LITERACY

A computer is one of the most important items society possesses today. Computers have deeply imbedded in our lives, so we can hardly imagine our life without them. But what is a computer? What are the main parts of this gadget? Let's try to sort it out. As we know, all computer systems perform functions of inputting, storing, processing, controlling, and outputting. So, there should be units performing these functions. The

functional units of a digital computer are:

- storage or memory — to store information and make it available at the appropriate time;
- arithmetic-logical unit (ALU) — to perform the calculations;
- control unit (CU) — to control and coordinate data movements within the central processing unit (CPU), between the CPU and the other components of the computer system;
- input/output unit (collectively termed I/O) — to insert data into a machine or to remove them from it for further consideration.

Speaking more precisely, “computer” refers to the central processing unit together with the internal memory. The CU and ALU are collectively known as CPU. The CPU coordinates all the actions performed by various components of the computer, by issuing commands to other parts of the system and by acting on responses.

The memory, one of the basic components, is often called storage. It stores calculation programmes, calculation formulae, initial data, intermediate and final results. Generally, memory consists of two main parts called the primary, or internal memory (RAM), and the secondary, or external memory (ROM). The advantage of the primary memory is an extremely high speed. The secondary memory in its turn has a comparatively low speed, but it can store a far greater amount of information than the primary memory.

Now if we look at the computer, what can we see? The case, or chassis, houses the following units: motherboard holding the CPU and physically connecting all the other main parts of the computer; HDD (hard disc drive, commonly called “winchester” in the youth slang); and a power supply unit. The visible units are physical components of a data processing system, or hardware.

Not visible is the software. Software programmes are of two types: system software and application software. System software is the programmes designed to control the operation of a computer system. They do not solve specific problems. Application software is the programmes written to solve specific tasks.

Output devices rendering information in the form of words, sounds, and pictures are a monitor, printers, speakers, etc. Input devices, enabling information to pass into a computer are a keyboard, a mouse, scanners, digital cameras, sound cards, etc.

Exercise 2. Agree or disagree with the following statements.

1. Computers have deeply embedded into our lives. 2. All computers perform functions of inputting, storing and controlling. 3. The functional units are storage, a control unit, and input/output. 4. The memory is often called storage. 5. The visible units are hardware, whereas invisible ones are software.

KEY VOCABULARY DEVELOPMENT

Exercise 1. Match the adjectives in column A with the nouns in column B to form meaningful phrases and then identify them at the sentence level in the text. It will help you understand the text in detail.

| A | B |
|-----------------|----------------|
| 1) appropriate | a) speed |
| 2) functional | b) results |
| 3) digital | c) units |
| 4) internal | d) time |
| 5) initial | e) information |
| 6) high | f) tasks |
| 7) specific | g) memory |
| 8) intermediate | h) computer |
| 9) available | i) components |
| 10) various | j) data |

Exercise 2. Decide which of the verbs on the left collocate with the nouns on the right and then identify the word combinations at the sentence level in the text. It will help you understand the text precisely.

| | |
|-------------------|-----------------|
| 1) to control | a) problems |
| 2) to solve | b) operations |
| 3) to insert into | c) parts |
| 4) to imagine | d) information |
| 5) to connect | e) data |
| 6) to remove | f) calculations |
| 7) to perform | g) units |

- 8) to house
- 9) to store
- 10) to issue

- h) life
- i) machine
- j) commands

Exercise 3. Try to enrich your vocabulary:

a) **find words in the text which have the same meanings as the following words:**

significant, to name, device, to fulfil, to insert, parts, storage, different, to contain, to join, to keep, exactly, basic, to get;

b) **find words in the text whose meanings are opposite to the meanings of the following words:**

with, to input, beyond, external, into, approximately, final, low, disadvantage, hardware, invisible;

c) **replace the words in italics with the words with similar meanings:**

1. What are the *basic parts* of this *device*? 2. An arithmetic-logical unit *fulfils* the calculations. 3. The case *contains* several units. 4. The motherboard *joins* the main parts of the computer. 5. Output devices *present* information in the form of words, sounds, and pictures.

Exercise 4. Complete the sentences: change the word in capitals at the end of each sentence to form a word that fits suitably in the blank space.

- 1. A ... computer deals with numbers DIGIT.
- 2. An input unit inserts data into a machine for further ... CONSIDER.
- 3. A computer has several ... units FUNCTION.
- 4. The secondary memory has a ... low speed COMPARE.
- 5. The secondary memory can store a far ... amount of information GREAT.

Exercise 5. Insert the words at the sentence level: fill in the blanks with the missing words (the first letter of each word is given).

1. The memory, one of the basic components, is also called s... . 2. M... stores programmes and formulae. 3. The C... coordinates all functions of the computer. 4. The memory consists of RAM and R... . 5. The C... and ALU are known as the CPU. 6. Memory makes information

available at a... time. 7. The ALU performs c... . 8. The CPU i... commands to other parts of the system. 9. RAM is an i... memory. 10. ROM is an e... memory.

TEST 6

1. Choose the proper words and fill in the blanks.

1. *The system ... is usually stored in read-only memory.*
 - A. hardware
 - B. software
 - C. firmware
 - D. variety
2. *Instructions and data are fed through the ... devices*
 - A. output
 - B. input
 - C. control
 - D. memory
3. *A computer can perform very complex numerical...*
 - A. communication
 - B. instructions
 - C. computations
 - D. tasks
4. *Numbers and instructions forming the programme are ... in the memory.*
 - A. stored
 - B. solved
 - C. settled
 - D. simulated
5. *The control unit serves for ... orders.*
 - A. reading
 - B. inputting
 - C. interpreting
 - D. fulfilling
6. *Magnetic disks constitute the ... storage media.*
 - A. internal
 - B. primary
 - C. secondary
 - D. main

7. *Magnetic ... were the main elements used in digital computers for many years.*

- A. cores
- B. tapes
- C. disks
- D. drives

8. *Input-output devices allow the computer to ... with its external environment.*

- A. compute
- B. communicate
- C. command
- D. cooperate

9. *Electronic memories have ... capacities for data storage.*

- A. more
- B. larger
- C. less
- D. similar

10. *The control unit ... instructions from the programme.*

- A. sends
- B. changes
- C. obtains
- D. gains

2. **The text contains different mistakes: 2 — in spelling, 4 — in grammar. Correct the mistakes and rewrite the text.**

The most comon keyboard device use the QWERTY keyboard. It called a “QWERTY” keyboard because there is the first six letters on the top left of the keyboard. The multimedia input devices is digit kamera, webcam, video capture, scanner, and voice data entry.

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МИНОБРНАУКИ РОССИИ

Федеральное государственное бюджетное образовательное
учреждения высшего образования
«Юго-Западный государственный университет»
(ЮЗГУ)

Кафедра иностранных языков

УТВЕРЖДАЮ
Проректор по учебной работе
О.Г. Локтионова
« 25 » 10 2022 г.



ENGLISH FOR ENGINEERS. PART 2

Методические указания для самостоятельной работы
по дисциплине «Иностранный язык» для обучающихся на
механико-технологическом факультете
по направлениям подготовки:
23.03.01, 23.03.03, 15.03.05, 15.03.01, 29.03.05, 20.03.01

Курск 2022

УДК 811.111(075.8)

Составитель: Е.А. Таныгина, А.Б. Ставинская

Рецензент

Кандидат филологических наук, доцент

А.В. Аппенкова

English for Engineers. Part 2 [Текст] : Методические указания для самостоятельной работы по дисциплине «Иностранный язык» для обучающихся на механико-технологическом факультете по направлениям подготовки: 23.03.01, 23.03.03, 15.03.05, 15.03.01, 29.03.05, 20.03.01 / Юго-Зап. Гос. Ун-т; сост.: Е.А. Таныгина, А.Б. Ставинская. – Курск, 2022. – 36 с. – Библиогр.: с. 36.

Методические указания для самостоятельной работы по иностранному языку для обучающихся на механико-технологическом факультете по направлениям подготовки: 23.03.01 Технология транспортных процессов, 23.03.03 Эксплуатация транспортно-технологических машин и комплексов, 15.03.05 Конструкторско-технологическое обеспечение машиностроительных производств, 15.03.01 Машиностроение, 29.03.05 Конструирование изделий лёгкой промышленности, 20.03.01 Техносферная безопасность соответствуют федеральному государственному образовательному стандарту высшего образования.

Цель методических указаний – усвоение необходимого минимума словарного состава текстов по техническим специальностям, включая общенаучную, терминологическую, служебную лексику, и включают в себя тексты для чтения, лексико-грамматические упражнения и тесты. Данное пособие также способствует формированию навыков перевода текста.

Текст печатается в авторской редакции

Подписано в печать .Формат 60x84 1/16.

Усл.печ. л. . Уч.-изд. Л.. Тираж 100 экз. Заказ. Бесплатно. *2140*

Юго-Западный государственный университет.

305040, г. Курск, ул. 50 лет Октября, 94.

Module 7 ENGINEERING MATERIALS

KEY VOCABULARY

Exercise 1. Read and guess the meanings of the new words.

- 1) *access*. The earliest humans had an access to only a very limited number of materials.
- 2) *property*. A lot of materials with specialized properties were produced.
- 3) *to encompass*. Material science encompasses various classes of materials.
- 4) *alloy*. Metallic materials include metals and alloys.
- 5) *ferrous metals*. Metallic materials which contain iron are called ferrous metals.
- 6) *non-ferrous metals*. Metallic materials which do not contain iron are called non-ferrous metals.
- 7) *cast iron*. The most common ferrous metals are cast iron and steel.
- 8) *to influence*. Different elements in alloys influence properties of materials.
- 9) *brittleness*. Large amount of carbon in cast iron increases its brittleness.
- 10) *to rust*. Steel containing nickel or chromium does not rust.
- 11) *tungsten*. Steels which contain tungsten or cobalt are extremely hard.
- 12) *copper*. Aluminium and copper are widely used.
- 13) *ductile, malleable*. Copper is a ductile and malleable metal.
- 14) *frequent*. Copper is a frequent element of various metal alloys.
- 15) *brass, tin, lead*. Brass contains copper and zinc, bronze contains copper and tin/lead.
- 16) *representative*. Polymers are representatives of non-metallic materials.
- 17) *rubber*. One of the best-known natural polymers is rubber.
- 18) *thermoplastics, thermosets*. Plastics can be divided into thermoplastics and thermosets.
- 19) *to mould*. Thermoplastics can be heated and moulded numerous times.
- 20) *indispensable*. The properties of plastics are indispensable.

- 21) *flexible*. Plastics are flexible.
- 22) *relevantly*. Plastics are relevantly cheap.
- 23) *subsequent cooling*. Ceramic materials are formed by the action of heat and subsequent cooling.
- 24) *clay*. Clay was one of the earliest materials used to produce ceramics.
- 25) *stiff*. Ceramics tend to be strong, stiff, brittle, and chemically inert.
- 26) *to vary*. Ceramics properties vary widely.
- 27) *insulator*. Porcelain is widely used to make electrical insulators.
- 28) *available*. A lot of engineering materials are available to engineer.
- 29) *to choose*. Engineers have to choose the engineering materials.
- 30) *purpose*. Engineers have to choose the engineering materials best suited the given purpose.
- 31) *to memorize*. Have you memorized the groups of engineering materials?
- 32) *to exist*. A wide variety of materials exists nowadays.
- 33) *to decline*. Some materials tend to have a declining usage.
- 34) *to save*. The manufacturers are switching from steel to aluminium to save weight of a car.
- 35) *to change*. The materials technology is constantly changing.
- 36) *to substitute*. Aluminium can substitute steel.
- 37) *to increase*. The popularity of aluminium is increasing.

Exercise 2. Try to enrich your vocabulary:

a) **analyse the following words with different suffixes and divide them into two groups — nouns and adjectives:**

development, civilization, natural, possible, various, traditional, ferrous, different, brittleness, stainless, structure, corrosion, resistance, thermal, electrical, frequent, indispensable, action, industrial, insulator, superconductor:

b) **make up as many words as you can by combining different parts of the words:**

| | | |
|--------|-----------|-------|
| super- | develop | -ment |
| in- | tradition | -al |
| re- | resist | -ance |

| | |
|---------|-------|
| differ | -ent |
| stain | -less |
| brittle | -ness |
| conduct | -or |
| mould | |

Exercise 3. Divide the following words into two groups, those which describe or belong to a) metallic materials; b) non-metallic materials.

Ferrous, iron, polymers, alloys, thermoplastics, steel, chromium, polycarbonate, copper, rust, tungsten, cobalt, ductile, brass, electrical insulators, thermosets, non-ferrous, cobalt, nickel, zinc, aluminium, ductile, bronze, rubber, thermoset, plastics, polyvinylchloride, ceramics, clay, porcelain, malleable, cast iron.

Exercise 4. Think over the definitions of the words which appear in the texts and dialogues and then:

a) agree or disagree with the following definitions

1. *Common* means happening frequently or existing in large amounts or numbers.
2. *Rubber* is a strong substance that can bend easily and is used for making things such as tyres or boots.
3. *Non-ferrous metals* are metals that do not contain iron.
4. *Ferrous metals* are metals that contain iron.
5. *Amount* is a quantity of something.

b) match each word with its correct definition

cast iron, property, conductor, insulator, copper

1. Quality or a feature of something.
2. Ferrous metal.
3. Non-ferrous metal.
4. Substance that allows heat or electricity to pass through it.
5. Substance that reduces the amount of heat or electricity that can pass through something.

EXPLORING GRAMMAR

Exercise 1. Read the sentences, point out the Complex Object. Give the Russian equivalents.

1. The engineers consider this material to be rather brittle.
2. I wish them to make this experiment.
3. I heard the engineers change the

technological process of producing this material. 4. They let him research this problem. 5. They allowed this alloy to be used in the production of these tools.

Exercise 2. Make up your own sentences with the Complex Object according to the models.

Model A: *They believe that this element influences the property of this material.*

They believe this element to influence the property of this material.

1. They consider that this material contains iron. 2. They suppose that this steel is stainless. 3. We expect that they form ceramics by the action of heat and subsequent cooling. 4. We know that ceramics is strong, stiff, brittle and chemically inert. 5. We believe that they use this material in this structure. 6. They think that this alloy contains nickel.

Model B: *We know that he investigated this problem.*

We know him to have investigated this problem.

1. He believes that they made an experiment. 2. He thinks that they used these data for their experiment. 3. We know that they described the experiment in the scientific article. 4. We expect that manufacturers increased the aluminium application in the production. 5. We consider that materials technology changed.

Exercise 3. Fill in the blanks to streamline the use of the Complex Object. The words in brackets are given to help you.

1. He supposes ... to study here (she). 2. We think the early humans ... a very limited number of materials (to use). 3. We believe ... to make an experiment (they). 4. I believe him ... an experiment long ago (to make). 5. She knows him ... this problem last year (to investigate).

Exercise 4. Make up sentences according to the models to practise the use of the Complex Object.

Model A: *Мы знаем, что они провели эксперимент. We know them to have made an experiment.*

1. Мы знаем, что он исследовал эту проблему. 2. Мы полагаем, что он учился здесь. 3. Мы думаем, что они изменили технологический процесс. 4. Мы считаем, что они решили эту проблему. 5. Мы знаем, что она выбрала самый лучший доклад.

Model B: *Она разрешила ему участвовать в конференции.*

She let him take part in the conference.

1. Он позволил им изменить технологический процесс. 2. Она за-

ставила их решить эту проблему. 3. Мы позволили ей выбрать лучший вариант. 4. Он заставил их исследовать эту проблему. 5. Они заставили инженеров выбрать конструкционные материалы с определенными механическими свойствами.

READING

Exercise 10. Read the text.

DIFFERENT KINDS OF ENGINEERING MATERIALS

Materials played a major role in the development of societies. Civilizations were named by the level of their materials development, e.g. the Stone Age, the Bronze Age, and the Iron Age. The earliest humans had an access to only a very limited number of natural materials. Modern technologies have made it possible to produce new materials. We believe more than 50,000 materials with specialized properties to have been developed by now. Materials science encompasses various classes of materials, but the traditional groups of engineering materials are metallic materials (metals and alloys) and non-metallic materials (polymers, ceramics, etc.).

Metallic materials include ferrous (those that contain iron) and non-ferrous (those that do not contain iron) metals. It should be noted that while describing alloys which are metallic materials it is possible to use the term “metals”. The most common ferrous metals are cast iron and steel, which are both alloys. Different elements in alloys influence properties of materials: large amount of carbon in cast iron increases its brittleness; stainless steels containing nickel or chromium do not rust; steels, which contain tungsten or cobalt, are extremely hard, etc. We consider the most widely used non-ferrous metals to be aluminium and copper. Aluminium alloys are widely used in engineering structures and components where light weight or corrosion resistance is required. Copper is a ductile, malleable metal with a very high thermal and electrical conductivity. It is a frequent element of various metal alloys: brass (copper and zinc), bronze (copper and tin/lead).

Polymers are representatives of non-metallic materials. One of the best known natural polymers is rubber. However, most of the polymers used in industry are not natural but synthetic; they are generally called ‘plastics’. Plastics can be divided in two categories: thermoplastics and thermosets. Thermoplastics can be heated and moulded numerous times.

Common engineering thermoplastics are ABS (acrylonitrile butadiene styrene); polycarbonate; PVC (polyvinylchloride). Thermosets can be heated and moulded only once, they cannot be remoulded. The most common engineering thermosets are epoxy resins and polyamides. The properties of plastics are indispensable: they are lightweight, hard, easy to shape and colour, flexible, non-rusting, relevantly cheap, etc.

Ceramic materials are inorganic, non-metallic materials which are formed by the action of heat and subsequent cooling. Clay was one of the earliest materials used to produce ceramics, but many different ceramic materials are now being used in domestic and industrial products. Ceramics tend to be strong, stiff, brittle, chemically inert. They are non-conductors of heat and electricity, but still their properties vary widely. For example, porcelain is widely used to make electrical insulators, but some ceramic compounds made from a metal and a non-metal are superconductors.

Thus, at present a lot of engineering materials are available to engineer, who has to choose the one best suited to serve the given purpose.

Exercise 2. Agree or disagree with the following statements.

1. A lot of materials were available to early humans. 2. The traditional groups of engineering materials are metals and alloys. 3. It is possible to use the term 'metals' instead of 'metallic materials'. 4. Representatives of nonmetallic materials are ceramics. 5. Copper is a frequent element of various metal alloys.

KEY VOCABULARY DEVELOPMENT

Exercise 1. Match the adjectives in column A with the nouns in column B to form meaningful phrases and then identify them at the sentence level in the text. It will help you understand the text in detail.

| A | B |
|------------------|-----------------|
| 1) stiff | a) amount |
| 2) electrical | b) steel |
| 3) various | c) element |
| 4) ferrous | d) conductivity |
| 5) ductile | e) insulators |
| 6) brittle | f) materials |
| 7) indispensable | g) ceramics |

- | | |
|--------------|---------------|
| 8) stainless | h) cast iron |
| 9) frequent | i) properties |
| 10) large | j) metals |

Exercise 2. Decide which of the verbs on the left collocate with the nouns on the right and then identify the word combinations at the sentence level in the text. It will help you understand the text precisely.

- | | |
|------------------|-------------------|
| 1) to encompass | a) classes |
| 2) to influence | b) thermoplastics |
| 3) to contain | c) material |
| 4) to change | d) properties |
| 5) to choose | e) nickel |
| 6) to mould | f) technology |
| 7) to substitute | g) popularity |
| 8) to increase | h) steel |
| 9) to save | i) groups |
| 10) to memorize | j) weight |

Exercise 3. Try to enrich your vocabulary:

a) find words in the text which have the same meanings as the following words:

for example, people, to embrace, big, an element, different, to manufacture, aim;

b) find words in the text whose meanings are opposite to the meanings of the following words:

the latest, unlimited, synthetic, small, decrease, soft, heavy, low, rare, the worst, stiff, expensive, organic, conductors;

c) replace the words in italics with the words with similar meanings:

1. Materials science includes *different* classes of materials. 2. Materials science *embraces* the traditional classes of engineering materials: metallic and non-metallic materials. 3. Clay was used *to manufacture* ceramics. 4. There are a lot of alloys containing copper, *for example*, brass, bronze, etc. 5. Ancient *people* had an access to a very limited number of natural materials.

Exercise 4. Complete the sentences: change the word in capitals at the end of each sentence to form a word that fits suitably in the blank space.

1. ... steels which contain nickel do not rust STAIN.

2. Materials were very important in the ... of societies DEVELOP.
3. Carbon increases ... in cast iron BRITTLE.
4. There are ... kinds of engineering materials DIFFER.
5. Corrosion ... is one of the aluminium properties RESIST.

Exercise 5. Insert the words at the sentence level: fill in the blanks with the missing words (the first letter of each word is given).

1. A lot of materials with specialized p... have been developed.
2. Metallic materials which contain iron are called f... metals.
3. Steels which contain t... are extremely hard.
4. Copper is a m... metal.
5. Copper is a f... element of various alloys.
6. R... is a natural polymer.
7. T... can be moulded numerous times.
7. The plastics properties are i... .
8. Ceramics are strong and s... .
9. Materials science e... different groups of materials.
10. Metallic materials include metals and a... .

TEST 7

1. **Choose the proper words and fill in the blanks.**

1. *Materials which consist of two or more elements combined by chemical reaction present a category of*

- | | |
|--------------|------------------------|
| A. elements | C. mixtures |
| B. compounds | D. composite materials |

2. *... is a matrix with a reinforced material inside it.*

- | | |
|---------------|-------------------------|
| A. An element | C. A mixture |
| B. A compound | D. A composite material |

3. *... includes two or more elements which are not chemically bound.*

- | | |
|---------------|-------------------------|
| A. An element | C. A mixture |
| B. A compound | D. A composite material |

4. *... cannot be broken into separate constituents.*

- | | |
|---------------|-------------------------|
| A. An element | C. A mixture |
| B. A compound | D. A composite material |

5. *Cast iron and steel are*

- | | |
|--------------|------------------------|
| A. elements | C. mixtures |
| B. compounds | D. composite materials |

6. *Copper is*

- | | |
|---------------|-------------------------|
| A. an element | C. a mixture |
| B. a compound | D. a composite material |

7. *Polymers are representatives of*

- A. ceramics C. non-metallic materials
 B. plastics D. thermosets
 8. ... *polymers are usually called "plastics"*.
 A. Natural B. Synthetic C. Cheap D. Non-rusting
 9. *Ceramics are ...*.
 A. ductile B. stiff C. malleable D. lightweight
 10. *A lot of engineering materials are ... to engineer.*
 A. flexible B. brittle C. available D. subsequent

2. The text contains different mistakes: 2 - in spelling, 5 - in grammar. Correct the mistakes and rewrite the text.

There are various classes of materials. They can be divided into two groups: metals and non-metals. Metals include ferrous and non-ferrous metals. Cast iron and steel are common ferrous metals. Copper and aluminium are non-ferrous metals. Non-metals embrace polymers, ceramics, etc.

Module 8. ENGINEERING MATERIALS TECHNOLOGY (1)

KEY VOCABULARY

Exercise 1. Read and guess the meanings of the new words.

- 1) *forming, cutting, joining*. Metalworking processes can be categorized as forming, cutting, and joining processes.
- 2) *to embrace*. Metalworking embraces forming, cutting, and joining.
- 3) *casting, castings*. Casting is a forming process during which metal castings are produced.
- 4) *to pour into a mold*. Heated liquid material is usually poured into a mold.
- 5) *hollow cavity*. A mold contains a hollow cavity of the desired shape.
- 6) *to solidify*. Heated liquid metal cools and solidifies in a mold.
- 7) *to eject*. A casting is ejected from the mold.
- 8) *to complete*. A casting is ejected or broken out of the mold to complete the process.
- 9) *foundry*. All metal castings are produced in foundries.

- 10) *rolling, extrusion, drawing*. All technological processes of metalworking with the application of force or pressure embrace final metallurgy(which includes rolling, extrusion, and drawing) and workpieces and machine parts manufacturing.
- 11) *forging, forgings*. Forging is one of the oldest metalworking processes during which forgings are produced.
- 12) *open die forging, impression die forging, closed die forging*. Workpieces and machine parts manufacturing embraces open die forging, impression die forging, closed die forging, etc.
- 13) *to improve*. Forging improves the mechanical properties of metals.
- 14) *grain*. Forging minimizes the internal grain size in metal.
- 15) *drawing out, upsetting, squeezing*. There are different kinds of forging operations: drawing out, upsetting, squeezing in compression dies.
- 16) *cross section*. While drawing out the workpiece length increases and its cross section decreases.
- 17) *die*. Most forging operations use metal-forming dies.
- 18) *to withstand*. Metal-forming dies must be precisely designed and carefully heat-treated to withstand the tremendous forces and pressure.
- 19) *flat, shaped*. Open die forging uses flat and shaped dies.
- 20) *to achieve*. On completing open die forging, forgings require their considerable machining to achieve the final shape.
- 21) *to attach to the anvil*. In impression die forging, the metal workpiece is placed in a die which is attached to the anvil.
- 22) *to drop*. The hammer is dropped on the workpiece to make the metal flow and fill the die cavities.
- 23) *excess metal, flash*. Excess metal flows out of the die and forms flash.
- 24) *to prevent from*. The flash cools more rapidly than the rest of material so it helps prevent from forming more flash.
- 25) *lubrication*. The disadvantage of closed die forging is the need for better lubrication and workpiece placement.
- 26) *sheet metal forming*. Sheet metal forming is one of the manufacturing processes.
- 27) *stamping, punching, bending*. Sheet metal forming includes stamping, punching, bending, etc.

28) *to involve*. Recent developments involve the heating of dies or workpieces.

29) *powder metallurgy*. Forming processes embrace casting, metalworking with the application of force or pressure, and powder metallurgy.

30) *molten metal*. Heated liquid metal is called molten metal.

31) *billet, bar, ingot*. Metal components can be formed by using metal powder instead of molten metal, billets, bars or ingots.

32) *sintering*. Sintering is the process when the powder is placed into a die, compressed and then heated until the powder particles join together structurally.

Exercise 2. Try to enrich your vocabulary:

a) analyse the following words with different suffixes and divide them into two groups — nouns and adjectives:

various, pressure, cavity, numerous, section, extrusion, final, mechanical, internal, plastic, deformation, temperature, different, operation, compression, tremendous, considerable, impression, variation, advantage, additional, lubrication, placement, thickness, dimensional, productivity, requirement, centrifugal, central, electricity, facility, production, equipment, desirable, economical, controllable;

b) make up as many words as you can by combining different parts of the words:

| | | | | |
|----------|-----------|---------|-----------|------|
| multi- | dimension | -al | impress | -ion |
| differ | | | -ent | |
| compress | | | -ion | |
| product | | | -able | |
| place | | | -ment | |
| equip | | | -ure | |
| press | consider | require | direction | |

Exercise 3. Divide the following words or phrases into three groups, those which describe or belong to a) casting; b) metalworking with the application of force or pressure; c) powder metallurgy.

Rolling, extrusion, foundry, flash, cross-section, drawing, forging, sheet metal forming, hollow cavity, pour, grain, drawing out, upsetting, flat die, shaped die, excess metal, lubrication, solidify, workpiece, recrystallization, punching, bending, billet, bar, ingot, molten metal, squeezing in compression dies.

Exercise 4. Think over the definitions of the words which appear in the texts and dialogues and then:

a) **agree or disagree with the following definitions**

1. *Cavity* is a hole or space inside a solid object.
2. *Foundry* is a factory where metal or glass is heated and made into different objects.
3. *Cross section* is the inside of the object that you can see by cutting through the middle of it from top to bottom.
4. *Die* is a block of metal used for pressing or cutting something into shape or pattern.
5. *Hammer* is a tool used for hitting things.

b) **match each word with its correct definition**

to embrace, to pour, to attach, to withstand, to divide

1. To make liquid or substance to flow in a continuous stream.
2. To accept and include something.
3. To separate people or things into smaller groups or parts.
4. To fasten or join one thing to another.
5. To be strong enough not to be harmed or destroyed by something.

EXPLORING GRAMMAR

Exercise 1. Read the sentences, point out the Complex Subject. Give the Russian equivalents.

1. Metalworking is known to be categorized as forming, cutting and joining processes. 2. Forging processes are expected to be performed at various temperatures. 3. True closed die forging proves to keep the workpiece from forming flash. 4. Over 70% of all metal castings appear to be produced in foundries via a sand casting process. 5. Sheet metal forming is certain to include such operations as stamping, punching, bending, etc.

Exercise 2. Make up your own sentences according to the models.

Model A: *It is expected that he will be a good engineer.*

He is expected to be a good engineer.

1. It is expected that he will test it experimentally. 2. It is known that a forging is stronger than an equivalent casting. 3. It is believed that this forging process will be performed below the recrystallization temperature. 4. It is said that sand casting is relatively cheap. 5. It is known that forging is one of the oldest metalworking processes.

Model B: *Will he take part in this manufacturing process? — Yes, he is certain to take part in this manufacturing process.*

1. Will he work in this foundry? 2. Will this forging require further processing? 3. Will this metal be forged cold? 4. Will this metal stock be passed through a pair of rolls? 5. Will this excess metal flow out of the die?

Exercise 3. Fill in the blanks to streamline the use of the Complex Subject. The words in brackets are given to help you.

1. He ... to have done this experiment (известно). 2. Castings ... to be produced in foundries (несомненно). 3. Forgings ... to be produced at various temperatures (определенно). 4. Do you ... to watch one of the metalworking forming processes (случайно)? 5. He ... to be a good engineer (говорят).

Exercise 4. Make up sentences according to the models to practise the use of the Complex Subject.

Model A: *Несомненно, они исследуют эту проблему (to be certain). They are certain to investigate this problem.*

1. Маловероятно, что они будут проводить этот эксперимент сегодня (to be unlikely). 2. Вероятно, существуют различные типы ковочных операций (to be likely). 3. Затвердевшая заготовка обязательно выбивается из литейной формы (to be sure). 4. Большинство операцийковки определенно используют бойки или штампы для формоизменяющих операций (to be certain). 5. Вряд ли он примет участие в конференции (to be unlikely).

Model B: *Кажется, эта проблема будет исследована (to seem). This problem seems to be researched.*

1. Кажется, этот процесс улучшит механические свойства металла (to seem). 2. Кажется, он переведет этот текст (to seem). 3. Оказывается, существуют многочисленные способы литья (to prove). 4. Кажется, он достигнет цели (to seem). 5. Оказывается, бойки должны пройти термообработку (to prove).

READING

Exercise 1. Read the text.

METALWORKING FORMING PROCESSES

Modern metalworking processes, though diverse and specialized, can be

categorized as forming, cutting, and joining processes. Forming processes are supposed to be classified in different ways. One way of classification includes casting, bulk forming processes, and sheet forming processes. Another way embraces casting, metalworking with the application of force or pressure, powder metallurgy. The latter is considered more common.

Casting is known to involve pouring heated liquid material into a mold which contains a hollow cavity of the desired shape, and then allowing it to cool and to solidify. The solidified part, a casting, is ejected or broken out of the mold to complete the process. There are numerous metal casting techniques but over 70% of all metal castings are produced in foundries via a sand casting process, which is characterized by using sand as the mold material.

All technological processes of metalworking with the application of force or pressure are known to be divided into final metallurgy processes (rolling, extrusion, drawing); workpieces and machine parts manufacturing processes (open die forging, impression die forging, closed die forging, sheet metal forming, etc.).

Forging is considered to produce a piece, a forging, that is stronger than an equivalent casting as it improves the mechanical properties of metals by minimizing the internal grain size in metal under controlled plastic deformation. Forging processes can be performed at various temperatures; they are generally classified by whether the metal temperature is above or below the recrystallization temperature. There are different kinds of forging operations available: drawing out (the workpiece length increases and its cross section decreases), upsetting (the workpiece length decreases and its cross section increases), squeezing in closed compression dies (it produces multidirectional flow), etc. Most forging operations use metal-forming dies. Dies must be precisely designed and carefully heat-treated to shape correctly the workpiece and withstand the tremendous forces and pressure.

Open die forging uses flat and shaped dies with almost no limit in size of forgings ranging from a few up to several hundred thousand kilograms but requiring their considerable machining to achieve the final shape.

In impression die forging, a metal workpiece is placed in a die resembling a mold which is attached to the anvil. The hammer die is usually shaped as well. The hammer is dropped on the workpiece to

make the metal flow and fill the die cavities. Excess metal flows out of the die and forms flash. The flash cools more rapidly than the rest of the material so it helps prevent from forming more flash and also forces the metal to fill completely the die cavity. In the end of this operation the flash is removed.

A variation of impression die forging is believed to be flashless forging, or true closed die forging. In this type of forging the die cavities are completely closed to keep the workpiece from forming flash. The major advantage of this process is that there is little or no escape of excess metal. The disadvantages include additional cost due to a more complex die design and the need for better lubrication and workpiece placement.

There is a variety of sheet metal forming manufacturing processes, such as stamping, punching, bending, etc. These types of forming processes are performed at room temperature. However, some recent developments involve the heating of dies or workpieces. Sheet metal forming is characterized by the fact that the thickness of the sheet metal changes little while processing.

Metal components can also be formed by using metal powder instead of molten metal, billets, bars or ingots. The powder is placed into a die and compressed into a solid mass, and then it is heated until the powder particles join together structurally. This process is often called sintering. Besides, metal powder can be shaped by rolling, extruding, etc.

Exercise 2. Agree or disagree with the following statements.

1. Casting is a process performed on the liquid materials. 2. Final metallurgy includes rolling, extrusion, and drawing. 3. A casting is stronger than an equivalent forging. 4. Forging processes can be performed only below the recrystallization temperature. 5. Sintering is a process of powder metallurgy.

KEY VOCABULARY DEVELOPMENT

Exercise 1. Match the adjectives in column A with the nouns in column B to form meaningful phrases and then identify them at the sentence level in the text. It will help you understand the text in detail.

| A | B |
|---------------|--------------|
| 1) various | a) material |
| 2) mechanical | b) processes |

- | | |
|----------------|----------------|
| 3) flashless | c) deformation |
| 4) hollow | d) techniques |
| 5) liquid | e) cavity |
| 6) numerous | f) property |
| 7) major | g) forces |
| 8) plastic | h) cost |
| 9) tremendous | i) forging |
| 10) additional | j) advantage |

Exercise 2. Decide which of the verbs on the left collocate with the words on the right and then identify the word combinations at the sentence level in the text. It will help you understand the text precisely.

- | | |
|-----------------|----------------------|
| 1) to embrace | a) liquid material |
| 2) to pour | b) heating |
| 3) to compress | c) properties |
| 4) to eject | d) dies |
| 5) to remove | e) flash |
| 6) to attach | f) tremendous forces |
| 7) to improve | g) die cavities |
| 8) to fill | h) categories |
| 9) to withstand | i) powder |
| 10) to involve | j) castings |

Exercise 3. Try to enrich your vocabulary:

a) find words in the text which have the same meanings as the following words:

usually, to include, to reduce, to finish, to manufacture, to name, different, types, to form, some, too, quickly, main, billet;

b) find words in the text whose meanings are opposite to the meanings of the following words:

solid, bulk, full, to begin, open, above, to increase, to heat, advantage, worse;

c) replace the words in italics with the words with similar meanings:

1. While upsetting, the workpiece length *decreases* and its cross section increases.
2. Castings are ejected from the molds *to complete* the process.
3. Modern metalworking processes are *diverse* and specialized.
4. Metal-forming dies must be designed carefully *to shape* correctly the

workpiece. 5. The flash cools more *rapidly* than the rest of the material.

Exercise 4. Complete the sentences: change the word in capitals at the end of each sentence to form a word that fits suitably in the blank space.

1. In ... die forging excess metal flows out of the die and forms flash IMPRESS.
2. In closed die forging the workpiece needs a better ... PLACE.
3. Forgings require their ... machining to achieve the final shape in open die forging CONSIDER.
4. There are ... sheet metal forming processes DIFFER.
5. One of the forging operations is squeezing the workpiece in the ... dies COMPRESS.

Exercise 5. Insert the words at the sentence level: fill in the blanks with the missing words (the first letter of each word is given).

1. Casting involves pouring m... metal into a mold where it cools and solidifies into the shape of the mold.
2. A mold contains a h... cavity.
3. A casting is e... from the mold.
4. Metal castings are produced in f... .
5. Forging i... the mechanical properties of metals.
6. Most forging operations use d... .
7. In impression die forging a die is attached to the a... .
8. Excess metal flow out of the die and forms f... .
9. True closed die forging needs better l... .
10. There is a variety of s... metal forming processes.

TEST 8

1. Choose the proper words and fill in the blanks.

1. *Forming processes ... casting, metalworking by the application of force or pressure, powder metallurgy.*
A. achieve B. embrace C. improve D. complete
2. *A mold ... a hollow cavity.*
A. improves B. achieves C. completes D. contains
3. *Molten metal is allowed*
A. to achieve B. to improve C. to solidify D. to complete
4. *Final metallurgy processes include ..., extrusion, drawing.*
A. rolling B. casting C. forging D. stamping
5. *Forging operations embrace drawing out, ..., squeezing in compression dies.*
A. rolling B. upsetting C. forging D. stamping

6. *In impression die forging a die is attached to the*
 A. hammer B. flash C. anvil D. mold
7. *The ... cools more rapidly than the rest of the material.*
 A. anvil B. flash C. mold D. hammer
8. *There is little or no escape of ... metal in closed die forging.*
 A. flashless B. major C. excess D. available
9. *Closed die forging needs more complex ... design.*
 A. flash B. die C. anvil D. mold
10. *... is a metalworking process which uses tensile forces to stretch metal.*
 A. Rolling B. Drawing C. Extrusion D. Casting

2. The text contains different mistakes: 4 – in spelling, 3 – in grammar. Correct the mistakes and rewrite the text.

Casting is one of the main manufacturing proceses. Casting is a process of poring molten metall into a mold where it solidify into the shape of a mold. Casting was well establish in the Bronze Age when it was use to form bronze pieces now found in muzeums.

Module 9 ENGINEERING MATERIALS TECHNOLOGY (2)

KEY VOCABULARY

Exercise 1. Read and guess the meanings of the new words.

- 1) *specified geometry*. Material is brought to specified geometry by removing excess material.
- 2) *chips or swarf*. In cutting metals the excess metal is chips or swarf.
- 3) *machining, burning*. Cutting is nearly fully represented by machining, burning, and some special processes.
- 4) *oxy-fuel cutting torch*. Using an oxy-fuel cutting torch to separate a plate of steel into smaller pieces is an example of burning.
- 5) *chemical milling*. Chemical milling is an example of a special process.
- 6) *etching and masking chemicals*. Chemical milling removes excess material by the use of etching and masking chemicals.
- 7) *turning*. Turning is a cutting process for producing a cylindrical surface.
- 8) *lathe*. Turning can be done on a lathe.

- 9) *continuous supervision*. Turning frequently requires continuous supervision.
- 10) *cutting tool*. Turning uses cutting tools.
- 11) *single-point*. Turning usually uses single-point cutting tools.
- 12) *to traverse along axes*. A cutting tool is traversed along two axes of motion.
- 13) *either ... or ...*. Turning can be either on the outside of the cylinder or on the inside.
- 14) *boring*. Turning on the inside of the cylinder is known as boring.
- 15) *milling*. Milling is a process of removing material to form the final part.
- 16) *comparatively*. Milling is a comparatively complex process.
- 17) *milling cutter*. A milling machine includes a milling cutter, a worktable, etc.
- 18) *multipoint*. A milling cutter is usually multipoint.
- 19) *axis — axes*. A milling cutter rotates about its axis.
- 20) *slot cutting, planing, drilling, threading, rabbeting*. Milling machines can perform a vast number of complex operations, such as slot cutting, planing, drilling, threading, rabbeting, etc.
- 21) *grinding*. A grinding machine is a machine used for producing very fine finishes.
- 22) *abrasive wheel*. A grinding machine uses an abrasive wheel as a cutting device.
- 23) *to meet specifications*. Finished parts should meet specifications.
- 24) *temporary and permanent joining*. One can distinguish between temporary and permanent joining techniques.
- 25) *fastening*. Sometimes mechanical fastening is called temporary mechanical joining.
- 26) *bolts, screws, studs*. Mechanical fastening includes joining processes which use bolts, screws, studs, etc.
- 27) *welding, brazing, soldering, riveting*. Permanent joining processes embrace welding, brazing, soldering, and riveting.

Exercise 2. Try to enrich your vocabulary:

a) analyse the following words with different suffixes and divide them into two groups — nouns and adjectives:

collection, special, technological, available, cylindrical, continuous, supervision, operator, computer, numerical, motion, various, final,

cutter, operation, horizontal, vertical, abrasive, inorganic, specification, different, per- manent, mechanical;

b) make up as many words as you can by combining different parts of the words:

| | | |
|-----|---------|------|
| in- | differ | -ic |
| re- | compute | -ion |
| | collect | -ent |
| | organ | -er |
| | move | |

Exercise 3 Divide the following words or phrases into four groups, those which describe or belong to a) turning; b) milling; c) grinding; d) joining:

lathe, bolts, single-point, multipoint, screws, threading, worktable, tubular, planing, rabbeting, welding, slot cutting, riveting, studs, milling cutter, brazing, drilling, soldering.

Exercise 4. Think over the definitions of the words which appear in the texts and dialogues and then:

a) agree or disagree with the following definitions

1. *A hole* is space in the surface of something that goes partly or completely through it.
2. *To remove* is to take something away.
3. *Chemical* is a substance produced by a process involving chemistry.
4. *A lathe* is a machine that holds a piece of wood or metal and makes it move around so that you can cut and shape evenly.
5. *To traverse* is to move over or across an area.

b) match each word with its correct definition

drilling, turning, grinding, boring, welding

1. Joining process.
2. Producing cylindrical surfaces.
3. Making holes.
4. Turning inside of the cylinder.
5. Producing very fine finishes.

EXPLORING GRAMMAR

Exercise 1. Read the sentences, point out the verbals. Give the

Russian equivalents. If you have some difficulties, use the grammar reference at the end of the book.

1. This is the material to be removed. 2. To produce fine finishes a grinding machine uses an abrasive wheel. 3. Finished parts should meet specifications. 4. Turning is a cutting process. 5. I can't explain it without watching the process. 6. They began grinding the workpiece. 7. He made the workpiece rotate. We consider this material to be rather hard. 9. Milling is known to be a very complex process. 10. A milling cutter proves to be a multipoint tool.

Exercise 2. Make up your own sentences according to the models.

Model A: *Turning is a cutting process. It produces a cylindrical surface.*

Being a cutting process, turning produces a cylindrical surface.

a. Milling is a comparatively complex process. It forms the final part.
b. An oxy-fuel cutting torch is a tool for the burning process. It cuts a plate of steel into smaller pieces. 3. A grinding machine is a cutting machine. It produces very fine finishes. 4. A milling machine is a cutting machine. It performs a vast number of complex operations. 5. Chemical milling is an example of a special process. It removes excess material by the use of etching and masking chemicals.

Model B: *The workpiece which should be turned is rather hard.*

The workpiece to be turned is rather hard.

c. The metal parts which should be cut are in the foundry. 2. The complex operations which should be done embrace slot cutting and threading. 3. A piece of material which should be turned is made of wood or metal. 4. The milling cutter which should be used is rather hard. 5. The cutting tool which should be traversed along two axes of motion produces precise diameters and lengths.

Exercise 3. Fill in the blanks to streamline the use of the infinitive constructions. The words in brackets are given to help you.

1. He is known ... this experiment (провел). 2. He is believed ... this experiment (проведет). 3. We suppose this experiment ... (будет проведен). 4. We thought that experiment ... (проведен). 5. This experiment is known to ... (был проведен).

Exercise 4. Make up sentences according to the models to practise the use of the infinitive constructions.

Model A: *Мы не ожидали, что этот процесс может быть*

осуществлен.

We didn't expect this process to be realized.

1. Мы не предполагали, что эта операция может быть выполнена на токарном станке. 2. Мы не ожидали, что сверление может быть осуществлено на фрезерном станке. 3. Мы не верили, что он выполнит эту операцию. 4. Мы не думали, что этот процесс такой сложный. 5. Мы не предполагали, что обточка может производиться на внутренней стороне цилиндра.

Model B: *Кажется, этот процесс может быть осуществлен (to seem).*

This process seems to be realized.

1. Кажется, этот процесс улучшит свойства металла (to seem). 2. Безусловно, обточка будет выполнена на токарном станке (to be certain). 3. Оказывается, фрезерование - сложный процесс (to prove). 4. Известно, что обточка - это процесс обработки резанием для изготовления цилиндрических поверхностей (to know). 5. Предполагается, что сверление будет происходить на фрезерном станке (to suppose).

READING

Exercise 1. Read the text.

CUTTING AND JOINING PROCESSES

Besides forming processes, metalworking includes cutting and joining processes. Cutting is considered to be a collection of processes wherein material is brought to a specified geometry by removing excess material. In cutting metals the excess metal is chips or swarf. Cutting is nearly fully represented by machining, burning, and some special processes. Machining is most commonly known to be a chip producing process. Drilling a hole in a metal part is the most common example of a chip producing process. Burning is a process during which metal parts are cut into pieces. Using an oxy-fuel cutting torch to separate a plate of steel into smaller pieces is an example of burning. Chemical milling is an example of a special process that removes excess material by the use of etching and masking chemicals.

In metalworking a lot of chip producing technological processes are available, such as turning, boring, milling, drilling, grinding, etc.

Turning is a cutting process for producing a cylindrical surface. It can be

done on a lathe, which frequently requires continuous supervision by the operator, or by using modern computer numerical control (CNC) lathes. When turning, a piece of material (wood, metal, plastics, or stone) rotates and a cutting tool (usually single-point) is traversed along two axes of motion to produce precise diameters and lengths. Turning can be either on the outside of the cylinder or on the inside (also known as boring) to produce tubular components of various sizes.

Milling is a comparatively complex process of removing material to form the final part. It is generally done on a milling machine, which includes a milling cutter (usually multipoint) that rotates about its axis, and a worktable that can move in multiple directions. Milling machines can perform a vast number of complex operations, such as slot cutting, planing, drilling, threading, rabbeting, etc. There are two common types of milling machines: the horizontal and vertical mills.

A grinding machine is a machine used for producing very fine finishes. As a rule, a grinding machine uses an abrasive wheel as a cutting device to remove material from the workpiece. It can be made of various sizes and types of stones or inorganic materials.

Finished parts that meet specifications are assembled into different kinds of machines. For this purpose, temporary and permanent joining techniques exist. Mechanical fastening, sometimes called temporary mechanical joining, includes joining processes which use bolts, screws, studs, etc. Permanent joining processes embrace welding, brazing, soldering, and riveting.

Exercise 2. Agree or disagree with the following statements.

1. Cutting is represented by machining and burning. 2. Chip producing processes include turning, milling, brazing, etc. 3. Joining processes embrace welding, brazing, soldering, and riveting. 4. A milling machine contains a multipoint milling cutter, a worktable, etc. 5. An abrasive wheel can be made of inorganic materials.

KEY VOCABULARY DEVELOPMENT

Exercise 1. Match the adjectives in column A with the nouns in column B to form meaningful phrases and then identify them at the sentence level in the text. It will help you understand the text in detail.

A

B

- | | |
|----------------|----------------|
| 1) abrasive | a) surface |
| 2) common | b) joining |
| 3) horizontal | c) control |
| 4) modern | d) supervision |
| 5) tubular | e) wheel |
| 6) various | f) examples |
| 7) permanent | g) mills |
| 8) numerical | h) computers |
| 9) cylindrical | i) sizes |
| 10) continuous | j) components |

Exercise 2. Decide which of the verbs on the left collocate with the words or phrases on the right and then identify the word combinations at the sentence level in the text. It will help you understand the text precisely.

- | | |
|----------------|---------------------------|
| 1) to remove | a) supervision |
| 2) to meet | b) a specified geometry |
| 3) to bring to | c) a hole |
| 4) to produce | d) a lathe |
| 5) to drill | e) specifications |
| 6) to cut into | f) excess material |
| 7) to traverse | g) a cutting tool |
| 8) to require | h) chips |
| 9) to do on | i) in multiple directions |
| 10) to move | j) pieces |

Exercise 3. Try to enrich your vocabulary:

a) find words in the text which have the same meanings as the following words:

embrace, to cut, application, often, to revolve, great, kinds, tool, various;

b) find words in the text whose meanings are opposite to the meanings of the following words:

single-point, limited, inside, simple, common, horizontal, organic, temporary;

c) replace the words in italics with the words with similar meanings:

1. A plate of steel is *separated* into smaller pieces by using an oxy-fuel cutting torch.
2. A milling cutter *rotates* about its axis.
3. A grinding machine uses an abrasive wheel as the cutting *device*.
4. Finished parts

are assembled into *different* kinds of machines. 5. Metalworking *includes* forming, cutting and joining processes.

Exercise 4. Complete the sentences: change the word in capitals at the end of each sentence to form a word that fits suitably in the blank space.

1. An abrasive wheel is made of ... materials ORGAN.
2. Modern ... numerical control lathes are used in manufacturing COMPUTE.
3. Cutting embraces a ... of processes COLLECT.
4. There are ... chip producing processes DIFFER.
5. Chemical milling ... excess material by the use of etching chemicals MOVE.

Exercise 5. Insert the words at the sentence level: fill in the blanks with the missing words (the first letter of each word is given).

1. In cutting metals the excess material is c... .
2. M... is most commonly known to be a chip producing process.
3. Cutting embraces machining, b... , and some special processes.
4. T... is a cutting process for producing a cylindrical surface.
5. A lathe requires c... supervision by the operator.
6. A cutting tool is traversed along two a... of motion.
7. B... is turning on the inside of the cylinder.
8. M... is a complex process of removing material to form the final part.
9. A milling machine usually uses a m... milling cutter.
10. Milling machines can perform t... .

TEST 9

1. Choose the proper words and fill in the blanks.

1. *Metalworking includes forming, cutting, and ... processes.*

A joining B. soldering C. knurling D. drilling

2. *Cutting embraces ..., burning, and some special processes.*

A. Joining B. machining C. milling D. producing

3. *Machining is represented by turning, ..., milling, drilling, grinding.*

A. knurling B. boring C. etching D. riveting

4. *Turning is a cutting process for producing a cylindrical*

A. motion B. lathe C. surface D. tool

5. *A cutting tool is traversed along two ... of motion.*

A. axes B. axis C. lengths D. diameters

6. ... material is removed.
 A. Excess B. Torch C. Etching D. Masking
7. A milling cutter rotates about its
 A. axis B. axes C. lengths D. diameters
8. A worktable of the milling machine can move in ... directions.
 A. etching B. multiple C. soldering D. milling
9. Milling machines can perform slot cutting, threading,
 A. welding B. brazing C. riveting D. rabbeting
10. Permanent joining processes embrace welding, brazing,
 A. riveting B. temporary C. drilling D. cutting

2. The text contains different mistakes: 4 – in spelling, 3 – in grammar. Correct the mistakes and rewrite the text.

The turning processes are typically carried out on a lathe. It is consider to be the oldest cutting mashine. It can be of four diferent types, which can pro- duced various shapes of materials. In general, turning use simple single-point cutting tools.

Module 10. DIFFERENT TYPES OF VEHICLES

KEY VOCABULARY

Exercise 1. Read and guess the meanings of the new words.

- 1) *to adopt*. The resolution was adopted.
- 2) *to be devoted*. The module was devoted to the engineering materials technology.
- 3) *vehicles and trailers*. One of the units of the resolution is devoted to the classification of vehicles and trailers.
- 4) *to be defined*. Vehicle categories may be defined according to their classification.
- 5) *carriage*. Category ‘M’ embraces motor vehicles with at least four wheels designed and constructed for the carriage of passengers.
- 6) *omnibuses and coaches*. Omnibuses and coaches are passenger vehicles.
- 7) *chassis frame, engine, fuel*. Passenger vehicles may be classified according to the type of chassis frame, engine, fuel, etc.
- 8) *desirable*. It is desirable to go there by a coach.
- 9) *goods*. Motor vehicles for the carriage of goods include light

commercial vehicles and large goods vehicles.

10) *truck or lorry*. 'A large goods vehicle' is the EU term for any truck (lorry) with mass over 3.5 tonnes.

11) *to vary*. Trucks vary greatly in size, power, and configuration.

12) *bulky equipment*. A pickup is desirable for the transportation of bulky equipment.

13) *non-self propelled vehicles*. Trailers and semitrailers are non-self propelled vehicles.

14) *to be towed*. Trailers and semitrailers are constructed to be towed by power-driven vehicles.

15) *purpose*. Special purpose vehicles perform special functions with special body arrangement and equipment.

16) *motor caravans, armoured vehicles, ambulances*. Special purpose vehicles embrace motor caravans, armoured vehicles, ambulances, etc.

17) *wheeled, with caterpillar tracks*. Agricultural tractors may be wheeled or with caterpillar tracks.

18) *to pull, to push*. Agricultural tractors are designed to pull, push, carry or actuate certain tools, machines or trailers.

19) *non-road mobile machinery*. The term 'non-road mobile machinery' means any mobile machine, transportable industrial equipment or vehicle with or without body not intended for the use of passenger- or goods- transport on the road.

20) *to install the internal combustion engine*. The internal combustion engines are installed in the non-road mobile machinery.

21) *earthmoving machinery*. Non-road mobile machinery embraces earthmoving machinery.

22) *off-road vehicles*. Category 'G' embraces off-road vehicles.

23) *paved or gravel surface*. Off-road vehicles can drive on and off paved or gravel surface.

24) *capable*. Off-road vehicles are capable of driving on and off paved or gravel surface.

25) *tyres with deep open treads*. Off-road vehicles usually have large tyres with deep open treads.

26) *flexible suspension*. Off-road vehicles are also characterized by a flexible suspension.

27) *versatile*. Off-road vehicles have versatile application.

Exercise 2. Try to enrich your vocabulary:

a) analyse the following words with different suffixes and divide them into two groups - nouns and adjectives:

harmonization, economic, commission, resolution, construction, classification, passenger, agricultural, numerous, commercial, transportation, bulky, European, special, function, arrangement, equipment, ambulance, transportable, industrial, internal, combustion, scraper, grader, capable, flexible, suspension, application, desirable;

b) make up as many words as you can by combining different parts of the words:

| | | | | |
|---------|-----------|----------|-----------|-----|
| in- | construct | -(at)ion | transport | -an |
| Europe | | -ment | | |
| arrange | | -able | equip | |
| land | | | | |

Exercise 3. Divide the following words or phrases into four groups, those which describe or belong to a) passenger vehicles; b) vehicles for the carriage of goods; c) non-road mobile machinery; d) off-road vehicles.

Coach, truck, pickup, omnibus, scraper, gravel surface, flexible suspension, lorry, excavator, caterpillar track, grader, bus, motor car, bulky equipment, large tyres, bulldozer, deep open treads.

Exercise 4. Think over the definitions of the words which appear in the texts and dialogues and then:

a) agree or disagree with the following definitions

1. *Bulky* is too big to be carried or stored easily.
2. *Bulldozer* is a heavy vehicle with a large curved open container at the front used for moving earth and stones, destroying buildings, etc.
3. *Coach* is a long comfortable vehicle for carrying a large number of passengers, especially on long journeys.
4. *Omnibus* is an old word meaning a 'bus'.
5. *Trailer* is a long container that can be fixed to a vehicle and used for moving heavy objects or large animals.

b) match each word with its correct definition

scraper, excavator, pickup, ambulance, truck

1. A machine used for removing a layer from a surface.
2. A large road vehicle used for carrying goods.
3. A vehicle for taking people to hospital.
4. A truck with an open back and low sides.

5. A large machine for digging holes in the ground.

EXPLORING GRAMMAR

Exercise 1. Read the sentences, point out the Subjunctive Mood. Give the Russian equivalents. If you have some difficulties, use the grammar reference at the end of the book.

1. It would be desirable to be present at the conference. 2. It would be to the point to look through this resolution. 3. It is required that special purpose vehicles should have special body arrangement and equipment. 4. They recommended that you should use this pickup. 5. I wish we were there. 6. He bought an off-road vehicle so that you might drive on and off paved or gravel surface. 7. If I had time I could be present at the conference. 8. If I had had time last Monday I would have attended the conference.

Exercise 2. Make up your own sentences according to the models.

Model A: *I am sorry I cannot define this term.*

I wish I could define this term.

1. I am sorry I cannot buy this motor car. 2. I am sorry I cannot carry the luggage. 3. I am sorry I cannot drive off the road. 4. I am sorry I cannot take part in the discussion. 5. I am sorry I cannot board the bus.

Model B: *I am sorry we didn't think about it before.*

I wish we had thought about it before.

1. I am sorry I didn't do it for you before. 2. I am sorry we didn't attend that conference. 3. I am sorry they didn't tell you then about it. 4. I am sorry I wasn't there before. 5. I am sorry you didn't use that equipment.

READING

Exercise 1. Read the text.

VEHICLE CATEGORIES

On the 30th of November, 2011 at the World Forum for Harmonization of Vehicles, the Inland Transport Committee of Economic Commission for Europe adopted 'Consolidated Resolution on the Construction of Vehicles'. One of the units of the resolution is devoted to the classification of powerdriven vehicles and trailers. Vehicle categories are defined according to the following classification: motor vehicles with at least four wheels designed and constructed for the carriage of passengers (category 'M'); motor vehicles with at least four wheels

designed and constructed for the carriage of goods (category 'N'); trailers (category 'O'); special purpose vehicles; agricultural and forestry tractors (category 'T'); non-road mobile machinery; off-road vehicles (category 'G').

There are numerous types of passenger vehicles: light passenger vehicles (motor cars or cars), people carriers or mini-buses, buses (omnibuses), coaches, etc. They may be classified according to the types of chassis frame, engine, fuel, as well as the purpose for which they are used.

Motor vehicles for the carriage of goods include light commercial vehicles (also light goods vehicle) and large goods vehicles, LGV (also heavy goods vehicle, HGV). 'A large goods vehicle' is the European Union (EU) term for any truck (lorry) with mass over 3.5 tonnes. Trucks vary greatly in size, power and configuration. Light commercial vehicles with mass not more than 3.5 tonnes are called light vans. When a vehicle is required for the transportation of bulky equipment, a pickup would be often desirable.

Trailers and semi-trailers are any non-self propelled vehicles. It is required that they should be towed by power-driven vehicles.

Special purpose vehicles embrace the vehicles of categories 'M', 'N' or 'O' for the carriage of passengers or goods and for performing special functions with special body arrangement and equipment. They include motor caravans, armoured vehicles, ambulances, etc.

Agricultural and forestry tractors are power-driven vehicles, either wheeled or caterpillar tracks, which are designed to pull, push, carry or actuate certain tools, machines or trailers.

The term 'non-road mobile machinery' means any mobile machine, transportable industrial equipment or vehicle with or without body not intended for the use of passenger- or goods- transport on the road, in which the internal combustion engine is installed. Non-road mobile machinery embraces earthmoving machinery, such as scrapers, bulldozers, graders, excavators, etc.

Off-road vehicles are considered to be any types of vehicles which are capable of driving on and off paved or gravel surface. They are generally characterized by having large tyres with deep open treads, a flexible suspension, or even caterpillar tracks. They have a versatile application, e.g. several types of motorsports involve racing off-road

vehicles.

Exercise 2. Agree or disagree with the following statements.

1. The classification of power-driven vehicles was defined at the World Forum for Harmonization of Vehicles. 2. Numerous types of passenger vehicles are known to be included into category 'M'. 3. Category 'G' represents offroad vehicles. 4. Light commercial vehicles are considered to be passenger vehicles. 5. Agricultural tractors may be either wheeled or with caterpillar tracks. 6. The vehicles of 'M', 'N' or 'O' categories may be special purpose vehicles. 7. Trailers are non-self propelled vehicles.

Exercise 3. Fill in the blanks to streamline the use of the Subjunctive Mood. The words in brackets are given to help you.

1. It ... useful to investigate this problem (to be). 2. There ... no results without these experiments (to be). 3. He suggested that you ... this article (to read). 4. I wish I ... about it (to know). 5. I brought the book for you so that you ... it (to read). 6. If I were you, I ... these lectures (to attend). 7. If you had visited the library yesterday, you ... some more information about it (to find). 8. It ... difficult to define this term (to be). 9. It is necessary that they ... there with me (to go). 10. It ... to the point to read this book (to be).

Exercise 4. Make up sentences according to the models to practise the use of the Subjunctive Mood.

Model A: *Было бы интересно побывать на этой конференции.*

It would be interesting to attend this conference.

1. Было бы полезно прочитать эту статью. 2. Было бы желательно выучить эти термины. 3. Было бы трудно решить эту проблему. 4. Было бы полезно обработать эти данные. 5. Было бы кстати посетить этот музей.

Model B: *Хотелось бы, чтобы этот автомобиль понравился вам.*

I wish you liked this motor car.

1. Хотелось бы, чтобы вы купили этот автомобиль. 2. Хотелось бы, чтобы вы определили этот термин. 3. Хотелось бы, чтобы вы приняли эту резолюцию. 4. Хотелось бы, чтобы вы использовали это оборудование. 5. Хотелось бы, чтобы вы поехали в автобусе.

KEY VOCABULARY DEVELOPMENT

Exercise 1. Match the adjectives in column A with the nouns in

column B to form meaningful phrases and then identify them at the sentence level in the text. It will help you understand the text in detail.

| A | B |
|-----------------|-------------------|
| 1) agricultural | a) classification |
| 2) numerous | b) equipment |
| 3) following | c) Union |
| 4) special | d) tools |
| 5) mobile | e) tractors |
| 6) European | f) body |
| 7) bulky | g) types |
| 8) internal | h) machinery |
| 9) flexible | i) suspension |
| 10) certain | j) combustion |

Exercise 2. Decide which of the verbs on the left collocate with the nouns on the right and then identify the word combinations at the sentence level in the text. It will help you understand the text precisely.

| | |
|---------------------|-------------------|
| 1) to adopt | a) categories |
| 2) to perform | b) classification |
| 3) to tow | c) functions |
| 4) to involve | d) resolution |
| 5) to define | e) trailers |
| 6) to be devoted to | f) tools |
| 7) to actuate | g) goods |
| 8) to carry | h) vehicles |
| 9) to board | i) engines |
| 10) to install | j) coaches |

Exercise 3. Try to enrich your vocabulary:

a) find words in the text which have the same meanings as the following words:

design, kinds, motor car, omnibus, aim, to embrace, big, truck, very much, to fulfil, application, motor, different, some;

b) find words in the text whose meanings are opposite to the meanings of the following words:

heavy, reconstruction, industrial, small, to pull, stationary, with, external, off the road, closed;

c) replace the words in italics with the words with similar meanings:

1. There are different *kinds* of vehicles. 2. A *truck* is a vehicle with mass over 3.5 tonnes. 3. Category 'M' includes *motor cars*. 4. The trucks vary in size *very much*. 5. They *fulfil* different functions.

Exercise 4. Complete the sentences: change the word in capitals at the end of each sentence to form a word that fits suitably in the blank space.

1. 'A large goods vehicle' is the ... Union term for any truck EUROPE.
2. This vehicle has special body ... ARRANGE.
3. It depends on the ... of the vehicle CONSTRUCT.
4. The LGV is for the ... of goods TRANSPORT.
5. This vehicle is for the carriage of the special ... EQUIP.

Exercise 5. Insert the words at the sentence level: fill in the blanks with the missing words (the first letter of each word is given).

1. V... categories are defined according to the classification. 2. There is a classification of power-driven vehicles and t... . 3. Passenger vehicles may be classified according to the types of e... . 4. Pickups are usually used for b... equipment. 5. Trucks v... in power and configuration. 6. Special purpose vehicles include armoured vehicles, a..., etc. 7. Agricultural tractors pull and p... trailers. 8. The internal c... engine is installed in the motor car. 9. The off-road vehicle has a f... s... . 10. Off-road vehicles have a v... application.

TEST 10

1. Choose the proper words and fill in the blanks.

1. *The resolution on the construction of ... was adopted.*
A. vehicles B. categories C. goods D. units
2. *Category 'M' includes motor vehicles for the ... of passengers.*
A. construction C. goods
B. carriage D. classification
3. *Motor cars may be classified according to the chassis*
A. engine B. fuel C. frame D. vehicle
4. *Pickups are used for the transportation of ... equipment.*
A. bulky B. desirable C. light D. wheeled

5. *Trucks ... in size.*
 A. adopt B. power C. vary D. perform
6. *Tractors may have ... tracks.*
 A. vehicles B. caterpillar C. tools D. trailers
7. *Tractors ... certain tools.*
 A. perform B. embrace C. intend D. actuate
8. *Scrapers are powerful ... machines.*
 A. rotating B. wheeled C. flat D. ground
9. *'HGV' should be used for motor vehicles which carry ... goods.*
 A. flat B. tracked C. wheeled D. heavy
10. *'HGV' stands for 'heavy ... vehicle'.*
 A. good B. goods C. great D. greatly

2. The text contains different mistakes: 4 - in spelling, 3 - in grammar. Correct the mistakes and rewrite the text.

An automobile, motor car or car are a wheeled motor vehicle used for transporting rather pasengers than goods, which also cary its own engine or motor. Most definitions of the term specifies that automobiles been desighed to run primarily on roads, to have seats for one to eight people, and to have typically four wheels.

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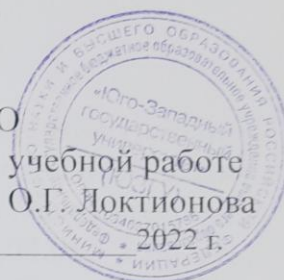
МИНОБРНАУКИ РОССИИ

Федеральное государственное бюджетное образовательное
учреждения высшего образования
«Юго-Западный государственный университет»
(ЮЗГУ)

Кафедра иностранных языков

УТВЕРЖДАЮ
Проректор по учебной работе
О.Г. Локтионова

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ENGLISH FOR ENGINEERS. PART 3

Методические указания для самостоятельной работы
по дисциплине «Иностранный язык» для обучающихся на
механико-технологическом факультете

по направлениям подготовки:

23.03.01, 23.03.03, 15.03.05, 15.03.01, 29.03.05, 20.03.01

Курск 2022

УДК 811.111 (075.8)

Составитель: Е.А. Таныгина, А.Б. Ставинская

Рецензент

Кандидат филологических наук, доцент
А.В. Анненкова

English For Engineers. Part 3 [Текст] : Методические указания для самостоятельной работы по дисциплине «Иностранный язык» для обучающихся на механико-технологическом факультете по направлениям подготовки: 23.03.01, 23.03.03, 15.03.05, 15.03.01, 29.03.05, 20.03.01 / Юго-Зап. Гос. Ун-т; сост.: Е.А. Таныгина, А.Б. Ставинская. – Курск, 2022. – 41 с. – Библиогр.: с. 41.

Методические указания для самостоятельной работы по иностранному языку для обучающихся на механико-технологическом факультете по направлениям подготовки: 23.03.01 Технология транспортных процессов, 23.03.03 Эксплуатация транспортно-технологических машин и комплексов, 15.03.05 Конструкторско-технологическое обеспечение машиностроительных производств, 15.03.01 Машиностроение, 29.03.05 Конструирование изделий лёгкой промышленности, 20.03.01 Техносферная безопасность соответствуют федеральному государственному образовательному стандарту высшего образования.

Цель методических указаний – усвоение необходимого минимума словарного состава текстов по техническим специальностям, включая общенаучную, терминологическую, служебную лексику, и включают в себя тексты для чтения, лексико-грамматические упражнения и тесты. Данное пособие также способствует формированию навыков перевода текста.

Текст печатается в авторской редакции

Подписано в печать .Формат 60x84 1/16.

Усл.печ. л. . Уч.-изд. Л.. Тираж 100 экз. Заказ. Бесплатно. 2141

Юго-Западный государственный университет.

305040, г. Курск, ул. 50 лет Октября, 94.

Module 11. MOTOR CAR COMPONENTS

KEY VOCABULARY

Exercise 1. Read and guess the meanings of the new words.

- 1) *engine, chassis, body.* The main structural components of a motor car are engine, chassis, and body.
- 2) *petrol (gasoline) engine.* A petrol (gasoline) engine is the most popular for light passenger vehicles.
- 3) *capacity.* The engine in heavy vehicles is usually a large capacity diesel.
- 4) *pulling power, reliability, low fuel consumption.* The main requirements for a diesel are high levels of pulling power, reliability, and low fuel consumption.
- 5) *transmission, drive lines, steering systems.* Chassis embraces transmission, drive lines, and steering systems.
- 6) *clutch, gearbox, propeller shaft, drive shafts, half-shafts.* Transmission includes clutch, gearbox, propeller shaft, main shaft, differentials, final drive shafts or halfshafts.
- 7) *front and rear axles, suspension.* Drive lines consist of frame, front and rear axles, suspension, and wheels.
- 8) *layout.* Motor cars may have three types of drive layout.
- 9) *rear-wheel drive, front-wheel drive, four-wheel drive.* Vehicles may contain rear-wheel drive, front-wheel drive, and four-wheel drive layout.
- 10) *accessible.* When the rear wheels act as the driving wheels, spacing out the main components makes each unit accessible.
- 11) *to intrude.* When the rear wheels act as the driving wheels, the transmission components intrude into the passenger compartment.
- 12) *to distribute.* Four-wheel drive arrangement distributes the drive to all four wheels.
- 13) *to reduce wheel spin.* It reduces the risks of wheel spin.
- 14) *springs, shock absorbers, linkages.* The suspension system involves springs, shock absorbers, and linkages.
- 15) *wheel steering, brake steering.* The steering systems involve wheel steering and brake steering.

- 16) *vehicle's handling*. The suspension system contributes to the vehicle's handling for good safety and driving pleasure.
- 17) *to isolate*. The suspension system keeps vehicle occupants comfortable and well isolated from road bumps, vibration, etc.
- 18) *integral chassis frame and body*. Most modern cars are built with integral chassis frame and body.
- 19) *stiff*. The frameless or integral arrangement provides a stiff light construction of the motor car.
- 20) *suitable*. This frameless or integral arrangement is suitable for massproduced vehicles.
- 21) *to withstand*. A suitable body shell can withstand various frame stresses.
- 22) *unitary*. A small passenger vehicle uses a lightweight unitary construction.
- 23) *to locate*. A light unitary construction contains relatively light vehicle systems and components.
- 24) *sufficient*. A light unitary construction provides sufficient space for a driver and passengers.

Exercise 2. Try to enrich your vocabulary:

a) analyse the following words with different suffixes and divide them into two groups – nouns and adjectives:

structure, requirement, location, necessary, unitary, construction, sufficient, driver, structural, transmission, propeller, suspension, usual, internal, combustion, traditional, usual, ability, reliability, accessible, intrusion, compactness, arrangement, acceleration, absorber, linkage, safety, pleasure, comfortable, vibration, integral, suitable, various;

b) make up as many words as you can by combining different parts of the words:

| | | |
|-----|-------------|-------|
| in- | require | -ment |
| un- | construct | -er |
| | drive | -ty |
| | access | -able |
| | comfort | -ion |
| | arrange | -ible |
| | absorb | -ness |
| | suit | -age |
| | compact | -ly |
| | usual | |
| | traditional | |
| | link | |

Exercise 3. Divide the following words or phrases into five groups, those which describe or belong to a) engine; b) transmission; c) drive lines; d) steering system; e) body.

Rear axle, capacity, clutch, pulling power, propeller shaft, wheels, springs, suspension, shock absorber, half-shafts, integral arrangement, gearbox, differentials, linkages, stiff light construction, main shaft, frame, front axles, wheel steering, diesel, brake steering, internal combustion, petrol, fuel consumption, gasoline, rear-wheel drive.

Exercise 4. Think over the definitions of the words which appear in the texts and dialogues and then:

a) agree or disagree with the following definitions

1. *Accessible* means easy for anyone to obtain and use.
2. *Unitary* means relating to or existing as a single thing.
3. *Sufficient* means as much as is needed.
4. *Capacity* is the amount of something that can be put in a container.
5. *Brake* is the equipment in a car or other vehicle that you use for slowing down or stopping.

b) match each word with its correct definition

clutch, gearbox, axle, suspension, transmission

1. The part of the vehicle that takes power from the engine to the wheels.
2. A metal box that contains the gears of the vehicle.
3. A piece of equipment in a vehicle that you press with your foot when you change gear.

4. The equipment that makes a vehicle move smoothly when it goes over bumps on the ground.
5. A metal bar that connects a pair of wheels on a car or other vehicle.

EXPLORING GRAMMAR

Exercise 1. Read the sentences, point out the Subjunctive Mood, the modal verbs and their equivalents. Give the Russian equivalents.

6. They have to provide the necessary tools.
2. This structure should fulfil a number of requirements.
3. The structure must contain all the systems and components.
4. They are able to arrange all the components.
5. The suspension system is to keep the vehicle occupants comfortable.
6. Being rather stiff the frameless or integral arrangement can withstand various frame stresses.
7. The front-wheel drive is designed to be rather compact.
8. The four-wheel drive is to reduce the risks of wheel spin.
9. It would be desirable to install a diesel in this vehicle.
10. I wish we were isolated from road bumps.

Exercise 2. Make up your own sentences according to the models.

Model A: *He can drive this motor car. He must drive this motor car. He is able to drive this motor car. He has to drive this motor car.*

1. He can arrange these components.
2. He can provide the proper model design.
3. He must provide the proper model design.
4. The four-wheel drive arrangement must distribute the drive to all four wheels.
5. She must handle the vehicle very carefully.

Model B: *This motor car hasn't a petrol engine.*

I wish this car had a petrol engine.

1. This vehicle hasn't a diesel.
2. This car hasn't sufficient space for a driver and passengers.
3. This motor car hasn't a four-wheel drive layout.
4. This automobile hasn't a good suspension system.
5. This vehicle hasn't a stiff light construction.

Exercise 3. Fill in the blanks to streamline the use of the Present Simple and Present Perfect. The words in brackets are given to help you.

1. The operations ... usually ... by this structure (to fulfil).
2. The engineer ... already ... the components (to arrange).
3. As a rule, the engine ... high levels of pulling power (to produce).
4. This suspension system always ... vehicles occupants comfortable (to keep).
5. Lately, most cars ... with integral chassis frame and body (to build).

Exercise 4. Make up sentences according to the models to practise the use of tenses.

Model A: *Как правило, они работают в офисе.*

As a rule, they work in the office.

1. Как правило, мы выполняем много заданий. 2. Назначение транспортного средства обычно определяет его размер и вес. 3. Небольшое пассажирское транспортное средство обычно использует легкий несущий кузов. 4. Шасси включает трансмиссию, ходовую часть и системы управления. 5. Устройство полного привода снижает риск буксования колес.

Model B: *Легкие несущие кузова используются в небольших автомобилях. Lightweight unitary constructions are used in small passenger vehicles.*

1. Все системы и компоненты автомобиля размещаются в несущем кузове. 2. Пружины, амортизаторы и направляющий аппарат входят в систему подвески. 3. Большинство современных автомобилей проектируются с несущим кузовом. 4. Риск буксования колес уменьшается при наличии устройства полного привода. 5. Высокие тяговые показатели обеспечиваются мощными дизельными двигателями.

READING

Exercise 1. Read the text, try to focus on its essential facts and choose the most suitable heading given below for each paragraph.

- 1) Engine
- 2) Suspension System
- 3) Integral Chassis Frame and Body
- 4) Motor Car Components
- 5) Transmission and Drive Lines

MOTOR CAR STRUCTURE

A structure of a vehicle has to fulfil a number of requirements. The prime purpose of the vehicle structure is to provide a location for all the necessary vehicle systems and components. The purpose of the vehicle will also dictate the size and weight of the vehicle systems and components and therefore the structure will be designed accordingly. The main structural components of a motor car are engine, chassis and

body. Chassis embraces transmission (clutch, gear- box, propeller shaft, main shaft, differentials, final drive shafts or half-shafts), drive lines (frame, front and rear axles, suspension and wheels) and steering systems (wheel steering and brake steering).

MOTOR CAR COMPONENTS

The usual source of power for a motor car is an internal combustion engine. A petrol (gasoline) engine has traditionally been the most popular for light passenger vehicles. The engine in heavy vehicles is usually a large capacity diesel, the main requirements for which are an ability to produce high levels of pulling power, reliability, and low fuel consumption.

The power of the engine is transmitted through the transmission and drive lines to the drive wheels. For the rear-wheel drive (RWD) layout, the rear wheels act as the driving wheels. Spacing out the main components in this layout makes each unit accessible but a drawback is the intrusion of the transmission components into the passenger compartment. The compactness of the front-wheel drive (FWD) layout has made it very popular on modern cars, especially on small cars. The arrangement of four-wheel drive (4WD) is safer because it distributes the drive to all four wheels and during acceleration it reduces the risks of wheel spin.

The suspension system involving springs, shock absorbers and linkages serves a dual purpose: contributing to the vehicle's handling for good active safety and driving pleasure, and keeping vehicles occupants comfortable and reasonably well isolated from road bumps, vibrations, etc.

Most modern cars are built with an integral chassis frame and body. This frameless or integral arrangement provides a stiff light construction to the motor car, which is particularly suitable for mass-produced vehicles. A suitable designed body shell can withstand various frame stresses. A lightweight unitary construction contains relatively light vehicle systems and components and provides sufficient space for a driver and passengers.

Exercise 2. Agree or disagree with the following statements.

1. To provide a location for all the necessary vehicle systems and components is the prime purpose of the vehicle structure. 2. The usual source of power for a motor car is a diesel. 3. The front-wheel drive layout is

rather compact. 4. Most of the modern cars are designed with an integral chassis frame and body. 5. A small passenger vehicle with a light unitary construction doesn't provide sufficient space for a driver and passengers.

KEY VOCABULARY DEVELOPMENT

Exercise 1. Match the adjectives in column A with the nouns in column B to form meaningful phrases and then identify them at the sentence level in the text. It will help you understand the text in detail.

- | A | B |
|---------------|-----------------|
| 1) dual | a) space |
| 2) necessary | b) source |
| 3) unitary | c) systems |
| 4) sufficient | d) vehicles |
| 5) structural | e) components |
| 6) usual | f) purpose |
| 7) heavy | g) wheels |
| 8) high | h) arrangement |
| 9) rear | i) levels |
| 10) integral | j) construction |

Exercise 2. Decide which of the verbs on the left collocate with the nouns on the right and then identify the word combinations at the sentence level in the text. It will help you understand the text precisely.

- | | |
|------------------|---------------------------|
| 1) to fulfil | a) drive |
| 2) to provide | b) risks |
| 3) to transmit | c) requirements |
| 4) to distribute | d) structure |
| 5) to reduce | e) systems and components |
| 6) to withstand | f) location |
| 7) to design | g) vehicle |
| 8) to locate | h) power |
| 9) to serve | i) stresses |
| 10) to handle | j) purpose |

Exercise 3. Try to enrich your vocabulary:

a) find words in the text which have the same meanings as the following words:

to perform, some, most important, aim, to construct, integral, enough, major, parts, motor, big, disadvantage, embrace, different;

b) find words in the text whose meanings are opposite to the meanings of the following words:

external, heavy, low, big, passive, old, frameless, unsuitable, unusual;

c) replace the words in italics with the words with similar meanings:

1. A structure of a vehicle should *perform some* requirements. 2. This vehicle provides *enough* space for a driver and passengers. 3. The *major* structural *parts* of a motor car are engine, chassis, and body. 4. The rear-wheel drive has *a disadvantage*. 5. The integral chassis frame and body can withstand *different* frame stresses.

Exercise 4. Complete the sentences: change the word in capitals at the end of each sentence to form a word that fits suitably in the blank space.

1. The frameless arrangement is ... for mass-produced vehicles **SUIT**.
2. This unitary structure has sufficient space for a ... and passengers **DRIVE**.
3. In the rear-wheel drive layout each unit is ... **ACCESS**.
4. The suspension system involves shock ... **ABSORB**.
5. This integral ... provides a stiff light construction to the motor car **ARRANGE**.

Exercise 5. Insert the words at the sentence level: fill in the blanks with the missing words (the first letter of each word is given).

1. This car provides s... space for vehicle's occupants. 2. Besides p... shaft, transmission embraces m... shaft and half-shafts. 3. S... is a component of the drive lines. 4. Steering system embraces w... steering and b... steering. 5. One of the requirements for the engine is low f... c... . 6. The most popular engine for light passenger vehicles is a p... engine. 7. The s... system involves springs, shock absorbers, etc. 8. The passengers are isolated from road b... . 9. This body shell can w... frame stresses. 10. This frameless arrangement is rather s... .

TEST 11

1. Choose the proper words and fill in the blanks.

1. A structure of a vehicle provides a ... for all necessary vehicle systems.

- A. location B. number C. requirement D. purpose
2. *A. motor car includes engine, chassis, and*
- A. suspension B. body C. diesel D. clutch
3. *Transmission embraces ..., gearbox, propeller shaft, etc.*
- A. frame B. brakes C. clutch D. rear axle
4. *... systems are wheel steering and brake steering.*
- A. Main B. Major C. Sufficient D. Steering
5. *D.rive lines include ..., front and rear axles, etc.*
- A. frame B. gearbox C. clutch D. space
6. *Suspension involves ..., shock absorbers, and linkage.*
- A. propeller shaft C. capacity
- B. springs D. handling
7. *For the RWD. ..., the rear wheels act as the driving wheels.*
- A. space B. linkage C. spacing out D. layout
8. *In the ... layout each unit is accessible.*
- A. RWD. B. FWD. C. 4WD.
9. *Relatively light vehicle systems and components are located in a light-weight ... construction.*
- A. sufficient B. unitary C. usual D. main
10. *The frameless arrangement provides a ... light construction to the motor car.*
- A. isolated B. driving C. front D. stiff

2. The text contains different mistakes: 4 – in spelling, 3 – in grammar. Correct the mistakes and rewrite the text.

In British English, the term ‘transmission’ refer to the whole drive train, including klutch, gearbox, propeller shaft (for rear-wheel drive), diferential, and final drive shafts. In American English, a gearbox are any device which convert speed and torque, whereas a transmission is a type of gearbox that can be “shifted” to change the speed-torque ratio dynamicaly.

Module 12. ENGINES

KEY VOCABULARY

Exercise 1. Read and guess the meanings of the new words.

- 1) *confined space*. An internal combustion engine is an engine in which combustion of the fuel takes place in a confined space.
- 2) *profound impact*. The invention and development of the internal combustion engine had a profound impact on human life.
- 3) *ignition*. The first internal combustion engines did not include compression of gas before ignition.
- 4) *fossil fuel*. Generally using fossil fuel (mainly petroleum), these engines appeared in transport in almost all vehicles.
- 5) *significant distinction*. The most important significant distinction between modern internal combustion engines and the early designs is the use of compression.
- 6) *spark ignition*. According to the type of ignition, engines can be divided into spark-ignition and compression-ignition engines.
- 7) *four-stroke cycle, piston*. A four-stroke cycle engine has four piston movements over two engine revolutions for each cycle.
- 8) *valve, I-head engine, L-head engine*. In accordance with valve location, engines are called I-head and L-head engines.
- 9) *reciprocating engine*. A reciprocating engine has one or more cylinders in which pistons reciprocate back and forth.
- 10) *combustion chamber*. The combustion chamber is located in the closed end of each cylinder.
- 11) *crankshaft*. Power is delivered to a rotating output crankshaft by mechanical linkage with the pistons.
- 12) *single-cylinder engine, in-line engine, V-type engine, opposed-cylinder engine, W-type engine, opposed-piston engine, radial engine*. Reciprocating engines are classified on the base of position and number of cylinders into single-cylinder engines, in-line engines, V-type engines, opposed-cylinder engines, W-type engines, opposed-piston engines, and radial engines.
- 13) *straight line*. In-line engine, cylinders are positioned in a straight line.
- 14) *at an angle*. In V-type engine, two banks of cylinders are at an angle to each other.
- 15) *opposite to each other*. An opposed-cylinder engine has two banks of cylinders opposite to each other on a single crankshaft.
- 16) *flat*. These engines are often called flat engines.

- 17) *connecting rod*. The connecting rods of the pistons are connected to a master rod.
- 18) *in turn*. The connecting rods of the pistons are connected to a master rod, which in turn, is connected to the crankshaft.
- 19) *rotary engine*. A rotary engine is made of a block (stator) built around a large non-concentric rotor and crankshaft.
- 20) *to slide against the inner surface*. The moving combustion chambers are formed by the corners of the rotor sliding against the inner surface of the non-rotating block
- 21) *carburetted engine, multipoint port fuel injection engine, throttle body fuel injection engine, gasoline direct injection engine*. By method of fuel input, spark ignition engines are divided into carburetted engines, multipoint port fuel injection engines, throttle body fuel injection engines, and gasoline direct injection engines.
- 22) *to facilitate*. Air and fuel are mixed to facilitate the combustion process in carburetted engines.
- 23) *intake*. A multipoint port fuel injection engine has one or more injectors at each cylinder intake.
- 24) *intake manifold*. In throttle body fuel injection engines, injectors upstream in intake manifold.
- 25) *to be mounted*. In gasoline direct injection engines, injectors are mounted in combustion chambers with injection directly into cylinders.
- 26) *homogeneous*. Well-mixed fuel and oxidizer are compressed to the point of auto-ignition in homogeneous charge compression-ignition engines.
- 27) *to identify*. Several or all of these classifications can be used at the same time to identify a given engine.

Exercise 2. Try to enrich your vocabulary:

a) analyse the following words with different suffixes and divide them into two groups – nouns and adjectives:

internal, combustion, development, successful, efficient, commercial, mixture, different, ignition, distinction, mechanical, injector, classification, motion, invention, operation, compression, production, application, significant, different;

b) make up as many words as you can by combining different parts of the words:

| | | |
|--------|----------|-------|
| re- | inject | -ment |
| dis- | intern | -al |
| multi- | compress | -age |
| | link | -or |
| | point | -ion |
| | place | |

Exercise 3. Divide the following terms into two groups, those which belong to

a) spark-ignition engines; b) compression-ignition engines.

Gasoline direct injection engines, homogeneous charge compression-ignition engines, multipoint port fuel injection engines, throttle body fuel injection engines, indirect injection engines, carburetted engines, direct injection engines.

Exercise 4. Think over the definitions of the terms which appear in the texts and dialogues and then:

a) agree or disagree with the following definitions

1. *An internal combustion engine is an engine* in which combustion of the fuel takes place in a confined space, producing expanding gases that are used directly to provide mechanical power.
2. *A four-stroke cycle engine* is an engine which has two piston movements over two engine revolutions for each cycle.
3. *A two-stroke cycle engine* is an engine which has four piston movements over one revolution for each cycle.
4. *A single-cylinder engine* is an engine which has some cylinders and pistons connected to the crankshaft.
5. *A reciprocating engine* is an engine which has one or more cylinders in which pistons reciprocate back and forth.

b) match each word with its correct definition

rotary engine, radial engine, in-line engine, W-type engine, carburetted engine

1. This engine is made of a block (stator) built around a large non-concentric rotor and crankshaft.
2. Cylinders are positioned in a straight line, one behind the other along the length of the crankshaft in this engine.

3. Pistons are positioned in a circular plane around a circular crankshaft in this engine.
4. Air and fuel are mixed to facilitate the combustion process in this engine.
5. This is an engine of two different cylinder arrangements.

EXPLORING GRAMMAR

Exercise 1. Read the sentences, point out the Passive Voice. Give the Russian equivalents.

1. Different internal-combustion engines are created by engineers.
2. A petrol engine has traditionally been used in light passenger vehicles.
3. The power of the engine is being transmitted through transmission and drive lines to the drive wheels.
4. Most modern cars are built with the integral chassis frame and body.
5. The internal-combustion engines are used in automobiles, locomotives, marines, aircrafts, and others.

Exercise 2. Make up your own sentences with the Passive Voice according to the model.

Model: *In the 19th century engineers developed various forms of internal combustion engines. In the 19th century various forms of internal combustion engines were developed by engineers.*

1. Étienne Lenoir created the first internal combustion engine in 1860.
2. Designers use engines in automobiles, locomotives, submarines, aircrafts, and others.
3. We usually use gasoline, diesel oil or fuel oil in automobiles.
4. A single combustion process causes two power strokes at the same time.
5. The scientists have classified engines of two different cylinder arrangements as W-type engines.

Exercise 3. Fill in the blanks to streamline the use of the Passive Voice. The words in brackets are given to help you.

1. Yesterday this letter ... to our British partners (to send). 2. The engines of a new type ... at Russian automobile plants next year (to produce). 3. This type of engine ... for the new model of the car recently (to test). 4. Every year the modern designs of the automobiles ... by the engineers and scientists at the international conferences (to discuss). 5. Such common fuel as gasohol consisting of 90% gasoline and 10% alcohol also ... in IC engines (use).

Exercise 4. Make up sentences according to the model to practise the use of the Passive Voice.

Model: *Современные двигатели внутреннего сгорания классифицируются по различным параметрам.*

Modern internal combustion engines are classified in a number of different ways.

1. В двигателе карбюраторного типа сжатая топливовоздушная смесь поступает в цилиндры и поджигается системой зажигания. 2. В технической литературе современный двигатель называют бензиновым двигателем, четырехтактным двигателем, поршневым двигателем, двигателем с турбонагнетателем, двигателем с искровым зажиганием, двигателем с V-образным расположением цилиндров, двигателем с верхним расположением клапанов, двигателем с водяным охлаждением, двигателем с распределённым впрыском топлива. 3. В двигателях с непрямым впрыском топлива топливо впрыскивается в отдельную дополнительную камеру сгорания. 4. В бензиновых двигателях с прямым впрыском топлива форсунки расположены в камерах сгорания, и топливо впрыскивается непосредственно в цилиндры. 5. В двигателях с распределённым впрыском топлива топливо попадает в каждый цилиндр через впускные клапаны.

READING

Exercise 10. Read the text.

AN INTERNAL COMBUSTION ENGINE

An internal combustion (IC) engine is an engine in which combustion of the fuel takes place in a confined space, so that expanding gases provide mechanical power and produce motion. The invention and development of the internal combustion engine in the 19th century had a profound

impact on human life. The first commercially successful internal combustion engine was created by a Frenchman, Étienne Lenoir in 1860. It ran on coal gas, but worked on a cycle of operations, which did not include compression of the gas before ignition: as a result, it was not very efficient. Although various forms of internal combustion engines had been developed before the 19th century, their widespread adoption in a variety of applications began with the commercial drilling and production of petroleum. Generally using fossil fuel (mainly petroleum), these engines appeared in almost all vehicles in the late 19th century. The most significant distinction between modern internal combustion engines and the early designs is the use of compression and, in particular, in-cylinder compression.

Modern internal combustion engines can be classified in a number of different ways. According to the type of ignition, they can be divided into spark-ignition (SI) and compression-ignition (CI) engines. Depending on the engine cycle, they are four-stroke cycle and two-stroke cycle ones. A four-stroke cycle engine has four piston movements over two engine revolutions for each cycle. A two-stroke cycle engine has two piston movements over one revolution for each cycle. In accordance with the valve location, the internal combustion engines are called I-head engines if valves are in head (overhead valve), and L-head engines if valves are in block (flat head). According to the type of cooling, engines can be classified as air-cooled engines and liquid-cooled engines (water-cooled engines).

Basic design divides engines into reciprocating and rotary ones. A reciprocating engine has one or more cylinders in which pistons reciprocate back and forth. The combustion chamber is located in the closed end of each cylinder. Power is delivered to a rotating output crankshaft by mechanical linkage with the pistons. Reciprocating engines are classified on the base of position and number of cylinders. These are single-cylinder engine, in-line engine, V-type engine, opposed-cylinder engine, W-type engine, opposed-piston engine, and radial engine. A single-cylinder engine has one cylinder and piston connected to the crankshaft. In-Line engine cylinders are positioned in a straight line, one behind the other along the length of the crankshaft. In V-type engine, two banks of cylinders are at an angle with each other along a single crankshaft, allowing for a shorter engine block. Opposed-

cylinder engine has two banks of cylinders opposite to each other on a single crankshaft. These engines are often called flat engines. Engines of two different cylinder arrangements have been classified as W-type engines in the technical literature. An opposed-piston engine has two pistons in each cylinder with the combustion chamber in the centre between the pistons. Radial engines are engines with pistons positioned in a circular plane around a circular crankshaft. The connecting rods of the pistons are connected to a master rod, which in turn, is connected to the crankshaft.

A rotary engine is made of a large non-concentric rotor with a built-in gearwheel, moving around a stationary block (stator). The moving combustion chambers are formed by the corners of the rotor sliding against the inner surface of the non-rotating block (housing). A number of experimental engines have been tested using this concept, but the only design that has ever become common in an automobile is the Wankel engine which has one, two, and three rotors.

By method of fuel input, spark-ignition engines are divided into four types: carburetted engines in which air and fuel are mixed to facilitate the combustion process; multipoint port fuel injection engines in which one or more injectors at each cylinder intake; throttle body fuel injection engines in which injectors upstream in intake manifold; gasoline direct injection engines in which injectors are mounted in combustion chambers with injection directly into cylinders. By method of fuel input, compression-ignition engines are divided into three types: direct injection engines in which fuel is injected into the main combustion chamber; indirect injection engines in which fuel is injected into the secondary combustion chamber; homogeneous charge compression ignition engines in which well-mixed fuel and oxidizer (typically, air) are compressed to the point of auto-ignition.

Besides, different kinds of fuel are used in engines: diesel oil, motor oil, naphtha; kerosene or benzol-oil mixtures; gas, natural gas methane; alcoholethyl, methyl; dual fuel. There are several engines that use a combination of two or more fuels.

Several or all of these classifications can be used at the same time to identify a given engine. Thus, a modern engine might be called a reciprocating, spark-ignition, four-stroke cycle, I-head, water-cooled, gasoline, multipoint port fuel injection automobile engine.

Exercise 2. Agree or disagree with the following statements.

1. The first commercially successful internal combustion engine was very efficient. 2. The most significant distinction between modern internal combustion engines and the early designs is the use of compression and, in particular, in-cylinder compression. 3. Depending on the engine cycle, engines are four-stroke cycle and five-stroke cycle ones. 4. In accordance with the valve location, the internal combustion engines are called I-head engines if valves are in head (overhead valve), and L-head engines if valves are in block (flat head). 5. Radial engines are often called flat engines.

KEY VOCABULARY DEVELOPMENT

Exercise 1. Match the words in column A with the words in column B to form meaningful phrases and then identify them at the sentence level in the text. It will help you understand the text in detail.

| A | B |
|----------------|----------------|
| 1) mechanical | a) designs |
| 2) fossil | b) power |
| 3) profound | c) result |
| 4) significant | d) impact |
| 5) in-cylinder | e) space |
| 6) combustion | f) chamber |
| 7) expanding | g) gases |
| 8) efficient | h) compression |
| 9) early | i) fuel |
| 10) confined | j) distinction |

Exercise 2. Decide which of the verbs on the left collocate with the nouns on the right and then identify the word combinations at the sentence level in the text. It will help you understand the text precisely.

| | |
|---------------------|-----------------------|
| 1) to run on | a) coal gas |
| 2) to deliver | b) cylinders |
| 3) to push | c) air (fuel) mixture |
| 4) to inject | d) power |
| 5) to slide against | e) process |
| 6) to identify | f) surface |

- | | |
|------------------|-----------------|
| 7) to facilitate | g) engines |
| 8) to mix | h) air and fuel |
| 9) to position | i) piston |
| 10) to produce | j) motion |

Exercise 3. Try to enrich your vocabulary:

a) **find words in the text which have the same meanings as the following words:**

limited, to construct, plane, important, to join, car, energy, to throw out, different, forward, application, to place;

b) **find words in the text whose meanings are opposite to the meanings of the following words:**

unusual, inefficient, small, to disjoin, to end, ancient, mobile, solid, forward, external, after, the last, outer, in front of, longer;

c) **replace the words in italics with the words with similar meanings:**

1. The most *important* distinction between modern internal combustion engines and the early designs is the *application* of compression and, in particular, in-cylinder compression. 2. *Power* is delivered to a rotating output crank- shaft by mechanical linkage with the pistons. 3. The connecting rods of the pistons are *joined* to a master rod. 4. Opposed-cylinder engines are common on some *automobiles* with an even number of cylinders from two to eight or more. 5. He *constructed* the internal combustion engine.

Exercise 4. Complete the sentences: change the word in capitals at the end of each sentence to form a word that fits suitably in the blank space.

1. The first internal combustion engines did not have in-cylinder...
COMPRESS.

2. In accordance with valve ..., the internal combustion engines are called I-head engines and L-head engines LOCATE.

3. Basic design divides engines into ... and rotary ones
RECIPROCATE.

4. The ... chambers are built into the non-rotating block in rotary engines COMBUST.

5. The ... of the internal combustion engine had a profound impact on human life INVENT.

Exercise 5. Insert the words at the sentence level: fill in the blanks with the missing words (the first letter of each word is given).

1. The invention and development of the internal combustion engine in the nineteenth century has had a p... impact on human life. 2. The first internal combustion engines did not have c... before i... . 3. Opposed-cylinder engines are often called f... engines. 4. A two-stroke cycle engine has two p... move- ments over one revolution for each cycle. 5. Radial engines are engines with pistons positioned in a circular plane around a circular c... 6. According to the basic design, engines are divided into r... and rotary engines. 7. In h... charge compression ignition engines, well-mixed fuel and oxidizer are compressed to the point of auto-ignition. 8. According to the type of c..., engines can be clas- sified as air-cooled engines and liquid-cooled engines (water-cooled engines).

10. Engines of two different c... arrangements have been classified as W-type engines in the technical literature. 10. In-line engine cylinders are positioned in a s... line.

TEST 12

1. Choose the proper words and fill in the blanks.

1. *An internal combustion (IC) engine is an engine in which ... of the fuel takes place in a confined space.*

A. melting B. combustion C. forging D. cutting

2. *The first internal combustion engine ran on..., but worked on a cycle of operations, which did not include compression of the gas before ignition.*

A. natural gas B. petrol C. coal gas D. diesel oil

3. *The most significant distinction between modern internal combustion en- gines and the early designs is the use of*

A. pressure B. damping C. ignition D. compression

4. *A reciprocating engine has one or more cylinders in which pistons reciprocate*

A. up and down C. left and right

B. back and forth D. round the cylinder

5. *Basic design divides engines into reciprocating and ... ones.*
 A. royal B. round C. rotary D. rolling
6. *Reciprocating engines are classified on the base of position and number of*
 A. pistons B. cylinders C. crankshafts D. valves
7. *A. single-cylinder engine has one cylinder and piston connected to the*
 A. crankshaft C. rotor
 B. combustion chamber D. stator
8. *Opposed-cylinder engine has... banks of cylinders opposite to each other on a single crankshaft.*
 A. two B. three C. four D. five
9. *An opposed-piston engine has ... pistons in each cylinder with the combustion chamber in the centre between the pistons.*
 A. two B. three C. four D. five
10. *A. rotary engine is made of a large non-concentric rotor with a built-in..., moving around a stationary block (stator).*
 A. cylinder B. crankshaft C. piston D. gearwheel

2. The text contains different mistakes: 4 – in spelling, 3 – in grammar. Correct the mistakes and rewrite the text.

Modern internal combustion engines can to be clasified in a number of different ways. Several or all of these classifications can be use at the same time to identify a given engine. Thus, a modern engine might be calles a reciprocating, spark-ignition, four-stroke cycle, I-head, woter-cooled, gasoline, multipoint port fuel injection avtomobile engine.

Module 13 OIL & GAS AND PETROCHEMICAL INDUSTRIES

KEY VOCABULARY

Exercise 1. Read and guess the meanings of the new words.

- 1) *primary products.* Natural gas and natural gas liquids are the primary products of oil and gas industry.
- 2) *crude oil.* Crude oil was used for fuel and medicine many years ago.
- 3) *oil and gas extraction industry.* The oil and gas extraction industry can be classified into four major processes.

- 4) *exploration*. Exploration is the first step in oil production.
- 5) *oil or natural gas deposits*. Exploration involves the search for oil and gas deposits.
- 6) *well development*. Well development means the construction of wells.
- 7) *site abandonment*. Site abandonment occurs when a well does not have economic quantities of oil or gas.
- 8) *to plug the well*. Site abandonment involves plugging the wells.
- 9) *to lack*. Site abandonment involves plugging the wells and restoring the site when a recently-drilled well lacks the potential to produce economic quantities of oil and gas.
- 10) *casing*. Casing is mounted in the well at the initial stage of the well development.
- 11) *drilling rig, production rig*. When the drilling rig is removed, then the production rig is installed.
- 12) *tubing*. Tubing carries the liquids and gas to the surface.
- 13) *flow of fluid*. A series of valves is installed to control the flow of fluid from the well.
- 14) *pump, rod pump*. The most common pump is the rod pump.
- 15) *formation pressure*. The pumping is required if the formation pressure is low.
- 16) *artificial lift*. If pumps are added, then such kind of production is called 'an artificial lift'.
- 17) *to suspend*. The rod pump is suspended on a string of rods from a pumping unit.
- 18) *to remove impurities*. Equipment is needed to remove impurities.
- 19) *pipeline, to facilitate*. A pipeline is connected to the well to facilitate transportation.
- 20) *storage container, to store*. A storage container is connected to the well to store the product.
- 21) *pores, fractures*. Sometimes hydrocarbons can hardly move easily through the pores or fractures into the reservoir.
- 22) *acidizing, fracturing*. There are some forms of stimulation such as acidizing and fracturing.
- 23) *light and heavy fraction*. Lighter fractions are collected at the top of the tower, and heavier fractions are collected at its bottom.

- 24) *fractioning column*. The separation of the mix of hydrocarbons is performed in a fractioning column, also known as an atmospheric distillation tower.
- 25) *refinery*. Crude oil is turned into usable products at refineries.
- 26) *perforated trays*. An atmospheric distillation tower is a tall steel tower with perforated trays.
- 27) *residual products, waxes, greases*. The residual products of the distillation are further processed to produce refinery fuels, waxes, greases, etc.
- 28) *cracking, coking*. The most widely used conversion methods are cracking and coking.
- 29) *derrick*. Wooden derricks were constructed long ago.
- 30) *domain*. The business of oil refining was John D. Rockefeller's domain.

Exercise 2. Try to enrich your vocabulary:

a) **analyse the following words with different suffixes and divide them into two groups — nouns and adjectives:**

important, connection, production, petrochemical, scientific, primary, development, chemical, significant, importance, abandonment, pressure, physical, economic, stimulation, exploration, geophysical, construction, equipment, appearance, different, available;

b) **make up as many words as you can by combining different parts of the words:**

| | | | |
|------|------------|--------|-----|
| re- | search | -er/or | -ly |
| non- | experiment | -al | |
| | store | -tion | |
| | move | -ment | |
| | equip | -able | |
| | sale | | |
| | construct | | |

Exercise 3. Divide the following words into two groups, those which describe

a) **oil & gas industry;** b) **petrochemical industry.**

Polymers, distillation, organic components, waxes, cracking, lubricants, refinery, well development, detergents, liquid hydrocarbons, synthetic rubbers, wellbore, crude oil, derrick, exploration, acidizing.

Exercise 4. Think over the definitions of the words which appear in the texts and dialogues and then:

a) **agree or disagree with the following definitions**

1. *Distillation tower* is a long vertical cylinder used in fractional distillation where the separation of high and low boiling fractions takes place.

2. *Derrick* is a tall tower built over an oil well that is used for raising and lowering the drill.

3. *Lubricants* are such substances as grease or oil that reduce friction when applied as a surface coating to moving parts.

4. *A well* is a deep hole in the earth to obtain oil, gas.

5. *A drilling rig* is a special apparatus used for drilling oil wells.

b) **match each word with its correct definition**

to process, to distill, to store, to lack, to prospect

1. To be without or not to have enough.

2. To explore for oil.

3. To separate or extract the essential elements.

4. To prepare, to treat or convert by subjecting to a special process.

5. To keep or accumulate for future use.

EXPLORING GRAMMAR

Exercise 1. Read the sentences, point out the complex sentences. Give the Russian equivalents.

1. Hydrogen and carbon making up petroleum came from plants and animals which were living on land and in sea long ago. 2. This explanation that you managed to listen to is generally accepted by scientists. 3. I believe you know, that carbon and hydrogen are the primary constituents of organic materials, both plant and animal. 4. Moreover, according to the material that you read before, carbon, hydrogen, and hydrocarbons are constantly produced by life processes of plants and animals. 5. Gas accumulates on the top of the reservoir as a "gas cap" over the oil in a typical trap, which one can be aware of. 7. Most of the world's petroleum was found trapped in rocks, which are

porous by nature. 7. It occurs because natural gas is lighter than oil, which in its turn is lighter than water. 8. Porosity is the ability of the rock which is characterized by holding oil and gas like water in a sponge. 9. Geophysicists can identify the structure, configuration, thickness, and depth of new basins if they apply measuring. 10. It is a well-known fact that heat and pressure transformed the organic materials into solid, liquid or gaseous hydrocarbons.

Exercise 2. Make up your own sentences according to the models.

Model A: *Main products are crude oil and natural gas. They have been used throughout the history.*

Main products are crude oil and natural gas which have been used throughout the history.

1. The oil industry has four processes. They are of great importance
2. The four processes are exploration, well development, production, and site abandonment. They make up entire cycle.
3. Well development is the first phase. It means the construction of wells.
4. Production is the second stage. It implies extracting of hydrocarbons and separating them.
5. Site abandonment is the final stage. It involves plugging the well.

Model B: *Drilling, casing, and testing are completed. The drilling rig is removed. When drilling, casing, and testing are completed, the drilling rig is re- moved.*

1. Drilling rig is removed. The production rig is installed.
2. Formation pressure is not sufficient. Pumps are added.
3. Natural gas cannot be stored easily. A pipeline connection is connected to the well.
4. The stimulation of the formation is required. The hydrocarbons can hardly move more easily to the wellbore through the pores and fractures into the reservoir.
5. The stimulation is done in some cases. The pump is removed for maintenance.

Exercise 3. Fill in the blanks to streamline the use of the complex sentences.

1. A fractioning column, ... is also known as an distillation tower, plays a very important role.
2. It is a tall steel tower, ... has perforated trays.
3. Several trays are required ... each fraction has a different boiling range.
4. There are light and heavy distillates ... people produce at refineries.
5. Residual products are further processed ... waxes, greases,

and asphalt are produced. 6. ... some oil wells contain enough pressure to push oil to the surface, pumping is not necessary. 7. ... testing operations are completed, the drilling rig is removed. 8. ... a well fails to produce required quality of oil or gas, then the decision about abandonment of the site is made.

Exercise 4. Make up sentences according to the models to practise the use of the complex sentences.

Model A: *Мы знаем, что эта проблема требует особого внимания.*
We know that this problem requires special attention.

1. Они знают, что буровая установка неисправна. 2. Мы информированы о том, когда нефтеразведка закончится. 3. Они полагают, что найденный пласт породы содержит залежи нефти и газа. 4. Мы знаем, что установка этого оборудования очень важна. 5. Они уверены, что насосы необходимы.

Model B: *Когда вы проведете испытание скважины, мы сможем оценить дебит скважины.*

When you make the well test, we'll be able to determine its flow rates.

1. Когда они установят обсадную колонну, мы будем готовы обсуждать мощность скважины. 2. Когда они уберут буровую установку, мы будем монтировать установку по добыче. 3. Если они начнут операции по обсадке скважины трубами на этой неделе, то мы закончим все работы в срок. 4. Если это будет необходимо, мы сможем применить гидравлический разрыв пласта залежи нефти.

READING

Exercise 1. Read the text.

OIL AND GAS INDUSTRY

The oil and gas industry is an important link in the energy supply of the countries. The primary products of the industry are crude oil, natural gas liquids, and natural gas. The oil and gas extraction industry can be classified into four major processes: exploration, well development, production, and site abandonment. Exploration involves the search for rock formations associated with oil or natural gas deposits, and involves geophysical prospecting and/or exploratory drilling. Well development

means the construction of one or more wells. Production is the process of extracting the hydrocarbons and separating the mixture of liquid hydrocarbons, gas, water, and solids; removing the constituents that are non-saleable; and selling the liquid hydrocarbons and gas. Finally, site abandonment involves plugging the well and restoring the site when a recently-drilled well lacks the potential to produce economic quantities of oil or gas.

Production equipment installation is of great importance. When drilling, casing, and testing operations are completed, the drilling rig is removed and the production rig is installed. In most cases, tubing is installed in the well which carries the liquids and gas to the surface. At the surface, a series of valves collectively called the Christmas tree because of its appearance is installed to control the flow of fluid from the well.

Pumps are added if the formation pressure is not sufficient to force the formation fluid to the surface. While some oil wells contain enough pressure to push oil to the surface, most oil wells drilled today require pumping. This is also known as artificial lift. Different types of pumps are available; the most common is the rod pump. The rod pump is suspended on a string of rods from a pumping unit, and the prime mover for pumping units can be an electric motor, or a gas engine. Equipment is usually installed on site to separate natural gas and liquid phases of the production and remove impurities. Finally, a pipe-line connection or storage container (tank) is connected to the well to facilitate transportation or store the product. In the case of natural gas, which cannot be stored easily, a pipeline connection is necessary before the well can be placed on production.

Christmas tree

In many oil and gas wells, one additional step is required - stimulating the formation by physical or chemical means so that the hydrocarbons can move more easily to the wellbore through the pores or fractures into the reservoir. This is usually done before installing a pump or when the pump is removed for maintenance. Some forms of stimulation such as acidizing and fracturing are commonly employed if required.

Exercise 2. Agree or disagree with the following statements.

1. The primary products of the industry are crude oil, natural gas liquids, and natural gas.
2. The main process characterizing oil and gas

industry are the following: exploration, production, site abandonment. 3. Production equipment is of great importance. 4. If the formation pressure is not enough for the formation to flow by gravity, pumps are added. 5. The formation can be stimulated by physical or chemical means.

KEY VOCABULARY DEVELOPMENT

Exercise 12. Match the adjectives in column A with the nouns in column B to form meaningful phrases and then identify them at the sentence level in the text. It will help you understand the text in detail.

A

- 1) primary
- 2) artificial
- 3) non-saleable
- 4) geophysical
- 5) liquid
- 6) economic
- 7) sufficient
- 8) different
- 9) prime
- 10) electric

B

- a) hydrocarbons
- b) constituents
- c) prospecting
- d) pressure
- e) mover
- f) motor
- g) pumps
- h) lift
- i) products
- j) quantities

Exercise 2. Decide which of the verbs on the left collocate with the nouns on the right and then identify the word combinations at the sentence level in the text. It will help you understand the text precisely.

- 1) to plug
- 2) to lack
- 3) to store
- 4) to suspend
- 5) to employ
- 6) to remove
- 7) to facilitate
- 8) to restore
- 9) to complete
- 10) to install

Exercise 3. Try to enrich your vocabulary:

- a) equipment
- b) stimulation
- c) products
- d) site
- e) transport
- f) drilling
- g) potential
- h) impurities
- i) pumps
- j) wells

a) find words in the text which have the same meanings as the following words:

significant, connection, main, to embrace, to manufacture, to finish, various;

b) find words in the text whose meanings are opposite to the meanings of the following words:

artificial, to join, solid, to buy, long ago, to star;

c) replace the words in italics with the words with similar meanings:

1. The oil and gas industry is a *significant link* in the energy supply of the countries. 2. The operations are *finished*. 3. There are *various* types of pumps. 4. The oil and gas extraction industry can be classified into four *main* processes. 5. Exploration *embraces* the search for oil and gas deposits.

Exercise 4. Complete the sentences: change the word in capitals at the end of each sentence to form a word that fits suitably in the blank space.

1. Some constituents are ... SALE.
2. Production is a process of ... the hydrocarbons EXTRACT.
3. They lack the potential to produce ... quantities of oil and gas ECONOMY.
4. Production ... installation is of great importance EQUIP.
5. A distillation tower can separate ... fractions VARY.

Exercise 5. Insert the words at the sentence level: fill in the blanks with the missing words (the first letter of each word is given).

1. W... development means the construction of one or more wells.
2. The drilling r... is removed.
3. C... is an important phase as well as testing operations.
4. Site a... involves plugging the w... .
5. Exploration involves the search for oil or natural gas d... .
6. T... is installed in the well which carries the liquids and gas to the surface.
7. P... are added if the formation pressure is not sufficient.
8. The r... pump is ... on a string of rods from a pumping unit.
9. Equipment is installed to remove i.
10. The hydrocarbons can move easily through the pores or f... into the reservoir.

TEST 13

1. Choose the proper words and fill in the blanks.

1. *The primary products of the oil & gas industry are... .*

- A. crude oil, natural gas liquids C. mazute
B. jet fuel D. crude oil, natural gas liquids, natural gas

2. *The major processes are... .*

- A. Exploration C. exploration, production, well development, site abandonment
B. production D. production, exploration, site abandonment

3. *Crude oil is the mixture of... .*

- A. hydrocarbons B. hydrogen C. oxygen D. carbon

4. *Most of the world's petroleum was found trapped in ... rocks.*

- A. porous B. deep C. sedimentary basins D. high

5. *... transformed the organic materials into solid, liquid or gaseous hydro- carbons.*

- A. Distillation B. Coking C. Heating D. Cooling

6. *Porosity is the ability of rock to hold oil and gas like water in*
 A. a sponge B. a pipe C. a tanker D. a reservoir
7. *The products of light distillates are... .*
 A. jet fuel and stove oil B. asphalt C. grease D. butane
8. *The products of middle distillation are... .*
 A. jet, diesel, fuel oil B. methane C. propane D. jet and stove oil
9. *Residual products are... .*
 A. heavy fuel oils B. wax C. grease D. diesel oil
10. *The most common type of pumps is ... pump.*
 A. rod B. pipe C. production D. deep
3. *The text contains different mistakes: 2 – in spelling, 5 – in grammar. Correct the mistakes and rewrite the text.*

When crude oil is first brought to the surface, it may contain a mixture of natural gas and produced fluids such as salt water and both dissolved and suspended solids. Natural gas is separated at the well site and is processed for sale if natural gas pipelines are nearby. Methane is the predominant component of natural gas, but ethane, propane and butane are also significant components.

Module 14 INDUSTRIAL AND ENVIRONMENTAL BIOTECHNOLOGY

KEY VOCABULARY

Exercise 1. Read and guess the meanings of the new words.

- 1) *to alter*. Biotechnology is application of science and technology to living organisms, products, and models to alter living and non-living materials for the production of knowledge, goods, and services.
- 2) *to derive from*. Biotechnology is derived from biological knowledge.
- 3) *detergents*. Industrial enzymes are used in detergents.
- 4) *fine chemicals*. They manufacture some antibiotics, vitamins, and other fine chemicals.
- 5) *ubiquitous applications*. The term 'bio-based products' comprises a great variety of innovative products in ubiquitous applications.
- 6) *perceptible characteristics*. No external, perceptible characteristics differentiate bio-based products from traditional products.

- 7) *to recognize*. Most bioproducts cannot be easily recognized by consumers.
- 8) *to play a vital role*. Healthcare biotechnology plays a vital role in addressing unmet medical needs.
- 9) *fungi, yeast*. Industrial biotechnology uses fungi, yeast, bacteria to make sustainable energy.
- 10) *gene, genomics, genetic engineering*. One of the main biotechnical techniques is DNA/RNA that deals with genomics, gene probes, and genetic engineering.
- 11) *engineering, synthesis engineering, cell and tissue engineering*. Synthesis engineering as well as cell and tissue engineering are well known biotechnological techniques.
- 12) *biobleaching, bioleaching, biopulping*. A biomodel is represented in biobleaching, bioleaching, and biopulping.
- 13) *feedstock*. Crude oil is used as feedstock in the production of chemicals and fuels.
- 14) *greenhouse effect*. Global warming is the result of the ‘greenhouse effect’, which is caused by carbon dioxide and other gases.
- 15) *carbon dioxide*. Carbon dioxide is a result of the combustion of hydrocarbons and coal.

Exercise 2. Try to enrich your vocabulary:

a) **analyse the following words with different suffixes and divide them into two groups - nouns and adjectives:**

biogradable, external, sustainable, scientific, biotechnological, biofiltration, natural, industrial, incredible, consumer, initial, organic, treatment, bioremediation, application, evolution, biological, medical, pharmaceutical, innovative;

b) **make up as many words as you can by combining different parts of the words:**

| | | | |
|--------|------------|-----|-----|
| nano- | visible | -al | -ly |
| petro- | experiment | -or | |
| bio- | technology | | |
| in- | chemical | | |
| | react | | |

Exercise 3. Divide the following words into two groups, those which describe

a) **white biotechnology; b) bioremediation.**

Antibiotics, biodegradable plastics, fine chemicals, enzyme, genomics, cell engineering, bioreactor, bioprocessing, biosystem, corn, wheat, bioethanol, biodiesel, substitute, biofuel.

Exercise 4. Think over the definitions of the words which appear in the texts and dialogues and then:

a) **agree or disagree with the following definitions**

1. *Biotechnology* is derived from biological knowledge.
2. *White biotechnology* is a broad field using new enzymes for a variety of industrial needs.
3. *Biofuel production* is a part of white biotechnology.
4. *DNA (deoxyribonucleic acid)* is a chemical substance that contains generic information and is found in all living cells and some viruses.
5. *RNA (ribonucleic acid)* is an acid in all living cells that uses information from DNA to make protein.

b) **match each word with its correct definition**

enzyme, detergent, genome, protein, cell

1. The total amount of generic information in the chromosomes of a living thing, including its genes and DNA.
2. A liquid or powder used for washing clothes or dishes.
3. A natural chemical produced by animal and plant cells that helps reactions and other processes to start.
4. A substance in food such as meat, eggs, and milk that people need in order to grow and be healthy.
5. The smallest part of a living structure that can operate as an independent unit or an individual unit inside a structure consisting of many similar units.

EXPLORING GRAMMAR

Exercise 1. Read the sentences, point out the finite forms of the verbs. Give the Russian equivalents.

1. The main task is to reduce the environmental impact of manufacturing.
2. Although bio-based polymers and plastics are still in their infancy, this industry has been characterized by great potential.
3. Today we also see the results of recent developments of new processes combining biotechnology and chemical synthesis.
4. Biosensors can be used for real-time monitoring of environmental pollutants.
5. Enzymes and other biological organisms can perform industrial processes in such traditional

industries as food industry, leather and textile industries, etc. 7. Biotechnology techniques are adapted and adopted for biofuel production. 8. Biorefineries are able to reuse waste materials as feedstock for energy and materials. 9. Some current biotechnological applications reduce emissions but also lead to a high degree of carbon feedstock. 10. The production of biofuel will create the technological foundation for replacing oil-based materials with bio-based materials.

Exercise 2. Make up your own sentences according to the models.

Model A: *Red biotechnology plays a vital role in addressing unmet medical needs.*

Red biotechnology has recently played a vital role in addressing unmet medical needs.

1. Biodiesel provides alternatives to fossil fuels. 2. Industrial biotechnology encompasses many waste treatments. 3. It produces biofuel from renewable raw materials. 4. It produces ethanol as a substitute for gasoline. 5. The term “bio-based products” comprises a great variety of innovative products.

Model B: *We use bio-based products in construction. Bio-based products are used in construction.*

1. We add industrial enzymes in detergents. 2. We use bacteria in food processing. 3. They transform feedstock into organic chemicals. 4. We use biodegradable plastics in household application. 5. We transform sugar-cane, sugar beet and wheat into main feedstocks.

Exercise 3 Fill in the blanks to streamline the use of the verbals. The words are given to help you.

1. ... features of the bioproducts are not visible at once (to distinguish). 2. Many countries think of ... an alternative fuel ... their emission reduction targets (to use, to meet). 3. Natural gas when ... emits 50-70% less carbon di- oxide (to burn). 4. Biofuels are extremely useful, at least in the short term, for ... the energy challenge (to address). 5. A new biomodel is ... (to represent). 6. ... the technological and business potential of biotechnologies takes time (to understand). 7. Multiple product biorefinery models include a complex network of individual process chains ... from biorenewable feedstocks to different intermediates and ... in diverse bio- and chemical end products (to start, to end). 8. In order to turn research into products, a crucial step is ... a proof of the concept and ... it under industrial conditions (to establish, to

test). 9. The biotechnological techniques can ... a key role in ... knowledge to commercial success stories (to play, to convert).

Exercise 4. Make up sentences according to the models to practise the use of the verbals.

Model A: *Мы разработали ряд мер по улучшению работы завода посредством привлечения новых инвесторов.*

We developed a set of measures of improving the plant's performance by attracting new investors.

a. Они сконцентрировались на некоторых шагах по внедрению биотехнологий посредством поставки возобновляемого сырья. 2. Он проанализировал слабые стороны производства биопродуктов, используя данные о поставке сырьевого материала. 3. Они нашли эффективные пути повышения производства биотоплива посредством преодоления проблем первого поколения биотоплива. 4. Промышленная биотехнология реализовала поставленные цели посредством неуклонного следования выбранной стратегии. 5. Они решили усовершенствовать производство за счет строительства бioneфтехперерабатывающего завода, использующего сельскохозяйственные отходы как ценное сырье.

Model B: *Они решили увеличить применение энзимов для большего количества химических продуктов.*

They decided to increase enzyme application for a growing range of chemical products.

1. Они планируют применять биосенсоры для мониторинга в режиме реального времени за загрязнением окружающей среды. 2. Они начали производить биоразлагаемые пластмассы. 3. Завод планирует внедрить технологию биовосстановления, следуя за другими производителями. 4. Ожидается, что они разработают модули с применением микротехнологий для диагностики биосистем.

READING

Exercise 1. Read the text.

BIOTECHNOLOGY: THE SCIENCE BEHIND

Biotechnology is defined as the application of science and technology to living organisms as well as parts, products, and models to alter living or non-living materials for the production of knowledge, goods, and

services. In other words, biotechnology is derived from biological knowledge and finally is associated with the evolution of the biological science.

Traditionally, biotechnology has been associated with the medical and pharmaceutical sectors. However, its domain is far wider. Bio-based products already existing on the market include biopolymer fibers used both in construction and household applications, biodegradable plastics, biofuels, lubricants, and industrial enzymes such as those used in detergents or in paper and food processing. Biotechnological processes also constitute a key element in the manufacturing of some antibiotics, vitamins, amino acids, and other fine chemicals.

The term 'bio-based products' comprises a great variety of innovative products in ubiquitous applications. However, due to the fact that no external, perceptible characteristics differentiate bio-based products from traditional products that are made with petrochemicals, most bioproducts cannot be easily recognized as such by consumers. The specific features of the bioproducts are mostly invisible for people.

Due to different historical reasons, biotechnology can fall within three areas: healthcare/red biotechnology that plays a vital role in addressing unmet medical needs; agricultural/green biotechnology provides farmers with the technology to grow food; industrial/white biotechnology that uses fungi, yeast, bacteria, and/or enzymes as 'cell factories' to make sustainable energy, chemicals, and a lot of other everyday things. Although the application and objectives of the three biotechnological areas are clearly differentiated, they have the same scientific and technological basis.

The main biotechnological techniques can be summarized as: DNA/RNA (genomics, gene probes, genetic engineering); proteins and other molecules (synthesis engineering of proteins and peptides); cell and tissue culture and engineering; processing biotechnological techniques (fermentation using bioreactors, bioprocessing, biobleaching, biopulping, bioleaching, bioremediation, biofiltration and phytoremediation); gene and RNA vectors (gene therapy); bioinformatics (construction of databases of genomes, modeling complex biological processes); nanobiotechnology (application of nano/microfabrication to build devices for studying and diagnostics of biosystems).

Exercise 2. Agree or disagree with the following statements.

1. Biotechnology has been associated with the medical and pharmaceutical sectors. 2. The specific features of the bioproducts are mostly invisible to people. 3. There are three areas within biotechnology: red, green and white. 4. These areas have the same scientific and technological basis. 5. The main biotechnical techniques are DNA/RNA, proteins, cell engineering, processing, bioinformatics, nanobiotechnology.

KEY VOCABULARY DEVELOPMENT

Exercise 1. Match the adjectives in column A with the nouns in column B to form meaningful phrases and then identify them at the sentence level in the text. It will help you understand the text in detail.

| A | B |
|-------------------|--------------------|
| 1) white | a) oil |
| 2) pharmaceutical | b) features |
| 3) specific | c) science |
| 4) biological | d) biotechnology |
| 5) biogradable | e) sector |
| 6) ubiquitous | f) applications |
| 7) perceptible | g) chemicals |
| 8) vital | h) plastics |
| 9) fine | i) role |
| 10) crude | j) characteristics |

Exercise 2. Decide which of the verbs on the left collocate with the nouns on the right and then identify the word combinations at the sentence level in the text. It will help you understand the text precisely.

| | |
|----------------------|---------------|
| 1) to alter | a) evolution |
| 2) to derive from | b) detergents |
| 3) to associate with | c) needs |
| 4) to exist on | d) variety |
| 5) to be used in | e) materials |

- | | |
|-----------------|----------------|
| 6) to comprise | f) knowledge |
| 7) to recognize | g) market |
| 8) to play | h) food |
| 9) to address | i) role |
| 10) to grow | j) bioproducts |

Exercise 3. Try to enrich your vocabulary:

a) **find words in the text which have the same meanings as the following words:**

use, field, broad, to embrace, main, various, aim, foundation, major, method, gadget;

b) **find words in the text whose meanings are opposite to the meanings of the following words:**

living, internal, visible, beyond, narrow, minor, common;

c) **replace the words in italics with the words with similar meanings:**

1. The 'white biotechnology' is a *wide* field. 2. The term 'bio-based product' *embraces* a great variety of innovative products. 3. The *aims* of the three biotechnological areas are clearly differentiated. 4. They have the same scientific and technological *foundation*. 5. There are some biotechnological *methods*.

Exercise 4. Complete the sentences: change the word in capitals at the end of each sentence to form a word that fits suitably in the blank space.

1. Biotechnology is derived from ... knowledge BIOLOGY.
2. Biopolymer fibers are used in construction and household ... APPLY.
3. Bioproducts comprise a great variety of ... products INNOVATE.
4. They have the same scientific and ... basis TECHNOLOGY.
5. Biotechnology is ... associated with the evolution of biological science FINAL.

Exercise 16. Insert the words at the sentence level: fill in the blanks with the missing words (the first letter of each word is given).

1. Biotechnology has been traditionally associated with the medical and p... sectors. 2. Industrial enzymes are used in d... . 3. There is no e... p... characteristics of a 'bio-based product'. 4. It is difficult for a consumer to r... a 'bio-based product'. 5. Red biotechnology plays a v...

role in addressing un- met medical needs. 6. The term ‘bio-based product’ comprises a wide variety of i... products in u... applications. 7. White biotechnology uses f..., y..., bacteria, and e... to make sustainable energy. 8. Cell and t... culture and engineering is one of the main biotechnical techniques.

TEST 14

1. Choose the proper words and fill in the blanks.

1. *The so-called ‘white biotechnology’ makes use of ... for industrial purposes.*

A. new enzymes B. genomes C. tissue D. proteins

2. *Biotechnology falls within ... areas.*

A. two B. three C. four D. many

3. *There are ... main biotechnological techniques.*

A. two B. three C. four D. seven

4. *Sugar cane, corn, sugar beet and wheat are... .*

A. foodstuffs B. dishes C. feedstock D. stock

5. *Acids, lipids, organic acids, vitamins are... .*

A. fine chemicals B. chemicals C. fibers D. biomass

6. *Bioethanol, biodiesel, biobutanol provide ... to fossil fuels.*

A. field C. alternative

B. fine chemicals D. commitment

7. *Bioproducts have ... external characteristics to differentiate them from traditional ones.*

A. no B. some C. many D. much

8. *Biobleaching, biopulping, bioleaching, bioremediation belong to ... bio- technology.*

A. red B. green C. white D. green and white

9. *Three areas of biotechnologies have ... scientific and technological basis.*

A. the same B. different C. similar D. external

10. *Abatement of pollution using microorganisms and plants is known as*

A. fine chemicals C. bioremediation

B. forestation D. bio-feedstocks

2. **The text contains different mistakes: 2 — in spelling, 5 — in grammar. Correct the mistakes and rewrite the text.**

Bioremediation a key area of ‘white biotechnology’, because the elimination of wide range of pollutants from water and soils are an absolute requirement for sustainable development. There numerous processes of clean water and solid wastes, using microorganisms aerobically and anaerobically. Some of them are quit sophisticated, while others is simple and are adapted to the conditions of countries.

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