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Підбрано теми, спрямовані на обговорення та дискусії за професійним спрямуванням. Структура органічно поєднує широкий спектр видів розвитку мовленнєвої діяльності (письмо, усне мовлення, читання фахової літератури). Завдання до вправ мають на меті розвинути навички комунікативної компетенції в професійному середовищі, сприймати інформацію на слух, оволодіти навичками письма, розширити словниковий запас загальної та термінологічної лексики, засвоїти необхідний для фахівця граматичний матеріал.

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ЗМІСТ

Передмова.....	4
Lesson 1	5
Lesson 2	7
Lesson 3	10
Lesson 4	12
Lesson 5	15
Lesson 6	17
Lesson 7	19
Lesson 8	22
Lesson 9	24
Lesson 10	26
Lesson 11	30
Lesson 12	35
Lesson 13	39
Lesson 14	42
Lesson 15	47
Lesson 16	49
Lesson 17	51
Lesson 18	53
Lesson 19	54
Lesson 20	56
Lesson 21	58
Lesson 22	60
GRAMMAR REVISION TABLES TERMINOLOGY OF ENGLISH	
GRAMMAR	64

ПЕРЕДМОВА

Навчальний посібник призначено для вивчення англійської мови студентами старших курсів факультету процесів і машин обробки тиском та машинобудівного факультету денної та заочної форм навчання.

Посібник складено згідно з вимогами навчальної програми з іноземної мови для підготовки бакалаврів та магістрів з інженерії. Він охоплює нормативну граматику англійської мови та базовий лексичний мінімум.

Мета посібника — розвиток навичок розуміння й аналізу оригінальних текстів із основних проблем машинобудування, нагромадження словникового запасу, удосконалення навичок розмовної мови, уміння вести бесіду, брати участь у дискусіях англійською мовою, формувати соціально-комунікативну позицію фахівця в галузі машинобудування.

Посібник складається з 22 розділів. Кожний розділ містить окрему проблему (тему) і включає оригінальні тексти із зарубіжної літератури. До текстів пропонуються дотекстові вправи на подолання фонетичних труднощів, коментар, лексичні вправи та завдання на відпрацьовування мовленнєвих навичок і вмінь використання лексичного матеріалу, що вивчається в ситуаціях реального спілкування. Це вправи на словотворення, перефразування, тлумачення окремих технічних термінів, переклад з української мови на англійську та навпаки. У кінці кожного розділу пропонуються мовні ситуації за темою, практичні завдання та вправи, спрямовані на закріплення вивченого граматичного матеріалу, представленого в граматичному довіднику. Щоб уникнути переобтяженості кожного розділу, граматичний матеріал у довіднику подається в кінці посібника у вигляді таблиць і схем.

У зв'язку з тим, що в сучасній вищій школі навчальний процес дедалі більше набуває характеру самостійної роботи студентів під керівництвом викладача на засаді сучасних методів і засобів навчання, постає завдання планування, раціональної організації й контролю самостійної роботи студентів, її дальшої активізації.

Практика показує, що одним із важливих принципів організації самостійної роботи є принцип активності. Його реалізація можлива тільки за попереднього засвоєння способів набуття знань на практичних заняттях з англійської мови з текстами за фахом.

Іншим важливим принципом є доступність видів завдань, вправ, текстів. Саме тому в кінці кожного розділу пропонуються завдання до самостійної роботи студентів.

LESSON 1

Machine-Building Engineering

Let me introduce myself to you. I'm ... I'm a second-year student of Donbas State Engineering Academy . I study at the Mechanical Engineering Faculty.

As for me, my future specialty is Machine-Building Engineering. I have chosen this profession because machines occupy a special place among outstanding man-made inventions. It can be said that without machines a human being would have never become the master of nature. And the principal purpose of Machine-Building Engineering is to master the processes of machine manufacturing. It is known that the range of problems facing mechanical engineering is very wide. Modern machines, that is machine tools with numerical program control, automobiles, airplanes, etc. are so complicated that it is not always easy to come to know their principal design. But mechanical engineer's task is not only to understand but also to perfect the machine structural arrangement.

Machine-building industry supplies equipment to all industries and effects the level of the development of modern society.

The life of modern society is impossible without machines. They are being improved constantly raising the standards of quality of the machines parts, which make researchers and engineers invent some new ways of their utilization and manufacture. But it is common knowledge that perfection has no limits and, therefore, human experts will be always required to master not only know-how of any mechanisms usage, but also to make a new one showing even more perfect performance. Thus, the faculty of Mechanical Engineering is authorized to train specialists of that kind.

To become highly-skilled specialists we are taught a number of general subjects, such as Mathematics, Physics, Philosophy, Psychology, English and special subjects: Descriptive Geometry, Welding Processes, Metal Working Processes, Machine Construction and many others. We also study different kinds of machine-tools, for example: lathes, grinding machines, drilling machines, boring machines, milling machines and so on.

Our laboratories are equipped with machine-tools having numerical program control, industrial robots, personal computers, etc. We design, then make pilot samples and operate engineering models.

Our graduates can work in different spheres of human activity (management, designing and research development). The level of their knowledge is high enough to work at almost any enterprises. I'll do my best to become a highly-skilled engineer and work according to my speciality.

Вправа 1. Перекладіть словосполучення.

man-made, highly-skilled, to be equipped with, the level of knowledge, a number of, pilot sample.

Вправа 2. Прочитайте та перекладіть слова.

Mechanical, faculty, speciality, engineering, profession, machine, modern, structural, standard, utilization, expert, know-how, specialist, model, sphere, activity, center, special, program control.

Вправа 3. Переконайтеся, чи знаєте ви три форми дієслів.

To study, to choose, to say, to have, to become, to know, to come, to understand, to make, to master, to train.

Вправа 4. Задайте питання до виділених слів.

1. Our Institute possesses *a high-level technical basis*.
2. The Institute provides *three forms of education*.
3. We study *various general and special* subjects.

Вправа 5. Доповніть речення інформацією з тексту.

1. My future specialty is
2. Mechanical engineer's task is
3. Machine building industry... .
4. Our laboratories are equipped

Вправа 6. Зробіть повідомлення англійською мовою про свою майбутню спеціальність.

1. I suppose.
2. It's true that.
3. I am sure that.
4. In my opinion.
5. I'd like to say, etc.

LESSON 2

My Future Profession

Hi, there! Here is Ann Sokolova again. I am afraid this will be my last meeting with you because I need to pack my suitcase. I am leaving for Sochi tonight. I have passed all the exams successfully and I'm free till the 1st of September.

As I have already told you, I was always good in mathematics and physics. My parents bought me a computer when I was in the 10th form. Since then I knew that I would become a specialist in computer technologies — a computer engineer.

Computer industry is developing so fast, that it comprises almost all spheres of professional life. No business now is possible without computers. This is especially true about automated manufacturing of products and robotics. Computer control of automated production opens new horizons for the cheap and quality production of goods. Information is now generated, transmitted, received, and stored electronically through computer networks on a scale unprecedented in history, and there is every indication that the explosive rate of growth in this field will continue.

Computer engineering is a general field. It deals with both electric and electronic industries.

Electronic engineering deals with the research, design, integration, and application of circuits and devices used in the transmission and processing of information.

Engineers in the field of electric and electronic engineering are concerned with all aspects of electrical communications, from fundamental questions such as «What is information?» to the highly practical, such as the design of telephone systems. In designing communication systems, engineers rely on various branches of advanced mathematics, such as Fourier analysis, linear systems theory, linear algebra, differential equations, and probability theory.

Engineers work on control systems which are used extensively in automated manufacturing and in robotics.

Major developments in the field of communications and control have been the replacement of analogue systems with digital systems; fibre optics are used now instead of copper cables. Digital systems offer far greater immunity to electrical noise. Fibre optics are likewise immune to interference; they also have great carrying capacity, and are extremely light and inexpensive to manufacture.

Computer engineering is now the most rapidly growing field. The electronics of computers is the design and manufacture of memory systems, of central processing units, and of peripheral devices. The most prospective industry now is the Very Large Scale Integration (VLSI) and new computer architectures. The field of computer science is closely related to computer engineering; however, the task of making computers more «intelligent»

(artificial intelligence), through creation of sophisticated programs or development of higher level machine languages or other means, is generally regarded as the dream of computer science.

One current trend in computer engineering is microminiaturization. Engineers continue to work to fit greater and greater numbers of circuit elements onto smaller and smaller chips.

Another trend is towards increasing the speed of computer operations through the use of parallel processors and superconducting materials.

So, as you see, there are a lot of employment opportunities in my field. I don't worry about finding a job. The most important thing for me now is to study well and to graduate from the Academy.

Вправа 1. Як Ви уявляєте свою майбутню професію? Дайте відповіді на питання.

1. What kind of work are you interested in?

- a) well paid
- b) interesting
- c) in a large and famous company
- d) quiet
- e) in an industry which has a future
- f) prestigious
- g) not to sit the whole day in the office
- h) to travel a lot

2. What position would you like to have?

- a) to manage people — manager
- b) to work for someone else — an employee
- c) to be your own boss — self-employed, businessman
- d) to be responsible for everything — top manager, director
- e) to work for the state — state employee

Вправа 2. Обговоріть зі своєю групою переваги та недоліки майбутньої професії.

The Future Of The Engineering Profession

Among various recent trends in the engineering profession computerization is the most widespread. The trend in modern engineering offices is also towards computerization. Computers are increasingly used for solving complex problems as well as for handling, storing, and generating the enormous volume of data modern engineers must work with.

Scientific methods of engineering are applied in several fields not connected directly to manufacture and construction. Modern engineering is characterized by the broad application of what is known as systems engineering principles.

Engineers in industry work not only with machines but also with people, to determine, for example, how machines can be operated most efficiently by

workers. A small change in the location of the controls of a machine or of its position with relation to other machines or equipment, or a change in the muscular movements of the operator, often results in greatly increased production. This type of engineering work is called time-study engineering.

A related field of engineering, human-factors engineering, also known as ergonomics, received wide attention in the late 1970s and 1980s when the safety of nuclear reactors was questioned following serious accidents that were caused by operator errors, design failures, and malfunctioning equipment.

Human-factors engineering seeks to establish criteria for the efficient, human-centred design of, among other things, the large, complicated control panels that monitor and govern nuclear reactor operations.

General understanding:

1. What is the most widespread trend in the engineering profession?
2. What are computers used for in modern engineering?
3. What approaches are used in modern engineering?
4. What is «ergonomics»?
5. What does human-factors engineering deal with?

Вправа 3. Відкрийте дужки та поставте дієслова в правильну форму.

1. He (go) out when the weather (get) warmer. 2. I (wait) for you until you (come) back from school. 3. I'm afraid the train (start) before we (come) to the station. 4. We (go) to the country tomorrow if the weather (to be) fine. 5. We (not pass) the examination next year if we not (work) harder. 6. If you (not drive) more carefully you (have) an accident. 7. You (be) late if you (not take) a taxi. 8. I (finish) reading this book before I (go) to bed. 9. You must (send) us a telegram as soon as you (arrive). 10. We (have) a picnic tomorrow if it (be) a fine day. 11. We (go) out when it (stop) raining. 12. We (not to have) dinner until you (come). 13. I'm sure they (write) to us when they (know) our new address.

Вправа 4. Утворіть прикметники зі слів.

colour, beauty, peace, use, hope, truth, rain, help, power, pain, care.

Вправа 5. Перекладіть українською мовою.

1. If I came later I would be late for the lesson. 2. If he had known the time-table he wouldn't have missed the train. 3. It would be better if you learned the oral topics. 3. I wish I had known this before the examination. 4. I would have come to you if you had not lived so far away. 5. If I had seen you yesterday I would have given you my text-book. 6. If I were in your place I wouldn't buy the tickets beforehand. 7. If I had known that you needed help I would have helped you.

LESSON 3

Mechanical Engineers

The engineer typifies the twentieth century. He is making a vast contribution in design, engineering and promotion. In the organization and direction of large-scale enterprises we need his analytical frame of mind. We need his imagination.

He is either designing the product itself or inventing new products or testing the product, its components, and the materials in it; or analyzing its performance and making a mathematical analysis.

He may be engaged in the development of new product, making drawings and specifications.

He may be concerning himself with the development of a new production process, or the adaptation of a current process to a new product.

He may be utilizing his engineering know-how in determining the best processes and equipment for the mass production of high-quality products.

He may be the project engineer in charge of the design and installation of a highly automatic conveyer system for handling different kinds of parts between various assembly stations.

He may be working on designing and developing tools, dies, jigs, assembly fixtures and welding fixtures for the production of an automotive body.

In the 20th century, the engineer had at his command many new sources of power. He worked hard to develop better materials, especially new alloys for special purposes. He wanted to make machinery automatic.

Вправа 1. Знайдіть у тексті англійські еквіваленти до слів і словосполучень.

існуючий процес, джерела енергії, установка, вузли, стопи, транспортування, наполегливо працювати, інженерне уміння, відповідальний за ..., у своєму розпорядженні.

Вправа 2. Прочитайте речення, перепитайте про дію, що відбувається, та дайте негативну відповідь.

Model: This engineer is working in the field of automaking.

Is this engineer working in the field of automaking?

No, he is not working in the field of automaking.

1. I am making a diagram now. 2. He is preparing for his report at the conference now. 3. He was doing an interesting work last week. 4. She will be working at our laboratory next year. 5. We are studying new drawings and specifications at present. 6. They were working on a new type of body fixtures last month.

Вправа 3. Порівняйте речення, перекладіть їх на українську мову.

1. Our engineers work hard at this problem. Look at these two men – they are working at a new problem. 2. Our autoplants produce all the main body components. This plant is producing only tyres now. 3. “Moskvitch 2141” has the speed about 150 kilometres per hour. Look at this car. I think it is doing 160 kilometers per hour now. 4. They designed this instrument for laboratory research last year. When we visited their institute they were designing the new equipment.

Вправа 4. Прочитайте текст і перекладіть його, звертаючи увагу на різноманітність функцій дієслова to be.

Mr. White is a transport planner. Among other things his work is to develop future transport systems. This is a very difficult task, because there is too little scientific information on this subject. He is to find answers to such questions as:

- Why are some people fond of cars while others are inclined to walk?
- What are the reasons for some people using aeroplanes?
- Are people going to use bicycles instead of cars?

Questions like these are not easy to answer.

Вправа 5. Перекладіть українською мовою.

The millionth electric motor is rolling off the conveyer like of the plant now. Representatives of more than 80 professions took part in its manufacture. Next year the plant will be producing 1000 electric motors every day.

Вправа 6. Розкрийте дужки та поставте дієслово в необхідну форму часу та виду.

1. I know she (to prepare) for a difficult experiment now. 2. What you (to do) when I came in? – I (to read) an article on the British educational system. 3. I thought you (to do) this work yesterday. – Yes, and I still (to do) it. 4. Tomorrow at 6 o'clock I (to report) the results of this analysis. 5. Our laboratory will be provided with new equipment. These two engineers (to mount) a new electronic system.

Вправа 7. Закінчіть речення, обравши відповідне закінчення в правій колонці.

- | | |
|--|---|
| 1. The engineer typifies ... | a) the products' performances. |
| 2. He makes a great contribution ... | b) deals with the automation of production processes. |
| 3. His main functions are ... | c) the 20 th century. |
| 4. The engineer also analyzes ... | d) the analytical frame of mind and imagination |
| 5. So he can work in ... | e) to progress. |
| 6. At present the engineer... | f) designing, developing and testing the products. |
| 7. The work of the engineer requires ... | g) the designing office, in the lab and in the production field of engineering. |

LESSON 4

Educating tomorrow's engineers

Engineering education developed very differently on the Continent and in the UK. On the Continent, engineering and technical sciences were set up in technical universities, while in the UK engineering departments were set up in multi-discipline universities. As a consequence, engineering education developed on the Continent as a more professionally oriented subject while in the UK the emphasis was on engineering science. Perhaps because of their size and their more professional engineering-oriented courses the Continental technical universities have developed a much closer relationship with industry. In Germany, the Herr Professor is also likely to be a Herr Director and there are many visiting industrial professors, who will spend a day a week in the University. In France much of the lecturing is provided by staff from the appropriate industries. There is nothing similar in UK engineering departments.

The question is what is to be done about engineering education in the UK? In the opinion of Britain's specialists, 70 to 80 engineering faculties in English universities and polytechnics should be condensed down into 20 or so major technical universities. They should become more industrially-oriented.

Lastly, the objective of engineering education and training should be recognized. So what should be the objective of undergraduate education? It is to educate and train people to think and search out knowledge for themselves, and to have the self-assurance to apply it to the job in hand. Many of the courses are now much too intensive and students have too little time or encouragement, to read and think for themselves. The solution is to recognize that it is impossible to cover all the subjects which an engineer may find useful in a lifetime, and realize that if he has been correctly educated he can read up on subjects which he may need as he progresses in his career.

However, industry must recognize that a graduate will need training in the specific area in which he is working, and must also be prepared to encourage him to attend continuing education courses and/or seminars and conferences as appropriate. It is clear that there is to be much more interchange of staff between industry and higher education.

The education and training of engineers must be a partnership between industry and higher education, which extends from undergraduate education and training through to post-graduate short and long courses and research.

The engineering profession

Engineering is one of the most ancient occupations in history. Without the skills included in the broad field of engineering, our present-day civilization never could have evolved. The first toolmakers who chipped arrows and spears from rock were the forerunners of modern mechanical engineers. The craftsmen

who discovered metals in the earth and found ways to refine and use them were the ancestors of mining and metallurgical engineers. And the skilled technicians who devised irrigation systems and erected the marvelous buildings of the ancient world were the civil engineers of their time.

Engineering is often defined as making practical application of theoretical sciences such as physics and mathematics. Many of the early branches of engineering were based not on science but on empirical information that depended on observation and experience.

The great engineering works of ancient times were constructed and operated largely by means of slave labor. During Middle Ages people began to seek devices and methods of work that were more efficient and humane. Wind, water, and animals were used to provide energy for some these new devices. This led to the Industrial Revolution that began in the eighteenth century. First steam engines and then other kinds of machines took over more and more of the work that had previously been done by human beings or by animals. James Watt, one of the key figures in the early development of steam engines, devised the concept of horsepower to make his customers understand the amount of work his machines could perform.

Since the nineteenth century both scientific research and practical application of its results have escalated. The mechanical engineer now has the mathematical ability to calculate the mechanical advantage that results from the complex interaction of many different mechanisms. He or she also has new and stronger materials to work with and enormous new sources of power. The Industrial Revolution began by putting water and steam to work; since then machines using electricity, gasoline, and other energy sources have become so widespread that they now do a very large proportion of the work of the world.

Вправа 1. Випишіть із тексту види джерел енергії та назвіть відповідні українські еквіваленти.

Вправа 2. Перекладіть слова.

engineering, civilization, modern, occupation, metal, construction, to refine, civil, metallurgical, irrigation, human, practical, physics, empirical, application, observation.

Вправа 3. Розташуйте дієслова у алфавітному порядку. Знайдіть їх значення в словнику. Випишіть словосполучення з тексту з поданими дієсловами. Перекладіть ці словосполучення українською мовою.

to discover, to refine, to devise, to erect, to depend, to provide, to perform, to lead, to escalate, to calculate.

Вправа 4. Вставте замість пропусків дієслова: to enable, to allow, to make, to cause. Перекладіть речення українською мовою.

1. The rise in temperature ... the mercury ... rise up the tube. 2. The motorway ... motorists ... travel from London to Birmingham much more quickly than before. 3. The use of tractors ... more food ... be produced more

cheaply. 4. The presence of oxygen ... the mixture ... burn rapidly. 5. The increase in exports ... the country ... import more raw materials. 6. The risk of an explosion ... the workers ... leave the factory. 7. The sharp rise in temperature ... the engine ... overheat. 8. The presence of non-metallic constituents in iron ... it ... behave in various ways. 9. The growth of industrial towns ... many people ... leave the countryside. 10. The differential gear ... the two real wheels ... turn at different speeds.

Вправа 5. Прочитайте речення. Перепишіть про дії, що відбуваються. Дайте негативну відповідь.

1. Pavel has worked at the factory for 12 years. 2. Our engineers have improved this new method of work. 3. They had completed their work by 5 o'clock yesterday. 4. This plant has developed new types of vehicles such as electromobiles, cars with magnetic suspension and so on. 5. For years my friend has dreamed of becoming a technical engineer.

Вправа 6. Перекладіть речення українською мовою.

1. The ZIL Works has already manufactured a new truck model with an engine that is protected against cold. 2. Every object of our industrialized world has practically flown from machine. 3. The construction of the KAMAZ complex within such a short period has become possible only by using the latest achievements of science and technology. 4. Graduation theses of these students were based on material they had accumulated while working at the Student Design Bureau. 5. Finally, when the planning engineer had ordered the material, the tool engineer had designed the tools and the design engineer had given the specification on the drawings, production began. 6. The chemical engineer will have completed the experiments by the 21st of June. 7. Michael Faraday gathered together and set in order all the work of the scientists who had worked on electrical problems before him.

Вправа 7. Розкрийте дужки та поставте дієслово в необхідну форму.

1. He (to like) physics and mathematics when he (to be) at school. 2. Let's try to answer questions which you (not to ask) yet. 3. Several famous scientists (to make) reports at the conference yesterday. 4. I already (to see) this device at the exhibition. 5. When you (to discuss) this problem with our chief engineer? – We (to discuss) it a few days ago. 6. Radical changes (to take place) in this country since then.

LESSON 5

Engineering

Today machines have to withstand such tremendous stresses and to be able of such complex motions that complicated and specialized calculations taking hundreds of factors into account are needed in the design of even quite a simple machine like a motor-car engine.

So, as engineering progresses, engineers must become ever more scientific and specialized. Today the branches of engineering are so wide that it is impossible to classify them satisfactorily. But we may try to divide them into uses. The main divisions of engineering may be listed as follows:

1. Mechanical engineering.

Steam engines, internal combustion engines, turbines (steam, gas, water), pumps; compressors; machine-tools; mechanisms.

2. Electrical engineering.

a) Power: generators; motors; transformers; transmissions (power lines and so on).

b) Electronics: radio, radar, television.

3. Civil engineering.

Dams; tunnels; roads, and so on.

4. Structural engineering.

The structural details of all large buildings and bridges.

5. Chemical engineering.

Any of these branches of engineering may require the special services of the following specialists: the metallurgist; the strength of materials expert; the thermodynamics of heat expert; the mechanics or machines expert; the various production engineering experts such as the engineering designer or the tool designer; the mathematician specializing in engineering problems and many more.

The engineer must also deal with the economists to assure himself that he is producing what is wanted, and economically.

Вправа 1. Знайдіть подані слова в тексті та уточніть їх значення за контекстом.

metallurgist, expert, mechanics, structural engineering, chemical engineering, mathematician, generator, civil engineering, heat expert, tool designer, economist, electrical engineering, engineering designer, strength of materials expert, turbine, tunnel, radio, engine, steam engine, internal combustion engine.

Вправа 2. Напишіть речення в пасивному стані.

1. They will start production of the new type of engine soon. 2. That country doesn't produce any heavy industrial machinery. 3. Jilles de Dion built the first mechanically propelled vehicle. 4. They reconstructed this plant entirely. 5. Our laboratory employs the most modern technology. 6. Tsarist Russia produced only a few automobiles before World War I.

Вправа 3. Знайдіть у тексті речення в пасивному стані та перекладіть їх українською мовою, звертаючи увагу на особливості перекладу пасиву.

Вправа 4. Закінчіть речення та перекладіть їх українською мовою.

1. Any branch of engineering requires the special services of the metallurgist to select the proper material for ... 2. A mechanical engineer should know thermodynamics to calculate heat processes in ... 3. A production engineer takes part in the manufacturing process to plan the ... 4. A tool designer cooperates with an engineering designer to select machinery for ...

Вправа 5. Перекладіть речення українською мовою.

1. Everything is ready for the experiment. 2. The students looked for this book everywhere, but couldn't find it anywhere. 3. Do you know anything about the history of the machine-building industry of Ukraine? 4. There is some reference-book on your table. 5. Everybody knows Professor Petrov. 6. The old plant had no modern facilities. 7. Everybody can do this. 8. Is there anybody there? 9. I left my textbook somewhere. 10 We read nothing about this type of automobile. 11. If you discover any faults in the part, tell the engineer about them.

Вправа 6. Доповніть речення (some of you, none of us, each of them, any of you) та перекладіть українською мовою.

1. Does (хто-небудь) of you know this engineer? 2. (Ніхто) of our students receives this newspaper. 3. (Кожний) of us can help you with your work. 4. Is (всі) ready for the test work? 5. I'll try to read (що-небудь) on this problem. 6. She knows (нічого) about this experiment. 8. Do you see (будь-кого) of your friends in the hall? 9. (Кожний) of us is ready to take this difficult examination.

Вправа 7. Перекладіть речення в *Passive Voice* на українську мову:

1. He was invited to visit our Institute. 2. Our laboratory is being equipped with new devices now. 3. The work has been done on time. 3. These plants are being reconstructed. 4. These machines are used for drilling. 5. Their research will have been finished soon. 6. We were sent some new equipment. 7. Atomic energy is obtained in nuclear reactors. 8. A lot of work had been done before they got good results. 9. Much was written about this problem. 10. Many experiments have been carried out and many more are needed before the problem will have been solved. 11. Plastics are widely used today. 12. They will be given time to get ready for their report. 13. When modern computers had been designed they found wide application in industry. 14. Great success has been achieved in the study of the Moon and the planets of the solar system. 15. Many new industrial enterprises will have been built by the end of the year. 16. The Nobel Prize has been awarded for this outstanding discovery to these scientists.

LESSON 6

So What is Engineering?

The engineering industry makes most of the things that are essential and useful: aerospace, cars, hospital equipment, telecommunications and even the humble kettle. Engineering also makes most of the things other industries need from cash dispensers and electronic mail for the banking industry to microphones and staging for the entertainment industry. In the production of everything from chocolates to the Channel Tunnel, the key individuals are the engineers. It's an industry that still contributes significantly to the wealth of the UK, the very diverse manufacturing industry sector alone generates around a third of the national wealth and employs approximately 32 percent of the working population.

In recent years, engineering has changed out of all recognition. The sheer speed of change in many manufacturing technologies is startling. Thanks to the introduction of computers and new technologies like Virtual Reality, people are more in control than ever. This also means the engineering employers are looking for people with a wider range of skills and personalities: from lone-theorists to more gregarious and practical individuals; from managers who can handle people, lead teams and solve problems, to creative designers with a keen sense of market realities. Engineering needs them all – women as well as men.

Вправа 1. Закінчіть речення, обравши відповідне закінчення в правій колонці.

- | | |
|--|--|
| 1. At present there are ... | a) more scientific and specialized. |
| 2. It is very difficult ... | b) the special services of specialists from various branches. |
| 3. The main divisions of engineering are... | c) numerous branches of engineering. |
| 4. So, engineers must become ... | d) complicated and specialized calculations are needed. |
| 5. In designing even a simple machine ... | e) to give a satisfactory classification of these branches. |
| 6. Thus, any branch of engineering may require | f) mechanical engineering, electrical engineering, civil engineering, structural engineering and chemical engineering. |

Вправа 2. Заповніть таблицю за зразком.

Branch of Engineering	Specialist	Object of Work
1. civil engineering	civil engineer	dams, tunnels, road ...
2. mechanical engineering		
3. electrical engineering		
a)		a)
b)		b)
4. structural engineering		
5. chemical engineering		

Mechanical engineering

Mechanical engineering has been recognized as a separate branch of engineering since the formation of the Institution of Mechanical Engineers in Great Britain in 1847. The development of the textile machinery, steam engines, machine-tools, pumping machinery, turbines and locomotives of that time made such a diversity interest for civil engineers that these and applied subjects were called mechanical engineering.

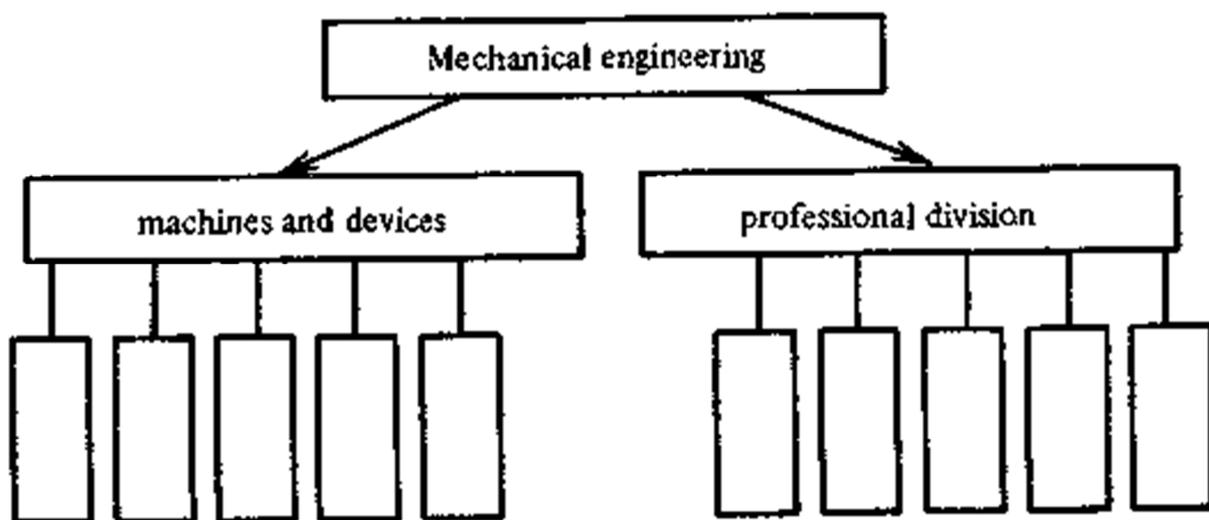
Mechanical engineering deals with the design, construction and operation of machines and devices of all kinds, and with research and sciences upon which these depend. Among these machines are prime movers such as engines and turbines using air, gas, steam and water as operating media; pumping machines and other hydraulic apparatus; steam boilers, heating, ventilating, air conditioning and refrigerating equipment, transportation structures used in aviation; automotive engineering, railroads and ships, machine-tools, special machines for industry and for construction of buildings, railroads and harbours. In fact, mechanical engineering enters into the work of all engineers whose machines are to be developed for the processes of specialists of the other branches of engineering. To understand better the extent of the activities and interests of mechanical engineers, the following lists of the professional divisions and technical committees of the American Society of Mechanical Engineers (ASME) are given: professional divisions, applied mechanics, aviation, fuel, graphic arts (printing), heat transfer, hydraulics, industrial instruments and regulators, management, materials handling, metals engineering, oil and gas power, process industries, production engineering, railroad, rubber and plastics, textiles, wood industries.

Вправа 3. Поставте речення в *Passive Voice*:

1. We will finish this work in time. 2. They built this house in 1960.
3. One uses chalk for writing on the blackboard. 4. They are translating this article now. 5. The students finished their translation in time. 6. Thousands of people attended this meeting. 7. He has just interrupted me. 8. The teacher has

explained it to us. 9. He wrote the report for me. 10. By six o'clock they had finished the work. 11. They have made a number of important experiments in this laboratory. 12. Livingstone explored Central Africa in the 19th century. 13. They were playing tennis from four till five. 14. They will show this film on TV. 15. They are building a new Metro station in our street. 16. He wrote this book in the 19th century. 17. We will bring the books tomorrow. 18. We will do the work in the evening. 19. I have translated the whole text.

Вправа 4. Заповніть схему, використовуючи інформацію з тексту.



LESSON 7

Trends in The Modern Machine-Building Industry

The scientific and technological progress will continue in engineering along two main headlines. Firstly, it is automation, including the creation of «unmanned» industries. Secondly, raising the reliability and extending the service life of machines.

This certainly requires new technology. The early machine modules made on a large scale are well suited for «unmanned» industries. Intense work is being carried out by new robots. What we need is not merely manipulators which can take up a work piece and pass it on, but robots which can identify objects, their position in space, etc.

We also need machines that would trace the entire process of machining. Some have been designed and manufactured. Over the past few years this country has created new automated coal-digging complexes and machine systems, installations for the continuous casting of steel, machines for spindleless

spinning and shuttleless weaving, machine-tools for electrophysical and electrochemical treatment of metals, unique welding equipment, automatic rotor transfer lines and machine-tool modules for flexible industries.

New technologies and equipment have been designed for most branches of engineering. In the shortest time possible we are to start producing new generations of machines and equipment, which would allow us to increase productivity several times and to find a way for the application of advanced technologies.

Large reserves in extending service life for machines can be found in the process of designing. At present, advanced methods have been evolved for designing machines proceeding from a number of criteria. Automatic design systems allow for an optimizing of the solutions in design and technology when new machines are still in the blueprint stage.

A promising reserve in increasing the life of parts is strengthening treatment. In recent years new highly-efficient methods have been found. First and foremost of them is the vacuum plasma method for coating components with hard alloy compounds, such as nitrides and carbides of titanium, tungsten and boron. Methods have been designed for reinforcing machine parts most vulnerable to wear and tear, such as in grain harvesters, to make them last several times longer.

Thus, it is not merely numbers engineers and scientists are after, rather it is a matter of major characteristics. In other words, this is a matter of quality, and not of the mere number of new machines, apparatuses and materials.

Вправа 1. Знайдіть подані слова в тексті та перекладіть, уточніть їх значення за контекстом

module, robot, to identify, manipulator, electrophysical, electrochemical, unique, rotor, line, productivity, to reserve, criteria, to optimize, vacuum, plasma, component, nitride, carbide, titanium, apparatus

Вправа 2. Визначте, які з поданих висловлювань відповідають змісту тексту.

1. There are two main trends in modern machine-building: automation and raising of the reliability of machines. 2. The creation of «unmanned» industries is included into automation. 3. Machine modules and robots are not suited for «unmanned industries». 4. Automation and raising of the reliability of machines require new technologies. 5. Advanced technologies are applied in most branches of engineering. 6. The service life of machine parts can't be increased by strengthening treatment. 7. Hard alloy compounds are employed for coating components. 8. The process of designing can also be automated. This gives the advantage of optimizing solutions in design and technology.

Вправа 3. Дайте відповідь на питання за темою «Trends in Modern Machine-Building Industry».

1. Name the main trends in modern machine-building. 2. What does automation include? 3. In what way can automation be achieved? 4. What is the role of new technologies? 5. Give some examples of advanced methods for increasing the service life of machine parts. 6. How can the process of designing be improved? 7. What is the main task of the engineers and scientists developing new machines and technologies?

Вправа 4. Перекладіть речення українською мовою.

1. Strengthening raises the service life of machine parts. We can raise the service life of machine parts by strengthening them. The technology of strengthening machine parts is called strengthening treatment. Different methods are used for strengthening machine parts.

2. Automatic systems designing new machines help the designing engineer to solve many difficult problems. Designing includes a number of criteria. Designing new machines the designer has to solve various engineering problems.

3. The industry producing all types of machines and mechanisms is called machine-building. Producing new generations of machines and equipment increases productivity. Producing new generations of machines and equipment experts find ways for the application of advanced technologies.

Вправа 5. Перекладіть речення.

1. Much attention is being given at present to the modern equipment of research laboratories. 2. The idea of constructing a new auto plant was being widely discussed some years ago. 3. Much is being done to improve the conditions for research work. 4. Wide investigation is being carried on in the field of machine-building now. 5. Many old plants and shops are being expanded and reconstructed now.

Вправа 6. Складіть речення, використовуючи подані форми дієслова.

1. ... was investigating ... 2. ... is supplied ... 3. ... will design ... 4. ... is being established ... 5. ... will be reconstructed ... 6. ... works ... 7. ... was being operated ... 8. ... is provided ... 9. ... will be expanding ... 10. ... was being developed ... 11. ... shall complete ...

Вправа 7. Розкрийте дужки та поставте дієслово в необхідну форму часу, стану та виду.

1. The question about the new laboratory (to discuss) at a special meeting yesterday at 6 p.m. 2. Different types of cars and lorries (to produce) in our country now. 3. This plant (to achieve) great results in producing fuel equipment years ago. 4. Many new service centres (to build) in our country now. 5. The work still (to finish). 6. My friend (to work) at a new design of this forging when I came to his laboratory a week ago. 7. Different body fixtures (to test) in this

laboratory. 8. This matter (to speak about) now. 9. What you (to do) when I came in? – I (to read) an article on internal combustion engines. 10. The scale of producing a new car (to increase) with every passing year.

Вправа 8. Перекладіть речення українською мовою.

1. Although machine-building has been a branch of human activity for centuries, only in the 20th century have machines begun to assume such an all-important role. 2. The engineer had visited many plants and designing offices, he had personally examined a great deal of different types of machines and had done a lot of work in his thesis, before performing a large number of experiments. 3. I'd like to know whether the series of experiments I have already performed and the data which I have obtained are enough. 4. These remarkable technological achievements have become possible by specially designed mechanisms and machines. 5. Man has obtained ultrahigh and ultralow temperatures, ultrahigh vacuums, superhigh pressures, ultrahigh strength, superelastic and superconducting materials and has been able to study the interaction of superhigh-energy particles.

LESSON 8

Reliability

Reliability is a basic requirement of any instrument, plant or machine. The most ingenious machine is nothing but useless unless it is reliable.

At present the main defect in any machine is the different service life of its parts. The first to break down are parts with friction, the most numerous in any machine. Until quite recently scientists differed in their explanations of why parts subjected to friction break.

At present scientists are engaged in research into friction and wear-and-tear resistance. The results of their comprehensive research will extend the useful life of units with friction by thirty to fifty percent as compared with what we have now.

Sufficient reliability and long service life of highly complicated automatic complexes, spaceships and assembly lines can be ensured by the high quality of their components, their accurate assembly and continuous checking while in operation, as well as by detecting faults as soon as they appear. This means that instruments are necessary for checking metal billets; all kinds of test installations and multiple switching control devices by which temperature, pressure and density in any part of a system may be inspected a number of times over a period of only one second. We need diagnostic systems and many different types of flow detectors and sensors because, as it known, reliability is the key which opens the way to large-scale automation.

Вправа 1. Дайте відповідь на питання.

1. Why is the service life of different machine parts different?
2. What factors do the service life and reliability of complicated systems depend on?
3. In what ways can the quality of machine parts be inspected?

Вправа 2. Перекладіть речення українською мовою.

1. All means of production have been recently modernized in this field.
2. Sixteen specialized plants including the first section of a plant in Cheboksary for the manufacture of heavy-duty tractors for melioration and construction work had been put into operation by the end of 1975.
3. The development in all fields of science and technology has always been marked by a desire to advance man's potentialities in all directions.
4. Of late great attention has been paid to have materials whose properties can be changed and controlled.
5. Every tool, machine and material used by the engineer to accomplish his purpose stems directly from machine-tools or has been evolved from machines which themselves were produced by machine-tools.
6. All these components have been developed into a complicated mechanism, detailed drawings have been made of all component parts.

Вправа 3. Складіть речення, використовуючи подані форми дієслів.

1. ... has worked out ...
2. ... is studying ...
3. ... was being developed ...
4. ... has been made ...
5. ... works ...
6. ... has manufactured ...
7. ... will be produced ...
8. Had been finished ...
9. ... will have discovered ...
10. ... have been developed ...
11. ... was referred to ...
12. ... has been determined ...
13. ... was twisting ...
14. ... is bent ...

Вправа 4. Заповніть пропуски в другому реченні дієсловом у пасивному стані з першого речення. Перекладіть речення.

1. This complex has produced many new types of vehicles recently. Many new types of vehicles ... at this complex recently.
2. The KAMAZ plant has occupied a huge territory of almost 1000 hectares. A huge territory of almost 1000 hectares ... by the KAMAZ plant.
3. After the engineer has finally checked the drawings and found them satisfactory, materials are ordered. After the drawings ... finally and found satisfactory, materials are ordered.
4. The scientists have proved that materials may exist whose properties are as superior to those of diamond as diamond is superior to carbon. It ... by scientists that materials may exist whose properties are as superior to those of diamond as diamond is superior to carbon.
5. Our specialists and representatives of the Renault company of France have worked out the technological processes of manufacturing the engines. Technological processes of manufacturing the engines ... by our specialists and representatives of the Renault Company of France.

Вправа 5. Розкрийте дужки та поставьте дієслово в необхідну форму часу, стану та виду.

1. Our plant (to re-equip) recently with every facility for body work including cold stamping of the main body components. 2. New machines (to design) nowadays to deal with new problems which continually arise in modern industry. 3. More than half a century ago the phenomenon of superconductivity (to discover). 4. At present great progress (to make) in technical re-equipment of automobile transport. 5. This new model (to produce) by the Volzhsky Motor Works in Togliatti. 6. An all-plastic car (to exhibit) lately: nearly the whole car except in the engine and transmission is of plastics or reinforced plastics.

Вправа 6. Перекладіть речення на українську мову, звертаючи увагу на особливості перекладу пасивних конструкцій:

1. What progress was made in utilizing solar energy? 2. Great attention is paid to social sciences in schools of higher learning. 3. University instruction is based upon the unity of training and research work. 4. Special attention is given to the use of electronic computers in teaching. 5. The laboratories are fitted out with the latest equipment. 6. Its work is based on the combination of theoretical studies with practical training. 7. What is solar energy used for? 8. Particular attention was paid to the reliability and safety of the machinery. 9. The economic might of the country is dependent upon the development of its natural resources. 10. When a body is acted upon by powerful outside forces it is broken. 11. The experiments in laboratories were followed by other research and practical work. 12. When a body is subjected to high pressure it changes its shape. 13. These plastics are worked at and experimented upon in different conditions. 14. Iron is acted upon by moist air. 15. The first sputniks were followed by a number of sputniks used for different purposes.

LESSON 9

Industrial Engineering and Automation

A major advance in twentieth century manufacturing was the development of mass production techniques. Mass production refers to manufacturing processes in which an assembly line, usually a conveyer belt, moves the product to stations where each worker performs a limited number of operations until the product is assembled. In the automobile assembly plant such systems have reached a highly-developed form. A complex system of conveyer belts and chain drives moves car parts to workers who perform the thousands of necessary assembling tasks.

Mass production increases efficiency and productivity to a point beyond which the monotony of repeating an operation over and over slows down the workers. Many ways have been tried to increase productivity on assembly lines: some of them are as superficial as piping music into the plant or painting the industrial apparatus in bright colours others entail giving workers more variety in their tasks and more responsibility for the product.

These human factors are important considerations for industrial engineers who must try to balance an efficient system of manufacturing with the complex needs of workers.

Another factor for the industrial engineer to consider is whether each manufacturing process can be automated in whole or in part. Automation is a word coined in the 1940s to describe processes by which machines do tasks previously performed by people. The word was new but the idea was not. We know of the advance in the development of steam engines that produces automatic valves. Long before that, during the Middle Ages, windmills had been made to turn by taking advantage of changes in the wind by means of devices that worked automatically.

Automation was first applied to industry in continuous-process manufacturing such as refining petroleum, making petrochemicals, and refining steel. A later development was computer-controlled automation of assembly line manufacturing, especially those in which quality control was an important factor.

Вправа 1. Перекладіть речення українською мовою.

1. The technology used at this plant has been improved. 2. Every object of our industrialized world has flown from the machine-tool. 3. The production engineer has planned the flow of the material into the finished production. 4. After the engineer had made the necessary calculations he applied his results in designing a new project. 5. By the 1920s Soviet engineers had introduced some automatic machine-tools into most processing industries. 6. The distinguishing qualities of aluminium have been described in this article. 7. The new plastic has been selected for manufacturing the body of a new car. 8. The properties of this substance had been determined by the end of last month. 9. All the variables affecting the strength of this metal have been controlled in the mechanical test, the strength will have been determined by the end of this week.

Вправа 2. Перефразуйте речення, вживши конструкцію *as ... as*.

Model: This car is the same size as that.

This car is a big (small) as that.

1. This device is the same price as that. 2. This machine is the same size as that. 3. This tyre is the same height as that. 4. This suspension is the same weight as that. 5. This tyre is the same width as that. 6. These materials are the same hardness as those. 7. This road is the same length as that.

Вправа 3. Перефразуйте речення, вживши негативну конструкцію *not so ... as*.

Model: This problem is hardly as important as that.
This problem is not so important as that.

1. This method is hardly as effective as that. 2. These results are hardly as interesting as Petrov's. 3. Mr. Smith's research is hardly as important as Mr. Black's. 4. This device is hardly as useful as that. 5. This apparatus is hardly as cheap as that. 6. Mr. Klimov's knowledge in physics is hardly as deep as Mr. Ivanov's.

Вправа 4. Визначте, які з висловлювань відповідають змісту тексту.

a) 1. Mass production referred to manufacturing processes with an assembly line. 2. Mass production refers to manufacturing processes with assembly line.

b) 1. Automated processes do tasks which have been performed by people. 2. Automated processes do tasks which were performed by people.

c) 1. Automation was first applied to assembly line manufacturing, then to continuous-process manufacturing such as refining steel. 2. Assembly line manufacturing was a later development of industrial automation.

Вправа 5. Дайте відповіді на питання.

1. What is a major development in manufacturing in the twentieth century? 2. How is mass production often exemplified by the assembly of automobiles? 3. Discuss efficiency and productivity in mass production. 4. Describe some experiments to increase productivity on assembly lines. 5. When and why was the word "automation" coined? 6. Give some examples of automation that were in use before the word itself was created. 7. To what kinds of industries was automation first applied? 8. What was a later development in industrial automation?

LESSON 10

Metals

Metals are materials most widely used in industry because of their properties. The study of the production and properties of metals is known as metallurgy.

The separation between the atoms in metals is small, so most metals are dense. The atoms are arranged regularly and can slide over each other. That is why metals are malleable (can be deformed and bent without fracture) and

ductile (can be drawn into wire). Metals vary greatly in their properties. For example, lead is soft and can be bent by hand, while iron can only be worked by hammering at red heat.

The regular arrangement of atoms in metals gives them a crystalline structure. Irregular crystals are called grains. The properties of the metals depend on the size, shape, orientation, and composition of these grains. In general, a metal with small grains will be harder and stronger than one with coarse grains.

Heat treatment such as quenching, tempering, or annealing controls the nature of the grains and their size in the metal. Small amounts of other metals (less than 1 per cent) are often added to a pure metal. This is called alloying (легирование) and it changes the grain structure and properties of metals.

All metals can be formed by drawing, rolling, hammering and extrusion, but some require hot-working. Metals are subject to metal fatigue and to creep (the slow increase in length under stress) causing deformation and failure. Both effects are taken into account by engineers when designing, for example, airplanes, gas-turbines, and pressure vessels for high-temperature chemical processes. Metals can be worked using machine-tools such as lathe, milling machine, shaper and grinder.

The ways of working a metal depend on its properties. Many metals can be melted and cast in moulds, but special conditions are required for metals that react with air.

General understanding:

1. What are metals and what do we call metallurgy?
2. Why are most metals dense?
3. Why are metals malleable?
4. What is malleability?
5. What are grains?
6. What is alloying?
7. What is crystalline structure?
8. What do the properties of metals depend on?
9. What changes the size of grains in metals?
10. What are the main processes of metal forming?
11. How are metals worked?
12. What is creeping?

Вправа 1. Закінчіть речення.

1. Metals are...
2. Metallurgy is...
3. Most metals are...
4. The regular arrangement of atoms in metals...
5. Irregular crystals...
6. The properties of the metals depend...
7. Metals with small grains will be...
8. ...controls the nature of the grains in the metal.
9. Alloying is...

10. All metals can be formed by...
11. Creep is...
12. Metals can be worked using...

Вправа 2. Поясніть значення поданих слів англійською мовою.

1. malleability
2. crystalline structure
3. grains
4. heat treatment
5. alloying
6. creep

Вправа 3. Перекладіть українською мовою.

1. Метали – щільні матеріали тому, що між атомами в металах мала відстань.
2. Метали мають кристалічну структуру через правильне розташування атомів.
3. Чим менше зерна, тем твердіше метал.
4. Загартування й відпалювання змінюють форму й розмір зерен у металах.
5. Легування змінює структуру зерен і властивості металів.
6. Метал деформується й руйнується через утому й повзучості.

Steel

The most important metal in industry is iron and its alloy — steel. Steel is an alloy of iron and carbon. It is strong and stiff, but corrodes easily through rusting, although stainless and other special steels resist corrosion. The amount of carbon in a steel influences its properties considerably. Steels of low carbon content (mild steels) are quite ductile and are used in the manufacture of sheet iron, wire, and pipes. Medium-carbon steels containing from 0.2 to 0.4 per cent carbon are tougher and stronger and are used as structural steels. Both mild and medium-carbon steels are suitable for forging and welding. High-carbon steels contain from 0.4 to 1.5 per cent carbon, are hard and brittle and are used in cutting tools, surgical instruments, razor blades and springs. Tool steel, also called silver steel, contains about 1 per cent carbon and is strengthened and toughened by quenching and tempering.

The inclusion of other elements affects the properties of the steel. Manganese gives extra strength and toughness. Steel containing 4 per cent silicon is used for transformer cores or electromagnets because it has large grains acting like small magnets. The addition of chromium gives extra strength and corrosion resistance, so we can get rust-proof steels. Heating in the presence of carbon or nitrogen-rich materials is used to form a hard surface on steel (case-hardening). High-speed steels, which are extremely important in machine-tools, contain chromium and tungsten plus smaller amounts of vanadium, molybdenum and other metals.

General understanding:

1. What is steel?
2. What are the main properties of steel?
3. What are the drawbacks of steel?
4. What kinds of steel do you know? Where are they used?
5. What gives the addition of manganese, silicon and chromium to steel?
6. What can be made of mild steels (medium-carbon steels, high-carbon steels)?
7. What kind of steels can be forged and welded?
8. How can we get rust-proof (stainless) steel?
9. What is used to form a hard surface on steel?
10. What are high-speed steels alloyed with?

Вправа 4. Знайдіть подані слова та словосполучення в тексті.

1. сплав заліза й вуглецю
2. міцний і твердий
3. легко корозує
4. нержавіюча сталь
5. низький вміст вуглецю
6. ковкість
7. листове залізо, дріт, труби
8. конструкційні сталі
9. придатні для кування й зварювання
10. твердий і крихкий
11. різальний інструмент
12. хірургічні інструменти
13. інструментальна сталь
14. упрочнювати
15. додавання марганцю (кремнію, хрому, вольфраму, молібдену, ванадію)

Methods Of Steel Heat Treatment

Quenching is a heat treatment when metal at a high temperature is rapidly cooled by immersion in water or oil. Quenching makes steel harder and more brittle, with small grains structure.

Tempering is a heat treatment applied to steel and certain alloys. Hardened steel after quenching from a high temperature is too hard and brittle for many applications and is also brittle. Tempering, that is re-heating to an intermediate temperature and cooling slowly, reduces this hardness and brittleness. Tempering temperatures depend on the composition of the steel but are frequently between 100 and 650 °C. Higher temperatures usually give a softer, tougher product. The color of the oxide film produced on the surface of the heated metal often serves as the indicator of its temperature.

Annealing is a heat treatment in which a material at high temperature is cooled slowly. After cooling the metal again becomes malleable and ductile (capable of being bent many times without cracking).

All these methods of steel heat treatment are used to obtain steels with certain mechanical properties for certain needs.

General understanding:

1. What can be done to obtain harder steel?
2. What makes steel more soft and tough?
3. What makes steel more malleable and ductile?
4. What can serve as the indicator of metal temperature while heating it?
5. What temperature range is used for tempering?
6. What are the methods of steel heat treatment used for?

Вправа 5. Перекладіть англійською мовою.

1. температура нормалізації
2. дрібнозерниста структура
3. швидке охолодження
4. загартована сталь
5. склад сталі
6. окісна плівка
7. індикатор температури
8. повільне охолодження

LESSON 11

Metalworking Processes

Metals are important in industry because they can be easily deformed into useful shapes. A lot of metalworking processes have been developed for certain applications. They can be divided into five broad groups:

- 1) rolling;
- 2) extrusion,
- 3) drawing,
- 4) forging,
- 5) sheet-metal forming.

During the first four processes metal is subjected to large amounts of strain (deformation). But if deformation goes at a high temperature, the metal will recrystallize — that is, new strain-free grains will grow instead of deformed grains. For this reason metals are usually rolled, extruded, drawn, or forged above their recrystallization temperature. This is called hot working. Under these conditions there is no limit to the compressive plastic strain to which the metal can be subjected.

Other processes are performed below the recrystallization temperature. These are called cold working. Cold working hardens metal and makes the part stronger. However, there is a limit to the strain before a cold part cracks.

Rolling

Rolling is the most common metalworking process. More than 90 percent of the aluminum, steel and copper produced is rolled at least once in the course of production. The most common rolled product is sheet. Rolling can be done either hot or cold. If the rolling is finished cold, the surface will be smoother and the product stronger.

Extrusion

Extrusion is pushing the billet to flow through the orifice of a die. Products may have either a simple or a complex cross section. Aluminum window frames are the examples of complex extrusions.

Tubes or other hollow parts can also be extruded. The initial piece is a thick-walled tube, and the extruded part is shaped between a die on the outside of the tube and a mandrel held on the inside.

In impact extrusion (also called back-extrusion) (штамповка выдавливанием), the workpiece is placed in the bottom of a hole and a loosely fitting ram is pushed against it. The ram forces the metal to flow back around it, with the gap between the ram and the die determining the wall thickness. The example of this process is the manufacturing of aluminum beer cans.

General understanding:

1. Why are metals so important in industry?
2. What are the main metalworking processes?
3. Why are metals worked mostly hot?
4. What properties does cold working give to metals?
5. What is rolling? Where is it used?
6. What is extrusion? What shapes can be obtained after extrusion?
7. What are the types of extrusion?

Вправа 1. Знайдіть подані словосполучення в тексті.

1. можуть легко деформуватися
2. потрібні форми
3. піддавати більшим деформаціям
4. зерна, вільні від деформації
5. температура перекристалізації
6. пластична деформація стиску
7. процес обробки металу
8. виріб прокату
9. отвір фільтри
10. первісний
11. складний перетин
12. пустотілі деталі
13. вільно вхідний плунжер
14. зазор між плунжером (пуансоном) і штампом
15. товщина стінки

Вправа 2. Перекладіть на англійську мову.

1. Здатність металу перекристалізуватися при високій температурі використовується при гарячому обробленні.
2. Перекристалізація – це ріст нових, вільних від деформації зерен.
3. Під час гарячого оброблення метал може зазнати дуже великої пластичної деформації стиску.
4. Холодне оброблення робить метал твердішим і міцнішим, але деякі метали мають межу деформації.
5. Листовий прокат може бути гарячим або холодним.
6. Поверхня холоднокатаного листа більш гладка й він міцніший.
7. Поперечний переріз фільтри для екструзії може бути простим або складним.
8. Алюмінієві й мідні сплави є найкращими для екструзії через їхню пластичність при деформації.
9. Алюмінієві банки, тубики для зубної пасти є прикладами використання штампування видавлюванням.
10. Товщина стінки алюмінієвої банки визначається зазором між пуансоном і штампом.

Drawing

Drawing consists of pulling metal through a die. One type is wire drawing. The diameter reduction that can be achieved in one die is limited, but several dies in series can be used to get the desired reduction.

Sheet metal forming

Sheet metal forming (штамповка листового металла) is widely used when parts of certain shape and size are needed. It includes forging, bending and shearing. One characteristic of sheet metal forming is that the thickness of the sheet changes little in processing. The metal is stretched just beyond its yield point (2 to 4 percent strain) in order to retain the new shape. Bending can be done by pressing between two dies. Shearing is a cutting operation similar to that used for cloth.

Each of these processes may be used alone, but often all three are used on one part. For example, to make the roof of an automobile from a flat sheet, the edges are gripped and the piece pulled in tension over a lower die. Next an upper die is pressed over the top, finishing the forming operation (штамповку), and finally the edges are sheared off to give the final dimensions.

Forging

Forging is the shaping of a piece of metal by pushing with open or closed dies. It is usually done hot in order to reduce the required force and increase the metal's plasticity.

Open-die forging is usually done by hammering a part between two flat faces. It is used to make parts that are too big to be formed in a closed die or in cases where only a few parts are to be made. The earliest forging machines lifted a large hammer that was then dropped on the workpiece, but now air or steam

hammers are used, since they allow greater control over the force and the rate of forming. The part is shaped by moving or turning it between blows.

Closed-die forging is the shaping of hot metal within the walls of two dies that come together to enclose the workpiece on all sides. The process starts with a rod or bar cut to the length needed to fill the die. Since large, complex shapes and large strains are involved, several dies may be used to go from the initial bar to the final shape. With closed dies, parts can be made to close tolerances so that little finish machining is required.

Two closed-die forging operations are given special names. They are upsetting and coining. Coining takes its name from the final stage of forming metal coins, where the desired imprint is formed on a metal disk that is pressed in a closed die. Coining involves small strains and is done cold. Upsetting involves a flow of the metal back upon itself. An example of this process is the pushing of a short length of a rod through a hole, clamping the rod, and then hitting the exposed length with a die to form the head of a nail or bolt.

General understanding:

1. How can the reduction of diameter in wire drawing be achieved?
2. What is sheet metal forming and where it can be used?
3. What is close-die forging?
4. What is forging?
5. What are the types of forging?
6. What types of hammers are used now?
7. Where are coining and upsetting used?
8. What process is used in wire production?
9. Describe the process of making the roof of a car.

Вправа 3. Перекладіть англійською мовою.

1. При волочінні дроту діаметр отвору волочильної дошки щораз зменшується.
2. Штампування листового металу містить у собі кування, вигин і обрізку.
3. Невелика деформація листа при розтяганні допомагає зберегти нову форму деталі.
4. Зміна форми при штампуванні проводиться шляхом стискування між двома штампами.
5. Краї листа при штампуванні відрізаються для одержання кінцевих розмірів.
6. При проковуванні деталь повинна бути гарячою для зменшення необхідних зусиль і збільшення пластичності металу.
7. Після кування в закритих штампах деталі не вимагають великої механічної обробки.
8. При карбуванні деформація металу невелика й відбиток формується на поверхні металу.
9. Висадження використовується для виготовлення голівок цвяхів і болтів.

Metalworking and Metal Properties

An important feature of hot working is that it provides the improvement of mechanical properties of metals. Hot-working (hot-rolling or hot-forging) eliminates porosity, directionality, and segregation that are usually present in metals. Hot-worked products have better ductility and toughness than the unworked casting. During the forging of a bar, the grains of the metal become greatly elongated in the direction of flow. As a result, the toughness of the metal is greatly improved in this direction and weakened in directions transverse to the flow. Good forging makes the flow lines in the finished part oriented so as to lie in the direction of maximum stress when the part is placed in service.

The ability of a metal to resist thinning and fracture during cold-working operations plays an important role in alloy selection. In operations that involve stretching, the best alloys are those which grow stronger with strain (are strain hardening) — for example, the copper-zinc alloy, brass, used for cartridges and the aluminum-magnesium alloys in beverage cans, which exhibit greater strain hardening.

Fracture of the workpiece during forming can result from inner flaws in the metal. These flaws often consist of nonmetallic inclusions such as oxides or sulfides that are trapped in the metal during refining. Such inclusions can be avoided by proper manufacturing procedures.

The ability of different metals to undergo strain varies. The change of the shape after one forming operation is often limited by the tensile ductility of the metal. Metals such as copper and aluminum are more ductile in such operations than other metals.

General understanding:

1. What process improves the mechanical properties of metals?
2. What new properties have hot-worked products?
3. How does the forging of a bar affect the grains of the metal? What is the result of this?
4. How are the flow lines in the forged metal oriented and how does it affect the strength of the forged part?
5. What are the best strain-hardening alloys? Where can we use them?
6. What are the inner flaws in the metal?
7. Can a metal fracture because of the inner flaw?
8. What limits the change of the shape during forming operations?

Вправа 4. Знайдіть у тексті.

1. важлива особливість гарячого оброблення
2. поліпшення механічних властивостей металу
3. неопрацьований виливок
4. напрямок максимальної напруги
5. здатність чинити опір стоншенню й руйнуванню
6. проявляти більше деформаційне зміцнення
7. руйнування деталі при штампуванні

8. внутрішні дефекти в металі
9. неметалічні включення
10. здатність металів зазнавати деформації
11. обмежується пластичністю металу при розтяганні

Вправа 5. Перекладіть на англійську мову.

1. Гаряче оброблення металу поліпшує його механічні властивості й усуває пористість і внутрішні дефекти.
2. Подовження зерен у напрямку плинності при куванні значно поліпшує міцність металу в цьому напрямку й зменшує його міцність у поперечному.
3. Гарне проковування орієнтує лінії плинності в напрямку максимальної напруги.
4. Деформаційне зміцнення металу при холодному обробленні дуже важливо для одержання металів з поліпшеними властивостями.
5. Внутрішні дефекти металу – це неметалічні включення типу окислів або сульфідів.
6. Зміна форми при штампуванні металевих деталей обмежується пластичністю металу при розтяганні.

LESSON 12

Mechanical Properties of Materials

Materials Science and Technology is the study of materials and how they can be fabricated to meet the needs of modern technology. Using the laboratory techniques and knowledge of physics, chemistry, and metallurgy, scientists are finding new ways of using metals, plastics and other materials.

Engineers must know how materials respond to external forces, such as tension, compression, torsion, bending, and shear. All materials respond to these forces by elastic deformation. That is, the materials return their original size and form when the external force disappears. The materials may also have permanent deformation or they may fracture. The results of external forces are creep and fatigue.

Compression is a pressure causing a decrease in volume. When a material is subjected to a bending, shearing, or torsion (twisting) force, both tensile and compressive forces are simultaneously at work. When a metal bar is bent, one side of it is stretched and subjected to a tensional force, and the other side is compressed.

Tension is a pulling force; for example, the force in a cable holding a weight. Under tension, a material usually stretches, returning to its original length if the force does not exceed the material's elastic limit. Under larger tensions, the material does not return completely to its original condition, and under greater forces the material ruptures.

Fatigue is the growth of cracks under stress. It occurs when a mechanical part is subjected to a repeated or cyclic stress, such as vibration. Even when the maximum stress never exceeds the elastic limit, failure of the material can occur even after a short time. No deformation is seen during fatigue, but small localized cracks develop and propagate through the material until the remaining cross-sectional area cannot support the maximum stress of the cyclic force. Knowledge of tensile stress, elastic limits, and the resistance of materials to creep and fatigue are of basic importance in engineering.

Creep is a slow, permanent deformation that results from a steady force acting on a material. Materials at high temperatures usually suffer from this deformation. The gradual loosening of bolts and the deformation of components of machines and engines are all the examples of creep. In many cases the slow deformation stops because deformation eliminates the force causing the creep. Creep extended over a long time finally leads to the rupture of the material.

General understanding:

1. What are the external forces causing the elastic deformation of materials? Describe those forces that change the form and size of materials.
2. What are the results of external forces?
3. What kinds of deformation are the combinations of tension and compression?
4. What is the result of tension? What happens if the elastic limit of material is exceeded under tension?
5. What do we call fatigue? When does it occur? What are the results of fatigue?
6. What do we call creep? When does this type of permanent deformation take place? What are the results of creep?

Вправа 1. Знайдіть у тексті.

1. відповідати вимогам сучасної технології
2. використовуючи лабораторні методи
3. нові способи використання металів
4. стиск, розтягання, вигин, крутіння, зріз
5. повертати первісний розмір і форму
6. зовнішня сила
7. постійна деформація
8. зменшення обсягу
9. розтягувальні й стискаючі сили
10. перевищувати межа пружності матеріалу
11. повторювані циклічні напруги
12. руйнування матеріалу
13. розвиток і поширення дрібних тріщин
14. опір матеріалів повзучості й втоми

Вправа 2. Перекладіть українською подані речення.

1. Пружна деформація – це реакція всіх матеріалів на зовнішні сили, такі як розтягання, стискування, скручування, вигин і зріз.

2. Утома й повзучість матеріалів є результатом зовнішніх сил.

3. Зовнішні сили викликають постійну деформацію й руйнування матеріалу.

4. Розтягувальні й стискувальні сили працюють одночасно, коли ми згинаємо або скручуємо матеріал.

5. Розтягання матеріалу, вище від межі його пружності, дає постійну деформацію або руйнування.

6. Коли деталь працює довгий час під циклічними напруженнями, у ній з'являються невеликі тріщини, що зростають через утому металу.

7. Повзучість – це повільна зміна розміру деталі під напругою.

Mechanical Properties of Materials

Density (specific weight) is the amount of mass in a unit volume. It is measured in kilograms per cubic metre. The density of water is 1000 kg/m^3 but most materials have a higher density and sink in water. Aluminium alloys, with typical densities around 2800 kg/m^3 are considerably less dense than steels, which have typical densities around 7800 kg/m^3 . Density is important in any application where the material must not be heavy.

Stiffness (rigidity) is a measure of the resistance to deformation such as stretching or bending. The Young modulus is a measure of the resistance to simple stretching or compression. It is the ratio of the applied force per unit area (stress) to the fractional elastic deformation (strain). Stiffness is important when a rigid structure is to be made.

Strength is the force per unit area (stress) that a material can support without failing. The units are the same as those of Stiffness, MN/m^2 , but in this case the deformation is irreversible. The yield strength is the stress at which a material first deforms plastically. For a metal the yield strength may be less than the fracture strength, which is the stress at which it breaks. Many materials have a higher strength in compression than in tension.

Ductility is the ability of a material to deform without breaking. One of the great advantages of metals is their ability to be formed into the shape that is needed, such as car body parts. Materials that are not ductile are brittle. Ductile materials can absorb energy by deformation but brittle materials cannot.

Toughness is the resistance of a material to breaking when there is a crack in it. For a material of given toughness, the stress at which it will fail is inversely proportional to the square root of the size of the largest defect present. Toughness is different from strength: the toughest steels, for example, are different from the ones with highest tensile strength. Brittle materials have low toughness: glass can be broken along a chosen line by first scratching it with a diamond. Composites can be designed to have considerably greater toughness than their constituent materials. The example of a very tough composite is fiberglass that is very flexible and strong.

Creep resistance is the resistance to a gradual permanent change of shape, and it becomes especially important at higher temperatures. A successful research has been made in materials for machine parts that operate at high temperatures and under high tensile forces without gradually extending, for example the parts of plane engines.

General understanding:

1. What is the density of a material?
2. What are the units of density? Where low density is needed?
3. What are the densities of water, aluminium and steel?
4. A measure of what properties is stiffness? When stiffness is important?
5. What is Young modulus?
6. What is strength?
7. What is yield strength? Why fracture strength is always greater than yield strength?
8. What is ductility? Give the examples of ductile materials. Give the examples of brittle materials.
8. What is toughness?
9. What properties of steel are necessary for the manufacturing of:
a) springs, b) car body parts, c) bolts and nuts, d) cutting tools?
10. Where is aluminium mostly used because of its light weight?

Вправа 3. Знайдіть подані словосполучення та речення в тексті.

1. кількість маси в одиниці об'єму
2. кілограм на кубічний метр
3. опір деформації
4. відношення прикладеної сили на одиницю площі до часткової пружної деформації
5. жорстка конструкція
6. міцність на стиск
7. здатність матеріалу деформуватися не руйнуючись
8. поглинати енергію шляхом деформації
9. назад пропорційно квадрату розміру дефекту
10. поступова зміна форми
11. підвищені температури
12. високі розтяжні зусилля

Вправа 4. Перекладіть на українську мову.

1. Щільність вимірюється в кілограмах на кубічний метр.
2. Більшість матеріалів мають більш високу щільність, ніж вода, й тонуть у воді.
3. Щільність матеріалу дуже важлива, особливо в авіації.
4. Модуль Юнга – відношення прикладеної сили до пружної деформації даного матеріалу.
5. Чим більш твердий метал, тем менше він деформується під навантаженням.

6. Коли метал розтягують, він спочатку тече, тобто пластично деформується.

7. Свинець, мідь, алюміній і золото – найковкіші метали.

8. Опір повзучості є дуже важливою властивістю матеріалів, які використовуються в авіаційних моторах.

Famous People Of Science and Engineering

Sikorsky Igor Ivanovich was a well-known aircraft engineer and manufacturer.

Sikorsky was born in 1889 in Kiev, in the Ukraine, and got his education at the naval college in St. Petersburg, and later in Kiev and Paris. He was the first to make experiments in helicopter design. In 1913 he designed, built, and flew the first successful aeroplane. Later he built military aircrafts for Russia and France.

In 1919 Sikorsky moved to the United States and later helped to organize an aircraft company that produced a series of multiengine flying boats for commercial service. Sikorsky became an American citizen in 1928. In the late 1930s he returned to developing helicopters and produced the first successful helicopter in the west. Helicopters designed by Sikorsky were used mostly by the US Army Air Forces during World War II. He died in 1972 at the age of 83.

Tupolev Andrey Nikolayevich, famous aircraft designer, was born in 1888. He graduated from the Moscow Higher Technical School, where he designed the first Russian wind tunnel. He helped to found the Central Aerohydrodynamics Institute in 1918 and later worked as the head of its design bureau. During his career he directed the design of more than 100 military and commercial aircraft, including the TU-2 and TU-4 bombers used in the World War II. In 1955 he designed the TU-104, the first passenger jet airliner. His TU-144 supersonic jet liner began its commercial passenger flights in 1977.

LESSON 13

Machines and Work

Defined in the simplest terms a machine is a device that uses force to accomplish something. More technically, it is a device that transmits and changes force or motion into work. This definition implies that a machine must have moving parts. A machine can be very simple, like a block and tackle to raise a heavy weight, or very complex, like a railroad locomotive or the mechanical systems used for industrial processes.

A machine receives input from an energy source and transforms it into output in the form of mechanical or electrical energy. Machines whose input is a natural source of energy are called prime movers. Natural sources of energy

include wind, water, steam, and petroleum. Windmills and waterwheels are prime movers; so are the great turbines driven by water or steam that turn the generators that produce electricity; and so are internal combustion engines that use petroleum products as fuel. Electric motors are not prime movers, since an alternating current of electricity which supplies most electrical energy does not exist in nature.

The terms like work, force, and power are frequently used in mechanical engineering, so it is necessary to define them precisely. Force is an effort that results in motion or physical change. If you use your muscles to lift a box you are exerting force on that box. The water which strikes the blades of a turbine is an exerting force on those blades, thereby setting them in motion.

In a technical sense work is the combination of the force and the distance through which it is exerted.

To produce work, a force must act through a distance. If you stand and hold a twenty-pound weight for any length of time, you may get very tired, but you are not doing work in an engineering sense because the force you exerted to hold up the weight was not acting through a distance. However, if you raised the weight, you would be doing work.

Power is another term used in a special technical sense when speaking of machines. It is the rate at which work is performed.

In the English-speaking countries, the rate of doing work is usually given in terms of horsepower, often abbreviated hp. You will remember that this expression resulted from the desire of the inventor James Watt to describe the work his steam engines performed in terms that his customers could easily understand. After much experimentation, he settled on a rate of 33,000 footpounds per minute as one horsepower.

In the metric system power is measured in terms of watts and kilowatts. The kilowatt, a more widely used term, equals a thousand watts or approximately 1/3 horsepower in the English system.

Вправа 1. Розподіліть подані слова в три групи: а) позначають основні поняття фізики й механіки; б) позначають джерела енергії; в) механізми, машини:

wind, power, water, force, work, steam, wind mill, petroleum, turbine, motion, weight, block, device, locomotive, input, output, steam engine, rate, effort, distance, generator, part, weight.

Вправа 2. З'єднайте термін з визначенням, що йому відповідає, наведеним у правій колонці.

Machine	is	the rate at which work is performed
Prime mover		a device that uses force to accomplish something
Force		an effort that results in motion or physical change
Work		a machine whose input is a natural source of energy
Power		a combination of the force and the distance through which it is exerted

Вправа 3. Подані дієслова часто поєднуються з поняттями фізики та механіки. Складіть із ними дієслівні сполуки, використовуючи матеріал тексту.

Model: to transmit – to transmit motion / force
to produce, to transform, to supply, to result in, to exert, to

Вправа 4. Підготуйте розгорнуті відповіді на питання:

1. What is a simple definition of a machine? What is a more technical definition? What does this definition imply? 2. Describe some very simple machines. What are some complex ones? 3. What are the machines called whose input is a natural source of energy? What are some natural sources of energy and the machines that use them? 4. Why aren't electric motors prime-movers? 5. What is force? Give some examples. 6. What is work? How can work be expressed mathematically? Give an example. 7. What is power? 8. How is the rate of doing work usually given in the English-speaking countries? Why was the term invented? 9. In what terms is power measured in the metric system?

Вправа 5. Прочитайте та перекладіть текст.

Couplings and Clutches

Couplings and clutches are intended to connect shafts or other revolving parts and in modern mechanical engineering they form integral components of almost all machines. Couplings and clutches link together the shafts of turbines and generators, prime movers and driving mechanisms, as well as the shafts of separate units and assemblies effect smooth or instantaneous starting stopping, reversing and gear change of machines; protect against overload and racing and prevent reverse rotation.

Hence the great diversity of types of couplings and clutches and the continuous development of new designs.

Clutches are employed to connect and disconnect shafts during their relative motion (under load) or at standstill. According to the forces which keep them engaged, clutches may be divided into four groups: friction, claw (toothed) electromagnetic fluid, and electromagnetic powder, and hydraulic clutches. Depending on the manner in which clutches are operated they are subdivided into those controlled by an operator directly or by means of auxiliary force, and power controlled clutches.

Advantages of Welded Work over Riveted Work

The application of welding instead of riveting to make permanent joints has a number of advantages, the chief being economy of material and labour. Metal is saved due to:

(a) the lighter weight of members joined by welding (the weight of welds comprises about 1-1,5 per cent of the work weight while the weight of rivets is about 3.5-4 per cent);

(b) the better utilization of metal due to the absence of holes which weaken the- effective sections;

(c) the possibility of a wide use of butt-joined seams requiring no additional elements such as straps.

The use of welding instead of riveting saves on an average 10 to 20 per cent in weight.

Less labour is required because it is no longer necessary to lay out, punch or drill the holes. Besides riveting is much more complicated and less productive job than welding which can be often largely automated.

LESSON 14

Machine-Tools

Machine-tools are used to shape metals and other materials. The material to be shaped is called the workpiece. Most machine-tools are now electrically driven. Machine-tools with electrical drive are faster and more accurate than hand tools: they were an important element in the development of mass-production processes, as they allowed individual parts to be made in large numbers so as to be interchangeable.

All machine-tools have facilities for holding both the workpiece and the tool, and for accurately controlling the movement of the cutting tool relative to the workpiece. Most machining operations generate large amounts of heat, and use cooling fluids (usually a mixture of water and oils) for cooling and lubrication.

Machine-tools usually work materials mechanically but other machining methods have been developed lately. They include chemical machining, spark erosion to machine very hard materials to any shape by means of a continuous high-voltage spark (discharge) between an electrode and a workpiece. Other machining methods include drilling using ultrasound, and cutting by means of a laser beam. Numerical control of machine-tools and flexible manufacturing systems have made it possible for complete systems of machine-tools to be used flexibly for the manufacture of a range of products.

Lathe

Lathe is still the most important machine-tool. It produces parts of **circular cross-section** by turning the workpiece on its axis and cutting its **surface** with a sharp **stationary** tool. The tool may be moved **sideways** to produce a cylindrical part and moved towards the workpiece to control the **depth** of cut. Nowadays all lathes are power-driven by electric motors. That allows continuous rotation of the workpiece at a variety of speeds. The modern lathe is

driven by means of a **headstock** supporting a hollow **spindle** on accurate bearings and carrying either a **chuck or a faceplate**, to which the workpiece is clamped. The movement of the tool, both along the **lathe bed** and at right angle to it, can be accurately controlled, so **enabling** a part to be machined to close **tolerances**. Modern lathes are often under numerical control.

General understanding:

1. What are machine-tools used for?
2. How are most machine-tools driven nowadays?
3. What facilities have all machine-tools?
4. How are the cutting tool and the workpiece cooled during machining?
5. What other machining methods have been developed lately?
6. What systems are used now for the manufacture of a range of products without the use of manual labor?
7. What parts can be made with lathes?
8. How can the cutting tool be moved on a lathe?
9. How is the workpiece clamped in a lathe?
10. Can we change the speeds of workpiece rotation in a lathe?
11. What is numerical control of machine tools used for?

Вправа 1. Знайдіть подані слова та словосполучення в тексті.

1. оброблюваний матеріал
2. електропривод
3. більш точний
4. окремі деталі
5. процес масового виробництва
6. пристосування для тримання різця й деталі
7. операції з механічною оброблення деталі
8. високовольтний розряд
9. свердління ультразвуком
10. різання за допомогою лазерного променя
11. гнучкі виробничі системи
12. деталі круглого перетину
13. повертати деталь навколо її осі
14. рухати убік, рухати в напрямку до деталі
15. глибина різання
16. безперервне обертання деталі
17. рух різця вздовж станини

Вправа 2. Перекладіть на англійську мову.

1. Токарний верстат дозволяє робити деталі круглого перетину.
2. Деталь зажимається в патроні або на планшайбі токарного верстата.
3. Різець може рухатися як уздовж станини, так і під прямим кутом до неї.
4. Сучасні токарські верстати часто мають цифрове керування.

Milling Machine

In a milling machine the cutter is a circular device with a series of cutting edges on its circumference. The workpiece is held on a table that controls the feed against the cutter. The table has three possible movements: longitudinal, horizontal, and vertical; in some cases it can also rotate. Milling machines are the most versatile of all machine tools. Flat or contoured surfaces may be machined with excellent finish and accuracy. Angles, slots, gear teeth and cuts can be made by using various shapes of cutters.

Drilling and Boring Machines

To drill a hole usually hole-making machine-tools are used. They can drill a hole according to some specification, they can enlarge it, or they can cut threads for a screw or to create an accurate size or a smooth finish of a hole.

Drilling machines are different in size and function, from portable drills to radial drilling machines, multispindle units, automatic production machines, and deep-hole-drilling machines.

Boring is a process that enlarges holes previously drilled, usually with a rotating single-point cutter held on a boring bar and fed against a stationary workpiece.

Shapers and Planers

The shaper is used mainly to produce different flat surfaces. The tool slides against the stationary workpiece and cuts on one stroke, returns to its starting position, and then cuts on the next stroke after a slight lateral displacement. In general, the shaper can make any surface having straight-line elements. It uses only one cutting-tool and is relatively slow, because the return stroke is idle. That is why the shaper is seldom found on a mass production line. It is, however, valuable for tool production and for workshops where flexibility is important and relative slowness is unimportant.

The planer is the largest of the reciprocating machine tools. It differs from the shaper, which moves a tool past a fixed workpiece because the planer moves the workpiece to expose a new section to the tool. Like the shaper, the planer is intended to produce vertical, horizontal, or diagonal cuts. It is also possible to mount several tools at one time in any or all tool holders of a planer to execute multiple simultaneous cuts.

Grinders

Grinders remove metal by a rotating abrasive wheel. The wheel is composed of many small grains of abrasive, bonded together, with each grain acting as a miniature cutting tool. The process gives very smooth and accurate finishes. Only a small amount of material is removed at each pass of the wheel, so grinding machines require fine wheel regulation. The pressure of the wheel against the workpiece is usually very light, so that grinding can be carried out on fragile materials that cannot be machined by other conventional devices.

General understanding:

1. What is the shape of a cutter in a milling machine?
2. What moves in a milling machine, a table or a cutter?
3. What possible movements has the table of a milling machine?

4. What kind of surfaces and shapes may be machined by a milling machine?
5. What can we use a drilling machine for?
6. What kinds of drilling machines exist?
7. What is rotated while boring, a cutter or a work-piece?
8. Describe the work of a shaper (planer).
9. What must be done to execute multiple simultaneous cuts on a planer?
10. What is the working tool in a grinder?
11. Can we obtain a very smooth surface after grinding and why?
12. Can we grind fragile materials and why?

Вправа 3. Перекладіть на англійську мову.

1. Токарний верстат усе ще залишається найважливішим верстатом.
2. Усі сучасні токарні верстати обладнані електроприводами.
3. Рух інструмента контролюється з високою точністю.
4. Електропривод дозволяє обробляти заготовку на різних швидкостях.

Dies

Dies are tools used for the shaping solid materials, especially those employed in the pressworking of cold metals.

In presswork, dies are used in pairs. The smaller die, or punch, fits inside the larger die, called the matrix or, simply, the die. The metal to be formed, usually a sheet, is placed over the matrix on the press. The punch is mounted on the press and moves down by hydraulic or mechanical force.

A number of different forms of dies are employed for different operations. The simplest are piercing dies, used for punching holes. Bending and folding dies are designed to make single or compound bends. A combination die is designed to perform more than one of the above operations in one stroke of the press. A progressive die permits successive forming operations with the same die.

In coining, metal is forced to flow into two matching dies, each of which bears an engraved design.

Wiredrawing Dies

In the manufacture of wire, a drawplate is usually employed. This tool is a metal plate containing a number of holes, successively less in diameter and known as wire dies. A piece of metal is pulled through the largest die to make a coarse wire. This wire is then drawn through the smaller hole, and then the next, until the wire is reduced to the desired measurement. Wiredrawing dies are made from extremely hard materials, such as tungsten carbide or diamonds.

Thread-Cutting Dies

For cutting threads on bolts or on the outside of pipes, a thread-cutting die is used. It is usually made of hardened steel in the form of a round plate with a hole in the centre. The hole has a thread. To cut an outside thread, the die is lubricated with oil and simply screwed onto an unthreaded bolt or piece of pipe, the same way a nut is screwed onto a bolt. The corresponding tool for cutting an inside thread, such as that inside a nut, is called a tap.

Вправа 4. Знайдіть у тексті подані сполуки.

1. видаляти металеву стружку
2. гострий різальний край
3. вміст вуглецю
4. різальна здатність
5. сталь для швидкісного різання
6. виправлення шліфувальних кіл
7. гідравлічний або механічний тиск
8. різні форми штампів

Вправа 5. Перекладіть на англійську мову.

1. Усі різці й фрези повинні мати гостру різальну крайку.
2. Під час різання різальний інструмент і деталь мають високу температуру й повинні охолоджуватися.
3. Вуглецеві сталі часто використовуються для виготовлення різців, тому що вони недорогі.
4. Швидкорізальні сталі містять вольфрам, хром і ванадій.
5. Алмази використовуються для різання абразивних матеріалів і чистового оброблення поверхні твердих матеріалів.
6. Для різних операцій використовують різні штампи.
7. Волоочильні дошки для дроту робляться з дуже твердих матеріалів.
8. Різбонарізні плашки й мітчики використовуються для нарізування різьблення зовні й усередині.

FAMOUS PEOPLE OF SCIENCE AND ENGINEERING

George Stephenson

George Stephenson was a British inventor and engineer. He is famous for building the first practical railway locomotive.

Stephenson was born in 1781 in Wylam, near Newcastle upon Tyne, Northumberland. During his youth he worked as a fireman and later as an engineer in the coal mines of Newcastle. He invented one of the first miner's safety lamps independently of the British inventor Humphry Davy. Stephenson's early locomotives were used to carry loads in coal mines, and in 1823 he established a factory at Newcastle for their manufacture. In 1829 he designed a locomotive known as the Rocket, which could carry both loads and passengers at a greater speed than any locomotive constructed at that time. The success of the Rocket was the beginning of the construction of locomotives and the laying of railway lines.

Robert Stephenson, the son of George Stephenson was a British civil engineer. He is mostly well-known known for the construction of several notable bridges.

He was born in 1803 in Willington Quay, near Newcastle upon Tyne, and educated in Newcastle and at the University of Edinburgh. In 1829 he assisted his father in constructing a locomotive known as the Rocket, and four years later

he was appointed construction engineer of the Birmingham and London Railway, completed in 1838. Stephenson built several famous bridges, including the Victoria Bridge in Northumberland, the Britannia Bridge in Wales, two bridges across the Nile in Damietta in Egypt and the Victoria Bridge in Montreal, Canada. Stephenson was a Member of Parliament from 1847 until his death in 1859.

LESSON 15

There are three types of internal combustion engines, which are of great importance to our industrial life and us. These three are the petrol engine, the diesel engine and the gas turbine.

They all three breathe air. They burn a liquid hydrocarbon fuel. They produce mechanical work and also, a great disadvantage, exhaust gases.

However, there are differences in the principles of their construction and operation. The first two, the petrol engine and the diesel engine are reciprocating engines. That is, they are based on a piston moving within a cylinder. The third engine, the one we are most interested in today, the gas turbine, is a rotary engine.

There are two basic types of a rotary engine, the turbo-jet and the turbo-prop. The turbo-jet is a very reliable engine. It consists of a main shaft at one end of which there is an axial compressor and the other end is a turbine. The purpose of this turbine is to drive the compressor. Between the compressor and the turbine are combustion chambers into which the fuel is injected. The fuel is, in fact, kerosene.

Air enters the compressor, the compressor is turning. As it passes through the compressor it increases both in pressure and in temperature. Then it flows into the combustion chambers, mixes with the fuel and at constant pressure the temperature goes up to a very high level. The gases then expand through the turbine. The turbine extracts work from those gases and turns the compressor. So, the turbine has no part in propelling the aircraft to which this turbine is attached. The propulsion of the aircraft is due to the reaction of the exhaust gases. A jet engine is a reaction engine.

The second type is the turbo-prop. The two engines are fundamentally the same: a turbine, a compressor and combustion chambers between the two of them. But here instead of an axial compressor, we have a centrifugal compressor. In this engine, the turbine has two functions. It not only has to run the compressor, it also turns the propeller because it is a propeller engine.

Both of these engines have certain advantages over a reciprocating engine. The first and the most important is that these engines have a high power-weight

ratio. In other words, for a given weight of engine the power they produce is much larger than that of a piston engine. The second characteristic is that they are very simple and have a very small number of moving parts. The third one is that they are able to run independent of water supply. Of great importance is their rapid starting. From the time you start the run-up procedure to the time the full power is developed is about 30 seconds compared to some minutes with a reciprocating engine.

The major use of these engines is in aviation. Because of the high power-weight ratio, it has made aviation faster. There are other uses, one of them being in electricity generation.

Вправа 1. Прочитайте речення.

1. They produce mechanical work and ..., a great disadvantage, exhaust gases.

2. ..., the turbine has no part in propelling the aircraft to which this engine is attached.

3. ..., for a given weight of engine the power they produce is much larger than that of a piston engine.

4. ... there are differences in the principles of their construction and operation.

Виберіть і вставте пропущені в них подані слова-зв'язки:

- | | | |
|-----------------|------------|-------------------------|
| a) thus; | d) so; | g) in other words; |
| b) however; | e) but; | h) also; |
| c) in this way; | f) unless; | i) on the condition if. |

Перекладіть речення на українську мову.

Вправа 2. Дайте відповіді на питання.

1. How many types of internal combustion engines are there?

2. The engines are based on a bar moving within a cylinder, aren't they?

3. Does the air in the compressor increase both in pressure and in temperature?

4. Which of these engines have certain advantages over a reciprocating ones?

5. Where are the combustion chambers set in the rotary engine?

6. Is the gas turbine of a diesel engine type or a rotary one?

Вправа 3. Закінчіть речення так, щоб його можна було використати в якості узагальнювального повідомлення.

The text tells us...

a) ... about the origin of the engines.

b) ... these three types of internal combustion engines breathe air, burn liquid hydrocarbon fuel and produce mechanical work.

c) ... the available internal combustion engines are harmful for the environment.

Вправа 4. Запропонуйте свої варіанти назви тексту.

Вправа 5. Перекладіть на англійську мову.

Старий, найстаріший, мій старий друг, більш далекий, найдальший, найдовший, найбільш відомий, коротший, найшвидший, щасливіший, найщасливіший, найкращий, найчорніший, довший, гірший, кращий, тепліший, її кращий друг.

LESSON 16

Thermodynamics

Thermodynamics is that branch of physics which deals with the conversion of mechanical energy into thermal energy and the reverse process of transforming heat into work.

The production of heat by mechanical means may be illustrated by the phenomenon of friction. For example, fire may be started while rubbing together two sticks of wood. Heat is developed when compressing a gas. The transformation of heat into work may be illustrated by operation of a steam or gas engine by means of which heat may be transformed into mechanical energy.

So a heat engine is a machine for transforming heat into mechanical energy, the most important of the practical heat engines being the steam engine and the internal combustion engines.

To transform energy from any of its numerous forms into heat is a comparatively simple process. To transform heat into work is a different matter. Experience shows that any actual physical process, as the change of state of a system, is irreversible and is accompanied by a frictional effect. A strictly reversible frictionless process being an ideal, it may be approached but never attained. In the case of the ideal reversible process, there is no change in the quantity of available energy. But an actual irreversible process is always accompanied by a decrease of the amount of energy available for transformation. All transformations of energy are subject to two far-reaching laws:

1) The general law of conservation of energy, of which the following is a statement: the total energy of an isolated system remains constant and cannot be increased or diminished by any physical process whatever.

2) The law of degradation of energy. According to this law, the result of any transformation of energy is the reduction of the quantity of energy that may be usefully transformed into mechanical work.

The first law of thermodynamics is merely the law of conservation applied to the transformation of heat into work. It may be stated as follows: when work is expended in producing heat the quantity of heat generated is equivalent to the work done. And conversely, when heat is employed to do work, a quantity of heat precisely equivalent to the work done disappears.

The second law of thermodynamics is essentially the law of degradation of energy. Whereas the first law gives a relation that must be satisfied in any transformation of energy, it is the second law that gives information regarding the possibility of transformation and the availability of a given form of energy for transformation into work. A general statement of the second law is: «No change in a system of bodies that takes place of itself can increase the available energy of the system».

Вправа 1. Перекладіть речення на українську мову.

1. The production of heat: by mechanical means may be illustrated by the phenomenon of friction. 2. In the case of the ideal reversible process, there is no change in the quantity of available energy. 3. A strictly reversible frictionless process being an ideal, it may be approached but never attained. 4. The total energy of an isolated system remains constant and cannot be increased or diminished by any physical process. 5. When heat is employed to do work, a quantity of heat precisely equivalent to the work done disappears. 6. No change in a system of bodies that takes place of itself can increase the available energy of the system.

Вправа 2. Знайдіть у тексті речення, що виражають основні положення тексту.

Вправа 3. Спираючись на зміст тексту, закінчить подані речення.

1. A heat engine is ...
 - a) a machine for transforming heat into mechanical energy.
 - b) a machine for defining the amount of mechanical energy.
 - c) a machine for solving physical problems.
2. The production of heat by mechanical means may be illustrated by ...
 - a) the phenomena of potential energy of a body which it possesses due to its position.
 - b) the phenomena of conservation of energy which can neither be created nor destroyed in any physical effects.
 - c) the phenomena of friction.
3. The first law of thermodynamics is ...
 - a) the law of degradation of energy.
 - b) the law of conservation of energy.
 - c) the law of transformation of energy.

Вправа 4. Розташуйте речення в тій послідовності, у якій вони подані в тексті.

1. The production of heat by mechanical means may be illustrated by the phenomenon of friction.
2. Experience shows that any actual physical process is irreversible and is accompanied by frictional effect.

3. Whereas the first law gives a relation that must be satisfied in any transformation of energy, it is the second law that gives information regarding the possibility of transformation.

4. Thermodynamics is that branch of physics which deals with the conversion of mechanical energy into thermal energy and the reverse process.

5. A heat engine is a machine for transforming heat into mechanical energy.

Вправа 5. Дайте відповіді на питання.

1. What does thermodynamics deal with? 2. The phenomenon of friction is the illustration of the production of heat by mechanical means, isn't it? 3. What are the most important heat engines? 4. Are there two or three laws of transformation of energy? 5. Will you explain the essence of the 1st law of thermodynamics? 6. What does the law of degradation of energy state?

LESSON 17

We now use the term automation for specific techniques combined to operate automatically in a complete system. These techniques are possible because of electronic devices, most of which have come into use in the last thirty years. They include program, action, sensing or feedback, decision, and control elements as components of a complete system.

The program elements determine what the system does and the step-by-step manner in which it works to produce the desired result. A program is a step-by-step sequence that breaks a task into its individual parts. Some steps in an industrial automation program direct other parts of the system when and how to carry out their jobs.

The action elements are those which do the actual work. They may carry or convey materials to specific places at specific times or they may perform operations on the materials. The term mechanical handling device is also used for the action elements.

Perhaps the most important part of an automated system is sensing or feedback. Sensing devices automatically check on parts of the manufacturing process such as the thickness of a sheet of steel or paper. This is called feedback because the instruments return or feed back this information to the central system control.

The decision element is used to compare what is going on in the system with what should be going on. It receives information from the sensing devices and makes decisions necessary to maintain the system correctly. If some action is necessary the decision element can give instructions or commands to the system.

The control element consists of devices to carry out the commands of the decision element. There may be many kinds of devices: valves that open or close, switches that control the flow of electricity, or regulators that change the voltage in various machines; they make the necessary corrections or adjustments to keep the system in conformity with its program.

An industrial engineer working with automated systems is a part of a team. Many components of the system, such as computers, are electronic devices. So electronic engineers and technicians are also involved. Many of the industries in which automation has proved particularly suitable – chemicals, papermaking, metals processing – involve chemical processes, so there may be chemical engineers at work too. An industrial engineer with expertise in all these fields may become a system engineer for automation projects thereby coordinating the activities of all the members of the team.

Вправа 1. Прочитайте текст і визначте, що складає основні частини автоматичної системи.

Вправа 2. Дайте назву тексту.

Вправа 3. Назвіть функції кожного елемента системи українською мовою.

Вправа 4. Дайте відповіді на питання

1. What are some elements of an automated system? What makes them possible?
2. What is a program? What does it do in an automated system?
3. Name two terms used to describe the elements which do the actual work. What are some jobs these elements may do?
4. What are some of the things sensing devices do?
5. How do sensing devices act on the information they receive? Why is the process sometimes called feedback?
6. What is the function of the decision element? What can it do?
7. What does the control element consist of? What can these devices do? What is their purpose?

Вправа 5. Вставте замість крапок слова *much* або *many*, *(a) little* або *(a) few* і поясніть їх вживання. Перекладіть речення на українську мову.

1. Scientists collected ... information about the Moon, its atmosphere and surface.
2. We had ... time for experiments and we made only ... of them.
3. ... young specialists take part in scientific research.
4. We have ... time for this work that is why we must work hard.
5. There is ... light in the laboratory; there are ... different devices there.
6. There is ... water in this lake.
7. This scientist works ... at the problem of using semiconductors.
8. Only ... students were present at the lecture.
9. This particle was discovered only half a year ago and ... is known about it yet.
10. You need ... facts touse them in your report.

LESSON 18

Automation is the third phase in the development of technology that began with the industrialization of the 18th century. First came mechanization which created the factory system and separated labour and management in production. Mechanization was a technology based on forms and applications of power. Mass production came next. It was a technology based on the principles of production and organization. Automation is a technology based on communication, computation and control.

The truly automated devices must possess one or more of the following elements: system approach, programmability, feedback.

With a system approach, factories which make things by passing them through successive stages of manufacturing without people intervening to transfer lines, which made their debut in car factories before the Second World War, are considered automated systems. These carry components past lines of machine-tools which each cuts them automatically. People are not required. The machines clamp the parts out of themselves without a workman being present. Thus transfer lines are different from assembly lines where people are very much in evidence. With programmability, a system can do more than one kind of job. An industrial robot is an automated machine. It works automatically and an operator can reprogram the computer that controls it to make the machine do different things.

Finally, feedback makes an automatic device vary its routine according to changes that take place around it. An automatic machine-tool with feedback would have sensors that detect, for example, if the metal it is cutting is wrongly shaped. If it is, the sensors instruct the machine to vary its routine accordingly. Other examples of devices with feedback are robots with "vision" or other sensors that can «see» or «feel» what they are doing.

Most examples of automation in factories today are not «programmable»; neither do they work with feedback. They are simply sets of machine-tools linked together according to «systems» approach. These mechanisms are inflexible. They turn out only one kind of part, which is all very well if the manufacturer wants to make thousands of identical components. But if he wants to change his routine, the machinery is not very useful. This is the case while automation is inflexible, flexible automation is on the way. Here, automated machinery has programmability and feedback and can turn out different kinds of components. The equipment will make a tremendous difference to factory floors throughout the world. Flexible automation adds up to a new industrial era.

Вправа 1. Дайте назву тексту.

Вправа 2. Закінчіть речення.

1. Automation is a third ... 2. It is based on ... 3. The truly automated machines must possess one of the ... 4. Flexible automation is automation where machines possess ... 5. Automation adds up

Вправа 3. Перекладіть речення на українську мову, звертаючи увагу на слова в присвійному відмінку.

1. Scientists obtained the data on the electrons and protons' structure. 2. Our country scientists' contribution to world science is tremendous. 3. University's laboratories are fitted out with the latest equipment. 4. The Moon's surface is studied by means of sputniks. 5. The University's main aim is the development of science. 6. It is one of the world's biggest power plants. 7. Scientists study the Earth's magnetic field, atmosphere and ionosphere. 8. It is possible now to observe the other side of the Moon hidden from man's view.

Вправа 4. Поставте замість крапок відповідні особові займенники.

1. This country is not rich in oil and ... exports it. 2. The teacher told the students to listen to ... attentively. 3. Where is Helen? – You can find ... in the lab. 4. I don't need these dictionaries, you can take ... with you. 5. My sister likes English and ... wants to be an English teacher. 6. He says he knows my brother and me; he saw ... yesterday with our parents. 7. Could you take these books with you and give ... to your brother? And you can read this book yourself – ... is also very interesting.

Вправа 5. Напишіть речення в питальній і заперечній формах, перекладіть їх на українську мову:

1. There are some interesting papers in this magazine. 2. He told us something interesting about his latest works. 3. Somebody left the books on the desk. 4. Somebody came and brought some English newspapers. 5. I met him somewhere. 6. Some students of our group will take part in this research. 7. Can you say anything about the construction of atomic power stations?

LESSON 19

Classification of Automatic Transfer Lines

An automatic transfer line (transfer machine) is a system of machine tools, work transference devices, and checking devices, which automatically carry out machining or assembling with predetermined interconnection and sequence, being operated by a central control system. Automatic transfer lines represent a higher stage of manufacturing process organization.

Automatic transfer lines (or simply transfer lines) fall into nine categories, depending on the mode of feeding blanks into the line and ejecting finished parts out of the line (piece-by-piece, a group of parts, a continuous flow of parts). Depending on the rate of production, transfer lines are classified as single-flow

(progressive action) lines and multiple-flow (parallel-progressive) lines. As to the type of machine tools employed, there are transfer lines with special machine tools designed and built for a given line, with unit-built machines, with semi- and fully-automatic general-purpose machines, and with modernized (automated) universal machines.

As to the type of intermachine transfer system, transfer lines are classified as:

a) the pass-through type in which the workpiece passes through the clamping zone (this type being used for machining housing-type parts on automatic unit-built machines);

b) the overhead type, where the workpiece is conveyed horizontally in a longitudinal direction and vertically in a transverse direction;

c) the side-loading (frontal) type with longitudinal and transverse conveying movements;

d) the combined-transfer type;

e) the rotary conveying type, used in rotary transfer lines.

With respect to the arrangement of equipment, transfer lines are divided into closed-loop and open-loop types. Closed-loop transfer lines may be circular and rectangular. Circular transfer lines, for example, rotary transfer machines, feature a small number of stations and a rotary indexing table. Most transfer lines have an open-loop arrangement, such as straight-line (in line), L-shaped, U-shaped, W-shaped, and zigzag.

The kind of workpiece and the sequence of operations in a manufacturing process are the key factors which determine the type of transfer line. As to the kind of workpieces machined the transfer lines are classified, as those for housing-type parts, for shafts, for disc-shaped parts (gear wheels, etc.), for antifriction bearing races, and for small parts (screws, pins, rollers, etc.).

Вправа 1. Перекладіть речення на українську мову, визначте ступені порівняння прикметників і прислівників:

1. Light moves faster than sound. 2. Baikal is one of the most unusual lakes in the world. 3. Kiev, the capital of our country, grows but does not grow older. On the contrary, each year it gets younger and more beautiful. 4. Venus is the nearest planet to the Earth, but until recently earthmen knew least of all about it.

Вправа 2. Поставте прикметники у відповідній формі та перекладіть речення на українську мову.

1. The (important) properties of aluminium are its high electrical and thermal conductivities and corrosion resistance. 2. The (common) conductors are metals, and silver and copper are (good) of them. 3. The advantage of copper is that it is (cheap) than silver. 4. The (low) the resistance of the material, the (much) current can pass through it. 5. Hydrogen is the (light) element. 6. Gas is (economical) fuel. 7. Automation reached the (high) stage in the development of technology. 8. Modern man comes (little) and (little) in contact with nature. 9. Chess is one of the (popular) sports. 10. January is (warm) month in Australia.

Вправа 3. Заповніть пропуски сполучниками *as ... as, not so ... as*:

1. Your research is ... important ... ours. 2. This problem is ... interesting ... that one. 3. Theoretical training is ... important ... practical work. 4. Aluminium is ... good conductor of electricity ... copper. 5. Your information is ... important ... his. 6. Today the weather is ... warm ... it was yesterday. 7. The weather is ... warm today ... it was expected. 8. Steam is ... powerful ... electricity.

Вправа 4. Перекладіть на українську мову речення.

1. The hotter the sun, the greater the output of cold in electric conditioners. 2. The quicker we run, the sooner we get tired. 3. The faster the motion of the magnet, the stronger is the flow of current. 4. The hotter the conductor, the greater the resistance. 5. The heavier the body, the greater its friction. 6. The longer the wire, the fewer electrons can pass through it in a given period of time. 7. The smaller the diameter of a wire, the greater the resistance.

Вправа 5. Підтвердіть або спростуйте висловлене твердження, використовуючи подані фрази.

That's right... / That's not right...

The rate of production and the control system are the key factors which determine the type of transfer line.

LESSON 20

What If Standards Did Not Exist?

If there were no standards, we would soon notice. Standards make an enormous contribution to most aspects of our lives – although very often that contribution is invisible. It is when there is an absence of standards that their importance is brought home. For example, as purchasers or users of products, we soon notice when they turn out to be of poor quality, do not fit, are incompatible with equipment we already have, are unreliable or dangerous. When products meet our expectations, we tend to take this for granted. We are usually unaware of the role played by standards in raising levels of quality, safety, reliability, efficiency and interchangeability – as well as in providing such benefits at an economical cost.

ISO (International Organization for Standardization) is the world's largest developer of standards. Although ISO's principal activity is the development of technical standards, ISO standards also have important economic and social repercussions. ISO standards make a positive difference, not just to engineers and manufacturers for whom they solve basic problems in production and distribution, but to society as a whole.

The International Standards which ISO develops are very useful. They are useful to industrial and business organizations of all types, to governments and other regulatory bodies, to trade officials, to conformity assessment professionals, to suppliers and customers of products and services in both public and private sectors, and, ultimately, to people in general in their roles as consumers and end users.

ISO standards contribute to making the development, manufacturing and supply of products and services more efficient, safer and cleaner. They make trade between countries easier and fairer. They provide governments with a technical base for health, safety and environmental legislation. They aid in transferring technology to developing countries. ISO standards also serve to safeguard consumers, and users in general, of products and services – as well as to make their lives simpler.

When things go well – for example, when systems, machinery and devices work well and safely – then often it is because they conform to standards. And the organization responsible for many thousands of the standards which benefit society worldwide is ISO.

Вправа 1. Знайдіть у тексті відповідь на питання-назву.

Вправа 2. Визначте значення слів.

standard, aspect, product, role, economical, engineer, international, professional, base, technology, system.

Вправа 3. Знайдіть у тексті речення, що виражають одну думку.

Вправа 4. Скоротіть текст за рахунок подробиць, що можуть бути опущені без шкоди для змісту.

Вправа 5. Які з поданих речень можуть бути використані в тексті.

1. Suppliers can base the development of their products and services on specifications that have wide acceptance in their sectors.

2. International standards can contribute to the quality of life in general.

3. Each participating member in ISO has one vote.

4. ISO standards are voluntary.

5. ISO standards are technical agreements which provide the framework for compatible technology worldwide.

Вправа 6. Доповніть речення інформацією з тексту:

a) International Organization for Standardization is

b) ISO Standards

Вправа 7. Перекладіть речення на українську мову.

a) Стандарти дуже важливі для всіх.

б) ISO – найбільший у світі розробник стандартів.

в) Ці стандарти корисні для промислових та торговельних підприємств усіх видів.

г) Вони полегшують роботу між державами

д) Стандарти приносять користь всьому світу.

LESSON 21

International Organization For Standardization

The International Organization for Standardization (ISO or Iso) is an international standard-setting body made up of representatives from national standards bodies. Founded in 1947 February 23, the organization produces world-wide industrial and commercial standards.

While the ISO defines itself as a non-governmental organization (NGO), its ability to set standards which often become law through treaties or national standards makes it more powerful than most NGOs, and in practice it acts as a consortium with strong links to governments. Participants include one standards body from each member country and major corporations.

ISO cooperates closely with the International Electrotechnical Commission (IEC), which is responsible for standardization of electrical equipment.

The organization is usually referred to simply as ISO (*pronounced eye-so*). It is a common misconception that ISO stands for International Standards Organization, or something similar. ISO is not an acronym; it comes from the Greek word *isos*, meaning equal. In English its name is International Organization for Standardization, while in French it is called Organisation Internationale de Normalisation; to use an acronym would result in different acronyms in English (IOS) and French (OIN), thus the founders of the organization chose ISO as the universal short form of its name. However it should be noted that ISO also identifies itself as the International Organization for Standardization in its own reports.

ISO standards are numbered, and have a format that contains «*ISO ISnnnnn:yyyy: Title*» where «*nnnnn*» is the standard number, «*yyyy*» is the year published, and «*Title*» describes the subject.

Aside from standards, ISO also creates Technical Reports for documents that cannot or should not become International Standards such as references, explanations, etc. The naming conventions for these are the same as for standards with the exception of having TR pretended in the place of IS in the standard's name. Examples:

- ISO IS17799:2000 Code of Practice for Information Security Management

- ISO TR15443-1/3 Information Technology – Security Techniques – A Framework for IT Security Assurance parts 1–3

Finally, ISO will on rare occasions issue a Technical Corrigendum. These are amendments to existing standards because of minor technical flaws, improvements to usability or to extend applicability in a limited way. Generally, these are issued with the expectation that the affected standard will be updated or withdrawn at its next scheduled review.

ISO documents are copyrighted and ISO charges for copies of most. ISO does not, however, charge for most draft copies of documents in electronic format. Although useful, care must be taken using these drafts as there is the possibility of substantial change before it becomes finalized as a standard.

During the 1990s, ISO gained a reputation for being slow, bureaucratic, congested, and insensitive to feedback from consumers and businesses. This was mainly due to the catastrophic failure of the enormous Open Systems Interconnect project, which was finally shut down in 1996. Since then, ISO has undertaken modest reforms to decrease the time required to promulgate new standards.

ISO International Standards are not in any way binding on either governments or industry merely by virtue of being International Standards. This is to allow for situations where certain types of standards may conflict with social, cultural or legislative expectations and requirements. This also reflects the fact that national and international experts responsible for creating these standards don't always agree and not all proposals become standards by unanimous vote. The individual nations and their Standards Bodies remain the final arbiter.

The fact that many of the ISO created standards are ubiquitous has led, on occasion, to common usage of «ISO» to describe the actual product that conforms to a standard. Some examples of this are:

- CD images end in the file extension «ISO» to signify that they are using the ISO 9660 standard filesystem (there are other file systems that can be used) – hence CD images are commonly referred to as «ISOs». Virtually all computers with CD-ROM drives can read CDs that use this standard. DVD-ROMs also use ISO 9660 filesystems.

- Photographic film sensitivity to light, its speed, is measured and determined by ISO standard, hence the film speed is often referred to as its «ISO number». There are equivalent standards giving us its ASA and DIN.

Вправа 1. Знайдіть у тексті відповіді на питання.

1. What is ISO?
2. Is it an acronym?
3. Where does this abbreviation come from?

Вправа 2. Знайдіть у тексті слова, однокореневі до поданих, визначте їх приналежність до частин мови, перекладіть їх.

- 1) represent; 2) amend; 3) govern; 4) except; 5) power; 6) improve;
- 7) explain; 8) use; 9) apply.

Вправа 3. Перекладіть словосполучення.

International standard-setting body, world-wide and commercial standards, each member country, common misconception, care must be taken.

LESSON 22

Intel CEO On The Need For International Standards

«Companies that embrace standards that have been globally adopted and reflect world-wide consensus are in the best position to succeed because they are able to create world-class products based on high-quality standards».

This is the view of Craig R. Barrett, chairman and chief executive officer of Intel, the world-leading semiconductor technology company. Barrett is the subject of an exclusive interview in the February issue of *ISO Focus* (www.iso.org/isofocus), the magazine of the International Organization for Standardization.

«These products have the benefit of being developed with broad participation, incorporating global perspectives and requirements», Barrett tells *ISO Focus*. «Standards that have been adopted globally free companies to compete in various markets around the world without **having to develop** multiple versions of a product».

Barrett appreciates that ISO standards are associated with worldwide consensus and quality. «Use of ISO standards in areas of management systems and supplier's declaration of conformity», he says, «have helped us to maintain our world-class manufacturing excellence Meeting these requirements will inspire high confidence among governments, regulatory bodies and consumers because the standard represents a world-class benchmark that can be applied globally across all businesses».

As a 'building-blocks' supplier, Intel uses ISO standards in its own products as well as to help set electronics industry-specific standards in, for example, the area of design for environment. Says Barrett, «Intel seeks to conform to international standards to promote product harmonization and to facilitate trade, which in turn makes it easier for our adopters and customers to market their products and compete in more markets around the world».

Both ISO 9001:2000 and ISO 14001:2004 management system standards, respectively for quality and environment, are fully integrated in Intel's corporate quality network and environmental, health and safety organizations world wide. «We have been able to use [ISO 9001] and its revisions as a means of driving continuous improvement in many areas», Barrett says in the interview. «In addition, we have leveraged the framework in our supplier selection, management and recognition processes, enabling us to keep pace with increasing expectations on supply chain performance».

Global standards also bring a great many benefits to consumers, Barrett emphasizes: «They lead to a higher number of product offerings for consumers, and introduce more competition and lower costs. Consumers are more willing to buy products when they are based on such standards because it is a safer choice».

«Intel remains a committed contributor to the development of ISO specifications», says the company's CEO. The world is getting smaller as people and countries become more interconnected, so the need for global standards has grown We look forward to ISO's continued leadership.

Вправа 1. Наведіть значення інтернаціональних слів.

standard, company, globally, consensus, position, product, perspective, version, electronics, industry, system, organization.

Вправа 2. Перекладіть словосполучення.

world-wide consensus, world-class products, high quality standards, chief executive officer, world-leading semiconductor Technology Company, health and safety organizations.

Вправа 3. Перекладіть групи слів:

- a) to succeed, success, successful, successfully;
- b) to create, creation, creative, created, creating, creator;
- c) to develop, development, developed, developing, developer, developmental;
- d) to compete, competition, competitive, competitor;
- e) to conduct, conductor, conducted, conduction.

Вправа 4. Знайдіть у тексті підтвердження поданим висловлюванням.

1. Standards are very important for the firms desiring to be competitive on the market.
2. Standards help to strengthen the international trade.
3. Consumers also need standards.

Вправа 5. Перекладіть речення на українську мову.

1. Our scientists are studying the biological resources of the ocean.
2. Electronics is helping us to study atom.
3. The extraction of oil and gas all over the world is increasing rapidly.
4. Atomic energy is enabling scientists to study cosmic rays.
5. Ukraine is developing a powerful industry.
6. The energy of the atom is serving our science and economics.
7. At present we are developing our chemical industry.
8. Last year they were working on that problem at our laboratory.
9. The speaker said that the international prestige of our science was growing from year to year.
10. Our scientists were carrying out scientific research in cooperation with foreign scientists.
11. Next term the students of our department will be studying electronics.
12. This station will be transmitting the electric current to these plants.

Вправа 6. Прочитайте речення, поясніть вживання часів і перекладіть речення на українську мову.

1. Scientists have developed new computers.
2. Over the past decades science has made all-round progress in our country.
3. The application of atomic power to the generation of electricity is becoming wider.
4. Science

has shown that the electron is a combination of mass and electrical charge. 5. Our engineers made an electric car of original construction. 6. Scientists have given the name of high-energy particles to the particles that form the nucleus of an atom. 7. They say they will have finished the construction of this power plant by the end of the year. 8. Three years ago he graduated from the Polytechnic Institute and began to work. 9. Women have made a great contribution to education and scientific progress. 10. We learnt that he had carried out a lot of experiments before he had published his results. 11. The students had finished studying kinematics by the end of the last term and now they are studying dynamics. 12. The workers got good results after the methods of their work had improved.

What «International Standardization» Means

When the large majority of products or services in a particular business or industry sector conform to International Standards, a state of industry-wide standardization can be said to exist. This is achieved through consensus agreements between national delegations representing all the economic stakeholders concerned – suppliers, users, government regulators and other interest groups, such as consumers. They agree on specifications and criteria to be applied consistently in the classification of materials, in the manufacture and supply of products, in testing and analysis, in terminology and in the provision of services. In this way, International Standards provide a reference framework, or a common technological language, between suppliers and their customers – which facilitates trade and the transfer of technology.

How ISO standards benefit society

For businesses, the widespread adoption of International Standards means that suppliers can base the development of their products and services on specifications that have wide acceptance in their sectors. This, in turn, means that businesses using International Standards are increasingly free to compete on many more markets around the world.

For customers, the worldwide compatibility of technology which is achieved when products and services are based on International Standards brings them an increasingly wide choice of offers, and they also benefit from the effects of competition among suppliers.

For governments, International Standards provide the technological and scientific bases underpinning health, safety and environmental legislation.

For trade officials negotiating the emergence of regional and global markets, International Standards create «a level playing field» for all competitors on those markets. The existence of divergent national or regional standards can create technical barriers to trade, even when there is political agreement to do away with restrictive import quotas and the like. International Standards are the technical means by which political trade agreements can be put into practice.

For developing countries, International Standards that represent an international consensus on the state of the art constitute an important source of technological know-how. By defining the characteristics that products and services will be expected to meet on export markets, International Standards give developing countries a basis for making the right decisions when investing their scarce resources and thus avoid squandering them.

For consumers, conformity of products and services to International Standards provides assurance about their quality, safety and reliability.

For everyone, International Standards can contribute to the quality of life in general by ensuring that the transport, machinery and tools we use are safe.

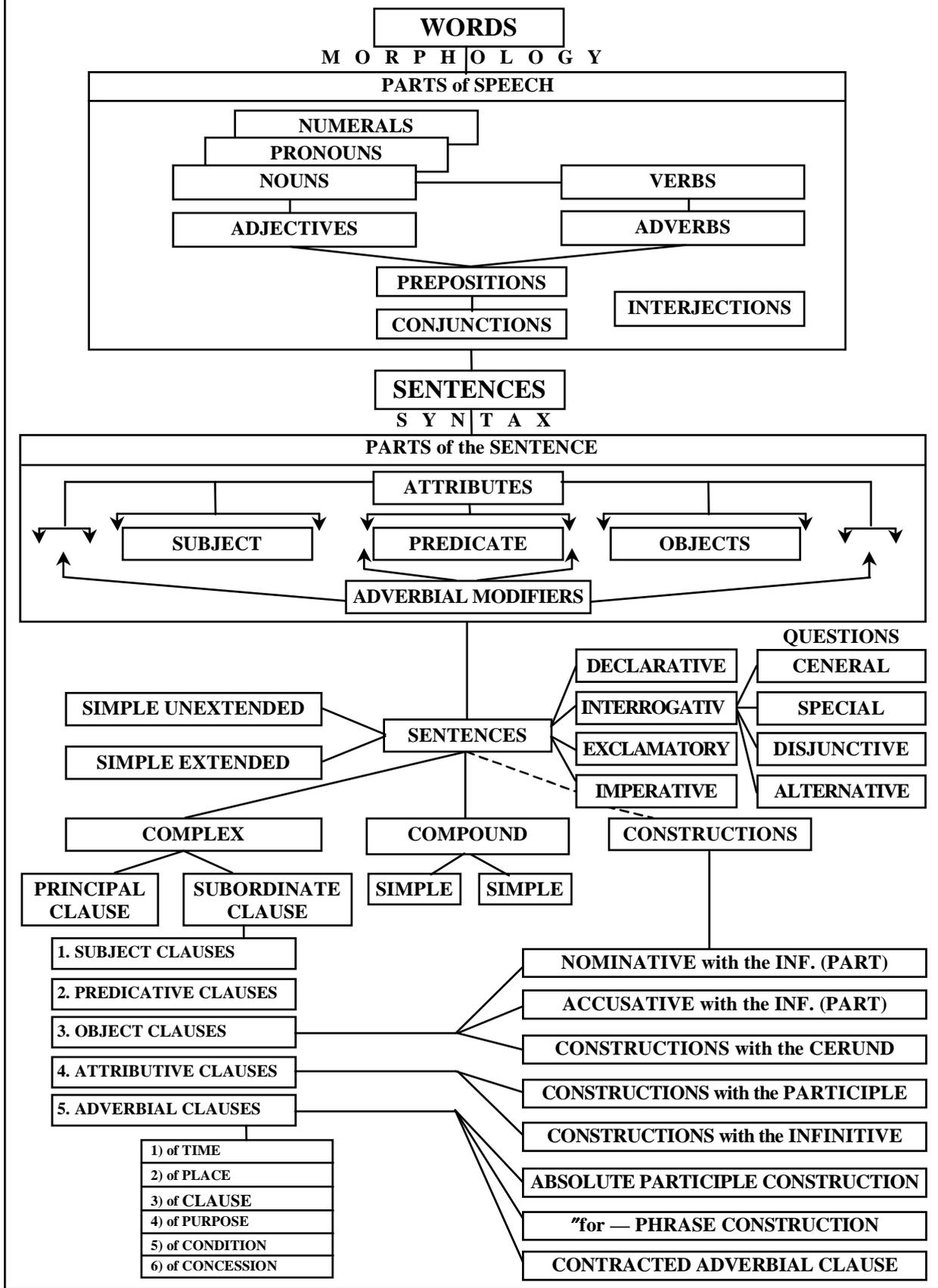
For the planet we inhabit, International Standards on air, water and soil quality, and on emissions of gases and radiation, can contribute to efforts to preserve the environment.

GRAMMAR REVISION TABLES

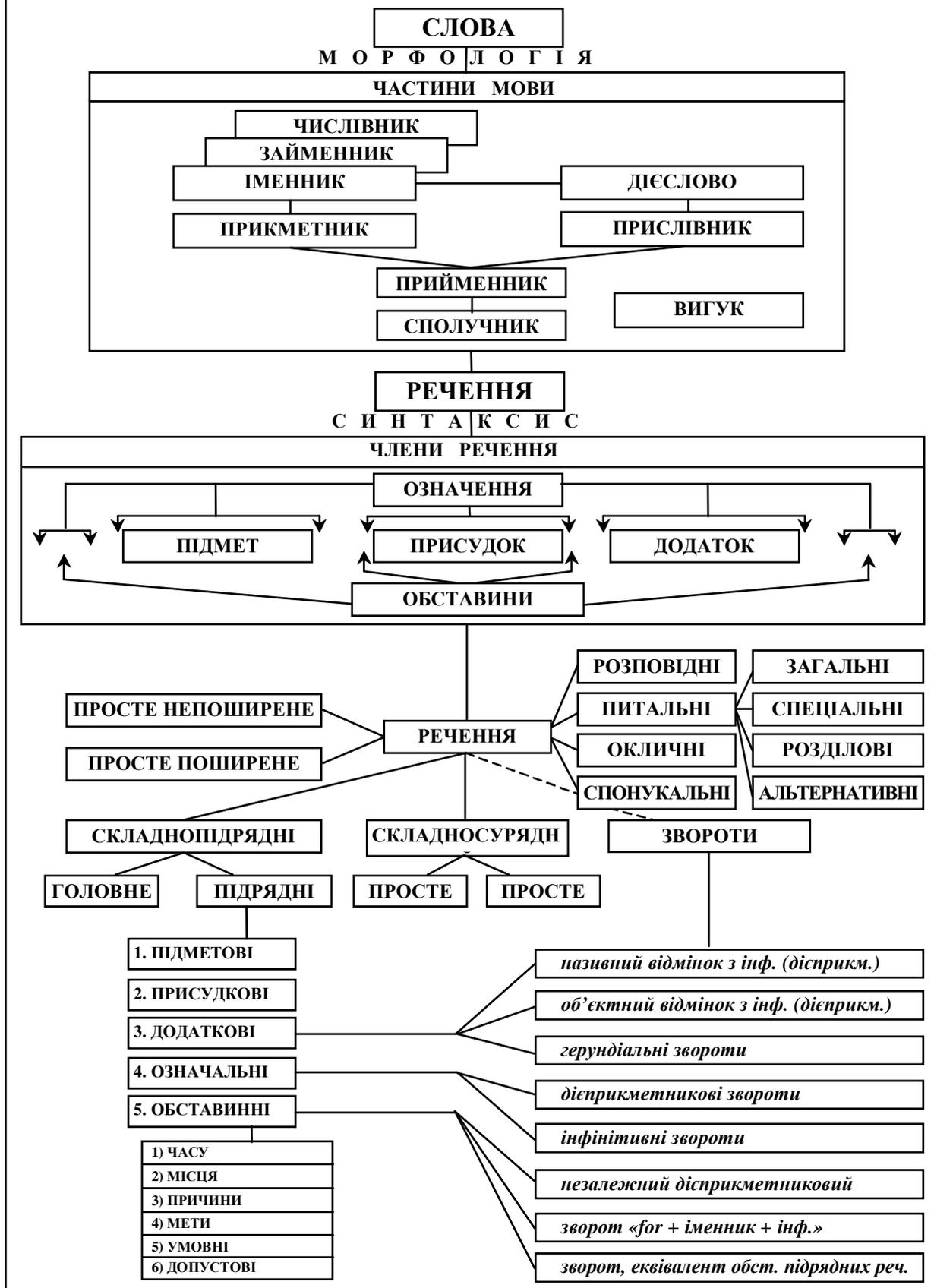
TERMINOLOGY OF ENGLISH GRAMMAR

Частини мови	Parts of Speech
Іменник	Noun
неозначений артикль	Indefinite Article
означений артикль	Definite Article
злічувані іменники	Count Nouns
незлічувані іменники	Noncount Nouns
абстрактні іменники	Abstract Nouns
число	Number
однина/множина	Singular/plural
загальний відмінок	Common Case
присвійний відмінок	Possessive Case
рід	Gender
Прикметник	Adjective
ступені порівняння	Degrees of Comparison
вищий ступінь порівняння	Comparative Degree
найвищий ступінь порівняння	Superlative Degree
Числівники	Numerals
кількісні числівники	Cardinal Numerals
порядкові числівники	Ordinal Numerals
Займенники	Pronouns
особові займенники	Personal Pronouns
присвійні займенники	Possessive Pronouns
зворотні займенники	Reflexive Pronouns
взаємні займенники	Reciprocal Pronouns
вказівні займенники	Demonstrative Pronouns
питальні займенники	Interrogative Pronouns
сполучні займенники	Conjunctive Pronouns
неозначені займенники	Indefinite Pronouns
заперечні займенники	Negative Pronoun
кількісні займенники	Quantitative Pronouns
Дієслово	Verb
правильні дієслова	Regular Verbs
неправильні дієслова	Irregular Verbs
особові форми дієслова	Finite Forms of the Verbs
неозначені часи	Indefinite Tenses
тривалі часи	Continuous Tenses
перфектні (доконані) часи	Perfect Tenses
перфектно-тривалі часи	Perfect Continuous Tenses

STRUCTURE of English Grammar



СТРУКТУРА граматики англійської мови



NOUNS: SINGULAR AND PLURAL

Singular	Plural	Uses
day bird street rose	days birds streets roses	The plural of a noun is usually made by adding -s to the singular
tomato match dish class box	tomatoes matches dishes classes boxes	Nouns ending in -o , -ch , -sh , -s , -ss or -x form their plural by adding -es . (NOTE: words of foreign origin or abbreviated words ending in -o add -s only: <i>dynamo</i> - <i>dynamos</i> ; <i>kilo</i> - <i>kilos</i> ; <i>photo</i> - <i>photos</i> ; <i>piano</i> - <i>pianos</i>);
baby city	babies cities	Nouns ending in -y following a consonant form their plural by dropping the -y and adding -ies .
loaf wife wolf calf half knife shelf life sheaf	loaves wives wolves calves halves knives shelves lives sheaves	Twelve nouns ending in -f or -fe drop the -f or -fe and add -ves : <i>loaf</i> , <i>wife</i> , <i>wolf</i> , <i>calf</i> , <i>half</i> , <i>leaf</i> , <i>self</i> , <i>knife</i> , <i>life</i> , <i>sheaf</i> , <i>shelf</i> , <i>thief</i> . (Exceptions: <i>beliefs</i> , <i>chiefs</i> , <i>roofs</i> , <i>cliffs</i> , <i>safes</i> , <i>cuffs</i> , <i>handkerchiefs</i>). The nouns <i>hoof</i> , <i>scarf</i> and <i>wharf</i> take either -s or -ves in the plural: <i>wharfs</i> or <i>wharves</i> , <i>hoofs</i> or <i>hooves</i> ; <i>scarfs</i> or <i>scarves</i> .
man woman foot goose tooth louse mouse child	men women feet geese teeth lice mice children	A few nouns form their plural by a vowel change.
sheep deer fish species swine	sheep deer fish species swine	Some nouns have the same form for singular and plural.
crisis criterion datum	crises criteria data	Some nouns that English has borrowed from other languages have foreign plurals.

NOUNS: COMMON AND POSSESSIVE CASE

a) Singular Noun the girl my wife my baby Tom Archimedes Pythagoras Thomas Carlos my brother-in-law	Possessive Form the <i>girl's</i> name my <i>wife's</i> coat my <i>baby's</i> toys <i>Tom's</i> friend <i>Archimedes'</i> Law <i>Pythagoras'</i> Theorem <i>Thomas's/Thomas'</i> <i>Carlos's/Carlos'</i> my <i>brother-in-law's</i> guitar	1. 's is used with singular nouns not ending in -s. 2. Classical names ending in -s usually add only the apostrophe. 3. Other names ending in -s take 's or the apostrophe alone. 4. With compounds, the last word takes the 's.
b) Plural Noun the girls the men my children	Possessive Form the <i>girls'</i> names the <i>men's</i> work my <i>children's</i> toys	1. A simple apostrophe (') is used with plural nouns ending in -s. 2. 's is used with plural nouns not ending in -s.

COUNT AND NONCOUNT NOUNS

1. I bought <i>a chair</i> . Tom bought <i>three chairs</i> . 2. We bought <i>some furniture</i> . <i>INCORRECT: We bought a furniture.</i> <i>INCORRECT: We bought some furnitures.</i>		<i>Chair</i> is a count noun; chairs are items that can be counted. <i>Furniture</i> is a noncount noun. In grammar, furniture cannot be counted.	
Singular	Plural		
COUNT NOUN	a chair one chair	chairs two chairs some chairs a lot of chairs many chairs	A count noun: a) may be preceded by a/an in the singular; b) takes a final -s/-es in the plural.
NONCOUNT NOUN	furniture some furniture a lot of furniture much furniture	—	A noncount noun: a) is not immediately preceded by a/an ; b) has no plural form; does not take a final -s/-es .

SOME COMMON NONCOUNT NOUNS

<p>1. Whole groups made up of similar items: <i>baggage, clothing, equipment, food, fruit, furniture, garbage, hardware, jewelry, junk, luggage, mail, machinery, make-up, money/cash/change, postage, scenery, traffic.</i></p>
<p>2. Fluids: <i>water, coffee, tea, milk, oil, soup, gasoline, blood, etc.</i></p> <p>3. Solids: <i>ice, bread, butter, cheese, meat, gold, iron, silver, glass, paper, wood, cotton, wool, etc.</i></p> <p>4. Gases: <i>steam, air, oxygen, nitrogen, smoke, smog, pollution, etc.</i></p> <p>5. Particles: <i>rice, chalk, corn, dirt, dust, flour, grass, hair, pepper, salt, sand, sugar, wheat, etc.</i></p>
<p>6. Abstractions:</p> <p>— <i>beauty, confidence, courage, education, enjoyment, fun, happiness, health, help, honesty, hospitality, importance, intelligence, justice, knowledge, laughter, luck, music, patience, peace, pride, progress, recreation, significance, sleep, truth, violence, wealth, etc.</i></p> <p>— <i>advice, information, news, evidence, proof;</i></p> <p>— <i>time, space, energy;</i></p> <p>— <i>homework, work;</i></p> <p>— <i>grammar, slang, vocabulary.</i></p> <p>7. Languages: <i>Arabic, Chinese, English, Spanish, etc.</i></p> <p>8. Fields of study: <i>economics, chemistry, engineering, history, literature, mathematics, psychology, etc.</i></p> <p>9. Recreation: <i>baseball, soccer, tennis, chess, bridge, poker, etc.</i></p> <p>10. General activities: <i>driving, studying, swimming, travelling, walking (and other gerunds).</i></p>
<p>11. Natural Phenomena: <i>weather, dew, fog, hail, heat, humidity, gravity, rain, lightning, sleet, snow, thunder, wind, darkness, light, sunshine, electricity, fire.</i></p>

USING NOUNS AS MODIFIERS

<p>1. The soup has vegetables in it. It is <i>vegetable soup</i>.</p> <p>2. The building has offices in it. It is an <i>office building</i>.</p>	<p>When a noun is used as a modifier, it is in its singular form.</p>
<p>3. The test lasted two hours. It was a <i>two-hour test</i>.</p> <p>4. Her son is five years old. She has a <i>five-year-old son</i>.</p>	<p>When a noun used as a modifier is combined with a number expression, the noun is singular and a hyphen (-) is used.</p>

THE INDEFINITE ARTICLE

Use of a/an	Examples
1. Before a singular countable noun, when it is mentioned for the first time and represents no particular person or thing:	<i>I can see a book on the table. They live in a flat. He bought an ice-cream.</i>
2. Before a singular countable noun which is used as an example of a class of things:	<i>A child needs love = All children need/Any child needs love.</i>
3. With a noun complement. This includes names of professions:	<i>My friend is a manager. She'll be a dancer.</i>
4. With certain numbers. Before half when half follows a whole number. But $\frac{1}{2}$ kg = half a kilo, though <i>a + half + noun</i> is sometimes possible. With $\frac{1}{3}$, $\frac{1}{4}$, etc a is usual:	<i>a dozen, a hundred, a million (but one dozen, one hundred, one million is also possible). $1\frac{1}{2}$ kilos = one and a half kilos or a kilo and a half; a half-holiday, a half-portion, a half-share; a third, a quarter etc., but one is also possible.</i>
5. In expressions of price, speed, ratio etc.:	<i>5p a kilo, sixty kilometres an hour, four times a day; (Here a/an = per)</i>
6. Before a singular countable noun after the word what in exclamatory sentences and after the words such, quite, rather :	<i>Such a long queue! Such long queues! What a pretty girl! What pretty girls! She is still quite a child. It is rather a difficult problem.</i>
7. With the nouns in the function of apposition. But when the apposition refers to a well-known person the is used:	<i>The report was made by Petrenko, a student of our University. Jack London, the great American novelist, was born in San Francisco.</i>
8. In a number of set expressions:	<i>a lot of, a great many, a great deal of, a good deal of, a great number of, a good many, a couple, a little, a few, at a speed of, at a time when, at a time, in time, on a large (small) scale, all of a sudden, by bus (train), to be in a hurry, to be in a position, to be at a loss, it's a pity, for a short (long) time, as a result of, as a matter of fact, to have a good time, to have a mind, in a loud (low) voice, to have a look, to have a headache, to take a sit, to have a cold, to go for a walk.</i>

THE DEFINITE ARTICLE

Use of «the»	Examples
1. Before a noun which has become definite as a result of being mentioned:	<i>I saw a new film on TV yesterday. The film wasn't very interesting.</i>
2. Before a noun made definite by the addition of a phrase or clause:	<i>the girl in blue; the boy that I met; the place where I met him.</i>
3. When the object or group of objects is unique:	<i>the earth, the sea, the sky, the moon, the sun, the world.</i>
4. Before a noun which by reason of locality can represent only one particular thing:	<i>Ann is in the garden. (the garden of this house). Please open the window.</i>
5. Before superlatives and <i>first, second</i> etc. used as adjectives or pronouns, and <i>only</i> :	<i>the first week; the best day; the only way.</i>
6. Before a noun that represents a class of animals or things: But <i>man</i> , used to represent the human race, has no article.	<i>The cow is a domestic animal. The pine is an evergreen tree. If oil supplies run out, <i>man</i> have to fall back on the horse.</i>
7. The + adjective represents a class of people:	<i>the old = old people in general. the rich = rich people in general.</i>
8. Before certain proper names of oceans, rivers, seas, gulfs, groups of islands, chains of mountains, plural names of countries, deserts, and before certain other names:	<i>The Atlantic, the Thames, the Alps, the Black Sea, the Crimea, the City, the United States of America, the Sahara, the Persian Gulf.</i>
9. Before the adjectives <i>east/west</i> etc. + noun in certain names:	<i>the East/West End, the East/West Indies, the North/South Pole.</i>
10. Before other proper names consisting of adjective + noun or noun + of + noun:	<i>The National Gallery, the Tower of London.</i>
11. Before names of newspapers, ships, orchestras, pop groups etc.	<i>the Times, the Great Britain, the Philadelphia Orchestra, the Beatles.</i>
12. the + plural surname can be used to mean «the ... family»:	<i>the Smiths = Mr and Mrs Smith (and children).</i>
13. the + a singular countable noun (type of machine, invention, musical instruments).	<i>The bicycle is an excellent means of transport. When was the telephone invented? The piano is my favourite instrument.</i>

NO ARTICLE

Uses	Examples
1. Before plural nouns:	<i>My friends are students.</i>
2. Before abstract nouns except when they are used in a particular sense:	<i>Men fear death.</i> but: <i>The death of the Prime Minister left his party without a leader.</i>
3. After a noun in the possessive case, or a possessive adjective:	<i>the boy's uncle</i> = the uncle of the boy <i>It is my (blue) book</i> = The (blue) book is mine.
4. Before names of meals:	<i>The Scots have porridge for breakfast</i> but: <i>The wedding breakfast was held in her father's house.</i>
5. Before names of games:	<i>He plays golf.</i>
6. Before parts of the body and articles of clothing, as these normally prefer a possessive adjective:	<i>Raise your right hand.</i> <i>He took off his coat.</i>
7. When <i>home</i> is used alone, i.e. is not preceded or followed by a descriptive word or phrase:	<i>He is at home. He went home.</i> <i>I arrived home after dark.</i> <i>I sent him home.</i>
8. Before the nouns: bed, church, court, hospital, prison, school/college/university , when these places are visited or used for their primary purpose. We can be/get back <i>from school/college/university</i> . We can <i>leave school, leave hospital</i> , be released <i>from prison</i> . <i>But</i> : When these places are visited or used for other reasons the is necessary:	We go: <i>to bed</i> to sleep; <i>to church</i> to pray; <i>to court</i> as litigants; <i>to hospital</i> as patients; <i>to prison</i> as prisoners; <i>to school/college/university</i> to study; similarly we can be: <i>in bed</i> , sleeping or resting; <i>at church</i> as worshippers; <i>in hospital</i> as patients; <i>at school</i> as students. <i>Sometimes he goes to the prison to give lectures.</i>
9. <i>work</i> = place of work.	<i>He is at work.</i> <i>He's on his way to work.</i>
10. We go <i>to sea</i> as sailors. To be <i>at sea</i> = to be on a voyage (as passengers or crew). But to go <i>to</i> or be <i>at the sea</i> = to go <i>to</i> or be <i>at the seaside</i> . We can also live <i>by/near the sea</i> .	

PERSONAL PRONOUNS

The Nominative Case	The Objective Case
I — я	me — мене, мені
he — він	him — його, йому
she — вона	her — її, їй
it — воно (він, вона)	it — його, йому, її, їй
we — ми	us — нас, нам
you — ви, ти	you — вас, вам, тебе, тобі
they — вони	them — їх, їм

POSSESSIVE PRONOUNS

Conjoint Form	Absolute Form
my — мій, моя, моє, мої	mine — мій, моя, моє, мої
his — його (<i>чоловічий рід</i>)	his — його (<i>чоловічий рід</i>)
her — її	hers — її
its — його (<i>середній рід</i>), її	—
our — наш, наша, наше, наші	ours — наш, наша, наше, наші
your — ваш, ваша, ваше, ваші твій, твоя, твоє, твої	yours — ваш, ваша, ваше, ваші твій, твоя, твоє, твої
their — їхній, їхня, їхнє, їхні	theirs — їхній, їхня, їхнє, їхні

REFLEXIVE PRONOUNS

Persons	Singular	Plural	
1 st pers.	myself	сам(а) себе	ourselves / самі себе
2 nd pers.	yourself		yourselves
3 rd pers.	himself, herself, itself		themselves
1. He looked at himself in the mirror.		A reflexive pronoun usually refers to the subject of a sentence. He and himself refer to the same person.	
2. He himself answered the phone, not his secretary.		Sometimes reflexive pronouns are used for emphasis.	
3. He answered the phone himself .			
4. She lives by herself .		The expression by + a reflexive pronoun usually means «alone».	

INDEFINITE PRONOUNS

Sentences		-thing	-body, -one	-where
Affirmative	some	something <i>що-небудь</i>	somebody someone <i>хтось</i> <i>хто-небудь</i>	somewhere anywhere <i>десь</i> <i>де-небудь</i>
	any	anything <i>усе,</i> <i>що завгодно</i>	anybody/anyone <i>усякий</i> <i>будь-який</i>	anywhere <i>де завгодно</i> <i>куди завгодно</i>
Interrogative	any	anything <i>що-небудь</i>	anybody anyone <i>хто-небудь</i> <i>будь-хто</i>	anywhere <i>де-небудь</i> <i>куди-небудь</i>
Negative	not ... any	not... anything <i>нічого</i>	not ... anybody not ... anyone <i>ніхто</i>	not ... anywhere <i>ніде, нікуди</i>
	no	nothing <i>нічого</i>	nobody/no one none <i>ніхто</i>	nowhere <i>ніде, нікуди</i>
Affirmative Interrogative Negative	every	everything <i>усе</i>	everybody everyone <i>усякий, кожний,</i> <i>усе</i>	everywhere <i>скрізь, усюди</i>

QUANTITATIVE PRONOUNS

few little <i>мало, мало хто,</i> <i>недостатньо</i>	Few birds can be seen in that place. (= <i>almost none</i>) I know little about painting. (= <i>almost nothing</i>)	Few and little have a negative meaning. They mean <i>not enough</i> .
a few <i>декілька</i> a little <i>трохи</i>	A few birds can be seen in that place. (= <i>some birds</i>) I know a little about painting. (= <i>something</i>)	A few, a little have a positive meaning. They mean <i>some though not much (many)</i>

DEMONSTRATIVE PRONOUNS

Singular		Plural	
this — цей, ця, це	that — той, та, те	these — ці	those — ті

DEGREES OF COMPARISON OF ADJECTIVES AND ADVERBS

Adjectives and Adverbs	Positive	Comparative	Superlative	Formation
One-syllable adjectives and adverbs	old wise hot easy fast early	older, elder wiser hotter easier faster earlier	oldest, eldest wisest hottest easiest fastest earliest	For most one-syllable adjectives and adverbs, -er and -est are added.
Two-syllable adjectives and adverbs	famous slowly	more famous more slowly	most famous most slowly	For most two-syllable adj. and adv., more and most are used.
	busy pretty	busier prettier	busiest prettiest	-Er/-est are used with two-syllable adjectives that end in -y . The -y is changed to -i .
	clever gentle friendly	cleverer more clever gentler more gentle friendlier more friendly	cleverest most clever gentlest most gentle friendliest most friendly	Some two-syllable adjectives use -er/-est or more/most : <i>able, pleasant, angry, handsome, simple, common, quiet, narrow, sour, polite, cruel.</i>
Adjectives and adverbs with three or more syllables	important productive carefully	more important more productive more carefully	most important most productive most carefully	More and most are used with long adjectives and adverbs.
Irregular Adjectives and Adverbs				
good/well bad/badly far much/many little	better worse farther/further more less		best worst farthest/furthest most least	

NUMERALS

Cardinal Numerals (how many?)		Ordinal Numerals (Which?)
1	one	first
2	two	second
3	three	third
4	four	fourth
5	five	fifth
6	six	sixth
7	seven	seventh
8	eight	eighth
9	nine	ninth
10	ten	tenth
11	eleven	eleventh
12	twelve	twelfth
13	thirteen	thirteenth
14	fourteen	fourteenth
15	fifteen	fifteenth
16	sixteen	sixteenth
17	seventeen	seventeenth
18	eighteen	eighteenth
19	nineteen	nineteenth
20	twenty	twentieth
21	twenty-one	twenty-first
22	twenty-two	twenty-second
23	twenty-three	twenty-third
24	twenty-four	twenty-fourth
25	twenty-five	twenty-fifth
26	twenty-six	twenty-sixth
27	twenty-seven	twenty-seventh
28	twenty-eight	twenty-eighth
29	twenty-nine	twenty-ninth
30	thirty	thirtieth
40	forty	fortieth
50	fifty	fiftieth
60	sixty	sixtieth
70	seventy	seventieth
80	eighty	eightieth
90	ninety	ninetieth
100	a hundred	hundredth
1,000	a thousand	thousandth
1,000,000	a million	millionth

140 400 1,006 5,000 260, 127	a/one hundred and forty four hundred a/one thousand and six five thousand two hundred and sixty thousand, one hundred and twenty-seven																														
Dates	March 10, 1998 — the tenth of March nineteen ninety-eight <i>or</i> March the tenth nineteen ninety-eight																														
Fractional Numerals	<p><i>Common Fractions:</i> $\frac{1}{2}$ — a half; $\frac{1}{4}$ — a quarter; $\frac{1}{5}$ — a/one fifth; $\frac{3}{5}$ — three fifths; $1\frac{1}{2}$ — one and a half; $3\frac{4}{5}$ — three and four fifths;</p> <p><i>Decimal Fractions:</i> 0.1 — nought point one; 10.92 — ten point nine two; 8.04 — eight point nought four;</p>																														
Percentage	a kind of decimal fraction, denominator of which is always 100: 2 % — 2 per cent — 2 p.c. — two per cent																														
Roman Numerals	<table> <tr> <td>1 — I</td> <td>16 — XVI</td> </tr> <tr> <td>2 — II</td> <td>17 — XVII</td> </tr> <tr> <td>3 — III</td> <td>18 — XVIII</td> </tr> <tr> <td>4 — IV</td> <td>19 — XIX</td> </tr> <tr> <td>5 — V</td> <td>20 — XX</td> </tr> <tr> <td>6 — VI</td> <td>21 — XXI</td> </tr> <tr> <td>7 — VII</td> <td>30 — XXX</td> </tr> <tr> <td>8 — VIII</td> <td>40 — XL</td> </tr> <tr> <td>9 — IX</td> <td>50 — L</td> </tr> <tr> <td>10 — X</td> <td>60 — LX</td> </tr> <tr> <td>11 — XI</td> <td>70 — LXX</td> </tr> <tr> <td>12 — XII</td> <td>80 — LXXX</td> </tr> <tr> <td>13 — XIII</td> <td>90 — XC</td> </tr> <tr> <td>14 — XIV</td> <td>100 — C</td> </tr> <tr> <td>15 — XV</td> <td>1000 — M</td> </tr> </table>	1 — I	16 — XVI	2 — II	17 — XVII	3 — III	18 — XVIII	4 — IV	19 — XIX	5 — V	20 — XX	6 — VI	21 — XXI	7 — VII	30 — XXX	8 — VIII	40 — XL	9 — IX	50 — L	10 — X	60 — LX	11 — XI	70 — LXX	12 — XII	80 — LXXX	13 — XIII	90 — XC	14 — XIV	100 — C	15 — XV	1000 — M
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14 — XIV	100 — C																														
15 — XV	1000 — M																														

NUMBERS IN MEASUREMENT

Weight Measure <i>Міри ваги</i>	1 dram	драхма	dr	1.77 g
	1 ounce	унція	oz (16 dr)	28.35 g
	1 pound	фунт	lb (16 oz)	453.59 g
	1 stone	стон	st (14 lb)	6,35 kg
	1 quarter	квартер	qr (28 lb)	12,7 kg
	1 hundredweight	хандредвейт	hwt (112 lb)	50,8 kg
1 ton	тонна	tn (20 hwt)	1016 kg	
Linear Measure <i>Лінійні міри</i>	1 inch	дюйм	in	2,54 cm
	1 foot	фут	ft (12 in)	30,48 cm
	1 yard	ярд	yd (3 ft)	91,44 cm
	1 mile	миля	ml (1760 yd)	1609.33 m
	1 International Nautical Mile	миля морська	INM (6076 ft)	1.852 km
Dry Measure <i>Міри сухих речовин</i>	1 gill	джил	gi	0,14 l
	1 pint	пінта	pt (4 gills)	0.57
	1 quart	кварта	qt (2pt)	1,14 l
	1 gallon	галон	gal (4qt)	4.55 l
	1 bushel	бушель	bu	36.35 l
	1 quarter	квартер	qr (8 bu)	290.94 l
Square Measure <i>Міри площини</i>	1 square inch	кв. дюйм	sq in	6.45 cm ²
	1 square foot	кв. фут	sq ft (144 sq in)	9.29 dm ²
	1 square yard	кв. ярд	sq yd (9 sq ft)	0.836 m ²
	1 acre	акр	ac (4.8 sq yd)	0.4 hectare
	1 square mile	кв. миля	sq ml (640 ac)	2.59 km ²
Cubic Measure <i>Міри об'єму</i>	1 cubic inch	куб. дюйм	cu in	16.39 cm ³
	1 cubic foot	куб. фут	cu ft (1728 cu in)	28,32 cm ³
	1 cubic yard	куб. ярд	cu yd (27 cu ft)	764.53 cm ³
	1 register ton	тонна реєстрова	reg t (100 cu ft)	2.83 m ³
Time Measure <i>Міри часу</i>	1 minute	хвилина	60 seconds	
	1 hour	година	60 minutes	
	1 day	день	24 hours	
	1 week	тиждень	7 days	
Angles Measure <i>Міри кута</i>	1 minute	хвилина	60 seconds (60'')	
	1 degree (1)	градус	60 minutes (60')	
	1 right angle	прямий кут	90 degrees (90°)	
	1 circle	розгорнений кут	360 degrees (360°) 4 right angles	

ОСОБОВІ ФОРМИ ДІЄСЛОВА
FINITE FORMS OF THE VERB

Дійсний спосіб The Indicative Mood					
Активний стан Active Voice <i>to ask</i>					
Пасивний стан Passive Voice <i>to be asked</i>					
Неозначені часи Indefinite Tenses <i>to ask</i>			Доконані часи Perfect Tenses <i>to have asked</i>		
<i>to be asked</i>			<i>to have been asked</i>		
Present	Past	Future	Present	Past	Future
<i>ask</i>		<i>shall</i>	<i>have</i>		<i>shall</i>
	<i>asked</i>	<i>ask</i>	<i>asked</i>	<i>had asked</i>	<i>have</i>
<i>asks</i>		<i>will</i>	<i>has</i>		<i>will asked</i>
<i>am</i>	<i>was</i>	<i>shall</i>	<i>have</i>	<i>had been</i>	<i>shall have</i>
<i>is asked</i>	<i>asked</i>	<i>be</i>	<i>been</i>	<i>asked</i>	<i>been</i>
<i>are</i>	<i>were</i>	<i>will asked</i>	<i>has asked</i>		<i>will asked</i>
Тривалі часи Continuous Tenses <i>to be asking</i>			Перфектно-тривалі часи Perfect Continuous Tenses <i>to have been asking</i>		
<i>to be being asked</i>			—		
Present	Past	Future	Present	Past	Future
<i>am</i>	<i>was</i>	<i>shall be</i>	<i>have</i>	<i>had been</i>	<i>shall have</i>
<i>is asking</i>	<i>asking</i>	<i>asking</i>	<i>been</i>	<i>asking</i>	<i>been</i>
<i>are</i>	<i>were</i>	<i>will</i>	<i>has asking</i>		<i>will asking</i>
<i>am</i>	<i>was</i>				
<i>is being</i>	<i>being</i>	—	—	—	—
<i>are asked</i>	<i>asked</i>				
	<i>were</i>				

INDEFINITE TENSES

(to work, to write)

Present Indefinite			
<i>work (s), write (s)</i>			
Affirmative	Interrogative	Negative	Interrogative-Negative
<i>I work, write</i>	<i>Do I work, write?</i>	<i>I do not work, write</i>	<i>Do I not work, write?</i>
<i>He/she works, writes</i>	<i>Does he/she work, write?</i>	<i>He/she does not work, write</i>	<i>Does he/she not work, write?</i>
<i>We/you/they work, write</i>	<i>Do we/you/they work, write?</i>	<i>We/you/they do not work, write</i>	<i>Do we/you/they not work, write?</i>
Past Indefinite			
<i>worked, wrote</i>			
Affirmative	Interrogative	Negative	Interrogative-Negative
<i>I worked, wrote</i>	<i>Did I work, write?</i>	<i>I did not work, write</i>	<i>Did I not work, write?</i>
<i>He/she worked, wrote</i>	<i>Did he/she work, write?</i>	<i>He/she did not work, write</i>	<i>Did he/she not work, write?</i>
<i>We/you/they worked, wrote</i>	<i>Did we/you/they work, write?</i>	<i>We/you/they/ did not work, write</i>	<i>Did we/you/they not work, write?</i>
Future Indefinite			
<i>shall/will + work, write</i>			
Affirmative	Interrogative	Negative	Interrogative-Negative
<i>I/we shall work, write</i>	<i>Shall I/we work, write?</i>	<i>I/we shall not work, write</i>	<i>Shall I/we not work, write?</i>
<i>He/she/you/they will work, write</i>	<i>Will he/she/you/they work, write?</i>	<i>He/she/you/they will not work, write</i>	<i>Will he/she/you/they not work, write?</i>

CONTINUOUS TENSES

(to work, to write)

Present Continuous			
<i>am, is, are + working, writing</i>			
Affirmative	Interrogative	Negative	Interrogative-Negative
<p><i>I am working, writing</i> <i>He/she is working, writing</i> <i>We/you/they are working, writing</i></p>	<p><i>Am I working, writing?</i> <i>Is he/she working, writing?</i> <i>Are we/you/they working, writing?</i></p>	<p><i>I am not working, writing</i> <i>He/she is not working, writing</i> <i>We/you/they are not working, writing</i></p>	<p><i>Am I not working, writing?</i> <i>Is he/she not working, writing?</i> <i>Are we/you/they not working, writing?</i></p>
Past Continuous			
<i>was, were + working, writing</i>			
Affirmative	Interrogative	Negative	Interrogative-Negative
<p><i>I/he/she was working, writing</i> <i>We/you/they were working, writing</i></p>	<p><i>Was I/he/she working, writing?</i> <i>Were we/you/they working, writing?</i></p>	<p><i>I/he/she was not working, writing</i> <i>We/you/they/ were not working, writing</i></p>	<p><i>Was I/he/she not working, writing?</i> <i>Were we/you/they not working, writing?</i></p>
Future Continuous			
<i>shall/will + be working, writing</i>			
Affirmative	Interrogative	Negative	Interrogative-Negative
<p><i>I/we shall be working, writing</i> <i>He/she/you/they will be working, writing</i></p>	<p><i>Shall I/we be working, writing?</i> <i>Will he/she/you/they be working, writing?</i></p>	<p><i>I/we shall not be working, writing</i> <i>He/she/you/they will not be working, writing</i></p>	<p><i>Shall I/we not be working, writing?</i> <i>Will he/she/you/they not be working, writing?</i></p>

PERFECT TENSES

(to work, to write)

Present Perfect			
<i>have, has + worked, written</i>			
Affirmative	Interrogative	Negative	Interrogative-Negative
I/we/you/they <i>have worked, written</i>	<i>Have I/we/ you/they worked, written?</i>	I/we/you/they <i>have not worked, written</i>	<i>Have I/we/ you/they not worked, written?</i>
He/she <i>has worked, written</i>	<i>Has he/she worked, written?</i>	He/she <i>has not worked, written</i>	<i>Has he/she not worked, written?</i>

Past Perfect			
<i>had+ worked, written</i>			
Affirmative	Interrogative	Negative	Interrogative-Negative
I/he/she/we/ you/they <i>had worked, written</i>	<i>Had I/he/she/ we/you/they worked, written?</i>	I/he/she/we/ you/they <i>had not worked, written</i>	<i>Had I/he/she/ we/you/they not worked, written?</i>

Future Perfect			
<i>shall/will have + worked, written</i>			
Affirmative	Interrogative	Negative	Interrogative-Negative
I/ We <i>shall have worked, written</i>	<i>Shall I/we have worked, written?</i>	I/ We <i>shall not have worked, written</i>	<i>Shall I/we not have worked, written?</i>
He/she/you/ they <i>will have worked, written</i>	<i>Will he/she/ you/they have worked, written?</i>	He/she/you/ they <i>will not have worked, written</i>	<i>Will he/she/ you/they not have worked, written</i>

PERFECT CONTINUOUS TENSES

(to work, to write)

Present Perfect Continuous			
<i>have, has + been + working, writing</i>			
Affirmative	Interrogative	Negative	Interrogative-Negative
I/we/you/they <i>have been working, writing</i>	<i>Have I/we/you/they been working, writing?</i>	I/we/you/they <i>have not been working, writing</i>	<i>Have I/we/you/ they not been working, writing?</i>
He/she <i>has been working, writing</i>	<i>Has he/she been working, writing?</i>	He/she <i>has not been working, writing?</i>	<i>Has he/she not been working, writing?</i>
Past Perfect Continuous			
<i>had + been + working, writing</i>			
Affirmative	Interrogative	Negative	Interrogative-Negative
I/he/she/we/ you/they <i>had been working, writing</i>	<i>Had I/he/she/we/you/they been working, writing?</i>	I/he/she/we/ you/they <i>had not been working, writing</i>	<i>Had I/he/she/we/you/they not been working, writing?</i>
Future Perfect Continuous			
<i>shall/will + have been working, writing</i>			
Affirmative	Interrogative	Negative	Interrogative-Negative
I/we <i>shall have been working, writing</i>	<i>Shall I/we have been working, writing?</i>	I/we <i>shall not have been working, writing</i>	<i>Shall I/we not have been working, writing?</i>
He/she/you/ they <i>will have been working, writing</i>	<i>Will he/she/you/they have been working, writing?</i>	He/she/you/ they <i>will not have been working, writing</i>	<i>Will he/she/you/they not have been working, writing?</i>

THE FUNCTIONS OF THE VERB «TO BE»

Functions	Examples
1. The Notional Verb	He <i>is</i> at home now. The students <i>are</i> in the classroom.
2. An Auxiliary Verb	He <i>is</i> writing a letter. I <i>was</i> asked a difficult question.
3. A Link Verb	Jhon <i>is</i> a student. He <i>is</i> intelligent. He <i>is</i> the best student in our group.
4. A Modal Verb	We <i>are to meet</i> at noon. They <i>are to begin</i> this work at once.

THE FUNCTIONS OF THE VERB «TO HAVE»

Functions	Examples
1. The Notional Verb	She <i>has</i> a large family. We <i>have got</i> a comfortable flat.
2. An Auxiliary Verb	He <i>has graduated</i> from the University. I <i>have been waiting</i> for you for half an hour.
3. A Modal Verb	I <i>have to get up</i> early on Mondays. They <i>had to go</i> there. He will have to do it.

THE FUNCTIONS OF THE VERB «TO DO»

Functions	Examples
1. The Notional Verb	The exercise was <i>done</i> well. You didn't <i>do</i> anything to help her.
2. An Auxiliary Verb a) The Present and Past Indefinite (interrogative and negative forms) b) The Imperative Mood (negative form) c) to express emphasis	He <i>doesn't work</i> here. <i>Did</i> you see him yesterday? — Yes, I <i>did</i> . <i>Don't</i> be late for the lessons. But I <i>do know</i> him.

GENERAL QUESTIONS

Predicate or auxiliary verb	Subject	Part of the Predicate	Object	Adverbial Modifiers	Short Answers	
					Affirmative	Negative
Is	he			at home?	Yes, he is.	No, he isn't.
Do	you	take	books	here?	Yes, I do.	No, I don't.
Does	she	live		in Kyiv?	Yes, she does	No, she
Did	it	rain		last night?	Yes, it did.	doesn't.
Will	he	be living?		there?	Yes, he will.	No, it didn't.
Are	you	studying?	French?	in class?	Yes, I am.	No, he won't.
Was	Ann				Yes, she was.	No, I'm not.
Can	you	swim?			Yes, I can.	No, she wasn't. No, I can't.

TAG QUESTIONS

Jack can come, can't he ? Fred can't come, can he ?	<i>A tag question is a question added at the end of a sentence. Speakers use tag questions chiefly to make sure their information is correct or to seek agreement.</i>
AFFIRMATIVE SENTENCE + NEGATIVE TAG = AFFIRMATIVE ANSWER EXPECTED	
Mary is here, isn't she ?	Yes, she is.
You like tea, don't you ?	Yes, I do.
They have left , haven't they ?	Yes, they have.
NEGATIVE SENTENCE + AFFIRMATIVE TAG = NEGATIVE ANSWER EXPECTED	
Mary isn't here, is she ?	No, she isn't.
You don't like tea, do you ?	No, I don't.
They haven't left , have they ?	No, they haven't.
This/That is your book, isn't it ? These/Those are yours, aren't they ?	The tag pronoun for this/that = it The tag pronoun for these/those = they
There is a meeting tonight, isn't there ?	In sentences with there + be , there is used in the tag.
Everything is okay, isn't it ? Everyone took the test, didn't they ?	Personal pronouns are used to refer to indefinite pronouns. They is usually used in a tag to refer to everyone, someone, everybody, somebody, no one, nobody .
Nothing is wrong, is it ? Nobody called on the phone, did they ? You've never been there, have you ?	Sentences with negative words take affirmative tags.
I am supposed to be here, am I not ? I am supposed to be here, aren't I ?	am I not? is formal English. aren't I? is common in spoken English.

QUESTION WORDS

WHEN

When did they arrive? When will you come?	Yesterday. Next Monday.	When is used to ask questions about <i>time</i> .
--	----------------------------	--

WHERE

Where is she? Where can I find a pen?	At home. In that drawer.	Where is used to ask questions about <i>place</i> .
--	-----------------------------	--

WHY

Why did he leave early? Why aren't you coming with us?	Because he's ill. I'm tired.	Why is used to ask questions about <i>reason</i> .
---	---------------------------------	---

HOW

How did you come to school? How does he drive?	By bus. Carefully.	How generally asks about <i>manner</i> .
How much money does it cost? How many people came?	Ten dollars. Fifteen.	How is used with <i>much</i> and <i>many</i> .
How old are you? How cold is it? How soon can you get there? How fast were you driving? How long has he been here? How often do you write home? How far is it to Paris from here?	Eighteen. Ten below zero. In ten minutes. 50 miles an hour. Two years. Every week. 500 miles.	How is also used with <i>adjectives</i> and <i>adverbs</i> . How long asks about <i>length of time</i> . How often asks about <i>frequency</i> . How far asks about <i>distance</i> .

MORE QUESTIONS WITH *HOW*

QUESTION	ANSWER	
a) <i>How do you spell</i> «coming»? C-O-M-I-N-G. b) <i>How do you say</i> «yes» in Japanese? Hai. c) <i>How do you say/pronounce</i> this word?		To answer a): Spell the word. To answer b): Say the word. To answer c): Pronounce the word.
d) <i>How are getting along?</i> e) <i>How are you doing?</i> f) <i>How's it going?</i>	Great. Fine. Okay. So-so.	In d), e), and f): How is your life? Is your life okay? Do you have any problems? NOTE: f) is often used in greetings: <i>Hi, Bob. How's it going?</i>
g) <i>How do you feel?</i> <i>How are you feeling?</i>	Terrific! Wonderful! Great! Fine. Okay. So-so. A bit under the weather. Not so good. Terrible! Awful!	The questions in g) ask about health or about general emotional state.
h) <i>How do you do?</i>	How do you do?	How do you do? is used by both speakers when they are introduced to each other in a somewhat formal situation.

WHO

Who can answer that question?	I can.	Who is used as the subject of a question.
Who came to visit you?	Jane and Tom.	It refers to people.
Who is coming to dinner tonight?	Ann and Tom.	Who is usually followed by a singular verb even if the speaker is asking about more than one person.
Who wants to come with me?	We do.	

WHOSE

Whose book did you borrow?	David's.	Whose ask questions about <i>possession</i> .
Whose key is this? (Whose is this?)	It's mine.	

WHAT

<p>What made you angry? What went wrong?</p>	<p>His rudeness. Everything.</p>	<p>What is used as the subject of a question. It refers to «things».</p>
<p>What do you need? What did Alice buy? What did he talk about? About what did he talk? <i>(formal)</i></p>	<p>I need a pencil. A book. His vacation.</p>	<p>What is also used as an object.</p>
<p>What kind of soup is that? What kind of shoes did he buy?</p>	<p>It's bean soup. Sandals.</p>	<p>What kind of asks about particular variety or type of something.</p>
<p>What did you do last night? What is Mary <i>doing</i>?</p>	<p>I studied. She is reading a book.</p>	<p>What + <i>a form of do</i> is used to ask questions about activities.</p>
<p>What countries did you visit? What time did she come? What colour is his hair?</p>	<p>Italy and Spain. Seven o'clock. Dark brown.</p>	<p>What may accompany a noun.</p>
<p>What is Tom <i>like</i>? What is the weather <i>like</i>?</p>	<p>He's kind and friendly. Hot and humid.</p>	<p>What + be like asks for a general description of qualities.</p>
<p>What does Tom <i>look like</i>? What does her house <i>look like</i>?</p>	<p>He is tall and has dark hair. It's a large, red brick house.</p>	<p>What + look like asks for a physical description.</p>

WHICH

<p>I have two pens. Which pen do you want? Which one do you want? Which do you want? Which book should I buy?</p>	<p>The blue one. That one.</p>	<p>Which is used instead of what when a question concerns choosing from a definite, known quantity or group.</p>
<p>Which countries did he visit? What countries did he visit? Which class are you in? What class are you in?</p>	<p>Paris and Canada. This class.</p>	<p>In some cases, there is little difference in meaning between which and what when they accompany a noun.</p>

**SUMMARY CHART OF VERB TENSES
ACTIVE VOICE**

	Indefinite	Continuous	Perfect	Perfect Continuous
Present	I <i>write</i> letters every week.	I <i>am writing</i> a letter now.	I <i>have written</i> a letter today.	I <i>have been writing</i> for an hour.
Past	I <i>wrote</i> this letter yesterday.	I <i>was writing</i> a letter at 5 o'clock.	I <i>had written</i> all my letters by 9 o'clock.	I <i>had been writing</i> for an hour when you came.
Future	I <i>shall write</i> this letter tomorrow.	I <i>shall be writing</i> a letter at 5 o'clock tomorrow.	I <i>shall have written</i> all my letters by 9 o'clock tomorrow.	If you come at 7 I <i>shall have been writing</i> for an hour by that time.

PASSIVE VOICE

	Indefinite	Continuous	Perfect	Perfect Continuous
Present	These letters <i>are written</i> (by me) every week.	A letter <i>is being written</i> (by me) now.	The letter <i>has been written</i> (by me) today.	—
Past	This letter <i>was written</i> yesterday.	This letter <i>was being written</i> at 5 o'clock.	By 9 o'clock all my letters <i>had been written</i> .	—
Future	This letter <i>will be written</i> tomorrow.	—	All my letters <i>will have been written</i> by 7 o'clock tomorrow.	—

**PASSIVE VOICE
PRESENT**

1. Викладач <i>пояснює</i> новий матеріал.	на кожному уроці	1. The teacher explains new material at every lesson.
2. Новий матеріал <i>пояснюється</i> викладачем.	на кожному уроці	2. New material is explained by the teacher at every lesson.
3. Викладач <i>пояснює</i> новий матеріал.	зараз	3. The teacher is explaining new material now.
4. Новий матеріал <i>пояснюється</i> викладачем.	зараз	4. New material is being explained by the teacher now.
5. Викладач <i>пояснив</i> новий матеріал.	на цьому тижні	5. The teacher has explained new material this week.
6. Новий матеріал <i>був пояснений</i> викладачем.	на цьому тижні	6. New material has been explained by the teacher this week.
7. Викладач <i>пояснює</i> новий матеріал.	уже 10 хв. з 9 год. ранку	7. The teacher has been explaining new material for 10 minutes since 9 o'clock in the morning.
8. Новий матеріал <i>пояснюється</i> викладачем.	уже 10 хв. з 9 год. ранку	8. New material has been explained by the teacher for 10 minutes since 9 o'clock in the morning.

PAST

1. Викладач <i>пояснив</i> новий матеріал.	учора	1. The teacher explained new material yesterday.
2. Новий матеріал <i>був пояснений</i> викладачем.	учора	2. New material was explained by the teacher yesterday.
3. Викладач <i>пояснював</i> новий матеріал.	учора о 10 годині	3. The teacher was explaining new material yesterday at 10 o'clock.
4. Новий матеріал <i>пояснювався</i> викладачем.	учора о 10 годині	4. New material was being explained by the teacher yesterday at 10 o'clock.

FUTURE

1. Викладач <i>пояснить</i> новий матеріал.	завтра	1. The teacher will explain new material tomorrow.
2. Новий матеріал <i>буде пояснений</i> викладачем.	завтра	2. New material will be explained by the teacher tomorrow.
3. Викладач <i>пояснить</i> новий матеріал.	завтра до кінця першого уроку	3. The teacher will have explained new material tomorrow by the end of the first lesson.
4. Новий матеріал <i>буде пояснений</i> викладачем.	завтра до кінця першого уроку	4. New material will have been explained by the teacher tomorrow by the end of the first lesson.

MODAL VERBS CAN; COULD; TO BE ABLE TO

Uses	Present/Future	Past
1) ability; capability	I <i>can run</i> fast. I <i>can help</i> you. I <i>am able to help</i> you. I <i>will be able to help</i> you.	I <i>could run</i> fast when I was a child, but now I can't. I <i>was able to help</i> you.
2) informal permission	You <i>can use</i> my car tomorrow.	
3) polite request	<i>Can I borrow</i> your pen? <i>Could I borrow</i> your pen? <i>Could you help</i> me?	
4) impossibility (negative only)	That <i>can't be</i> true! That <i>couldn't be</i> true!	That <i>can't have been</i> true! That <i>couldn't have been</i> true!
5) suggestion	— I need help in math. You <i>could talk</i> to your teacher.	You <i>could have talked</i> to your teacher.
6) less than 50% certainty	— Where is John? He <i>could be</i> at home.	He <i>could have been</i> at home.
7) doubt; astonishment (interrogative)	<i>Can she know</i> Japanese?	<i>Can he have done</i> it?

MAY; MIGHT

Uses	Present/Future	Past
1) polite request	<i>May I borrow</i> your pen? <i>Might I borrow</i> your pen?	—
2) formal permission	You <i>may leave</i> the room.	—
3) less than 50% certainty	— Where is John? He <i>may be</i> at the library. He <i>might be</i> at the library.	He <i>may have been</i> at the library. He <i>might have been</i> at the library.

MUST; BE TO; HAVE TO; HAVE GOT TO

Uses	Present/Future	Past
1) duty; obligation; strong necessity	I <i>must go</i> to class today. I <i>have to go</i> to class today. I <i>have got to go</i> to class today.	I <i>had to go</i> to class yesterday.
2) lack of necessity (<i>negative</i>)	I <i>don't have to go</i> to class today.	I <i>didn't have to go</i> to class yesterday.
3) prohibition (<i>negative</i>)	You <i>must not open</i> that door.	—
4) 90 % certainty	Mary isn't in class. She <i>must be</i> sick. (present only)	Mary <i>must have been</i> sick yesterday.
5) plan; agreement	We <i>are to meet</i> at nine.	We <i>were to meet</i> at nine.
6) order; instruction	You <i>must go</i> there at once. You <i>are to go</i> there at once.	—
7) destiny (<i>past only</i>)	—	He <i>was never to see</i> his wife again.

SHOULD; OUGHT TO

Uses	Present/Future	Past
1) advisability; desirability	I <i>should study</i> tonight. I <i>ought to study</i> tonight.	I <i>should have studied</i> last night. I <i>ought to have studied</i> last night.
2) 90 % certainty	She <i>should do well</i> on the test. She <i>ought to do</i> well on the test. (<i>future only</i>)	She <i>should have done</i> well on the test. She <i>ought to have done</i> well on the test.

SHALL

Uses	Present/Future	Past
1) polite question to make a suggestion	<i>Shall I open</i> the window?	—
2) future with «I» or «we» as subject	I <i>shall arrive</i> at nine. (<i>will</i> = more common)	—

WILL; WOULD

Uses	Present/Future	Past
1) 100 % certainty	He <i>will be</i> here at nine.	He said he <i>would be</i> here at nine.
2) polite request	<i>Will</i> you please <i>pass</i> the salt? <i>Would</i> you please <i>pass</i> the salt? <i>Would</i> you <i>mind</i> if I left early?	—
3) willingness	— The phone's ringing. I'll <i>get</i> it.	—
4) preference	I <i>would rather go</i> to the park than <i>stay</i> home.	I <i>would rather have gone</i> to the park.

INDEFINITE PRONOUN «ONE»

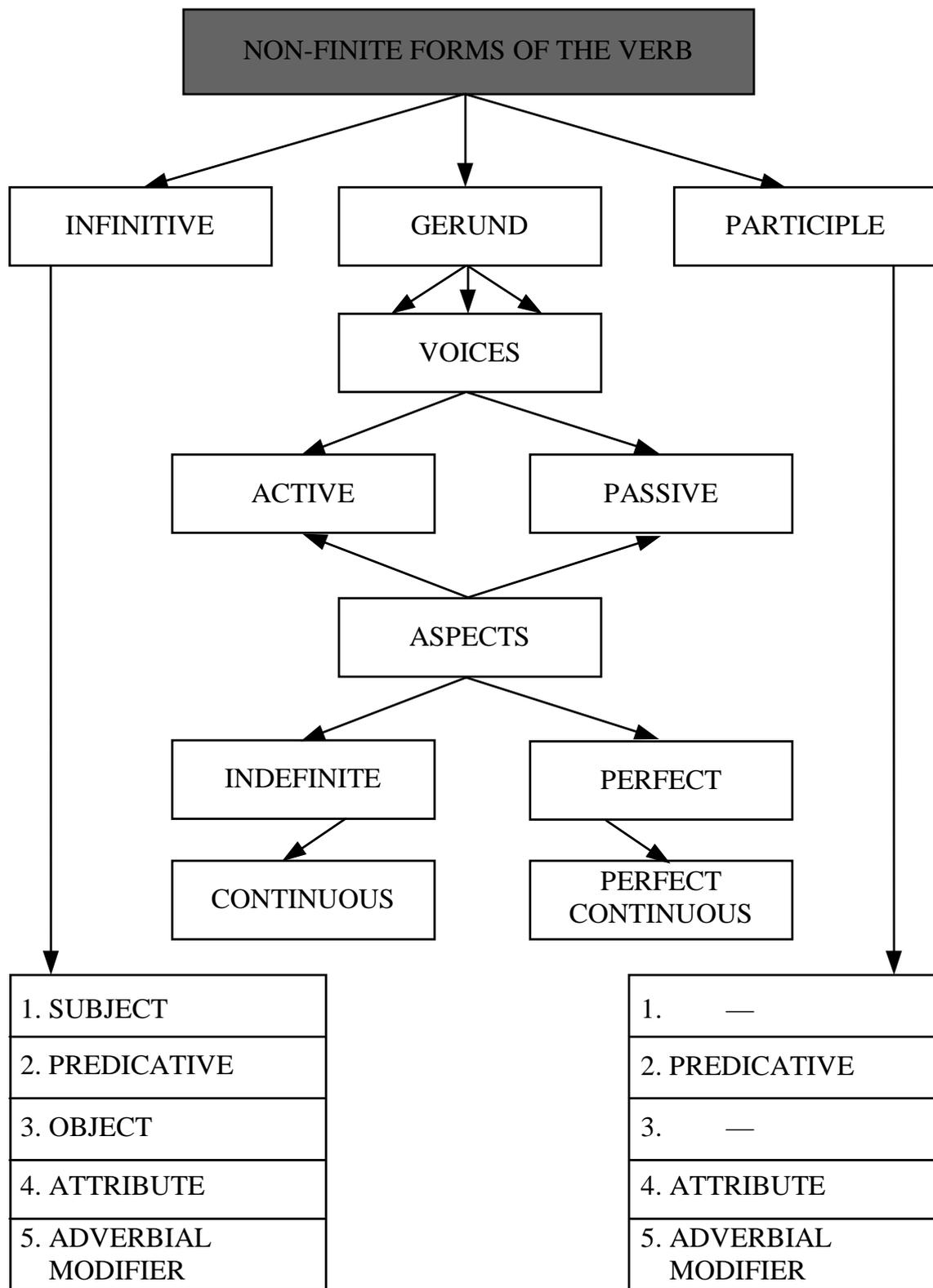
Examples	Functions
<i>One</i> should always be polite. How does <i>one</i> get to 5 th Avenue from here? <i>One</i> must keep <i>one's</i> word.	<i>one</i> means any person, people in general. The subject of an impersonal sentence. (<i>usually not translated</i>)
This book is more interesting than <i>the one</i> we read last week. Here are two books. Which <i>one</i> would you like?	Any function for replacing a noun already mentioned.
<i>One</i> should take care of <i>one's</i> health. <i>One</i> should take care of <i>his</i> health. <i>One</i> should take care of <i>his</i> or <i>her</i> health.	Notice the pronouns that may be used in the same sentence to refer back to <i>one</i> .

THE PRONOUNS «BOTH, EITHER AND NEITHER»

Examples	Functions
<p>Both these children are mine. These children are both mine. Both my children are boys. They both accepted the invitation. You are both right. They have both been invited. We must both go there.</p>	<p>Both is plural in meaning and applied only to two persons or things.</p>
<p>a) Take either book. I don't mind which. The news didn't shock either of them. Have you seen either of your parents today?</p> <p>b) You may go by either road. The houses on either side were tall and big.</p>	<p>Either refers to two persons or things and has two meanings.</p> <p>a) one or the other of two;</p> <p>b) each of two; both.</p>
<p>Neither brother has been abroad. We accepted neither offer. Neither of the statements is true.</p>	<p>Neither means <i>not the one nor the other</i>.</p>

SEQUENCE OF TENSES DIRECT AND INDIRECT SPEECH

If the main verb of the sentence is in the present, no change is made in the verb tense or modal in the object clause.	If the main verb of the sentence is in the past, the verb in the object clause is usually also in a past form.
He sais (that) he <i>works</i> hard.	He said (that) he <i>worked</i> hard.
He sais (that) he <i>is working</i> hard.	He said (that) he <i>was working</i> hard.
If the action of the object clause is simultaneous with that of the principal clause, the Past Indefinite or the Past Continuous is used in the object clause no matter which Past tense-aspect form is found in the principal clause.	
He sais (that) he <i>worked</i> hard.	He said (that) he <i>had worked</i> hard.
He sais (that) he <i>was working</i> hard.	He said (that) he <i>had been working</i> hard.
He sais (that) she <i>has</i> already <i>left</i> .	He said (that) she <i>had</i> already <i>left</i> .
If the action of the object clause precedes that of the principal clause, the Past Perfect or the Past Perfect Continuous is used in the object clause no matter which Past tense-aspect form is found in the principal clause.	
He sais (that) he <i>will work</i> hard.	He said (that) he <i>would work</i> hard.
He sais (that) he <i>will have finished</i> the work by September.	He said (that) he <i>would have finished</i> the work by September.
He sais (that) he <i>will be working</i> hard all day long.	He said (that) he <i>would be working</i> hard all day long.
If the action of the object clause follows that of the principal clause, the Future-in-the-Past or one of the other means of expressing future actions viewed from the past is used in the object clause no matter which Past tense-aspect form is found in the principal clause.	
He sais (that) he <i>is going to work</i> hard.	He said (that) he <i>was going to work</i> hard.
He sais (that) he <i>can work</i> hard.	He said (that) he <i>could work</i> hard.
He sais (that) he <i>may work</i> hard.	He said (that) he <i>might work</i> hard.
He sais (that) he <i>has to work</i> hard.	He said (that) he <i>had to work</i> hard.
He sais (that) he <i>must work</i> hard.	He said (that) he <i>had to work</i> hard.
He sais (that) he <i>should work</i> hard.	He said (that) he <i>should work</i> hard.
He sais (that) he <i>ought to work</i> hard.	He said (that) he <i>ought to work</i> hard.
The rules of sequence of tenses cannot be observed with certain modal verbs which have only one form. (<i>must, should, ought and need</i>)	



THE INFINITIVE

Infinitive	Active voice	Passive voice	Uses
Indefinite	to write to come	to be written —	the action is simultaneous with that expressed by the finite verb.
He wants to write her about it. He wants to be written about it.			
Continuous	to be writing to be coming	— —	the action is temporary and not a usual one.
He may be writing a new novel.			
Perfect	to have written to have come	to have been written —	the action precedes that of the predicate.
I am glad to have written her about it. I was surprised to have been written about it.			
Perfect Continuous	to have been writing to have been coming	— —	the action began before the time indicated by the predicate and is still going on.
He is said to have been writing this novel for 2 years already.			

Functions	Examples
Subject	To know him is to trust him. It is difficult to translate this text.
Predicative	Our aim is to master English. What I want is to be left alone.
Part of a Compound Verbal Predicate	We must stay at home. We decided to work together.
Object	He asked me to wait . He promised to come in time.
Attribute	He is always the first to come . The article to be translated is on the table.
Adverbial Modifier	I have come here to help you. The problem is too complicated to be solved at once.

REFERENCE LIST OF VERBS FOLLOWED BY INFINITIVES

A. VERBS FOLLOWED IMMEDIATELY BY AN INFINITIVE	
1. <i>afford</i>	I <i>can't afford to buy</i> it.
2. <i>agree</i>	They <i>agreed to help</i> us.
3. <i>appear</i>	She <i>appears to be</i> tired.
4. <i>arrange</i>	I'll <i>arrange to meet</i> you at the airport.
5. <i>ask</i>	He <i>asked to come</i> with us.
6. <i>beg</i>	He <i>begged to come</i> with us.
7. <i>care</i>	I <i>don't care to see</i> that show.
8. <i>claim</i>	She <i>claims to know</i> a famous movie star.
9. <i>consent</i>	She finally <i>consented to marry</i> him.
10. <i>decide</i>	I <i>have decided to leave</i> on Monday.
11. <i>demand</i>	I <i>demand to know</i> who is responsible.
12. <i>deserve</i>	She <i>deserves to win</i> the prize.
13. <i>expect</i>	I <i>expect to enter</i> graduate school next year.
14. <i>fail</i>	She <i>failed to return</i> the book to the library in time.
15. <i>forget</i>	I <i>forgot to mail</i> the letter.
16. <i>hesitate</i>	<i>Don't hesitate to ask</i> for my help.
17. <i>hope</i>	Jack <i>hopes to arrive</i> next week.
18. <i>learn</i>	He <i>learnt/learned to play</i> the piano.
19. <i>manage</i>	She <i>managed to finish</i> her work early.
20. <i>mean</i>	I <i>didn't mean to hurt</i> your feelings.
21. <i>need</i>	I <i>need to have</i> your opinion.
22. <i>offer</i>	They <i>offered to help</i> us.
23. <i>plan</i>	I <i>am planning to have</i> a party.
24. <i>prepare</i>	We <i>prepared to welcome</i> them.
25. <i>pretend</i>	He <i>pretends not to understand</i> .
26. <i>promise</i>	I <i>promise not to be</i> late.
27. <i>refuse</i>	I <i>refuse to believe</i> his story.
28. <i>regret</i>	I <i>regret to tell</i> you that you failed.
29. <i>remember</i>	I <i>remembered to lock</i> the door.
30. <i>seem</i>	That <i>cat seems to be</i> friendly.
31. <i>struggle</i>	I <i>struggled to stay</i> awake.
32. <i>swear</i>	She <i>swore to tell</i> the truth.
33. <i>threaten</i>	She <i>threatened to tell</i> my parents.
34. <i>volunteer</i>	He <i>volunteered to help</i> us.
35. <i>wait</i>	I <i>will wait to hear</i> from you.
36. <i>want</i>	I <i>want to tell</i> you something.
37. <i>wish</i>	She <i>wishes to come</i> with us.

B. VERBS FOLLOWED BY A (PRO)NOUN + AN INFINITIVE

1. <i>advise</i>	She <i>advised me to wait</i> until tomorrow.
2. <i>allow</i>	She <i>allowed me to use</i> her car.
3. <i>ask</i>	I <i>asked John to help</i> us.
4. <i>beg</i>	They <i>begged us to come</i> .
5. <i>cause</i>	Her laziness <i>caused her to fail</i> .
6. <i>challenge</i>	She <i>challenged me to race</i> her to the corner.
7. <i>convince</i>	I couldn't <i>convince him to accept</i> our help.
8. <i>dare</i>	He <i>dared me to do</i> better than he had done.
9. <i>encourage</i>	He <i>encouraged me to try</i> again.
10. <i>expect</i>	<i>I expect you to be</i> in time.
11. <i>forbid</i>	I <i>forbid you to tell</i> him.
12. <i>force</i>	They <i>forced him to tell</i> the truth.
13. <i>hire</i>	She <i>hired a boy to mow</i> the lawn.
14. <i>instruct</i>	He <i>instructed them to be careful</i> .
15. <i>invite</i>	Harry <i>invited the Johnsons to come</i> to his party.
16. <i>need</i>	We <i>needed Chris to help</i> us figure out the solution.
17. <i>order</i>	The judge <i>ordered me to pay</i> a fine.
18. <i>permit</i>	He <i>permitted the children to stay up</i> late.
19. <i>persuade</i>	I <i>persuaded him to come</i> for a visit.
20. <i>remind</i>	She <i>reminded me to lock</i> the door.
21. <i>require</i>	Our teacher <i>requires us to be</i> in time.
22. <i>teach</i>	My brother <i>taught me to swim</i> .
23. <i>tell</i>	The doctor <i>told me to take</i> these pills.
24. <i>urge</i>	I <i>urged her to apply</i> for the job.
25. <i>want</i>	I <i>want you to be</i> happy.
26. <i>warn</i>	I <i>warned you not to drive</i> too fast.

THE PREPOSITIONAL INFINITIVE COMPLEX

Subject	It is easy <i>for you to say</i> that. <i>For him to help</i> his friends is quite natural.
Predicative	The question is <i>for you to decide</i> . The best thing is <i>for you to move</i> to the South.
Object	I waited <i>for him to speak</i> .
Attribute	This is the book <i>for you to read</i> .
Adverbial modifier of purpose	He opened the doors of the car <i>for us to get in</i> . I've brought two books <i>for my son to read</i> .
Adverbial modifier of result	The weather was too cold <i>for the children to go out</i> . It was too dark <i>for her to see</i> him.

THE OBJECTIVE INFINITIVE COMPLEX

<i>is used after the verbs denoting a) perceptions of senses*:</i>	to see	I saw <i>him get off</i> the bus.
	to hear	Did you hear <i>her sing</i> ?
	to feel	She felt <i>her voice tremble</i> .
	to watch	I watch <i>her enter</i> the shop.
	to observe	We observe <i>the direction</i> constantly <i>change</i> .
	to notice	Nobody noticed <i>him come</i> in.

b) wish, intention, emotions:	to want	I want <i>you to help</i> me.
	to wish	He wishes <i>the work to be done</i> at once.
	to like	He likes <i>dinner to be</i> in time.
	to dislike	I dislike <i>you to say</i> such words.
	to hate	I hate <i>you to talk</i> like that.
	to intend	He intended <i>me to go</i> with him.
	should/would like	I should like <i>you to stay</i> here.

c) mental activity:	to consider	I consider <i>him to be</i> right.
	to believe	I believe <i>her to be</i> a good teacher.
	to think	We thought <i>him to be sleeping</i> .
	to find	We find <i>this value to be</i> accurate enough.
	to know	I know <i>him to have said</i> that.
	to expect	We expected <i>her to return</i> .
	to suppose	I suppose <i>him to be</i> about fifty.

d) order, request, permission, advice, compulsion:	to order	He ordered <i>the children to stop</i> talking.
	to ask	I asked <i>Tom to help</i> me.
	to request	He requested <i>the matter to be kept</i> secret.
	to allow	She doesn't allow <i>anyone to smoke</i> .
	to advise	She advised <i>me to tell</i> the police about it.
	to recommend	I wouldn't recommend <i>you to stay</i> here.
	to cause	Her laziness caused <i>her to fail</i> .
	to force	He forced <i>me to go</i> there.
	get	I got <i>him to repair</i> my car.
	to make*	What makes <i>you think</i> so?
	to let*	Let <i>me go</i> .

*The verbs **to make**, **to let** and the verbs of physical perception are followed by the infinitive without «to».

THE SUBJECTIVE INFINITIVE COMPLEX

<i>is used with</i> a) the verbs of speech:	to say to report to inform	<i>She</i> is said to write a new novel. <i>They</i> are reported to have left London. <i>He</i> was informed to have arrived in Kyiv.
<i>verbs denoting:</i> b) mental activity:	to consider to believe to think to find to know to expect to suppose	<i>He</i> is considered to be a good speaker. <i>He</i> is believed to know English. <i>He</i> was thought to have gone . <i>They</i> are found to be unfit for service. <i>History</i> is known to repeat itself. <i>She</i> is expected to come any minute. <i>He</i> is supposed to know these things.
c) perceptions of senses	to see to hear to feel to watch to observe to notice	<i>He</i> was seen to cross the street. <i>She</i> was heard to mention your name. <i>She</i> was felt to be suffering . <i>He</i> was watched to dance in the hall. <i>The woman</i> was observed to follow him. <i>He</i> was noticed to unlock the door.
d) order, request, permission, advice, compulsion:	to order to ask to allow to advise to force to make	<i>They</i> were ordered to go to bed . <i>She</i> was asked to come on Monday. <i>I</i> wasn't allowed to watch the film. <i>We</i> were advised not to drink the water. <i>He</i> was forced to give up this work. <i>He</i> was made to repeat the rule.
e) with the verbs	to seem to appear to happen to chance to prove to turn out	<i>The child</i> seems to be asleep . <i>He</i> appears to know a lot of things. <i>I</i> happened to see him yesterday. <i>He</i> chanced to have recognized me. <i>Your advice</i> proved to be very useful. <i>He</i> turned out to be a good friend.
f) with the expressions:	to be likely to be unlikely to be sure to be certain	<i>They</i> are likely to come here. <i>He</i> is unlikely to come tomorrow. <i>He</i> is sure to go hunting . <i>He</i> is sure to ring you up .

THE PARTICIPLE

Form	Transitive verbs		Intransitive verbs
	Active voice	Passive voice	Active voice
Participle I (Present Participle)	writing	being written	going
Participle II (Past Participle)	—	written	gone
Perfect Participle	having written	having been written	having gone
Seeing that I was late I hurried. Be careful while crossing the street. Being left alone I went on with my work. She tried to calm the crying child. Not knowing what to say he kept silent.		Participle I (Active and Passive) denotes an action simultaneous with the action expressed by the finite verb.	
Having written the letter he went to post it. Having finished their classes the students went home.		Perfect Participle (Active and Passive) denotes an action prior to that of the finite verb.	
Being asked for her opinion she blushed. Having been shown the wrong direction he lost his way.		Perfect and Non-Perfect Participle (Passive) denotes a passive action.	

COMPLEXES WITH THE PARTICIPLE THE OBJECTIVE PARTICIPLE COMPLEX

<i>is used with the verbs denoting a) sense perceptions:</i>	to see to hear to feel to watch to observe to notice	I saw <i>her walking</i> along the street. We heard <i>him speaking</i> in the next room. She felt <i>her hand trembling</i> . I watched <i>the children playing</i> in the garden. The teacher observed <i>the students</i> writing compositions.
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b) wish and mental activity:	to want to wish to find to leave	I want <i>the letter posted</i> at once. I wish <i>your dreams realized</i> . When I returned I found <i>her gone</i> . He left <i>his work unfinished</i> .
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to have to get	She had <i>her dress made</i> here. I must have <i>my hair cut</i> . He will have <i>his coat cleaned</i> . She must have <i>her hair done</i> . Have you got <i>your car repaired</i> ?	After these verbs only Past Participle is used. It denotes an action performed by someone else for the benefit of the person expressed by the subject.
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THE SUBJECTIVE PARTICIPLE COMPLEX

<i>is used with the verbs denoting sense perceptions:</i>	to see	<i>She</i> was seen walking along the street..
	to hear	<i>Two people</i> were heard quarrelling .
	to watch	<i>They</i> were watched playing in the garden.
	to notice	<i>He</i> was noticed entering the office.
	to consider	<i>The work</i> was considered finished .

THE ABSOLUTE PARTICIPLE COMPLEX

<p><i>The rain having stopped</i>, we went home.</p> <p><i>The day being fine</i>, she went for a walk.</p> <p><i>Time permitting</i>, we'll go to the forest.</p>	<p>In this complex Participle has its own subject expressed by a noun in the Common Case or a personal pronoun in the Nominative case.</p>
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Functions	Examples
Complex Subject (The Subjective Participle complex)	<i>They</i> were heard speaking in a lively manner. <i>He</i> was seen surrounded by a group of students. <i>He</i> was noticed entering the library.
Complex Object (The Objective Participle complex)	I saw <i>the workers</i> packing the goods. They watched <i>the car</i> being repaired . They want <i>the goods</i> shipped on Monday.
Attribute	The cars being produced at our plant are very good.
Adverbial Modifier	<i>Walking in the park</i> , he met his old friend.
The Absolute Participle complex	<i>The letter being written</i> , I went to post it. <i>He being tired</i> , I decided not to disturb him.

THE GERUND. FORMS AND FUNCTIONS

Gerund	Active	Passive	Uses
Indefinite	reading	being read	The action expressed by the gerund: a) is simultaneous with that expressed by the finite verb. b) doesn't refer to any particular time.
She likes <i>reading</i> . She likes <i>being read</i> .			
Perfect	having read	having been read	The action expressed by the gerund precedes that expressed by the finite verb.
Thank you <i>for having helped me</i> . I remember <i>having been asked</i> this question.			

Functions	Examples
Subject	<i>Reading</i> books is useful. <i>Smoking</i> is harmful. <i>Reading</i> love stories made her cry.
Predicative	His hobby is <i>collecting</i> stamps. The main thing is <i>getting</i> there in time. Seeing is <i>believing</i> .
Part of a Compound Verbal Predicate	She went on <i>reading</i> . She stopped <i>smoking</i> .
Direct Object	I couldn't avoid <i>speaking</i> to her. The film is worth <i>seeing</i> . I don't mind <i>waiting</i> .
Prepositional Object	I am fond of <i>reading</i> . He insisted on <i>doing</i> the work himself. I don't like his habit of <i>making</i> people wait.
Attribute	All liked the idea of <i>going</i> to the country. I have no intention of <i>discussing</i> this question. There are different ways of <i>solving</i> this problem.
Adverbial Modifier	On <i>entering</i> the room he came up to me. He left the room without <i>saying</i> a word. Excuse me for <i>being</i> so late.

REFERENCE LIST OF VERBS FOLLOWED BY GERUNDS

1. <i>admit</i>	He <i>admitted stealing</i> the money.
2. <i>advise</i>	She <i>advised waiting</i> until tomorrow.
3. <i>anticipate</i>	I <i>anticipate having</i> a good time on vacation.
4. <i>appreciate</i>	I <i>appreciated hearing</i> from them.
5. <i>avoid</i>	He <i>avoided answering</i> my question.
6. <i>complete</i>	I finally <i>completed writing</i> my term paper.
7. <i>consider</i>	I <i>will consider going</i> with you.
8. <i>delay</i>	He <i>delayed leaving</i> for school.
9. <i>deny</i>	She <i>denied committing</i> the crime.
10. <i>discuss</i>	They <i>discussed opening</i> a new business.
11. <i>dislike</i>	I <i>dislike driving</i> long distances.
12. <i>enjoy</i>	We <i>enjoyed visiting</i> them.
13. <i>finish</i>	She <i>finished studying</i> about ten.
14. <i>forget</i>	I'll <i>never forget visiting</i> Napoleon's tomb.
15. <i>can't help</i>	I <i>can't help worrying</i> about it.
16. <i>keep</i>	I <i>keep hoping</i> he will come.
17. <i>mention</i>	She <i>mentioned going</i> to the cinema.
18. <i>mind</i>	<i>Would you mind helping</i> me with this?
19. <i>miss</i>	I <i>miss being</i> with my family.
20. <i>postpone</i>	Let's <i>postpone leaving</i> until tomorrow.
21. <i>practise</i>	The athlete <i>practised throwing</i> the ball.
22. <i>quit</i>	He <i>quitted trying</i> to solve the problem.
23. <i>recall</i>	I <i>don't recall meeting</i> him before.
24. <i>recollect</i>	I <i>don't recollect meeting</i> him before.
25. <i>recommend</i>	She <i>recommended seeing</i> the show.

26. <i>regret</i>	I regret telling him my secret.
27. <i>remember</i>	I can remember meeting him when I was a child.
28. <i>resent</i>	I resent her interfering in my business.
29. <i>resist</i>	I couldn't resist eating the dessert.
30. <i>risk</i>	She risks losing all of her money.
31. <i>stop</i>	She stopped going to classes when she got sick.
32. <i>suggest</i>	She suggested going to the cinema.
33. <i>tolerate</i>	She won't tolerate cheating during an examination.
34. <i>understand</i>	I don't understand his leaving school.

THE GERUNDIAL COMPLEX

The Gerundial Complex consists of a noun (in the Common or Possessive Case) or a possessive pronoun and the gerund.	
Functions	Examples
Complex Subject	<i>Your coming</i> here is very desirable. It's no use <i>my telling</i> you a lie.
Predicative	What annoys me is <i>his being careless</i> .
Direct Object	I don't like <i>his reading</i> aloud. Forgive <i>my saying</i> it.
Prepositional Object	I insist on <i>your doing</i> it. Everything depends on <i>your getting</i> there in time.
Attribute	Everyone liked the idea of <i>his joining</i> us. I don't know the reason of <i>your leaving</i> .
Adverbial Modifier	He entered the room without <i>his seeing</i> it.

CONDITIONAL SENTENCES

Type of condition	if-clause	main clause	Examples
Type I Real condition (refers to the future)	Present Indefinite	Future Indefinite can + Infinitive	If I have enough money, I will/ can buy a car.
Type II Unreal condition (refers to the present or future)	Present Subjunctive II (Past Indefinite)	would/could + Infinitive	If I had enough money, I would/could buy a car
Type III Unreal condition (refers to the past)	Past Subjunctive II (Past Perfect)	would/could have + Past Participle	If I had had enough money, I would/could have bought a car.

IRREGULAR VERBS

Infinitive		Past Indefinite	Past Participle
1		2	3
abide	терпіти	abode, abided	abode, abided
arise	виникати	arose	arisen
awake	будити	awoke	awaked, awoke
be	бути	was, were	been
bear	нести; народжувати	bore	borne, born
beat	бити	beat	beaten
become	ставати	became	become
befall	траплятися	befell	befallen
beget	виробляти	begot	begotten
begin	починати	began	begun
behold	помічати	beheld	beheld
bend	згинати(ся)	bent	bent, bended
bereave	втрачати	bereaved, bereft	bereaved, bereft
beseech	благати, просити	besought	besought
beset	оточувати	beset	beset
bet	битися об заклад	bet, betted	bet, betted
bid	пропонувати ціну	bade, bid	bidden, bid
bind	зв'язувати	bound	bound
bite	кусати(ся)	bit	bitten, bit
bleed	кровоточити	bled	bled
bless	благословляти	blessed, blest	blessed, blest
blow	дути	blew	blown
break	ламати(ся)	broke	broken (broke)
breed	розводити	bred	bred
bring	приносити	brought	brought
broadcast	передавати по радіо	broadcast (-ed)	broadcast (-ed)
build	будувати	built	built
burn	палити, горіти	burnt, burned	burnt, burned
burst	спалахнути	burst	burst
buy	купувати	bought	bought
cast	кидати, скидати	cast	cast
catch	ловити	caught	caught
choose	вибирати	chose	chosen
cleave	розколювати(ся)	clove, cleft	cloven, cleft
cling	чіплятися	clung	clung
clothe	вдягати	clothed (clad)	clothed (clad)
come	приходити	came	come
cost	коштувати	cost	cost
creep	повзти, повзати	crept	crept
cut	різати	cut	cut

	1	2	3
dare	сміти; наважуватися	dared (durst)	dared
deal	займатися	dealt	dealt
dig	копати; рити	dug	dug
do	робити	did	done
draw	тягти; малювати	drew	drawn
dream	мріяти	dreamed, dreamt	dreamed, dreamt
drink	пити	drank	drunk
drive	водити; їхати	drove	driven
dwell	жити; мешкати	dwelt	dwelt
eat	їсти	ate	eaten
fall	падати	fell	fallen
feed	годувати	fed	fed
feel	відчувати	felt	felt
fight	битися	fought	fought
find	знаходити	found	found
flee	тікати; уникати	fled	fled
fling	кидати(ся)	flung	flung
fly	літати	flew	flown
forbid	забороняти	forbade, forbad	forbidden
forecast	передбачати	forecast, forecasted	forecast, forecasted
forego	передувати	forewent	foregone
foresee	передбачати	foresaw	foreseen
foretell	провіщати	foretold	foretold
forget	забувати	forgot	forgotten
forgive	прощати	forgave	forgiven
forsake	залишати; покидати	forsook	forsaken
freeze	морозити	froze	frozen
get	отримувати	got	got, gotten
gild	золотити	gilded, gilt	gilded
give	давати	gave	given
go	ходити	went	gone
grind	точити; шліфувати	ground	ground
grow	рости	grew	grown
hang	вішати	hung, hanged	hung, hanged
have	мати	had	had
hear	чути	heard	heard
heave	піднімати	heaved, hove	heaved, hove
hew	рубати	hewed, hid	hewed, hewn
hide	ховати(ся)	hid	hidden, hid
hit	ударяти	hit	hit
hold	тримати	held	held
hurt	завдавати болю	hurt	hurt
keep	тримати	kept	kept
knit	в'язати; плести	knitted, knit	knitted, knit

	1	2	3
know	знати	knew	known
lade	навантажувати	laded	laden
lay	класти; накривати	laid	laid
lead	вести	led	led
lean	нахиляти(ся)	leant, leaned	leant, leaned
leap	стрибати	leapt, leaped	leapt, leaped
learn	вивчати	learnt, learned	learnt, learned
leave	залишати	left	left
lend	позичати	lent	lent
let	дозволяти	let	let
lie	лежати	lay	lain
light	запалювати(ся)	lighted, lit	lighted, lit
lose	втрачати	lost	lost
make	робити	made	made
mean	означати	meant	meant
meet	зустрічати	met	met
melt	танути	melted	melted, molten
mislaid	загубити	mislaid	mislaid
mislead	вводити в оману	misled	misled
mistake	помилятися	mistook	mistaken
mow	косити	mowed	mowen
outdo	перевершувати	outdid	outdone
outgrow	переростати	outgrew	outgrown
overbear	перемагати	overbore	oveborne
overcast	хмаритися	overcast	overcast
overcome	перемогти	overcame	overcome
overdo	перебільшувати	overdid	overdone
overdraw	перевищувати	overdrew	overdrawn
overhear	підслуховувати	overheard	overheard
overtake	доганяти	overtook	overtaken
overthrow	перекидати	overthrew	overthrown
partake	брати участь	partook	partaken
pay	платити	paid	paid
put	класти	put	put
read	читати	read	read
rebuild	відбудовувати	rebuilt	rebuilt
relay	міняти; замінити	relaid	relaid
rend	рвати; розривати	rent	rent
retell	переказувати	retold	retold
rid	позбавляти	ridded, rid	rid, ridded
ride	їхати верхи	rode	ridden
ring	дзвонити	rang	rung
rise	вставати	rose	risen

	1	2	3
run	бігати	ran	run
saw	пиляти	sawed	sawn, sawed
say	казати	said	said
see	бачити	saw	seen
seek	шукати; просити	sought	sought
sell	продавати	sold	sold
send	посилати	sent	sent
set	ставити; класти	set	set
sew	шити; зашивати	sewed	sewn, sewed
shake	трусити; хитати	shook	shaken
shear	стригти	sheared	shorn, sheared
shed	губити; втрачати	shed	shed
shine	світити; сяяти	shone	shone
shoe	взувати	shod	shod
shoot	стріляти	shot	shot
show	показувати	showed	shown, showed
shut	зачиняти(ся)	shut	shut
sing	співати	sang	sung
sink	тонути; осідати	sank	sunk, sunken
sit	сидіти	sat	sat
slay	приголомшити	slew	slain
sleep	спати	slept	slept
sling	кидати; шпурляти	slung	slung
slink	їти крадькома	slunk	slunk
slit	розрізати вздовж	slit	slit
smell	пахнути	smelt, smelled	smelt, smelled
sow	сіяти; засівати	sowed	sown, sowed
speak	говорити	spoke	spoken
speed	поспішати	sped, speeded	sped, speeded
spend	витрачати	spent	spent
spoil	псувати(ся)	spoilt, spoiled	spoilt, spoiled
spread	поширювати(ся)	spread	spread
stand	стояти	stood	stood
stave	розбитися	staved, stove	staved, stove
steal	красти	stole	stolen
stick	колоти	stuck	stuck
stride	переходити	strode	stridden, strid
strike	бити; страйкувати	struck	struck, stricken
strive	старатися	strove	striven
swear	присягати(ся)	swore	sworn
swell	збільшуватися	swelled	swollen, swelled
swim	плавати	swam	swum
swing	гойдати(ся)	swung	swung
take	брати	took	taken

	1	2	3
teach	навчати	taught	taught
tear	руйнувати	tore	torn
tell	розповідати	told	told
think	думати	thought	thought
throw	кидати	threw	thrown
thrust	штовхати	thrust	thrust
understand	розуміти	understood	understood
undertake	починати; братися	undertook	undertaken
wake	будити	woke, waked	waked, woken
wear	носити	wore	worn
win	вигравати	won	won
withdraw	відкликати	withdrew	withdrawn
withhold	відмовляти	withheld	withheld
write	писати	wrote	written

Навчальне видання

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АНГЛІЙСЬКА МОВА

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