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ENGLISH IN MODERN WORLD

Учебное пособие

Составитель Е. В. Кузьмина

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Рецензенты: кафедра английского языка Ульяновского государственного педагогического университета имени И.Н. Ульянова;
кандидат педагогических наук, доцент кафедры английской лингвистики и перевода Ульяновского государственного университета О.Ю. Кузнецова.

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ОГЛАВЛЕНИЕ

ВВЕДЕНИЕ

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В пособии представлены общенаучные и технические тексты, содержащие современные специальные термины, которые позволят повысить уровень понимания и усвоения языкового материала на любом этапе подготовки.

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РАЗДЕЛ 1: ЧТЕНИЕ И ПЕРЕВОД НАУЧНО-ТЕХНИЧЕСКОЙ ЛИТЕРАТУРЫ

Text 1: Inventors and inventions (part 1)

Have you ever dreamed of becoming a great inventor of having a fantastically clever idea that changes society for the better and makes you rich in the process? The history of technology is, in many ways, a story of great inventors and their brilliant inventions. Think of Thomas Edison and the light bulb, Henry Ford and the mass-produced car, or, more recently, Tim Berners-Lee and the World Wide Web. Inventing isn't just about coming up with a great idea; that's the easy part! There's also the matter of turning an idea into a product that sells enough to recoup the cost of putting it on the market. And there's the ever-present problem of stopping other people from copying and profiting from your ideas. Inventing is a difficult and often exhausting life; many inventors have died penniless and disappointed after struggling for decades with ideas they couldn't make work. Today, many lone inventors find they can no longer compete and most inventions are now developed by giant, powerful corporations. So, are inventors in danger of going extinct? Or will society always have a place for brave new ideas and stunning new inventions? Let's take a closer look and find out.

What is invention? That sounds like a trivial question, but it's worth pausing a moment to consider what "invention" really means. In one of my dictionaries, it says an inventor is someone who comes up with an idea for the first time. In another, an inventories described as a person of "unique intuition or genius" who devises an original product, process, or machine. Dictionary definitions like these are badly out of date and probably always have been. Since at least the time of Thomas Edison (the mid-to-late 19th century), invention has been as much about manufacturing and marketing inventions successfully a about having great ideas in the first place.

Some of the most famous inventors in history turn out, on closer inspection, not to have originated ideas but to have developed existing ones and made them stunningly successful. Edison himself didn't invent electric light, but he did develop the first commercially successful, long-lasting electric light bulb. (By creating a huge market for this product, he created a similarly huge demand for electricity, which he was busily generating in the world's first power plants.) In much the same way, Italian inventor Guglielmo Marconi can't really be described as the inventor of radio. Other people, including German Heinrich Hertz and

Englishman Oliver Lodge, had already successfully demonstrated the science behind it and sent the first radio messages. What Marconi did was to turn radio into a much more practical technology and sell it to the world through bold and daring demonstrations. These days, we'd call him an entrepreneur – a self-starting businessperson who has the drive and determination to turn a great idea into a stunning commercial success.

It's important not to underestimate the commercial side of inventing. It takes a lot of money to develop an invention, manufacture it, market it successfully, and protect it with patents. In our gadget-packed homes and workplaces, modern inventions seldom do completely original jobs. More often, they have to compete with and replace some existing gadget or invention to which we've already become attached and accustomed. When James Dyson launched his bag less cyclone vacuum cleaner, the problem he faced was convincing people that it was better than the old-fashioned vacuums they had already. Why should they spend a fortune buying a new machine when the one they had already was perfectly satisfactory? Successful inventions have to dislodge existing ones, both from our minds (which often find it hard to imagine new ways of doing things) and from their hold on the marketplace (which they may have dominated for years or decades). That's another reason why inventing is so difficult and expensive – and another reason why it's increasingly the province of giant corporations with plenty of time and money to spend. Scientific breakthroughs – Some inventions appear because of scientific breakthroughs. DNA fingerprinting (the process by which detectives take human samples at crime scenes and use them to identify criminals) is one good example. It only became possible after the mid-20th century when scientists understood what DNA was and how it worked: the scientific discovery made possible the new forensic technology. The same is true of many other inventions. Marconi's technological development of radio followed on directly from the scientific work done by Lodge, Hertz, James Clerk Maxwell, Michael Faraday, and numerous other scientists who fathomed out the mysteries of electricity and magnetism during the 19th century. Generally, scientists are more interested in advancing human knowledge than in commercializing their discoveries; it takes a determined entrepreneur like Marconi or Edison to recognize the wider, social value of an idea – and turn theoretical science into practical technology.

Trial and error – But it would be very wrong to suggest that inventions (practical technologies) always follow on from scientific discoveries (often abstract, impractical theories). Many of the world's greatest inventors lacked any scientific training and perfected their ideas through trial and error. The scientific reasons why their inventions succeeded or failed were only discovered long afterward. Engines (which are machines that burn fuel to release heat energy that can make something move) are a good example of this. The first engines, powered by steam, were developed entirely by trial and error in the 18th century by such people as Thomas New Comen and James Watt. The scientific theory of how these engines worked, and how they could be improved, was only figured out about a century later by Frenchman Nicolas Sadi Carnot. Thomas Edison, one of the most prolific inventors of all time, famously told the world that "Genius is one percent inspiration and 99 percent perspiration"; he had little or no scientific training and owed much of his success to persistence and determination (when he came to develop his electric light, he tested no fewer than 6000 different materials to find the perfect filament).

Text 2: Inventors and inventions (part 2)

Some inventions are never really invented at all they have no single inventor. You can comb your way through thousands of years of history, from the abacus to the iPhone, and find not a single person who could indisputably be credited as the sole inventor of the computer. That’s because computers are inventions that have evolved over time. People have needed to calculate things for as long as they’ve traded with one another, but the way we’ve done this has constantly changed. Mechanical calculators based on levers and gears gave way to electronic calculators in the early decades of the 20th century. As newer, smaller electronic components were developed, computers became smaller too. Now, many of us own cell phones that double-up as pocket computers, but there’s no single person we can thank for it. Cars evolved in much the same way. You could thank Henry Ford for making them popular and affordable, Karl Benz for putting gasoline engines on carts to make motorized carriages, or Nikolaus Otto for inventing modern engines in the first place – but the idea of vehicles running on wheels is thousands of years old and its original inventor (or inventors) has long since disappeared in time.

Accidental inventions – Some inventions happen through pure luck. When Swiss inventor George De Mestral was walking through the countryside, he noticed how burrs from plants stuck to his clothes and was hard to pull away. That gave him the idea for the brilliant two-part clothing fastener that he called VELCRO®. Another inventor who got lucky was Percy Spencer. He was experimenting with a device called a magnetron, which turns electricity into microwave radiation for radar detectors (used for direction-finding in ships and planes), when he noticed that a chocolate bar in his pocket had started to melt. He realized the microwave radiation was generating heat that was cooking (and melting) the food and that gave him the idea for the microwave oven. Teflon®, the super-slippery nonstick coating, was also discovered by accident when Roy Plunkett accidentally made some strange white goo in a chemical laboratory. Its amazing nonstick properties were only discovered and put to use later. All these inventions, and numerous others, were chance discoveries produced by accidents or mistakes.

Advantageous inventions – From IBM and Sony to Goodyear and AT&T, many of the world's biggest, best-known corporations have been built on the back of a single great invention. IBM, for example, grew out of an earlier company selling intricate mechanical census-counting machines developed by Herman Hollerith; Sony made its name selling cheap, high quality radios made with tiny transistors; Goodyear owes its name (and its chief product) to Charles Goodyear, a hapless inventor who finally developed durable, modern, "Vulcanized" rubber after a lifetime of trial and error; AT&T can trace its roots back to the telephone patented by Alexander Graham Bell in 1876. But a modern company can't survive and thrive on one great idea alone. That's why so many companies have huge research and development laboratories where inspired scientists and engineers are constantly trying to come up with better ideas than the ones on which their original success was founded. As marketing genius Theodore Levitt pointed out in the 1960s, visionary companies need the courage to try to put themselves out of business by coming up with new products that make their existing ones obsolete; companies that rest on their laurels will be put out of business by their inventive competitors. This kind of corporate invention – companies trying to out-invent themselves and one another – is very much the way the world works now. The world of corporate invention – There are probably more people trying to invent things now than at any time in history, but relatively few of them are lone geniuses struggling away in home workshops and garages. There will always be room for lucky individuals who have great ideas and get rich by turning them into world-beating products. But the odds are stacked increasingly against them. It's unlikely you'll get anywhere tinkering away in your garage trying to invent a personal computer that will change the world, the way Steve Wozniak and Steve Jobs did back in the mid-1970s when they put together the first Apple Computer. To do that, you'd have to set yourself up in competition with Apple Computer (Which became the world's richest company in 2011), staffed with legions of brilliantly creative scientists, engineers, and designers, and with billions of dollars to spend on research and development. Really prolific inventors might file a few dozen patent applications during their lifetime, if they're lucky; but the world's most inventive company, IBM, files several thousand patents every single year. Companies like IBM have to keep on inventing to keep themselves in business: inventions are the fuel that keeps them going. Think of inventions in the 19th century and you'll come across lone inventors like Charles Goodyear, Thomas Edison, Alexander Graham Bell, George Eastman (of Kodak) and many more like them. But think of inventing in the 20th and 21st century and you'll come across inventive corporations instead such companies as DuPont (the chemical company that gave us nylon, Teflon®, Kevlar®, Nomex®, and many more amazing synthetic materials), Bell Labs (where transistors, solar cells, lasers, CD players, digital cell phones, commercial fax machines, and CCD light sensors were developed), and 3M (pioneers of Scotchgard textile protector and Post-It® Notes, to name only two of their best-known products). It was Thomas Edison who transformed the world of inventing, from lone inventors to inventive corporations, when he established the world's first ever invention "factory" at Menlo Park, New Jersey, in 1876. These days' corporations dominate our world and they dominate the world of inventing in exactly the same way. If it's your dream to become a great inventor, go for it and good luck to you but be prepared to take on some very stiff, very well-funded, corporate competition. If you succeed, congratulations: maybe you'll prove to be the founder of the next Apple, AT&T, or IBM.

Text 3: Marie Curie

Marie Curie was born in Warsaw on 7 November, 1867. Her father was a teacher of science and mathematics in a school in the town, and from him little Maria Sklodowska – which was her Polish name – learned her first lessons in science. Maria's wish was to study at the Sorbonne in Paris, and after many years of waiting she finally left her native land in 1891.

In Paris Maria began a course of hard study and simple living. She determined to work for two Master's degrees – one in Physics, the other in Mathematics. This she had to work twice as hard as the ordinary student. Yet she had scarcely enough money to live on. She lived in the poorest quarter of Paris. Night after night, after her hard day's work at the University, she got to her poorly furnished room and worked at her books steadily for hours, Sometimes she had no more than a bag of cherries. Though she was often weak and ill, she worked in this way for four years.

She had chosen her course and nothing could turn her from it. Among the many scientists Maria met and worked with in Paris was Pierre Curie. Pierre Curie, born in 1859 in Paris, was the son of a doctor, and from early childhood he had been fascinated by science.

At sixteen he was a Bachelor of Science, and he took his Master's degree in Physics when he was eighteen: When helmet Maria Sklodowska he was thirty-five years old and was famous throughout Europe for his discoveries in magnetism. But in spite of the honor he had brought to France by his discoveries, the, French Government could only give him a very little salary as a reward, and the University of Paris refused him a laboratory of his own for his researches.

Pierre Curie and Maria Sklodowska, both of whom loved science more than anything else, very soon became the closest friends. They worked together constantly and discussed many problems of their researches. After little more than a year they fell in love with each other, and in 1895 Maria Sklodowska became Mme. Curie. Theirs was not only to be a very happy marriage but also one of the greatest scientific partnerships. Marie had been the greatest woman-scientist of her day but she was a mother too, a very loving one. There were their two little girls, Irene and Eye. By this time Mme. Curie had obtained her Master's degree in Physics and Mathematics, and was busy with researches on street. She now wished to obtain a Doctor's degree. For this it was necessary to offer to the examiners a special study, called a thesis.

For some time Pierre Curie had been interested in the work of a French scientist named Becquerel. There is rare metal called uranium which, as Becquerel discovered, emits rays very much like X-rays. These rays made marks on a photographic plate when it was wrapped in black paper. The Curie got interested in these rays of uranium. What caused them? How strong were they? There were many such questions that puzzled Marie Curie and her husband. Here, they decided, was the very subject for Marie's Doctor's thesis.

The research was carried out under great difficulty. Mme. Curie had to use an old store-room at the University as her laboratory – she was refused a better room. It was cold there was no proper apparatus and very little space for research work. Soon she discovered that the rays of uranium were like no other known rays. Marie Curie wanted to find out if other chemical substances might emit similar rays. So she began to examine every know chemical substance. Once after repeating her experiments time after time she found that a mineral called pitchblende emitted much more powerful rays than any she had already found. Now, an element is a chemical substance which so far as is known cannot be split up into other substances. As Mme. Curie had examined every known chemical element and none of them had emitted such powerful rays as pitchblende she could only decide that this mineral must contain some new element.

Scientists had declared that every element was already known to them. But all Mme. Curie's experiments pointed out that it was not so. Pitchblende must contain some new and unknown element. There was no other explanation for the powerful rays which it emitted. At that moment Pierre Curie stopped his own investigations on the physics of crystals and joined his wife in her effort to find those more active unknown chemical elements. Scientists call the property of giving out such rays "radioactivity", and Mme. Curie decided to call the new element "radium", because it was more strongly radioactive than any known metal.

In 1903 Marie and Pierre together with Henry Becquerel were awarded the Nobel Prize in Physics. In 1911 Marie received the Nobel Prize in Chemistry. But the second prize went to her alone for in 1906 Pierre had died tragically in a traffic accident.

Mme. Sklodowska-Curie, the leading woman-scientist, the greatest woman of her generation, has become the first person to receive a Nobel Prize twice. Marie lived to see her story repeated. Her daughter Irene grew into a woman with the same interests as her mother's and she was deeply interested in her mother's work. From Marie she learned all about radiology and chose science for her career. At twenty-nine she married Frederic Joliot, a brilliant scientist at the Institute of Radium, which her parents had founded.

Together the Joliot-Curies carried on the research work that Irene's mother had begun. In 1935 Irene and her husband won the Nobel Prize for their discovery of artificial radioactivity. So, Marie lived to see the completion of the great work, but she died on the eve of the award.

NOTES TO THE TEXT

science – естественные науки

thesis – диссертация

Pitchblende – уранит (урановая смолка)

Text 4: Ernest Rutherford

Ernest Rutherford was born on August 30, 1871, in New Zealand, in the family of English settlers. In 1861 gold was found in New Zealand and many foreigners came to live there. Industry began to develop, the country began to increase its export. Ernest's father earned his living by bridge-building and other construction work required in the country at that period. At the same time he carried on small-scale farming.

Little Ernest was the fourth child in the family. When the boy was five he was sent to primary school. After finishing primary school he went to the secondary school. He liked to read at school very much. His favorite writer was Charles Dickens. He also liked to make models of different machines He was particularly interested in watches and cameras, he even constructed a camera himself.

At school he was good at physics, mathematics, English, French and Latin. He paid much attention to chemistry too. Ernest became the best pupil at school. At the age of 19 he finished school and entered the New Zealand University.

At the University Ernest Rutherford was one of the most talented students. He worked hard and took an active part in the work of the Scientific Society of the University. But he was also fond of sports and took part in the students sport competitions.

At one of the meetings of the Scientific Society he made his scientific report "The Evolution of Elements". At the same time he began his research work. For his talented scientific research he got a prize. After graduation Rutherford went to Cambridge where he continued his investigations (исследования).

Some years later Rutherford moved to Canada to continue his research work at the University in Montreal. Besides his successful researches he also lectured a lot at the leading Universities of the United States and England.

Rutherford's famous work "The Scattering (распространение) of Alpha and Beta Particles of Matter and the Structure of the Atom" proved that the atom could be bombarded so that the electrons could be thrown off, and the nucleus (ядро) itself could be broken. In the process of splitting the nucleus matter was converted into energy, which for the scientists of the 19th century seemed unbelievable.

The splitting of the atom has opened to Man new and enormous source of energy. The most important results have been obtained by splitting the atom of uranium. At present we are only at the beginning of the application of atomic energy and all its possible uses for peaceful purposes in power engineering, medicine and agriculture. Emes Rutherford paid much attention to his young pupils. After 1920 he did not make great discoveries in science, but taught young scientists who worked in the field of atomic research work. Among his favorite pupils was Pyotr Kapitsa famous Soviet physicist. Ernest Rutherford died in the autumn of 1937 at the age of 66, and was buried at Westminster Abbey not far from the graves of Isaac Newton, Charles Darwin and Michael Faraday.

Tasks for the text:

Answer the questions.

1. How did Ernest Rutherford's father earn his living? 2. In what subjects did Ernest distinguish himself (отличился)? 3. In what activities did Rutherford take part when he was a student? 4 .What did Rutherford do besides research work? 5. In what fields of economy can atomic energy find its peaceful application?

Text 5: Alfred Nobel

Alfred Nobel, the great Swedish inventor and industrialist, was a man of many contrasts. He was the son of a bankrupt, but became a millionaire, a scientist who cared for literature, an industrialist who managed to remain an idealist He made a fortune but lived a simple life, and although cheerful in company he was often sad when remained alone. A lover of mankind, he never had a wife or family to love him, a patriotic son of his native land, he died alone in a foreign country. He invented a new explosive, dynamite, to improve the peacetime industries of mining and road building, but saw it used as a weapon of war to kill and injure people. During his useful life he often felt he was useless. World-famous for his works, he was never personally well-known, for while he lived he avoided publicity. He never expected any reward for what he had done. He once said that he did not see that he had deserved any fame and that he had no taste for it. However, since his death, his name has brought fame and glory to others.

He was born in Stockholm on October 21, 1833 but moved to Russia with his parents in 1842, where his father, Emmanuel, made a strong position for himself in the engineering industry. Emmanuel Nobel invented the landmine 1 and got plenty of money for it from government orders during the Crimean War, but then, quite suddenly went bankrupt.2 Most of the family went back to Sweden in 1859. Four years later Alfred returned there too, beginning his own study of explosives in his father's laboratory. It so occurred that he had never been to school or University but had studied privately and by the time he was twenty was a skillful chemist and excellent Ibguist having mastered Swedish, Russian, German, French and English. Like his father, Alfred Nobel was imaginative and inventive, but he had better luck in business and showed more financial sense He was quick to see industrial openings for his scientific inventions and built up over 80 companies in 20 different countries Indeed his greatness lay in his outstanding ability to combine the qualities of an original scientist with those of a forward-looking industrialist.

But Nobel was never really concerned about making money or even making scientific discoveries. Seldom happy, he was always searching for a meaning to life, and from his youth had taken a serious interest in literature and philosophy. Probably because he could not find ordinary human love he never married – he began to care deeply about the whole mankind He took every opportunity to help the poor: he used to say that he would rather take care of the stomachs of the living than the glory of the dead in the form of stone memorials. His greatest wish, however, was to see an end to wars, and thus peace between nations; and he spent much time and money working for the cause until his death in Italy in 1896. His famous will, in which he left money to provide prizes for outstanding work in physics, chemistry, physiology, medicine, economics, literature and promotion of world peace is a memorial to his interests and ideals. And so the man who often believed that he was useless and had done little to justify his life is remembered and respected long after his death. Nobel's ideals which he expressed long before the threat of nuclear war have become the ideals of all progressive people of the world. According to Nobel's will the capital was to be safely invested to form a fund. The interest' on this fund is to be distributed annually in the form of prizes to those who, during the previous year, did the work of the greatest use to mankind within the fields of physics, chemistry, physiology or medicine, economics, literature and to the person who has done the most for brotherhood between nations, for the abolition or reduction of permanent armies and for the organization and encouragement of peace conferences.

He will Nobel wrote that it was his firm wish that in choosing the prize winner no consideration should be given to the nationality of the candidates, but that the most worthy should receive the prize, whether Scandinavian or not. This will was written in Paris, on November 27th, 1895. Since Nobel's death many outstanding scientists, writers and public figures from different countries have become Nobel prize winners.

Tasks for the text:

Read the text again and divide it into four parts. Give titles to these parts choosing the most suitable from the list below:

1. The childhood and youth of Alfred Nobel.
2. The career of Alfred Nobel's father.
3. The contrasts in the life of Alfred Nobel.
4. The life ideals of Alfred Nobel.

5. Alfred Nobel as a scientist.
6. Alfred Nobel's will.
7. Nobel prize winners.

Text 6: Alexander Graham Bell

Alexander Graham Bell was born in Edinburgh in 1847. His father was a world-famous teacher of speech and the inventor of a system which he called “Visible Speech”. It helped deaf (глухой) persons to pronounce words they could not hear. Alexander chose the same profession, and as his father became a teacher of the deaf, he moved to the United States and began to teach deaf children to speak. At the same time he worked at improving his father’s invention.

In 1866, the nineteen-year-old Bell started thinking about sending tones (звуки) by telegraph. It was then that there came to his mind the idea of the “harmonic telegraph”, which would send musical tones electrically from one place to another. Bell was not a scientist. So he had to give all his energy and time to one thing only – knowledge of electricity. There was little time for rest ant little time to eat. Hour after hour, day and night he and his friend Watson worked at testing and experimenting with the telephone. Sometimes it worked and sometimes it did not. “We have to do something to make our telephone work better,” Bell used to say again and again. At last they decided to try a new kind of transmitter (микрофон). The new transmitter was set (устанавливать) in Bell’s bedroom. Watson was sitting in the laboratory. He put his ear to the receiver (трубка) and was waiting. Suddenly he heard Bell’s voice. And not the voice only but the words too. “Mr. Watson, come here. I want you.” It was on the 10^{th} of March, 1876. Alexander Graham Bell had invented the telephone. In a few years there were telephones all over the world. In 1915, the first transcontinental telephone line was opened. Graham Bell, a very old man now, sat in New York at a desk with a telephone before him, while his friend Watson was listening more than three hundred thousand miles away in San Francisco. People were interested what speech Bell had prepared for that great day, on which the telephone invented by him was to carry sound from the Atlantic coast to the Pacific.

Bell was sitting in a big hall; there were many people in it. Everyone expected to hear a serious, scientific speech. Suddenly everybody heard his clear voice as he spoke into his old transmitter, “Mr. Watson, come here. I want you”. He repeated the words which he had said almost forty years ago. Much to the amusement (удовольствие) of the people Watson answered, “I would be glad (рад) to come, but it would take me a week”.

Tasks for the text:

a) Complete sentences choosing the variant corresponding to the contents of the text.

1. Alexander Bell was:
a) an engineer
b) a teacher
c) a doctor.

2. He worked at inventing:
a) a radio -set
b) a tape-recorder
c) telephone.

3. He worked at it:
a) alone
b) with his friend
c) with a group of scientists.

4 .The first transcontinental telephone line was opened between:
a) New York and San Francisco
b) Paris and London,
c) Rome and Berlin.

5. During the experiment Mr.Watson:
a) heard very badly
b) Bell very well
c) nothing.

5. Answer the following questions:

1. What did Alexander Bell's father invent?
2. Whom and where did Alexander Bell teach?
3 What did Alexander Bell begin to work at when he was nineteen years old?
4. What device did A. Bell use which made his invention work well?
5. How many years later was the first transcontinental telephone line opened?
6. Who made the first test of the transcontinental telephone line between New York and San Francisco?
7. What did Bell say on the opening of this line and what impression did it make on the listeners?

Text 7: Little -known facts about well-known people

1. Was Einstein a capable or a backward (умственно отсталый) child?

Albert Einstein is one of the greatest scientists of our age, yet in his childhood he was slow, shy and backward. He found it extremely difficult to talk.

2. What kind of life did Einstein lead?

Later he became one of the most famous men in world. The Theory of Relativity brought him fame on five continents. Yet, he led a very simple sort of life, went around in old clothes, and seldom wore a hat. He said that he did not care for fame or riches. The captain of a transatlantic ship once offered Einstein the most expensive rooms on the ship; Einstein refused and said he would rather travel on deck than accept any special favours (привилегия).

3. What brought Einstein more joy than anything else?

Einstein impressed everybody as being a very happy man. He said he was happy because he didn't want anybody. He didn't want money or praise. He made his own happiness out of such simple things as his work, his violin and his boat. Einstein's violin brought him more joy than anything else in life. He said he often thought in music.

4. By what illustration did Einstein explain his Theory of Relativity?

Einstein's Theory of Relativity, which seemed a flight of imagination (полет воображения) to many at first, is now the cornerstone of modern physics. Many physical phenomena could never be explained without the Theory of Relativity. Einstein said that there were only twelve people living who understood his Theory of Relativity, although more than nine hundred books had been written trying to explain it.

He himself explained relativity by this very simple illustration: "When you sit with a nice girl for an hour, you think it is only a minute; but when you sit on a hot stove for a minute, you think it is an hour. Well, well – so that's relativity. It sounds all right to me; but if you don't believe me and would like to try it out (хотели бы проверить), I'll be glad to sit with the girl if you'll sit on the stove."

5. What two rules of conduct did Einstein have?

Mrs. Einstein said that even she didn't understand the Theory of Relativity; but she understood something that is more important for a wife; she understood her husband. Mrs. Einstein said that her husband liked order in his thinking, but he didn't like it in his living. He did whatever he wanted to, whenever he wanted to, he had only two rules of conduct (поведение). The first was: don't have any rules whatever. And the second was: be independent of the opinions (мнение) of others.

Text 8: Early history of the automobile (Part 1)

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

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

3. In Russia there were cities where motor cars were outlawed altogether. When the editor of the local newspaper in the city of Uralsk bought a car, the governor issued these instructions to the police: “When the vehicle appears in the streets, it is to be stopped and escorted to the police station, where its driver is to be prosecuted”.

4. From 1860 to 1900 was a period of the application of gasoline engines to motor cars in many countries. The first to perfect gasoline engine was N. Otto who introduced the four-stroke cycle of operation. By that time motor cars got a standard shape and appearance.

In 1896 a procession of motor cars took place from London to Brighton to show how reliable the new vehicles were. In fact, many of the cars broke, for the transmissions were still unreliable and constantly gave trouble. The cars of that time were very small, two-seated cars with no roof, driven by an engine placed under the seat. Motorists had to carry large cans of fuel and separate spare tyres, for there were no repair or filling stations to serve them.

After World War I it became possible to achieve greater reliability of motor cars, brakes became more efficient. Constant efforts were made to standardize common components. Multi-cylinder engines came into use, most commonly used are four-cylinder engines.

5. Like most other great human achievements, the motor car is not the product of any single inventor. Gradually the development of vehicles driven by internal combustion engine – cars, as they had come to be

known, led to the abolition of earlier restrictions. Huge capital began to flow into the automobile industry.

From 1908 to 1924 the number of cars in the world rose from 200 thousand to 20 million; by 1960 it had reached 60 million! No other industry had ever developed at such a rate.

6. There are about 3,000 Americans who like to collect antique cars. They have several clubs such as Antique Automobile Club and Veteran Motor Car Club, which specialize in rare models. The clubs practice meetings where members can exhibit their cars. Collectors can also advertise in the magazines published by their clubs. Some magazines specialize in a single type of car such as glorious Model "T". A number of museums have exhibitions of antique automobile models whose glory rings in automobile history. But practically the best collection – 100 old cars of great rarity – is in possession of William Harrah. He is very influential in his field. 5the value of his collection is not only historical but also practical: photographs of his cars are used for films and advertisements.

7. In England there is the famous "Beaulieu Motor Museum" – the home for veteran cars. The founder of the Museum is Lord Montague, the son of one of England's motoring pioneers, who opened it in 1952 in memory of his father. Lord Montague's father was the first person in England to be fined by the police for speeding. He was fined 5 pounds for going faster than 12 miles per hour! In the Museum's collection there is a car called the Silver Ghost which people from near and far go to see. It was built by Rolls-Royce in 1907, and called the Silver Ghost because it ran so silently and was painted silver. There is a car called The Knight. It is the first British petrol-driven car. Its top speed was only 8 m.p.h.! In the Museum there is also a two-seater car built in 1903.

Text 9: Early history of the automobile (Part 2)

The early history of the automobile can be divided into a number of eras based on the prevalent means of propulsion. Later periods were defined by trends in exterior styling, size and utility preferences. In 1807 François Isaac de Rivaz designed the first car powered by an internal combustion engine fuelled by hydrogen.

In 1864 Siegfried Marcus built the first gasoline powered combustion engine which he placed on a pushcart building four progressively sophisticated combustion-engine carsover a 10-to-15-year span that influenced later cars. Marcus created the two-cycle combustion engine. The car's second incarnation in 1880 introduced a four-cycle, gasoline powered engine, an ingenious carburetor design and magneto ignition. He created an additional two models further refining his design with steering, a clutch and brakes.

The four-stroke petrol (gasoline) internal combustion engine that still constitutes the most prevalent form of modern automotive propulsion was patented by Nikolaus Otto. The similar four-stroke diesel engine was invented by Rudolf Diesel. The hydrogen fuel cell, one of the technologies hailed as a replacement for gasoline as an energy source for cars, was discovered in principle by Christian Friedrich Schönbein in 1838.The battery electric car owes its beginnings to Ányos Jedlik, one of the inventors of the electric motor, and Gaston Planté who invented the lead acid battery in 1859. In 1886 Karl Benz developed petrol or gasoline powered automobile.

This is also considered to be the first "production" vehicle as Benz made several other identical copies. The automobile was powered by a single cylinder two stroke engine. At the turn of the 20th century electrically powered automobiles were a popular method of automobile propulsion, but their common use did not last long, and they diminished to a niche market until the turn of the 20th century.

Tasks for the text:

Answer the question.

1. What is a motor vehicle? 2. What is the difference between motor vehicles and trains or trams? 3. What provides the vehicle propulsion? 4. What is global vehicle ownership per capita? 5. What is a commercial purpose of motor vehicle use? 6. What do these dates mean in the early history of the automobile?

Text 10: Electric automobiles

In 1828 Ányos Jedlik, a Hungarian who invented an early type of electric motor, created a tiny model car powered by his new motor. In 1834 Vermont blacksmith Thomas Davenport, the inventor of the first American DC electrical motor, installed his motor in a small model car which he operated on a short circular electrified track. In 1835 Professor Sibrandus Stratingh of Groningen, the Netherlands and his assistant Christopher Becker created a small-scale electrical car, powered by non-rechargeable primary cells. In 1838 Scotsman Robert Davidson built an electric locomotive that attained a speed of 4 miles per hour (6 km/h). In England a patent was granted in 1840 for the use of rail tracks as conductors of electric current, and similar American patents were issued to Lilley and Colten in 1847. Between 1832 and 1839 (the exact year is uncertain)

Robert Anderson of Scotland invented the first crude electric carriage powered by non-rechargeable primary cells.

The *Flocken Elektrowagen* of 1888 by German inventor Andreas Flocken is regarded as the first real electric car of the world.

Electric cars enjoyed popularity between the late 19th century and early 20th century when electricity was among the preferred methods for automobile propulsion providing a level of comfort and ease of operation that could not be achieved by the gasoline cars of the time. Advances in internal combustion technology, especially the electric starter, soon rendered this advantage moot; the greater range of gasoline cars, quicker refueling times, and growing petroleum infrastructure, along with the mass production of gasoline vehicles by companies such as the Ford Motor Company, which reduced prices of gasoline cars to less than half that of equivalent electric cars, led to a decline in the use of electric propulsion, effectively removing it from important markets such as the United States by the 1930s. However, in recent years increased concerns over the environmental impact of gasoline cars, higher gasoline prices, improvements in battery technology, and the prospect of peak oil have brought about renewed interest in electric cars which are perceived to be more environmentally friendly and cheaper to maintain and run despite high initial costs after a failed reappearance in the late-1990s.

Text 11: Mass Production

Mass production is the manufacture of large quantities of standardized products, frequently utilizing assembly line technology. Mass production refers to the process of creating large numbers of similar products efficiently. Mass production is typically characterized by some type of mechanization, as with an assembly line, to achieve high volume, the detailed organization of materials flow, careful control of quality standards and division of labor.

Henry Ford designed his first moving assembly line in 1913, and revolutionized the manufacturing processes of his Ford Model T. This assembly line, at the first Ford plant in Highland Park, Michigan, became the benchmark for mass production methods around the world.

It was Henry's intention to produce the largest number of cars, to the simplest design, for the lowest possible cost. When car ownership was confined to the privileged few, Henry Ford's aim was to "put the world on wheels" and produce an affordable vehicle for the general public.

In the early days, Ford built cars the same way as everybody else – one at a time. The car sat on the ground throughout the building as mechanics and their support teams sourced parts and returned to the car to assemble it from the chassis upwards. To speed the process up, cars were then assembled on benches which were moved from one team of workers to the next. But this was not fast, as Ford still needed skilled labour teams to assemble the ’hand-built’ car. So production levels were still low and the price of the car was higher to cover the costs of mechanics.

What was needed was automation. Henry and his engineers invented machines to make large quantities of the parts needed for the vehicle and devised methods of assembling the parts as fast as they were made. They were ready for the breakthrough.

To achieve Henry Ford’s goal of mass consumption through mass production, productivity needed to increase. At the Detroit factory in Michigan, workers were placed at appointed stations and the chassis was hauled along between them using strong rope. The chassis stopped at each station, where parts were fitted, until it was finally completed.

He continued experimenting until every practice was refined, and his mass production vision became a reality.

Another initiative was to use interchangeable parts that could be put together easily by unskilled workers. The experiments continued with gravity slides and conveyors. Naturally, even the placement of men and tools was meticulously researched to ensure the production line ran as efficiently as possible.

Each department, in the manufacturing process was broken down into its constituent parts. These sub-assembly lines were set up in each area until, as Henry was heard to remark, “Everything in the plant moved”. As a result, production speeds increased – sometimes they were up to four times faster.

The ultimate step was the creation of the moving final assembly line. Starting with a bare chassis, it moved along the line and through each workstation until a complete car was driven off under its own power. An essential part of this process was that all feeder lines along the route were synchronized to supply the right parts, at the right time.

Tasks for the text:

Answer the questions.

1. What is mass production? 2. What did Henry Ford designed in 1913? 3. Where was the first Ford plant located? 4. How did Ford build cars in the early days?

Text 12: The wheel, steam carriages and railways

One of mankind’s earliest and greatest inventions was the wheel. Without it there could be no industry, little transportation or communication, only crude farming, no electric power.

Nobody knows when the wheel was invented. There is trace of the wheel during the Stone Age, and it was not known to the American Indians until the White Man came. In the Old World it came into use during the Bronze Age, when horses and oxen were used as work animals. At first all wheels were solid discs.

The problem to be solved was to make the wheels lighter and at the same time keep them strong. At first holes were made in the wheels, and they became somewhat lighter. Then wheels with spokes were made. Finally, the wheel was covered with iron and with rubber. Light two-wheeled carriages were used widely in the ancient world. As time passed they were made lighter, stronger, and better. Later people joined together a pair of two-wheeled vehicle. At first only kings and queens had the privilege of driving in them.

In the West the first steam carriage was invented in France. The three-wheeled machine had the front wheel driven by a two-cylinder steam engine, and carried two people along the road at a walking pace. It was not a great success, as the boiler did not produce enough steam for keeping the carriage going for more than about 15 minutes. The steam engine appeared in 1763. It was followed by several improved steam road carriages. Their further development was prevented by railway companies. The rapid spread of railways in the United Kingdom was due largely to George Stephenson, who was an enthusiast as well as a brilliant engineer.

He demonstrated a locomotive that could run eighteen kilometers an hour and carry passengers cheaper than horses carried them. Eleven years later Stephenson was operating a railway between Stockton and Darlington. The steam locomotive was a success.

In Russia the tsar’s government showed little interest in railway transportation. After long debates the government, which did not believe in its own engineers, finally decided to invite foreign engineers to submit (представить) projects for building railways in Russia.

Yet at the very time when foreign engineers were submitting their plans, in the Urals a steam a steam locomotive was actually in use. It had been invented and built by the Cherepanovs, father and son, both skillful mechanics and serfs (крепостные). The first Russian locomotive was, of course, a “baby” compared with the locomotives of today. Under the boiler (котел) there were two cylinders which turned the locomotive’s two driving wheels (there were four wheels in all). At the front there was a smoke stack (труба), while at the back there was a platform for the driver.

Text 13: Laws of Motion

Sir Isaac Newton was one of the greatest scientists and mathematicians that ever lived. He was born in England on December 25, 1643. He was born the same year that Galileo died. He lived for 85 years. Isaac Newton was raised by his grandmother. He attended Free Grammar School and then went on to Trinity College Cambridge. Newton worked his way through college. While at college he became interested in math, physics, and astronomy. Newton received both a bachelor's and master's degree.

While Newton was in college he was writing his ideas in a journal. Newton had new ideas about motion, which he called his three laws of motion. He also had ideas about gravity, the diffraction of light and forces. Newton's ideas were so good that Queen Anne knighted him in 1705. His accomplishments laid the foundations for modern science and revolutionized the world. Sir Isaac Newton died in 1727.

According to Newton's first law an object at rest will remain at rest unless acted on by an unbalanced force. An object in motion continues in motion with the same speed and in the same direction unless acted upon by an unbalanced force. This law is often called "the law of inertia". This means that there is a natural tendency of objects to keep on doing what they're doing. All objects resist changes in their state of motion. In the absence of an unbalanced force an object in motion will maintain this state of motion.

According to Newton's second law acceleration is produced when a force acts on a mass. The greater the mass (of the object being accelerated), the greater the amount of force needed (to accelerate the object). Everyone unconsciously knows the Second Law. Everyone knows that heavier objects require more force to move the same distance as lighter objects. For an object with a constant mass m, the second law states that the force F is the product of an object's mass and its acceleration a: $F = m * a$.

This is an example of how Newton's Second Law works: Mike's car which weighs 1,000 kg is out of gas. Mike is trying to push the car to a gas station and he makes the car go 0.05 m/s/s. Using Newton's Second Law you can compute how much force Mike is applying to the car. Answer = 50 Newton's.

According to Newton's third law for every action there is an equal and opposite reaction. This means that for every force there is a reaction force that is equal in size, but opposite in direction. That is to say that whenever an object pushes another object it gets pushed back in the opposite direction equally hard.

Let's study how a rocket works to understand Newton's Third Law. The rocket's action is to push down on the ground with the force of its powerful engines, and the reaction is that the ground pushes the rocket upwards with an equal force.

Tasks for the text:

Answer the questions.

1. Who is Sir Isaac Newton? 2. What areas did Newton work? 3. What does Newton's first law state? 4. Why is Newton's first law called "the law of inertia"? 5. Which Newton's law states that acceleration is produced when a force acts on a mass? 6. What does the Newton's third law state?

Text 14: From the history of human dwellings

1. Where did primitive people look for protection? Most of the time of a modern man is spent within the walls of some building. Houses are built for dwelling; large buildings are constructed for industrial purposes; theatres, museums, public and scientific institutions are built for cultural activities of the people. The purposes of modern buildings differ widely, but all of them originate from the efforts of primitive (первобытный) men to protect themselves from stormy weather, wild animals and human enemies. Protection was looked for everywhere. In prehistoric times men looked for protection under the branches of trees; some covered themselves with skins of animals to protect themselves from cold and rain; others settled in caves (пещеры).

2. What are the earliest types of human dwellings? When the Ice Age had passed, Europe remained very cold, at least in winter, and so the people of the Old Stone Age had to find some warm and dry place to shelter from bad weather. They chose caves, dwelling places that storm and cold could not destroy. On the walls of their caves ancient people painted pictures. Such decorated caves are found in Europe, Asia and Africa. When man began to build a home for himself, caves were imitated in stone structures, trees were taken as a model for huts built of branches, skins were raised on poles and formed tents. Primitive stone structures, huts and tents are the earliest types of human dwellings, they are lost in the prehistoric past but serve as prototypes for structures of later historic times.

3. Why were the house in town higher than in country? In the days of early civilization, once men had learnt how to build simple houses for their families, they began to feel a need to have a number of different kinds of houses in one place. At first the difference was mainly in size – the chief or leader had a larger hut or tent than the rest of the people. Much later, when men began to build towns, there grew up a difference between town houses and county houses. The streets in towns were very narrow and there was not much place for building within the town walls, and therefore houses had to be built higher than they were in the country. A typical town house consisted of a shop opening on the street where the man did his work or sold his goods, with a kitchen behind and a bedroom above.

4. What were the houses in ancient Egypt built of? In the country ordinary people lived in simple one-storey cottages which did not differ much from the mud and stone huts of an earlier age. The rich people in the country, on the other hand, built huge castes (замки) with thick walls and narrow windows. These castles were built not only as dwellings, but also to stand up to enemy attack and to be strong bases in time of war. The earliest houses of which anything is known are those of ancient Egypt. They were built of bricks dried in the sun. Some of them were build around a courtyard or garden with rooms opening into it.

5. How did the light come into early English houses? Greek houses, too, had a courtyard in the middle and round their courtyard ran a covered walk (аллея), its ceiling supported by pillars. There were special women's quarters, usually upstairs on the second storey. In Rome bricks were used for building and houses were often finished with plaster over bricks on both inside and outside walls. The centre of family life was a garden-courtyard, surrounded by columns and with rooms opening out into it. The earliest houses in Britain were round, built of wood or wicker basket work (плетение из прутьев) plastered over with clay. In the centre of the house was the hearth (очаг) and light came in through the hole in the roof above it and through the door because there were no windows.

Text 15: Widely Used Building Materials

The designer must be able to select and adapt such materials of construction that will give the most effective result by the most economical means. In this choice of materials for any construction work, the civil engineer must consider many factors. These factors include availability, cost, physical properties of materials and others. Timber, steel and concrete all vary, sometimes over considerable ranges in the properties desired by the engineer. Even steel, uniform as it appears to be, varies considerably in its micro structure. Concretes even less uniform than other materials. Another important class of cement is high alumina cement. High alumina cement is a material containing alumina. It has an extremely high rate of strength increase which is, owing to the violence of the chemical reaction, accompanied by a considerable evolution of heat. It therefore follows that Portland cement like other materials can to some extent be modified to suit a particular application. The scope for such purpose-made cements hassled to the development of an increasing variety such as high alumina cement, blast-furnace slag and pozzuolanas. Portland blast-furnace cement has greater resistance to some forms of chemicals. The most important building materials may be considered to be structural steel and concrete. Concrete may be considered an artificial conglomerate of crushed stone, gravel or similar inert material with a mortar. A mixture of sand, screenings or similar inert particles with cement and water which haste capacity of hardening into a rock like mass is called mortar. The fundamental object in proportioning concrete or mortar mixes is the production of a durable material of requisite strength, water tightness another essential. The most accurate method of measuring proportions is to weigh the required quantities of each material. It is widely used in large building construction, but in small building construction the less accurate method of measuring proportions by volumes is frequently used. The chief inaccuracies in volumetric measurement arise from the wide variation in the bulk of the fine aggregate due to small changes in its moisture content and faulty methods of filling measuring devices. Workability and strength tests are chief control tests made on concrete. To be able to undergo high compressive loads is a specific characteristic of this material.

Text 16: The total cost of building materials

In history there are trends in building materials from being: natural to becoming more man-made and composite; biodegradable to imperishable; indigenous (local) to being transported globally; repairable to disposable; and chosen for increased levels of fire-safety. These trends tend to increase the initial and long term economic, ecological, energy, and social costs of building materials.

Economic

The initial economic cost of building materials is the purchase price. This is often what governs decision making about what materials to use. Sometimes people take into consideration the energy savings or durability of the materials and see the value of paying a higher initial cost in return for a lower lifetime cost. For example an asphalt shingle roof costs less than a metal roof to install, but the metal roof will last longer so the lifetime cost is less per year. Risks when considering lifetime cost of a material is if the building is damaged such as by fire or wind, or if the material is not as durable as advertised. The cost of materials should be taken into consideration to bear the risk to buy combustive materials to enlarge the lifetime. It is said that, ‘if it must be done, it must be done well’.

Ecological

Pollution costs can be macro and micro. The macro, environmental pollution of extraction industries building materials rely on such as mining, petroleum, and logging produce environmental damage at their source and in transportation of the raw materials, manufacturing, transportation of the products, retailing, and installation. An example of the micro aspect of pollution is the off-gassing of the building materials in the building or indoor air pollution. Red List building materials are materials found to be harmful. Also the carbon footprint, the total set of greenhouse gas emissions produced in the life of the material. A life-cycle analysis also includes the reuse, recycling, or disposal of construction waste. Two concepts in building which account for the ecological economics of building materials are green building and sustainable development.

Energy

Initial energy costs include the amount of energy consumed to produce, deliver and install the material. The long term energy cost is the economic, ecological, and social costs of continuing to produce and deliver energy to the building for its’ use, maintenance, and eventual removal. The initial embodied energy of a structure is the energy consumed to extract, manufacture, deliver, install, the materials. The life time embodied energy continues to grow with the use, maintenance, and reuse/recycling/disposal of the building materials themselves and how the materials and design help minimize the life-time energy consumption of the structure.

Social

Social costs are injury and health of the people producing and transporting the materials and potential health problems of the building occupants if there are problems with the building biology. Globalization has had significant impacts on people both in terms of jobs, skills, and self-sufficiency are lost when manufacturing facilities are closed and the cultural aspects of where new facilities are opened. Aspects of fair trade and labor rights are social costs of global building material manufacturing.

Text 17: The properties of building materials

Materials that are used for structural purposes should meet several requirements. In most cases it is important that they should be hard, durable, fire-resistant and easily fastened together.

The most commonly used materials are steel, concrete, stone, wood and brick. They differ in hardness, durability and fire-resistance. Wood is the most ancient structural material. It is light, cheap and easy to work. But wood has certain disadvantages: it burns and decays. Stone belongs to one of the oldest building materials used by man. It is characteristic of many properties. They are mechanical strength, compactness, porosity, sound and heat insulation and fire-resistance. Bricks were known many thousands of years ago. They are the examples of artificial building materials.

Concrete is referred to as one of the most important building materials. Concrete is a mixture of cement, sand, crushed stone and water. Steel has come into general use with the development of industry. Its manufacture requires special equipment and skilled labor. Plastics combine all the fine characteristics of a building material with good insulating properties. It is no wondered that the architects and engineers have turned to them to add beauty to modern homes and offices. All building materials are divided into three main groups: 1) Main building materials such as rocks and artificial stones, timber and metals. 2) Binding materials such as lime, gypsum and cement. 3) Secondary or auxiliary materials which are used for the interior parts of the building.

We use main building materials for bearing structures. Binding materials are used for making artificial stone and for joining different planes. For the interior finish of the building we use secondary materials. Natural building materials are: stone, sand, lime and timber. Cement, clay products and concrete are examples of artificial building materials.

Tasks for the text:

Answer the questions. 1. What are the properties of the building materials? 2. What are the most commonly used building materials? 3. Do building materials differ from each other? 4. What can you say about the most ancient building materials? 5. What can you say about bricks? 6. Is concrete an artificial or natural building material? 7. Into what groups do we divide building materials? 8. Can you give an example of a building material? 9. What artificial building materials do you know? 10. What natural building materials do you know?

Text 18: Cementitious materials

Cementations materials include the many products that are mixed with either water or some other liquid or both to form a cementing paste that may be formed or molded while plastic but will set into a rigid shape. When sand is added to the paste, mortar is formed. A combination of coarse and fine aggregate (sand) added to the paste forms concrete.

TYPES OF CEMENTITIOUS MATERIALS

There are many varieties of cements and numerous ways of classification. One of the simplest classifications is by the chemical constituent that is responsible for the setting or hardening of the cement. On this basis, the silicate and aluminates cements, wherein the setting agents are calcium silicates and aluminates, constitute the most important group of modern cements. Included in this group are the Portland, aluminous, and natural cements. Limes, wherein the hardening is due to the conversion of hydroxides to carbonates, were formerly widely used as the sole cementations material, but their slow setting and hardening are not compatible with modern requirements. Hence, their principal function today is to plasticize the otherwise harsh cements and add resilience to mortars and stuccoes. Use of limes is beneficial in that their slow setting promotes healing, the recementing of hairline cracks. Another class of cements is composed of calcined gypsum and its related products. The gypsum cements are widely used in interior plaster and for fabrication of boards and blocks; but the solubility of gypsum prevents its use in construction exposed to any but extremely dry climates. Oxychloride cements constitute a class of specialty cements of unusual properties. Their cost prohibits their general use in competition with the cheaper cements; but for special uses, such as the production of spark proof floors, they cannot be equaled. Masonry cements or mortar cements are widely used because of their convenience. While they are, in general, mixtures of one of more of the above-mentioned cements with some admixtures, they deserve special consideration because of their economies. Other cementitious materials, such as polymers, fly ash, and silica fume, may be used as a cement replacement in concrete. Polymers are plastics with long chain molecules. Concretes made with them have many qualities much superior to those of ordinary concrete. Silica fume, also known as micro silica, is a waste product of electric-arc furnaces. The silica reacts with limes in concrete to form a cementitious material. A fume particle has a diameter only 1% of that of a cement particle. Properties of cement. All types of cement shrink during setting. In a normal concrete the amount of this shrinkage will depend both on the proportion of cement in the mix and the quantity of mixing water employed. Provided enough water is present to enable the chemical action of setting to take place, and then the smaller t amount of water the less shrinkage there will be. The type of aggregate used has an appreciable effect upon both the amount of water and the amount off aggregate that can be mixed with given quantity of cement. Strength and durability of concrete are linked properties in that they are both associated with the low water-cement ration. In addition to the proportion of cement and the water cement ratio of a cement product, the method of curing will also affect the amount of shrinkage. Normally, the slower the drying the less shrinkage there will be. All cement products are able to a considerable shrinkage during setting and hardening.

PORTLAND CEMENTS

Portland cement, the most common of the modern cements, is made by carefully blending selected raw materials to produce a finished material meeting the requirements of ASTM C150 for one of eight specific cement types. Four major compounds and two minor compounds constitute the raw materials. The calcareous materials typically come from limestone, calcite, marl, or shale. The argillaceous materials are derived from clay, shale, and sand. The materials used for the manufacture of any specific cement are dependent on the manufacturing plant's location and availability of raw materials. Portland cement can be made of a wide variety of industrial by-products. In the manufacture of cement, the raw materials are first mined and then ground to a powder before blending in predetermined proportions. The blend is fed into the upper end of a rotary kiln heated to 2600 to 3000F by burning oil, gas, or powdered coal. Because cement production is an energy-intensive process, reheaters and the use of alternative fuel sources, such as old tires, are used to reduce the fuel cost. (Burning tires provide heat to produce the clinker and the steel belts provide the iron constituent.) Exposure to the elevated temperature chemically fuses the raw materials together into hard nodules called cement clinker. After cooling, the clinker is passed through a ball mill and ground to fineness where essentially all of it will pass a No. 200 sieve (75 m). During the grinding, gypsum is added in small amounts to control the temperature and regulate the cement setting time. The material that exits the ball mill is Portland cement. It is normally sold in bags containing 94 lb of cement. Concrete, the most common use for Portland cement, is a complex material consisting of Portland cement, aggregates, water, and possibly chemical and mineral admixtures. Only rarely is Portland cement used alone, such as for a cement slurry for filling well holes or for a fine grout. Therefore, it is important to examine the relationship between the various Portland cement properties and their potential effect upon the finished concrete. Portland cement concrete is generally selected for structural use because of its strength and durability. Strength is easily measured and can be used as a general directly proportional indicator of overall durability. Specific durability cannot be easily measured but can be specified by controlling the cement chemistry and aggregate properties.

ALUMINOUS CEMENTS

These are prepared by fusing a mixture of aluminous and calcareous materials (usually bauxite and limestone) and grinding the resultant product to a fine powder. These cements are characterized by their rapid-hardening properties and the high strength developed at early ages. Table 4.3 shows the relative strengths of 4-in cubes of 1:2:4 concrete made with normal Portland, high-early-strength Portland, and aluminous cements. Since a large amount of heat is liberated with rapidly by aluminous cement during hydration, care must be taken not to use the cement in places where this heat cannot be dissipated. It is usually not desirable to place aluminous-cement concretes in lifts of over 12 in; otherwise the temperature rise may cause serious weakening of the concrete. Aluminous cements are much more resistant to the action of sulfate waters than are Portland cements. They also appear to be much more resistant to attack by water containing aggressive carbon dioxideor weak mineral acids than the silicate cements. Their principal use is in concretes where advantage may be taken of their very high early strength or of their sulfate resistance, and where the extra cost of the cement is not an important factor. Another use of aluminous cements is in combination with firebrick to make refractory concrete. As temperatures are increased, dehydration of the hydration products occurs. Ultimately, these compounds create a ceramic bond with the aggregates.

NATURAL CEMENTS

Natural cements are formed by calcining a naturally occurring mixture of calcareous and argillaceous substances at a temperature below that at which sintering takes place. The ‘‘Specification for Natural Cement’’ requires that the temperature be no higher than necessary to drive off the carbonic acid gas. Since natural cements are derived from naturally occurring materials and no particular effort is made to adjust the composition, both the composition and properties vary rather widely. Some natural cement may be almost the equivalent of Portland cement in properties; others are much weaker. Natural cements are principally used in masonry mortars and as an admixture in Portland-cement concretes.

LIMES

These are made principally of calcium oxide (CaO), occurring naturally in limestone, marble, chalk, coral, and shell. For building purposes, they are used chiefly in mortars. Hydraulic Limes these are made by calcining a limestone containing silica and alumina to a temperature short of incipient fusion so as to form sufficient free lime to permit hydration and at the same time leave unhydrated sufficient calcium silicates to give the dry powder its hydraulic properties. Because of the low silicate and high lime contents, hydraulic limes are relatively weak. They find their principal use in masonry mortars. A hydraulic lime with more than 10% silica will set under water.

Tasks for the text:

1. Ask and answer the questions about building materials used:

The sand should be clean and free from clay and vegetable matter because when it is mixed with water and cement a chemical action takes place. Therefore, if impurities are present, the binding or adhesion is affected.

2. Insert the needed words and groups of words:

Portland cement is a … product. It is made of …, … or … . They are … and … with water to form a paste. The mixture is then … in a kiln. The clinker is ground to … .

Text 19: Town planning

That cities should have a plan is now admitted in our time of large scale construction and plan making has become an everyday activity. The purpose of a town plan is to give the greatest possible freedom to the individual. It does this by controlling development in such a way that it will take place in the interests of the whole population.

The new development absorbs or modifies an existing environment, and so before it can be designed it is necessary to find out about that environment. It is also necessary to do research of the trends of population growth, the distance from work to home, the preferences for different types of dwelling, the amount of sunshine in rooms, the degree of atmospheric pollution and so on. After the survey is complete a forecast of future development is made in the form of a map, or series of maps: the master plan or development plan. As no one can be certain when the development is to take place and since a society is an organic thing, with life and movement, the plan of a city must be flexible so that it may extend and renew its dwellings, reconstruct its working places, complete its communications and avoid congestion in every part.

The plan is never a complete and fixed thing, be rather one that is continually being adapted to the changing needs of the community for whom it is designed. Until quite recent year town plans were always made as inflexible patterns, but history has shown that a plan of this description inevitably breaks down in time. The flexible plan, preceded by a survey, is one of the most revolutionary ideas that man has ever had about the control of his environment.

Most cities today have a characteristic functional pattern as follows: a central core containing the principal shopping center, business zones, surrounded by suburbs of houses. Most town planners accept the traditional town pattern. In the preparation of a master plan they are preoccupied with the definition of the town center, industrial areas and the areas of housing; the creation of open space for recreation, the laying down a pattern of main road which run between the built-up areas (thus leaving then free of through traffic) and connect them to each other.

The master plan thus has to define the ultimate growth of the town, but though the master plan is a diagram, and even a flexible one, it is the structure upon which all future development is to take place.

Tasks for the text:

Answer the questions.

1. What is the purpose of a town plan? 2. What research is necessary to do for town planning? 3. Why must the plan of the city be flexible? 4. Most towns today have a characteristic functional pattern, haven't they? 5. What does the master plan define?

Text 20: Types of buildings

The type and the function of a building govern its design, building materials and techniques. But the common and necessary conditions are: its suitability to use by human beings in general and its adaptability to particular human activities the stability and permanence of its construction.

Speaking of residential construction we must say that the apartment houses are mostly built to suit urban conditions. Group housing provides home for many families and is at once public and private. The techniques of construction or the methods by which structures are formed from particular materials are influenced not only by the availability and character of materials but also by the total technological development of society.

The evolution of techniques is conditioned by two factors: one is economic – the search for a maximum of stability and durability in building with a minimum of materials, labor and time; the other is expressive – the desire to produce meaningful form. Techniques evolve rapidly when economic requirements suggest new expressive forms or when the conception of new forms demands new procedures.

Large housing programs have tended to stimulate technological change in the building industry. Craft operations at the building site are being replaced by mechanized operations at the factory and houses are increasingly becoming assemblages of factory-made elements. Windows and doors, once made and fitted by carpenters at the site now arrive from a factory fitted and finished with hardware and glass, ready to be set in place. Modular design (i.e. design in which the elements are dimensioned in combinations of a fixed unit) has led to standardization of elements, interchangeability of parts and increased possibilities for mass production, with resultant economies. A wide variety of mass-produced elements from which substantial portions of the house can be assembled are now available. Examples are kitchen cabinets and mechanical equipment and window and door units. Entire apartment assemblages are available and are being used to an increasing extent. These techniques aim at a higher output of better structures at lower cost.

The high degree of mechanization and standardization is successfully achieved by reinforced concrete blocks and units. Reinforced concrete homes are produced by a variety of construction methods. Various methods of constructing reinforced concrete houses involve extensive use of large sections manufactured in heavily mechanized factories and erected at the site.

The built-in space of an apartment should be carefully thought of as well. The contemporary trend is expressed by joining the living and dining areas into a single space or by relating the kitchen and dining areas. It has become increasingly important as rooms that have become smaller should appear as spacious as possible. Therefore, there is a considerable trend toward built-in furniture. Rooms should be both efficient and visually satisfying. The extent of built in cabinets must be determined. Drawers and shelves can often be concealed behind walls, freeing valuable floor space.

The windows and doors must look well from the interior as well as from the exterior. Satisfactory functioning is also involved; windows must be sized and located for the best possible lighting and ventilation; as for electricity it should be mentioned that the electric load of most houses has increased enormously as standards of lighting rose and mechanical and household equipment multiplied. Great technological advances have been made in plumbing. Much progress has been made with respect to standardization and production of the elements of kitchen equipment.

Text 21: Westminster Abbey

It is safe to say that the three most famous buildings in England are Westminster Abbey, the Tower of London and St. Paul’s Cathedral.

Westminster Abbey is a fine Gothic building, which stands opposite the Houses of Parliament. It is the work of many hands and different ages. The oldest part of the building dates from the eighth century.

It was a monastery – the West Minster. In the 11th century, Edward the Confessor after years spent in France founded a great Norman Abbey. In 200 years Henry III decided to pull down the Norman Abbey and build a more beautiful one after the style then prevailing in France. Since then the Abbey remains the most French of all English Gothic churches, higher than any other English church (103 feet) and much narrower. The towers were built between 1735–1740. One of the greater glories of the Abbey is the Chapel of Henry VII, with its delicate fan-vaulting.

The Chapel is of stone and glass, so wonderfully cut and sculptured that it seems unreal. It contains an interesting collection of swords and standards of the “Knights of the Bath”. The Abbey is famous for its stained glass.

Since the far-off time of William the Conqueror, Westminster Abbey has been the crowning place of the kings and queens of England. The Abbey is sometimes compared with a mausoleum, because there are tombs and memorials of almost all English monarchs, many statesmen, famous scientists, writers and musicians. In 1997, the funeral of Diana, Princess of Wales, took place there.

If you go past the magnificent tombstones of kings and queens, some made of gold and precious stones, past the gold-and-silver banners of the Order of the Garter which are hanging from the ceiling, you will come to Poets’ Corner. There many of the greatest writers are buried: Geoffrey Chaucer’, Samuel Johnson, Charles Dickens, Alfred Tennyson, Thomas Hardy and Rudyard Kipling. Here too, though these writers are not buried in Westminster Abbey, are memorials to William Shakespeare and John Milton, Burns and Byron, Walter Scott, William Makepeace Thackeray and the great American poet Henry Wadsworth Longfellow.

Here in the Abbey there is also the Tomb of the Unknown Warrior, a symbol of the nation’s grief. The inscription on the tomb reads: “Beneath this stone rests the body of a British Warrior unknown by name or rank brought from France to lie among the most illustrious of the land...”

In the Royal Air Force Chapel there is a monument to those who died during the Battle of Britain, the famous and decisive air battle over the territory of Britain in the Second World War.

Text 22: St Paul's Cathedral

St Paul's Cathedral is the work of the famous architect Sir Christopher Wren. It is said to be one of the finest pieces of architecture in Europe. Work on Wren's masterpiece began in 1675 after a Norman church, old St Paul's, was destroyed in the Great Fire of 1666. For 35 years the building of St Paul's Cathedral went on, and Wren was an old man before it was finished. From far away you can see the huge dome with a golden ball and cross on the top.

But if you want to reach the foot of the ball, you have climb 637 steps. As for Christopher Wren, who is now Known as `the architect of London`, he found his fame only after his death. He was buried in the Cathedral.

Those who are interested in English architecture can study all the architectural styles of the past 500 or 600 years in Cambridge. The College is the most beautiful building in Cambridge and one of the greatest Gothic buildings in Europe. It is built in the Perpendicular style. Its foundation stone was laid in 1446. The interior of the Chapel is a single lofty aisle and the stonework of the walls is like lace. The Chapel has a wonderful fan vaulting which is typical of the churches of that time. We admire the skill of the architects and crafts men who created all these wonderful buildings.

Text 23: The Tower of London

The Tower on the north bank of the Thames is one of the most ancient buildings of London. It was founded in the 11th century by William the Conqueror. But each monarch has left some kind of personal mark on it. For many centuries the Tower has been a fortress, a palace, a prison and royal treasury. It is now a museum of arms and armour, and as one of the strongest fortresses in Britain, it has the Crown Jewels.

The grey stones of the Tower could tell terrible stories of violence and injustice. Many sad and cruel events took place within the walls of the Tower. It was here that Thomas More, the great humanist, was falsely accused and executed. Among the famous prisoners executed at the Tower were Henry VIII'swives Ann Boleyn and Catherine Howard.

When Queen Elizabeth was a princess, she was sent to the Tower by Mary I Tudor ("Bloody Mary") her half-sister and kept prisoner for some time. The ravens, whose forefathers used to find food in the Tower, still live there as part of its history. There is a legend that if the ravens disappear the Tower will fall. That is why the birds are carefully guarded.

The White Tower was built by William the Conqueror to protect and control the City of London. It is the oldest and the most important building, surrounded by other towers, which all have different names. The Tower is guarded by the Yeomen Warders, popularly called “Beefeaters”. There are two letters, E. R., on the front of their tunics. They stand for the Queen’s name Elizabeth Regina. The uniform is the same as the one in Tudor times. Their everyday uniform is black and red, but on state occasions they wear a ceremonial dress: fine red state uniforms with the golden and black stripes and the wide lace-collar, which were in fashion in the 16th century.

Every night at 10 p.m. in the Tower of London the Ceremony of the Keys (or locking up of the Tower for the night) takes place. It goes back to the Middle Ages. Five minutes before the hour the Head warder comes out with a bunch of keys and an old lantern. He goes to the guardhouse and cries: “Escort for the keys.” Then he closes the three gates and goes to the sentry, who calls: “Halt, who comes there? The Head warder replies: “The Keys.” “Whose Keys?” demands the sentry. “Queen Elizabeth’s Keys,” comes the answer. “Advance Queen Elizabeth’s Keys. All’s well.” The keys are finally carried to the Queen’s House where they are safe for the night. After the ceremony everyone who approaches the gate must give the password or be turned away.

Text 24: Building construction

Building construction is the process of adding structure to real property or construction of buildings. The vast majority of building construction jobs are small renovations, such as addition of a room, or renovation of a bathroom. Often, the owner of the property acts as laborer, paymaster, and design team for the entire project. However, all building construction projects include some elements in common – design, financial, estimating and legal considerations. Many projects of varying sizes reach undesirable end results, such as structural collapse, cost overruns, and/or litigation. For this reason, those with experience in the field make detailed plans and maintain careful oversight during the project to ensure a positive outcome.

Commercial building construction is procured privately or publicly utilizing various delivery methodologies, including cost estimating, hard bid, negotiated price, traditional, management contracting, construction management-at-risk, design & build and design-build bridging.

Residential construction practices, technologies, and resources must conform to local building authority regulations and codes of practice. Materials readily available in the area generally dictate the construction materials used (e.g. brick versus stone, versus timber). Cost of construction on a per square meter (or per square foot) basis for houses can vary dramatically based on site conditions, local regulations, economies of scale (custom designed homes are often more expensive to build) and the availability of skilled trades people. As residential construction (as well as all other types of construction) can generate a lot of waste, careful planning again is needed here.

Residential construction:

1. The most popular method of residential construction in North America is wood-framed construction. Typical construction steps for a single-family or small multi-family house are:
2. Develop floor plans and obtain government building approval if necessary
3. Clear the building site
4. Pour a foundation with concrete
5. Build the main load-bearing structure out of thick pieces of wood and possibly metal I-beams for large spans with few supports. See framing (construction)
6. Add floor and ceiling joists and install subfloor panels
7. Cover outer walls and roof in particle board or plywood and vapor barrier.
8. Install roof shingles or other covering for flat roof
9. Cover the walls with siding, typically vinyl or wood, but possibly stone or other materials
10. Install windows
11. Frame out interior walls with wooden 2×4s
12. Add internal plumbing, HVAC, electrical, and natural gas utilities
13. Building inspector visits if necessary to approve utilities and framing
14. Install interior dry wall panels and fiberglass insulation to make walls and ceilings
15. Install bathroom fixtures
16. Spackle, prime, and paint interior walls and ceilings
17. Additional tiling on top of drywall for wet areas, such as the bathroom and kitchen backsplash
18. Install final floor covering, such as floor tile, carpet, or wood flooring
19. Install major appliances

20. Unless the original owners are building the house, at this point it is typically sold or rented.

Text 25: Modern Architecture

Modern architecture is the term universally applied to the style of building, which evolved a number of countries after the First World War as the International Style and which has culminated in the current design of glass, concrete and steel based on module construction presently being erected all over the world.

In the early 20th century an instinctive desire of architects to break away from the confusions and contrivances of the 19th century, and their efforts to introduce a style which responded to new social needs and exploited new materials led to the changed appearance of buildings; simple rectangular outlines; avoidance of symmetry; absence of applied ornament; flat roofs and white walls, resulting from the use of reinforced concrete, now the favorite material; large windows, which new structural techniques permitted, but which were encouraged also by the spirit of the times, which believed in opening up the interiors of buildings to light and air. The development of the International Style was reinforced by two events: a series of exhibitions at which architects from different countries saw and were influenced by each other's experiments and the formation of international organization – The Congres Internationaux d'Architecture Moderne – through which ideas could be exchanged and mutual support enjoyed. The dominant figure in modern architecture of the time was Le Corbusier whose works became monuments of modern architecture. Until the 1930s, Germany was the main center of new architecture because of the presence there of another unifying institution, the Bauhaus, a college of design, which became synonymous with modern teaching methods in architecture.

In the years after 1945 the emphasis was on town–planning and housing. This was the era of new towns, vast housing estates. In matters of architectural style, if became less a question of conflict between period revival and modern design than between buildings designed for effect and those that aimed at the creation of a modern vernacular and a humane and harmonious environment. The Modern Movement cannot be said to have had a clear historical end. It always exited concurrently with other ways of designing.

Text 26: Construction processes

In the modern industrialized world, construction usually involves the translation of designs into reality. A formal design team may be assembled to plan the physical proceedings, and to integrate those proceedings with the other parts. The design usually consists of drawings and specifications, usually prepared by a design team including surveyors, civil engineers, cost engineers (or quantity surveyors), mechanical engineers, electrical engineers, structural engineers, fire protection engineers, planning consultants, architectural consultants, and archaeological consultants. The design team is most commonly employed by (i.e. in contract with) the property owner. Under this system, once the design is completed by the design team, a number of construction companies or construction management companies may then be asked to make a bid for the work, either based directly on the design, or on the basis of drawings and a bill of quantities provided by a quantity surveyor. Following evaluation of bids, the owner typically awards a contract to the most cost efficient bidder.

The modern trend in design is toward integration of previously separated specialties, especially among large firms. In the past, architects, interior designers, engineers, developers, construction managers, and general contractors were more likely to be entirely separate companies, even in the larger firms. Presently, a firm that is nominally an "architecture" or "construction management" firm may have experts from all related fields as employees, or to have an associated company that provides each necessary skill. Thus, each such firm may offer itself as "one-stop shopping" for a construction project, from beginning to end. This is designated as a "design build" contract where the contractor is given a performance specification and must undertake the project from design to construction, while adhering to the performance specifications.

Several project structures can assist the owner in this integration, including design-build, partnering and construction management. In general, each of these project structures allows the owner to integrate the services of architects, interior designers, engineers and constructors throughout design and construction. In response, many companies are growing beyond traditional offerings of design or construction services alone and are placing more emphasis on establishing relationships with other necessary participants through the design-build process.

The increasing complexity of construction projects creates the need for design professionals trained in all phases of the project's life-cycle and develop an appreciation of the building as an advanced technological system requiring close integration of many sub-systems and their individual components, including sustainability. Building engineering is an emerging discipline that attempts to meet this new challenge.

Text 27: Concrete

It is difficult to imagine modern structure without concrete. Concrete is the very building material which led to great structural innovations. The most important quality of concrete is its property to be formed into large and strong monolithic units. The basic materials for making concrete are cement, aggregate and water. Cement is the most essential and important material for making concrete of high quality. Cement is made of limestone and clay. It is burnt at high temperature and ground up into powder. Depending on the kind and composition of the raw materials different types of cement are obtained. Portland cement, blast furnace cement are suitable for putting up marine structures.

Concrete is made by mixing cement, water, sand and gravel in the right amount. As soon as it is thoroughly mixed it is poured into forms that hold it in place until it hardens. Cement starts hardening one hour after the water has been added and the process of hardening lasts for about twenty-eight days. The process is called concrete curing.

The characteristics of concrete depend upon the quality of the materials used, grading of the aggregates, proportioning and amount of water. The most important requirements for concrete are: it should be strong, hard, durable, fire-resistant and economical. Concrete may be divided into two classes: mass or plain concrete and reinforced concrete where it is necessary to introduce steel. Plain concrete can be used for almost all kinds of buildings. Reinforced concrete is used for building bridges and arches, dams and dock-walls, for under-water structures, for foundations, columns, and beams and so on.

At present two types of new building materials are successfully used by our builders: alkali-slag concrete and silica concrete. Silica concrete is light, acid-proof and contains no cement. It is widely used in aviation and in under water constructions.

Text 28: Reinforced Concrete

Reinforced concrete is a combination of two of the strongest structural materials, concrete and steel. This term is applied to a construction in which steel bars or heavy steel mesh are properly embedded in concrete. The steel is put in position and concrete is poured around and over it, and then tamped in place so that the steel is completely embedded. When the concrete hardens and sets, the resulting material gains great strength. This new structural concrete came into practical application at the turn of the 19th century.

The reinforcing of concrete was first introduced in France in 1861 by Joseph Monier, who constructed flower pots, tubs and tanks, and Francois Coignet, who published theories of reinforcing for beams, arches, and large pipes. Very little was accomplished in building construction until twenty-five years later when German and Austrian engineers developed formulas for design, and Hennebique in France began the use of bent-up bars. Between 1880 and 1890 several reinforced concrete buildings were erected in the United States, and since 1896 the development of reinforced concrete work has made great progress. And the reasons of this progress are quite evident. Concrete has poor elastic and tensional properties, but it is rigid, strong in compression, durable under and above ground and in the presence or absence of air and water, it increases its strength with age. Steel has great tensional, compressive and elastic properties, but it is not durable being exposed to moisture, it loses its strength with age, or being subjected to high temperature. So, what is the effect of the addition of steel reinforcement to concrete?

Steel does not undergo shrinkage or drying but concrete does and therefore steel acts as a restraining medium in a reinforced concrete member. First there was a tendency among architects to consider reinforced concrete as a method of construction suited only to heavy and massive structures. Much study and experience have led to vast improvements in the manufacture of this concrete. The potentialities of a substance which can be poured into any form or shape from delicate ornament to huge cantilevers and parabolic arches and which is monolithic throughout its mass appear to be in the hands of the creators of concrete buildings.

Text 29: The History of Computer Development

The rapidly advancing field of electronics led to construction of the first general-purpose electronic computer in 1946 at the University of Pennsylvania. It was Electronic Numerical Integrator and Computer or ENIAC, the device contained 18,000 vacuum tubes and had a speed of several hundred multiplications per minute. Its program was wired into the processor and had to be manually altered.

Later transistors appeared. The use of the transistor in computers began in the late 1950s. It marked the advent of smaller, faster elements than it was possible to create with the use of vacuum-tube machines. Because transistors use less power and have a much longer life computers alone were improved a lot. They were called second-generation computers.

Components became smaller and the system became less expensive to build. Modern digital computers are all conceptually similar, regardless of size and shape. Nevertheless, they can be divided into several categories on the basis of cost and performance.

The first one is the personal computer or microcomputer, a relatively low-cost machine, usually of desk-top size. Sometimes they are called laptops. They are small enough to fit in a briefcase. The second is the workstation, a microcomputer with enhanced graphics and communications capabilities that make it especially useful for office work. The largest and fastest of these are called supercomputers.

A digital computer is not actually a single machine in the sense that most people think of computers. Instead it is a system composed of five distinct elements: a central processing unit, input devices, memory storage devices, output devices and a communications network, called a “bus” that links all the elements of the system and connects the system itself to the external world.

Talking about a central processing unit or the heart of computer it is necessary to add that there were several generations of microprocessors. The first generation was represented by processing unit Intel 8086. The second generation central processing unit was represented by processing unit Intel 80286, used in IBM PC AT 286. In the end of 80s such computer costs about 25-30 000 rubles in the former USSR. The third generation is represented by Intel 80386 used in IBM PC AT 386. The microprocessors of the fourth generation were used in computers IBM PC AT 486. There are also central processing units of the fifth generation used in Intel Pentium 60 and Intel Pentium 66, central processing units of the sixth generation used in computers Intel Pentium 75, 90, 100 and 133.

Computer speeds are measured in gigahertz today. Recently an optical central processing unit has been invented which is capable of executing trillions discrete operations per second orit is as fast as the speed of light. So we are at the threshold of new computer era when artificial intelligence could be invented. There are no questions with «if», the only question is «when». And time will show us either computers become our best friends or our evil enemies as it is shown in some movies.

Tasks for the text:

Answer the questions.

1. When was the first general-purpose electronic computer constructed? 2. When did the use of transistor in computers begin? 3. Are all modern digital computers conceptually similar? 4. What is a laptop? 5. What is a server computer? 6. What is supercomputer? 7. How many elements can be distinguished in a computer?

РАЗДЕЛ 2: ОСНОВНЫЕ ПРАВИЛА ГРАММАТИКИ

Глагол to be

Спряжение глагола to be в настоящем времени

Утвердительное предложение		Отрицательное предложение		Вопросительное предложение
I You	am are	I You	am not are not	Am I ...? Are you ... ?
He / She / It	is	He / She / It	is not	Is he / she / it ... ?
We	are	We	are not	Are we ... ?
You	are	You	are not	Are you ... ?
They	are	They	are not	Are they ... ?

Спряжение глагола to be в прошедшем времени

Утвердительное предложение		Отрицательное предложение		Вопросительное предложение
I	was	I	was not	Was I ...?
You	were	You	were not	Were you ... ?
He / She / It	was	He / She / It	was not	Was he / she / it ... ?
We	were	We	were not	Were we ... ?
You	were	You	were not	Were you ... ?
They	were	They	were not	Were they ... ?

Спряжение глагола to be в будущем времени

Утвердительное предложение		Отрицательное предложение		Вопросительное предложение
I	will be	I	will not be	Will I be ...?
You	will be	You	will not be	Will you be ... ?

He / She / It	will be	He / She / It	will not be	Will he / she / it be ... ?
We	will be	We	will not be	Will we be ... ?
You	will be	You	will not be	Will you be ... ?
They	will be	They	will not be	Will they be ... ?

3. Вопросительные предложения

Тип вопроса	**Пример**
Общий	Do you study at university? – *Ты учишься в университете?*
Специальный	Where do you study? – *Где ты учишься?*
Альтернативный	Do you study at university or college? – *Ты учишься в университете или колледже?*
Разделительный	Do you study at university, don't you? – *Ты учишься в университете, не так ли?*
Вопрос к подлежащему	Who studies at university? – *Кто учится в университете?*

Альтернативный вопрос (alternative question)

вопросе должен быть выбор между двумя вариантами. Такой вопрос можно задать к любому члену предложения. И самое главное – здесь всегда вы встретите союз *or* (или). Формула такая же, как в общем вопросе, но надо не забыть поставить *or* там, где нужно.

Did they finish writing the article in the morning ***or*** *at night? Where are you going: to the cinema* ***or*** *to the park? When did you arrive: Sunday* ***or*** *Monday?*

Общий вопрос (yes/no or general question)

Это наиболее простой и распространенный из пяти типов вопросов в английском языке. Он задается ко всему предложению и подразумевает простой утвердительный или отрицательный ответ – да или нет.

Общая схема образования общего вопроса:

Вспомогательный / модальный глагол	подлежащее	сказуемое	дополнение	обстоятельство
Do	you	play	football	every day?
Can	you	do	it for me?	

Разделительный вопрос (disjunctive or tag-question)

Порядок слов в таком вопросе прямой, как в обычном предложении. И только в конце такого упражнения мы встретим вопрос, который называется *tag*. В русском языке тоже есть такой вопрос, и звучит он так: **«не так ли?»** / **«не правда ли?»** / **«да?»**. Для того чтобы образовать *tag-question*, вспомогательный глагол и подлежащее надо поставить в конец предложения.

Вопрос к подлежащему (question to the subject)

Этот тип вопроса в английском языке задается к подлежащему и также как предыдущий, содержит вопросительное слово. Обычно это Who, Whose, Whom, What и т. д. Особенность заключается в том, что такое вопросительное предложение имеет прямой порядок слов и не нуждается во вспомогательных глаголах. Есть лишь один нюанс – в настоящем времени прибавляем окончание -s к глаголу.

Специальный вопрос (Wh- or special question)

Каждый *Wh-question* начинается с вопросительного слова: *why, where, what, which, whom, whose* и т. д. Эта особенность и стала причиной появления такого названия.

Общая схема построения специального вопросительного предложения:

Вопросительное слово	**вспомогательный/ модальный глагол**	**подлежащее**	**сказуемое**	**дополнение**	**обстоятельство**
When	do	you	play	football?	
What	can	you	do	for me?	
Where	are	you	going?		

Степени сравнения прилагательных и наречий

Имя прилагательное и наречие в английском языке имеют три степени сравнения

Положительная степень *(the Positive Degree)* обозначает качество предмета без сравнения. *This car is new. – Эта машина новая.*

Сравнительная степень *(the Comparative Degree)* это сравнение двух и более предметов. *This car is newer than that car. – Эта машина новее, чем та машина.*

Превосходная степень *(the Superlative Degree)* выражает наибольшую степень качества. *This is the newest car I have ever seen. – Это самая новая машина, которую я когда-либо видел.*

Слова заместители (one/that)

В английском языке имеются слова, которые употребляются в предложении для того, чтобы избежать повторения одного и того же слова, части предложения или всего предложения. Такие слова называются словами-заменителями. На русский язык слова-заместители либо вовсе не переводятся, либо переводятся ранее употребленным словом.

Слова-заменители		
Слово-заменитель	**Особенности употребления**	**Пример**
ONE (во мн. ч. – **ONES)**	Может заменять ранее упомянутое исчисляемое существительное	I haven′t got a pen. I must buy **one.** – *У меня нет ручки, мне нужно ее купить.* I don′t like these yellow flowers. Let me have some red **ones**. – *Мне не нравятся эти желтые цветы. Дайте мне красных.*
THAT (во мн. ч. – **THOSE)**	Может заменять ранее упомянутое существительное, за которым следует какой-либо предложный оборот	This power-station on the is much more powerful than that on the Dnieper. – *Эта электростанция намного мощнее, чем та, что на Днепре.* The railways of our country are longer than those of any other country. – *Железные дороги нашей страны длинней, чем (железные дороги) какой-либо другой страны.*

Способы перевода страдательного залога на русский язык

Существует три способа перевода страдательного залога на русский язык:

При помощи глагола **«быть»** + краткая форма причастия

Пример: Were his books translated into Russian? – Были ли его книги переведены на русский язык?

Глаголами, оканчивающимися на **-ся**

Пример: Letters are delivered by mailmen. – Письма доставляются почтальонами.

Неопределенно-личным оборотом (этот способ перевода возможен в тех случаях, когда в английском предложении не упоминается исполнитель действия).

Пример: They were taught French last year. – Их учили французскому языку в прошлом году.

Причастие I, Причастие II

Причастие – неличная форма глагола, обладающая признаками глагола, прилагательного и наречия. В английском языке нет такой части речи, как деепричастие. Поэтому английское причастие соответствует и причастию, и деепричастию в русском языке.

В английском языке существует два причастия:

Причастие I (Participle I) – причастие настоящего времени действительного и страдательного залога. Имеет две формы:

а) Present Participle Simple. Соответствует русскому причастию настоящего времени и деепричастию несовершенного вида: *reading* – читающий, читая, *resting* – отдыхающий, отдыхая;

б) Present Participle Perfect. Соответствует русскому деепричастию совершенного вида: *having written* – написав, *having read* – прочитав.

Причастие II (Participle II) – причастие прошедшего времени страдательного залога: *opened* – открытый, *dressed* – одетый, *made* – сделанный

Present Participle Simple

Эта форма употребляется независимо от времени, в котором стоит сказуемое, выражая лишь **одновременность** с действием, выраженным глаголом-сказуемым.

Образуется путем прибавления окончания **-ing** к основе глагола.

Отвечает на вопросы «что делающий?», «что делая?».

ask + ing = asking	→	спрашивающий, спрашивая
walk + ing = walking	→	гуляющий, гуляя

know + ing = knowing	→	знающий, зная
smile + ing = smiling	→	улыбающийся, улыбаясь

Функции

Причастие I в английском языке может выполнять в предложении несколько функций и быть:

Определением (как и русское причастие), которое стоит перед существительным или после него.

Пример: The man **waiting** for you has come from Moscow. – *Человек, **ожидающий** вас, приехал из Москвы.*

I saw her **smiling** face in the window. – *Я увидел ее **улыбающееся** лицо в окне.*

The girl **smiling** to see her friends is my sister. – *Девочка, **заулыбавшаяся** при виде друзей – моя сестренка.*

The house **being built** in this street now will be a new library. – *Дом, **строящийся** сейчас на этой улице, будет новой библиотекой.*

Обстоятельством (образа действия, причины, времени). Причастие в этой функции обычно стоит в начале предложения, то есть перед подлежащим или следует за группой сказуемого. В данном случае перед причастием могут стоять союзы **when, while, if, though** и пр. Причастие (с союзом или без) переводится на русский язык или полным придаточным предложением или деепричастием.

Пример: **Knowing** English perfectly he was able to watch foreign movies. – ***Зная** английский в совершенстве, он мог смотреть иностранные фильмы.*

Crossing the road first look to the left. – ***Переходя** дорогу, посмотрите сначала налево.*

When **crossing** the road, first look to the left. – ***Когда переходите (при переходе)** дорогу, посмотрите сначала налево.*

Present Participle Perfect

Эта форма употребляется для выражения действия, **предшествующего** действию, выраженному глаголом-сказуемым, и употребляется только в функции **обстоятельства**.

Образуется с помощью вспомогательного глагола **have** с прибавлением окончания **-ing** и **третьей формой глагола (V3)**. Отвечает на вопрос «что сделав?»

Have + ing + V3 → **having asked** → спросив

having done → сделав

Пример: **Having finished** the test he put down the results. –***Закончив*** *тестирование, он записал результаты.*

Having done his homework he went for a walk. – ***Сделав*** *домашнее задания, он пошел гулять.*

Причастие II (Participle II)

Чтобы образовать это причастие в английском языке от **правильных глаголов**, необходимо добавить окончание **-ed** к основе глагола:

ask + ed = asked → спрошенный, train+ ed = trained → обученный.

неправильных глаголов форма причастия II особая.

Она указана в таблице неправильных глаголов и находится в третьей колонке:

written → написанный, bought → купленный.

Это причастие отражает законченный процесс, а на русский язык мы его переводим страдательным причастием совершенного или несовершенного вида. В основном в этом причастии в английском языке представлено действие, которое **предшествует** действию, выраженному глаголом-сказуемым.

Таблица 2. Причастие II (Participle II)

Время Залог	Активный (Active)	Страдательный (Passive)
Past	------------	**discussed –** *обсужденный* **written –** *написанный*

Функции

Причастие II в английском языке может выполнять в предложении несколько функций и быть:

Определением, которое стоит перед существительным или после него.

Пример: The **discussed** problems are interesting. – ***Обсуждаемые*** *проблемы интересны.*

They spoke of the problems **discussed**. – *Они говорили об* ***обсуждаемых*** *проблемах.*

The problems **discussed** at the conference are interesting. – *Проблемы,* ***обсуждаемые*** *на конференции, интересны.*

Обстоятельства (часто с предшествующими союзами **when, if, unless**)

Пример: **Written** in pencil, the article was difficult to read. – ***Написанную*** *карандашом статью трудно было читать.*

When **asked**, he looked at us and was silent. – *Когда его* ***спрашивали****, он смотрел на нас и молчал.*

If **invited**, I'll go there. – *Если меня* ***пригласят****, я поеду туда.*

They will leave, unless **stopped**. – *Они уйдут, если их не* ***остановить****.*

Герундий

Герундий – это неличная форма глагола, обладающая признаками как глагола, так и существительного. Подобной формы в русском языке нет. Как и глагол, герундий имеет формы времени и залога, может определяться наречием. Как и существительное, герундий может выполнять в предложении функцию подлежащего, дополнения и определяться притяжательным или указательным местоимением. В сочетании с предлогом *of* герундий может выполнять функцию определения.

Формы герундия совпадают с формами причастия настоящего времени и перфектного причастия. *Indefinite Gerund* выражает действие, одновременное с действием глагола-сказуемого; *Perfect Gerund* выражает действие, которое предшествует действию, выраженному глаголом-сказуемым. На русский язык герундий переводится существительным, неопределенной формой глагола, деепричастием, глаголом в личной форме или придаточным предложением:

Пример: Students often have difficulties in understanding the difference between the Present Perfect and the Past Indefinite. – *Учащиеся часто испытывают трудности в понимании различия между настоящим совершенным временем (глагола) и прошедшим неопределенным (или: «в том, чтобы понять различие...».*

Функция	Пример
1. Подлежащего	**Reading** gives you knowledge. – *Чтение приносит вам знание.* **Swimming** in the lake is forbidden. – *Купаться (купание) в озере запрещено*
2. Именной части сказуемого	Seeing is **believing**. – *Увидеть – значит поверить.*
3. Дополнения (прямого, предложного)	The teacher has aimed at **teaching** students to speak in correct English. – *Учитель поставил цель научить учащихся правильно говорить на английском языке.*

4. Определения	The difficulties of **rebuilding** the plant were successfully overcome. – *Трудности, связанные с перестройкой завода, были успешно преодолены.*
5. Обстоятельства	You can help him by **supporting** him. – *Вы можете помочь ему тем, что поддержите его.*

Сходство **герундия** и **причастия** настоящего времени состоит в том, что они образуются одинаково, т. е. путем прибавления к основе инфинитива суффикса *-ing*, и имеют признаки глагола. Герундий и причастие настоящего времени могут определяться наречием употребляются в предложении в функции обстоятельств. Вне контекста бывает трудно определить, чем является неличная форма глагола, оканчивающаяся на *-ing*: причастием или герундием. Вместе с тем, герундий и причастие – это разные неличные формы глагола, отличающиеся одна от другой и по своему значению, и по функциям, выполняемым ими в предложении. Герундий имеет признаки глагола и существительного, в то время как причастие имеет признаки глагола и прилагательного.

Герундий	**Причастие**
1. Употребляется в функции подлежащего, именной части сказуемого, дополнения: Carrying out this operation is very important. – *Выполнение этой операции очень важно.*	1. Не употребляется в функции подлежащего, именной части сказуемого, не может быть дополнением.
2. В функции определения употребляется с предлогом: The method of carrying out the operation is well known. – *Метод выполнения операции хорошо известен.*	2. В функции определения употребляется без предлога: The group carrying out the operation consisted of 20 men. – *Группа,выполнявшая операцию, состояла из двадцати человек.*
3. В функции обстоятельства употребляется с предлогом: Before carrying out the operation one should study all the instructions. – *Прежде чем выполнять операцию, нужно изучить все указания.*	3. В функции обстоятельства употребляется без предлога: Carrying out the operation the tanks penetrated into the enemy rear. – *Выполняя операцию, танки зашли в тыл противника.*

Сходство **герундия** и **отглагольного существительного** заключается в том, что отглагольное существительное образуется путем прибавления к основе инфинитива суффикса *-ing*, т. е. по форме отглагольное существительное совпадает с герундием:

to begin (начинать) – beginning (начало); to open (открывать) – opening (открытие, отверстие).

Но отглагольное существительное и герундий – это две разные части речи, имеющие разные значения и выполняющие разные функции в предложении.

Отглагольное существительное имеет все свойства существительного и на русский язык переводится чаще всего существительным, герундий же имеет только некоторые свойства существительного.

Герундий	**Отглагольное существительное**
1. Не может иметь артикля: I remember meeting in Moscow. – *Я помню, как встретил его в Москве.*	1. Может иметь артикль: The meeting began at 7. – *Собрание началось в 7 часов.*
2. Не может иметь формы множественного числа: I don’t mind your opening the window. – *Я не возражаю, если вы откроете окно.*	2. Может иметь форму множественного числа: All these shuttings and openings of the door dis turb me greatly. – *Все эти открывания и закрывания дверей страшно мне мешают.*
3. Может иметь прямое дополнение: He began doing his exercises when I left him. – *Когда я ушел от него, он начал выполнять упражнения.*	3. Может иметь предложное дополнение: The doing of the exercises didn’t take him long. – *Выполнение упражнений не отняло у него много времени.*
4. Может определяться наречием: I don’t like your speaking so loudly. – *Я не люблю, когда вы так громко разговариваете.*	4. Может определяться прилагательным: My attention was attracted by his loud speaking. – *Мое внимание было привлечено его громкой речью.*
5. Имеет формы времени и залога: Mother disapproved of her son’s having come so late. – *Мать неодобрительно отнеслась к тому, что ее сын пришел так поздно.*	5. Не имеет форм времени и залога.

РАЗДЕЛ 3: СЛОВАРЬ-МИНИМУМ

A
ability – способность
acceleration – ускорение
amount of force – количество силы
ancient world – древний мир
artificial intelligence – искусственный интеллект
automotive industry – автомобильная промышленность
autonomous robot – автономный робот

B
bachelor's degree – степень бакалавра
battery-powered devices – устройства с питанием от батареи
branch – отрасль
brakes – тормоза
breadth – широта (ширина)
builder – строитель

C
central processing unit – центральный процессор
circular electrified track – круговой электрифицированный путь
clutch – сцепление
combustion – сжигание
communications network – сеть связи
conductor – проводник
in conjunction with – вместе
to construct – конструировать
construction engineer – инженер-строитель
construction equipment – строительное оборудование
in countless ways – бесчисленными способами
to create solutions – разработать решения
creative thinking – творческое мышление

D
to deal with – иметь дело с
to define – определять
design engineer – инженер-конструктор
diffraction of light – дифракция
to diminish – уменьшать

direction – направление
diverse – разнообразный

E
ease of operation – удобство управления
electric current – электрический ток
electric locomotive – электровоз
energy conversion – преобразование энергии
to enjoy popularity – пользоваться популярностью
enterprise – предприятие
equal – равный
expensive – дорогой
to extend or augment human capabilities – расширить и увеличить возможности человека

F
factory – фабрика
fleet – автотранспортный парк
fluid mechanics – механика жидкости
foreman – мастер
fossil fuels – органическое топливо
fracture mechanics – механика разрушения
functionality – функциональное назначение

G
gasoline – бензин
general-purpose electronic computer – компьютер общего назначения
grant a patent – выдавать патент
gravity – сила тяжести

H
heat transfer – теплопередача
horseless – безлошадный
household appliances and devices – бытовые приборы и устройства
human assistance – помощь человека
human sized robots – роботы размером с человека
humanoid machine – человекообразная машина
hydrogen – водород

I
to be identified – идентифицировать (быть идентифицированным)
ignition system – система зажигания
to improve – улучшать
incarnation – воплощение
independently – независимо
Industrial Revolution – промышленная революция
ingenious carburetor design and magneto ignition – гениальный проект карбюратора и магнето зажигание
input devices – устройства ввода
insurance – страхование
to be interested in – интересоваться
internal combustion engine – двигатель внутреннего сгорания
internal combustion technology – технология внутреннего сгорания

L
to launch a career – начать карьеру
to lay the foundations – заложить основы
lead-acid battery – свинцово-кислотная аккумуляторная батарея
license – водительские права
light truck – грузовой автомобиль малой грузоподъемности
liquid – жидкость

M
machine- tool – станок
to make attempts – делать попытки
to manufacture – производить
manufacturing tasks – задачи производства
mass production – массовое производство
master's degree – степень магистра
by means of – с помощью
mechanic – механик
mechanical engineering – машиностроение
memory storage device – запоминающее стройство
metallurgy – металлургия
micropower generation – микромощная генерация
microprocessor – микропроцессор
microscale sensors – крошечные датчики
mine – шахта
miner – шахтер

modern concept – современное понятие
in motion – в движении
motor vehicle – автомобиль

N
niche market – сегмент рынка
night shift – ночная смена
non-rechargeable primary cell – не перезаряжаемый первичный элемент
Numerical Integrator and Calculator – электронный цифровой интегратор и калькулятор

O
off-road vehicle – внедорожное транспортное средство
to operate without failure – работать без сбоя
in operation – в действии
origin – происхождение
output devices – устройства вывода
to overcome all constraints – снимать все ограничения
oxygen – кислород

P
per capita – на душу населения
to perform domestic tasks – заниматься домашними делами
performance – производительность
petroleum infrastructure – нефтяная инфраструктура
plant – завод
to play an important role – играть важную роль
plug-in hybrid – сетевой гибрид
power station – электростанция
powerful engine – мощный двигатель
pressurized steam – пар, находящийся по давлением
prevalent means – преобладающие средства
to propel – двигать вперед
property – имущество
propulsion – приведение в движение
pushcart – ручная тележка

R
at rest – в состоянии покоя
rail tracks – рельсовый путь
to reduce – снижать
to regard as – рассматривать в качестве
regardless of – независимо от
to revolutionize the world – кардинально изменить мир

S
second-generation computers – компьютеры второго поколения
self-propelled – самоходный
semiconductor – полупроводник
shift – смена
simultaneously – одновременно
single – единственный
site – участок
skills – навыки
small-scale – небольшой
solid mechanics – механика твердого тела
solid waste – твердые отходы
sophisticated – сложный
speed – скорость
to be subjected to – быть подверженным

T
talking mechanical handmaidens – говорящие механические служанки
team – бригада
technologies hailed as a replacement – технологии, оцениваемые как замена
technician – техник
technologist – технолог
textile engineering – текстильная промышленность
total – общий
transportation – перевозка
to be trialed – подвергаться тестированию

U
unbalanced force – неуравновешенная сила **upwards** – вверх

V
vacuum tube – электровакуумный прибор
variety of – разнообразие
vehicle engine – автомобильный двигатель
virtually – фактически

W
welder – сварщик
worker – рабочий
workshop – мастерская

АНГЛОЯЗЫЧНЫЕ НАУЧНО-ТЕХНИЧЕСКИЕ РЕСУРСЫ СЕТИ ИНТЕРНЕТ

http://www.infoniac.com

InfoNIAC – Latest Inventions. The main goal of the site is to inform on various technical innovations, latest inventions and talented people around the world.

http://www.brighthub.com

Science and technology articles, education lesson plans, tech tips, computer hardware and software reviews, news and more.

http://beforeitsnews.com

Before It's News® is a community of individuals who report on what's going on around them, from all around the world.

http://www.inventions-handbook.com

Inventions help and inspiration for the first-time inventors.

http://www.scientificamerican.com

Science news, articles, and information – Scientific American.

http://www.telegraph.co.uk/technology/

The latest technology news, reviews, advice, picture galleries and video.

http://www.independent.co.uk/life-style/gadgets-and-tech

Tech – The Independent.

http://listverse.com

Listverse — the original Top 10 site — publishes lists that intrigue and educate, specializing in the bizarre or lesser-known trivia. Every day they present three or more new, unique lists.

http://www.infoplease.com/biography/science-technology-bios.html

Science and Technology: Biographies – Information about outstanding scientists, inventors and explorers.

http://scienceworld.wolfram.com/biography/

Eric Weisstein's World of Scientific Biography – A database of very brief biographies for over 1,000 figures in science.

http://www-history.mcs.st-and.ac.uk/

The MacTutor History of Mathematics archive – Comprehensive collection of biographies and history of mathematics articles.

http://www.achievement.org/autodoc/halls/sci

Academy of US Achievement: Science and Exploration – Collection of Biographies of US explorers, profiles and interviews with them.

http://nobelprize.org/nobel_prizes/

Nobel prize.org – All related information on all Nobel Prize Laureates, biographies, autobiographies, interviews and lectures.

http://inventors.about.com/

About: Inventors – A collection of biographies of famous inventors indexed in alphabetical order.

http://www.thefamouspeople.com/profiles/

World Famous Personalities: The Famous People – Society for recognition of famous people.

http://www.animatedengines.com/

Animated illustrations that explain the inner workings of a variety of steam, Stirling, and internal combustion engines.

http://www.science20.com/

Science and technology articles classified by the field of knowledge.

http://www.realclearscience.com

Real Clear Science – Science News and Opinion.

https://www.sciencenews.org/

Daily news articles, blogs and biweekly magazine covering all areas of science.

http://www.bbc.com/news/technology/

Technology – BBC News.

http://www.sciencedaily.com/

One of the Internet's most popular science news web sites.

http://www.abc.net.au/science/news/

The Australian Broadcasting Corporation's online gateway to science.

http://www.huffingtonpost.com/science/

HuffPost Science – Science news, discoveries and breakthrough scientific research.

http://phys.org/

Phys.org is a leading web-based science, research and technology news service which covers a full range of topics. These include physics, earth science, medicine, nanotechnology, electronics, etc.

http://www.newscientist.com/section/science-news

New Scientist – Science and technology news.

http://www.lingvo-online.ru/ru

Онлайн-словарь ABBYY Lingvo-Online

http://www.multitran.ru/c/m.exe?a=1

Электронный словарь Мультитран

http://dictionary.cambridge.org/ru

Бесплатный кембриджский словарь и тезаурус по английскому языку

http://www.short-stories.co.uk/

Ресурс для тех, кто хочет забыть об адаптированных текстах и перейти на чтение в оригинале. Это сборник коротких рассказов, разбитых на 8 категорий по жанрам. На сайте есть читательский рейтинг, а также коллекция игр со словами, с помощью которых можно закреплять лексику.

https://www.usingenglish.com

Тексты с заданиями по трем уровням: Beginner, Intermediate, Advanced. Большинство из них основаны на заданиях к популярным экзаменам, таким как Cambridge ESOL, TOEFL, IELTS и т.д.

english03.ru

Самоучитель-справочник по учебнику Raymond Murphy "Essential Grammar in Use" (красный Мерфи) и видео разговорник английского языка для самых начинающих.

learn-english-today.com

Краткое англоязычное пособие по грамматике.

correctenglish.ru

На этом сайте представлены тесты по грамматике английского языка для начинающих и продолжающих.

audioenglish.org

Этот англоязычный ресурс удобен тем, что предлагает прослушивать группы слов, классифицированные по темам.

newsinlevels.com

Новости на английском языке для начинающих начитаны профессиональным диктором в замедленном темпе.

esl.fis.edu

По указанной ссылке вы найдете тесты по английскому языку для начинающих, помощью этих заданий вы проверите, насколько хорошо знаете базовые слова, и сможете изучить новую лексику, догадываясь о ее значении по объяснениям.

БИБЛИОГРАФИЧЕСКИЙ СПИСОК

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Ульяновский государственный технический университет
432027, Ульяновск, Сев. Венец, 32.
ИПК « Венец» УлГТУ, 432027, Ульяновск, Сев. Венец, 32.

Тел.: (8422) 778-113
E-mail: venec@ulstu.ru
venec.ulstu.ru