

ДЕПАРТАМЕНТ ВНУТРЕННЕЙ И КАДРОВОЙ ПОЛИТИКИ БЕЛГОРОДСКОЙ ОБЛАСТИ  
ОБЛАСТНОЕ ГОСУДАРСТВЕННОЕ АВТОНОМНОЕ ПРОФЕССИОНАЛЬНОЕ ОБРАЗОВАТЕЛЬНОЕ  
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**Английский язык**  
**«Mining in Russia»**

**Учебное пособие для горных специальностей**

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**ОДОБРЕНО**

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## **Preface** (предисловие)

Данное учебное пособие предназначено для работы со студентами 4 курса, обучающимися по специальности среднего профессионального образования “Открытые горные работы”. Пособие подготовлено по разделу “Профессиональный английский язык”, который является составной частью программы дисциплины “Английский язык” в соответствии с ФГОС СПО.

Учебное пособие ориентировано на обеспечение самореализации обучающегося как языковой личности в будущей профессиональной деятельности, формирование языковой, речевой, социокультурной компетенций через развитие его познавательной активности.

Учебный курс состоит из 12 занятий. Каждое из 11 занятий построено по определенной схеме и включает в себя основной технический текст, словарь, грамматический материал, тренировочные упражнения, языковой комментарий. На двенадцатом занятии проводится контрольная работа. Материалы примерных контрольных заданий имеются в пособии.

Технические тексты подобраны в соответствии с принципами новизны, доступности и преемственности учебного материала. Лексические и грамматические упражнения каждого занятия позволяют лучше раскрыть и усвоить тему. Тренировочные упражнения помогут студентам повторить основные правила английской грамматики в их практическом применении, освоить профессиональную лексику.

Учебный материал, содержащийся в текстах и упражнениях, поможет обучающимся найти нужную информацию, необходимую для будущей профессиональной деятельности. В учебном пособии имеются интересные и полезные сведения о первых высших горных учебных заведениях в России, об исследованиях крупнейших российских ученых, работавших в области горного дела и геологии, таких как: А.П. Карпинский, А.М. Терпигорев, В.А. Обручев. Учебный материал содержит сведения о горных породах, полезных ископаемых, условиях их залегания и разведки.

## Lesson1. **First Mining Educational Institutions in Russia**

Text: **The First Mining School in Russia**

Grammar Revision: **Plural of the Nouns. Pronouns: *much, many***

### **The First Mining School in Russia**

Moscow Mining Academy was established<sup>1</sup> in 1918. The main task of the Academy was to train mining engineers and technicians, to popularize technological achievements among miners, to work on important problems of mining and metallurgical engineering and to direct scientific research.

There were three departments in the Academy: mining, geological prospecting and metallurgy. The Moscow Mining Academy introduced a new course in coal mining mechanization which provided the basis for the development of mining engineering. The two scientists A.M. Terpigorev and M.M. Protodyakonov wrote the first textbook on machinery for mining bedded deposits. Much credit for the establishment of the Moscow Mining academy and the development of cooperation among outstanding scientists-and educators is due to<sup>2</sup> Academician I.M.Gubkin, a prominent geologist and oil expert.

In 1925 the Moscow Mining Academy was one of the best-known educational institutions in Russia. It had well-equipped laboratories, demonstration rooms and a library which had many volumes of Russian and foreign scientific books and journals. The Academy established close contacts with the coal and ore mining industries. The scientists carried out scientific research and worked on important mining problems.

The rapid growth of the mining industry called for the training of more highly-qualified specialists and the establishment of new educational institutions. New collieries and open-cast mines, concentration plants, metallurgical works and metal-working factories for processing non-ferrous and ferrous metals appeared in the country. The people took an active part in the construction of new industrial enterprises.

The Academy alone could not cope with the problem of training specialists. In 1930 the Moscow Mining Academy was transformed<sup>3</sup> into six independent institutes. Among the new colleges which grew out of the Academy's departments was the Moscow mining Institute and the Moscow Institute of Geological Prospecting. Later, the scientific research Institute of Mining appeared near Moscow.

#### **Notes:**

1.was established – была основана,

2.much credit... is due to – большая заслуга ... принадлежит

3.was transformed – была преобразована

#### **Working vocabulary:**

Prospecting	разведка
to introduce	вводить, привносить
prominent	выдающийся
colliery	каменноугольная копь
open-cast mines	шахты с открытым способом добычи
to cope	справиться

to call for	требовать
establishment	основание, учреждение
concentration plant	обогажительная фабрика
processing	обработка
department	факультет
scientific research Institute of Mining	научно-исследовательский горный институт

### Exercises:

#### 1. Read and translate the text: The First Mining School in Russia

#### 2. Answer the questions:

1. What was the main task of the Academy?
2. What new course did the academy introduce?
3. Were there three or four departments at the academy?
4. What industries did the Academy establish contacts with?
5. Who wrote the first textbook on machinery for mining bedded deposits?
6. Why was the Academy transformed?

#### 3. Match the verbs from the list A with the corresponding nouns from the list B.

##### Translate word combinations.

A: to carry out, to direct, to prospect for, to introduce, to equip, to establish

B: new courses, laboratories, experiments, research, contacts, new deposits

#### 4. Find the equivalents of the following word combinations:

- |                                      |                                    |
|--------------------------------------|------------------------------------|
| 1. mining equipment                  | а) обогажительная фабрика          |
| 2. to carry out research             | б) подготовка горных инженеров     |
| 3. new course in                     | в) разведка нефти                  |
| 4. to direct scientific activity     | г) обработка цветных металлов      |
| 5. to take an active part            | д) техническое образование         |
| 6. prospecting for oil               | е) новый учебный курс (по)         |
| 7. bedded deposit                    | ж) принимать активное участие      |
| 8. concentration plant               | з) проводить исследование          |
| 9. technical education               | и) направлять научную деятельность |
| 10. the training of mining engineers | к) горное оборудование             |
| 11. processing of non-ferrous metals | л) пластовые месторождения         |

#### 5. Translate the sentences into English, using words from the text:

1. Московская горная академия готовила инженеров и техников для горной и металлургической промышленности.
2. Ученые проводили научные исследования в области геологии, горного дела и

металлургии.

3. Академия устанавливала тесные контакты с промышленными предприятиями.

4. Быстрый рост горной промышленности требовал подготовки высококвалифицированных специалистов.

5. В России появились новые специальные учебные заведения.

### 6. Choose the right plural form of the nouns.

1. a baby	A	babys	B	babies	C	babyes
2. a man	A	man	B	men	C	mans
3. a boy	A	boys	B	bois	C	boyes
4. a mouse	A	mouses	B	mice	C	mouss
5. a fox	A	fox	B	foxes	C	foxs
6. money	A	moneys	B	money	C	moneies
7. a knife	A	knifes	B	knifs	C	knives
8. an umbrella	A	umbrellas	B	umbrallaes	C	umbrells
9. a city	A	citys	B	cities	C	cityes
10. a postman	A	postmans	B	postsman	C	postmen
11. an ox	A	ox	B	oxes	C	oxen
12. a fish	A	fish	B	fishes	C	fishs
13. a watch	A	watches	B	watchs	C	watch
14. a roof	A	roofs	B	roofes	C	roofes
15. a tooth	A	toothes	B	teeth	C	teethes

### 7. Use the necessary pronoun: much or many

1. Thank you very ... .
2. My friend didn't make ... mistakes.
3. How ... money have you got?
4. There isn't ... milk in the bottle.
5. I haven't got... time, but I'll try to help you.
6. Have your parents been to ... countries?
7. There weren't... people in the street.
8. Has your son made... friends in France?
9. Dan doesn't spend ... money on his clothes.
10. You watch TV too... .
11. Was there ... traffic in sight?
12. Did you take ...photos in Spain?
13. Try to do as ...as possible.
14. Do you get ... letters every week?
15. My wife didn't speak ... at the party.

## **Lesson 2. Development of Higher Mining and Geological Education**

**Text: Mining and Geological Higher Schools in Russia**

**Word formation: Prefixes and Suffixes of Nouns and Adjectives**

**Grammar Revision: Degrees of Comparison of Adjectives**

### **Mining and Geological Higher Schools in Russia**

In Russia young people get mining education at special institutes which train geologists and mining engineers for coal and ore mining. The total number of students of an institute includes full-time students, part-time students and postgraduate students.

Russian higher educational establishments offer different specializations for the students. Thus, at the geological institutes, the students specialize in geology, the science which deals with different problems connected with the Earth, its history, the study of rocks, their physical and chemical properties. One of the main tasks of geology is to prospect, discover and study the deposits of useful minerals.

Geology is both a theoretical and an applied science. Mining geology is of great importance to the mining engineer. The outstanding Russian geologist V.A. Obruchev says that geology is the science of the Earth which reveals to us how the Earth took shape, its composition and its changes. Geology helps to prospect for ores, coal, oil, salt and other useful minerals.

Higher mining schools (universities, academies, institutes and colleges) develop a wide range of courses and programmes that meet the requirements of the society. They offer courses in mining technology, machinery and transport, hydraulic engineering, electrical engineering, industrial economics, automation, surveying, geodesy, information technology, etc.

The main trend in the development of higher mining education is the introduction of courses in environmental protection, management (environmental human resources), economics and management of mining enterprises, marketing studies, computer-aided design (CAD)' and others. Computer science is also of great importance. The course aims at providing students with understanding how software and hardware technology helps solving problems.

Laboratory work is an important part in training specialists. Experiments in laboratories and workshops will help students to develop their practical skills. They have a short period of field work to gain working experience. The students go through practical training at mines, plants and other industrial enterprises. They become familiar with all stages of production and every job from worker to engineer. Here they get practical knowledge and experience necessary for their diploma (graduation) papers.

A lot of students belong to students' scientific groups. They take part in the research projects which their departments usually conduct. Postgraduates carry out research in different fields of science and engineering. Students graduate from mining and geological higher schools as mining engineers, mining mechanical engineers, ecologists, mining electrical engineers, geologists, economists and managers for mining industry.

**Notes:** 1computer-aided design (CAD) –автоматизированное проектирование



### Working vocabulary:

post graduate	аспирант
post graduate studies	аспирантура
establishment	заведение, учреждение, ведомство
properties	свойства
deposit	залежь, месторождение
minerals	полезные ископаемые
applied	прикладной
to reveal	открывать, обнаруживать
to take shape	формировать
composition	состав
hydraulic	гидравлический
surveying	обследование, обозрение
to become familiar	знакомиться, быть осведомленным
wide range	диапазон, круг, сфера
to aim at	стремиться, нацеливаться
to gain working experience	получить рабочий опыт
to go through	проходить

### Exercises:

**1. Read and translate the text:** Mining and Geological Higher Schools in Russia.

#### 2. Answer the questions:

1. Where can one get mining education in Russia?
2. What does geology study?
3. How did Obruchev define geology?
4. What specializations do the higher mining schools offer?
5. Where do the students go through practical training?
6. What does the computer course aim at?
7. As what specialists do the students graduate from mining and geological higher schools?

#### 3. Translate the sentences, paying attention on the meaning of the pronoun *both* and the conjunction *both ... and*.

*pronoun*                      *conjunction*  
***both***- *оба* ***both*** ... ***and***— *и ...и, как... таки*

1. In Russia young people get mining education *both* at special colleges *and* at mining departments of universities.
2. Practical work *both* in the field *and* in drawing classes is very important for the future surveyor.
3. The mining institutes design their courses to give attention *both* to basic engineering *and* mathematics. *Both* subjects are of great importance for the future engineer.
4. A new institute will train *both* geologists *and* mining engineers.

5. *Both* methods of prospecting are in use.

**4. Find the equivalents of the following word combinations:**

- |                                     |                                     |
|-------------------------------------|-------------------------------------|
| 1. a wide range of problems         | а) широкий круг проблем             |
| 2. mining mechanical engineer       | б) горный инженер-механик           |
| 3. graduation paper                 | в) принимать форму                  |
| 4. to train mining engineers        | г) дипломная работа                 |
| 5. students' scientific groups      | д) физические и химические свойства |
| 6. to gain experience               | е) приобретать опыт                 |
| 7. take shape                       | ж) готовить горных инженеров        |
| 8. physical and chemical properties | з) высшие горные учебные заведения  |
| 9. higher mining schools            | и) студенческие научные общества    |

**5. Form the adjectives, using suffixes – ful or - less. Translate them into Russian.**

beauty (красота), thank (благодарить), hope (надеяться), doubt (сомнение), care (забота), aim (цель), use (польза), shape (форма).

**6. Translate the words into Russian, paying attention on the meaning of prefix and root.**

untrue, decompose, demilitarization, discover (cover - покрывать), antibody, non-inductivity, non-resistance, invariable, antiparticle, disappearance, disjoin, rearrangement, reconstruct, ex-champion, pre-war, prefabricate, post-war, supersonic, coauthor, extraterritorial, pre- historic, ultramodern.

**7. Form comparative and superlative degrees of the following adjectives and translate into Russian:**

Long, large, thick, thin, difficult, necessary, good, bad, much, little, lumpy, easy.

**8. Give the first form of the following adjectives:**

Best, fewer, bigger, earliest, highest, thinner

**9. Translate into Russian:**

1. Our recourses of oil are *greater than* those of any other country. 2. The industrial importance of coal is *greater than* that one peat. 3. These methods of work are *as productive as* those which are in use at the mine No 3.

### Lesson 3. **Pioneers of Russian Mining School**

Text: **M. Terpigorev**

Grammar Revision: **The verbs: *to be, to have* in Present, Past, Future Simple Tense. Phrases: *there is..., there are...***

#### **A.M. Terpigorev (1873-1959)**

Academician A.M. Terpigorev is a well-known mining engineer who successfully combined his practical experience with scientific research. He was born in 1873 in Tambov. In 1892 he finished school with honors and decided to get a higher education. He chose the Mining Institute in St.Petersburg, passed all the entrance examinations successfully and became a student of the Mining Institute. At the institute he studied the full range of subjects relating to metallurgy, mining and mining mechanics.

At that time students' specialization was based on<sup>1</sup> descriptive courses and elementary practical training. One of the best lecturers was A.P. Karpinsky. His lectures on historical geology were very popular. During his practical training Terpigorev visited mines and saw that the miners' work was very difficult. While he was working in the Donbas he collected material for his graduation paper which he soon defended. The mining of flat seams in the Donbas was carefully studied and described in it. In 1897 Terpigorev graduated from the Institute with a first-class diploma of mining engineer.

His first job as a mining engineer was at the Sulin mines where he worked for more than three years first as Assistant Manager and later as Manager. From 1900 till 1922 Terpigorev worked at the Yekaterinoslav Mining Institute (later the Mining Institute in Dnepropetrovsk). In 1922 he accepted an offer to take charge of<sup>2</sup> the mining chair at the Moscow Mining Academy and moved to Moscow. From 1930 he headed, the chairs<sup>3</sup> of Mining Transport and Mining of Bedded Deposits at the Moscow Mining Institute.

Academician Terpigorev took a particular interest in mine safety. As a result of his investigations a series of safety measures in gassy collieries was worked out. For some time he was working on the problem of fire damp, the most harmful and dangerous of all the gases in mines.

His two-volume work *Coal Mining and Mine Transport Facilities* is a full description of the state of mechanization and the economy of the Donbas. His other works are about mining transport facilities, mechanization of coal mining and mining machinery. He is one of the pioneers in scientific methods of coal gasification.

#### **Notes:**

1. was based on- базировалась

2. to take charge of (smth) - руководить, осуществлять контроль (над чем-либо)

3. headed the chairs – возглавил кафедры

#### **Working vocabulary:**

descriptive courses

graduation paper

flat seams

mining chair

описательные курсы

дипломная работа

напластования

кафедра горного факультета

bedded deposits	напластованные залежи
mine safety	безопасность на шахте
investigations	исследования
safety measures	меры безопасности
gassy collieries	загазованные копи
firedamp	рудничный газ
harmful	вредный, губительный
mining transport facilities	горный транспорт

## Exercises:

### 1. Read and translate the text: A.M. Terpigorev (1873-1959)

### 2. Answer the questions:

1. Academician A.M. Terpigorev is a well-known mining engineer who successfully combined his practical experience with scientific research, isn't he?
2. When and where was Terpigorev born?
3. Where did he decide to get a higher education after finishing school?
4. Why were his lectures on historical geology very popular?
5. What material did he collect while A.M. Terpigorev was working in the Donbas?
6. What institute did he graduate from?
7. What material did he collect while he was working in the Donbas?
8. Where did Terpigorev work from 1900 till 1922?
9. What did Terpigorev take a particular interest in?
10. What works by Terpigorev do you know?

### 3. Find the equivalents of the following word combinations:

- |                                       |                                |
|---------------------------------------|--------------------------------|
| 1. firedamp                           | а) охрана труда в шахтах       |
| 2. flat seam                          | б) эксплуатация месторождений  |
| 3. mine safety                        | в) выдающиеся исследователи    |
| 4. to collect the material            | г) происхождение железной руды |
| 5. exploitation of deposits           | д) мероприятия по охране труда |
| 6. two-volume work                    | е) описательный курс           |
| 7. descriptive course                 | ж) горизонтальный пласт        |
| 8. safety measures                    | з) метан                       |
| 9. the origin of iron ore             | и) собирать материал           |
| 10. outstanding prominent researchers | к) начальник шахты             |
| 11. the manager of a colliery         | л) мероприятия по охране       |

### 4. Fill in the gaps in the sentences. Use the corresponding preposition where it is necessary (*of, for, in, at, to, during, with, from, on*). Translate the sentences.

One ...the professors ... our Institute is known ... his work ... field ... geology. He finishes

school ... St.Petersburg and entered ...the Institute of Mining there. ... the Institute he studied the full range ... subjects relating ... geology and mining. ... his practical training he visited many coal-fields and collected material ... his graduation paper ... the stratigraphy of the Urals. After graduating ...the Institute he worked as a geologist in the Kuzbas. He investigated geological conditions and their influence ... the choice ... methods ... mining useful minerals.

### **5. Translate the sentences,**

1. There were several vacant seats in the bus.
2. There was no chance of getting tickets for this concert.
3. There are very powerful cranes for unloading ships in this port.
4. There was still some hope of reaching the destination in time.
5. Is there any demand for the tubes of that size?
6. There are unique conditions in space for producing materials with special qualities.
7. There remains one more test to be carried out before using the device.

### **6. Copy the following sentences, fill in the gaps with the verbs: *to be*, *to have* in corresponding forms. Translate the sentences.**

1. I know that his father ...many books in different foreign languages.
2. Usually he ... at home on Sunday.
3. Next year there ... new equipment in our school laboratory.
4. Now there ...beautiful gardens near the house.
- 5.Ten years ago there ... only a primary school in our village.
6. There ... two terms in the academic year.

### **7. Insert the verb *to be* (*am, is, are; was, were; will be*) в нужной форме:**

1. There ... telegram on the table. 2.... there any telegrams from Moscow? Yes, there ... some. 3. ... there a flight for Moscow tomorrow? Yes, there... 4. There... much snow last winter. 5. There ... a lot of stars and planets in space. 6. .... there ... a lift in your future house? Yes, there... 7. Some years ago there ... many old houses in our street. 8. .... there any lectures yesterday? No, there ... 9. ... there a test last lesson? No, there... 10. Soon there ... a new film on.

### **8. Ask questions on the following sentences.**

1. There are some new pupils in our group. 2. There is no book on the table. 3. There were many old houses in our street. 4. There are 4 seasons in a year. 5. There will be a conference next week. 6. There are many large cities in our country. 7. There was nobody in the room. 8. There are 7 days in a week. 9. There is something on the shelf. 10. There are many places of interest in Gubkin.

#### Lesson 4. **A.P. Karpinsky is one of the Prominent Russian Scientists who laid the Foundation<sup>1</sup> of Russian School of Geology and Mining.**

Text: **A.P. Karpinsky**

Grammar Revision: **Conjunctions. Indefinite pronouns: some, any, on, every**

##### **A.P. Karpinsky (1847-1936)**

V.A. Obruchev, I.M. Gubkin, A.Y. Fersman, V.I. Vernadsky and A.P. Karpinsky were the prominent Russian scientists who laid the foundation<sup>1</sup> of the Russian school of geology and mining.

An entire epoch in the history of Russian geology is connected with Karpinsky's name. One of the greatest Russian geologists, he was a member and for some time President of the academy of Sciences of the former USSR and a member of several Academies abroad. The Geological Society of London elected him a foreign member in 1901 His greatest contribution to geology was a new detailed geological map of the European part of Russia and the Urals.

For many years he headed the Russian Geological Committee the staff of which was made up of<sup>2</sup> his pupils. He was one of those geologists who embraced the whole of geological science. He created stratigraphy of Russia. He studied the geological systems in various regions of the country and was the first to establish<sup>3</sup> the regularity of the Earth's crust movement.

His paleontological studies are of no less importance, especially those on Palaeozoic ammonites<sup>4</sup>. He also took an interest in deposits of useful minerals and gave a classification of volcanic rocks. He advanced the view that petroleum deposits existed in Russia, which was confirmed later. He studied some ore and platinum deposits and may be justly considered<sup>5</sup> the founder of practical geology of the Urals. He was the first Russian scientist who introduced microscope in the study of petrographic slides<sup>6</sup>.

Karpinsky was a prominent scientist, an excellent man and citizen. He was one of the best lecturers at the Mining Institute in his time. He was also one of the greatest Russian scientists who later became the first elected President of the Academy of Sciences of the USSR. Every geologist and every geology student knows well Karpinsky's most significant work *An Outline of the Physical and Geographical Conditions in European Russia in Past Geological Periods*.

##### **Notes:**

1. to lay the foundation – заложить фундамент
2. to be made up of – состоять из
3. the first to establish – первым установил
4. Paleozoic ammonites – палеозойские аммониты
5. may be considered – может считаться
6. petrographic slides – петрографические сдвиги

##### **Working vocabulary:**

entire epoch

целая эпоха

contribution

вклад

to embrace	охватывать (мыслью, взглядом)
regularity	непрерывность, регулярность
to be of no less importance	иметь не меньшее значение
the whole	в целом
stratigraphy	стратиграфия
Earth's crust	земная кора
to advance the view	продвигать точку зрения
justly	справедливо, законно
prominent	выдающийся, известный
significant	значительный
volcanic rocks	вулканические породы
petroleum deposits	месторождения нефти
to confirm	подтверждать, поддерживать
elected President	избранный президент
outline	набросок, очерк, описание

### Exercises:

**1. Read and translate the text. Rewrite the fields of geology, in which A.P. Karpinsky was a pioneer.**

### Answer the questions:

- 1) What prominent Russian scientists who laid the foundation<sup>1</sup> of the Russian school of geology and mining do you know?
- 2) A.P. Karpinsky was one of the greatest Russian geologists, was not he?
- 3) What society elected Karpinsky a foreign member and when?
- 4) What was the greatest Karpinsky's contribution to geology?
- 5) What did A.P. Karpinsky study?
- 6) Was the first to establish the regularity of the Earth's crust movement.
- 7) Was he the head of the Russian Geological Committee or was he member of that Committee?
- 8) What regions did Karpinsky investigate?
- 9) He studied some ore and platinum deposits and may be justly considered the founder of practical geology of the Urals, may not he?
- 10) What can you say about Karpinsky's investigations in petrology?
- 11) How can you characterize him as a man and citizen?
- 12) Which of his works are the most significant?

### 3. Find the equivalents of the following word combinations:

- |                                |                             |
|--------------------------------|-----------------------------|
| 1. prominent scientist         | а) возглавить комитет       |
| 2. deposits of useful minerals | б) высказать точку зрения   |
| 3. to make up a detailed map   | в) интересоваться геологией |
| 4. remarkable works            | г) земная кора              |
| 5. to advance the view         | д) избирать председателя    |
| 6. the Earth's crust           | е) научное общество         |

7. scientific society	ж)выдающийся ученый
8. to head a Committee	з)залежи полезных ископаемых
9. to elect chairman	и) замечательные работы
10. to take an interest in geology	к) составить подробную карту

#### 4. Translate the sentences, paying attention at subordinate conjunctions.

1. The children made such a noise that I couldn't work. 2. The book was so difficult that I couldn't read it. 3. My friend was so busy yesterday that he couldn't go to the country with me. 4. When I was a student, I lived in Kiev. 5. Please stay here until I return. 6. Wait for him here till he comes back. 7. Give me this book to read after you have finished it. 8. You should see the doctor before you go back to work. 9. While I'm writing this, you can read a newspaper. 10. As soon as he saw us, he came towards us. 11. Can I have this book to read if it's interesting? 12. I couldn't go to the institute because I was ill. 13. As my lessons began at eight, I had to get up at seven. 14. My friend works hard at his English, as he wants to speak the language well. 15. Since I didn't know my friend's new address, I could hardly find him. 16. Is Leningrad as big as Moscow? 17. The weather was not so nice yesterday as it is today. 18. Tell him that I'll be back. 19. We'll go to the country if the weather's fine. 20. If I were you, I wouldn't do it. 21. Nothing will happen provided you follow the instructions. 22. We shall be late unless you hurry. 23. He put up his coat lest he should be cold. 24. You will feel well provided you give up smoking. 25. He looked through his notes carefully in order that to make a good report. 26. They introduced this principle into their research although it brought about much difficulty. 27. The more the cathode is heated, the more electrons it sends out.

#### 5. Translate the sentences, paying attention at the translation of pronouns.

a) 1. *I* have *no* time to help *you* today. 2. *He* is the only man who checked this document. 3. *I* was neither in Austria nor in Nigeria. 4. *I*'ve got *something* important for *you*. 5. Either *he* or *she* is at home now. 6. *I*'ve got *something* important for *you*. 7. *Nothing* special happened yesterday. 8. *He* is either in Russia or in Britain. 9. *He* was the only person *I* loved. 10. *They* signed *both these* contracts and agreements yesterday.

б) 1. *I* saw *nobody* in the library. 2. There has been *no* rain for several days. 3. *He* said *nothing* about it in *his* last letter. 4. *I* have received *no* letters from *him* lately. 5. *He* gave *me no* ink. 6. *I* have *no* dictionary. 7. *He* said *nothing*. 8. *I* shall give the book to *nobody* else.



## Lesson 5. The Process of Rock Disintegration

Text: **Weathering of Rocks**

Grammar Revision: **Articles with proper names. The word order in the English sentence.**

### Weathering of Rocks

All rocks which are exposed on the Earth's surface (high mountain peaks, deserts) are decomposed to a certain degree. The process of rock disintegration by the direct influence of local atmospheric conditions on the Earth's surface is called *weathering*. This phenomenon is often referred to in geology because weathering is an active process. It takes place in the upper layers of the Earth's crust.

The main cause of *physical weathering* is the change in temperature that takes place with the succession of day and night. This phenomenon can best be observed in the deserts and high mountains where the changes in temperature are common. During the day under the influence of heat, rocks expand whereas at night they begin to contract. As rocks are generally composed of different minerals, their expansion and contraction do not occur uniformly. As a result of this rocks crack. At the beginning these cracks or fissures are hardly noticeable but gradually they become wider and deeper until the whole surface of rock is finally transformed into gravel, sand or dust.

In the regions of a moderate or cold climate where the temperature in winter goes down below 0 (zero), the decomposition of rocks is greatly facilitated by action of water. When water freezes it increases in volume and develops enormous lateral pressure. Under the action of water, rocks decompose to pieces of varied forms and sizes. The decomposition of rocks under the direct influence of heat and cold is called *physical weathering*.

Rocks are subjected not only to physical decomposition but also to *chemical weathering*, i.e. to the action of chemical agents, such as water, carbon dioxide and oxygen. In a general way, chemical weathering is an acid attack on the rocks of the Earth's crust, in particular an attack on the most abundant minerals - quartz (sand) and aluminium silicates (clays). Only few minerals and rocks are resistant to the action of natural waters. The solvent action of water is stronger when it contains carbon dioxide. Water causes more complex and varied changes. With the participation of oxygen and carbon dioxide up to 90 per cent of rocks is transformed into soluble minerals, which are carried away by the waters.

Organisms and plants also take part in the disintegration of rocks. Certain marine organisms accelerate the destruction of rocks by making holes in them to live in. The action of plants can often be even more destructive. Their roots penetrate into the fissures of rocks and develop the lateral pressure which fractures and destroys rocks.

### Working vocabulary:

to be exposed

быть подвергнутым действию (солнца, ветра и т.п.)

to decompose

распадаться, разрушаться

disintegration	распадение, разрушение
weathering	выветривание
upper layers	верхние слои
fissures	трещины, расщелины, изломы
lateral pressure	боковой, горизонтальный
abundant	обильный, богатый
to be resistant	быть устойчивым

## Exercises:

### 1. Read and translate the text.

### 2. Answer the following questions:

1. What process is called weathering?
2. What process is called physical weathering (chemical weathering)?
3. What substances can act as solvents?
4. Are all minerals and rocks resistant to the action of natural waters?
5. How do organisms act on the destruction of rocks?

### 3. Use the definite article *the* if it is necessary

1. I went to ... France last year, but I haven't been to ...Netherlands yet.
2. I live in... Tverskaya Street.
3. Thames flows through... London.
4. My train leaves from ...Waterloo Station at 7.10 p.m.
5. St. Bernard dogs are named after a monastery high up in       Alps.
6. Queen Elizabeth II won't speak on TV tomorrow.
7. USA is the fourth largest country in the world after...Russia...Canada and the Republic of... China.
8. English Channel is between Great Britain and ... France.
9. Trafalgar Square is the geographical centre of... London.

### 4. Make sentences, using the following words:

1. traditions, our, interesting, has, university, many.
2. an, plays, of, role, people, life, music, important, in.
3. this, did, the, university, why, enter, you?
4. sport, is, what, favourite, your?
5. students, have, the, in the first year, not, at, college, the, a lot of, important.
6. course, new, what, academy, the, did, introduce?

### 5. Make questions to the following sentences:

- 1) *Yes, they did.* (The -scientists carried out research in the field of geology and mining.)
- 2) *No, there were not.* (There were only a few higher mining schools in the country.)
- 3) *No, it did not.* (The Academy established close contacts with the coal and ore mining industries.)
- 4) *Yes, they did.* (They took active part in the development of heavy industry.)

## **Lesson 6. The Earth's Crust. Three main Groups of Rocks**

**Texts: The Earth's Crust. Sedimentary Rocks.**  
**Grammar Revision: Modal verbs and their equivalents.**

### **The Earth's Crust**

Most mineral resources are derived from the Earth's crust. The crust is composed of minerals that are crystalline solids with specific and rather simple composition. Minerals in the Earth's crust are concentrated into specific groups which are called rocks. Two distinctly different types of crust are recognized: oceanic and continental.

Since it is difficult to investigate the floor of the ocean, the composition of the oceanic crust is not known completely. Scientists say that it is relatively constant in composition. The oceanic floor consists largely of minerals rich in calcium, magnesium, iron and silicon, and it is formed by the cooling of laves extruded on the sea floor to form a type of rock called basalt. It is subjected to the same forces of erosion and weathering.

The continental crust contains less iron and magnesium than the oceanic crust, but relatively more silicon, aluminium, sodium and potassium. The continental crust is more complicated and has a more variable thickness and a less well defined structure.

A systematic examination of all known types shows that the rocks of the Earth's crust are divided into three main groups: sedimentary rocks, which consist of fragments or particles of pre-existing rocks; igneous rocks which have solidified from magma and metamorphic rocks. Metamorphic rocks have been derived from either igneous or sedimentary rocks.

### **Sedimentary Rocks**

Sedimentary rocks represent one of the three major groups of rocks that make up the crust of the Earth. Most sedimentary rocks have originated by sedimentation. They are layered or stratified. Thus, stratification is the most important characteristic of sediments and sedimentary rocks. It is necessary to note that the processes which lead to the formation of sedimentary rocks are going on around us.

Sediments are formed at or very near the surface of the Earth by the action of heat, water (rivers, glaciers, seas and lakes) and organisms. Sedimentary rocks form a very small proportion by volume of the rocks of the Earth's crust (only 5%), but about three quarters of the Earth's surface is occupied by sedimentary rocks. It means that most of sedimentary rocks are formed by sediments, accumulations of solid material on the Earth's surface.

The thickness of the layers of sedimentary rocks can vary greatly from place to place. They can be formed by the mechanical action of water, wind, frost and organic decay. Such sediments as gravel, sand and clay "can be transformed into conglomerates, sandstones and clay schists as a result of the accumulation of materials achieved by the destructive mechanical action of water and wind.

Mechanical sediments can be unconsolidated and consolidated. For example, gravel, sand and clay form the group of unconsolidated mechanical sediments, because they

consist of loose uncemented particles (grains). On the Earth's surface we also find consolidated rocks, which are very similar to the loose sediments whose particles are firmly cemented to one another by some substance. The usual cementing substances are sand, clay, calcium carbonate and others.

On the other hand, chemical sediments are the result of deposits or accumulations of substances achieved by the destructive chemical action of water. The minerals such as rock salt, gypsum and others are formed through sedimentation of mineral substances that are dissolved in water.

Sediments can also be formed by the decay of the remains of organisms, by the accumulation of plant relics. They are called organic sediments. Limestone, peat, coal, mineral oil and other sediments may serve as an example of organic sediments.

The most principal kinds of sedimentary rocks are conglomerate, sandstone, siltstone, shale, limestone and dolomite. Many other kinds with large practical value include common salt, gypsum, phosphate, iron oxide and coal.

### **Working vocabulary:**

to be derived	получать, извлекать
solid	твердый, твердое вещество
distinctly	отчетливо, определенно, ясно
to investigate	исследовать
extruded on the sea floor	выталкивать, вытеснять со дна моря
to be subjected	быть подвергнутым
to define	определять, обозначать
sedimentary rocks	осадочные породы
igneous rocks	вулканические породы
metamorphic rocks	метаморфические породы
to stratify	наслаиваться, напластовываться
decay	разложение, гниение
schists	аспидный сланец

### **Exercises**

#### **1. Read and translate the text.**

#### **2. Answer the questions:**

1. What main groups of rocks do you know?
2. What is the most important characteristic feature of sediments?
3. How and where are Sediments formed?
4. About three quarters of the Earth's surface is occupied by sedimentary rocks, isn't it?
5. Can the thickness of the layers of sedimentary rocks vary greatly from place to place?
6. What kind of sediments can be unconsolidated and consolidated?
7. Are chemical sediments the result of deposits or accumulations of substances achieved by the destructive chemical action of water?

8. What the most principal kinds of sedimentary rocks do you know?

**3. Translate the sentences into English. Use the words from the text.**

- 1) Земная кора состоит из осадочных, изверженных и метаморфических пород.
- 2) Осадочные породы образуются под действием воды, тепла, холода и органических веществ.
- 3) Толщина слоев осадочных пород может сильно меняться от места к месту.
- 4) Они могут быть сформированы благодаря механическому воздействию воды, ветра, мороза и органическому разложению.
- 5) Они называются органическими осадочными породами.

**4. Change the words in brackets with modal verbs: must, can, may, need**

1. You (должны) replace this old table.
2. We (можем) use energy more affectively.
3. They (нужно) to test the pollution of the water.
4. The students (могут) make the experiment.
5. People (не могут) reduce the pollution immediately.

**5. Underline modal verbs and their equivalents. Translate into Russian.**

1. We must sign this contract.
2. Would you tell me the way to the station?
3. You are allowed to pay with your credit card.
4. Who is to answer the letters?
5. Nobody could translate this text.
6. The customers may take these catalogues.
7. Can you deliver the goods tomorrow?
8. They had to do this work.
9. The train is to come soon.
10. You needn't come so early.

**6. Find equivalents of the following word combinations:**

**7. Translate these sentences. Pay your attention at the meaning of modal verbs and their equivalents.**

1. The thermonuclear process of fusion can take place only at extremely high temperatures.
2. One ought to know that it was in Obninsk (Russia) that the first atomic power station was put into operation.
3. Man-made satellites and spaceships are to investigate various types or radiations in space.
4. On a clear night a man is able to see with a naked eye about 4,000 stars.
5. Lots of problems had to be solved before the plant could be built.
6. With the creation of industrial thermonuclear reactors energy resources may become inexhaustible.

## Lesson 7. **The Earth's Crust. Three main Groups of Rocks**

Texts: **Igneous Rocks. Metamorphic Rocks.**

Grammar Revision: **Modal verbs with the Infinitive in Passive Voice**

### **Igneous Rocks**

Igneous rocks have crystallized from solidified magma. Igneous rocks can be classified in a number of ways and one of them is based on mode of occurrence. They occur either as intrusive (below the surface) bodies or as extrusive masses solidified at the Earth's surface.

The grain size of igneous rocks depends on their occurrence. The intrusive rocks generally cool more slowly than the extrusive rocks and crystallize to a larger grain size. The coarser-grained intrusive rocks with grain size of more than 0.5 mm called plutonic or abyssal are referred to as intrusive igneous rocks because they are intruded into older pre-existing rocks. Extrusive or volcanic rocks have even finer grains, less than 0.05 mm and are glassy.

Exposed igneous rocks are most numerous in mountain zones for two reasons. First, the mountain belts have been zones of major deformation. Second, uplifts in mountain belts have permitted plutonic masses to be formed.

Extrusive igneous rocks have been formed from lava flows which come from fissures to the surface and form fields of volcanic rocks such as hyalite (гиалит), basalt, as well as volcanic ashes and dust, tuff, etc. As a rule, these rocks of volcanic origin cool rapidly and are fine-grained. It is interesting to note that basalt is the most abundant of all lava types. It is the principal rock type of the ocean floor.

Igneous rocks are rich in minerals that are important economically or have great scientific value. Igneous rocks and their veins are rich in iron, gold, zinc, nickel and other ferrous metals.

### **Metamorphic Rocks**

Metamorphic rocks compose the third large family of rocks. "Metamorphic" means "changed from". It shows that the original rock has been changed from its primary form to a new one. Being subjected to pressure, heat and chemically active fluids beneath the Earth's surface, various rocks in the Earth's crust undergo changes in texture, in mineral composition and structure and are transformed into metamorphic rocks. The process described is called metamorphism.

As is known, metamorphic rocks have been developed from earlier igneous and sedimentary rocks by the action of heat and pressure. The role of water in metamorphism is determined by at least four variable geologically related parameters: rock pressure, temperature, water pressure, and the amount of water present.

Many of the metamorphic rocks consist of flaky materials such as mica and chlorite. These minerals cause the rock to split into thin sheets, and rocks become foliated. Slate, phylum, schist and gneiss belong to the group of foliated metamorphic rocks. Marble and quartzite are non-foliated metamorphic rocks.

The structure of metamorphic rocks is of importance because it shows the nature of pre-existing rocks and the mechanism of metamorphic deformation. Every trace of original structure is of great importance to geologist. Metamorphic rocks represent the oldest

portion of the Earth's crust. They are mostly found in the regions of mountain belts where great dislocations on the Earth once took place.

### **Working vocabulary:**

igneous rocks	вулканические породы
metamorphic rocks	метаморфические породы
solidified magma	застывшая магма
mode of occurrence	способ залегания (полезных ископаемых)
extrusive	вытесняющий, выталкивающий
intrusive	интрузивный, плутонический (о породах)
coarser	крупный, необработанный
to intrude	вторгаться
uplifts	взброс, подъем
fissures	трещина, расщелина, излом
beneath	внизу
flaky	слоистый
slate	сланец
phylum	тип
schist and gneiss	аспидный сланец, гнейс (минерал)

### **Exercises:**

#### **1. Read and translate the texts.**

#### **2. Answer the questions**

1. Which types of igneous rocks do you know?
2. What does the grain size of igneous rocks depend on?
3. The intrusive rocks generally cool more slowly than the extrusive rocks and crystallize to a larger grain size, don't they?
4. Why are the coarser-grained intrusive rocks with grain size of more than 0.5 mm called plutonic or abyssal referred to as intrusive igneous rocks?
5. For what two reasons are exposed igneous rocks most numerous in mountain zones?
6. What metals are igneous rocks and their veins rich in?
7. Do you know how metamorphic rocks have been formed?
8. By what four variable geologically related parameters the role of water in metamorphism is determined?
9. What rocks do we call foliated?
10. What can you say about non-foliated metamorphic rocks?
11. What do many of the metamorphic rocks consist of ?
12. By what conditions rocks become foliated?

#### **3. Translate the sentences into English. Use the words from the text.**

- 1) Изверженные породы образуют большую группу минералов, которые являются экономически важными.

- 2) Как известно, каменная соль образуется путем осаждения минеральных веществ. Эти вещества растворяются в воде.
- 3) Метаморфические породы образовались из изверженных и осадочных пород.
- 4) Гнейс имеет слоистую структуру и относится к группе метаморфических пород.
- 5) Метаморфические породы имеют большое значение, так как их структура дает возможность установить следы существовавших ранее пород.

#### **4. Find equivalents of the following word combinations:**

- |                                  |                                   |
|----------------------------------|-----------------------------------|
| 1. fine grained sand             | а) уплотненные осадки             |
| 2. the Earth's crust             | б) следы первоначальной структуры |
| 3. exposed rocks                 | в) абиссальные (глубинные) породы |
| 4. consolidated sediments        | г) составляющие пород             |
| 5. abyssal rocks                 | д) форма и размер зерен           |
| 6. shape and size of grains      | е) земная кора                    |
| 7. zones of major deformation    | ж) сланцеватая структура          |
| 8. scientific value              | з) обнаженные породы              |
| 9. constituents of rocks         | и) зоны крупных нарушений         |
| 10. schistose structure          | к) мелкозернистый песок           |
| 11. traces of original structure | л) научная ценность               |

#### **6. Translate the sentences. Pay your attention at the meaning of modal verbs and their equivalents.**

1. Large shovels are to be used in strip mines because they can handle all types of mineral, including blocky material.
2. Scrapers have good mobility. Their use should be limited to soft and easily broken material for good production.
3. Draglines are normally used for handling unconsolidated and softer material but larger units can handle blasted rock. They may or may not require waste haulage equipment.
- 4 Bucket-wheel excavators must be widely used in open-cast mining for stripping overburden and excavating minerals.
5. Many factors have to be taken into consideration in designing various types of equipment which is to be utilized for stripping operations.

#### **7. Translate the sentences into Russian.**

##### **Pay your attention on combination of modal verbs with the infinitive of in Passive voice:**

1. Today you can be taken everywhere in any direction in a few days.
1. Air must be let into the cylinder of the engine because no fuel will burn without air.
2. The air must be compressed.
3. The amplifier (усилитель) can be used with any high resistance galvanometer.
4. It must be cleaned.
5. This metal can be cut dry.
6. The floor must be cleared and swept.
7. The hole must be deepened and widened.



## Lesson 8. **Minerals**

Text: **Mineral Deposits**

Grammar Revision: **Indefinite Tenses**

### **Mineral Deposits**

Minerals that make up rocks are defined as inorganic substances which occur naturally and have a definite chemical composition and physical properties which vary within known limits. The major properties are colour, crystal form, hardness, cleavage and others. Cleavage is one of the most diagnostically useful mineralogical properties which can be found throughout the mineral.

Minerals of use to man can be grouped into two broad categories: 1) metals, such as aluminium, copper, gold, silver, iron, tin, platinum, chromium, nickel, lead and zinc, and 2) non-metallic minerals, such as diamonds, salt, limestone, cement, sulphur, and asbestos. When minerals occur so that they can be worked at a profit they are called ore deposits. Mineral deposits are seldom equally rich throughout.

Economic minerals are those which are of economic importance and include both metallic and non-metallic minerals.

Most minerals consist of several elements. Such elements are oxygen, silicon, titanium, aluminium, iron, magnesium, calcium, sodium, potassium and hydrogen. They make up more than 99 per cent by weight of all the rock-forming minerals. Of these, aluminium, iron and magnesium are industrial metals. The other metals are present in small quantities, mostly in igneous rocks.

For example, iron is one of the most abundant metals in the Earth's crust. There are three important classes of iron deposits: deposits associated with igneous rocks; residual deposits and sedimentary deposits. Iron deposits associated with igneous rocks are usually small but very rich bodies either of haematite or magnetite. Large concentrations have been successfully mined in Pennsylvania (the USA) and in the Russian Federation.

Residual deposits of iron minerals are formed wherever weathering occurs. Iron deposits formed this way are very widespread. It should be stressed that the residual deposits were among the first to be exploited by man.

Sedimentary iron deposits make up most of the world's current production.

As the essential component of every variety of steel, iron is obviously the most important of all industrial metals. It has played a large part in the development of our modern civilization. Iron ores are mainly used for producing cast iron, steel and ferro-alloys. From a scientific point of view, iron's most important property is that it becomes magnetized.

The magnetic iron ore is the main wealth of the Kursk Magnetic Anomaly (KMA). Iron fields are worked by surface mining which is more economical. But the KMA is rich not only in iron ores. Its deposits contain bauxite, phosphorite, cement, sand and clays.

### **Working vocabulary:**

cleavage

слоистость, раскол

tin, lead, limestone, sulphur  
oxygen, hydrogen,  
silicon, magnesium  
calcium, sodium, potassium  
abundant  
throughout  
residual deposits  
haematite  
magnetite  
to occur  
to exploit  
cast iron  
ferro-alloys  
bauxite

олово, свинец, сера  
кислород, водород  
кремний, магний  
кальций, натрий, калий  
богатый, обильный  
повсюду, на всем протяжении  
остаточные месторождения  
гематит, крапчатый железняк  
магнетит, магнитный железняк  
залегать  
эксплуатировать, разрабатывать  
чугун  
ферросплавы, железные сплавы  
боксит, алюминиевая руда

### Exercises:

#### 1. Read and translate the text.

#### 2. Answer the questions:

1. How are minerals that make rocks defined?
2. Why is cleavage the most important property of minerals?
3. Where can cleavage one of the most diagnostically useful mineralogical properties be found?
4. What two groups of minerals do you know?
5. When are minerals called ore deposits?
6. What minerals are called economic minerals?
7. What are three important classes of iron deposits?
8. What are iron ores mainly used for?
9. What is the main wealth of the Kursk Magnetic Anomaly?
10. The KMA is rich not only in iron ores, isn't it? What do its deposits contain except iron ores?
11. What elements do most minerals consist of?
12. What mineral is one of the most abundant metals in the Earth's crust?

#### 3. Choose the proper variant.

1. Where the Johnsons (live)?

*A Where do the Johnsons live?*

*B Where are the Johnsons live?*

*C Where does the Johnsons live?*

2. I(not/understand) that man because I (not\know) English.

*A not understand, don't know*

*B don't understand, not know*

*C don't understand, don't know*

3. Everybody in our family (help) Mummy about the house. Dad (walk) the dog, I (water) the flowers and my brothers (clean) the rooms.

*A help, walks, water, clean*

*B helps, walks, water, clean*

*C help, walks, water, cleans*

4....Jane Smith (speak) English?

*AIs... speak*

*B Does... speak*

*C Do... speaks*

5. ... you (like)swimming?

*A Do you like*

*B Does you like*

*C Are you like*

6. ... your sister often (go) to the theatre?

*A Is...go*

*B Does...go*

*C Do...goes*

7. ... Bob (know) what I want?

*A Bob knows*

*B Do Bob knows*

*C Does Bob know*

### **8. Use the verbs in brackets in the Future Indefinite Tense.**

1. I'm tired. I will (to go) to bed. 2. It's late. I think I (to take) a taxi. 3. ... I (to answer) the question? 4. We don't know their address. What... we (to do)? 5. Our test (not to take) long. 6. I'm afraid they (not to wait) for us. 7. ...Diana (to come) to the party tomorrow? 8. You (to arrive) in Paris tomorrow evening. 9. The boy (to remember) this day all his life.

### **9. Use the verbs in brackets in the Past Indefinite Tense.**

1. There isn't a cloud in the sky, but it (to be) cloudy in die morning. 2. Mrs. Clay usually finishes her work at half past three, but she (to finish) it later yesterday afternoon. 3. Every day I help mother about the house, but last week I was very busy with my exam. So I (not to help) her much. 4. Tom will not be playing tennis tomorrow afternoon, he (not to play) tennis yesterday. 5. We generally have lunch at 12.30, but yesterday we (to have lunch) later. 6. Now my brother smokes a lot, but he (not to smoke) before. 7. The Erasers live in a four-room apartment, but last year they (to live) in a small house in the country. 8. I don't eat meat at all, but the other day I visited my friends and (to eat) pork there. 9. My Dad always goes to work by car, but last week he (go) to work on foot. 10. The weather is nice today, but it (to be) bad yesterday. 11. We rarely watch television, but last week we (to watch) a lot of interesting programmes. 12. Do you often see Tom? Not often, but I (to see) him at the party the other day. 13. I (to get) to the market myself last time, but now I don't remember how to get there. 14. I sleep well, but last night I (not to sleep) at all.

## Lesson 9. Coal

Text: **Coal and Its Classification**

Grammar Revision: **Continuous Tenses**

### Coal and Its Classification

Coal is the product of vegetable matter that has been formed by the action of decay, weathering, and the effects of pressure, temperature and time millions of years ago. Although coal is not a true mineral, its formation processes are similar to those of sedimentary rocks. Structurally coal beds are geological strata characterized by the same irregularities in thickness, uniformity and continuity as other strata of sedimentary origin.

Coal beds may consist of essentially uniform continuous strata or like other sedimentary deposits may be made up of different bands or benches of varying thickness. The benches may be separated by thin layers of clay, shale, pyrites or other mineral matter, commonly called partings. Like other sedimentary rocks coal beds may be structurally disturbed by folding and faulting.

According to the amount of carbon coals are classified into: brown coals, bituminous coals and anthracite. Brown coals are in their turn subdivided into lignite and common brown coal. Although carbon is the most important element in coal, as many as 72 elements have been found in some coal deposits, including lithium, chromium, cobalt, nickel, tungsten and others.

Coal is still of great importance for the development of modern industry. It may be used for domestic and industrial purposes. Being the main source of coke, coal is widely used in the iron and steel industry. Lignite, for example either in the raw state or in briquettes, is a source of industrial carbon and industrial gases.

There is a strong tendency now for increased research into new technologies to utilize coal. No doubt, coal will be used as a raw material for the chemical industry and petrochemical processes. All these processes involve coal conversion which includes gasification designed to produce synthetic gas from coal as the basis for hydrogen manufacture, liquid fraction for making liquid fuel from coal and other processes.

#### Working vocabulary:

decay	гниение, распад, разложение
weathering	выветривание
beds	пласт, слой, залегание
stratum <i>pl</i> (strata)	пласт, напластование, формация
irregularity	неровность, беспорядочность
uniformity	единообразие
bands	полоса
bench	терраса, уступ
shale	сланцевая глина, глинистый сланец
pyrite s	серный колчедан, пирит
partings	прослойки
folding	складка

faulting	разлом
bituminous	битумный
anthracite	антрацит
to subdivide	подразделять (ся)
lignite	лигнит, бурый уголь
lithium	литий
chromium	хром
tungsten	вольфрам
coke	кокс
conversion	переработка
liquefaction	разжижение, сжижение

### Exercises:

#### 1. Read and translate the text.

#### 2. Answer the questions:

1. What kind of product is coal?
2. May coal beds consist of essentially uniform continuous strata?
3. What are coals classified into?
4. Brown coals are in their turn subdivided into lignite and common brown coal, aren't they?
5. For what purposes may coal be used?
6. Will coal be used as a raw material for the chemical industry and petro-chemical processes?
7. What does coal conversion include?

#### 3. Find the equivalents of the following words:

- |                                      |                                 |
|--------------------------------------|---------------------------------|
| 1. in its turn                       | а) смешиваться с другими углями |
| 2. amount of carbon                  | б) быстро выветриваться         |
| 3. of improved quality               | в) свою очередь                 |
| 4. the most abundant variety of coal | г) содержание углерода          |
| 5. to smelt iron ore                 | д) высокосортный уголь          |
| 6. high-rank coal                    | е) широко распространенные угли |
| 7. to weather rapidly                | ж) улучшенного качества         |
| 8. to blend with other coals         | з) теплотворная способность     |
| 9. heat value                        | е) плавить железную руду        |

#### 4. Use Present simple or Present Continuous

1. It (often/ rain) in this part of the work.  
*A is often raining*  
*B often rains*
2. Take your umbrella. It (rain) cats and dogs.

*A rains*

*B is raining*

3. Granny is in the kitchen. She (make) a plum cake.

*A is making*

*B makes*

4. My wife (often/ make) plum- cakes.

*A is often making*

*B often makes*

5. Can you phone a bit later, please? Jane...

*A is having a bath*

*B has a bath*

6. Run downstairs. Your sister (wait) for you.

*A is waiting*

*B waits*

7. I don't know Spanish, but I (learn) it now.

*A am learning*

*B learn*

8. John (still/work) in the garden.

*A is still working*

*B still works*

## **5. Use Past Simple or Past Continuous**

1. I saw a light in your window as I (pass) by.

*A passed*

*B was passing*

2. Yesterday as I was walking down Cherry Lane, I (meet) Tomas, an old friend of mine

*A met*

*B was meeting*

3. Liz's elder brother said that he (go) to enter Leeds University.

*A went*

*B was going*

4. While my son (wait) for my call, somebody knocked at the door.

*A waited*

*B was waiting*

5. We have just spoke about him when he suddenly (come) in.

*A came in*

*B was coming in*

6. Yesterday while Dad (shave) he (cut) himself slightly.

*A shaved    A was cutting*

*B was shaving    B cut*

7. They (quarrel) while they (wash) their car.

*A quarreled    A were washing*

*B were quarrelling    B washed*

## Lesson 10. Coal Mining Industry

Text: **Coal Mining Industry in Russia**

Grammar Revision: **Passive Voice**

### Coal Mining Industry in Russia

Our Land is rich in coal. People own the riches of their land and miners work for the good of the whole people. Coal miners produce much coal both to the export and to the import. But economy in our country needs still more coal for its mills, factories and railway transport.

In order to produce more high-grade coal the miners apply various progressive methods of coal mining. The miners' labour methods are productive. The coal miners work with the aid of coal cutters and coal combines. Coal cutters and cutter-loaders (combines) play a very important role in mining. They do the hard work in our mines. They make man's labour easier.

The Federal and local Government display great concern for the development of the coal mining industry and for the safety of coal miners' labour. For this purpose the most famous mining engineers invent various types of devices. Face workers, coal combine operators and timber men take part in the inventors' work. They help them to develop various engines, motors, coal cutters, combines, loaders, and different types of timber and metal support.

The inventors develop mighty fans for intake and return airways. In order to make the miners' labour safer, they develop various progressive methods of strata and roof control. Thus, miner's work in Russia grows safer and easier every year.

#### Do you know these words?

- |                |                                      |
|----------------|--------------------------------------|
| 1. airway      | вентиляционная выработка             |
| 2. apply       | применять, использовать              |
| 3. concern     | забота, участие                      |
| 4. intake      | выработка, подающая воздух           |
| 5. mighty      | мощный                               |
| 6. combiner    | машинист комбайна                    |
| 7. order       | порядок                              |
| 8. in order to | для того, чтобы                      |
| 9. thus        | таким образом                        |
| 10. timber     | лесоматериал, крепежный лес, крепить |
| 11. timber man | крепильщик                           |

#### Exercises:

##### 1. Read and translate the text.

##### 2. Answer the questions:

1. Is our country rich in coal?

2. What makes man's labour easier?
3. Are the miners' labour methods productive?
4. What types of support do the miners use?
5. Do the combines do the hard work in our mines?
6. Who invents various types of devices?
7. What do the inventors develop?
8. Who helps the inventors to develop various engines, motors, combines and loaders?
9. Do these devices play an important role in mining?

**3. Rewrite the sentences. Underline the words with ending -s: the nouns -with one line, the verbs -with two lines. Translate the sentences into Russian.**

1. The miners' methods are highly productive. 2. The cutter-loader cuts and loads coal. 3. This combine makes man's labour easier. 4. The machines do the hard work in our mines. 5. We apply different coal mining methods. 6. They develop various types of devices for this work. 7. The inventors' work helps the miners to produce more coal. 8. Belt-conveyors transport coal from faces. 9. Transport plays a very important role in mining.

**4. Translate the word combinations.**

1) a belt conveyor, 2) a conveyor belt, 3) a coal face, 4) a coal face conveyor, 5) a coal combine operator, 6) labour safety, 7) labour time, 8) a coal-cutter driver, 9) high-grade coal, 10) coal miners' labour, 11) miners' labour methods, 12) coal miners' labour safety.

**5. Translate into English.**

1. Эти шахтеры добывают много угля. 2. Погрузочные машины погружают уголь в вагонетки. 3. Этот комбайн высокопроизводителен. 4. Они работают на этой шахте. 5. Машины делают тяжелую работу в наших шахтах. 1. Мы применяем различные системы (методы) разработки угля. 7. Они не работают на шахте.

**6. Use the verbs in brackets in Passive Voice.**

1. The day before yesterday we (invited) to the restaurant by Tom Jenkins.

*A are invite B were invited C invite*

2. Look! The bridge (repair).

*A is being repaired B is been repaired C has being repaired*

3. The letter and the parcel (post) tomorrow.

*A will be post B will have been posted C will be posted*

4. Margaret (know) to be a very industrious person.

*A has been known B is known C is been known*

5. In Greece the Olympic Games (hold) once in four years.

*A were held B are being held C are held*

6. The problem (study) for three years, but they haven't got any results.

*A has been studied B has being studied C was studied*

7. Dad phoned us and asked if our luggage (already/pack).

*A was already being packed B had already been packed C was packed*

8. The doctor said that Tommy's leg (X-rayed) the following day.



## Lesson 11. **Prospecting for Mineral Deposits**

Text: **Prospecting**  
Grammar Revision: **Perfect Tenses**

### **Prospecting**

Mining activities include prospecting and exploration of a mineral deposit through finding, proving, developing, extracting and processing the ore. That is why it is possible to divide the mining activity into three phases: 1) *before mining* which involves prospecting and exploration required to locate, characterize and prove a potential ore body; 2) *mining* which refers to actual coal or ore extraction. Extraction processes include underground or surface mining and dredging; 3) *after mining* which involves processing and preparing the raw ore for the end product.

Before a mineral deposit can be worked, that is, before it can be extracted from the Earth for use by man, it must first be found. The search for economically useful mineral deposits is called *prospecting*. To establish the quality and quantity of a mineral deposit, the type of country rock, etc. means to prove it and this process is called *proving*. Prospecting and proving are only two different stages of mining geological exploration; the latter includes drilling and driving of openings.

Last century prospectors looked for visible evidence of mineralization on the surface of the Earth. To recognize valuable minerals it was necessary to know their various distinctive physical properties. For example, gold occurs in nature as a heavy malleable yellow metal. Galena, the most important mineral containing lead, is dark grey, heavy and lustrous. The first ores of iron to be mined were deposits of magnetite, a black heavy mineral capable of attracting a piece of iron.

As the deposits of mineral that cropped out at the surface were mined, the search for additional supplies of minerals took place. The science of geology was used to explain the occurrence of ore deposits. The aim of geological prospecting is to provide information on a preliminary estimation of the deposit and the costs of the geological investigations to be made. It also indicates whether it is available to continue the exploration or not.

Prospecting work includes three stages: 1) finding signs of the mineral; 2) finding the deposit; 3) exploring the deposit. General indications of the possibility of exposing this or that mineral in a locality can be obtained by studying its general topographical relief, the type of ground and its general natural conditions. Thus, in mountainous regions where fissures were formed during the process of mountain formation, ore minerals could be expected in the fissure fillings.

Certain deposits are found only in a particular type of ground. Coal seams, for example, are found in sedimentary formations mainly consisting of sandstones and shales. Veins, on the other hand, are found in crystalline (igneous) rocks, and the type of country rock usually determines the type of minerals.

At present, prospecting methods to be used are as follows: 1) Surface geological and mineralogical prospecting such as panning. 2) Geophysical, geochemical, geo-botanical prospecting. 3) Aerial photography with geological interpretation of the data to be obtained is highly effective from aircraft or helicopter. Besides, successful development of space

research has made it possible to explore the Earth's resources from space by satellites. In modern prospecting the methods mentioned above are used together with the study of geological maps.

### Do you know these words?

prospecting	разведка
divide	делить, разделять
proving	подтверждение
extraction	добыча, извлечение
dredging	черпание, экскавация
drilling	бурение
driving	вывоз
recognize	признавать

### Exercises

#### 1. Read and translate the text.

#### 2. Answer the questions:

1. What is prospecting?
2. What is proving?
3. How did prospectors find mineral deposits in the last century?
4. What does prospecting work provide?
5. What are the three main stages of prospecting?
6. What methods of prospecting do you know?
7. What are the most effective aerial methods of prospecting now?

#### 3. Fill in the gaps with the proper words: *deposit, extracting, end, include, ore, processes, possible, into*

Mining activities\_\_\_\_\_ prospecting and exploration for a mineral\_\_\_\_\_ through finding, proving, developing, \_\_\_\_\_and processing the ore. That is why it is\_\_\_\_\_ to divide the mining activity\_\_\_\_\_ three phases: 1) *before mining* which involves prospecting and exploration required to locate, characterize and prove a potential\_\_\_\_\_ body; 2) *mining* which refers to actual coal or ore extraction. Extraction include\_\_\_\_\_ underground or surface mining and edging; 3) *after mining* which involves processing and preparing the raw ore for the\_\_\_\_\_ product.

#### 4. Use Present Perfect или Past Simple:

1. We (not have) a holiday last year.  
A *didn't have*  
B *haven't had*  
C *hadn't have*
2. My parents (be) to the USA many times.  
A *have been*

*B were*

*C have being*

3. I (buy) a new dress last week, but I (not / wear) it yet.

*A have bought B bought C had bought*

*A haven't worn B wore C didn't wear*

4. ... it (stop) raining yet?

*A did it stop*

*B is it stopped*

*C has it stopped*

5. Don't worry about your letter I (send) it the day before yesterday.

*A send*

*B have sent*

*C sent*

6. I (lose) my glasses. I (have) them when I came to the college this morning.

*A lased B have lost C lost*

*A have had B had C have*

## **5. Use the Present Perfect Tense**

1. I'm afraid I (forget) my book at home. 2. The secretary (yet/come)? 3. I (learn) the rhyme. Could you listen to me. 4. You (ever / be) to Italy? 5. They (already / inform) me about the accident. 6. He is the most handsome man I (ever / know). 7. Kevin (already / leave for) Manchester. 8. He (not / receive) any letters from her this week. I (not / hear) from him since he left Paris. 9. I (not / see) Tom for ages. 10. You (have) a holiday this year? 11. We (see) some good films recently. 12. They (wait) for you for half an hour. 13. Alan (work) in the bank for a year.

## **6. Use Past Perfect or Past Simple Tense.**

1. I (wake up) early and got out of bed.

*A woke up*

*B had woken up.*

2. I got out of bed an hour later I (wake up)

*A woke up*

*B had woken up*

3. We were late. The meeting (starts) an hour before.

*A started*

*B had started*

4. She was the most delightful person I (ever/ meet)

*A ever met*

*B had ever met*

5. That morning she (dress), (phone) somebody, and went out.

*A dressed B had dressed*

*A phoned B had phoned*

6. That morning she went out after she (phone) somebody.

*A phoned B had phoned*

## Lesson 12. Tests. "Mining in Russia"

### Variant I

#### 1. Answer the questions:

1. What specializations do the higher mining schools offer?
2. Where do the students go through practical training?
3. When and where was Terpigorev born?
4. What material did he collect while he was working in the Donbas?
5. What process is called weathering?
6. What main groups of rocks do you know?
1. What can you say about non-foliated metamorphic rocks?
2. What two groups of minerals do you know?
3. What is the KMA rich in?
10. What is coal?
- 1 1. What is prospecting?

#### II. Choose Russian equivalents to the following English words.

- |                                  |                                   |
|----------------------------------|-----------------------------------|
| 1. fine-grained sand             | а) уплотненные осадки             |
| 2. the Earth's crust             | б) следы первоначальной структуры |
| 3. exposed rocks                 | в) абиссальные (глубинные) породы |
| 4. consolidated sediments        | г) составляющие пород             |
| 5. abyssal rocks                 | д) форма и размер гранул (зерен)  |
| 6. shape and size of grains      | е) земная кора                    |
| 7. zones of major deformation    | ж) сланцеватая структура          |
| 8. scientific value              | з) обнаженные породы              |
| 9. constituents of rocks         | и) мелкозернистый песок           |
| 10. schistose structure          | к) научная ценность               |
| 11. traces of original structure | л) зоны крупных нарушений         |

#### III. Translate into Russian:

1. a belt conveyor, 2. a conveyor belt, 3. a coal face, 4. a coal face conveyor, 5. a coal combine operator, 6. labour safety, 7. coal miners, 8. labour, 9. miners' labour methods, 10. coal miners' labour safety, 11. labour time.

#### IV. Use the proper pronoun. Translate the sentences into Russian.

1. As it is known, only (*little, few*) minerals and rocks are resistant to the action of natural waters.
2. There are (*many much*) causes of weathering, but (*much, many*) depends on the change in temperature.
3. The roots of plants developed (*little, few*) pressure which did not fracture overlaying rocks.

#### V. Translate the sentences paying special attention to pronouns and conjunctions.

1. I've got something important for you.
2. Nothing special happened yesterday.
3. He is either in Russia or in Britain.
4. He was the only person I loved.
5. They signed both these contracts and agreements yesterday.
6. In Russia young people get mining education both at special colleges and at mining departments of universities.
7. Both methods of prospecting are in use.
8. He put on his coat because it could be cold.
9. He looked through his notes carefully in order that to make a good report.
10. They introduced this principle into their research although it brought about much difficulties.

**VI. Translate the sentences paying attention to meaning of modal verbs and their equivalents.**

1. The thermonuclear process of fusion can take place only at extremely high temperatures.
2. One ought to know that it was in Obninsk (Russia) that the first atomic power station was put into operation.
3. Man-made satellites and spaceships are to investigate various types of radiations in space.
4. On a clear night a man is able to see with a naked eye about 4,000 stars.
5. A lot of problems had to be solved before the plant could be built.

**VII. Translate the sentences paying attention to modal verbs with infinitive in Passive.**

1. Today you can be taken everywhere in any direction in a few days.
2. Air must be let into the cylinder of the engine because no fuel will burn without air.
3. The air must be compressed.
4. The amplifier (усилитель) can be used with any high resistance galvanometer.
5. The car may be immobilized by a wheel-clamp.

**VIII. Use the proper tense:**

**a) Future Indefinite Tense**

1. I'm tired. I shall (to go) to bed.
2. It's late. I think I (to take) a taxi.
3. ...I (to answer) the question?
4. We don't know their address. What ... we (to do)?

**b) Past Indefinite Tense**

1. There isn't a cloud in the sky but it (to be) cloudy in the morning.
2. Clay usually finishes her work at half past three, but she (to finish) it later yesterday afternoon.
3. Every day I help Mom about the house, but last week I was very busy with my

exam. So I (not to help) her much.

4. Tom isn't playing tennis tomorrow afternoon, he (not to play) tennis yesterday.

**c) Past Perfect или Past Simple Tense**

1. (wake up) early and got out of bed.

*Awoke up B had woken up.*

2. got out of bed an hour later I (wake up)

*A woke up B had woken up*

3. We were late. The meeting (starts) an hour before.

*A started B had started*

**d) Present Simple или Present Continuous Tense**

1. It (often/ rain) in this part of the country.

*A is often raining B often rains*

2. Take your umbrella. It (rain) cats and dogs.

*A rains B is raining*

3. Granny is in the kitchen. She (make) a plum cake.

*A is making B makes*

4. My wife (often/ make) plum- cakes.

*A is often making B often makes*

**IX. Use proper form in Passive voice, translate the sentences into Russian.**

1. The day before yesterday we (invited) to the restaurant by Tom Jenkins.

*A are invited B were invited C invited*

2. Look! The bridge (repair).

*A is being repaired B is been repaired C has being repaired*

3. The letter and the parcel (post) tomorrow.

*A will be post B will have been posted C will be posted*

4. Margaret (know) to be a very industrious person.

*A has been known B is known C is been known*

5. In Greece the Olympic Games (hold) once in four years.

*A were held B are being held C are held*

6. The problem (study) for three years, but they haven't got any results.

*A has been studied B has being studied C was studied*

## Lesson 12. Tests. "Mining in Russia"

### Variant II

#### I. Answer the questions:

1. Where can one get mining education in Russia?
2. What does geology study?
3. How did Obruchev define geology?
4. What regions did Karpinsky investigate?
5. What process is called physical weathering (chemical weathering)?
6. Which types of igneous rocks do you know?
7. What rocks do we call foliated?
8. How can ore deposits be defined?
9. What are iron ores used for?
10. What is the classification of coal based on?
11. What are the three main stages of prospecting?

#### II. Choose Russian equivalents to the following English words.

- |                                        |                                |
|----------------------------------------|--------------------------------|
| 1. firedamp                            | а) физическое выветривание     |
| 2. flat seam                           | б) охрана труда в шахтах       |
| 3. mine safety                         | в) эксплуатация месторождений  |
| 4. to collect the material             | г) выдающиеся исследователи    |
| 5. exploitation of deposits            | д) охрана труда в шахтах       |
| 6. descriptive course                  | е) горизонтальный пласт        |
| 7. safety measures                     | ж) собирать материал           |
| 8. outstanding (prominent) researchers | з) происхождение железной руды |
| 9. the origin of iron ore              | и) метан                       |
| 10. the manager of a colliery          | к) мероприятия по охране труда |
| 11. physical weathering                | л) описательный курс           |

#### III. Translate into Russian:

1. the Earth's crust, 2. to make up a detailed map, 3. remarkable works, 4. to advance the view, 5. scientific society, 6. to head a Committee, 7. to elect chairman, 8. to take an interest in geology. 9. a coal-cutter driver, 10. high-grade coal, 11. deposits of useful minerals.

#### IV. Use the proper pronoun. Translate the sentences into Russian.

1. (*Much, many*) minerals undergo changes. They have already undergone (*much, many*) transformation.
2. A new geological map of the region will appear in a (*little, few*) years.
3. Now there are (*little, few*) sources of energy as important as atomic energy.

#### V. Translate the sentences paying special attention to pronouns and conjunctions.

1. I have no time to help you today.

2. He is the only man who checked this document.
3. I was neither in Austria nor in Nigeria.
4. I've got something important for you.
5. Either he or she is at home now.
6. The mining institutes design their courses to give attention both to basic engineering and mathematics. Both subjects are of great importance for the future engineer.
7. A new institute will train both geologists and mining engineers.
8. Since I didn't know my friend's new address, I could hardly find him.
9. If I were you, I wouldn't do it.
10. Nothing will happen provided you follow the instructions.
11. We shall be late unless you hurry.

**VI. Translate the sentences paying attention to meaning of modal verbs and their equivalents:**

1. With the creation of industrial thermonuclear reactors energy resources may become inexhaustible.
2. A nuclear power plant of 100,000 kilowatts capacity is to consume about 200 grams of uranium daily.
3. Large shovels are to be used in strip mines because they can handle all types of mineral, including blocky material.
4. Scrapers have good mobility. Their use should be limited to soft and easily broken material for good production.
5. Draglines are normally used for handling unconsolidated and softer material but larger units can handle blasted rock.

**VII. Translate the sentences paying attention to combination of modal verbs with the infinitive in Passive voice:**

1. It must be cleaned.
2. This metal can be cut dry.
3. The floor must be cleared and swept.
4. The hole must be deepened and widened.
5. The car may be immobilized by a wheel-clamp.

**VIII. Use the proper tense.**

**a) future simple tense:**

1. Our test (not to take) long.
2. I'm afraid they (not to wait) for us.
3. Diana (to come) to the party tomorrow?
4. You (to arrive) in Pans tomorrow evening.

**b) past Indefinite tense:**

1. We generally have lunch at 12.30, but yesterday we (to have lunch) later.
2. Now my brother smokes a lot, but he (not to smoke) before.
3. The Erasers live in a four-room apartment, but last year they (to live) in a small house in the country.
4. Today we visit our friends, but yesterday we (not can).



**c) past perfect *упрост simple*:**

1. She was the most delightful person I (ever/ meet)  
*A ever met B had ever met*
2. That morning she (dress), (phone) somebody, and went out.  
*A dressed B had dressed*
3. That morning she went out after she (phone) somebody.  
*A phoned B had phoned*
4. He was tired because he (work) hard in the garden all day.  
*A worked B had worked*

**d) present simple *или present continuous*:**

1. Can you phone a bit later, please? Jane...  
*A is having a bath B has a bath*
2. Run downstairs. Your sister (wait) for you.  
*A is waiting B waits*
3. I don't know Spanish, but I (learn) it now.  
*A am learning B learn*
4. John (still/work) in the garden.  
*A is still working B still works*

**IX. Use the necessary form of the verb in Passive voice, translate the sentences into Russian.**

1. Dad phoned us and asked if our luggage (already/pack).  
*A was already being packed B had already been packed C was packed*
2. The doctor said that Tommy's leg (X-rayed) the following day.  
*A will be X-rayed B would be X-rayed C will have been X-rayed*
3. A police car came when the injured man (carry off) the road.  
*A was being carried off B was been carrying off C has been carried off*
5. I (bear) in a small Russian town not far from Samara.  
*A was borne B am born C was born*
6. This book (republish) by the end of September.  
*A would be republished B will have been republished C will be republished*
7. What a pity, John won't come. He (tell) about the meeting beforehand.  
*A should have been told B should be told C should be told*

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