

ФЕДЕРАЛЬНОЕ АГЕНТСТВО ЖЕЛЕЗНОДОРОЖНОГО ТРАНСПОРТА  
Федеральное государственное бюджетное образовательное учреждение  
высшего образования  
«Иркутский государственный университет путей сообщения»  
Сибирский колледж транспорта и строительства

МЕТОДИЧЕСКИЕ УКАЗАНИЯ К ПРАКТИЧЕСКИМ ЗАНЯТИЯМ  
(очной и/или заочной формы)  
**СГЦ.03. Иностраный язык в профессиональной деятельности**  
для специальности **21.02.03**  
для обучающихся 3 курса  
**«Сооружение и эксплуатация газонефтепроводов и газонефтехранилищ»**  
базовая подготовка  
среднего профессионального образования

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государственный университет путей сообщения».

## ПОЯСНИТЕЛЬНАЯ ЗАПИСКА

Данные учебно-методические указания для практических работ предназначены для обучающихся 3-х курсов специальности 21.02.03 Сооружение и эксплуатация газонфтепроводов и газонфтехранилищ Учебно-методическое пособие содержит специализированные тексты с закрепляющими лексико-грамматическими упражнениями и заданиями, краткий грамматический справочник, вокабуляр по темам.

Практические занятия направлены на экспериментальное подтверждение теоретических положений, отнесены наряду с другими к основным видам учебных занятий.

В результате изучения дисциплины «Иностранный язык» обучающийся должен: знать: лексический (1200-1400 лексических единиц) и грамматический минимум, необходимый для чтения и перевода (со словарём) иностранных текстов профессиональной направленности.

уметь: общаться (устно и письменно) на иностранном языке на профессиональные и повседневные темы;

переводить (со словарём) иностранные тексты профессиональной направленности;

самостоятельно совершенствовать устную и письменную речь, пополнять словарный запас.

Обучающийся должен обладать общими и профессиональными компетенциями:

ОК 01. Выбирать способы решения задач профессиональной деятельности применительно к различным контекстам;

ОК 02. Использовать современные средства поиска, анализа и интерпретации информации, и информационные технологии для выполнения задач профессиональной деятельности;

ОК 03. Планировать и реализовывать собственное профессиональное и личностное развитие, предпринимательскую деятельность в профессиональной сфере, использовать знания по финансовой грамотности в различных жизненных ситуациях;

ОК 04. Эффективно взаимодействовать и работать в коллективе и команде;

ОК 05. Осуществлять устную и письменную коммуникацию на государственном языке Российской Федерации с учетом особенностей социального и культурного контекста;

ОК 06. Проявлять гражданско-патриотическую позицию, демонстрировать осознанное поведение на основе традиционных общечеловеческих ценностей, в том числе с учетом гармонизации межнациональных и межрелигиозных отношений, применять стандарты антикоррупционного поведения;

ОК 09. Пользоваться профессиональной документацией на государственном и иностранном языках.

На 3 курсе изучаются следующие темы и усваиваются следующие компетенции:

Наименование тем	Кол-во часов	Усвоенные компетенции
История нефтедобычи	14 часов	ОК 02, ОК 06, ОК 04, ОК 05, ОК 09
Свойства нефти	6 часов	ОК 01, ОК 03, ОК 05, ОК 04
Происхождение нефти	6 часов	ОК 04, ОК 05, ОК 06, ОК 01, ОК 03
Мировые запасы нефти	10 часов	ОК 04, ОК 06, ОК 03, ОК 05
Переработка нефти	18 часов	ОК 03, ОК 05, ОК 04, ОК 01,

**Content**

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## **UNIT 1. HISTORY OF USE**

oil	нефть
complex mixture	сложное соединение
liquid	жидкий
gaseous	газообразный
solid	твёрдый
surface seep	поверхностный выход (протекание) нефти
petroleum	нефть; нефтяной; нефтепродукт; керосин
crude oil	сырая, необработанная нефть
asphalt	асфальт, нефтяной битум
extraction	извлечение, экстрагирование. отжим
fuel	топливо, горючее
oil field	нефтяное месторождение, нефтяной промысел
distillation	дистилляция, перегонка
explorer	исследователь
flammable	воспламеняющийся, огнеопасный
well	скважина, колодец, источник
transport	перемещение, транспортировка
concentrate	концентрат. обогащённый продукт; концентрировать, обогащать (руду)
groundwater	грунтовые воды. подземные воды
immense and intricate system	огромная и сложная система
barrel	баррель (мера вместимости для нефти = 159 л.)
transitory affair	кратковременное дело
consumption	потребление, расход

### **1.1 Introduction**

Oil is complex mixture of hydrocarbons that occur in the Earth in liquid, gaseous, or solid forms. The term is often restricted to the liquid form, commonly called crude oil, but as a technical term it also includes natural gas and the viscous or solid form known as bitumen. The liquid and gaseous phases of petroleum constitute the most important of the primary fossil fuels.

Liquid and gaseous hydrocarbons are so intimately associated in nature that it has become customary to shorten the expression "petroleum and natural gas" to "petroleum" when referring to both. The word petroleum (literally "rock oil" from the Latin *petra*, "rock" or "stone," and *oleum*, "oil") was first used in 1556 in a treatise published by the German mineralogist Georg Bauer, known as Georgius Agricola.

#### **1 Answer the following questions:**

1. What is oil?

2. What do the liquid and gaseous phases of oil constitute?
3. When was first used the word “petroleum”?

**2. Complete the following words from the text:**

h-droc-rb-ns, cr-d- oil, v-sc—s, l-q-id, b-t-m-n, c-nst-t-t-, f-ss-l f—ls, - nt-m-t-ly, tr—t-s-.

3. Write down all the nouns from the text in plural.
4. Write down all irregular verbs and their three forms.

**1.2 Exploitation of surface seeps**

Small surface occurrences of petroleum in the form of natural gas and oil seeps have been known from early times. The ancient Sumerians, Assyrians, and Babylonians used crude oil and asphalt (“pitch”) collected from large seeps at Tuttul (modern-day Hit) on the Euphrates for many purposes more than 5,000 years ago. Liquid oil was first used as a medicine by the ancient Egyptians, presumably as a wound dressing, liniment, and laxative.

Oil products were valued as weapons of war in the ancient world. The Persians used incendiary arrows wrapped in oil-soaked fibres at the siege of Athens in 480 BC. Early in the Christian era the Arabs and Persians distilled crude oil to obtain flammable products for military purposes. Probably as a result of the Arab invasion of Spain, the industrial art of distillation into illuminants became available in Western Europe by the 12th century.

Several centuries later, Spanish explorers discovered oil seeps in present-day Cuba, Mexico, Bolivia, and Peru. In North America oil seeps were plentiful and were noted by early explorers in what are now New York and Pennsylvania, where the Indians were reported to have used the oil for medicinal purposes.

**1. Guess the meaning of these words:**

Seep, presumably, wound dressing, liniment, laxative, incendiary, siege, flammable, invasion, oil-soaked.

**2. Find the equivalents for these sentences:**

1. Продукты нефти оценивались как орудия войны в Древнем мире.
2. В ранней христианской эре арабы, персы обрабатывали сырую нефть, чтобы получить воспламеняемые продукты для военных целей.
3. В Северной Америке залежи нефти были многочисленными и отмечались ранними исследователями там, где сейчас Нью-Йорк и Пенсильвания.

**3. Complete the sentences:**

1. Early times, of, natural gas, small surface, of, oil seeps, have been, occurrences, known, of, petroleum, from, in the form.
2. Medicine, presumably, liniment, liquid, oil, was first used, a wound dressing, as a, by the ancient Egyptians, and laxative, as a.
3. Oil-soaked fibres, used, at the siege, the Persians, incendiary, of Athens, arrows, in 480 BC, wrapped in.

**4. Make the following sentences negative, and put into the interrogative forms.**

- 1) Small surface occurrences of petroleum in the form of natural gas have been known from early times.
- 2) Liquid oil was first used as a medicine by the ancient Egyptians.
- 3) Oil products were valued as weapons of war in the ancient world.
- 4) Persians distilled crude oil to obtain flammable products for military purposes.

**5. Find all the sentences from the text with the forms of the verb “to be”.**

**1.3 Extraction from underground reservoirs**

Until the beginning of the 19th century, illumination in the United States and in many other countries was little improved over that known by the early Greeks and Romans. The need for better illumination that accompanied the increasing development of urban centres made it necessary to search for new sources of oil, especially since whales, which had long provided fuel for lamps, were becoming harder and harder to find. By the mid-19th century kerosene, or coal oil, derived from coal was in common use in both North America and Europe.

The Industrial Revolution brought on an ever-growing demand for a cheaper and more convenient source of lubricants as well as illuminating oil. It also required better sources of energy. Energy had previously been provided by human and animal muscle and later by the combustion of such solid fuels as wood, peat, and coal. These were collected with considerable effort and laboriously transported to the site where the energy source was needed. Liquid petroleum, on the other hand, was a more easily transportable source of energy. Oil was a much more concentrated and flexible form of fuel than anything previously available.

The stage was set for the first well specifically drilled for oil, a project undertaken by Edwin L. Drake in northwestern Pennsylvania. The completion of the well in August 1859 established the groundwork for the petroleum industry and ushered in the closely associated modern industrial age. Within a short time inexpensive oil from underground reservoirs was being processed at already existing coal-oil refineries, and by the end of the century oil fields had been discovered in 14 states from New York to California and from Wyoming to Texas. During the same period, oil fields were found in Europe and East Asia as well.

**1. Find the meaning of these words:**

Extraction, illumination, whale, lubricant, illuminating oil, peat, considerable effort, laboriously, well, to drill, completion, to usher, refinery, stage.

**2. Answer the following questions:**

1. Why was it necessary to use new sources of oil?
2. When was the completion of the well?
3. Where had been discovered oil fields by the end of the century?

**3. Find the equivalents to these sentences from the text:**

1. Они собирались со значительным усилием и с трудом перевозились туда, где требовался источник энергии.
2. Промышленная революция внесла вечно растущий спрос на более дешёвый и удобный источник смазочных материалов, равно как на светильную нефть.
3. За короткое время недорогая нефть из подземных резервуаров обрабатывалась на уже существующих угольно-нефтеперерабатывающих заводах.
4. Необходимость в лучшем освещении, которое сопровождалось увеличением развития городских центров, сделало необходимым искать новые источники нефти.

**4. Unscramble the following words:**

letpeurom \_\_\_\_\_  
ntilliumiano \_\_\_\_\_  
esoruc \_\_\_\_\_  
eegnry \_\_\_\_\_

udliiq \_\_\_\_\_  
ncoptemloi \_\_\_\_\_  
serreriov \_\_\_\_\_

**5. Write all the following nouns in plural.**

Century, seep, illumination, oil, demand, source, coal, effort, form, fuel, time, field.

**6. Complete the table ( pay attention to degrees of comparison):**

little		
early		
	better	
long		
	harder	
	cheaper	
		the most convenient
	later	
flexible		

**1.4. Significance of oil in modern times**

At the beginning of the 20th century the Industrial Revolution had progressed to the extent that the use of refined oil for illuminants ceased to be of primary importance. The oil industry became the major supplier of energy largely because of the advent of the automobile. Although oil constitutes a major petrochemical feedstock, its primary importance is as an energy source on which the world economy depends.

The significance of oil as a world energy source is difficult to overdramatize. The growth in energy production during the 20th century is unprecedented, and increasing oil production has been by far the major contributor to that growth. Every day an immense and intricate system moves more than 60,000,000 barrels of oil from producers to consumers. The production and consumption of oil is of vital importance to international relations and has frequently been a decisive factor in the determination of foreign policy. The position of a country in this system depends on its production capacity as related to its consumption. The possession of oil deposits is sometimes the determining factor between a rich and a poor country. For any country, however, the presence or absence of oil has a major economic consequence.

On a time scale within the span of prospective human history, the utilization of oil as a major source of energy will be a transitory affair of about 100 years. Nonetheless, it will have been an affair of profound importance to world industrialization.

**1. Find the definitions for these sentences:**

1. Владение нефтяными депозитами – это определяющий фактор между богатой и бедной страной.
2. Хотя нефть составляет главную нефтехимическую подачу, её первоначальная важность – это источник энергии, от которого зависит мировая экономика.
3. Производство и потребление нефти – это жизненная необходимость в международных отношениях и, часто является определяющим фактором в определении внешней политики.
4. Нефтяная промышленность стала главным поставщиком энергии главным образом из-за нашествия автомобилей.

**2. Read the text again and complete the sentences:**

1. ....as a world energy source..... .
2. ....the Industrial Revolution had progressed ..... .
3. The growth in energy production ..... .
4. .... it will have been an affair of profound importance.



**3. Make the following sentences negative and put into the interrogative form:**

1. The oil industry became the major supplier of energy.
2. Its primary importance is an energy source.
3. The growth in energy production during the 20<sup>th</sup> century is unprecedented.
4. The production and consumption of oil has frequently been a decisive factor in the determination of foreign policy.
5. The position of a country in this system depends on its production capacity.

**4. Make up your own sentences with the following words:**

Refined oil, illuminating oil, refinery, fossil fuels, production and consumption.

**5. Mark the tense-forms of the verbs and translate the sentences.**

1) The oil industry became the major supplier of energy. (\_\_\_\_\_)

---

2) It will have been an affair of profound importance to world industrialization. (\_\_\_\_\_)

---

3) The position of a country in this system depends on its production capacity. (\_\_\_\_\_)

---

4) The utilization of oil as a major source of energy will be a transitory affair of about 100 years. (\_\_\_\_\_)

---

5) the presence or absence of oil has a major economic consequence. (\_\_\_\_\_)

---

**UNIT 2. PROPERTIES OF OIL**

hydrocarbon	углеводород
range from	колебаться в некоторых пределах
specific gravity	удельный вес
immiscible	не поддающийся смешиванию
hence	отсюда, с этих пор
float	всплывать
tar sands	смолистые пески
well bore	буровая скважина
volatile	быстро улетающий
confine	ограничивать
residual oil	кубические остатки нефти

	(амер.)
token	знак, примета
enhance	повышать. увеличивать

### 2.1 Physical properties

Oil consists of a closely related series of complex hydrocarbon compounds that range from gasoline to heavy solids. The various mixtures that constitute crude oil can be separated by distillation under increasing temperatures into such components as (from light to heavy) gasoline, kerosene, gas oil, lubricating oil, residual fuel oil, bitumen, and paraffin.

Crude oils vary greatly in their chemical composition. Because they consist of mixtures of thousands of hydrocarbon compounds, their physical properties such as colour, specific gravity, and viscosity also vary widely

### 2.2 Specific gravity

Crude oil is immiscible with and lighter than water; hence it floats. Crude oils are generally classified as tar sands, heavy oils, and medium and light oils on the basis of specific gravity (i.e., the ratio of the weight of equal volumes of the oil and pure water at standard conditions, with pure water considered to equal 1) and relative mobility. Tar sands contain immobile oil, which does not flow into a well bore (see below). Heavy crude oils have enough mobility that, given time, they can be obtained through a well bore in response to enhanced recovery methods. The more mobile medium and light oils are recoverable through production wells.

The widely used American Petroleum Institute (API) gravity scale is based on pure water, with an arbitrarily assigned API gravity of 10°. Liquids lighter than water, such as oil, have API gravities numerically greater than 10. Crude oils below 20° API gravity are usually considered heavy, whereas the conventional crudes with API gravities between 20° and 25° are regarded as medium, with light oils ranging above 25°.

### 2.3 Boiling and freezing points

Because oil is always at a temperature above the boiling point of some of its compounds, the more volatile constituents constantly escape into the atmosphere unless confined. It is impossible to refer to a common boiling point for crude oil because of the widely differing boiling points of its numerous compounds, some of which may boil at temperatures too high to be measured.

By the same token, it is impossible to refer to a common freezing point for a crude oil because the individual compounds solidify at different temperatures. However, the pour point—the temperature below which crude oil becomes plastic and will not flow—is important to recovery and transport and is always determined. Pour points range from 32° C to below -57° C.

### 2.4 Measurement systems

In the United States, crude oil is measured in barrels of 42 gallons each; the weight per barrel of API 30° light oil would be about 306 pounds. In many other countries, crude oil is measured in metric tons. For oil having the same gravity, a metric ton is equal to approximately 252 imperial gallons or about 7.2 U.S. barrels.

#### **1. Give the synonyms:**

Essential, during normal operating conditions, each, substance, main, material, to enter, under normal conditions, every, to come in, lubricant, oil, to pass through, to rush through, previously mentioned, about, approximately, mentioned above.

#### **2. Give the translation of the sentences:**

1. Lightness and strength are essential in the construction of engines.
2. Today's engines are essentially different from yesterday's.
3. This material is readily combustible.

4. A gas is readily compressible.
5. The higher pressure ratio and temperature can also be assumed to have resulted in an improvement in specific fuel consumption.
6. The results are likely to be known in two months.
7. The investigation is likely to give good results.
8. Tar sands contain immobile oil, which does not flow into a well bore.
9. Crude oil vary greatly in their chemical compositions.

**3. Translate the words and word combinations:**

***Essence-essential-essentially***

To essence of the paper, essential difference, to differ essentially, to increase the speed essentially, to be similar in essence.

***Previous-previously***

The previous chapter, the device had been used previously, it was previously stated, as previously mentioned.

***Necessary- necessity***

Necessary information, necessary equipment, the necessity of lubrication, the necessity of an air cleaner, it is necessary to say that.

**4. Make the following sentences negative and put into the interrogative form.**

- 1) Tar sands contain immobile oil.
- 2) The widely used American Petroleum Institute gravity scale is based on pure water.
- 3) Crude oils vary greatly in their chemical composition.
- 4) It is impossible to refer to a common boiling point for crude oil.

**5. Find all the sentences containing modal verbs “must”, “can”. Copy them in your copy-books and translate.**

**6. Give the three forms of these verbs:**

Vary-  
Become-  
Have-  
Contain-  
Know-  
Use-  
Come in-

**7. Prepare the report about the properties of oil.**

## **UNIT 3. ORIGIN OF CRUDE OIL**

carbon	углерод
hydrogen	водород
primordial	изначальный, искомый
To derive	производить, получать
Single-celled	одноклеточный
diatom	диатома (вид водорослей)
algae	морская водоросль
burial	захоронение
abundant	изобильный, достаточный
Fine-grained	тонко-волокнистый
sediment	осадок
immature	незрелый
matter	вещество
to convert	превращать
insoluble	нерастворимый
detritus	обломки горных пород
decomposition	разложение
precursors	предвестник
sulfur	сульфат
nitrogen	азот

### **3.1 From planktonic remains to kerosene**

Although it is recognized that the original source of carbon and hydrogen was in the materials that made up the primordial Earth, it is generally accepted that these two elements have had to pass through an organic phase to be combined into the varied complex molecules recognized as crude oil. The organic material that is the source of most oil has probably been derived from single-celled planktonic (free-floating) plants, such as diatoms and blue-green algae, and single-celled planktonic animals, such as foraminifera, which live in aquatic environments of marine, brackish, or fresh water. Such simple organisms are known to have been abundant long before the Paleozoic Era, which began some 540,000,000 years ago.

Rapid burial of the remains of the single-celled planktonic plants and animals within fine-grained sediments effectively preserved them. This provided the organic materials, the so-called protopetroleum, for later diagenesis (i.e., the series of processes involving biological, chemical, and physical changes) into true petroleum.

The first, or immature, stage of petroleum formation is dominated by biological activity and chemical rearrangement, which convert organic matter to kerosene. This dark-coloured, insoluble product of bacterially altered plant and animal detritus is the source of most hydrocarbons generated in the later stages. During the first stage, biogenic methane is the only hydrocarbon generated in commercial quantities. The production of biogenic methane gas is part of the process of decomposition of organic matter carried out by anaerobic microorganisms (those capable of living in the absence of free oxygen).

### **3.2 From kerosene to petroleum**

Deeper burial by continuing sedimentation, increasing temperatures, and advancing geologic age result in the mature stage of petroleum formation, during which the full range of petroleum

compounds is produced from kerosene and other precursors by thermal degradation and cracking (the process by which heavy hydrocarbon molecules are broken up into lighter molecules). Depending on the amount and type of organic matter, oil generation occurs during the mature stage at depths of about 760 to 4,880 metres (2,500 to 16,000 feet) at temperatures between 65° and 150° C. This special environment is called the “oil window.” In areas of higher than normal geothermal gradient (increase in temperature with depth), the oil window exists at shallower depths in younger sediments but is narrower. Maximum oil generation occurs from depths of 2,000 to 2,900 metres. Below 2,900 metres primarily wet gas, a type of gas containing liquid hydrocarbons known as natural gas liquids, is formed.

Approximately 90 percent of the organic material in sedimentary source rocks is dispersed kerosene. Its composition varies, consisting as it does of a range of residual materials whose basic molecular structure takes the form of stacked sheets of aromatic hydrocarbon rings in which atoms of sulfur, oxygen, and nitrogen also occur. Attached to the ends of the rings are various hydrocarbon compounds, including normal paraffin chains. The mild heating of the kerosene in the oil window of a source rock over long periods of time results in the cracking of the kerosene molecules and the release of the attached paraffin chains. Further heating, perhaps assisted by the catalytic effect of clay minerals in the source rock matrix, may then produce soluble bitumen compounds, followed by the various saturated and unsaturated hydrocarbons, asphaltenes, and others of the thousands of hydrocarbon compounds that make up crude oil mixtures.

At the end of the mature stage, below about 4,880 metres, depending on the geothermal gradient, kerosene becomes condensed in structure and chemically stable. In this environment, crude oil is no longer stable and the main hydrocarbon product is dry thermal methane gas.

### 1. Find the equivalents:

Химически устойчивый, увлажнённый газ. Источник скелета породы, насыщенный углеводородами, одноклеточные планктонные животные и растения, остаточные материалы, процесс разложения, нерастворимый продукт, нефтяные соединения, образование нефти.

### 2. Translate the sentences:

1. Начальная ступень образования нефти доминируется биологической активностью и химической реорганизацией, которая превращает органическое вещество в керосин.
2. Этот тёмного цвета нерастворимый продукт бактериологически изменённого растения и обломки горных пород – источник большинства углеводородов, переработанных на последних ступенях.
3. Различные углеводородные соединения также прикрепляются к концам колец. Включая нормальные парафиновые цепи.
4. Максимальное образование нефти происходит с глубин от 2.000 до 2.900 метров.
5. Дальнейшее нагревание возможно с участием каталитического эффекта глиняных минералов в источнике скелета породы.
6. В этой среде сырая нефть не является более устойчивой (прочной), и главный углеводородный продукт является сухим метановым газом.

### 3. Find the suitable answer:

1. Where has the organic material been derived from?
  - a) from aquatic environments;
  - b) from complex molecules;
  - c) from single-celled planktonic plants
2. What is the first stage of petroleum dominated by?
  - a) by biological activity and chemical rearrangement;
  - b) by the process of decomposition of organic matter;
  - c) by biological, chemical, and physical changes
3. The special environment is called ...
  - a) “oil floor”
  - b) “oil window”
  - c) “oil door”
4. What is wet gas?
5. Where does the maximum oil generation occur?

6. What is cracking?

**4. Make questions using the words below.**

1. Such simple organisms are known to have been abundant long before the Paleozoic Era, which began some 540 000 000 years ago. (When....?)
2. This dark-colored , insoluble product of bacterially altered plant and animal detritus is the source of most hydrocarbons. ( What.....?)
3. Approximately 90 percent of the organic material in sedimentary source rocks is dispersed kerosene. ( How many.....?)
4. This special environment is called the ‘oil window’. ( How.....?)
5. The organic material that is the source of most oil has probably been derived from single-celled planktonic plants. (Where...../)

**5. Make the indicated forms of the verbs:**

To depend ( Present Continuous)-\_\_\_\_\_

To assist (Present Simple Passive)-\_\_\_\_\_

To follow (Past Continuous Passive)-\_\_\_\_\_

To develop ( Present Perfect Passive)-\_\_\_\_\_

To occur (Past Simple Active)-\_\_\_\_\_

## **UNIT 4. WORLD DISTRIBUTION OF OIL**

Exploration drilling	разведочное бурение
ultimately	окончательно
recoverable oil	извлекаемая, добываемая нефть
yielded oil	произведённая нефть
predominant	преобладающий
oil accumulation	накопление нефти
dimension	измерение, величина, объём
to exceed	превышать. превосходить

### **4.1 Oil fields**

Two overriding principles apply to world petroleum production. First, most petroleum is contained in a few large fields, but most fields are small. Second, as exploration progresses, the average size of the fields discovered decreases, as does the amount of petroleum found per unit of exploratory drilling. In any region, the large fields are usually discovered first.

Since exploration for oil began during the early 1860s, some 50,000 oil fields have been discovered. More than 90 percent of these fields are insignificant in their impact on world oil production. The two largest classes of fields are the super giants, fields with 5,000,000,000 or more barrels of ultimately recoverable oil, and world-class giants, fields with 500,000,000 to 5,000,000,000 barrels of ultimately recoverable oil. Fewer than 40 supergiant oil fields have been found worldwide, yet these fields originally contained about one-half of all the oil so far discovered. The Arabian-Iranian sedimentary basin in the Persian Gulf region contains two-thirds of these supergiant fields. The remaining super giants are distributed as follows: two in the United States, two in Russia, two in Mexico, one in Libya, one in Algeria, one in Venezuela, and two in China.

The nearly 280 world-class giant fields thus far discovered, plus the super giants, account for about 80 percent of the world's known recoverable oil. There are, in addition, approximately 1,000 known large oil fields that initially contained between 50,000,000 and 500,000,000 barrels. These fields account for some 14 to 16 percent of the world's known oil. Less than 5 percent of the known fields originally contained roughly 95 percent of the world's known oil.

### **4.2 Sedimentary basins**

Giant petroleum fields and significant petroleum-producing sedimentary basins are closely associated. In some basins, huge amounts of petroleum apparently have been generated because perhaps only about 10 percent of the generated petroleum is trapped and preserved. The Arabian-Iranian sedimentary basin is predominant because it contains more than 20 supergiant fields. No other basin has more than one such field. In 20 of the 26 most significant oil-containing basins, the 10 largest fields originally contained more than 50 percent of the known recoverable oil. Known world oil reserves are concentrated in a relatively small number of giant fields in a few sedimentary basins.

Worldwide, approximately 600 sedimentary basins are known to exist. About 160 of these have yielded oil, but only 26 are significant producers and 7 of these account for more than 65 percent of total known oil. Exploration has occurred in another 240 basins, but discoveries of commercial significance have not been made.

### **4.3 Geologic study and exploration**

Current geologic understanding can usually distinguish between geologically favourable and unfavourable conditions for oil accumulation early in the exploration cycle. Thus, only a relatively few exploratory wells may be necessary to indicate whether a region is likely to contain significant amounts of oil. Modern petroleum exploration is an efficient process. If giant fields exist, it is likely that most of the oil in a region will be found by the first 50 to 250 exploratory wells. This number may be exceeded if there is a much greater than normal amount of major prospects or if exploration drilling patterns are dictated by either political or unusual technological considerations. Thus, while undiscovered commercial oil fields may exist in some of the 240 explored but seemingly barren basins, it is unlikely that they will be of major importance since the largest are normally found early in the exploration process.

The remaining 200 basins have had little or no exploration, but they have had sufficient geologic study to indicate their dimensions, amount and type of sediments, and general structural character. Most of the underexplored (or frontier) basins are located in difficult environments, such as Polar Regions or submerged continental margins. The larger sedimentary basins—those containing more than 833,000 cubic kilometres (200,000 cubic miles) of sediments—account for some 70 percent of known world petroleum. Future exploration will have to involve the smaller basins as well as the more expensive and difficult frontier basins.

### 1. Make up sentences and translate them

1. To, worldwide, 600, basins, approximately, sedimentary, are, exist, known.
2. Associated, and, petroleum-producing, giant, closely, petroleum, significant, sedimentary, fields, are, basins.
3. An, modern, is, process, exploration, efficient, petroleum.

### 2. Add the sentences and translate them

1. Known world oil reserves are concentrated in a relatively small number of.....
2. Exploration has occurred in another 240 basins, but discoveries of .....
3. Future exploration will have to involve the smaller basins as well as .....
4. More than 90 percent of these fields are insignificant in .....
5. In any region, the large fields are .....
6. The Arabian-Iranian Sedimentary basin in the Persian Gulf region contains two-thirds of .....
7. These fields account for some 14 to 16 percent of .....

*( the world's known oil; commercial significance have not been made; giant fields in a few sedimentary basins; the more expensive and difficult frontier basins, these supergiant fields; their impact on world oil production; usually discovered first)*

### 3. Find the opposites:

Recoverable oil-	favourable-
Predominant-	efficient-
Decrease-	usual-
Significant-	discovered-

### 4.4 Status of the world oil supply

The first 200,000,000,000 barrels of world oil were produced in 109 years from 1859 to 1968. Since that time world oil production rates have stabilized at a rate of about 22,000,000,000 barrels a year. Reserves are identified quantities of “in-place” petroleum that are considered recoverable under current economic and technological conditions. Estimated by petroleum engineers and geologists using drilling and production data along with other subsurface information, these figures are revised to include projected field growth as development progresses. Petroleum reserves are reported by oil companies and by some governments, and such data are compiled by the U.S. Department of Energy and the U.S. Geological Survey, as well as by oil industry trade journals. Undiscovered petroleum resources of the



world have been estimated by the U.S. Geological Survey by the extrapolation of known production and reserve data into untested sediments of similar geology. A most likely consensus estimate was established, as was a range with upper and lower yield limits at 5 and 95 percent probabilities. The range for undiscovered oil resources assessed for the whole world is 275,000,000,000 to 1,469,000,000,000 barrels.

The most likely total world oil endowment is about 2,390,000,000,000 barrels. Of this amount, 77 percent has already been discovered and 30 percent has already been produced and consumed. If this estimate proves to be reasonably accurate, current relatively stabilized world oil-production volumes could be sustained to about the middle of the 21st century, at which time a shortage of conventional oil resources would force a production decline.

The Middle East is thought to have had an estimated 41 percent of the world's total oil endowment. North America is a distant second but has already produced almost half of its total oil. Eastern Europe, because of the large deposits in Russia, is well endowed with oil. Western Europe is not, with most of its oil under the North Sea. Likewise, Africa, Asia, and South America are thought to have only relatively moderate amounts of oil. It is interesting to note that a large undiscovered oil resource is believed to exist in North America, which has many frontier basins. Both the Middle East and Eastern Europe, however, are also thought to contain significant oil prospects.

**1. Complete the following words from the text:**

En\_wm\_nt, b\_rr\_l, est\_m\_t\_, v\_l\_m\_, pr\_duct\_\_on, r\_sour\_s, d\_cl\_ne, b\_s\_n, d\_pos\_t\_on, d\_sc\_v\_ry.

**2. Write down the nouns in plural:**

Country, production, oil, region, generation, discovery, field, barrel, area, centre.

**3. Make the following sentences negative and put into the interrogative:**

1. Mexico has produced only about one –fifth of its estimated total oil endowment.
2. This giant field has yet to be developed.
3. This situation has contributed to a significant drop in domestic oil output.
4. A second parallel system was constructed in the middle 1970s.
5. Russia has two supergiant oil fields, Samatlor and Romashkino.

#### **4.5 Major oil-producing countries**

18 countries believed to have had an original oil endowment exceeding 20,000,000,000 barrels. It also serves to show the concentration of world oil. These 18 countries have accounted for 86 percent of the world's oil production. They hold 94 percent of its reserves. Significantly, they are projected to have 82 percent of the world's remaining undiscovered oil resources. As can be seen, regions geologically favourable to the generation and deposition of oil are fairly rare. The 18 countries listed are estimated to have contained 89 percent of the world's original oil endowment.

##### **Saudi Arabia**

Saudi Arabia is thought to have had the largest original oil endowment of any country. The discovery that transformed Saudi Arabia into a leading oil country was the Al-Ghawār field. Discovered in 1948, this field has proved to be the world's largest, containing 82,000,000,000 barrels. Another important discovery was the Saffānīyah offshore field in the Persian Gulf. It is the third largest oil field in the world and the largest offshore. Saudi Arabia has eight other supergiant oil fields. Thus, it has the largest oil reserve in the world, not to mention significant potential for additional discoveries.

##### **Russia**

Russia is thought to possess the best potential for new discoveries. Also, it has significant reserves. Russian oil is derived from many sedimentary basins within the vast country, while Saudi Arabian fields, as well as many other Middle Eastern fields, are located in the great Arabian-Iranian basin. Russia has two supergiant oil fields, Samotlor and Romashkino. Production from these fields is on the decline, bringing total Russian oil output down with them. The best prospects for new Russian discoveries appear to exist in the difficult and expensive frontier areas.

Russian Volgo-uralskaya Neftegazonosnaya Oblast, also called Second Baku, Russian Vtoroye Baku, principal petroleum-producing region of Russia. Situated in the southern part of European Russia, it stretches from the west flank of the Ural Mountains to west of the Volga River. The largest fields are in Bashkortostan and Tatarstan and near Samara (Syzran fields), Perm, and Orenburg. Buguruslan has large natural-gas fields. Exploitation of the fields began in 1929. The name Second Baku was an allusion to the old oil fields around Baku in Azerbaijan. There are also many large oil refineries in the Volga-Ural region. A pipeline system, more than 3,000 miles (5,000 km) long, was built in 1960–64. A second parallel system having a greater diameter was constructed in the mid-1970s. It supplies the region's oil to Russian industrial centres and also connects to Poland, eastern Germany, Slovakia, Czech Republic, and Hungary.

#### **United States, Mexico, and Canada**

Basins in the United States have been intensively explored and their oil resources developed. More than 33,000 oil fields have been found, but only two are supergiants (Prudhoe Bay in the North Slope region of Alaska and East Texas). Cumulatively, the United States has produced more oil than any other country but is still considered to have a significant remaining undiscovered oil resource. Prudhoe Bay, which accounted for approximately 17 percent of U.S. oil production during the mid-1980s, is in decline. This situation, coupled with declining oil production in the conterminous United States, has contributed to a significant drop in domestic oil output.

Mexico has produced only about one-fifth of its estimated total oil endowment. With two supergiant fields (Cantarell offshore of Campeche state and Bermudez in Tabasco state) and with substantial remaining reserves and resources, it will be able to sustain current production levels well into the 21st century. Conversely, Canada, with considerably smaller oil reserves and most of its undiscovered resource potential in remote regions, is unlikely to be able to sustain current production levels beyond the 1990s. Canada's largest oil field is Hibernia, discovered off Newfoundland in 1979. This giant field has yet to be developed.

#### **Iraq, Kuwait, and Iran**

The Middle Eastern countries of Iraq, Kuwait, and Iran are each estimated to have had an original oil endowment in excess of 100,000,000,000 barrels. These countries have a number of supergiant fields, all of which are located in the Arabian-Iranian basin, including Kuwait's Al-Burqān field. Al-Burqān is the world's second largest oil field, having originally contained 75,000,000,000 barrels of recoverable oil. Iraq possesses a significant potential for additional oil discoveries.

#### **United Kingdom**

The United Kingdom is an important North Sea exporter; however, as its undiscovered resource potential appears somewhat limited, it may require more of its oil output for internal use in the future.

### **4.6 Undiscovered resources**

With an estimated 77 percent of the world's total recoverable oil endowment having already been discovered, the remaining 23 percent, mostly located in smaller fields or in more difficult environments, is expected to become ever more expensive to find and to recover. More than 11,000 man-years were required to construct the largest of the North Sea gravity platforms, making capital costs per daily oil production as much as 40 times the costs in the Middle East. A guyed tower constructed in more than 300 metres of water in the Gulf of Mexico has been estimated to produce oil at about 65 times the production cost in the Middle East. As oil exploitation moves into deeper waters or under Arctic ice, the cost will further escalate and will be reflected in the world economy.

#### **1. Write Tense and Voice and translate the forms below:**

1. Is contained \_\_\_\_\_
2. Began \_\_\_\_\_
3. Have been discovered \_\_\_\_\_

4. Have been found \_\_\_\_\_
5. Are distributed \_\_\_\_\_
6. Discovered \_\_\_\_\_
7. Contained \_\_\_\_\_
8. Are associated \_\_\_\_\_
9. Have been generated \_\_\_\_\_
10. Is preserved \_\_\_\_\_

**2. Write down all the sentences with modal verbs and their equivalents from the text and translate them.**

**3. Write the interrogative forms:**

1. More than 90 percent of these fields are insignificant in their impact on world oil production.
2. The Arabian-Iranian sedimentary basin in the Persian Gulf region contains two-thirds of these supergiant fields.
3. Giant petroleum fields and significant petroleum-producing sedimentary basins are closely associated.

## **UNIT 5. THE OIL WELL**

drilling	бурение
cable tooling	крепление тросом
chisel-shaped bit	долото бура
rotary drill	турбобур
penetration method	метод прохода
weighted fluid	взвешенная жидкость
drill pipe	обсадная труба, бурильная труба
kelly	верхняя часть обсадной трубы
drill collars	нижняя часть обсадной трубы
turntable	поворотная платформа, круг
derrick	башенная вышка
hoisting equipment	подъемное оборудование
casing	крепление скважины обсадными трубами
circumference	окружность, периферия
directional drilling	направленное бурение
to scour	прочистать
well logging	буровой журнал работы
drill-stem	буровая штанга
well completion	оснастка скважины
production tubing	
perforating	просверливание
fracturing	дробление
barge	баржа
treater	продукты обогащения
valve	клапан

### **5.1 Drilling**

#### ***a) Cable tooling***

Early oil wells were drilled with impact-type tools in a method called cable-tool drilling. A weighted, chisel-shaped bit was suspended from a cable to a lever at the surface, where an up-and-down motion of the lever caused the bit to chip away the rock at the bottom of the hole. The drilling had to be halted periodically to allow loose rock chips and liquids to be removed with a collecting device attached to the cable. At these times the chipping tip of the bit was sharpened, or “dressed” by the tool dresser. The borehole had to be free of liquids during the drilling so that the bit could remove rock effectively. This dry condition of the hole allowed oil and gas to flow to the surface when the bit penetrated a producing formation, thus creating the image of a “gusher” as a successful oil well. Often a large amount of oil was wasted before the well could be capped and brought under control.

## 1. Answer the questions

2. How were early oil wells drilled?
3. Why had the drilling to be halted periodically?
4. What had the borehole to be free of liquids for?

## 2. Find equivalents from the text

рычаг на поверхности  
в скважине не должно быть влаги  
ударный тип  
часто много нефти терялось  
пробивать скалу

### *b) The rotary drill*

During the middle and late 20th century, rotary drilling became the preferred penetration method for oil and gas wells. In this method a special tool, the drill bit, rotates while bearing down on the bottom of the well, thus gouging and chipping its way downward. Probably the greatest advantage of rotary drilling over cable tooling is that the well bore is kept full of liquid during drilling. A weighted fluid (drilling mud) is circulated through the well bore to serve two important purposes. By its hydrostatic pressure, it prevents the entry of the formation fluids into the well, thereby preventing “blowouts” and gushers. In addition, the drilling mud carries the crushed rock to the surface, so that drilling is continuous until the bit wears out.

Rotary drilling techniques have enabled wells to be drilled to depths of more than 9,000 metres. Formations having fluid pressures greater than 1,400 kilograms per square centimetre (20,000 pounds per square inch) and temperatures greater than 250° C (480° F) have been successfully penetrated.

## 1. Answer the questions

1. When did rotary drilling become the preferred penetration method for oil and gas wells?
2. What is the greatest advantage of rotary drilling?
3. What depths have rotary drilling techniques enabled wells to be drilled to?

## 2. Find equivalents from the text

выдалбливая и пробивая проход  
гидростатическое давление  
несет осколки скалы  
две важные цели  
успешно проходят сквозь

### *c) The drill pipe*

The drill bit is connected to the surface equipment through the drill pipe, a heavy-walled tube through which the drilling mud is fed to the bottom of the borehole. In most cases, the drill pipe also transmits the rotary motion to the bit from a turntable at the surface. The top piece of the drill pipe is a tube of square (or occasionally six- or eight-sided) cross section called the kelly. The kelly passes through a similarly shaped hole in the turntable. At the bottom end of the drill pipe are extra-heavy sections called drill collars, which serve to concentrate the weight on the rotating bit. In order to help maintain a vertical well bore, the drill pipe above the collars is usually kept in tension. The drilling mud leaves the drill pipe through the bit in such a way that it scours the loose rock from the bottom and carries it to the surface. Drilling mud is carefully formulated to assure the correct weight and viscosity properties for the required tasks. After screening to remove the rock chips, the mud is held in open pits or metal tanks to be recirculated through the well. The mud is picked up by piston pumps and forced through a swivel joint at the top of the kelly.

## 1. Answer the questions

1. How is the drill bit connected to the surface equipment?
2. What is the top piece of the drill pipe called?
3. What do drill collars serve to?
4. How is the drilling mud picked up?

## 2. Find equivalents from the text

обычно находится в напряжении  
открытые разработки  
связан с оборудованием на поверхности  
чтобы помочь удерживать  
после сортировки.

## 3. Write the following words in correct order and translate them:

1. Pipe, to, transmits, rotary, the drill, also, motion, the, turntable, bit, at, the, from, a, surface.
2. Drill, a tube, the top, cross, pipe, called, is, of square, piece, the Kelly, section.
3. A similarly, passes, turntable, hole, the kelly, shaped, in, through, the.
4. Piston, through, joint, pumps, a swivel, of the Kelly, at the, mud, is picked, by, up, and, forced, top.

### d) *The derrick*

The hoisting equipment that is used to raise and lower the drill pipe, along with the machinery for rotating the pipe, are contained in the tall derrick that is characteristic of rotary drilling rigs. While early derricks were constructed at the drilling site, modern rigs can be moved from one site to the next. The drill bit wears out quickly and requires frequent replacement, often once a day. This makes it necessary to pull the entire drill string from the well and stand all the joints of drill pipe vertically at one side of the derrick. Joints are usually nine metres long. While the bit is being changed, sections of two or three joints are separated and stacked. Drilling mud is left in the hole during this time to prevent excessive flow of fluids into the well.

## 1. Answer the questions

1. What is the difference between early derricks and modern rigs?
2. What is the usual length of joints?
3. Why is drilling mud left in the hole during changing of the bit?

## 2. Find equivalents from the text

остаётся в скважине все это время  
используется, чтобы поднимать и опускать  
требует частой замены  
наряду с механизмом для вращения трубы  
с одной рабочей площадки на другую.

## 3. Make the following sentences negative and put into the interrogative:

1. The drill bit wears out quickly and requires frequent replacement.
2. Joints are usually nine metres long.
3. Drilling mud is left in the hole during this time to prevent excessive flow of fluids into the well.
4. While early derricks were constructed at the drilling site, modern rigs can be moved from one site to the next.

### e) *Casing*

Modern wells are not drilled to their total depth in a continuous process. Drilling may be stopped for logging and testing, and it also may be stopped to insert casing and cement it to the outer circumference of the borehole. Casing is steel pipe that is intended to prevent any transfer of fluids between the borehole and the surrounding formations. Since the drill bit must pass through any installed casing in order to continue drilling, the borehole below each string of casing is smaller than the borehole

above. In very deep wells, as many as five intermediate strings of progressively smaller-diameter casing may be used during the drilling process.

**1. Answer the questions**

1. When may drilling be stopped?
2. What is casing intended for?
3. When may casing be used during the drilling process?

**2. Find equivalents from the text**

крепления меньшего диаметра  
 предназначено, чтобы предотвратить любое попадание  
 на общую глубину непрерывно  
 на внешнюю окружность.

**3. Complete the table ( pay attention to degrees of comparison):**

modern		
		the deepest
	slower	
	much faster	
	lower	
capable		
		the widest

**f) The turbodrill**

One variation in rotary drilling employs a fluid-powered turbine at the bottom of the borehole to produce the rotary motion of the bit. Known as the turbodrill, this instrument is about nine metres long and is made up of four major parts: the upper bearing, the turbine, the lower bearing, and the drill bit. The upper bearing is attached to the drill pipe, which either does not rotate or rotates at a slow rate (6 to 8 revolutions per minute). The drill bit, meanwhile, rotates at a much faster rate (500 to 1,000 revolutions per minute) than in conventional rotary drilling. The power source for the turbodrill is the mud pump, which forces mud through the drill pipe to the turbine. The mud is diverted onto the rotors of the turbine, turning the lower bearing and the drill bit. The mud then passes through the drill bit to scour the hole and carry chips to the surface. The turbodrill is capable of very fast drilling, but the bit and bearings wear quickly in the harsh environment. Turbodrills were widely used in the former Soviet republics of Russia and Central Asia, but they are rare elsewhere.

**1. Answer the questions**

1. What is turbodrill?
2. What are the parts of turbodrill?
3. What part of a turbodrill rotates faster?
4. Are turbodrills used now everywhere?

**2. Find equivalents from the text**

состоит из четырех основных частей  
 быстро изнашиваются в суровых условиях  
 вращается в медленном режиме  
 переносит осколки на поверхность

**g) Directional drilling**

Frequently, the drilling platform and derrick cannot be located directly above the spot where the well should penetrate the formation (if, for example, petroleum reservoirs lie under lakes, towns, or

harbours). In these cases, the surface equipment must be offset and the well bore drilled at an angle that will intersect the underground formation at the desired place. This is done by drilling the wells vertically to start and then angling them at depths that depend on the relative position of the target. Since the nearly inflexible drill pipe must be able to move and rotate through the entire depth, the angle of the borehole can be changed only a few degrees at any one time. In order to achieve a large deviation angle, therefore, a number of small deviations must be made. The borehole, in effect, ends up making a large arc to reach its objective. The traditional tool for “kicking off” such a well is the whipstock. This consists of an inclined plane on the bottom of the drill pipe that is oriented in the direction the well is intended to take. The drill bit is thereby forced to move off in the proper direction. A more recent technique makes use of a “bent sub” at the bottom of the drill pipe that is pointed in the desired direction. A mud-powered turbine at the bottom of the sub drills the first few metres of the angled hole. Directional drilling techniques have advanced to the point where well bores can end in horizontal sections with lengths greater than 300 metres.

### 1. Answer the questions

1. When is directional drilling used?
2. What does the whipstock consist of?
3. What length can in horizontal sections of well bores be?

### 2. Find equivalents from the text

угол наклона скважины может быть изменен  
часто башенная вышка не может быть установлена непосредственно над  
должна быть способна двигаться и вращаться  
будет проникать сквозь подземные слои в нужное место  
более современные технологии сделали возможным.

### 3. Complete the following words from the text:

D\_\_\_ll\_ng, r\_t\_te, adv\_nt\_ge, f\_rm\_tion, r\_t\_ry, techn\_q\_\_\_, p\_n\_tr\_te.

### 4. Find all the sentences from the texts (d, e, f, g) in the Passive Voice. Copy them in your exercise-books and translate.

### 5. Find all the sentences from the text (g) with the modal verbs.

## 5.2 Offshore platforms

### *a) Shallow water*

Many petroleum reservoirs are found in places where normal land-based drilling rigs cannot be used. In shallow inland waters or wetland areas, a drilling platform and other normal equipment may be mounted on a barge, which can be floated into position and then made to rest on the bottom. The actual drilling platform can be raised above the water on masts if necessary. Drilling and other operations on the well make use of an opening through the barge hull. This type of rig is generally restricted to water depths of 15 metres or less.

In shallow Arctic waters where drifting ice is a hazard for fixed platforms, artificial islands are constructed. Onshore in Arctic areas, permafrost makes drilling difficult because melting around and under the drill site makes the ground unstable. Here, too, artificial islands are built up with rock or gravel.

### 1. Answer the questions

1. Where normal land-based drilling rigs cannot be used?
2. Where may drilling equipment be mounted on if petroleum reservoirs are in shallow inland waters or wetland areas?
3. When are artificial islands built up?



## 2. Find equivalents from the text

дрейфующий лед опасен для  
на мелководье или в заболоченных местах  
насыпаются из скальника или гравия  
оборудование может быть установлено на барже.

## 3. Find all the sentences from the text with the modal verbs. Copy them in your exercise-books and translate.

## 4. Mark the tense-forms and Voice of the verbs and translate the sentences:

1. Drilling and other operations on the well make use of an opening through the barge hull.
2. This type of rig is generally restricted to water depths of 15 metres or less.
3. In shallow Arctic waters where drilling ice is a hazard for fixed platforms, artificial islands are constructed.
4. Artificial islands are built up with rock and gravel.

### *b) Deep water*

In deeper, more open waters over continental shelves, drilling is done from free-floating platforms or from platforms made to rest on the bottom. Floating rigs are most often used for exploratory drilling, while bottom-resting platforms are usually associated with the drilling of wells in an established field. One type of floating rig is the drill ship. This is an oceangoing vessel with a derrick mounted in the middle, over an opening for the drilling operation. The ship is usually held in position by six or more anchors, although some vessels are capable of precise maneuvering with directional thrust propellers. Even so, drill ships will roll and pitch from wave action, making the drilling difficult. A more stable platform is obtained with semisubmersible vessels. In these vessels, buoyancy is afforded by a hull that is entirely underwater, while the operational platform is held well above the surface on slender supports. Normal wave action affects the platforms very little. These vessels are also kept in place during drilling by either anchors or precise maneuvering.

Fixed platforms, which rest on the seafloor, are very stable, although they cannot drill in water as deep as floating platforms can. The most popular type is called a jack-up rig. This is a floating (but not self-propelled) platform with legs that can be lifted high off the seafloor while the platform is towed to the drilling site. There the legs are cranked downward by a rack-and-pinion gearing system until they encounter the seafloor and actually raise the platform 10 to 20 metres above the surface. The bottoms of the legs are usually fastened to the seafloor with pilings. Other types of bottom-setting platforms may rest on rigid steel or concrete bases that are constructed onshore to the correct height. After being towed to the drilling site, flotation tanks built into the base are flooded, and the base sinks to the ocean floor. Storage tanks for produced oil may be built into the underwater base section.

In some platforms the legs have been replaced by cables fastened to the seafloor. The platform is pulled down on the cables so that its buoyancy creates a tension in the cables that holds it firmly in place. These platforms typically operate in water up to 100 metres deep.

For both fixed and floating rigs, the drill pipe must still transmit both rotary power and drilling mud to the bit; in addition, the mud must be returned to the platform for recirculation. In order to accomplish these functions through seawater, an outer casing, called a riser, must extend from the seafloor to the platform. Also, a guidance system (usually consisting of cables fastened to the seafloor) must be in place to allow equipment and tools from the surface to enter the well bore. In the case of floating platforms, there will always be some motion of the platform relative to the seafloor, so this equipment must be both flexible and extensible. A guidance system will be especially necessary if the well is to be put into production after the drilling platform is moved away.

## 1. Answer the questions

1. What is drill ship?

2. What is a jack-up rig?
3. How are the bottoms of legs fastened to the seafloor?
4. When will a guidance system be especially necessary?

## 2. Find equivalents from the text

система безопасности будет особенно необходима  
 волны мало влияют на платформы  
 бурение ведется на свободно перемещающихся платформах  
 обычно укреплены на морском дне  
 океаническое судно с башенной вышкой в центре.

## 3. Write Tense and Voice and translate the forms below:

Is done \_\_\_\_\_  
 Are used \_\_\_\_\_  
 Are associated \_\_\_\_\_  
 Will roll \_\_\_\_\_  
 Is held \_\_\_\_\_  
 Affects \_\_\_\_\_  
 Are cranked \_\_\_\_\_  
 Have been replaced \_\_\_\_\_  
 Is pulled down \_\_\_\_\_

## 4. Find the Infinitive and Participles in these sentences, mark their functions and translate the sentences:

1. Storage tanks for produced oil may be built into the underwater base section.
2. For both fixed and floating rigs, the drill pipe must still transmit both rotary power and drilling mud to the bit.
3. In some platforms the legs have been replaced by cables fastened to the seafloor.
4. A guidance system will be especially necessary if the well is to be put into production after drilling platform is moved away.
5. Fixed platforms, which rest on the seafloor, are very stable.
6. A guidance system must be in place to allow equipment and tools from the surface to enter the well bore.
7. drill ships will roll and pitch from wave action, making the drilling difficult.

## 5 Construct the following sentences and translate them:

1. Usually, are, to the, pilings, with, seafloor, of the legs, the bottoms.
2. Obtained, a more, vessels, platform, stable, with, semisubmersible, is.
3. Oil, underwater, may, storage, for, section, into, the, produced, built, tanks, be, base.
4. These, deep, typically, in, to, water, up, operate, metres, too, platforms.

### 5.3 Well logging and drill-stem testing

After the borehole has penetrated a potential productive zone, the formations must be tested to determine if expensive completion procedures should be used. The first evaluation is usually made using well-logging methods. The logging tool is lowered into the well by a steel cable and is pulled past the formations while response signals are relayed to the surface for observation and recording. Often these tools make use of the difference in electrical conductivities of rock, water, and petroleum to detect possible oil or gas accumulations. Other logging tools use differences in radioactivity, neutron absorption, and acoustic wave absorption. Well-log analysts can use the recorded signals to determine potential producing formations and their exact depth. Only a production test, however, can establish the potential productivity of a formation.

The production test normally employed is the drill-stem test, in which a testing tool is attached to the bottom of the drill pipe and is lowered to a point opposite the formation to be tested. The tool is equipped with expandable seals for isolating the formation from the rest of the borehole, and the drill pipe is emptied of mud so that formation fluid can enter. When enough time has passed, the openings into the tool are closed and the drill pipe is brought to the surface so that its contents may be measured. The amounts of oil and gas that flow into the drill pipe during the test and the recorded pressures are used to judge the production potential of the formation. (If there is gas present in the formation, the gas may flow from the top of the drill pipe during the test.) Similar tools are available that can seal off and test a formation in a cased well bore or that can bring a small sample of produced reservoir fluid to the surface at reservoir pressures.

### 1. Answer the questions

1. When are the openings into the tool closed?
2. How is the first evaluation usually made?
3. What can establish the potential productivity of a formation?
4. How is the logging tool lowered into the well?
5. What is the tool equipped with for isolating the formation from the rest of the borehole?

### 2. Find equivalents from the text

опускается в скважину на стальном тросе  
образцы нефти и газа, которые попадают в обсадную трубу  
проводимость породы, воды  
доставляются на поверхность для рассмотрения и регистрации  
оценить производственный потенциал месторождения

### 3. Complete the sentences

1. The amounts of..... flow into the drill pipe during the test.
2. Logging tools use differences in.....
3. Similar tools can bring.....to the surface at reservoir pressures.
4. Well-log analysts can use the recorded signals to .....
5. Similar tools are available that can ..... in a cased well bore.

### 4. Make the following sentences negative and put into the interrogative.

1. The first evaluation is usually made using well-logging methods.
2. only a production test can establish the potential productivity of a formation.
3. Other logging tools use differences in radioactivity, neutron absorption, and acoustic wave absorption.
4. Often these tools make use of the difference in electrical conductivities of rock, water, and petroleum to detect possible oil or gas accumulations.

### 5. Mark the types of the Complex Sentences and translate them.

1. The production test normally employed is the drill-steam test, in which a testing tool is attached to the bottom of the drill pipe.
2. When enough time has passed, the openings into the tool are closed and the drill pipe is brought to the surface so that its contents may be measured.
3. If there is gas present in the formation, the gas may flow from the top of the drill pipe during the test.

## 5.4 Well completion

### **a) Production tubing**

If preliminary tests show that one or more of the formations penetrated by a borehole will be commercially productive, the well must be prepared for the continuous production of oil or gas. First, the casing is completed to the bottom of the well. Cement is then forced into the annulus between the casing and the borehole wall to prevent fluid movement between formations. As mentioned earlier, this casing may be made up of progressively smaller-diameter tubing, so that the casing diameter at the bottom of the well may range from 10 to 30 centimetres (4 to 12 inches). After the casing is in place, a string of production tubing (5 to 10 centimetres in diameter) is extended from the surface to the productive formation. Expandable packing devices are placed on the tubing to seal the annulus between the casing and the production tubing within the producing formation from the annulus within the remainder of the well. If several producing formations are penetrated by a single well, as many as four production strings may be hung. If a lifting device is needed to bring the oil to the surface, it is generally placed at the bottom of the production tubing.

#### **1. Answer the questions**

1. When must the well prepared for production?
2. What is completed first?
3. What is forced to prevent fluid movement between formations?
4. What is a lifting device needed to?

#### **2. Find equivalents from the text**

подъемное устройство  
скважина должна быть подготовлена для промышленной добычи  
в основном размещается внизу  
цемент заливается в кольцевой зазор между  
коммерчески продуктивно.

#### **3. Mark the tense-forms and the Voice of the verbs:**

Will be \_\_\_\_\_  
Show \_\_\_\_\_  
Is forced \_\_\_\_\_  
Is completed \_\_\_\_\_  
Is \_\_\_\_\_  
Are placed \_\_\_\_\_  
Are penetrated \_\_\_\_\_

### **b) Perforating and fracturing**

Since the casing is sealed with cement against the productive formation, openings must be made in the casing wall and cement to allow formation fluid to enter the well. A perforator tool is lowered through the tubing on a wire line. When it is in the correct position, bullets are fired or explosive charges are set off to create an open path between the formation and the production string. If the formation is quite productive, these perforations (usually about 30 centimetres apart) will be sufficient to create a flow of fluid into the well. If not, an inert fluid may be injected into the formation at pressure high enough to cause fracturing of the rock around the well and thus open more flow passages for the petroleum. In early wells, nitroglycerin was exploded in the uncased well bore for the same purpose. An acid that can dissolve portions of the rock is sometimes used in a similar manner.

#### **1. Answer the questions**

1. How is a perforator tool lowered?
2. What can be if the formation is quite productive?
3. How was nitroglycerin used in early wells?

## 2. Find equivalents from the text

иногда используется для тех же целей  
если месторождение достаточно продуктивно  
чтобы создать свободный проход  
чтобы создать трещины в скале вокруг скважины.

## 3. Put these sentences into the Present, Past and Future Indefinite forms. Translate them.

1. A perforator tool is lowered through the tubing on a wire line.
2. In early wells, nitroglycerin was exploded in the uncased well bore for the same purpose.
3. An acid is sometimes used in a similar manner.

### *c) Surface valves*

When the subsurface equipment is in place, a network of valves, referred to as a Christmas tree, is installed at the top of the well. The valves regulate flow from the well and allow tools for subsurface work to be lowered through the tubing on a wire line. Christmas trees may be very simple, as in those found on low-pressure wells that must be pumped, or they may be very complex, as on high-pressure flowing wells with multiple producing strings.

## 1. Answer the questions

1. What makes the subsurface equipment as a Christmas tree to be seeded?
2. What do valves regulate?
3. What do the quantity of valves depend on?

## 2. Find equivalents from the text

они могут быть очень сложными  
сеть клапанов  
в скважинах с низким давлением  
клапаны регулируют поток.

## 3. Find the Complex sentences and mark their types. Translate them.

### *d) Gas cycling*

Natural gas reservoirs often contain appreciable quantities of heavier hydrocarbons held in the gaseous state. If reservoir pressure is allowed to decline during gas production, these hydrocarbons will condense in the reservoir to liquefied petroleum gas (LPG) and become unrecoverable. To prevent a decline in pressure, the liquids are removed from the produced gas, and the "dry gas" is put back into the reservoir. This process, called gas cycling, is continued until the optimal quantity of liquids has been recovered. The reservoir pressure is then allowed to decline while the dry gas is produced for sale. In effect, gas cycling defers the use of the natural gas until after the liquids have been produced.

## 1. Answer the questions

1. What substances do natural gas reservoirs contain?
2. What is gas cycling?
3. What is the "dry gas"?

## 2. Find equivalents from the text

когда сухой газ производится на продажу  
часто содержит достаточное количество тяжелого углеводорода  
чтобы предотвратить спад давления  
продолжается до тех пор пока оптимальное количество жидкости.

**3. Write down all the sentences in Passive Voice, mark their Tense-forms, translate them.**

**4. Write down all the sentences with modal verbs or with their equivalents, translate them.**

### **5.5 Surface equipment**

Water often flows into a well along with oil and gas. All these fluids are collected by surface equipment for separation into gas, oil, and water fractions for storage and distribution. The water, which contains salt and other minerals, is usually reinjected into formations that are well separated from freshwater aquifers close to the surface. In many cases it is put back into the formation from which it came. At times, produced water forms an emulsion with the oil or a solid hydrate compound with the gas. In those cases, specially designed treaters are used to separate the three components. The clean crude oil is sent to storage at near atmospheric pressure. Natural gas is usually piped directly to a central processing plant (called a gasoline plant), where the remaining liquids (LPGs) are removed before it is fed to the consumer pipeline. LPG is the major feedstock for making plastics and synthetic fibres and is the source of butane and propane fuel.

#### **1. Answer the questions**

1. What flows into a well along with oil and gas?
2. What are specially designed treaters used to?
3. What is LPG used for?

#### **2. Find equivalents from the text**

для производства пластмасс и синтетических волокон  
собираются наземным оборудованием  
очищенная сырая нефть  
которая содержит соль и другие минералы  
по трубопроводу доставляется прямо на перерабатывающее предприятие.

#### **3. Complete these sentences. Translate them:**

1. Into, along, often, with, water, flows, a well, oil, gas, and.
2. It, back, formation, into, in, many, the, cases, came, is, which, put, it.
3. Near, sent, the, pressure, storage, atmospheric, at, clean, crude, to, oil, is.

#### **4. Mark the Tense-forms of the verbs:**

Flows \_\_\_\_\_  
Are collected \_\_\_\_\_  
Contains \_\_\_\_\_  
Are used \_\_\_\_\_  
Are removed \_\_\_\_\_

#### **5. Mark Participle 1 or Participle 2 and translate these combinations of words:**

Produced water \_\_\_\_\_  
Processing plant \_\_\_\_\_  
Remaining liquids \_\_\_\_\_  
Separated minerals \_\_\_\_\_  
Designed treaters \_\_\_\_\_

**5.6 Storage and transport**

Almost all storage of petroleum is of relatively short duration, lasting only while the oil or gas is awaiting transport or processing. Crude oil, which is stored at or near atmospheric pressure, is usually stored aboveground in cylindrical steel tanks, which may be as large as 30 metres in diameter and 10 metres tall. (Smaller-diameter tanks are used at well sites.) Natural gas and the highly volatile LPGs are stored at higher pressure in steel tanks that are spherical or nearly spherical in shape. Gas is seldom stored, even temporarily, at well sites.

In order to provide supplies when production is lower than demand, longer-term storage of oil and gas is sometimes desirable. This is most often done underground in caverns created inside salt domes or in porous rock formations. Underground reservoirs must be surrounded by nonporous rock so that the oil or gas will stay in place to be recovered later.

Both crude oil and gas must be transported from widely distributed production sites to treatment plants and refineries. Overland movement is largely through pipelines. Crude oil from more isolated wells is collected in tank trucks and taken to pipeline terminals; there is also some transport in specially constructed railroad cars. Pipe used in “gathering lines” to carry oil and gas from wells to a central terminal may be less than five centimetres in diameter. Trunk lines, which carry petroleum over long distances, are as large as 120 centimetres. Where practical, pipelines have been found to be the safest and most economical method to transport petroleum.

Although barges are used to transport petroleum in sheltered inland and coastal waters, overseas transport is conducted in specially designed tanker ships. Tanker capacities vary from less than 100,000 barrels to more than 2,000,000 barrels. Tankers that have pressurized and refrigerated compartments also transport liquefied natural gas and LPG.

**1. Answer the questions**

1. What is the size of steel tanks for storing of crude oil?
2. When is longer-term storage of oil and gas desirable?
3. What is the safest and most economical method to transport petroleum?
4. Why must underground reservoirs be surrounded by nonporous rock?

**2. Find equivalents from the text**

в пещерах с созданными соляными куполами  
 специально сконструированные железнодорожные вагоны  
 хранится при атмосферном давлении  
 под высоким давлением в стальных цистернах  
 подземные резервуары  
 для того, чтобы обеспечить поставки

**3. Complete the sentences**

1. .... is the safest and most economical method to transport petroleum.
2. .... are used to transport petroleum in sheltered inland and coastal waters.
3. Tankers that have .....also transport liquefied natural gas.
4. Gas is seldom stored, even temporarily, at .....
5. Almost all storage of petroleum is of..... duration.

**4. Complete the table ( pay attention to degrees of comparision)**

short		
	nearer	
large		
		the tallest
	higher	

	lower	
desirable		
	later	
	more isolated	
		the safest
		most economical

**5. Write the following words in correct order to make sentences and translate them:**

1. Tanks, at, sites, smaller-diameter, are, used, well.
2. Production, must, transported, be, sites, and, to the treatment, oil, gas, and, plants, both, refineries, crude, distributed, from, widely.
3. Demand, and, storage, longer-term, supplies, gas, sometimes, lower, is, desirable, production, to provide, of oil, when, than, is in order.
4. Inside, underground, created, domes, often, rock formations, salt, porous, most, this, is, or, done, in, in caverns.



## **UNIT 6. OIL & GAS AND PETROCHEMICAL INDUSTRIES**

### **1. Read and guess the meanings of the new words.**

- 1) *primary products*. Natural gas and natural gas liquids are the primary products of oil and gas industry.
- 2) *crude oil*. Crude oil was used for fuel and medicine many years ago.
- 3) *oil and gas extraction industry*. The oil and gas extraction industry can be classified into four major processes.
- 4) *exploration*. Exploration is the first step in oil production.
- 5) *oil and natural gas deposits*. Exploration involves the search for oil and gas deposits.
- 6) *well development*. Well development means the construction of wells.
- 7) *site abandonment*. Site abandonment occurs when a well does not have economic quantities of oil or gas.
- 8) *to plug the well*. Site abandonment involves plugging the wells.
- 9) *to lack*. Site abandonment involves plugging the wells and restoring the site when a recently-drilled well lacks the potential to produce economic quantities of oil and gas.
- 10) *casing*. Casing is mounted in the well at the initial stage of the well development.
- 11) *drilling rig, production rig*. When the drilling rig is removed, then the production rig is installed.
- 12) *tubing*. Tubing carries the liquids and gas to the surface.
- 13) *flow of fluid*. A series of valves is installed to control the flow of fluid from the well.
- 14) *pump, rod pump*. The most common pump is rod pump.
- 15) *formation pressure*. The pumping is required if the formation pressure is low.
- 16) *artificial lift*. If pumps are added, then such kind of production is called “an artificial lift”.
- 17) *to suspend*. The rod pump is suspended on a string of rods from a pumping unit.
- 18) *to remove impurities*. Equipment is needed to remove impurities.
- 19) *pipeline, to facilitate*. A pipeline is connected to the well to facilitate transportation.
- 20) *storage container, to store*. A storage container is connected to the well to store the product.
- 21) *pores, fractures*. Sometimes hydrocarbons can hardly move easily through the pores or fractures into the reservoir.
- 22) *acidizing, fracturing*. There are some forms of stimulation such as acidizing and fracturing.
- 23) *light and heavy fraction*. Lighter fractions are collected at the top of the tower, and heavier fractions are collected at its bottom.
- 24) *fractioning column*. The separation of the mix of hydrocarbons is performed in a fractioning column, also known as an atmospheric distillation tower.
- 25) *refinery*. Crude oil is turned into usable products at refineries.
- 26) *perforated trays*. An atmospheric distillation tower is a tall steel tower with perforated trays.
- 27) *residual products*. The residual products of the distillation are further processed to produce refinery fuels, waxes, greases, etc.
- 28) *cracking, coking*. The most widely used conversion methods are cracking and coking.
- 29) *derrick*. Wooden derricks were constructed long ago.
- 30) *domain*. The business of oil refining was John D. Rockefeller’s domain.

### **2. Read the international words, transcribe and translate them.**

Natural, gas, industry, process, fact, product, production, construction, potential, economic, operation, control, type, electric, motor, phase, container, transport, stimulation, physical, chemical, reservoir, form, mixture, component, mix, transformation, diesel, atmosphere, distillation, temperature, methane, propane butane, kerosene, conversion, molecule.

**3 Analyze the following words with different suffixes and divide them into two groups – nouns and adjectives:**

Important, connection, production, petrochemical, scientific, primary, development, chemical, significant, importance, abandonment, pressure, physical, economic, stimulation, exploration, geophysical, construction, equipment, appearance, different, available.

**4 Match each word with its correct definition**

*To process, to distill, to store, to lack, to prospect*

1. To be without or not to have enough.
2. To explore for oil.
3. To separate or extract the essential elements.
4. To prepare, to treat or convert by subjecting to a special process.
5. To keep or accumulate for future use.

**5 Read the sentences, point out the complex sentences. Give the Russian Equivalent.**

1. Hydrogen and carbon making up petroleum came from plants and animals which were living on land and in sea long ago. 2. This explanation that you managed to listen to is generally accepted by scientists. 3. I believe you know, that carbon and hydrogen are the primary constituents of organic materials, both plant and animal. 4. Moreover, according to the material that you read before, carbon, hydrogen, and hydrocarbons are constantly produced by life processes of plants and animals. 5. Gas accumulates on the top of reservoir as a “gas cap” over the oil in a typical trap, which one can be aware of. 6. Most of the world’s petroleum was found trapped in rocks, which are porous by nature. 7. It occurs because natural gas is lighter than oil, which in its turn is lighter than water. 8. Porosity is the ability of the rock which is characterized by holding oil and gas like water in sponge. 9. Geophysicists can identify the structure, configuration, thickness, and depth of new basins if they apply measuring. 10. It is a well-known fact that heat and pressure transformed the organic materials into solid, liquid or gaseous hydrocarbons.

**6 Make up your own sentences according to the models:**

**Model A:** *Main products are crude oil and natural gas. They have been used throughout the history.*

*Main products are crude oil and natural gas which have been used throughout the history.*

1. The oil industry has four processes. They are of great importance. 2. The four processes are exploration, well development, production, and site abandonment. They make up entire cycle. 3. Well development is the first phase. It means the construction of well. 4. Production is the second stage. It implies extracting of hydrocarbons and separating them. 5. Site abandonment is the final stage. It involves plugging the well.

**Model B:** *Drilling, casing, and testing are completed. The drilling rig is removed.*

*When drilling, casing, and testing are completed, the drilling rig is removed.*

1. Drilling rig is removed. The production rig is installed. 2. Formation pressure is not sufficient. Pumps are added. 3. Natural gas cannot be stored easily. A pipeline connection is connected to the well. 4. The stimulation of the formation is required. The hydrocarbons can hardly move more easily to the wellbore through the pores and fractures into the reservoir. 5. The stimulation is done in some cases. The pump is removed for maintenance.

### **6.1 Oil and gas industry**

The oil and gas industry is an important link in the energy supply of the countries. The primary products of the industry are crude oil, natural gas liquids, and natural gas. The oil and gas extraction industry can be classified into four major processes: exploration, well development, production, and abandonment. Exploration involves the search for rock formations associated with oil or natural gas deposits, and involves geophysical prospecting and exploratory drilling. Well development means the construction of one or more wells. Production is the process of extracting the hydrocarbons and separating the mixture of liquid hydrocarbons, gas, water, and solids; removing the constituents that are non-saleable; and selling the liquid hydrocarbons and gas. Finally, site abandonment involves plugging the well and restoring the site when a recently-drilled well lacks the potential to produce economic quantities of oil or gas.

Production equipment installation is of great importance. When drilling, casing, and testing operations are completed, the drilling rig is removed and the production rig is installed. In most cases, tubing is installed in the well which carries the liquids and gas to the surface. At the surface, a series of valves collectively called the Christmas tree because of its appearance is installed to control of fluid from the well.

Pumps are added if the formation pressure is not sufficient to force the formation fluid to the surface. While some oil wells contain enough pressure to push oil to the surface, most oil wells drilled today require pumping. This is also known as artificial lift. Different types of pumps are available; the most common is the rod pump. The rod pump is suspended on a string of rods from a pumping unit, and the prime mover for pumping units can be an electric motor, or a gas engine. Equipment is usually installed on site to separate natural gas and liquid phases of the production and remove impurities. Finally, a pipeline connection or storage container (tank) is connected to the well to facilitate transportation or store the product. In the case of natural gas, which cannot be stored easily, a pipeline connection is necessary before the well can be placed on production.

In many gas and oil wells, one additional step is required – stimulating the formation by physical or chemical means so that the hydrocarbons can move more easily to the wellbore through the pores or the fractures into the reservoir. This is usually done before installing a pump or when the pump is removed for maintenance. Some forms of stimulation such as acidizing and fracturing are commonly employed if required.

#### **1. Agree or disagree with the following statements.**

1. The primary products of the industry are crude oil, natural gas liquids, and natural gas. 2. The main process characterizing oil and gas industry are the following: exploration, site abandonment. 3. Production equipment is of great importance. 4. If the information pressure is not enough for the formation yo flow by gravity, pumps are added. 5 The formation can be stimulated by physical or chemical means.

#### **2. Match the adjectives in column A with the nouns in column B to form meaningful phrases and then identify them at the sentences level in the text.**

A	B
1) primary	a) hydrocarbons
2) artificial	b) constituents
3) non-saleable	c) prospecting
4) geophysical	d) pressure
5) liquid	e) mover
6) economic	f) motor
7) sufficient	g) pumps
8) different	h) lift

9) prime 10) electric	i) products j) quantities
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**3 Decide, which of the verbs on the left collocate with the nouns on the right and then identify the word combinations at the sentences level in the text.**

1) to plug 2) to lack 3) to store 4) to suspend 5) to employ 6) to remove 7) to facilitate 8) to restore 9) to complete 10) to install	a) equipment b) stimulation c) products d) site e) transport f) drilling g) potential h) impurities i) pumps j) wells
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**4. Try to enrich your vocabulary:**

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

significant, connection, main, to embrace, to manufacture, to finish, various;

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

artificial, to join, solid, to buy, long ago, to star;

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

1. The oil and gas industry is a *significant link* in the energy supply of the countries. 2. The operations are *finished*. 3. There are *various* types of pumps. 4. The oil and gas extraction industry can be classified into four *main* processes. 5. Exploration *embraces* the search for oil and gas deposits.

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

1. W... development means the construction of one or more wells. 2. The drilling r... is removed. 3. C... is an important phase as well as testing operations. 4. Site a... involves plugging the w... . 5. Exploration involves the search for oil and natural gas d... . 6. T... is installed in the well which carries the liquids and gas to the surface. 7. P... are added if the formation pressure is not sufficient. 8. The r... pump is ... on a string of rods from a pumping unit. 9. Equipment is installed to remove i... . 10. The hydrocarbons can move easily through the pores or f... in the reservoir.

**6. Fill in the blanks to streamline the use of the complex sentences.**

1. A fractioning column,... is also known as an distillation tower, plays a very important role. 2. It is a tall steel tower, ... has perforated trays. 3. Several trays are required ... each fraction has a different boiling range. 4. There are light and heavy distillates ... people produce in refineries. 5. Residual products are further processed ... waxes, greases, and asphalt are produced. 6. ... some oil wells contain enough pressure to push oil to the surface, pumping is not necessary. 7. ... testing operations are completed, the drilling rig is removed. 8. ... a well fails to produce required quality of oil or gas, then the decision about abandonment of the site is made.

**7. Make up sentences according to the models to practice the use of the complex sentences.**

**Model A:** Мы знаем, что эта проблема требует особого внимания.

*We know that this problem requires special attention.*

1. Они знают, что буровая установка неисправна. 2. Мы информированы о том, когда нефтеразведка закончится. 3. Они полагают, что найденный пласт породы содержит залежи нефти и газа. 4. Мы знаем, что установка этого оборудования очень важна. 5. Они уверены, что насосы необходимы.

**Model B:** *Когда вы проведёте испытание скважины, мы сможем оценить дебит скважины.*

*When you make the well test, we'll be able to determine its flow rates.*

1. Когда они установят обсадную колонну, мы будем готовы обсуждать мощность скважины. 2. Когда они уберут буровую установку, мы будем монтировать установку по добыче. 3. Если они начнут операции по обсадке скважины трубами на этой неделе, то мы закончим все работы в срок. 4. Если это будет необходимо, то мы сможем применить гидроавлический разрыв пласта залежи нефти.

### **6.2 The history of oil industry**

*Mind the words and phrases given to comprehend better the information of the text.*

To trace back – восходить к определённому периоду в прошлом;

Steam engine – паровой двигатель;

To spark – побуждать;

An oil boom – нефтяной бум;

To buy out competitors – выкупать конкурентов;

Associates – партнёры;

To spread – распространяться;

To take the lead – занимать первое место;

Annual – ежегодный;

To replace – заменять.

Many centuries ago, Native Americans used crude oil for fuel and medicine. But the start of the oil industry as it is known today can be traced back to 1859. In that year, retired railroad conductor Edwin L. Drake drilled a well near Titusville, Pennsylvania. The well powered by an old stem engine, soon produced oil and sparked an oil boom. By the 1860's, wooden derricks had covered the hills of western Pennsylvania. In 1865, the first successful oil pipeline was built from an oil field near Titusville to a railroad station five miles away. From there, railcars transported oil to refineries on the Atlantic coast.

The business of refining oil was largely the domain of John D. Rockefeller. The New York-born industrialist financed his first refinery in 1862. Then he went on to buy out competitors, and, along with his brother, William, and several associates, he created Standard Oil Company. By 1878, Rockefeller had controlled 90 per cent of the oil refineries in the United States.

Drilling for oil spread quickly beyond Pennsylvania. By 1900, Texas, California, and Oklahoma had taken the lead in oil production, and eleven other states had had active oil deposits. Annual U.S. oil production climbed from two thousand barrels in 1859 to 64 million barrels in 1900. Other countries were also getting into the oil business. Russia was producing slightly more than the United States around the beginning of the twentieth century. Smaller producers were Italy, Canada, Poland, Peru, Venezuela, Mexico, and Argentina. The first major oil discovery in the Middle East occurred in Iran in 1908. Prospectors struck oil in Iraq in 1927 and in Saudi Arabia in 1938.

The demand for petroleum products became even greater after World War 11. Petroleum use in the United States went from about 1,75 billion barrels in 1946 to almost 2,5 billion barrels in

1950. By the early 1950s, petroleum had replaced coal as the country's chief fuel. And plastic was the primary reason.

**1. Agree or disagree with the following statements.**

1. Many centuries ago Native Americans used crude oil for fuel and medicine. 2. By 1860s wooden derricks had covered the hills of Western Pennsylvania. 3. The business of oil refining was mainly Ford's domain. 4. Fourteen states had active oil deposits. 5. The first major oil discovery in the Middle East occurred in 1908.

**2. Make up general and disjunctive questions and answer them according to the models.**

**Model A:** *The industry produces crude oil, natural gas liquids, and natural gas.*

*Does the industry produce crude oil, natural gas liquids, and natural gas? – Yes, it does.*

*The industry produces crude oil, natural gas liquids, and natural gas, doesn't it? – Yes, it does.*

1. Exploration involves the search of rock formation and exploratory drilling. 2. Well development means the construction of one or more wells. 3. Production aims at extracting the hydrocarbons. 4. Production equipment plays a prominent role. 5. A well contains enough pressure to push oil to the surface.

**Model B:** *Native Americans used crude oil for fuel and medicine.*

*Did Native Americans use crude oil for fuel and medicine?*

*- Yes, they did.*

*Native Americans used crude oil for fuel and medicine, didn't they?-*

*Yes, they did.*

1. Retired railroad conductor E. Drake drilled a well in Pennsylvania. 2. In 1860s wooden derricks covered the hills of western Pennsylvania. 3. J.D. Rockefeller dominated in the oil refining business. 4. He bought out his competitors. 5. The first major oil discovery in the Middle East occurred in Iran in 1908.

**3. Make up special questions according to the models and answer them.**

**Model A:** *Drilling rig is removed.*

*What is removed?*

1. The production rig is installed. 2. Tubing is mounted. 3. Equipment is usually installed to separate natural gas and liquid phases of the production. 4. The pump is removed for maintenance. 5. Acidizing is commonly employed.

**Model B:** *Valves can control the flow of fluid from the well.*

*What can valves control?*

1. Pumps can increase formation pressure. 2. Equipment can remove impurities. 3. A pipeline connection can facilitate product transportation. 4. It can speed up product storage. 5. The hydrocarbons can move more easily to the wellbore through the pores or fractures into the reservoir. 6. They can add one more form of stimulation.

**4. Ask questions and use the words in italics in your answers. The words in brackets will help you.**

1. In producing gas and oil, *efficient performance* of producing wells has more and more importance (what). 2. A variety of tests must be made *to determine the performance of oil and gas well* (what, what for). 3. There are some well tests *to obtain certain information about the flow rates* ( what for). 4. *Potential* test is a measurement of the largest amount of oil and gas produced by a well in a 24-hour period (what kind of). 5. The oil goes *to stock tanks* (where).

**5. Read the following dialogue, sum up the information and act out.**

**HOW TO TURN CRUDE OIL INTO USABLE PRODUCTS**

A.: Would you be so kind as to name the important stages of turning crude oil into different usable products?

B.: Well, you see, crude oil is a mixture of many hydrocarbon components, so refineries must first separate and then process the mix of hydrocarbons which make up crude oil before they can be transformed into gasoline, diesel, and jet fuels, to name a few.

A.: I've never been at the refinery! Could you tell me at least about the first stage, I mean the separation step?

B.: Sure. This process takes place in a fractionating column, also known as an atmospheric distillation tower.

A.: Excuse me please, did you say "atmosphere distillation tower"?

B.: No, that is atmospheric distillation tower!

A.: I see. What is this?

B.: This is a tall steel tower with perforated trays. A number of trays are needed as each fraction has a different boiling range, and a distillation tower can separate various fractions using heat and cooling.

A.: I know from the tutorials that heavier hydrocarbons boil at much higher temperatures than lighter hydrocarbons.

B.: Right you are. So they settle in trays at the bottom of the tower closest to furnace. As for lighter fractions, they are collected at the top. As each fraction reaches the tray where the temperature is just below its own boiling point, it condenses, liquefies and is drawn off the tray by pipes.

A.: Oh, my God! What a complicated process it is! I wish I saw it with my own eyes! What are the final products of the distillation then?

B.: First, gases and light gasoline such as methane, ethane, propane, and butane. Second, light distillates as naphta, and kerosene.

A.: What is naphta used for?

B.: Naphta is used in the production of gasoline and petrochemicals. The third product is middle distillates (light and heavy gas oils). Light gas oils are turned into jet, diesel, and furnace fuels. Heavy gas oils undergo further chemical processing such as cracking to produce naphta and other products. And the fourth product is residual products that further processed to produce refinery fuels, heavy fuel oil, waxes, greases and asphalt.

A.: You said 'cracking', didn't you? What does it mean?

B.: It's the next step – conversion. By the way, the most widely used conversion methods are cracking and coking!

A.: Why cracking?

B.: This method uses heat and pressure to 'crack' heavy hydrocarbon molecules into lighter ones.

A.: It's so interesting! I believe this information can be of great help for my exam!

B.: You are always welcome! Wish you luck at your exam!

**6. Complete the following sentences in a logical way.**

1. The primary products of oil and gas industry are crude oil, natural gas...

2. The oil and gas industry can be classified into four processes exploration, well development, production, and...
3. Exploration involves the search for rock formation, associated with...
4. Well development means the construction of one or...
5. Production is the process of extracting the hydrocarbons and separating...
6. Site abandonment involves plugging the well and restoring site when...
7. When drilling rig is removed then production rig .....
8. At the surface a series of valves which are collectively called .....
9. Pumps are added to force formation fluid to .....
10. Equipment is installed to separate natural gas and liquid phases .....
11. One additional step is required to stimulate the formation by .....
12. Some forms of simulation are acidizing and .....
13. There are two stages of turning crude oil into different usable products .....
14. There are two stages of turning crude oil into different usable products .....
15. The products of distillation can be divided into 4 phases: gases and light gasoline; light distillates, middle distillates; and residual .....
16. Gases and light gasoline are methane, ethane .....
17. Light distillates are naphtha .....
18. Middle distillates include light and heavy .....
19. Residual products are further processed to produce refinery fuel, waxes .....

**7. Translate the following sentences from Russian into English.**

1. Нефть – это природная смесь углеводородов.
2. Добыча – это процесс очистки добытой нефти от нефтяного газа, различных примесей.
3. Этот процесс называется первичной сепарацией нефти.
4. Первичными продуктами нефтегазовой промышленности являются нефть, газоконденсат и природный газ.
5. Процесс ликвидации объекта происходит тогда, когда скважина не имеет достаточного потенциала производить нефть и газ в объёме, который экономически выгоден.
6. Оборудование для добычи играет существенную роль.
7. Когда закончено бурение, обсадка (скважины трубами), и проведены испытания скважины, тогда убирают буровую установку для добычи нефти.
8. Некоторые нефтяные скважины содержат давление, чтобы подкачивать нефть на поверхность.
9. Промысловая нефть после первичной сепарации поступает в ректификационную колонну на атмосферную перегонку.

**8. Make the summary of the text using the following phrases:**

1. The title of the text is ....
2. The text is about.... The text deals with....
3. The text covers such points as....first....second....third....
4. It should be underlined that....
5. In conclusion, I may say that....
6. To my mind.... In my opinion....

**Petrochemistry**

All spheres of modern life are directly connected with chemical products. Petrochemistry has one of the key roles in the production of polymers, synthetic rubbers, lubricating oils, dissolvent, colorants, additives, detergents, and raw materials for most organic compounds.



Petrochemistry is a science that can readily be applied to fundamental human needs, such as health, hygiene, housing, and food. Yet, it is an inventive business sector constantly adapting to new environments and meeting new challenges.

Chemicals derived from petroleum or natural gas – petrochemicals – are an essential part of the chemical industry today. Today, the main purposes of petrochemistry are the study and development of methods of hydrocarbons, natural gas and other oil component processing for the creation of optimal processes of producing organic compounds. The organic compounds are used as raw material for production of the marketable chemical products (such as polymers, films, synthetic rubbers, detergents, lubricants, colorants, additives, etc.). Most organic compounds are “petrochemical”, but usually this term is applied to the products, which are made in relatively large quantities.

Petrochemistry is a fairly young industry, According to the opinion of Russian scientists, the beginning of the petrochemistry development is 1920, when the American company “Standard Oil” started to produce isopropyl alcohol from propylene. The first petrochemical plant, involved in ethylene production, was put in operation in 1923 by another American company – Union Carbide.

Before then, it used to be an experimental sector, starting with basic materials: synthetic rubbers in the 1900s, Bakelite, the first petrochemical derived in 1907, the first petrochemical in the 1920s, polystyrene in the 1930.

The new industry started to grow rapidly only in the 1940s, more than 80 years after the drilling of the first commercial oil well in 1859. During World War II, the demand for materials to replace costly and sometimes less efficient products caused the petrochemical industry to develop into a major sector in today’s economy and society.

The petrochemistry industry includes an incredible variety of areas – from household goods to medicine, from leisure to highly specialized fields like archaeology or crime detection.

However, all this is little known. Petrochemicals do not reach the final consumer, they are first sold to customer industries, undergo several transformations, and then go into products that seem to bear no relations, and then go into products that seem to bear no relation whatsoever to the initial raw materials. As a result, few of us make the connection between the petrochemical industry and their equipment, their CDs, food packaging or computers; few realize the amount of scientific efforts that went into these commonplace objects.

Although benefiting daily from end products that have been made thanks to the input of the petrochemical industry, we don’t see an obvious connection between these everyday commodities and petrochemistry.

### **Self-work of the students**

**1. Make up your own story about the oil and gas industry according to the following points of the plan. The words and phrases are supposed to make your story logical and interesting.**

1. *The primary products of the oil & gas industry*

The oil and gas industry is

The primary products of the industry are

2. *The major processes of the oil & gas industry*

Exploration involves

Well development means

Production is

Site abandonment embraces

3. *Production equipment*

Drilling rigs is removed

Production rig is installed

Tubing is installed

Pumps are added

4. *Stimulation*

Stimulation the formation can be done by

Stimulation is used

5. *The product of distillation*

There are

Residual products are processed

**2. Write an e-mail to your friend about the products of distillation that present the greatest value for you as a specialist in the oil and gas industry.**

**3. Compile information about the oil and gas industry and participate in a project. Give reasons why this field of industry is of interest for our country. Present the project to your group. You may use the following website: [www.shell.com/globalsolutions](http://www.shell.com/globalsolutions), [www.usctcgateway.net/tool](http://www.usctcgateway.net/tool)**

## Grammar tests

### Test 1

1. was used

- a) будут использовать;
- b) используют;
- c) использовался;
- d) использовали

2. discovered

- a) обнаружат;
- b) будет обнаружен;
- c) обнаруживают;
- d) обнаружили

3. will stay

- a) Present Perfect;
- b) Future Simple;
- c) Past Simple;
- d) Present Continuous

4. the safest

- a) самый безопасный;
- b) безопасный;
- c) безопаснее;
- d) наименее оласный.

5. flows into

- a) Past Simple;
- b) Present Simple;
- c) Future Simple;
- d) Present Perfect

6. The drill bit is connected to the surface equipment through the drill pipe.

- a) был соединён;
- b) соединили;
- c) соединён;
- d) будет соединён

7. Oil fields were found in Europe and East Asia.

- a) будут найдены;

- b) были найдены;
- c) находятся;
- d) находился

8. By the mid-19<sup>th</sup> century kerosene, or oil derived ... coal was in common use.

- a) by;
- b) for;
- c) from;
- d) to

9. Two overriding principles apply ... world petroleum production.

- a) for;
- b) to;
- c) from;
- d) at

10. Pipelines have been found to be .... method to transport petroleum.

- a) the safest;
- b) more safe;
- c) safer;
- d) safe

11. In order to provide supplies when production is .... Than demand, longer-term storage of oil and gas is sometimes desirable.

- a) low;
- b) more lower;
- c) the lowest;
- d) lower

12. Only a production test ..... establish the potential productivity of a formation..

- a) had;
- b) will be able;
- c) is;
- d) can

## Test 2

- 1 Lisbon is ...capital of Portugal.  
a) a;      b) an;      c) the;      d)-
2. The united Kingdom is ... important North Sea exporter.  
a) a;      b) an;      c) the;      d)-
3. We were .... Business in Mexico.  
a) with;      b) for;      c) on
4. The world petroleum was first used .... 1556.  
a) on;      b) at;      c) in
5. Basins .... the United States have been intensively explored.  
a) of;      b) in;      c) at
6. .... my opinion scientists take a pessimistic view.  
a) according to;      b) in;      c) by
7. They are laying a pipeline .....Siberia.  
a) across;      b)over;      c) through
8. Our use of central heating is really .....  
a) economical;      b) economic;      c) cheap
9. She ... the problems of deriving the oil,  
a) spoke on;      b) spoke of;      c) spoke for
10. The minister ....about social welfare.  
a) made a speech;;      b) did a speech;  
c) made a talk;      d) did a talk
11. As far as I can ..... this problem can be solved easily.  
a) look at;      b)watch;      c) see
12. I ....things differently now.  
a) look at;      b) see;      c) watch

13. Four points .....32 degrees C to below -57 degrees C.

a) range from;    b) range up;    c) range to

14. Surely we can .... this.

a) agree to;        b) agree on;        c) agree with

### Test 3

1. We had ....time than we needed to finish the job.  
a) more little;    b) less little;    c) less
2. Computers are .... Nowadays.  
a) complicateder;    b) more complicated than;    c) more complicated
3. They will have to think of a ....method.  
a) gooder;    b) better;    c) more better
4. I'm beginning to feel .....about the results.  
a) hopeful than;    b) more hopefuller;    c) more hopeful
5. This is .....country in the world.  
a) poorest;    b) poorer;    c) the poorer;    d) the poorest
6. Of all the machines, this one works ..... .  
a) gooder;    b) better;    c) best
7. This is the ..... company in the world.  
a) bigger;    b) biggest;    c) the biggest
8. The hole was ..... small.  
a) too;    b) very
9. How ... oil has the company got ?  
a) many;    b) little;    c) much
10. I don't have ..... time today. Sorry!  
a) some;    b) any;    c) no
11. She ..... a course in civil engineering last year.  
a) makes;    b) does;    c) made;    d) did

## Lexical tests

### Test 1

1. What does the word “petroleum” mean?
  - a) petroleum and hydrocarbons;
  - b) petroleum and crude oil;
  - c) petroleum and natural gas;
  - d) petroleum and oil field
  
2. Liquid oil was first used as a .....
  - a) medicine;
  - b) fuel;
  - c) illumination;
  - d) lubricant
  
3. Liquid petroleum was a more easily transportable .....of energy.
  - a) key;
  - b) spring;
  - c) source
  
4. There’s a old .....wall at the end of the well.
  - a) stone;
  - b) stony
  
5. It’s impossible to cultivate such .....soil.
  - a) stone;
  - b) stony
  
6. She wouldn’t drink water that flows through .....pipes.
  - a) lead;
  - b) leaden
  
7. Our whole project is balanced ..... between success and failure.
  - a) fine;
  - b) finely
  
8. The need for ..... Illumination made it necessary to search for new sources of oil.
  - a) worst;
  - b) good;
  - c) better;



d) bad

9. The Middle East is thought to have had an estimated 41 percent of the world's .....oil endowment.

- a) total;
- b) totally

10. Many people believe the fire was caused by an ..... fault.

- a) electric;
- b) electrical

11. You can't keep warm with a small .....fire.

- a) electric;
- b) electrical

12. You can control the whole system with this ..... button.

- a) magical;
- b) magic

13. They use lights to create .....effects on the stage.

- a) magical;
- b) magic

## Test 2

1. Do/ make good
2. Do/ make money
3. Do/make fortune
4. Do/ make something wrong
5. Do/ make research
6. Do/ make some work
7. Do/ make a deal
8. Do/ make an effort
9. Do/ make business
10. Do/ make progress

11. Do/ make nothing of something

### Test 3

#### Третий лишний ( Odd - One - Out)

1. In front of; behind; between; lots of opposite
2. Must; ought ; have to; should; can
3. Broken; destroyed; damaged; repaired; out of order
4. Along; around; down; across; landmark
5. Blue; dark; yellow; green; grey
6. Portugal; Russian; Britain; Bulgeria; Austria
- 7 .Liquid; gaseous; solid; viscous; complex
8. The Sumerians; the Assyrians; the Englishmen; the Babyloni ans; the Persians



- A. the Middle East
- B. America
- C. Eastern Europe
- D. Western Europe

11. ....are thought to contain significant prospects.

- A. Africa, Asia and South America
- B. Middle East and South Europe
- C. Western Europe
- D. Middle East

12. ....is the third largest oil field in the world and the largest offshore.

- A. Prudhoe Bell
- B. Samotlor and Romashkino
- C. Saffaniayah offshore
- D. Cantarell offshore

13. Russia is thought .....the best potential for new discoveries.

- A. possessing
- B. possessed
- C. to possess
- D. to have possessed

14. Russian oil is derived ... many sedimentary basins.

- A. for
- B. in
- C. on
- D. from

15. Russia has two supergiant oil fields,..... .

- A. Bashkortostan and Tatarstan
- B. Samotlor and Romashkino
- C. Perm and Orenburg
- D. Russian Vtoroe Baku

16. Basins in the United States.....intensively..... .

- A. have been explored
- B. have been found
- C. have been discovered
- D. have been supplied

17. The United States has produced .....than any other country.

- A. much
- B. many
- C. more
- D. less

18. How was called the method, in which early oil wells were drilled with impact-type tools?

- A. up-and-down motion
- B. tool dresser
- C. cable-tool drilling
- D. "gusher"

19. When did rotary drilling become the preferred penetration method for oil and gas wells?

- A. in the middle of the 19<sup>th</sup> century
- B. during the middle and late 20<sup>th</sup> century
- C. in the 21<sup>st</sup> century
- D. at the beginning of the 20<sup>th</sup> century

20. The drill bit is connected .....the surface equipment through the drill pipe.

- |         |        |
|---------|--------|
| A. on   | C. for |
| B. with | D. to  |

## GRAMMAR REFERENCE

### Степени сравнения прилагательных

	Положительная	Сравнительная	Превосходная
I	long easy	longer easier	(the) longest (the) easiest
II	interesting	more interesting	(the) most interesting
III	good bad much, many little	better worse more less	(the) best (the) worst (the) most (the) least

### Сводная таблица модальных глаголов и их эквивалентов

	Present	Past	Future
Долженствование	I must meet him. I have to meet him. I am to meet him. I <b>should</b> meet him.	I <b>had</b> to meet him. I <b>was</b> to meet him.	I <b>shall have to</b> meet him. I'll be to meet him.
Способность или возможность совершения действия	He <b>can</b> help you. He is able to help you.	He <b>could</b> help you. He was able to help you.	He <b>will be able to</b> help you.
Разрешение или возможность (вероятность)	I may use this device. I am allowed to use the device.	I might use this device. I was allowed to use the device.	I <b>shall be allowed to</b> use the device.

### Таблица времен группы *Simple Active*

Форма	Present Simple	Past Simple	Future Simple
Утвердительная	My friends study French. He speaks English.	My friends studied French at school. He <b>spoke</b> English at the conference.	My friends <b>will study</b> French at the Institute. The teacher <b>will speak</b> about our English exam.

Вопросительная	<b>Do</b> your friends study French? <b>Does</b> he speak English?	<b>Did</b> your friends study French at school? <b>Did</b> he speak English at the conference?	<b>Will</b> your friends study French at the Institute? <b>Will</b> the teacher speak about our English exam?
Отрицательная	My friends <b>don't</b> study French. He <b>doesn't</b> speak English.	My friends <b>did not</b> study French. He <b>didn't</b> speak English at the conference.	My friends <b>won't study</b> French at the Institute. The teacher <b>won't speak</b> about our English exam.

*Таблица времен группы Progressive Active*

Форма	Present Progressive	Past Progressive	Future Progressive
Утвердительная	They <b>are having</b> an English class.  He <b>is still writing</b> an exercise.	They <b>were having</b> an English class when I came to see them. He <b>was writing</b> an exercise from 6 till 8 o'clock.	They <b>will be having</b> an English class tomorrow at 9 o'clock. He <b>will be writing</b> an exercise from 6 till 8 o'clock tomorrow.
Вопросительная	<b>Are</b> they <b>having</b> an English class?  <b>Is</b> he still <b>writing</b> an exercise?	<b>Were</b> they <b>having</b> an English class when I came to see them? <b>Was</b> he <b>writing</b> an exercise from 6 till 8 o'clock.	<b>Will</b> they <b>be having</b> an English class tomorrow at 9 o'clock? <b>Will</b> he <b>be writing</b> an exercise from 6 till 8 o'clock tomorrow?

Отрицательная	<p>They <b>aren't having</b> an English class, they are having a Russian class.</p> <p>He <b>isn't writing</b> an exercise, he is reading a book.</p>	<p>They <b>weren't having</b> an English class when I came to see them, they were having a Russian <b>class</b>.</p> <p>He <b>wasn't writing</b> an exercise from 6 till 8 o'clock, he was reading a book.</p>	<p>They <b>will not be having</b> an English class tomorrow at 9 o'clock, they will be having a Russian class.</p> <p>He <b>won't be writing</b> an exercise from 6 till 8 o'clock tomorrow, he'll be reading a book.</p>
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**Таблица времен Simple, Progressive, Perfect in Passive Voice**

	Simple	Progressive	Perfect
	to be + Participle II	to be + being + Participle II	to have + been + Participle II
Present	The letter is translated	The letter is being translated	The letter has been translated
	Is the letter translated?	Is the letter being translated?	Has the letter been translated?
	The letter isn't translated	The letter isn't being translated	The letter hasn't been translated.
Past	The letter was translated	The letter was being translated	The letter had been translated
	Was the letter translated?	Was the letter being translated?	Had the letter been translated?
	The letter wasn't translated.	The letter wasn't being translated	The letter hadn't been translated?
Future	The letter will be translated	Не употребляются.	The letter will have been
	Will the letter be translated?		Will the letter have been translated?
	The letter won't be translated		The letter won't have been translated.

**Таблица времен группы Perfect Active**

Форма	Present Perfect	Past Perfect	Future Perfect
Утвердительная	I <b>have sent</b> the letter.	I <b>had</b> already <b>sent</b> the letter by 6 o'clock yesterday.	I <b>shall have sent</b> the letter by tomorrow evening.
Вопросительная	<b>Have</b> you <b>sent</b> the letter?	<b>Had</b> you <b>sent</b> the letter by 6 o'clock yesterday?	<b>Will</b> you <b>have sent</b> the letter by tomorrow evening?
Отрицательная	I <b>have not sent</b> the letter yet.	I <b>had not sent</b> the letter by 6 o'clock yesterday.	I <b>shall not have sent</b> the letter by tomorrow evening.

<i>Infinitive</i>	<i>Past</i>	<i>Participle II</i>	<i>Translation</i>
arise	arose	arisen	возникать
awake	awoke	awaked	будить, проснуться
be	was, were	been	быть
bear	bore	born	родить
beat	beat	beaten	бить
become	became	become	стать
begin	began	begun	начать
bend	bent	bent	согнуться
bind	bound	bound	связать
bite	bit	bitten	кусать
blow	blew	blown	дуть
break	broke	broken	ломать
bring	brought	brought	приносить
build	built	built	строить
burst	burst	burst	разразиться, взорваться
buy	bought	bought	покупать
catch	caught	caught	ловить
choose	chose	chosen	выбирать
cut	cut	cut	резать
deal	dealt	dealt	иметь дело
dream	dreamt	dreamt	мечтать
do	did	done	делать
draw	drew	drawn	рисовать
drink	drank	drunk	пить
drive	drove	driven	ехать
eat	ate	eaten	есть, кушать
fall	fell	fallen	падать
feed	fed	fed	кормить
fight	fought	fought	сражаться
find	found	found	находить
fly	flew	flown	летать
forbid	forbade	- forbidden	запретить
forget	forgot	forgotten	забыть
forgive	forgave	forgiven	прощать
freeze	froze	frozen	замёрзнуть
get	got	got	получить
give	gave	given	дать
go	went	gone	идти
grow	grew	grown	расти
hang	hung	hung	висеть, повесить
have	had	had	иметь
hear	heard	heard	слушать
hit	hit	hit	ударить
hold <sup>1</sup>	held	held	держать
hurt	hurt	hurt	причинять боль
know	knew	known	знать
keep	kept	kept	держать
lay	laid	laid	положить
lead	laid	laid	вести
leap	leapt/leaped	leapt/leaped	прыгать

leave	left	left	оставлять
lend	lent	lent	одолжить
let	let	let	пустить, дать
lie	lay	lain	лежать
lose	lost	lost	терять
make	made	made	делать
meet	met	met	встречать
pay	paid	paid	платить
put	put	put	класть
read	read	read	читать
ride	rode	ridden	ездить верхом
ring	rang	rung	звонить
rise	rose	risen	поднимать
run	ran	run	бежать
say	said	said	сказать
see	saw	seen	видеть
sell	sold	sold	продавать
send	sent	sent	послать
set	set	set	устанавливать
shake	shook	shaken	трясти
shine	shone	shone	светить, сиять
shoot	shot	shot	стрелять, давать побег
show	showed	shown/showed	показывать
sing	sang	sung	петь
sink	sank	sunk	опускаться
sit	sat	sat	сидеть
sleep	slept	slept	спать
slide	slid	slid	скользить
speak	spoke	spoken	говорить
spend	spent	spent	тратить
steal	stole	stolen	украсть
stick	stuck	stuck	втолкнуть, приклеить
strike	struck	struck/stricken	ударять, бастовать
swear	swore	sworn	клясться
swim	swam	swum	плавать
take	took	taken	брать
teach	taught	taught	учить
tell	told	told	говорить
think	thought	thought	думать
throw	threw	thrown	бросить
wake	woke	woken	просыпаться, будить
wear	wore	worn	носить
weep	wept	wept	плакать
win	won	won	выигрывать
wind	wound	wound	заводить
write	wrote	written	писать

## Литература

### **Основная литература:**

Афанасьева О.В. Английский язык : 11 класс: базовый уровень / О.В.Афанасьева, И.В.Михеева, К.М.Баранова. – 8-е изд., стереотип. – М.: Просвещение, 2023. – 199, [1] с. : ил. – (Rainbow English) **30 шт + ЭБС Знаниум**

### **Дополнительная литература:**

Литвинская С.С. Английский язык для технических специальностей: учебное пособие/ С.С.Литвинская. – Москва: ИНФРА – М, 2023. – 252 с. – (Среднее профессиональное образование). **ЭБС Знаниум**