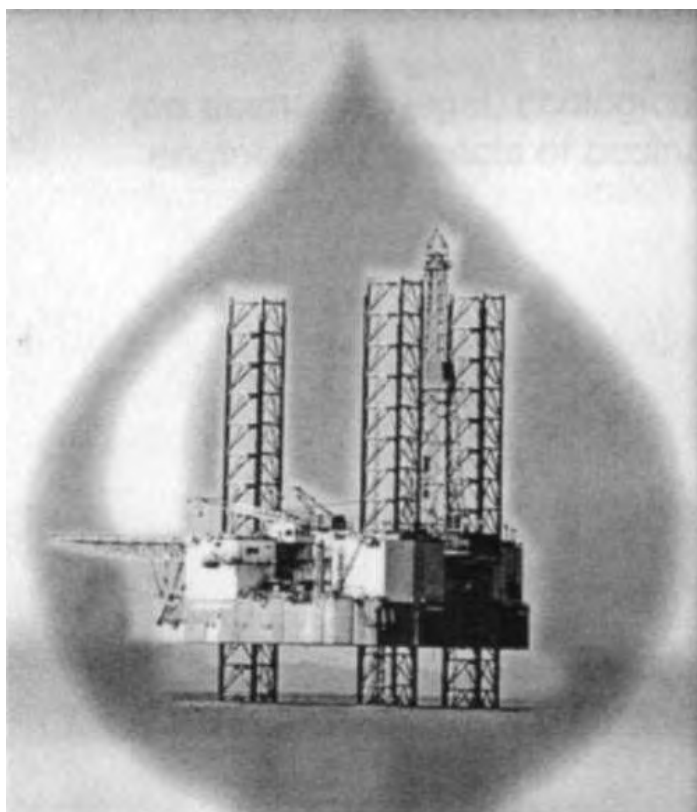


Министерство образования и науки Российской Федерации
Волгоградский государственный архитектурно-строительный университет

МОРСКИЕ НЕФТЕГАЗОВЫЕ СООРУЖЕНИЯ

Методические указания к практическим занятиям
по английскому языку

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Методические указания предназначены для формирования иноязычной профессионально ориентированной терминологической системы, развития навыков иноязычного чтения, перевода и обсуждения актуальных проблем производства, экономики и экологии в нефтяной и газовой промышленности у бакалавров направления подготовки «Морские нефтегазовые сооружения».

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PART I

Краткий русско-английский словарь по нефтегазовой геологии и бурению

Аккумуляция нефти	oil (petroleum) accumulation
База	base
... запасов	reserve base
Бассейн	basin
... нефтегазоносный	petroleum basin
Бензин	gasoline
Битум	bitumen
... нефтяной	oil bitumen
Бурение	drilling
... морское	offshore drilling
... на суше	onshore drilling
... разведочное	extension drilling
... неглубокое	shallow drilling
... сверхглубокое	ultra deep drilling
Бурильщик	driller
Вещество	substance
... горючее	combustible substance
... поверхностно-активное	surfactant
Выбросито	jig
Вода	water
... агрессивная	aggressive water
... мягкая	soft water
... нефтяная	petroleum water
Водонасыщение	water saturation
Возраст	age

.... залежи	age of the pool
Выброс нефти	oil eruption
Высота	height
... залежи нефти	oil pool height
Вытеснение нефти (из пласта)	oil displacement
Вышка	derrick
...буровая	derrick
... нефтяная	production derrick
Вязкость	viscosity
... нефти	oil viscosity
Газосодержание (нефти)	gas content
Глубина	depth
... бурения	drilling depth
... залежи	formation depth
... скважины	well depth
Головка колонная	column head, cap
... фонтанная	Christmas tree
.. цементирующая	cementing head
Горизонт	horizon
... нефтеносный	oil horizon
Граница	border, boundary
... месторождения	boundary of the field
Давление	pressure
... забойное	bottom-hole pressure
... пластовое	reservoir pressure
Дегазация	degasification
... нефти	oil degasification
Динамика	dynamics
... добычи	production history

Добыча	production, extraction
... валовая	gross output production
... рентабельная	commercial production
... суточная	daily production
... чистая	net production
Доразведка	detail exploration
Забой	bottom-hole
Завод	plant
... НПЗ	refinery
Загрязнение	pollution
... нефтяное	oil pollution
...окружающей среды	environment pollution
Залегание	occurrence, bedding
Залежь	pool, reservoir
... нефтяная	oil pool
... рентабельная	commercial pool
Запасы (геол.)	reserves
Запасы (в хранилищах)	stock
Зона	zone
... нефтеносная	oil zone
Излив (на поверхность)	spill
Инструмент	tool
... буровой	drilling tool
Испытание	testing
... скважины	well testing
Истощение	depletion
... запасов	reserves depletion
Контур	outline
.. нефтеносности	oil pool outline

Крепление (скважин)	well casing
Мазут	fuel oil
Мачта (буровая)	drilling mast
Месторождение	field
... морское	offshore field
... на суше	onshore field
... неразведанное	unexplored field
... освоенное	developed field
Мощность (пласта)	thickness
... добычи	production capacity
... нефтенасыщенная	oil saturated thickness
Наличие нефти	oil evidence (presence)
Неочищенный	crude
Нефть	oil
...ароматическая	aromatic oil
...асфальтовая	asphaltenic oil
...безводная	pure oil
...вторичная	secondary oil
... вязкая	viscous oil
... живая	live oil
... кислая	acid oil
... легкая	light oil
... мертвая	dead oil
...необычная	non-conventional oil
...пластовая	oil in place
...сладкая	sweet crude oil
...смолистая	tarry oil
... тяжелая	heavy oil
...угольная	coal oil

Нефтяник	oilman
Область	area
... нефтегазоносная	petroleum area
Обнаружение	discovery
Оборудование	equipment
Объем	volume
... нефти в пластовых условиях	formation oil volume
... нефти в поверхностных условиях	stock-tank oil volume
Окисление	oxidation
... нефти	petroleum oxidation
Освоение	development
...ресурсов	resources development
Открытие	discovery
... месторождения	field discovery
Отложения	sediments, deposits
...морские	marine sediments
...надсолевые	oversaline deposits
... осадочные	sedimentary deposits
...подсолевые	subsalt deposits
...пресноводные	fresh water sediments
Оценка ресурсов	estimation of resources
Падение добычи	production falling
Период	period
... стабильной добычи	stable production period
... эксплуатации	production life
Перспективы	potential
... нефтегазоносности	petroleum potential
... роста добычи	production growth potential
Пласт	seam, bed, layer, stratum

... мощный	thick seam
Плотность	density
Поверхностный	superficial
Подготовка к транспортировке	oil conditioning for transport
Поиски	prospecting, search, exploration
... нефти	petroleum exploration
Порода	rock
... мягкая	soft rock
... твердая	hard rock
Потенциал	potential
... добычи	production potential
Потребление	consumption
... нефти	oil requirements, necessity, demand
Признаки	evidence, indication, show
... нефти	oil show
Приток (в скважине)	influx
... нефти	oil influx
Продуктивность	efficiency, productivity
...скважины	well efficiency
Производительность (скважин)	production, capacity, discharge
Работы	works
... буровые	drilling works
... поисковые	prospecting works
Разведка	exploration, survey
... месторождения детальная	detail exploration
...месторождения предварительная	preliminary exploration
Размещение скважин	well spacing
Разработка	exploitation, extraction, production
Разрез	section, column, sequence

... отложений	sedimentary column
... скважины	well column
...поперечный	cross section
... продольный	longitudinal section
...схематический	diagrammatic section
...типовой	type section
Район	region, area
... нефтегазодобывающий	petroleum producing area
Режим	drive
... нефтяного пласта	oil reservoir drive
Резервуар (геол.)	reservoir
Резервуар (емкость)	tank
Ресурсы	resources
Сбор нефти	oil gathering
Свойства	properties
Скважина	well, hole, borehole
... истощенная	depleted well
... непродуктивная	dry hole
... продуктивная	productive well
...резервная	back-up well
... эксплуатационная	development well
Скорость	velocity, speed
... бурения	drilling speed
Сланец	shale
... горючий	combustible shale
Содержание	content
... нефти	oil content
Способ	method, technique
... добычи	production technique

Ствол скважины	well, hole
Сырой (о нефти)	crude
Темп	rate
.. добычи	production rate
... потребления	consumption rate
Толщина пласта	thickness
Топливо	fuel
... газообразное	gaseous fuel
... жидкое	liquid fuel
... твердое	solid fuel
Трубопровод	pipeline
... магистральный	long-distance pipeline
... подводный	submarine pipeline
Усадка нефти	oil shrinkage
Установка буровая	drill rig
Фонтан	flow, blowing, eruption
... нефтяной	oil flow
... открытый	open flow, blow out
Хранилище	storage
Чистка скважины	cleaning of the borehole
Шлам	drill cuttings
Шнек	screw conveyer
Штанга	rod, bar
Эффективность	efficiency
... поискового бурения	wildcat drilling efficiency
... эксплуатационного бурения	development drilling efficiency

**Краткий русско-английский разговорник
по нефтегазовой геологии и бурению**

I. Planning and Organization Work I. Планирование и организация работ

- | | |
|--|---|
| 1. What are the terms and conditions for drawing up a project? | 1. Каковы сроки и условия подготовки проекта? |
| 2. It's necessary to sign a contract for the deputation of a group of experts. | 2. Необходимо подписать контракт для командирования группы специалистов. |
| 3. We have already decided to send a group of experts. | 3. Нами уже принято решение послать группу специалистов |
| 4. We are engaged in the development of oil fields. | 4. Мы занимаемся работой, связанной с разработкой нефтяных месторождений. |
| 5. What type of work under contract will be performed? | 5. Какие виды работ по контракту предполагается выполнить? |
| 6. Who will organize oil transportation via... ? | 6. Кто будет заниматься организацией транспортировки нефти через... |
| 7. The work program stipulates the laboratory work. | 7. Рабочая программа предполагает выполнение лабораторных расчетов. |
| 8. Oil will be pumped into tanks and shipped by railway. | 8. Нефть будет перекачена в цистерны и отправлена по ж/д. |
| 9. A pipeline runs along the Northern Shelf of the Caspian Sea. | 9. Нефтепровод тянется вдоль северного шельфа Каспийского моря. |
| 10. The project provides building installations for oil treatment. | 10. Проект предусматривает строительство установок по переработке нефти. |
| 11. This is Russia's largest un/developed field with oil reserves. | 11. Это самое крупное в России не/разработанное месторождение нефти. |
| 12. Pipe line has been laid underneath the river's bottom. | 12. Трубопровод проходит под руслом реки. |
| 13. What's the capacity of | 13. Каковы мощности установки? |

installation?

14. Who showed interest in the project?

15. The pipeline is located to the North

16. Oil is extracted in great amounts

17. We'll decide on building the oil gathering and treatment system

18. They export crude oil

19. Oil transportation infrastructure is being developed

20. Pipeline network covers the West Siberia area

14. Кто заинтересовался проектом?

15. Трубопровод расположен к северу

16. Нефть добывают в большом количестве.

17. Мы примем решение о строительстве системы

накопления и переработки нефти

18. Они экспортируют неочищенную нефть.

19. Разрабатывается инфраструктура транспортировки нефти.

20. Сеть трубопроводов охватывает территорию Западной Сибири.

2. Maintenance of Equipment

1. What's the term of guarantee maintenance?

2. The servicing is provided by drilling crew

3. The failure of equipment is not possible

4. You need truck tractors to relocate the mast

5. The set of spare parts is available

6. Where is fire extinguisher?

7. What's the procedure to repair broken equipment?

8. What are the dates of deliveries of emergency goods?

2. Материально техническое обеспечение

1. Каков срок гарантийного обслуживания?

2. Техническое обслуживание обеспечивается бригадой бурильщиков

3. Поломка оборудования невозможна

4. Вам нужны тягачи, чтобы переместить вышку

5. Имеется комплект запасных частей

6. Где огнетушитель?

7. Каков порядок ремонта поврежденного оборудования?

8. Каковы сроки поставок срочных грузов?

9. Drilling tools are damaged
10. How is the renting period of the equipment estimated?

9. Повреждены бурильные инструменты
10. Как исчисляется срок аренды оборудования?

3. Execution of work

1. Drilling of exploratory well will start next week
2. What is the design of the well?
3. Three casing strings are supposed to be lowered
4. The project depth is...
5. What complications are expected in the course of drilling?
6. Narrowing of the hole and partial loss of mud circulation are expected
7. Coring and drill cuttings shall be collected every 2 meters throughout the hole
8. The drilling crew must be instructed on safety measures
9. What types of formation tests are planned for the well?
10. The following types of testing will be performed in the well: open hole formation testing, wire line formation testing
11. While drilling it's necessary to check the recordings of load indicator and drill pump working pressure

3. Выполнение работ

1. На следующей неделе начнется бурение разведочной скважины.
2. Какова конструкция скважины?
3. Предполагается спуск трех обсадных колонн.
4. Проектная глубина ...
5. Какие осложнения ожидаются в процессе бурения?
6. Ожидается сужение ствола и частичная потеря промывочной жидкости
7. По всему стволу скважины через каждые 2 метра будут отбираться керн и пробы шлама
8. Бригада буровиков должна пройти инструктаж по технике безопасности
9. Какие виды испытаний пластов планируются для скважины?
10. Предусматриваются следующие виды испытания скважины: испытание пласта в открытом стволе, испытание пласта кабельным испытателем
11. При бурении необходимо следить за показаниями индикатора веса и рабочим давлением насоса

- | | |
|---|--|
| 12. What's the level of mud in the receiver tanks? | 12. Каков уровень раствора в приемных чанах? |
| 13. The bit load should be of 10 tons | 13. Нагрузка на долото должна быть 10 т. |
| 14. Keep a close watch on the drilling mud circulation | 14. Обязательно следите за циркуляцией промывочной жидкости |
| 15. Check the safe operation of blowout preventers | 15. Проверяйте работу противовыбросового оборудования |
| 16. The installation should provide safety for the derrickman | 16. Установка должна обеспечивать безопасность верховому рабочему на буровой вышке |

Краткий англо-русский словарь по морскому бурению

- | | |
|---------------------------|--|
| 1. offset drilling | 1. бурение в условиях близкого соседства скважин, принадлежащих конкурирующим фирмам |
| 2. offset link | 2. переходное звено (втулочнорычковой цепи) |
| 3. offset method | 3. метод определения остаточной деформации |
| 4. offset roller cone bit | 4. эксцентричное шарошечное долото |
| 5. offset seismic profile | 5. сейсмический профиль, отклоненный от вертикали |
| 6. offset tubing head | 6. специальная головка на устье скважины с боковыми приспособлениями для спуска измерительных приборов |
| 7. offset well | 7. скважина, пробуренная на границе с территорией другого владельца (также подсосывающая скважина) |

8. offset _v	8. возмещать, компенсировать: смещать, сместить скважину
9. offset a well	9. забурить скважину на некотором расстоянии от намеченной точки (на более удобной площадке)
10. offset the pressure in a well	10. создать противодействие на пласт
11. offsetting well	11. подсасывающая скважина (синоним: offset well)
12. offshore _a	12. находящийся на недалеко от берега (или в открытом море)
13. offshore beach, offshore coastal strip	13. береговая полоса
14. offshore deposits	14. прибрежные отложения
15. offshore drilling	15. бурение в море (или возле берега)
16. offshore drilling tenders	16. тендерные суда для морского бурения
17. offshore field	17. морское месторождение
18. offshore loading system	18. система налива в море
19. offshore .mooringbuoy loading system	19. система налива в море с помощью буяпричала
20. offshore oil	20. нефть под дном моря
21. offshore oil delivery	21. перекачка нефтепродуктов (с судна на берег) по подводному трубопроводу
22. offshore oil spar	22. морское нефтехранилище с беспричальным наливом
23. offshore pipeline	23. морской трубопровод, подводный трубопровод, дюкер
24. offshore platform	24. морская платформа для бурения

25. offshore production platform	скважин и добычи нефти 25. морское основание для добычи нефти
26. offshore rig	26. морская буровая установка
27. offshore sediments	27. осадки открытого моря
28. offshore strip	28. морская прибрежная полоса, прибрежная акватория
29. offshore structure	29. морское основание (для буровой)
30. offshore unloading	30. слив (нефтепродуктов) по подводному трубопроводу
31. offshore well	31. морская скважина
32. offside shift	32. отдыхающая смена рабочих
33. offshore	33. неработающий
34. offshore pipeline	34. трубопровод, в котором продукт не движется
35. offshore unit	35. бездействующая, простаивающая установка
36. offshore well	36. скважина за пределами нефтеносной структуры
37. offtake	37. всякая отходящая труба, газоотвод
38. offshore	38. обычный, серийный; выпускаемый промышленностью
39. ohmic drop of potential	39. омическое падение напряжения
40. oil	40. нефть; смазочное масло
41. oil accumulation	41. залежь нефти; формирование нефтяных залежей
42. oil and gas column	42. высота залежи нефти и газа
43. oil and gas conservation law	43. закон об охране нефти и газа

1 Oil. How it affects you?

Have you ever stopped to think what life for many would be like without petroleum and its products? The word *petroleum* comes from Latin and means *rock oil*. It is customarily used to identify two closely related compounds – natural gas, also known as methane, and oil. Both substances sometimes seep to the surface through cracks in the earth. As for oil, it can be liquid or in the form of asphalt, pitch, bitumen, or tar. Oil made from petroleum is used to lubricate motor vehicles, bicycles, strollers, and other things with moving parts. Oil lessens friction, thus slowing the breakdown of machine components. But that is not all.

Oil is used to make fuel for planes, automobiles, and heating systems. A multitude of cosmetics, paints, inks, drugs, fertilizers, and plastics as well as a myriad of other items contain petroleum products. Daily life for many would be drastically different without oil. Little wonder that according to one source, petroleum and its derivatives have "a greater variety of uses than perhaps any other substance in the world." How do we get oil? Where does it come from? How long has mankind used it?

Even the Bible tells us that more than two millenniums before Christ, Noah, following divine instructions, constructed a gigantic vessel and used tar – possibly a petroleum substance – to make it watertight. Petroleum substances were used by the Babylonians for their kiln-dried bricks, by the Egyptians in the mummification process, and by other ancient peoples for medicinal purposes.

Who would have imagined that this product would come to be of such importance in today's world? No one can deny that modern industrial civilization depends on petroleum. The use of oil from petroleum for artificial lighting was oil's springboard to fame. As early as the 15th century, oil from surface wells was used in lamps in Baku (Azerbaijan). In 1650, shallow oil reservoirs were dug in Romania, where oil, in the form of kerosene, was used for

lighting. By the mid-19th century, that country and others in Eastern Europe already had a prosperous oil industry.

In the United States, it was mainly the search for a high-quality illuminant in the 1800's that made a group of men direct their efforts toward oil. These men rightly concluded that in order to produce enough kerosene to supply the market, they would have to drill for oil. So in 1859 an oil well was successfully drilled in Pennsylvania. The oil fever had begun. What happened next?

Answer the following questions

1 How do natural gas (also known as methane) and oil sometimes seep to the surface?

2 What for were petroleum substances used by the Babylonians and the Egyptians?

3 When and where did people start using oil from surface wells in lamps for artificial lighting?

4 What made a group of men in the United States direct their efforts toward oil in the 1800's?

5 When and where was an oil well successfully drilled?

2 PETROLEUM AND OIL – WHAT IS THE DIFFERENCE?

Although usually coming from what are called oil wells, oil is in fact petroleum, or crude oil, that issues from below the ground. Petroleum is defined as "a thick, flammable, yellow-to-black mixture of gaseous, liquid, and solid hydrocarbons that occurs naturally beneath the earth's surface." It "can be separated into fractions including natural gas, gasoline, naphtha, kerosene, fuel and lubricating oils, paraffin wax, and asphalt and is used as raw material for a wide variety of derivative products." – *The American Heritage Dictionary of the English Language*.

Oil. How Do We Get It?

‘Let there be light.’ In the United States in the 19th century, a new source of

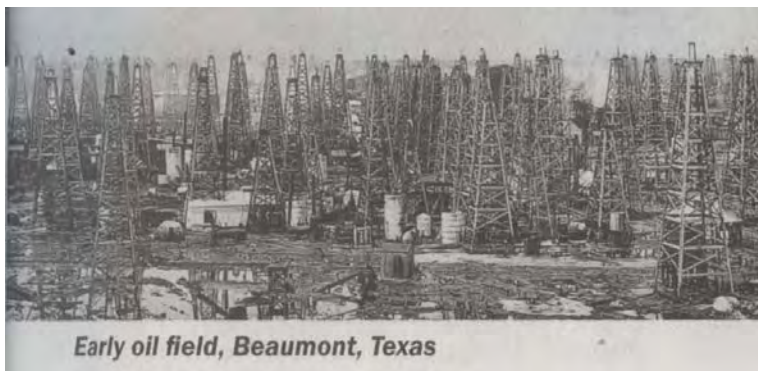


artificial light was needed to replace the inconveniences of flickering light produced by fats, whale oil, and other substances. What was the solution? Oil! Where could it be found?

In 1859, Edwin L. Drake, a retired railroad conductor, using an old steam engine, drilled a well 22 meters deep to the first crude oil discovered near Titusville, Pennsylvania, U.S.A. That marked the beginning of the oil

era. As oil was discovered in many parts of the world, it caused great economic and political repercussions. It proved to be the high-quality source of artificial light that the world eagerly awaited.

Soon, frantic buying of land and drilling of wells was a major activity in the so-called oil regions of the United States. In those years it was common to hear of people who suddenly became wealthy and oil gushing out of others who later lost their fortunes. Ironically, Edwin Drake, the man who drilled the first well in Pennsylvania, was one of the latter.



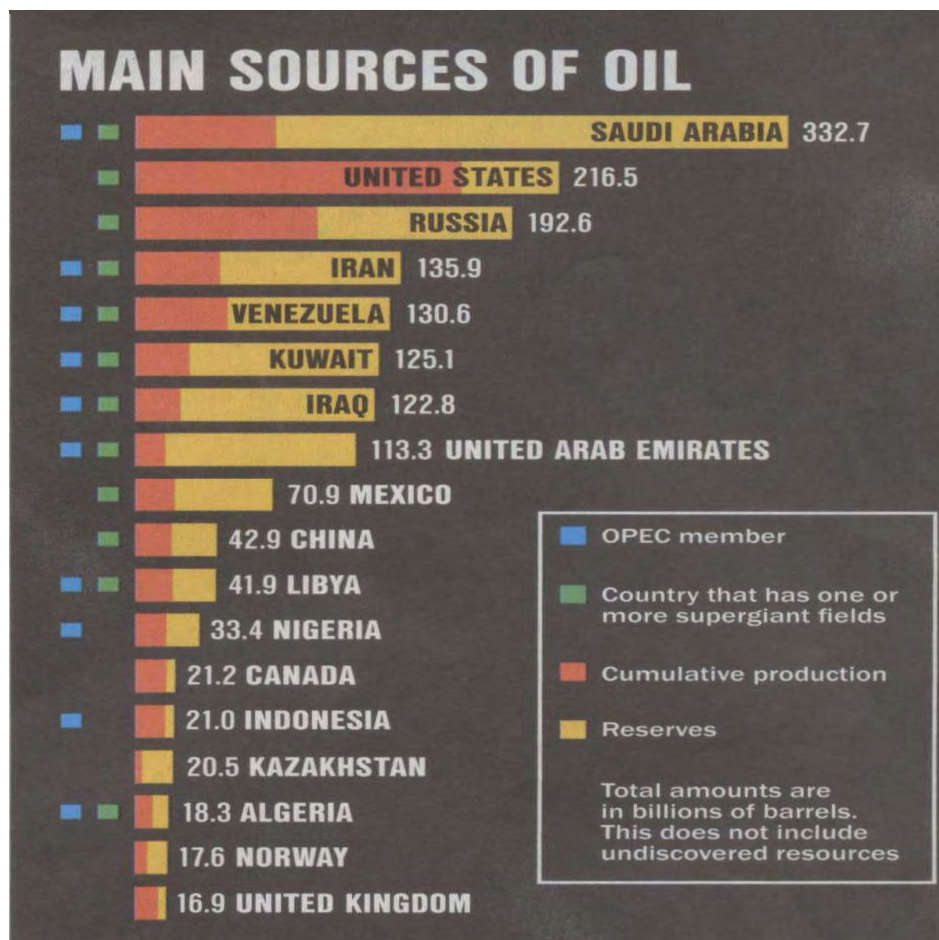
Despite its extraordinary boom, or perhaps because of it, the oil industry in Pennsylvania soon experienced its first drop. Oil fell from \$20 a barrel to 10 cents! Overproduction and

speculation made prices collapse, and some wells rapidly became exhausted. A special reminder of those times is Pithole City, Pennsylvania, which today is a ghost town. It was established, it flourished, and it was deserted – all within the span of little more than one and a half years. Those ups and downs would become an integral part of oil history.

In 1870, John D. Rockefeller and a few associates incorporated the Standard Oil Company. This company dominated the kerosene market until competitors appeared, especially in the Russian oil industry. One rival was Marcus Samuel, a founder of what is today known as the Royal Dutch / Shell Group. In addition, as a result of the ingenuity of the Nobel brothers (one of them, Alfred Bernhard Nobel, would later become the founder of the Nobel Prizes) a powerful oil enterprise was established in Russia with the oil extracted from fields in Baku.

Those were the beginnings of the history of a series of oil enterprises. Since then, alliances and organizations have been created to avoid the price and production instability of the early times. One of them is the Organization of Petroleum Exporting Countries (OPEC), whose 11 members collectively possess most of the world's proven crude-oil reserves. See Table 1.

Table 1.



Answer the following questions

- 1 How is petroleum defined?
- 2 Into what can petroleum be separated?
- 3 Who drilled a well to the first crude oil discovered in Pennsylvania (USA)?
- 4 What was a major activity in the so-called oil regions of the United States in the 19th century and how did it often finish?
- 5 Of what time is Pithole City, ghost town, a special reminder?
- 6 When was the Standard Oil Company founded and by whom?
- 7 Who collectively possess most of the world's proven crude-oil reserves?

3 How Much Oil and Where Is It?

By the end of the 19th century, the widespread use of electricity could have meant bankruptcy for the oil enterprises. However, another outstanding invention had drastically reversed the situation – the internal-combustion engine, used mainly in automobiles. Gasoline, a petroleum derivative, was now essential for self-propelled vehicles, which were already available in most industrialized nations by the late 1920's. Now much more oil was needed to keep the world moving, but where would it be found? With passing years, oil's supremacy in the global market has been reinforced by the ongoing discovery of new oil fields in various parts of the world – some 50,000 of them! But in terms of production, the important factor is, not the number of fields discovered, but their size. How big are they?

Oil fields that contain at least five billion barrels of recoverable oil – called super-giants – are the largest in the classification, while the second largest (from five hundred million to five billion barrels) are called world-class giants. Although some 70 countries are listed in the 'U.S. Geological Survey World Petroleum Assessment 2000' as having some oil reserves, only a few of them have giant oil

fields. The largest number of supergiant oil fields are grouped in the Arabian-Iranian sedimentary basin, which comprises the area in and around the Persian Gulf.

The search for new oil sources has not stopped. Instead, it has been reinforced by state-of-the-art technology. Currently the Caspian Sea region, made up of the nations of Azerbaijan, Iran, Kazakhstan, Russia, Turkmenistan, and Uzbekistan, has caught the attention of oil producers. According to the U.S Energy Information Administration, this region has huge potential for the exploitation of oil and natural gas. Alternative exportation routes, such as through Afghanistan, are being studied. Additional potential has also been found in the Middle East, Greenland, and parts of Africa. The conversion of discovered hydrocarbons into energy and items for use in everyday life is a story in itself.

Barrels or tons?

The first Pennsylvania oil companies shipped oil in 180-liter wine barrels. Eventually only 159 liters of oil was put in to allow for spillage during shipment. A barrel (159 liters) is still used today for oil commerce. From the beginning, oil for Europe was transported by sea and was usually measured by weight, in tons, as is the practice today.

Answer the following questions

1. What outstanding invention had drastically reversed the bankruptcy situation for the oil enterprises by the end of the 19th century?
2. Why was much more oil needed by the late 1920's ?
3. Why has oil's supremacy in the global market been reinforced with passing years?
4. What is the difference between super-giant and world-class giant oil fields?
5. What regions have huge potential for the exploitation of oil and natural gas nowadays and why?

4 How Did Petroleum Form?

The opinion that has prevailed among most scientists since the 1870's is called the biogenic theory. This 'holds that biological debris buried in sediments decays into oil and natural gas in the long course of time and that this petroleum then becomes concentrated in the pore space of sedimentary rocks in the uppermost layers of the Earth's crust'. This process then produces petroleum, whose main components are hydrocarbons – that is, hydrogen and carbon. However, since the 1970's this theory has at times been challenged by some scientists.

In the August 20, 2002, issue of *Proceedings of the National Academy of Sciences*, the article *The Genesis of Hydro-carbons and the Origin of Petroleum* was published. The authors argue that the origin of natural petroleum must occur at depths that are 'well into the mantle of the Earth' and not at the much shallower depths generally accepted. Physicist Thomas Gold has suggested some controversial theories and explains his reasons in detail in his book *The Deep Hot Biosphere – The Myth of Fossil Fuels*. He writes: 'The theory of the biological origin of hydrocarbons was so favored in the United States and in much of Europe that it effectively shut out work on the opposing viewpoint. This was not the case in the countries of the former Soviet Union'. That was 'probably because the revered Russian chemist Mendeleev had supported the abiogenic (not biological) view. The arguments he presented are even stronger today, given the greatly expanded information we now have'.

What is the abiogenic view? Gold states: 'The abiogenic theory holds that hydrocarbons were a component of the material that formed the earth, through accretion of solids, some 4.5 billion years ago'. According to this theory, the elements of petroleum have been deep in the earth since the earth's formation.

Answer the following questions

1. In what layers of the Earth's crust is petroleum concentrated?
2. What are the main components of petroleum?
3. Do all scientists agree with the theory of the biological origin of hydrocarbons?
4. What arguments did the revered Russian chemist Mendeleev present for the abiogenic (not biological) view?
5. What is the difference between the biological and abiogenic view?

5 How Is Oil Extracted?

Geologists and surveyors search for places where crude oil could be trapped underground. After performing some specific measurements and taking samples, they drill to confirm that there is actually oil. In the early days, successfully hitting an oil field might have meant being showered by a gusher of mud and oil, with the consequent loss of the initial outpouring and the risk of explosion. However, by means of measuring instruments and special valves, today's drilling rigs prevent this from happening. Smaller and deeper drillings are also possible today.

Eventually, the pressure that makes the oil and gas emerge decreases, and it must be maintained by the injection of water, chemicals, carbon dioxide, or other gases, such as nitrogen. Depending on the zone, oil can have different degrees of density. Naturally, light oil is by far preferred, for it is easier to obtain and refine.

As explained by the American Petroleum Institute, modern technology includes horizontal drilling, done virtually parallel to the earth's crust, which reduces the number of wells that must be bored. Offshore extraction, which began in 1947 in the Gulf of Mexico, greatly increased oil production. A guayed tower constructed in more than 300 metres (11.000 feet) of water in the Gulf of Mexico has been estimated to produce oil at about 65 times the production cost in the Middle East. Of course, the extraction method used has a direct effect on the price of the final product.

Answer the following questions

1. What were the reasons of loss of the initial outpouring of oil in the early days?
2. What techniques prevent the risk of oil explosion nowadays?
3. What does modern technology include?
4. What is the significance of offshore extraction in the Gulf of Mexico?
5. How much oil is produced in the Gulf of Mexico?

6 How Is Oil Transported?

In 1863 in Pennsylvania, small-diameter wooden pipelines were built for transporting oil, as they were cheaper and less cumbersome to use than 159-liter barrels moved on horse carts. In the early days, oil was stored and transported in wooden barrels, the same as those used for wine. Today's pipeline systems have evolved and multiplied. According to the Association of Oil Pipe Lines, the United States alone has a network of 300,000 kilometers of petroleum pipeline!

Such pipeline systems, mainly made of metal, transport not only crude oil to refineries but also final oil products to distributors. Modern pipeline technology allows for automated systems that monitor flow and pressure. So-called intelligent pigs (devices used to inspect hundreds of kilometers of pipeline), Magnetic Flux Leakage inspection, and ultrasonic in-line inspection have also been developed. Yet, all that the ordinary user of the final products will probably see is a sign indicating that a petroleum pipe-line lies underground and warning that no digging should be done at the site.

As useful as it is, though, a pipeline system is not practical for the transportation of large quantities of oil overseas. But early oil entrepreneurs found a solution for that too – immense oil tankers. These are specially designed ships as much as 400 meters long. Tankers are the largest ships to sail the oceans and are able to carry up to a million or more barrels of oil. Unfortunately, as mighty as they look, tankers have a vulnerability that has not been surmounted, as the box

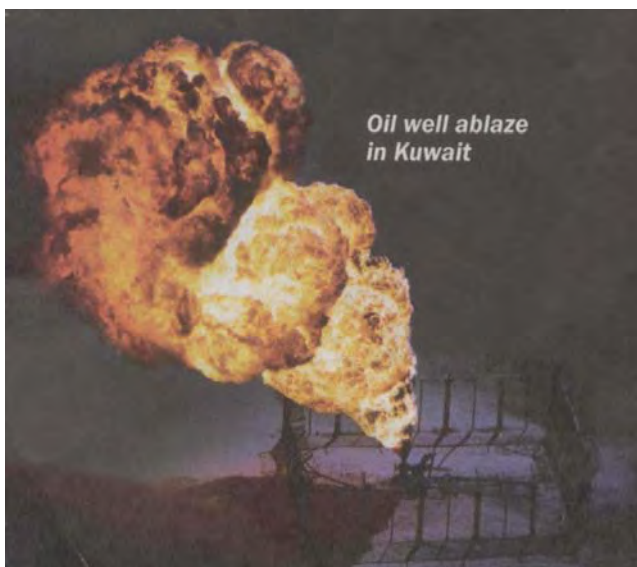
‘About Oil Spills’ shows. Barges and railcars are also common means of bulk oil transportation. Nevertheless, in oil's journey, transportation is only half the story.

A small flame coming from a tall pipe stack or flare – which acts as a safety valve – is a good indication that you are looking at an oil refinery. Basically, in these huge refining facilities, crude oil is heated and sent to an atmospheric distillation tower, where it is separated into several fractions. These fractions range from the lightest – gases, such as butane – to the heaviest, which are processed into lubricants, among other products. But this still leaves the quest! Is oil a mixed blessing?

Answer the following questions

1. How was oil stored in the early days?
2. Why were small-diameter wooden pipelines built in Pennsylvania in 1863?
3. How has modern pipeline technology been developed?
4. Why is a pipeline system not practical for the transportation of large quantities of oil overseas?
5. What solution did early oil entrepreneurs find for the transportation of petroleum products?

7 OIL: A BLESSING AND A CURSE?



About Oil Spills. The total quantity of oil spilled by tankers between 1970 and 2000 is 5,322,000 tons. The largest oil spill occurred in 1979 when the Atlantic Empress collided with the Aegean Captain in the Caribbean, resulting in a spill of 287,000 tons of oil



The Exxon Valdez was only about the 34th-largest oil tanker spill. Although most tanker spills result from operations such as loading, discharging, and bunkering, the largest spills are related to collisions and

groundings.

Some major oil spills from causes other than tankers: blowout of the exploratory well Ixtoc I in 1979, in the Gulf of Mexico. Total spilled: 500,000,000 liters. Blowout of a platform in a well in the Persian Gulf in 1983. Total spilled: 300,000,000 liters. Deliberate release in 1991, in the Persian Gulf. Total spilled: 900,000,000 liters.

To what extent do industrialized nations depend on oil and its products? Oil – and natural gas – are essential to them, and this has created, as Daniel Yergin states in his book *The Prize*, a "Hydrocarbon Society." Just think of heating oil, greases, waxes, asphalts, and the items made from petrochemicals – aircraft, automobiles, boats, adhesives, paint, polyester clothes, sneakers, toys, dyes, aspirin, deodorant, makeup, recording discs, computers, TVs, telephones. Every day many people use a number of the *over 4,000* oil-derived products or items that shape modern life. But what about the harm to the fabric of life that has characterized the history of oil since its beginning?

Answer the following questions

1 What is the total quantity of oil spilled by tankers between 1970 and 2000?

2 When and where did the largest oil spill occur? To what are the largest spills related?

3 What else causes some major oil spills?

4 What is the number of oil-derived products or items that shape modern life? Name some of them?

5 To your mind is oil a blessing or a curse?

8 A King That ‘Does Not Rule Benevolently’

By the end of 1940, when war between Romania and Hungary seemed imminent, Nazi dictator Adolf Hitler was quick to act as arbitrator. A gesture of goodwill? What Hitler really wanted to prevent was having Romanian oil wells fall under the control of the Soviet Union. Oil was also a major factor in the Iraqi invasion of Kuwait in 1990 and the inclusion of other nations in the counter-offensive. By no means are these isolated events. So many times the determination to control oil has been the cause of conflict and suffering.

Not only is oil essential to modern life but it is also deeply rooted in the very heart of politics and the special interests of a few powerful people. As the Organization of Petroleum Exporting Countries (OPEC) recently stated, oil is not an ordinary product but "a strategic asset." Oil has been used between nations for political leverage, through embargoes and sanctions. In addition, oil wells, refineries, and tankers have been the target of terrorist attacks – often causing terrible damage to the environment.

The oil industry has been accused of adding to the damage done to the environment by carbon dioxide emissions, which may contribute to global climate change. According to a report from PEM EX (Mexican Petroleums), one of the world's biggest oil enterprises, contaminants are emitted during various phases of petroleum processing. Although gasolines are cleaner now – nearly six years after the Kyoto Protocol, when 161 nations met to take steps to reduce the threat of global climate warming – many feel that little has changed. On the other hand,

OPEC says that "oil is the creator of the wealth and prosperity enjoyed today" by many countries. But is this always the case?

Some would point to damage that has resulted from the drilling of oil wells and the construction of pipelines. Others might point to the increasing number of unemployed in Saudi Arabia, the country richest in oil deposits. Ali Rodriguez Araque, president of OPEC, says: 'The governments of the industrialized nations are taking enormous advantage of the sacrifices which they demand of producers, refiners and consumers'. CorpWatch, an organization that works to hold corporations accountable on issues such as environmental justice, states: 'Oil is still King. But it does not rule benevolently'. What will be the future for oil?

Answer the following questions

1 How does the Organization of Petroleum Exporting Countries (OPEC) define oil?

2 How has oil been used between nations for political leverage?

3 Of what has oil been often accused?

4 What was the main purpose of the Kyoto Protocol and how many countries have signed it?

5 How will you interpret the phrase: 'Oil is still King. But it does not rule benevolently'?

9 Oil Will It Ever Run Out?

Without energy the wheels of industry do not turn ... No cars, trucks, trains, ships or airplanes could be built. Without it houses would remain cold and unlighted, food would be uncooked. Without energy resources we would literally be back in the Stone Age.

Energy experts theorize that oil supplies may eventually become exhausted. Some estimate that world oil reserves will last from 63 to 95 years more. In the meantime, other energy sources are being tapped, some of which have been used for decades. Among those that are renewable – or can be replenished quickly – are

the following types: solar, wind, wave, hydroelectric, and ocean thermal. But at present, major problems remain involving their production and distribution.

The prospect of exhausting nonrenewable energy sources and only then turning to renewable ones is certainly gloomy. Oil companies are ready to take advantage of the limited time that they say oil is calculated to last. Unfortunately, there is every reason to expect that the social and environmental problems associated with oil will last just as long. But the root of these problems is not oil itself. It is man's greed and thirst for power that has given oil its bad reputation.



Answer the following questions

- 1 According to energy experts how long will oil reserves last?
- 2 What other energy sources have been used for decades? Which of them is the most realistic?
- 3 What has given oil its bad reputation? Do you share this opinion?
- 4 Learn professional terminology related to stages of oil production, oil extracting and oil refining. Render these processes in English.

10 Stages of Oil Production (Simplified) (See Picture 1)

- Satellite** – the Global Positioning System provides accurate signals for surveying
- 1 Exploring** – seismic surveying, one method used, records the below-ground reflections of artificially generated sound waves
 - 2 Extracting** – extraction methods include the use of inland, offshore, and underwater oil wells. To maintain the pressure, gases or water may be injected

3 Transporting – pipelines above the ground, below the ground, and under the sea transport the oil. Other methods of transport include tankers, barges, and railcars

4 Refining – crude oil is heated, distilled, and broken up into fractions that can be used to make everyday products

Stages of Oil Extracting (See Picture 1)

1 Horizontal Drilling – motors controlled remotely by an engineer turn the drill bit and sensors detect the rock properties

2 Underwater Oil Well – remotely operated submarines are used to construct production facilities on the sea bottom

3 Catalytic Crackers – the hydrocarbons are heated by steam and mixed with the hot catalyst of powdered alumina-silica gel. This process cracks, or breaks up, the hydrocarbons into smaller and more useful molecules

Powdered catalyst mixes with the hydrocarbon in steam

Ethanol – solvent used in the manufacturing of paints, soaps, cosmetics, perfumes, and dyes

Plastics – polystyrene made by polymerizing styrene

Gasoline – octane booster preventing gas from igniting too quickly in the engine

Additives – preventing gas from igniting too quickly in the engine

Stages of Oil Refining (See Picture 1)

1 Distillation Tower – when sticky, dark crude oil is heated in the furnace, the hydrocarbons turn into gases. The gases condense back into liquids at different temperatures. Oil is thus separated into its parts, or fractions.

2 Refinery Gases – these include methane, ethane, propane, and butane

3 Gasoline – used as automobile fuel and as a raw material for plastics

4 Naphtha – can be made into plastics, automobile fuel, and other chemicals

5 Kerosene – made into jet fuel and stove oil

6 Gas oil – made into diesel and furnace fuels

7 Residue – further processed into refinery fuels, heavy fuel oil, candle wax, greases, and asphalt.

OIL PRODUCTION

SIMPLIFIED

1 EXPLORING

Seismic surveying, one method used, records the below-ground reflections of artificially generated sound waves

SATELLITE
The Global Positioning System provides accurate signals used for surveying

2 EXTRACTING

Extraction methods include the use of inland, offshore, and underwater oil wells. To maintain the pressure, gases or water may be injected

3 TRANSPORTING

Pipelines above the ground, below the ground, and under the sea transport the oil. Other methods of transport include tankers, barges, and railcars

4 REFINING

Crude oil is heated, distilled, and broken up into fractions that can be used to make everyday products

DISTILLATION TOWER ▶

When sticky, dark crude oil is heated in the furnace, the hydrocarbons turn into gases. The gases condense back into liquids at different temperatures. Oil is thus separated into its parts, or fractions

- REFINERY GASES**
These include methane, ethane, propane, and butane
- GASOLINE**
Used as automobile fuel and as a raw material for plastics
- NAPHTHA**
Can be made into plastics, automobile fuel, and other chemicals
- KEROSENE**
Made into jet fuel and stove oil
- GAS OIL**
Made into diesel and furnace fuels
- RESIDUE**
Further processed into refinery fuels, heavy fuel oil, candle wax, greases, and asphalt

FURNACE 400 °C.

CATALYTIC CRACKER ▶

The hydrocarbons are heated by steam and mixed with the hot catalyst of powdered alumina-silica gel. This process cracks, or breaks up, the hydrocarbons into smaller and more useful molecules

Powdered catalyst mixes with the hydrocarbon in steam

- ETHANOL**
This solvent is used in the manufacturing of paints, cosmetics, perfumes, soaps, and dyes
- PLASTICS**
Polystyrene, for example, is made by polymerizing styrene
Photo Courtesy of Philippe Petroleum Company
- GASOLINE ADDITIVES**
Octane booster prevents gas from igniting too quickly in the engine, thus improving its performance

11 THE ORIGIN, MIGRATION, TRAPPING OF PETROLEUM AND EXPLORING FOR IT

The Origin of Petroleum

During certain geologic ages, when the climate was suitable, petroleum has emerged as organic material derived from plants and animals which grew in abundance. As these organisms went through their cycles of growing and dying, buried organic material slowly decayed and became our present-day fossil fuels: oil, gas, coal and bitumen. Oil, gas and bitumen were dispersed in the sediments (usually clay-rich shales). Over millions of years, these organic-laden shales expelled their oil and gas under tremendous pressures from the overburden. The oil and gas migrated into permeable strata below or above them, then migrated further into traps that we now call *reservoirs*. It's interesting to note that the word "petroleum" is derived from the Latin words for "rock" (*petra*) and "oil" (*oleum*), indicating that its origins lie within the rocks that make up the earth's crust.

These ancient petroleum hydrocarbons are complex mixtures and exist in a range of physical forms – gas mixtures, oils ranging from thin to viscous, semi-solids and solids. Gases may be found alone or mixed with the oils. Liquids (oils) range in color from clear to black. The semi-solid hydrocarbons are sticky and black (tars). The solid forms are usually mined as coal, tar sand or natural asphalt such as gilsonite.

As the name "hydrocarbon" implies, petroleum is comprised of carbon atoms and hydrogen atoms bonded together; the carbon has four bonds and the hydrogen has one. The simplest hydrocarbon is methane gas (CH₄). The more complex hydrocarbons have intricate structures, consisting of multiple carbon-hydrogen *rings* with carbon-hydrogen side chains. There are often traces of sulfur, nitrogen and other elements in the structure of the heavier hydrocarbons.

The migration and trapping of petroleum sedimentary rocks. Oil is seldom found in commercial amounts in the source rock where it was formed.

Rather, it will be found nearby, in reservoir rock. These are normally "sedimentary" rocks – layered rock bodies formed in ancient, shallow seas by silt and sand from rivers. Sandstone is the most common of the sedimentary rock types. Between the sand grains that make up a sandstone rock body there is space originally filled with seawater. When pores are interconnected, the rock is *permeable* and fluids can flow by gravity or pressure through the rock body. The seawater that once filled the pore space is partially displaced by oil and gas that was squeezed from the source rock into the sandstone. Some water remains in the pore space, coating the sand grains. This is called the reservoir's *connate water*. Oil and gas can migrate through the pores as long as enough gravity or pressure forces exist to move it or until the flow path is blocked. A blockage is referred to as a *trap*.

Carbonate rock, lime stones (calcium carbonate) and dolomites (calcium magnesium carbonate) are sedimentary rocks and are some of the most common petroleum reservoirs. Carbonate reservoirs were formed from ancient coral reefs and algae mounds that grew in ancient, shallow seas. Organic-rich source rocks were also in proximity to supply oil and gas. to these reservoir rocks. Most limestone strata do not have a matrix that makes them permeable enough for oil and gas to migrate through them. However, many limestone reservoirs contain fracture systems and/or interconnecting vugs (cavities formed when acidic water dissolved some of the carbonate). These fractures and vugs, created after deposition, provide the porosity and permeability essential for oil to migrate and be trapped. Another carbonate rock, dolomite, exhibits matrix permeability that allows fluid migration and entrapment. Dolomites also can have fracture and vugular porosity, making dolomite structures attractive candidates for oil deposits.

Salt domes. A significant portion of oil and gas production is associated with salt domes which are predominately classified as *piercement-type* salt intrusions and often mushroom shaped. Piercement-type domes were formed by the plastic movement of salt rising upward through more dense sediments by buoyant forces resulting from the difference in density.

1. Read the text and find equivalents to the following Russian terms and word combinations

Органический материал, в изобилии, ископаемое топливо, покрывающие пласты или наносы, проницаемый слой, газовая смесь, земная кора, осадочная горная порода, сила тяжести, давление, трещина (излом), пустота в породе, углекислый кальций, углекислый магний, пористость, соляные купола, движение, подъемная сила, точно определить положение цели, поверхность земли, аэросъемка, разведочное бурение, оценивать, выход (просачивание) нефти, месторождение, плотность и твердость, подповерхностные образования, магнитные свойства.

2. Match English terms and their Russian equivalents

Petroleum	Сланец
Bitumen	Нефть
Shale	Уголь
Hydrocarbon	Карбонат, соль угольной кислоты
Liquid	Твердое тело
Tar	Глина
Carbonate	Углеводород
Coal	Сера
Sulphur	Азот
Nitrogen	Битум
Sandstone	Известняк
Limestone	Песчаник
Pore	Жидкость
Solid	Пора
Clay	Деготь, смола

3. Complete the following sentences

1. Petroleum began as organic material derived from...
2. The ancient petroleum hydrocarbons are complex mixtures and exist in a range of physical forms - ...
3. The solid forms are usually mined as ...
4. The more complex hydrocarbons have intricate structures, consisting of ...
5. In the structure of the heavier hydrocarbons there are often traces of ...
6. Sedimentary rocks are layered rock bodies formed in ancient, shallow seas by ...
7. Oil and gas can migrate through the pores of sandstone as long as ...
8. Most limestone strata do not have a matrix that makes them ...
9. Salt domes predominately classified as ...
10. Modern aerial and satellite surveying is more sophisticated allowing a number of features to be evaluated, including ...
11. Detailed geological maps show ...
12. The seismologist can determine depth, thickness and type of rock by ...

4. Answer the questions

1. In what way have our present-day fossil fuels appeared?
2. What Latin words is the word "petroleum" derived from?
3. What is petroleum comprised of?
4. Methane gas is the simplest hydrocarbon, isn't it?
5. Where is oil found?
6. What is the most common type of the sedimentary rocks?

7. What were carbonate reservoirs formed from?
8. Do many limestone reservoirs contain fracture systems and / or interconnecting vugs?
9. What do these fractures and vugs provide?
10. How were salt domes formed?
11. Is it easy to pinpoint traps for below the earth's surface?
12. What methods have been used to locate petroleum traps?
13. What can be clearly observed by aerial surveying?
14. Can seismic exploration give a "picture" of subsurface formations?

5. Give a short summary of the text using the models

1. The title of the text I have read is ...
2. The text deals with ...
3. The first part of the text is devoted to ...
4. Further, the author describes ...
5. It is pointed out that ...
6. The author tells that ...
7. The text also discusses ...
8. The text ends saying that ...

12 EXPLORING FOR PETROLEUM

Locating petroleum.

One thing is to know that petroleum traps exist, but pinpointing traps far below the earth's surface is quite another thing. Many methods have been used to locate petroleum traps, but the most important methods are aerial surveying, geological exploration, geophysical (seismic) exploration and exploratory drilling.

Aerial and satellite.

Surveys from high altitudes give a broad picture of a geographic area of interest. Major surface structures such as anticlines and faulted regions can be clearly observed by these methods. This information helps locate areas where more detailed study is warranted. In the early years of petroleum exploration, visualization from an aircraft or mapping river and creek drainage patterns were successful surveying techniques. Modern aerial and satellite surveying is more sophisticated allowing a number of features to be evaluated, including thermal anomalies, density variations, mineral composition, oil seepage and many others.

Surface geological exploration.

Observations by trained geologists of rock outcrops (where subsurface layers reach the surface), road cuts and canyon walls can identify lithology and assess the potential for hydrocarbon source rocks, reservoir-quality rocks and trapping mechanisms in an area under study. Much has been learned about ancient deposits from studying modern river deltas, for example. Detailed geologic maps, made from these observations, show the position and shape of the geologic features and provide descriptions of the physical characteristics and fossil content of the strata.

Geophysical exploration.

Through the use of sensitive equipment and analytical techniques, geophysicists learn a great deal about the subsurface. Chief among these techniques is seismic exploration in which shock waves, generated at the surface and aimed downwards, are reflected back to the surface as echoes off the strata below. Because rocks of varying density and hardness reflect the shock waves at different rates of speed, the seismologist can determine depth, thickness and type of rock by precisely recording the variances in the time it takes the waves to arrive back at the surface. Continual improvements in seismic measurement and the mathematical methods (algorithms) used to interpret the signals can now give a clearer "picture" of

subsurface formations. Other geophysical methods use variations in the earth's gravity and magnetic properties to detect gross features of subsurface formations.

1. Answer the following questions

1 How can major surface structures such as anticlines and faulted regions be clearly observed?

2 What can modern aerial and satellite surveying evaluate?

3 What can detailed geologic maps show?

4 Where can be the position and shape of the geologic features and descriptions of the physical characteristics and fossil content of the strata provided?

5 What are the chief analytical techniques which help geophysicists to learn a great deal about the subsurface?

6 What does seismic exploration reflect?

2 Does the text contain any new information for you? Have you found the text interesting (dull, useful, of no value, informative, too hard to understand)? Why?

13 EXPLORATION FOR OIL AND NATURAL GAS

Exploration for oil and natural **gas** is conducted in areas of the earth's crust known as sedimentary basins. These are areas which, at one time in the earth's development, were covered by warm seas teeming with marine life and were rimmed by lush vegetation. Over millions of years this organic plants and animal matter were buried in the sea beds and became blanketed by layer upon layer of sea shells, mud and sand. These sediments turned into rock as millions of years went by. Sand became sandstone; shells became limestone; and mud became shale. As ages passed and the waters withdrew the organic matter in these sediments was

converted by bacterial action, heat, and pressure into hydrocarbons. The basic elements of oil and natural gas, as well as coal, are hydrogen and carbon; hence the term hydrocarbons. Earthquakes and other natural forces buckled the earth and trapped these hydrocarbons under masses of non-porous rock. The subsurface of Alberta, the northeastern part of British Columbia, the southern half of Saskatchewan, and the southwestern corner of Manitoba consist of these oil and gas-bearing layered floors of ancient seas. This vast area supplies most of Canada's natural gas. Similar sediments are found in the Yukon, the Northwest Territories, under the Islands of the High Arctic, in pockets in southwestern Ontario, under Hudson Bay and on both the eastern and western continental shelves.

Western Sedimentary Basin contains four of the most important geological structures where oil and gas may be found; and these are known to geologists as Anticlines, Fault Traps, Stratigraphic Traps and Reefs.

These structures have a common characteristic - a reservoir consisting of sponge-like porous rock surrounded by impervious rock which prevents the escape of the oil and gas. Without such structures there could be no accumulation of hydrocarbons because hydrocarbons are mobile; and can migrate through porous strata or along fissures or faults and eventually dissipate or escape to the surface. In the migration of subsurface fluids and gases through porous rocks natural gas, being the lightest, rises to the top. This is followed by the next lightest substance, oil, and thereby water. Thus a hydrocarbon reservoir will commonly contain a zone of natural gas on top, overlying a zone of crude oil, with salt water underlying the oil.

Sedimentary basins may have been formed within any one geologic period, but most of the world's known hydrocarbon reserves are in basins that date back to the Paleozoic and Mesozoic eras. In western Canada most natural gas reserves occur in reservoirs of the Cretaceous, Mississippian, and the Upper Devonian ages.

The most important type of oil and gas trap in the western Sedimentary Basin is the reef. Reefs were built by tiny coral and other organisms in Devonian time - 350 to 450 million years ago; and grew to thicknesses in excess of 960 feet

(293 meters) covering areas from a few acres (hectares) to hundreds of square miles (kilometers) in size. Animal and plant life flourished in parts of these reefs where food and water conditions were favorable and, on death, these organisms were transformed into oil and gas that migrated into the porous reefs where it was trapped by overlaying layers of impervious rock.

Pattern procedure of exploration for oil and gas follows a standard pattern throughout the world. Geologists, geophysicists and geochemists study areas of interest from the air, on the ground and beneath the surface. This information helps to unravel the geological picture of the area which aids in the later phases of exploration, and even into the development or exploitation operations which follow the discovery well. During this initial reconnaissance, aerial photography and magnetometer and gravity surveys give searchers a three-dimensional look at the earth's surface and general information about underground rock formation. Geologists on the surface also study rock outcroppings for hints of what may lay thousands of feet below.

If a study of this information indicates hydrocarbon potential, seismography is the next step in exploring the area. In seismic surveys explosive charges are detonated in shallow drilled holes, with the energy waves reverberating down through several thousand feet of rock and bouncing back to the surface. The energy waves are picked up by geophones laid out on the surface and recorded on magnetic tape by seismographs, the same instruments that are used to measure earthquakes. It has been said these geophysical instruments are so sensitive they can measure the force of an ant's footfall!

By knowing the velocity at which energy travels through rocks of different types, and by measuring the time it takes for energy to be reflected to the surface, seismologists are able to prepare contour or relief maps of the deeply buried rock formations. When the clues for geological and geophysical studies and surveys have been interpreted, the only certain way to find oil gas is to drill for it. While geological and geophysical methods help minimize the risk of drilling costly dry

holes, the element of chance makes exploration and constant and expensive gamble.

Sound waves from small controlled explosions near the surface travel downward, strike underlying layers of rock, and are reflected back to the surface where they are recorded by the seismograph. From the time required for the sound waves to travel down to the reflecting rock bed and back to the surface, the depth of the reflecting bed can be determined. These depth measurements, taken over several miles, enable geophysicists to draw a relief map of the subsurface rock layers and locate traps which could contain oil or gas. In actual practice usually 24 sound wave detectors (geophones) are used to cover up to a mile on the surface.

No matter how encouraging the results of seismic survey, or how enthusiastic the reports of the geologists and geophysicists, the only sure way to determine if a structure has locked-in hydrocarbons is to drill. The decision to drill is not taken lightly by a producing company for it involves a high commitment of both capital and personnel, which may or may not result in a gas find. The object of drilling is to penetrate the porous sedimentary rocks underlying the field and forests to a point where geology and geophysics have indicated that those rocks may have formed a trap for crude oil or natural gas. Once the drill bit has reached the target there is no longer any doubt what's down there: oil, or gas, or both, or salt water, or nothing but more rock.

1. Answer the following questions

1. Where is exploration for oil and natural gas conducted?
2. How are sedimentary basins formed?
3. What are the basic elements of oil and natural gas?
4. Why is a reservoir surrounded by impervious rock?
5. The consequence of substances within a reservoir is the following: gas on top, oil and water, isn't it?
6. What is the most important type of oil and gas trap?

7. What is the standard pattern of exploration for oil and gas?
8. How can the depth of the oil and gas bed be determined?
9. Is drilling the only sure way to determine if a structure has locked-in hydrocarbons?
10. Do most of hydrocarbons reserves date back to Cainozoic or Paleozoic eras?

2. Finish the sentence

1. Sedimentary basins are areas, which ...
2. The basic elements of oil and natural gas are ...
3. Sedimentary basins have a common characteristic ...
4. Hydrocarbon reservoir contains some zones ...
5. The most important type of oil and gas trap is ...
6. Reefs are ...
7. The information of geologists helps to ...
8. In seismic surveys ...
9. By knowing the velocity at which energy travels through rocks of different types, ...
10. No matter how encouraging the results of seismic survey ...

3. Say if it is right or wrong

1. Over hundreds of years organic sediments turned into rock.
2. The impervious rock prevents the escape of the oil and gas from a reservoir.
3. Hydrocarbons are static.
4. Sedimentary basins may have been formed within Paleozoic and Mesozoic eras.

5. Reefs were built by tiny coral and other organisms.
6. If aerial photography indicates hydrocarbon potential, drilling is the next step in developing the area.
7. Geophysical instruments give approximate information.

4. Find English equivalents

Разведка нефти и газа, осадочный бассейн, отложения, раковины, песчаник, известняк, глинистый сланец, углеводороды, шельф, губчатая пористая порода, непроницаемая порода, по трещинам и изломам, сырая нефть, процедура разведки, следовать стандартной схеме, составить геологическую карту местности, разработка месторождения, гравиметрическая съемка, трехмерное изображение, взрывчатые заряды, звуковые волны, единственный надежный способ, буровая конструкция, сверло достигло цели.

5. Find Participle 1, Participle 2, Gerund, Verbal Noun in the text and translate them

14 OPERATION ON OIL AND GAS FIELD. GENERAL INFORMATION ABOUT WELLS

During operation of oil and gas fields is the rise of production operations (oil, gas, brine and their mixtures) with depth to the surface. The main object of any Deposit - well. Well formed as the result of drilling of the earth surface through drilling machinery and equipment.

Well is a vertical, horizontal or inclined aimed mountain development, connecting the earth with a given reservoir. Well forms a channel for lifting production from the reservoir to the surface. Start well on the surface is called mouth, lateral surface – trunk, the bottom of the well – face. The distance from the

mouth along the axis of the barrel to the bottom is called a borehole. To strengthen the walls of the borehole from destruction and collapse in her lower part metal pipes are installed, called casing. Well it is a cylindrical speed channel, tapering down. On the depth of the well is divided into zones, with special names: direction, conductor, intermediate column, production column. *Direction* is the initial part of the well depth of 4-8 meters. This is the maximum pipe diameter. The space between the walls of the breed and pipe is filled with rubble stones and poured cement mortar. This site provides stability of the top plot (layer) of well, lying in the zone of breeds which are easily washed away by water. *Conductor-plot* is drilled for the direction of the diameter up to 900 mm, depth from 50 to 400 meters. This plot of land is fixed by casing pipe. The space between the hole wall and the outer surface of the casing poured with cement mortar is under pressure to divide the weak (porous) layers to the well. *Intermediate column* is the area to be drilled for the conductor diameter smaller than the diameter of the casing string conductor and fixed casing pipes, followed by cementation of annulus by pressure. In the well depending on its depth, the type of rocks and other factors may be different, as the number of intermediate columns. The gap between the well wall and the outer surface of each intermediate casing filled with cement mortar is not at the full height of the column. The number of intermediate columns can reach three or even four. *Production column* is site well, lined with pipes of smaller diameter than the last intermediate column. The space between the wall of the casing and the well wall is filled with cement mortar to a certain height with the help of special techniques.

1. Remember the words and word combinations

deposit – месторождение;

well – скважина;

casing – кожух, корпус;

plot – участок

mortar –раствор;

drilling machinery and equipment – буровая техника и оборудование;
mouth – устье;
lateral surface – боковая поверхность;
bottom – дно;
intermediate column промежуточная колонна;
cementation of annulus by pressure –цементирование затрубного пространства под давлением
production column – эксплуатационная колонна.

2. Answer the following questions and discuss your answers

1. What is the main object of any deposit?
2. What is a well?
3. What are the special names of a well on the depth?
4. What do you know about an intermediate column?
5. What do you know about a production column?

15 CLASSIFICATION OF WELLS

Depending on the purpose wells are divided into operation and exploration ones. Exploration wells are of the following categories: reference, parametric, prospecting, exploration. There are two categories of production wells: production and injection. Injection wells are intended for injection of water or gas from the surface into productive formations. Production wells are designed to extract oil or gas from production reservoirs.

Fountain well

Fountain well is a producing well, in which the rise of oil from the bottom up to the mouth is fulfilled due to the natural energy of the productive formation. The operation of such wells is the most economically advantageous due to its simplicity and lack of energy additional costs for oil lifting. Fountain well differs

from the well finished by drilling. To ensure the lifting of oil in a column down the special column pipe, pump-compressor pipes (PCP) are used. Wellhead equipment is installed at the wellhead. It serves for suspension of pump-compressor pipes lowered down into the well to seal the mouth, directions of the produced oil in the onshore pipelines and regulation of well operation mode. Column of pump-compressor pipes is the link to lift oil from the bottom of the wells to the mouth. The length of the pump-compressor pipes (casing) reaches 3000 meters. The column consists of standard of pipes of 5 to 10 m length, with external diameter of 33; 42; 48; 60; 73; 89; 102; 114 mm with wall thickness from 4 to 7 mm. The pipes are connected between themselves by special threaded couplings. The weight of the lowered down pipe reaches dozens of tons. The descent and ascent of the casing is made by special machinery – lifting units. Fountain well equipment is a steel thick-walled pipe structure, tees, crosses, and shut-off devices, connected with the flange bolts. All units and fittings are designed for operation at high pressures of 7; 14; 21; 35, 70 and 105 MPa. The weight of wellhead equipment reaches hundreds of kilograms and depends on the presence of impurities in crude production. Two types of wellhead equipment are applied: cross, commonly used in oil wells in production with no mechanical impurities; for production wells with high content of mechanical impurities different diagrams of wellhead equipment are used. Mounting and dismantling require the use of hoisting equipment.

1 Remember the words and word combinations

fountain well – фонтанная скважина

wellhead – устье скважины

wellhead equipment – фонтанная арматура

pump-compressor pipes – насосно-компрессорные трубы

well operation mode – операционный режим скважины

mounting and dismantling – монтаж и демонтаж

1. Answer the following questions

1. What is a fountain well?
2. Why is it most advantageous?
3. Where is wellhead equipment installed?
4. What connects pipes between themselves?
5. Does the weight of wellhead equipment depend on the presence of impurities in crude production?
6. What requires the use of hoisting equipment?

16 MIXING PLANTS

During the development and repair of wells cementing of oil and gas wells, hydraulic fracturing and isolation works are conducted. These jobs require special equipment that allows accumulation and transportation of dry cement materials to the work site to prepare solutions of given consistency. Mixers are designed for preparation of cement mortars and various cement mixtures and can also be used for preparation of dry, normal and weighted washing fluids, for transportation of sand, making sand-liquid mixture for pumps in case of fracturing of oil and gas reservoirs and abrasive jet perforation. Transport base consists of the following main units: a bunker; the mixing device, a hopper; auger boot; metering screw conveyors; box PTO; cardan shafts. UDCPS unit allows to prepare liquid mixture on the basis of hydrochloric acid. US-30 units work together with a cementing unit. Water is supplied in the required amount to the mixing device. Simultaneously cement materials are carried in adjustable amount. The ready solution is supplied to the cementing unit. Loading of cement is done through metering screw conveyor and pneumatic way through the feeding tube. To prevent material arching pneumatic drive is installed in the bunker. The unit is equipped with a meter and a device controlling the speed of rotation of screw conveyors (augers). At the request of consumers the unit can be supplied without the boot pipeline (the startup of the pipeline)

1. Learn active vocabulary

cementing of oil and gas wells – цементирование нефтяных и газовых скважин;

hydraulic fracturing – гидроразрыв пласта;

solutions of given consistency – растворы заданной консистенции;

bunker – бункер;

mixing device – смесительное устройство;

a hopper – приемная воронка;

auger boot – загрузочный шнек;

metering screw conveyer – дозирующий винтовой конвейер;

feeding (boot) tube – загрузочная труба.

boot pipeline – загрузочный конвейер

2. Answer the following questions

1. What operations are conducted upon completion and repair work?
2. What is designed for preparation of cement mortars and various cement mixtures?
3. What are main units of a transport base?
4. How is cement loaded?
5. What is the US-30unit equipped with?

3. Read the text and render it in Russian

The well operated by the installation of submersible electric centrifugal pump

This is a producing well, in which the tubing under the oil level is lowered by a submersible pump unit, consisting of a multistep borehole pump and

submersible electric motor, called ESP. Electricity to the submersible motor ESP is served by armoring cable lowered into the well and fixed outside of the casing. On the surface of the earth the cable is connected to the transformer and control station. The rise of the oil is carried out inside of the casing in the operation of submersible centrifugal pump which is driven by a connected with it submersible electric motor. Suspension of the casing in the well has a special seal that ensures sealing of the cable in place of its exit from the wells. Submersible pump unit for ESP is a centrifugal and submersible electric motor, connected in one design cylindrical form. Transportation of ESP in terrestrial conditions, as a rule, is carried out in parts (pump separated from the electric motor) in a set with ground-based equipment, transformer, control station and the cable wound on a drum, for which special devices of loading and transporting type like IAEA-6 are used. In some areas of the country transportation of cable is carried out separately on a special sledge or wheel trailer like CPC-2000. The descent and ascent of ESP in wells are generally made in the fields with operational lifts or underground repair aggregates.

1 Learn active vocabulary

submersible pump unit – погружной насосный агрегат

suspension of the casing – подвеска кожуха (колонны)

centrifugal electric motor – центробежный электродвигатель

in terrestrial conditions – в наземных условиях

in a set with ground-based equipment – в комплекте с наземным оборудованием

2 Answer the following questions

1 Of what does a submersible pump unit consist?

2 To what is cable of the submersible electric motor connected on the surface of the earth?

- 3 How is transportation of ESP ground condition usually carried out?
- 4 How is carriage of cable carried out in some areas of the country?
- 5 Where are the descent and ascent of ESP wells generally accepted?

3 Render the text in Russian

17 EXTERNAL CORROSION OF OIL AND NATURAL GAS PIPELINES

PIPELINES play an extremely important role throughout the world as a means of transporting gases and liquids over long distances from their sources to the ultimate consumers. The general public is not aware of the number of pipelines that are continually in service as a primary means of transportation. A buried operating pipeline is rather unobtrusive and rarely makes its presence known except at valves, pumping or compressor stations, or terminals. In the United States, there were approximately 217,000 km (135,000 mi) of hazardous liquid transmission pipelines, 34,000 km (21,000 mi) of crude oil gathering pipelines, 483,000 km (300,000 mi) of natural gas transmission pipelines, and 45,000 km (28,000 mi) of natural gas gathering pipelines in 2000. There were approximately 60 major natural gas transmission pipeline operators and 150 major hazardous liquid pipeline operators in the United States in 1998. The first oil pipeline, which was 175 km (109 mi) in length and 152 mm (6 in.) in diameter, was laid from Bradford to Allentown, PA in 1879. Since the late 1920s, virtually all oil and gas pipelines have been made of welded steel. Although the first cross-country pipeline that connected some major cities was laid in 1930, it was not until World War II that large-scale pipelines were laid connecting different regions of the country. In the 1960s, larger-diameter pipelines ranging from 813 to 914 mm (32 to 36 in.) were built. Discovery of oil on Alaska's North Slope resulted in the construction of the country's largest pipeline, the Trans-Alaska Pipeline System, with a 1219 mm (48 in.) diameter and 1287 km (800 mi) length. Demand continues to add more miles of pipelines.

A summary of the major accidents reported to the U.S. Department of Transportation (for the 6-year period between 1994 and 1999) show that for transmission pipeline systems (both hazardous liquid and natural gas), approximately 25% of all reported accidents were due to corrosion. Of the hazardous liquid pipeline accidents caused by corrosion, 65% were due to external corrosion and 34% were due to internal corrosion. For natural gas transmission pipeline accidents 36% were caused by external corrosion and 63% were caused by internal corrosion. For natural gas distribution pipeline accidents, only approximately 4% of the total accidents were caused by corrosion, and the majority of those were caused by external corrosion. The accidents reported are for major accidents that resulted in injury, fatality, or more than \$50,000 in property damage.

In addition to the reportable accidents, an average of 8000 corrosion leaks per year are repaired on natural gas transmission pipelines, and 1600 spills per year are repaired and cleaned up for liquid product pipelines. In a summary report for incidents between 1995 and 2004, corrosion accounted for 28.5% of pipeline incidents on natural gas transmission and gathering pipelines. In a summary report for incidents between 1996 and 2006, corrosion accounted for 25.1% of pipeline incidents on hazardous liquid pipelines. These values correspond very well to the statistics for 1999-2004. Given the implications of pipeline failures and the role that external corrosion plays in these failures, it is apparent that proper corrosion control can have a major impact on the safety, environmental preservation, and the economics of pipeline operation.

The vast majority of underground pipelines are made of carbon steel, based on American Petroleum Institute API 5L specifications. Typically, maximum composition limits are specified for carbon, manganese, phosphorous, and sulfur. In some cases, other alloying elements are added to improve mechanical properties. Composition and tensile requirements for common line pipe steels have inadequate alloy additions to be considered corrosion resistant and undergo a variety of corrosion failure modes/mechanisms in underground environments,

including general corrosion, pitting corrosion, and stress-corrosion cracking (SCC).

The terms general corrosion and pitting corrosion are used rather loosely when describing the morphology of underground corrosion. The classical pitting often associated with passive metals (such as stainless steels) is typically not observed on underground pipelines, with the possible exception of cases where microbial activity is involved. Likewise, true general corrosion, where there is uniform metal loss, such as observed with carbon steel in a concentrated acid, is not commonly found on underground pipelines. The most common morphology of corrosion on underground pipelines is uneven metal loss over localized areas covering a few to several hundred square inches. The most common mechanism causing this corrosion is referred to as differential corrosion cells. Microbes and stray direct current (dc) in the soil also can affect underground corrosion. Because of the relatively poor corrosion resistance of line pipe steels in underground environments, a combination of mitigation strategies consisting of coatings and cathodic protection (CP) is required. In this article, the most common causes and contributing factors for corrosion and SCC, as well as prevention, mitigation, detection, and repair are discussed

1. Answer the following questions

1. What are pipelines used for?
2. How many gas transmission and hazardous liquid pipelines were there in the USA in 1998?
3. Where was the 1st pipeline laid in 1879?
4. What were the pipelines made of in the late 1920s?
5. How did the dimensions of pipelines change throughout the history?
6. What was the percentage of accidents in pipelines due to corrosion for the period between 1994 and 1999?
7. What elements are added to the steel to improve mechanical properties?

8. The classical pitting is often associated with passive metals, such as stainless steel, isn't it?

9. What could solve the problem of pipelines corrosion?

2. Continue the sentence

1. Pipelines play an important role as a means of ...

2. A buried operating pipeline is unobtrusive and ...

3. The 1st oil pipeline ...

4. Discovery of oil on Alaska's North Slope ...

5. Approximately 25% of accidents between 1994 and 1999 were ...

6. Proper corrosion control can have a major impact on ...

7. Maximum composition limits are specified for ...

8. The classical pitting corrosion is often associated with ...

9. True general corrosion, where there is uniform metal loss, ...

10. Because of the relatively poor corrosion resistance ...

3. Say if it is right or wrong

1. The general public is aware of how pipelines work.

2. There were 50 natural gas transmission pipelines in the USA in 1998.

3. The diameter of the 1st pipeline was 152mm.

4. The large-scale pipelines didn't appear until World War 2.

5. Of the hazardous liquid pipeline accidents 65% were due to external corrosion.

6. The problem of corrosion can be solved easy.

7. The terms general corrosion and pitting corrosion are alike.

8. Because of the poor corrosion resistance a combination of mitigation strategies is required.

9. Microbes in the soil affect underground corrosion.

4. Find English equivalents

Количество трубопроводов, средство транспортировки, подземный трубопровод, колодцы, компрессорные станции и терминалы, сырая нефть, трубопровод; транспортирующий опасные жидкости; сборный трубопровод, сварная сталь, из-за коррозии; несчастные случаи, вызванные коррозией; имеет влияние на безопасность и сохранение окружающей среды; углеродистая сталь; марганец, фосфор и сера; легирующие элементы, нержавеющая сталь, постоянный ток, требуется покрытие и катодная защита.

5. Read the numerals and dates

1985	175km	65%
1994	152mm	28.5%
1960s	1287km	34%
2000	914mm	36%
1920s	109mi	25.1%
\$50.000	6in	49%

18 DETECTION OF CORROSION AND SCC

On existing pipelines, there are three methods to detect corrosion and SCC—hydrostatic retesting, field investigation programs (direct assessment), and in-line inspection.

Hydrostatic Testing. Hydrostatic retesting involves pressure testing the pipeline with water at a pressure that is higher than the operating pressure, typically 125% of the maximum operating pressure (MOP) of the pipeline. This is the most common method to ensure the integrity of a pipeline and establish a safe operating pressure, regardless of the types of flaws present in the pipeline. Any flaws that are larger than a critical size at the hydrostatic retest pressure are removed from the pipeline. However, subcritical flaws remain in the pipeline after a hydrostatic retest. If the defects are growing with time, as might be the case with

corrosion or SCC, the pipeline is generally periodically retested to ensure integrity. Hydrostatic retesting is expensive and creates problems associated with the acquisition, treatment, and disposal of the water, especially for pipelines carrying liquid products.

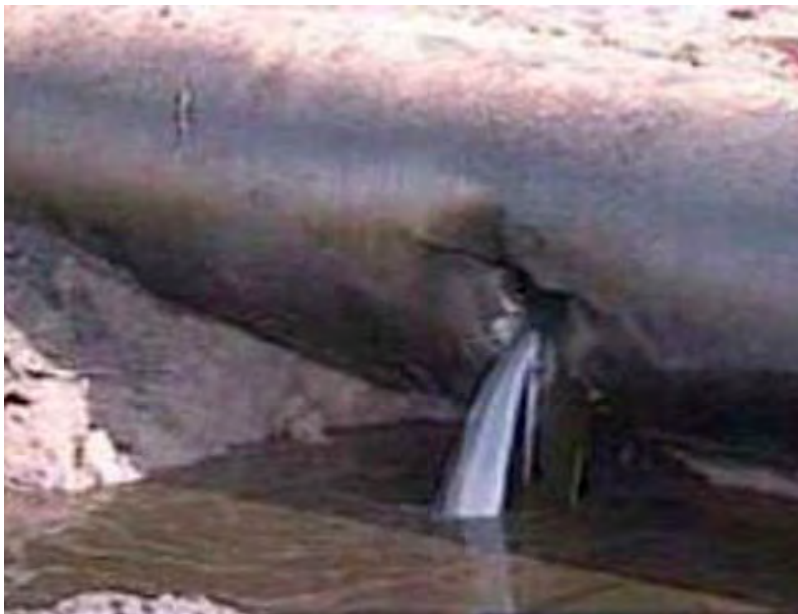
Direct Assessment. As a part of condition-monitoring programs, pipeline companies commonly use field investigation (direct assessment) programs. The overall condition of the coatings and pipelines is assessed, and it is determined whether corrosion or SCC is present on the system. Models are sometimes developed to predict the likelihood of the presence and severity of corrosion or cracking. This information is then used to prioritize the system for direct examination, hydrostatic testing, in-line inspection, recoating, or pipe replacement. Dig programs and the associated models are not generally considered as a replacement for hydrostatic testing as a means to ensure the integrity of a pipeline. See the article "External Corrosion Direct Assessment Integrated with Integrity Management" in this Volume.

In-line inspection (ILI) tools, also referred to as smart or intelligent pigs, are devices that are propelled by the product in the pipeline and are used to detect and characterize metal loss caused by corrosion and cracking. There are two primary types of metal-loss ILI tools: magnetic flux leakage (MFL) tools and ultrasonic tools (UT).

Magnetic flux leakage tools measure the change in magnetic flux lines produced by the **defect** and produce a signal that can be correlated to the length and depth of a **defect**. In recent years, the magnetics, data storage, and signal interpretation have improved, resulting in improved mapping of the flaw and a decrease in the number of unnecessary excavations. The high-resolution MFL tool is typically capable of readily detecting corrosion pits with a diameter greater than three times the wall thickness. Once detected, these tools can typically size the depth of the corrosion within +10% of the wall thickness with an 80% level of confidence. The MFL tool can be used to inspect either liquid product pipelines or natural gas pipelines.

What is a typical MFL tool? The wire brushes in the front of the tool are used to transfer the magnetic field from the tool to the pipe wall. The ring of sensors between the wire brushes are used to measure the flux leakage produced by defects in the pipe. The drive cups are the mechanism that is used to propel the tool by the product in the pipeline. The odometer wheels monitor the distance traveled in the line and are used to determine the location of the defects identified. The trailing set of inside-diameter/ outside-diameter sensors (ID/OD sensors) is used to discriminate between internal and external wall loss.

Ultrasonic tools utilize large arrays of ultrasonic transducers to send and receive sound waves that travel through the wall thickness, permitting a detailed mapping of the pipe wall. Ultrasonic tools can indicate whether the wall loss is internal or external. The typical resolution of a UT is + 10% of the pipe wall thickness with an 80% level of confidence. Ultrasonic tools are typically used in product pipelines (those carrying crude oil, gasoline, and the like) since the product in the pipeline is used as the required couplant for the ultrasonic sensors. This tool can be used to inspect natural gas pipelines, but requires introducing a liquid (such as water) into the pipeline for an ultrasonic couplant.



There is significant interest in the pipeline industry in developing ILI tools that can reliably detect and size stress-corrosion cracks. Crack-detection tools avoid problems associated with acquisition, treatment, and disposal of the water used in hydrostatic retesting. It is

desirable for a fully developed tool to be capable of detecting and sizing subcritical cracks such that the pipeline can be repaired long before these cracks become an integrity concern. The detection of smaller cracks also extends the time interval

between inspections. Ultrasonic tools are available that can detect stress-corrosion cracks in liquid pipelines, but the detection and sizing capability of the tools has not been fully established. These tools require the presence of a liquid couplant and therefore are difficult and expensive to use in gas. pipelines.

1. ***Learn the active vocabulary***

detection of corrosion – обнаружение коррозии;

hydrostatic testing – гидростатическое тестирование;

direct assessment – прямая оценка;

to direct and characterize metal loss – обнаружить и охарактеризовать металлический дефект;

magnetic flux leakage tools – инструменты утечки магнитного потока;

ultrasonic tools – сверхзвуковые инструменты.

couplant – гель

2. ***Answer the questions to the text***

1. What methods are used to detect corrosion?
2. What is the most common method to ensure the integrity of a pipeline and establish a safe operating pressure?
3. What do the following abbreviations mean: MOP, ILI, MFL, UT, MFL, ID/OD sensors

3. ***Read the text and make a resume***

19 IMPULSE TEMPERATURE INFLUENCE ON STRESS-CORROSION CRACKING OF BIG-DIAMETER GAS MAINS

The big diameter gas main laid in areas with continental climate is a powerful source of heat in spite of moderate temperatures of operation (about 30° C). Such a pipeline affects the adjoining ground creating a zone of heat influence up to 10 meters to all sides from the pipe. The effect is summed up if several pipelines are laid in one corridor.

The ground state along big-diameter pipeline contour and the change of ground characteristics are determined by climate conditions, snow thawing and ground saturation with flood water, by dry and rainy seasons, etc.

Ground humidity depends on environmental factors, but it can also change around the gas mains due to industrial factors. In the zone of heat influence of a pipeline redistribution of humidity -temperature field of the ground takes place due to the influence of heat flow from the pipe towards the periphery and due to the thermomotivity force. This effect is known and studied, up to the certain degree, for "hot" pipelines where temperatures of operation are much higher. Migration flows in the zone of heat influence of 'hot' pipelines lead to ground drying and prevail in the process of moisture redistribution.

More complicated processes take place around underground pipelines. Here exist 3 phenomena that are comparatively equal in their significance:

1. Underground big-diameter pipelines break ground hydraulic conditions and create barrage and drainage effects. As a result filtration movement of ground water either slows and creates water-encroached areas or, vice versa, drainage under the lower generating line of the pipe is created.

2. In the zone of non-isothermal pipelines heat influence migration flows are being developed caused by temperature influence. But the temperature pressure and gradients around the pipeline are not high, that is why the adjoining ground humidity decreases only partially. There is no full moisture migration. At some distance from the pipe an overmoistened ground ring is formed that accumulates moisture. This moisture returns back to the pipeline when gas temperature and temperature pressure decrease.

3. The most complicated processes take place in the ground surrounding the non-isothermal pipeline of big diameter. Practice of gas mains operation shows that due to 2 different causes temperature of gas while gas injection changes impulsely, that is changes by several degrees in several days or even during the day. As the gas pipeline is a quick-response system (as compared with oil pipeline) then the change of gas temperature is transmitted as if by "a wave-guide" to the

initial segment of the pipeline (at 10...20 km distance or more) and causes impulse temperature change in the adjoining ground layer of 5... 10 cm thickness.

Thus, alongside with the change of gas temperature, humidity of ground contacting with the pipe also changes. If gas temperature changes impulsely then the ground humidity also changes impulsely but with some time delay due to heat inertia of ground. Let inspect impulse moisture movement as activating factor of stress-corrosion cracking. As ground humidity changes not only in the course of time but along the pipe perimeter as well then anode and cathode zones are created on the pipe surface and electrochemical, biological and other processes of micro-corrosion elements are being activated that are developing by SCC-type (stress-corrosion cracking).

The analysis of stress-corrosion cracking on the inspected sections of "Polyana-Moskovo" gas main showed that, under other equal conditions, zones of periodical water encroachment (coombs, gullies, gulches, etc.) are subjected to more intensive stress-corrosion. The authors studying stress-corrosion cracking processes at high pH note that in these processes seasonal differences controlling the changes of ground electrolyte parameters play the important role.

For the formation of concentrated medium with high pH cathode potential should be rather high. But the potential range in which such type of SCC occurs is within natural potential of pipe steels corrosion and potential of regulated cathode protection (850mV Cu/SO₄). Seasonal changes cause differences of medium and potential parameters, thus creating the conditions that can cause SCC.

We should also note that seasonal and climate temperature differences begin at ground surface, so they are rather far from the pipe and because of high heat capacity and accumulating capacity of the ground can not always reach the pipe contour. The same may be said about atmospheric precipitation. But nevertheless researchers note the effect of the influence of seasonal humidity differences and of periodical water encroachment at SCC processes.

It's natural to suppose that differences of gas temperatures that cause differences of ground humidity on the pipe contour, have much greater effect on

SCC development including the same very place which is the centre of corrosion cracking. In fact the process of corrosion cracking at the initial segments develops under the direct impulse temperature influence of a gas pipeline.

It correlates with the fact that no SCC is found at oil pipelines. Really, an oil pipeline, unlike a gas pipeline, has greater heat-hydraulic inertia which is enough for dampening not only vibration pressure changes but also .impulse ones and for smoothing temperature differences as the liquid flows through the initial part of the pipeline. There is no impellent for corrosion fractures development because the pipe wall temperature is stable and the humidity of adjoining ground doesn't change.

Fracture researches show that fracture development has 3 stages. At the 1st stage an intergranular fracture is formed under the influence of corrosive medium. At the 2nd stage the fracture cavity increases in size because of corrosion dissolution of its walls and mechanical tensile stress. The 3rd stage is the stage of final mechanical cracking. The authors attract attention to the possibility of reversible alternation of the 1st and 2nd stages in corrosion cracking development.

As we can see sign-variable migration flows, attendant to the impulse temperature influence of a pipeline at the adjacent ground, activate wavy corrosion processes and, as a result, discrete growth of SCC fractures.

Nowadays, humidity redistribution and breaking of the ground hydraulic condition are not taken into account to the full extent when pipeline stressed state, ground corrosion activity and cathode protection are calculated because the above mentioned processes are not still completely studied.

1 Give Russian equivalents to the English ones

Powerful source of heat, pipeline, adjoining ground, heat influence, sum up, ground state, climate conditions, snow thawing, ground saturation, flood water, ground humidity, environmental factors, zone of heat influence, redistribution of humidity-temperature field, take place, thermomotivity force, ground drying, prevail, moisture redistribution, underground pipelines, ground hydraulic conditions, drainage effects, water-encroached areas, lower generating line, non-

isothermal pipelines, cause, temperature pressure, moisture migration, overmoisten, accumulate, decrease, nonisothermal pipeline, gas injection, adjoining ground layer, transmit, thickness, moisture movement, stress-corrosion cracking, pipe surface, equal conditions, seasonal differences, potential range, heat capacity, accumulate, capacity of the ground, precipitation, dampening, vibration pressure, smoothing, impellent, liquid, fracture, corrosion dissolution, tensile stress, sign-variable migration, mechanical cracking, initial segments, fracture cavity, adjacent ground, ground hydraulic condition, reversible alternation, growth.

2 Give English equivalents to the Russian ones

Магистральный газопровод, диаметр, район, мощный источник тепла, оказывать, тепловое воздействие, массив грунта, создавать, зона теплового влияния, трубопровод, состояние грунта, в сечении, таяние снежного покрова, насыщение грунтов, паводковые воды, засушливый период, влажность массива грунта, зависеть, изменение, происходить, техногенные причины, зона теплового влияния, перераспределение, тепловой поток, осушение грунта, перераспределение влаги, подземные газопроводы, гидрологический режим грунтов, дренажный эффект, грунтовые воды, температурное воздействие, миграционные потоки, аккумулировать влагу, неизотермический газопровод, градусы, нефтепровод, изменение температуры, изменение температуры, прилегающий слой грунта, влажность грунта, коррозионное растрескивание под напряжением, сезонные изменения, колебания, нефтепроводы, газопровод, жидкость, трещина, коррозионное разрушение, миграционные потоки.

3. Answer the questions

1. What is a powerful source of heat in areas with continental climate?
2. How does a pipeline affect the adjoining ground and when is the effect summed up? What is the ground state along big-diameter pipeline determined by?
3. What does ground humidity depend on?

4. Why are "hot" pipelines called so? What phenomena can take place around underground pipelines?
5. What can break ground hydraulic conditions and create barrage and drainage effects? Why does the adjoining ground humidity decrease only partially?
6. What can accumulate moisture?
7. What kind of process takes place in the ground surrounding the nonisothermal pipeline of big diameter?
8. When does this moisture return back to the pipeline? How is humidity of ground connected with the pipe change?
9. When are anode and cathode zones created on the pipe surface?
10. What does stress-corrosion cracking (SCC) mean? What plays the important role in SCC processes? What has greater effect on SCC development? What did the analysis of stress-corrosion cracking on the inspected sections of 'Polyana-Moskovo' gas main show?
11. Where does the seasonal and climate temperature differences begin?
12. What determines the ground state along big-diameter pipeline contour and the change of ground characteristics?
18. Name 3 phenomena that take place around underground pipelines and are comparatively equal in their significance. Describe them. Which of these 3 phenomena is the most complicated one. Why? What else will change alongside with the change of gas temperature?
25. What plays an important role in controlling the changes of ground electrolyte parameters?
26. What process develops under the direct impulse temperature influence of a gas pipeline?
27. Why is there no impellent for corrosion fractures development at an oil pipeline? What differs an oil pipeline from a gas pipeline from a heat-hydraulic point of view? Are the processes of humidity redistribution and breaking of the ground hydraulic condition taken into account to the full extent nowadays?

PART II

20 JOINT OFFSHORE PROJECT

Russia and Kazakhstan agreed to sign a letter of intent to jointly develop offshore fields in the Caspian, with Rosneft as executor. Joint projects will include:

- seismic exploration work in one or two areas of the Caspian shelf followed by production of any fields discovered;
- using the 1,200-tonne *Ispolin* crane ship for lifting, transport and assembly work when rebuilding offshore fields;
- production of metal parts in Astrakhan for restructuring offshore fields.

Fuel exchanges

Rosneft, Lukoil, Onako, Tyumen Oil Company and Runo will deliver Russian oil to Kazakhstan and Munaigaz, Munaiimpex, Karachaganakgazprom and Tengizchevroil will ship crude in the opposite direction. Rosneft will coordinate deliveries to Kazakhstan's Pavlodar Oil Refinery and Lukoil will look after movements to Chimkent Oil Refinery.

The two countries will exchange up to 4 million tonnes of oil a year, and Kazakhstan has agreed to supply the Orsk refinery with up to 2 million tonnes this year.

Russia will transit at least 6 million tonnes of Kazakh crude, of which at least 3.5 million tonnes outside the CIS. Russia previously gave Kazakhstan a transit quota of 6 million tones. New limits exclude oil produced by Russian-Kazakh joint ventures.

Transit of Kazakh oil in the first quarter of the year will be at least 2 million tonnes, of which 1 million tonnes outside the CIS. Most Kazakh exports outside the CIS will go via Odessa port.

Vocabulary

discover v	открывать
assembly work	монтажные работы
exploration	разведочные работы
ship	отгружать
crude	сырая нефть
refinery	нефтеперерабатывающий завод

Questions

- 1 What will joint projects of Russia and Kazakhstan include?
- 2 What companies will coordinate deliveries to refineries?
- 3 How much oil a year will the two countries exchange?
- 4 How many tonnes of crude will Russia transit outside the CIS?
- 5 How much oil will Kazakhstan transit outside the CIS?

21 TAXES HOLD BACK MITSUI \$700 MLN LOAN TO LUKOIL. CHEVRON DEAL

Russia's crippling taxes for oil companies are preventing Lukoil from going ahead with deals for a \$700 million equipment loan from Mitsui, signed in 1994 and guaranteed by the Export-Import Bank of Japan, and export crude sales to Chevron, a senior Lukoil official told the Petroleum Information Agency.

Lukoil experts said Lukoil and Mitsui were ready to agree on final terms early this year, but the government's decision to reappraise oil firms' fixed assets over a short period of time and raise oil excise after abolishing exDort duty could seriously hit Lukoil's finances.

The loan was supposed to pay for Japanese equipment to rehabilitate conserved oil wells in Russia, and only became possible after Chevron International Oil Company Inc. signed a deal with Lukoil to buy around 70,000

barrels of oil a day for export. Chevron was supposed to buy 180 million barrels (around 24 million tonnes) over eight years, and Lukoil would use currency revenues from sales to repay Mitsui's loan.

The credit deal states Lukoil must repay 5% of the loan as soon as the agreement comes into effect, deposit 10% in a special account and transfer it to Mitsui as equipment, materials and services are delivered and pay 85% in installments.

Vocabulary

crippling taxes	непомерные налоги
deal	сделка
loan	заем
appraise v fixed assets	оценивать основные средства
excise	акциз
currency revenues	валютные доходы
account	счет
installments.	очередной взнос

Questions

- 1 What prevents Lukoil from going ahead with deals for a \$700 million equipment loan from Mitsui ?
- 2 Why was the loan supposed to pay for Japanese equipment?
- 3 How much of the loan must Lukoil repay as soon as the agreement comes into effect?

22 CRIMEAN OIL COMPANY PLANS TO INTENSIFY WORK ON UKRAINIAN SHELF

Crimean Oil Company plans to intensify its exploration work on the Ukrainian Black Sea shelf, after complaints from its Ukrainian founder that it was moving too slowly. Agreement was reached on speeding up the joint venture's work at a recent meeting of its founders, Britain's JKC Oil & Gas and Ukrainian state oil and gas company Chernomorneftegaz in Simferopol.

JKC was asked to register its investments in Ukraine under a law on foreign investments and draft a program of research with Chernomorneftegaz and present it to the Crimean Oil Company board council.

JKC Oil & Gas, which used to be part of JP Kenny under the name JP Kenny Exploration and Production, has two ventures in Ukraine, the other being Poltava Gas and Oil Company, which works the Novo Nikolayevskaya-Rudenskoyevskaya group of fields in Poltava region and in which JKC owns 49%. The European Bank for Reconstruction and Development recently lent JKC Oil & Gas \$8 million to invest in oil production in the region.

Crimean Oil Company is active in the Delfin area off the Black Sea coast, and JKC paid \$150,000 for its stake. The venture has drilled one well, but it turned out to be unproductive. Meanwhile, the number of companies working on Ukraine's Black Sea shelf is about to increase.



Shell International Petroleum' & America's Pecten have won the first license under an extended tender to explore and produce hydrocarbons in the Ukrainian sector of the Black Sea.

Vladimir Byelsky, deputy head of Ukraine's Committee for Geology and the Use of Underground Resources and a member of the tender committee, told Interfax-Ukraine the two firms bid for four offshore sections: 69, 70, 79 and 80.

Meanwhile, Unitsky earlier said the sections lie near the Shtormovoye field, which his firm develops, and there was no need to draw foreign companies to develop them, since Chernomorneftegaz could do so itself.

According to the first round conditions, Shell and Pecten can now get a license from the committee to study and operate fields only after signing the necessary documents, including one on joint activity with state-owned oil producer Chernomorneftegaz. Ukraine now plans to offer another 146 sections in a tender that will last until all sections are given out or 10 years, whichever is sooner.

Vocabulary

complaint _n	жалоба
draft _v	составить проект
lent _v	предоставить ссуду
stake _n	доля
bid _v	предлагать цену
draw _v	привлекать

Questions

- 1 Why does Crimean Oil Company plan to intensify its exploration work?
- 2 What had company complained about?
- 3 What was JKX asked to do?
- 4 How many ventures has JKX?
- 5 What bank lent JKX Oil & Gas and why?
- 6 Has the venture drilled a productive well in the Delfin area of the Black Sea coast?
- 7 What kind of license have Shell International Petroleum and America's Pecten won?

8 Why is there no need to draw foreign companies to develop four offshore sections in the Black Sea?

9 How many sections does Ukrain plan to offer in a tender and how long will it last?

23 ITOCHU EYES GEORGIAN PROJECTS, CHEVRON ABOUT TO INK DEAL

Officials from Japan's Itochu, which recently gained a stake in Azerbaijan's \$7.5 billion Caspian offshore oil development, have arrived in Georgia to look at investing in exploration and production in the country, which is slated as the main route for Azerbaijan's oil.

An official at the Georgian International Oil Corporation said the delegation, which consists mainly of geological experts, will offer GIOC bosses concrete proposals on projects linked to transporting Azerbaijan oil West.

Itochu plans to take an active part in the projects to build transport and utilities infrastructure and an oil terminal in Supsa. Itochu specialists in rail transport, power and chemicals will arrive soon to look at the Japanese company's part in projects to boost the capacity of Georgia's railways, rebuild a chemical complex in Rustavi and rehabilitate and build hydroelectric power stations.

Meanwhile, Georgia and America's Chevron Overseas Petroleum Corporation Inc. may sign a contract for the transportation of crude to be produced at the Tengiz field in Kazakhstan via Georgia within days.

The Georgian International Oil Corporation (GIOC) told Interfax the deal, which might be wrapped up during a July 16-18 visit to Georgia by Richard Herman Matzke, the Chevron Overseas president, would involve the Company transporting a trial consignment of 30,000 tonnes of crude across the country to Georgia's Black Sea ports by rail, perhaps this September. Georgia's pipeline network will not be ready in time. Chevron and GIOC officials will also discuss

the possibility of the U.S. company becoming involved in oil exploration in Georgia. Chevron specialists have already conducted geological and ecological surveys of Georgian oilfields, and reckon, allowing for the risk factor, the country possesses considerable oil reserves. They say over half of these, or as much as 300 million tonnes, lie in offshore fields.

Vocabulary

oil development	разработка нефтяного месторождения
slate _v	намечать, выдвигать
boost _v	повысить
trial	пробный
pipeline	трубопровод
surveys	изыскание, обследование
recon	разведка
oil reserves	запасы нефти

Questions

- 1 Why have officials from Japan's Itochu arrived in Georgia?
- 2 Whom does the delegation consist of and what will it offer GIOC bosses?
- 3 What projects does Itochu plan to take part in?
- 4 What American company may sign a contract with Georgia ?
- 5 What possibility will Chevron and GIOC officials discuss?

24 TURKMENISTAN SIGNS FIRST AGREEMENT ON CASPIAN SHELF

Turkmenistan and Malaysian national oil company Petronas have signed their first production share agreement on exploring and developing three oil fields on the Turkmen shelf of the Caspian Sea.

According to a highly placed government source, Petronas Turkmen subsidiary Petronas Carigali will spend 26 years exploring, drilling and processing the Gubkin, Barinov and Livanov deposits, with estimated known reserves of 800 million tonnes of oil. Other details of the agreement have not been released.

The agreement assumes that Petronas will receive first flows within years of signing a contract to work the 1,467-square-kilometer offshore

Petronas Carigali will be using state-of-the-art two- and three-dimensional seismic imaging techniques and drilling two exploratory and two test wells.

Turkmenistan has agreed to waive all taxes and customs duties except those laid out in the agreement. Deputy Prime Minister Khekim Ishanov said that Petronas had accepted all of Turkmenistan's terms. In particular Ishanov pointed to the fact that all investments in oil processing would be under Turkmen control.

The Gubkin, Barinov and Livanov fields are the first of eight tracts that Turkmenistan has opened to foreign companies since the early 1990s.

Foreign companies expressed an interest in the Gubkin and Livanov fields as early as 1993. An international consortium of Oxy, Oil Capital, and Lapis Holding won a November 1993 tender to develop the fields and set up the Girkanneft joint venture, which was supposed to begin geophysical research in the area. But the companies backed out in 1994. Dutch Larmag Energy is at present the only foreign company on the Turkmen section of the Caspian Shelf, working the Zhdanov Bank field since January 1994.

Ishanov admitted that Turkmenistan is lagging behind Azerbaijan and Kazakhstan in developing its section of the Caspian Shelf. But the Malaysian side has a great deal of experience in off-shore exploration and production.

Vocabulary

processing	обработка
deposits	залежь, месторождение
estimated	расчетные
flow	поток
assumes	предполагать
exploratory wells	разведочно-эксплуатационная скважина
test wells	разведочная скважина
waive v	воздержаться
customs duties	таможенные пошлины
lay out	излагать
tracts	участок площадью 40 акров
back out v	отступать, отказаться
lag behind v	отставать

Questions

- 1 How many oil fields are Turkmenistan and Petronas going to explore?
- 2 Where do the companies plan to work and for how long?
- 3 When will Petronas receive first flows?
- 4 What techniques will Petronas be using and how many wells will it be drilling?
- 5 How many tracts has Turkmenistan opened to foreign companies since the early 1990s?
- 6 When was the Girkanneft joint venture set up and what it was supposed to do?
- 7 Why is Dutch Larmag Energy the only foreign company on the Turkmen section of the Caspian Shelf at present?

8 Does Turkmenistan go ahead Azerbaijan and Kazakhstan in developing the Caspian Shelf?

25 LUKOIL, AKER RAUMA OFFSHORE TO MOVE RIG FROM GULF TO CASPIAN

Russian oil major Lukoil and Finland's Aker Rauma Offshore have signed a \$20-million under which the Finnish firm will move the Marava floating drilling rig from the Persian Gulf to the Caspian Sea.

An official in Lukoil's department of sea and river transport told Interfax the rig is currently on its way to Finland, where it will be dismantled, loaded onto a river-sea ship, and sent via Russian internal waterways to Astrakhan, southern Russia.

Work is already underway to ready infrastructure for servicing Caspian platforms. Lukoil officials did not say exactly where in the Caspian the rig would be used, but some sources said Lukoil planned to use it in the northern part of the sea in Russian waters.

Alexander Ilichev, director of Astrakhan shipyard Krasnye Barrikady, said the plant April 3 signed a deal with Aker Rauma Offshore to put the rig back together for Lukoil. The three-legged rig is 66 meters high and can drill to depths of around 5,000 meters. It will reach Astrakhan by June 15 and should be assembled by late October 1997.

Vocabulary

floating drilling rig	плавучая буровая установка
dismantle _v	демонтировать
load _v	грузить

Questions

1 What have two oil majors agreed to do? What will it be done with the rig

in Finland?

2 Where does Lukoil plan to use the rig?

3 What deal did the shipyard in Astrakhan sign with Aker Rauma Offshore?

4 What are special design features of the rig?

26 RAMCO TO EXPAND IN CASPIAN, BLACK SEA REGION

Georgian state oil company Saknavtobi (Gruzneft) and Britain's Ramco will start talks on joint development of the Kakheti oil and gas block in northeast Georgia on April 23 in Tbilisi.

Mikhail Galkin, president of Ramco Caspian, a Ramco subsidiary, told Interfax that the two sides signed a protocol on December 18, 1996, under which Gruzneft and Ramco will base their joint activities on a production-sharing agreement.

Galkin said Ramco is currently in talks with Russian-U.S. company Petroalliance on making geophysical studies of the block this summer. Galkin said more work in Georgia does not mean Ramco is leaving projects in Azerbaijan, but is linked to a general expansion in the Caspian and Black Sea region, into Georgia and Kazakhstan. Ramco announced a year ago it was bidding in a tender to continue development of Kazakhstan's onshore Uzen field together with America's Unocal and its partner Delta, a Saudi Arabian petroleum company registered in the United States.

Ramco has a stake in Azerbaijan's \$7.5-billion project to develop its Azeri, Chirag and Guneshli fields. It is also developing Azerbaijan's Muradkhanly field and is the initiator of the MRT Energy consortium with Mobil and Total, which will work off Azerbaijan's Caspian coast.

Ramco in early March placed a major stake on the U.S. stock market for \$77 million and plans to use the money to finance oil and gas projects in Azerbaijan and the Caspian.

Vocabulary

expand v	расширять
subsidiary	дочерняя компания
bid v	предлагать
stock market	фондовая биржа

Questions

- 1 What talks will Gruzneft and Britain's Ramco start in Georgia?
- 2 Is a Ramco subsidiary leaving projects in Azerbaijan ?
- 3 What tender was Ramco bidding in a year ago?
- 4 What stake has Ramco in Azerbaijan's \$7.5-billion project?
- 5 How does Ramco plan to finance oil and gas projects in Azerbaijan and the Caspian?

27 PRODUCTION SHARING IN TIMAN PECHORA: FOR AND AGAINST

Legislators in Nenets autonomous district voted in early April to remove all fields in the north European Russian region, including in the Timan Pechora oil and gas province, from a list of fields slated for development under production-sharing contracts. They also recommended the district administration move to develop the local hydrocarbon reserves under the existing tax system and start organizing tenders for licenses. Nenets lawmakers thus effectively began a new phase of the long battle between advocates and foes of production sharing for Timan Pechora.

Nenets deputies' initiative on local oil fields is "excessively politicized," said Anatoly Frolov, first deputy general director of Arkhangelskgeoldobycha, a Rosneft unit that is one member of a proposed consortium to develop Timan Pechora acreage.

Nenets deputies want to exclude South Khylochuyu field on the Barents coast from production sharing, and Frolov said this would "objectively complicate work on its further development" and "will potentially have a negative effect on Arkhangelskgeoldobycha's situation."

Frolov said South Khylochuyu is very well prepared from the point of view of geological exploration. He said Arkhangelskgeoldobycha and America's Conoco carried out exploration and preliminary drilling at the field. He said "we are ready with our worthy partners to continue full-scale development of this field, without even waiting for the " production-sharing list to be passed."

While agreeing that developments in the Northern Territories could be profitable under current legislation, Frolov said "existing Russian legislation does not guarantee against changes in the tax regime from time to time, and, as a rule, not [changes] for the better."

Frolov said that if Russia's new tax code is passed by parliament, "it will severely complicate industrial activity in the north of the country." The production-sharing law, meanwhile, provides tax guarantees "and it is this that attracts foreign investors," Frolov said.

The Nenets parliament voted to exclude 11 Timan Pechora fields from production sharing: Varandei, Toravei, South Toravei, Laboganskoye, Naulskoye, Trebs, Passedskoye, Titov, Syurk-haratinskoye, Verkhne-Kolvinskoye and Visovoye.

South Khylochuyu has reserves of over 200 million tonnes of oil, of which 60 million tonnes is recoverable, and is one of the four fields in the so-called "Northern Territories" contract zone. Rosneft, Arkhangelskgeoldobycha and America's Conoco plan to set up a consortium to develop them. Preliminary calculations put the cost of the project at \$2 billion over 30 years.

Vocabulary

vote v	ГОЛОСОВАТЬ
slat v	ВНОСИТЬ В СПИСКИ
foe	недруг
complicate	усложнять
activity	деятельность
law	закон
recoverable	извлекаемый

Questions

- 1 What did Nenets legislators vote to do?
- 2 Why is Nenets deputies' initiative 'excessively politicized'?
- 3 Is Arkhangelskgeoldobycha ready to continue the development of the Khulchuyu field?
- 4 What will severely complicate industrial activity in the north of the country?
- 5 What reserves has South Khulchuyu?

28 \$2 BILLION REQUIRED TO OPEN UP CASPIAN D-222 OIL FIELD

Opening up the Caspian offshore D-222 (Yalama) field will cost about \$2 billion according to preliminary estimates, the Lukoil press center reported Thursday evening. Lukoil President Vagit Alekperov and Azerbaijan State Oil Company President Natic Aliyev signed a production-sharing agreement to explore and develop D-222 in Moscow Thursday.

Lukoil's press center said the Russian oil major would control 60% of the project and Azerbaijan State Oil 40%.

Meanwhile, Aliyev said in an interview after the signing that each company would control 50% of the project. This is the sixth production-sharing contract that Azerbaijan has signed with a foreign company and the first signed exclusively with a Russian firm. Experts believe this has due to D-222's location in the Caspian off the coast of Dagestan, the Russian autonomous republic.

The project will be able to make effective use of the Baku-Tikhoretsk-Novorossiisk oil pipeline to transport the oil from the wellhead, a Lukoil official said.

As was reported earlier, Lukoil will finance 100% of the geophysical exploration. This is expected to cost about \$70 million, Alekperov has said.

In an interview with the Petroleum Information Agency, Aliyev said that the contract stipulates a four-year period to carry out the extensive exploration required. D-222 is located in a totally unstudied sector of the Caspian and so geophysical studies of D-2 and D-3 and exploratory drilling are required, he said.

No third parties will take part in the project, Aliyev said. "Although all our contracts provide for transferring part of the project share to other participants, we rarely make use of it," he said.

Vocabulary

estimate _v	оценивать
wellhead	устье скважины
stipulate _v	обуславливать
provide for _v	предусматривать

Questions

- 1 What agreement did V. Alekperov and N. Alijev sign?
- 2 What is the aim of this project?
- 3 Who will finance the geological exploration?
- 4 What period does the contract stipulate?

29 LUKOIL, ROSNEFT, BAKU TO EXPLOIT CASPIAN OFFSHORE OIL FIELD

Russian oil majors Lukoil and Rosneft will enter into a production-sharing agreement with the Azerbaijan State Oil Company to exploit the Kyapaz oil field on the Caspian shelf. The three signed the initial agreement Friday in Moscow.

The Petroleum Information Agency has learned that Azerbaijan State Oil will control a 50% share in the project, Lukoil 30% and Rosneft 20%.

The project is expected to require investments of about \$1 billion. The field contains 50 million tonnes of oil according to preliminary estimates. Lukoil President Vagit Alekperov said the oil from the Kyapaz field would be shipped via links to the transport system from the Azeri and Chirag offshore fields.



Interfax has learned that Lukoil and Azerbaijan State Oil may soon agree to talks on opening up the promising Kunit structure in the Caspian.

Vocabulary

exploit v	разрабатывать
link	звено
structure	сооружение, устройство

Questions

1 Why will Lukoil and Rosneft enter into a production-sharing agreement with the Azerbaijan State Oil?

2 What will be the control share of the partners?

How much money is it expected to invest?

3 How will oil from the Kyapaz be shipped?

4 Are Lukoil and Azerbaijan State Oil going to open up a promising Kunit structure?

30 THE NORTH SEA

One of the problems of drilling exploratory wells in the North Sea is the shortage of drilling equipment. Continental Oil Company of England (CONOCO) and the National Coal Board (NCB) have specially designed the rig for oil and gas exploration in deep waters of the North Sea. The advanced equipment, incorporating the latest offshore drilling technology, is well suited for exploration in deeper waters of the North Sea. The cost of this project is approximately \$ 24 million. CONOCO and NCB have contracted to operate a giant semisubmersible drilling rig for two years.



The rig is a self-propelled, semisubmersible unit which is able to drill to depth of 25,000 ft, in water depth of up to 1000 ft. Special design features enable normal drilling. The rig is able withstand galeforce for sustained periods when it is impossible to re-supply due to weather conditions. The drilling rig has living quarters for 90 people.

CONOCO and the NCB will probably first use the rig on the northern North Sea acreage. CONOCO indicated that its participation in this rig building program is an expression of optimism in the future of North Sea Oil and Gas prospects.

Vocabulary

exploratory well	разведочная скважина
drill V	бурить
equipment	оборудование
rig	установка
exploration	разведка
incorporate v	включать
offshore	в открытом море
submersible	погружной, потопляемый
propel	приводить в движение
depth	глубина
design features	детали конструкций
enable	давать возможность
withstand	выдерживать
gale force	штормовая сила
sustained	длительный
supply	подача, снабжения
living quarters	жилые помещения

Questions

- 1 What have CONOCO and NCB contracted to operate?
- 2 Why have CONOCO and the NCB designed the rig ?
- 3 Is the project expensive or not?
- 4 What are special design features of the rig and what do they enable?
- 5 Why is the rig able to withstand gale force of winds and seas?
- 6 Where are CONOCO and the NCB going to use the rig first ?
- 7 What is one of the problems of drilling exploratory wells in the North Sea?

31 MITTELPLATE: A MODEL OF ENVIRONMENT-FRIENDLY OFFSHORE PRODUCTION

The Mittelplate drilling platform is a unique high-technology complex specifically customized to suit its location in the tidal shallows of the North Sea. Here, petroleum drilling and production operations are implemented and monitored round the clock by a highly qualified team. Both in terms of ecology and cost-efficiency the platform represents the state of the art of present day oil production technology.



Output is not the only thing that counts. The mud flats, constantly changing with the ebb and flow of the tides, are a very sensitive and unique natural environment that needs to be preserved. At the same time, the "Wattenmeer" national park is the location of the largest

oil deposit to be found anywhere. In order to extract the 30 million tons of crude oil estimated to be down under the seabed waiting for cost-efficient development, a consortium has developed a concept whose implementation is widely regarded as a model of environment-friendly offshore production.

The drilling platform itself resembles a huge steel tub whose form prevents sea water from entering and also stops oil or dirt from escaping. Any spray water coming in over the "tide mark" in stormy weather or rainwater collecting in the drilling platform is collected via a sewer system, filtered and returned to the sea. Platform waste water is first treated and then transported ashore by boat for disposal. Rubble and drilling mud are also brought ashore for correct disposal. The crude oil recovered at Mittelplate is processed to refinery specifications on the

platform and stored in large double-walled "tank in tank" receptacles until ready for transport. With every high tide - i.e. every twelve hours - special barges, again with double-walled tanks, collect the petroleum produced and bring it to Brunsbittel for further processing. To make loading safe, the platform has its own little harbor basin. Once the barge has entered, a lock closes behind it. Should there ever be any accidental leakage, the oil would remain within the harbor basin and could be sucked off the water surface without any problems.

Since production started up in 1987, 3 million tons of petroleum have been extracted, processed, loaded and transported here. Not once has so much as a single drop of oil leaked out into the surrounding North Sea. Observations conducted by independent bodies have established that the organisms living in the tidal flats have in no way been affected during these eleven years of accident-free operations. One day, when the oil deposits in Mittelplate have been exhausted, the drilling platform will be completely dismantled and the intrusion materials disposed of on land.

Vocabulary

round the clock	круглосуточно
mud	буровой раствор
ebb	отлив
tub	бадья
sewer	сточная труба
receptacles	приемный резервуар

Questions

1 Why is the Mittelplate drilling platform in the North Sea a unique high-technology complex?

2 Why is Mittelplate widely regarded as a model of environment-friendly offshore production?

3 Describe the main operational stages of the Mittelplate technology complex?

4 What is production capacity of the Mittelplate technology complex?

32 U.S. THREATENS AN OIL INTERVENTION

An oil price slump will not mean great loss for the Russian state budget. By Nikolai Gorelov Vremya MN

The United States seems to be set to bring direct pressure to bear on the world oil market. President Bill Clinton announced February 16 that his country might put up some of its strategic oil reserves for sale, adding that it might do so as early as this week. Analysts predict that this move may force down the world price of oil by \$7 to \$8 a barrel, or by nearly a third; they don't rule out sharper fluctuations of short duration.

For two months now we have heard talk about a prospective sale of part of the U.S. strategic reserves. Yet the U.S. authorities continue to insist that the measure "is not being discussed at the moment"; they say it is considered only as a last resort – if OPEC cannot be persuaded to make more oil available.

Russian oil analysts, however, presume that the U.S. would not cut into its reserves, and that the American president's pronouncement is a ruse to halt the oil price hike. The world oil market could well react to his statement by taking \$1.5 to \$2 off a barrel. With the on going presidential election campaign, this is particularly important for the United States because high oil prices are pushing up domestic inflation.

The opinion of the Russian oil analysts is shared by Alexander Livshits, chairman of the Interdepartmental Commission for Russia's participation in 8 meetings. After talking with representatives of the U.S. Security Council and State Department, he said "the United States is not going to sell oil from its strategic reserves to push prices down."

In an Ekho Moskvyy radio broadcast, former fuel and energy minister Yuri Shafranik said that "the world understands that Clinton's utterance is a move agreed upon with oil exporting countries." Prime-TASS has quoted spokesmen of the global oil companies as saying that OPEC would be compelled to increase output. According to one of them, a price of \$30 per barrel could trigger higher inflation and slow down economic growth in the oil-importing countries, which would lead to a drop in oil consumption; this runs counter to OPEC's long-term interests, he said. An increase of output whether official or not (quota observance by OPEC countries fell to 61 % in January), could bring down the price to \$25 per barrel in summer.

But if the United States really starts selling a portion of its strategic reserves, lower world prices "could turn out to be very sad news for us," Russian experts say. Sergei Generalov, another former minister for fuel and energy, came up with the following calculation in interview with Vremya MN: "We export 10 to 11 million tonnes of oil a month. There are just over seven barrels in a tonne. So a fall of \$1 in the price per barrel means that we will receive over \$7 less for each tonne, and thus lose about \$80 million a month. As a result, a year's oil sales will fetch us around \$1 billion less. And if the price slump is \$ 7 to \$8 per barrel, the whole country will probably be nearly \$7 billion poorer within a year. Note that this will be a loss for the entire country, not for the state budget."

Shafranik said the Russian budget was so dependent on petrodollars that any drop in oil prices would call to mind the August 1998 crisis. Nevertheless, he added, he does not expect another "black August" to happen because' Russian oil companies have projected a price of \$18 to \$22 per barrel in their budgets.

In Generalov's opinion, the Russian oil companies will be the hardest hit by a world price slump. They will lose, a substantial portion of their profits because the state will not cut the export tax as promptly as it increased it. The state budget, however, is unlikely to suffer great losses from any fall in oil prices, Generalov opines. The point is that gas prices are pegged to those of oil, and when the latter plunge, a fall in gas prices will not follow until six to eight months later.

Accordingly, last year's oil price hike will start jacking up gas prices from February. This means that the Russian budget will be getting more revenues from gas exports than last year.

"To my mind, the gains from higher gas prices will offset any losses from falling oil prices," Generalov says. "But this year will probably be the last when Russia can build its budget mostly on revenues from the raw-material sector. Subsequent years will see either a policy of developing other sectors, or the exhaustion of the fuel and energy resources. In the latter case, the fuel and energy complex will lack raw materials not only for export but even for domestic consumption.

Vocabulary

rule out _v	исключать
a last resort	последняя мера
a ruse	хитрость
a hike	рост
to compel	заставлять
to trigger _v	запустить
a slump	падение
to peg _v	искусственно поддерживать
jack up _v	повышать
offset _v	компенсировать
a plunge	крупная биржевая спекуляция

Questions

1 What did Bill Clinton announce February 16 about the country's strategic oil reserves?

2 What is the opinion of the Russian oil analysts about Bill Clinton pronouncement?

3 What will the oil price slump influence Russia's economy?

4 Why is the state budget unlikely to suffer great losses from any fall in oil prices?

33 NEW PIPELINE TO BYPASS THE BALTICS

Acting President Vladimir Putin concerned about the country's energy security, by Vasily Verbin and Vera Kuznetsova

The government has endorsed a project to build a Baltic pipeline system, which will link the West Siberian oil fields with the Leningrad Region's port Primorsk. The pipeline will make Russia independent of the Baltic countries, which possess monopoly rights to the Baltic Sea outlets. Besides, Russia will save around \$100 million a year if it stops transporting oil via Latvia.



President Putin believes that the state too has a vested interest in the Baltic pipeline. "The decision to build the line was passed back in 1997, but nothing has been done about it up till now," he complained. Unless construction of the pipeline gets under way, Russia

will be faced with "a problem of energy and transport security," he said.

Construction of the projected line has largely been hampered by what the acting president calls "a tug-of-war over distribution of stakes and financing." "We must proceed primarily from the state's interests, and harmonize them with those of the companies concerned," he said. Stakes in the pipeline will be allocated as follows: 50% + 1 share will go to the state-owned pipeline operator Transneft, and the remaining shares will be distributed among the companies that will have paid their "investment tariff (part of the amount paid by oil companies for their oil to be exported through Transneft pipelines that will go into the Baltic line's construction). According to Deputy Fuel and Energy Minister Vladimir Staney

(who is also chairman of Transneft's board of directors), the amount of the investment tariff for this year will be determined later by the Federal Energy Commission.

Jump-starting the construction work will have to wait until all negotiations with the contractors are completed, and the prices of the contracts are agreed upon, Stanev said. He noted that on February 4 Transneft's board of directors had endorsed the estimate of expenditures (\$70 million) on the Baltic line's construction for the first half of 2000. That sum is likely to go into the construction of an oil terminal at Primorsk because "it is the most complex facility in engineering terms, and it will take a long time to build," Stanev said.

It will cost a total of \$460 million to complete the first section of the Baltic line (Kirishi-Primorsk); of that sum, \$230 million will be contributed by companies in the form of investment tariff. Transneft collected around \$100 million in such tariffs last year and expects to take in \$130 million this year. (Transneft will most likely contribute its operating Kirishi-Yaroslavl pipeline as payment for its stake). However, most companies do not intend to participate in the Baltic line's construction (at the moment, only Surgutneftegaz and LUKoil are interested in the project). The majority are reluctant to invest in a pipeline that others will use. We can try to persuade companies to pay investment tariff, but we can't force them to do so," said Stanev, adding that other investors besides oil companies might want to take part in the project.

Vocabulary

endorse v	утверждать
vested	законный
projected	запланированный
hamper v	препятствовать
a tug-of-war (slang)	напряженная борьба (переносное значение)
allocate v	распределять

expenditures	расходы
stake	доля

Questions

- 1 What is the purpose of building a Baltic pipeline system?
- 2 How will stakes in the pipeline be allocated?
- 3 What companies are supposed to take part in the Baltic line's construction?
- 4 Why are the majority of companies are reluctant to invest in a pipeline?

34 OIL TERMINAL CONSTRUCTION: AN ICY START

LUKoil and Surgutneftegaz are not particularly enthusiastic about the Baltic Pipeline System (BPS). By Igor Ponomarev, Vremya MN.

One hundred and twenty kilometers away from St. Petersburg, on a sandbar near the port of Primorsk, the foundation stone has been laid for the construction of the Baltic Pipeline System (BPS). The project provides for building an oil terminal at Primorsk, laying a pipeline to Kirishi, and modernizing the Kirishi-Yaroslavl oil pipeline. The project – the construction of its first section will cost \$460 million - will provide the oil-rich Timano-Pechora region with an oil outlet to the Primorsk export terminal. When the BPS comes into service two years from now, it will pump 12 million tonnes of oil a year into ocean-going tankers at this terminal.

This is approximately as much as is annually exported by Russia through Latvia's Ventspils port – about 15 million tonnes, or roughly 15% of its total oil exports. No wonder politicians were supportive of Russian pipeline operator Trans-neft's idea to build a Russian oil terminal on the Baltic Sea. Oil companies, however, were markedly less enthusiastic. Still, the oil companies were attracted by the prospect of saving up to \$4 on every tonne of oil exported. The project began to be realized only after the government agreed to let the oil companies become BPS shareholders.

The ceremony of laying the foundation stone was unexpectedly low-key. No more than 150 people came to hear the short speeches made by Deputy Fuel and Energy Minister Vladimir Stanev and Transneft Vice President Sergei Ter-Sarkisyants at a place swept by a piercing wind from the ice-covered Gulf of Finland. The boulder adorned with a plaque that said "Baltic Pipeline System" was to be unveiled by Deputy Prime Minister Viktor Khristenko and Transneft's head Semyon Vainshtok, but at the last moment they sent proxies instead of attending the ceremony themselves.

According to AO Giprotuboprovod, most of the \$460 million will be spent on building the oil terminal. Laying the pipeline will require just over \$200 million, and building the pumping stations, \$54.8 million. Part of the sum needed for the project has already been raised. For a year oil companies had been paying a so-called "export tariff - \$1.43 for every tonne of oil exported was transferred to a special account to fund the BPS. Last year brought in just over \$100 million. Collection of the "export tariff continued in March of this year, which, it is hoped, will add another \$130 million to the BPS fund. Apart from the oil companies, the project's willing funders include EBRD and Sberbank.

The maximum capacity the BPS will eventually reach is 30 million tonnes of oil a year, but by that time investments in the project will have reached \$800 million, Stanev said. However, it is already doubtful that this figure is feasible. Northern Russia is being vigorously developed by fuel companies. This year's oil output from the Timano-Pechora Fields is expected to total 13.16 million tonnes; toward 2010, the annual out-put will presumably be 20 million tonnes, which is quite enough for the cost-effective operation of BPS for many years. However, squabbling between the government, Transneft, and the oil companies over funding schemes and distribution of shares in the BPS has prompted the companies to look for other transportation options.

For example, Russia's oil major, LUKoil, which is developing Timano-Pechora's Kharyaginsk field jointly with France's Total, Norway's Norsk Hydro, and the Nenets Oil Company, is more keen on its own Northern Gate" project.

LUKoil plans to build a Barents Sea oil terminal to be linked with that field by a 200-km pipeline, which will have a capacity of 30 million tonnes of oil a year, like the BPS. LUKoil argues that Kharyaginsk oil is light and more expensive, and that if it is pumped through Transneft's pipelines, what will come out at the other end will be Russia's usual heavy oil - the Urals blend. Nor does the BPS appear very lucrative to Surgutneftegaz, owner of the Kirishi Refinery and another major player on the Russian oil market. The company fears that its refinery, which processes some 600,000 tonnes of oil a year and sells its oil products to Finland and West European countries, might not have enough crude to process.

On 30 October 2009, Primorsk Oil Terminal launched into operations a new exported TRUVOR ice-class tug-boat with 5000 hp, 63 ton to wing capacity, 32 m length and 12 m beam.

The tug-boat is designated for a 24 hour readiness for search-and-rescue missions as well as providing ecologically safe patrolling and monitoring of the sea environmental conditions around oil-transit terminal at the Primorsk Port (Leningrad Region), fire fighting aboard ships, tug escort for tankers, secure mooring and nautical tugging.

TRUVOR was an addition to the terminal of the Port's fleet especially designed and built to serve under conditions of the Primorsk Port. In its specifications, TRUVOR, as well as Rurik and Askold tug-boats, stand out in the whole North-West Region of the Russian Federation

Vocabulary

boulder	валун
proxy	заместитель
squabble v	ссориться
to be keen on	быть заинтересованным
blend	смесь
lucrative	прибыльный

Questions

- 1 How much will the first section of the project cost?
- 2 Why were politicians supportive of a Russian oil terminal on the Baltic Sea?
- 3 What are the reasons for oil companies to be less enthusiastic about it?
- 4 Why has part of the sum needed for the project been already raised?
- 5 What important terminals are planned to be built by oil majors in the future?

35 IMPENDING OIL PRICE SLUMP

How will it affect Russia?

This is a thought that is haunting not only oil companies. Oil is one of the major sources of budget revenues, and the 1998 ruble crash was largely due to a drop in oil prices. As the fuel and energy minister announced two weeks ago, the government, without waiting for oil revenues to fall, intends to introduce floating oil export duties to offset any price reduction. What are the implications for the state budget and the oil companies?

Sergfi Generalov, former fuel and energy minister and currently deputy chairman of the State Duma's Committee and Economic Policy, answers this and other questions. "I think there is good reason to speak of oil prices failing. A decision to lower prices might be taken at the regular OPFC session scheduled for March. It is most likely to decide on increasing the OPEC countries oil production quotas - a move that will instantly affect oil prices.

There are many reasons why OPEC is bound to adopt such a decision. Overt US pressure to begin with. The US administration's tough oil policy is dictated by domestic political interests. The US is the largest oil importer and processes twice as much oil as it produces. High oil prices are jacking up the US inflation rate. Any administration would try to avoid higher inflation in a presidential election year. A \$1 decrease in the price of a barrel of oil would reportedly cause Russia to lose \$1 billion a year. Is that so?

Yes, the yearly loss for us would really be around \$1 billion. If a barrel's price drops by \$7 or \$8 (which is highly probable, though no one can name the exact figure), the whole country could lose some \$600 million a month, or about \$7 billion a year. Note that this would be a loss to Russia as a whole, not to the state budget alone. How the budget and the oil companies would share this loss between them is a very complex question. This year the oil companies will presumably have to take upon themselves a large portion of the loss.

Still, to what extent will a smaller oil revenue affect budget implementation?

This year's rise in gas prices gives one grounds to believe that budget problems will be minimal. There is a link between oil and gas prices. A change in the former inevitably affects the latter, but there is always a six to eight months' lag. Accordingly, last year's oil price hike started having an effect on gas prices in early February. Which means that this year's gas exports will bring the Russian budget more money than last year's. I believe the 'gas gains' will make up for the 'oil losses.' So the impending oil price slump will affect primarily the Russian oil companies' balance sheets and will have little effect on the state budget.

But this year seems to be the last when Russia can build its budget predominantly on revenues from the raw-material sectors. In the future, it will have to boost production in other sectors, otherwise its fuel and energy resources will be depleted and the country will not have enough fuels not only to export but even to meet its domestic needs.

Vocabulary

haunt v	преследовать
export duties	экспортные пошлины
budget implementation	исполнение бюджета
balance sheet	баланс
boost v	повышать
deplete v	исчерпывать, истощать

Questions

- 1 What are the implications for the state budget and the oil companies?
- 2 What would cause Russia to lose \$1 billion a year? Why?
- 3 How the budget and the oil companies will share this loss between them?
- 4 To what extent will a smaller oil revenue affect budget implementation? ^{5 5}
- 5 What is the link between oil and gas prices?
- 6 Why does this year seem to be the last when Russia can build its budget predominantly on revenues from the raw material sectors?

36 HEDGING AGAINST OIL PRICE SLUMP

New export duties on some fuels took effect on government and the relevant government resolution has increased the duty on oil and oil products from 15 to 20 euros (€) per tonne, and that on diesel fuel and intermediate distillates from €10 to 15 per tonne. The export duties on light distillates and black oil have remained unchanged – €20 and 12 per tonne, respectively.

When world oil prices topped \$30 per barrel, the duty was €15 per tonne. But when prices dropped, bringing down exporters' earnings, duty rates were raised. Yet this is not shortsightedness on the government's part.



All experts predicted in early March that after the OPEC (Oil Producing and Exporting Countries) meeting in Vienna, world oil prices would drop, and the government had no reason to think otherwise. It therefore increased export duties as a hedge against a possible price slump. Hence its bold announcements to the effect that

budget revenues from export duties would see no significant change in the near

future. And the Finance Ministry has estimated that the oil companies can afford to pay a duty of €20 per tonne with world prices ranging between \$20 and \$25 per barrel.

The rate of oil export duties changed several times in the past year. Last May's duty was €2.5 per tonne; over the summer it rose to €7.5, and toward the end of 1999 it doubled. The present upward adjustment is not the last one either. Duties are going to be different in June. As the Cabinet has pointed out, the coming alterations will be more rational, flexible, and convenient for exporters as well as for the state budget.

The government is working over a new method of automatic adjustment of crude export duty rates depending on the world price situation. The government's Commission for Protective Measures in Foreign Trade and Customs Tariff Policy has already endorsed a new duty schedule, according to which, oil will not be subject to export duty if its world market price falls below \$12.5 per barrel. If the price band is between \$12.5 and \$15 per barrel, the export duty will be two euros per tonne. And the duty per tonne will rise following further price hikes: Five euros, if a barrel costs between \$15 and \$17.5; nine euros, if the price band is \$17.5 to \$20; €14, if it is \$20 to \$22.5; €20 – \$22.5 to \$25; €27 – \$25 to \$27.5; €34 – \$27.5 to \$30; and €41 – \$30 to \$32.

And if oil soars to a fantastic \$32.5 per barrel, the export duty will jump to €48 per tonne. The government has not yet decided the price of which oil to use in calculating the duty rate – the benchmark Brent, or Russia's Urals blend.

The government has not confirmed that such a sliding scale will indeed be introduced and take effect soon. For one thing, it has not yet decided on a method of calculating duty rates. For another, the oil companies, while supporting the principle of flexible rates, want export duties to be set not in terms of euros per tonne, but as a percentage of the world market oil price, or in dollars for each dollar in any oil price increase. For an automatic duty rate setting mechanism to be in place, the State Duma must make the pertinent amendments to Part I of the Tax Code. The Code has a clause which stipulates a four-week lag between a change in

world prices and adjustment of export duty rates. This means that existing legislation rules out an automatically sliding scale.

Understandably, the oil companies have taken exception to the latest rise in export duties, complaining that the government wants to share in their high export earnings, but not in their losses on the domestic market. Despite the government's declarations of support for the oil sector, it will apparently continue to live off the oil companies, which bring in 30% of the consolidated budget revenues and 45% of the country's total hard-currency receipts.

Vocabulary

lag v	отставать
soar v	резко взлетать (о ценах)
benchmark	опорная отметка (уровня)
pertinent	соответствующий
amendment	поправка, дополнение

Questions

- 1 What export duties have remained unchanged?
- 2 What is a new duty schedule endorsed by government?
- 3 Why has the government not confirmed a sliding scale introduction in June ?
- 4 What export duties are expected if oil soars to a fantastic \$32.5 per barrel?
- 5 In what time will the adjustment of export duty rates take place after the change in world oil prices according to the Tax Code?

GRAMMAR APPENDIX

1 Grammar Tenses. Active Voice

Видо-временные формы английского глагола (активный залог)

Simple V	Continuous to be+V _{ing}	Perfect to have + V _{ed} /V ₃	Perfect Continuous to have +been+ V _{ing}
Present			
Vs ⁽³⁾ usually, every day, generally, often, as a rule do/does в вопросе и отрицании	am/ is/are+ Ving now, at present, still, at the moment	have /has + V_{ed}/V₃ ever, never, just, yet, already, lately, recently, so far, today, since, this year (week, month,	have/has been+ Ving for, since, all life, all this week (month, year)
Past			
V (ed) yesterday, last month (year, week), 5 days ago, the other day did в вопросе и отрицании	was/, were + Ving at 5 o'clock, from 5 till 6, at the moment	had + V_{ed}/V₃ by 5 o'clock, other action	had been + Ving for, those two years, all that month, of late, since
Future			
will+ V tomorrow, the day after tomorrow , next year, in 5 days	will + be+ Ving at 5 o'clock, from 5 till 6, the other action	will+ have+ V_{ed}/V₃ by 5 o'clock, by the other action	will + have been Ving for

The Present Indefinite Tense

The Present simple tense shows an action that happens regularly or permanently

Ex.1. Open the brackets using the verbs in the Present Indefinite

(USUALLY) 1. Andrea Schatzzuann, an exchange student from Switzerland, (to live) with the Connor family in San Francisco. She (to get) up at 7 am and (to take) a shower. She normally (not to have) breakfast. At half past seven she (to catch) the bus. Her first class (to start) at a quarter past eight. She always (to have) lunch at 12 o'clock in the cafeteria. The cafeteria food (to be) OK and it (to be) cheap too. Her afternoon classes (to be) from 1.15 till 3.00 pm, so she (to be) at school all day. She usually (to have) dinner with the Connors at about 8.00. On Saturdays she (to have) lunch at the restaurant. Once a week, usually on Sunday mornings, she (to go) swimming. A few friends usually (to go) along, too. One of her friends has got a car, so he (to pick) them up and then he (to drive) them home. After swimming they often (to go) out for a pizza. On Saturday evenings she sometimes (to go) out with friends to a party or maybe to a concert. Sometimes she (to invite) friends to her

Ex.2. Translate the sentences into English putting the verbs in brackets into the Present Indefinite

(ОБЫЧНО) 1. Я работаю. 2. Мы работаем. 3. Они не работают. 4. Вы работаете? – Да. 5. Он работает? – Нет. Он учится. 6. Мой брат не учится. Он работает. 7. Ты носишь очки? 8. Вы помогаете людям? 9. Он любит читать сказки? 10. Она любит играть на скрипке? 11. Моя сестра не читает книг. 12. Наша бабушка любит спать на диване. 13. Вы любите отдыхать в кресле? 14. Мы едим и пьем в кухне. 15. Мой брат не любит читать газеты. 16. Мы спим в спальне. 17. Мой брат спит на диване в жилой комнате. 18. Моя сестра одевается перед зеркалом. 19. Мой дядя пишет книги. 20. Мы пишем

упражнения в школе. 21. Я трачу свои карманные деньги на мороженое. 22.
Он читает все время и не любит смотреть телевизор.

The Future Indefinite Tense

The Future Simple Tense expresses a decision or an assumption with regard to the future.

1. Choose the right variant

1. Who the next president?

- a. will be b. will being c. be

2. I can't stay any longer, my friend..... tomorrow.

- a. will come b. came I c. will came

3. What for dinner?

- a. will we eat b. we will eat c. we eat

4. I the house because we are going to rebuild it.

- a. will clean b. will not clean c will cleaned

5. Next Monday there a new comedy on.

- a. will be b. will not be c. will

6. If you study harder you this exam.

- a. pass b. will passing c. will pass

7. What for Christmas?

- a. will you buy b. you will buy c. will not you buy

8 In future people less coffee.

- a. will drink b. will drinking c. will drink

9. At 9 o'clock Bob you with information.

- a. will call b. is called c. will calls

2. Put the verbs in brackets into the affirmative, interrogative and negative forms of the Future Simple

1. I (to do) morning exercises. 2. He (to work) at a factory. 3. She (to sleep) after dinner. 4. We (to work) part-time. 5. They (to drink) tea every day. 6. Mike (to be) a student. 7. Helen (to have) a car. 8. You (to be) a good friend. 9. You (to be) good friends. 10. It (to be) difficult to remember everything.

The Past Indefinite Tense

The Simple Past expresses an action that started and finished at a specific time in the past.

1. Open the brackets using the verbs in the Past Indefinite

1. What your neighbours (to do) yesterday? 2. Mr. Smith (to fix) his car yesterday morning. 3. His wife (to water) plants in the garden. 4. Their children (to clean) the yard and then they (to play) basketball. 5. In the evening their boys (to listen) to loud music and (to watch) TV. 6. Their little girl (to cry) a little and then (to smile). 7. Her brothers (to shout) at her. 8. Mrs. Smith (to work) in the kitchen. 9. She (to bake) a delicious apple pie. 10. She (to cook) a good dinner. 11. She (to wash) the dishes and (to look) very tired. 12. The children (to brush) their teeth, (to yawn) a little and (to go) to bed. 13. Their mother (to change) her clothes and (to brush) her hair. Then she (to talk) on the phone. 14. Her husband (to smoke) a cigarette and (to talk) to his wife. 15. They (to wait) for the bus. The bus (to arrive) at 9 o'clock. 16. They (to visit) their friends. 17. They (to dance) a lot there. 18. Mr. and Mrs. Smith (to rest) very well last night. They really (to have) a wonderful time at their friends.

2. Open the brackets using the verbs in the Present or Past Indefinite

1. His sister (to study) English every day. 2. She (to study) English two hours ago. 3. You (to come) home at six o'clock yesterday? – No. I Yesterday I (to come) home from school at half past eight. I (to be) very tired. I (to have)

dinner with my family. After dinner I (to be) very thirsty. I (to drink) two cups of tea. Then I (to rest). 4. I (to go) to bed at ten o'clock every day. 5. I (to go) to bed at ten o'clock yesterday. 6. My brother (to wash) his face every morning. 7. Yesterday he (to wash) his face at a quarter past seven. 8. I (not to have) history lessons every day. 9. We (not to rest) yesterday. 10. My brother (not to drink) coffee yesterday. 11. My mother always (to take) a bus to get to work, but yesterday she (not to take) a bus. Yesterday she (to walk) to her office. 12. You (to talk) to the members of your family every day? – Yes, I But yesterday I (not to talk) to them: I (to be) very busy yesterday. 13. Your sister (to go) to school every day? – Yes, she 14. Mary (to like) writing stories. 15. Last week she (to write) a funny story about her pet. 16. You (to tell) your mother the truth about the

3. Open the brackets using the verbs in the Present, Past or Future Indefinite

1. I (to go) to bed at ten o'clock every day. 2. I (to go) to bed at ten o'clock yesterday. 3. I (to go) to bed at ten o'clock tomorrow. 4. I (not to go) to the cinema every day. 5. I (not to go) to the cinema yesterday. 6. I (not to go) to the cinema tomorrow. 7. You (to watch) TV every day? 8. You (to watch) TV yesterday? 9. You (to watch) TV tomorrow? 10. When you (to leave) home for school every day? 11. When you (to leave) home for school yesterday? 12. When you (to leave) home for school tomorrow? 13. My brother (to go) to work every day. He (to leave) home at a quarter past eight. At the office he (to work) at (to be) near our house, he (to walk) there. He (not to take) a bus. Yesterday he (not to go) to work. Yesterday he (to get) up at nine o'clock. 14. You (to have) a PT lesson yesterday? – No, I 15. What you (to buy) at the shop yesterday? – I (to buy) a book. 16. Yesterday my father (not to read) newspapers because he (to be) very busy. He (to read) newspapers tomorrow.

4. Open the brackets using the verbs in the Present, Past or Future Indefinite

1. He (to turn) on the television to watch cartoons every morning. 2. He (to turn) on the television to watch cartoons yesterday morning. 3. He (to turn) on the television to watch cartoons tomorrow morning. 4. I always (to go) to the Altai Mountains to visit my relatives there. 5. I (to be) very busy last summer and I (not to go) there. 6. I (not to go) then next year because it (to cost) a lot of money and I can't afford it. 7. They (to enjoy) themselves at the symphony yesterday evening? 8. Who (to take) care of the child in the future? 9. How often you (to go) to the dentist's? 10. We (not to have) very good weather, but we still (to have) a good time during our short stay in London. 11. She (to do) all the washing in their house. 12. He even (not to know) how to use the washing machine. 13. Two years ago they (to be) rich and money (to be) never a problem. 14. You (to think) you (to be) happy in your new neighbourhood? 15. When the cabbage soup (to be) ready? 16. The customs officers at JFK airport in New York (to arrest) that young man when he (to arrive). 17. I (to like) to get on with my friends, so I often (to do) what they (to want). 18. When (to be) your birthday? 19. When you (to get) your watch? 20. Who (to create) Mickey Mouse?

The verb to be

Present		Past		Future	
I	am	I	was	I	will be
he	is	he	was	he	will be
she		she		she	
it		it		it	
we	are	we	were	we	will be
you		you		you	
they		they		they	

1. Insert the verb *to be* in the Present, Past or Future Indefinite

1. The students ... in the Russian Museum. 2. Last month they ... in the Hermitage. There ... an interesting exhibition there. 3. In two weeks they ... in the

Tretyakov Gallery. They ... lucky. 4. My father ... a teacher. 5. He ... a pupil twenty years ago. 6. I ... a doctor when I grow up. 7. My sister ... not ... at home tomorrow. 8. She ... at school tomorrow. 9. ... you ... at home tomorrow? 10. ... your father at work yesterday? 11. My sister ... ill last week. 12. She ... not ill now. 13. Yesterday we ... at the theatre. 14. Where ... your mother now? – She ... in the kitchen. 15. Where ... you yesterday? – I ... at the cinema. 16. When I come home tomorrow, all my family ... at home. 17. ... your little sister in bed now? – Yes, she ... 18. ... you ... at school tomorrow? – Yes, I 19. When my granny ... young, she ... an actress. 20. My friend ... in Moscow now. 21. He ... in St. Petersburg tomorrow. 22. Where ... your books now? – They ... in my bag.

2. Translate into English using the verb *to be* in the Present, Past or Future Indefinite

1. Вчера они были в библиотеке. 2. Сейчас они в школе. 3. Завтра они будут в театре. 4. В данный момент его здесь нет. 5. В воскресенье он будет на концерте. 6. В прошлую субботу он был на стадионе. 7. Мой брат сейчас в школе. 8. Мой брат был вчера в кино. 9. Мой брат будет завтра дома. 10. Ты будешь дома завтра? 11. Она была вчера в парке? 12. Он сейчас во дворе? 13. Где студенты? 14. Где они были вчера? 15. Где они будет завтра? 16. Мои книги были на столе. Где они сейчас? 16 Ты будешь врачом? – Нет, я не буду врачом. Я буду инженером.

The Present Continuous Tense

The Present Continuous Tense is used to talk about activities happening now.

1. Open the brackets using the verbs in the Present Continuous

(NOW) 1. Timothy (to feed) his dog. 2. Mr. Jones (to clean) his yard. 3. Nancy (to paint) her kitchen. 4. Our neighbours (to wash) their car. 5. I (to wash) my hair. 6. Who (to fix) your sink? 7. What she (to do) now? – She (to dance). 8. The children (to brush) their teeth. 9. What he (do) at the moment? – He (to fix)

his bicycle. 10. They (to have) a big dinner together. 11. The boys (to run) about in the garden. 12. I (to do) my homework. 13. John and Ms friends (to go) to the library. 14. Ann (to sit) at her desk. She (to study) geography. 15. A young man (to stand) at the window. He (to smoke) a cigarette. 16. The old man (to walk) about the room. 17. The dog (to lie) on the floor. 18. You (to have) a break? 19. What language you (to study)? 20. Who (to lie) on the sofa? 21. What they (to talk) about? 22. It still (to rain). 23. I (to open) an umbrella. 24. John (to play) computer games

2. Translate the sentences into English using the verbs in the Present Continuous

(СЕЙЧАС) 1. Я сижу в парке на скамейке и кормлю птиц. 2. Мама сидит на диване в гостиной и смотрит телевизор. 3. Это фотография моих друзей. Том играет на гитаре, а Джейн поет. 4. А здесь они танцуют на моем дне рождения. 5. Мы делаем упражнение. 6. Мы не купаемся. 7. Они играют во дворе? 8. Нина и Аня моют пол. 9. Коля помогает маме. 10. Ты помогаешь папе? 11. Моя сестра читает интересную книгу. 12. Они идут в школу. 13. Вы идете в школу? 14. Он работает? 15. Твоя бабушка идет в магазин? 16. Он покупает конфеты. 17. Что делает твоя сестра? 18. Где играют дети? 19. Почему ты смеешься? 20. Куда они идут?

3. Open the brackets using the verbs in the Present Continuous or Present Indefinite

1. He (to work) in the centre of Chicago. 2. He (to work) in the centre of Chicago? 3. He (not to work) in the centre of Chicago. 4. They (to read) many books. 5. They (to read) many books? 6. They (not to read) many books. 7. The children (to eat) soup now. 8. The children (to eat) soup now? 9. The children (not to eat) soup now. 10. You (to play) volleyball well? 11. When you (to play) volleyball? 12. What Nick (to do) in the evening? 13. He (to go) to the cinema in

the evening? 14. We (not to dance) every day. 15. Look! Kate (to dance). 16. Kate (to sing) well? 17. Where he (to go) Ln the morning? 18. He (not to sleep) after dinner. 19. My granny (to sleep) after dinner. 20. When you (to sleep)? 21. Nina (not to sleep) now. 22. Where John (to live)? – He (to live) in England. 23. My friends from Switzerland (to speak) four languages. 24. Elvire (to speak) English, German and French? Yes, she 25. She only (not to speak) Italian.

4. Open the brackets using the verbs in the Present Continuous or the Present Simple

1. In the evening I often (to go) to see my friends. 2. On Sunday we sometimes (to go) to the cinema or to a disco club. 3. Andrew (to get) up very early as he (to live) far from school. He (to be) never late. 4. It (to be) six o'clock in the evening now. Victor (to do) his homework. His sister (to read) a book. His mother and grandmother (to talk). 5. I (to write) a letter to my grandmother who (to live) in Novgorod. I (to write) to her very often. 6. It (to take) me forty minutes to get to school. 7. Hello, Pete, where you (to go)? – I (to hurry) to school. 8. When your lessons (to begin) on Monday? – They (to begin) at nine o'clock. 9. Where your sister (to be)? – She (to do) her homework in the next room. 10. It usually (to take) me an hour to do my written exercises. 11. Where Boris (to be)? I (to look) for him. – He (to have) dinner. 12. I (to look) for a cassette recorder.

The Past Continuous Tense

The Past Continuous tense expresses an action at a particular moment in the past. The action started before that moment but has not finished at that moment.

1. Open the brackets using the verbs in the Past Indefinite or Past Continuous

1. I (to go) to the cinema yesterday. 2. I (to go) to the cinema at four o'clock yesterday. 3. I (to go) to the cinema when you met me. 4. I (to do) my homework the whole evening yesterday. 5. I (to do) my homework when mother came home.

6. I (to do) my homework yesterday. 7. I (to do) my homework from five till eight yesterday. 8. I (to do) my homework at six o'clock yesterday. 9. I (not to play) the piano yesterday. I (to write) a letter to my friend. 10. I (not to play) the piano at four o'clock yesterday. I (to read) a book. 11. He (not to sleep) when father came home. He (to do) his homework. 12. When I (to go) to school the day before yesterday, I met Mike and Pete. They (to talk) and (to laugh). They told me a funny story. Soon I (to laugh), too. I still (to laugh) when we came to school. After school I (to tell) this story at home. My father and mother (to like) it very much. 13. When we were in the country last summer, I (to go) to the wood one day. In the wood I (to find) a little fox cub. I (to bring) it home. I (to decide) to tame the cub. Every day I (to feed) it and (to take) care of it. I (to tame) it the whole summer. Now the fox cub is quite tame. It lives in my house.

1. Open the brackets using the verbs in the Past Simple or the Past Continuous

1. I (to go) to the theatre yesterday. 2. At seven o'clock yesterday I (to go) to the theatre. 3. What you (to do) at 5 o'clock yesterday? – I (to play) the piano. 4. When I (to come) to school, the children (to stand) near the classroom. 5. We (to play) in the yard the whole evening yesterday. 6. When I (to prepare) breakfast in the morning, J (to cut) my finger. 7. Last year I (to go) to the United States. 8. You (to go) to Great Britain last year? – No, I (to go) to France. 9. What you (to do) yesterday? – I (to translate) a very long article. 10. When I (to ring) up my friend, he (to sleep). 11. When grandfather (to watch) TV, he (to fall) asleep. 12. When my friend (to come) to see me, I (to do) my homework. 13. When I (to go) to the stadium, I (to meet) Kate and Ann. 14. When Nick (to ring) me up yesterday, I (to help) mother. 15. When the children (to walk) through the wood, they (to see) a fox. 16. When I (to come) home, my sister (to wash) the floor. 17. When Mike (to play) in the yard, he (to find) a ball. 18. When I (to draw) yesterday, I (to break) two pencils. 19. When I (to meet) Tom, he (to go) to the shop. 20. When I (to look) out of the window, the children (to play) hide-and-seek.

The Present Perfect Tense

The present perfect is used for three reasons:

1. To describe an action that goes from the past up to the present moment.
2. To describe an action that occurred sometime in the past but the exact time is unknown.
3. To describe an action that was repeated many times in the past.

1. Open the brackets using the Present Perfect or the Past Indefinite

1. I (not yet to eat) today. 2. He (not to eat) yesterday. 3. You (to play) the piano yesterday? 4. You (to play) the piano today? 5. What you (to prepare) for today? 6. Look at this birdhouse. Mike (to make) it himself. He (to make) it last Sunday. 7. Where you (to put) my pen? I cannot find it. 8. You (to see) Mary today? 9. When you (to see) Mary? – I (to see) her last week. 10. Your mother (to promise) to take you to the theatre? 11. Look at my new dress! I (to make) it myself. 12. He is not at school today, he (to fall) ill. – When he (to fall) ill? – He (to fall) ill yesterday. 13. I already (to do) my homework. Now I can go for a walk. 14. I (to do) my homework yesterday. 15. He just, (to come) home. 16. He (to come) home a minute ago. 17. Nick (to play) football yesterday. 18. She already (to come) from school. Now she is doing her homework. 19. I (to read) this book last year. 20. I (to read) this book this year. 21. I never (to be) to Washington. 22. You ever (to be) to New York? 23. You ever (to see) the eruption of a volcano? 24. I (to invite) Linda to the party. – When you (to see) her? – I (not to see) her for ages. I (to call) her an hour ago.

2 Open the brackets using the Present Perfect, Present Continuous, Present Simple or Past Simple

1. What you (to do) here at such a late hour? You (to write) your composition? –No, I (to write) it already. I (to work) at my report. – And when you (to write) your composition? – I (to finish) it two days ago. 2. I say, Tom, let's

have dinner. – No, thank you, I already (to have) dinner. 3. What the weather (to be) like? It still (to rain)? – No, it (to stop) raining. 4. Please give me a pencil, I (to lose) mine. 5. I (not to meet) Peter since Monday. 6. Nina just (to finish) work. 7. Where Sergei (to be)? – He (to go) home. He (to leave) the room a minute ago. 8. What you (to read) now? – I (to read) ‘Jane Eyre’ by Charlotte Bronte. 9. They (to read) ‘Ivanhoe’ by Walter Scott a month ago. What about you? You (to read) ‘Ivanhoe’? 10. My watch (to stop). There (to be) something wrong with it. 11. You (to see) Jack today? – Yes, I (to see) him at the institute. 12. You (to hear) the new symphony by M.? – Yes, I – When you (to hear) it? – I (to hear) it last Sunday. 13. You (to change) so much. Anything (to happen)?

The Past Perfect Tense

The past perfect simple is used to describe one action that happened before another action in the past.

1. Open the brackets using the verbs in the Past Indefinite or Past Perfect

1. By two o'clock the teacher (to examine) all the students. 2. On my way to school I (to remember) that I (to leave) my report at home. 3. All my friends (to be) glad to hear that I (to pass) all the examinations successfully. 4. Poor Oliver (to lie) unconscious on the spot where Sikes (to leave) him. 5. He (to open) his eyes, (to look) around and (to try) to remember what (to happen) to him. 6. All the passengers (to see) at once that the old man (to travel) a great deal in his life. 7. By the time we (to come) to see him, he (to return) home. 8. During the holidays my friend (to visit) the village where he (to live) in his childhood. 9. When they (to enter) the hall, the performance already (to begin). 10. When I came home, my mother (to tell) me that she (to receive) a letter from grandfather. 11. Where you (to work) before you (to enter) the institute? 12. He (to study) French before he (to enter) the university. 13. Lanny (to say) that he (to get) his education in Cape Town. 14. The boy (to want) to act the main part in the play because he (to

organize) the theatre. 15. Lanny (not to know) who (to attack) him in the darkness. 16. The girl (to be) glad that she (to find) a seat near the window. 17. Suddenly he (to remember) that he (not to ring) her up in the morning. 18. By the time the train (to reach) the city, he (to make) friends with many passengers. 19. When my uncle (to leave), he (to hurry) to the station to book a ticket. 20. She (to think) that Gert and Lanny (to quarrel).

The Future Perfect Tense

The future perfect tense is used to describe an event that has not yet happened but which is expected or planned to happen before another.

1. Open the brackets using the Future Indefinite, Future Continuous or Future Perfect

1. I (to do) my homework tomorrow. 2. I (to do) my homework at six o'clock tomorrow. 3. I (to do) my homework by six o'clock tomorrow. 4. Tomorrow I (to begin) doing my homework as soon as I come from school. I (to do) my homework from three till six. My father (to come) home at seven o'clock tomorrow. I (to do) all my homework by the time he comes, and we (to go) for a walk together. 5. When I come home tomorrow, my family (to have) supper. 6. When you come to my place tomorrow, I (to read) your book. I (to do) my homework by the time you come. 7. Don't come to my place tomorrow. I (to write) a composition the whole evening. 8. I (not to go) to the cinema tomorrow. I (to watch) TV the whole evening. 9. What you (to do) tomorrow? 10. What you (to do) at eight o'clock tomorrow? 11. You (to play) volleyball tomorrow? 12. You (to do) this work by next Sunday? 13. When you (to go) to see your friend next time? 14. How many pages you (to read) by five o'clock tomorrow?

2. Open the brackets using the Present, Past, Future Indefinite; the Present, Past Continuous; the Present, Past Perfect

It was eight o'clock in the morning and time for me to go to work. I (to look) out of the window. It (to rain) hard. 'You (to get) wet through if you (to go) out now,' said my mother. 'No, I ...' I answered, 'I (to take) an umbrella and we (to have) five umbrellas in the house, but when I (to want) to take one, I (to find) that there (to be) not one that I could use: they all (to be) torn or broken. So I (to take) them all and (to carry) them to the umbrella maker, saying that I would call for the umbrellas on my way home in the evening. When I (to go) to have lunch in the afternoon, it still (to rain) very hard. I (to go) to the nearest cafe, and (to sit) down at a table. A few minutes later a young woman (to come) in and (to sit) down at the same table with me. When I (to finish) my lunch and (to be) ready to leave, I absent-mindedly (to take) her umbrella and (to start) for the exit. She (to stop) me saying that I (to take) her umbrella. I (to return) the umbrella with many apologies. In the evening I (to go) to the umbrella maker, (to take) my five umbrellas and (to get) on the tram to go home. It so happened that the woman I (to meet) at the cafe (to ride) in the same tram. When she (to see) me with my five umbrellas, she (to say): "You (to have) a successful day today, (to have not) you

Оборот there + is / are (наличие / отсутствие предмета или явления)

	Indefinite	Perfect
Past	There was / were	There had been
Present	There is / are	There has been / have been
Future	There will be	There will have been

1. Complete the sentences

1. There ... a bathroom opposite the hall. 2. There ... hot and cold water and gas in our house. 3. There ... a lot of flats in this block next year. 4. ... there a garden at the back of your house? 5. There ... some bad marks in his diary last year. 6. There ... no piano in the living-room yesterday.

2. Write the questions

1. There are three rooms in their flat. (How many . . .) 2. There is a lot of metal in the yard of the factory. (How much . . .) 3. There is a cosy living room in our flat. (What . . .) 4. There is a lot of bread on the plate. (What . . .) 5. There are 6 lessons today. (How many . . .) 6. There are a lot of seats for today in a restaurant. (Are there . . .)

3.Translate into Russian

Is there a sofa in this room? Is there any paper in the bag? Is there any salt there? Are there any flowers on the window? There is no bed in this room. There is a diskette on the desk. Is there a train at 5 o'clock? There are only twelve letters in the Hawaiian alphabet: A, E, H, I, K, L, M, N, O, P, U and W. There is a street in Canada that is 1,900km long. There are about 790,000 words in English. There are about 5,000 languages in the world (845 in India).

4.Translate into English

1. На стене – 4 картины. 2. В этом магазине хорошая одежда. 3. На полу – ковер. 4. На окне несколько цветов. 5. На столе яблоки и апельсины. 6. В альбоме 220 фотографий. 7. Что у тебя в сумке?. 8. Вверх по лестнице 2 спальни. 9. На 5 странице 2 картинки. 10. на 6 странице картинок нет. 11. Во дворе бассейн? 12. За домом гараж.(behind) 13. На Оксфорд-стрит мало магазинов.14. В 2 часа есть автобус до N. 15. На 5 этаже бар. 16. На 6 этаже спортивный зал. 17. Там несколько машин. 18. Есть места в первый ряд на 4 часа. 19. Рядом со стулом кошка. 20. Там много детей. 21. В той комнате был телефон? 22. Там пожар. 23. В этой комнате нет телефона. 24. Дверь – вон там. 25. В бутылке не было воды. 26. В деревне не было школы. 27. В тетради не будет упражнений. 28. В этом словаре не было рисунков.

Irregular verbs

Verbs with the same infinitive, past simple and past participle

cost	cost	cost	СТОИТЬ
cut	cut	cut	резать
hit	hit	hit	ударять
let	let	let	ПОЗВОЛЯТЬ
put	put	put	КЛАСТЬ
read /ri:d/	read /red/	read /red/	ЧИТАТЬ
set	set	set	УСТАНАВЛИВАТЬ
shut	shut	shut	ЗАКРЫВАТЬ

Verbs with the same past simple and past participle, but a different infinitive

bring	brought	brought	ПРИНОСИТЬ
build	built	built	СТРОИТЬ
burn	burnt/burned	burnt/burned	ГОРЕТЬ, ЖЕЧЬ
buy	bought	bought	ПОКУПАТЬ
catch	caught	caught	ЛОВИТЬ
feel	felt	felt	ЧУВСТВОВАТЬ
find	found	found	НАХОДИТЬ
get	got	got	ПОЛУЧАТЬ
have	had	had	ИМЕТЬ
hear	heard	heard	СЛЫШАТЬ
hold	held	held	ДЕРЖАТЬ
keep	kept	kept	ХРАНИТЬ
learn	learnt/learned	learnt/learned	УЧИТЬ
leave	left	left	ПОКИДАТЬ
lend	lent	lent	ОДАЛЖИВАТЬ
light	lit/lighted	lit/lighted	ОСВЕЩАТЬ, ЗАЖИГАТЬ

lose	lost	lost	терять
make	made	made	делать
mean	meant	meant	значить
meet	met	met	встречать
pay	paid	paid	платить
say	said	said	говорить
sell	sold	sold	продавать
send	sent	sent	посылать
sit	sat	sat	сидеть
sleep	slept	slept	спать
smell	smelt/smelled	smelt/smelled	пахнуть
spell	spelt/spelled	spelt/spelled	произносить
spend	spent	spent	проводить
stand	stood	stood	стоять
teach	taught	taught	учить
understand	understood	understood	понимать
win	won	won	выигрывать

Verbs with the same infinitive and past participle but a different past simple

become	became	become	становиться
come	came	come	приходить
run	ran	run	бежать

Verbs with a different infinitive, past simple and past participle

be	was/were	been	быть
begin	began	begun	начинать
break	broke	broken	ломать
choose	chose	chosen	выбирать
do	did	done	делать

drink	drank	drunk	пить
drive	drove	driven	ездить
eat	ate	eaten	есть
fall	fell	fallen	падать
fly	flew	flown	летать
forget	forgot	forgotten	забывать
give	gave	given	давать
go	went	gone	идти
grow	grew	grown	расти
know	knew	known	знать
lie	lay	lain	лежать
ring	rang	rung	звонить
rise	rose	risen	подниматься
see	saw	seen	видеть
show	showed	shown	показывать
sing	sang	sung	петь
speak	spoke	spoken	говорить
swim	swam	swum	плавать
take	took	taken	брать
throw	threw	thrown	бросать
wake	woke	woken	будить, просыпаться
wear	wore	worn	носить
write	wrote	written	писать

2 PREPOSITIONS

Предлоги	Значение	Примеры	Перевод
а) ПРЕДЛОГИ ДВИЖЕНИЯ			

to	движение по направлению к предмету (лицу)	Let's go to the park. Come up to me. Go to the lecture now.	Пойдемте в парк. Пойдемте ко мне. Идите сейчас на лекцию.
from	движение от предмета (лица)	Step aside from the door. Take my book from me. When do you come home from the Institute?	Отойдите от двери. Возьмите книгу у меня. Когда вы приходите домой из института?
into	движение внутрь пространства	Come into the room.	Войдите в комнату.
out of	движение из пространства	Take your books out of your bags.	Выньте книги из портфелей.
on (to)	движение на поверхность	The passengers stepped onto the platform.	Пассажиры вышли на платформу.
6) ПРЕДЛОГИ МЕСТА			
at	местонахождение у предмета, а также там, где протекает процесс	I am sitting at the table. She is at her brother's. The children are at the lesson (theatre).	Я сижу за столом. Она у брата. Дети сейчас на уроке (в театре).
in	местонахождение внутри пространства	The student is in the class-room.	Студент в аудитории.
on	местонахождение на поверхности	The map is on the wall. A book is on the shelf.	Карта на стене. На полке лежит книга.
under	местонахождение под другим предметом	A box is under the bed.	Под кроватью – ящик.
across	через	A bridge lies across a river.	Через реку проложен мост.
over	местонахождение над другим предметом	The sky is over our heads.	Над нашими головами небо.
above	местонахождение над другим предметом	There is a picture above the table.	Над столом висит картина.
in front	местонахождение	I sit in front of the	Я сижу перед столом

of	предмета перед другим	teacher's table.	преподавателя.
behind	местонахождение предмета позади другого	The garden is behind the house.	Сад находится позади дома.
around	нахождение предмета вокруг другого	The guests were sitting around the table.	Гости сидели вокруг стола.
в) ПРЕДЛОГИ ВРЕМЕНИ			
in	внутри временного отрезка	in September, in 1980	в сентябре, в 1980
in	через некоторое время	in two days	через 2 дня
at	в (точка во времени)	at 7 o'clock, at midnight	в 7 часов, в полночь
on	в (с днями недели, датами)	on Monday, on 1 st of May	в понедельник, 1 ^{го} Мая
by	к точному моменту	by 5 o'clock, by Friday	к 5 часам, к пятнице
from. till	от ... до ...	from 2 till 3 o'clock	с двух до трех
for	в течение времени	for an hour	в течение часа
during	во время (чего-либо)	during the meeting	во время собрания
after	после (чего-либо)	after classes	после занятий

Особые случаи употребления предлогов времени

IN (the)

Parts of the day (not night)	in the morning(s) in the evening (s) in the afternoon, etc
months	in February
seasons	in (the) summer
years	in 1998
decades	in the 1920s
centuries	in the 20 th century

AT (the)

clock time	at 5 o'clock at 7.45 p.m
night	at night
holiday periods	at Christmas at the weekend (BrE)

ON (the)

day of the week	on Saturday
dates	on (the) 20 th (of) May
particular days	on Good Friday on New Year's Day on my birthday on the following day

1. Insert prepositions *on, in, into*

1. There are many people ... the park today. There is a girl standing ... the bridge. Why is she crying? – She has dropped her doll ... the water. There is no tea ... my cup. 4. Pour some tea ... my cup. 5. Put these flowers ... the windowsill. 6. I saw many people ... the platform waiting for the train. 7. We went ... the garden and sat down ... a bench. 8. The teacher hung a picture ... the blackboard. 9. I opened the door and went ... the classroom. The teacher was writing some words ... the blackboard. The pupils were writing these words ... their exercise books. There were some books and pens ... the teacher's table. There were two maps ... the wall and some flowers ... the windowsills. I saw a pen ... the floor. I picked it up and put it ... the table. 10. He put his hand ... his pocket, took out a letter and dropped it ... the mailbox which hung ... the wall of the house. Then he got ... his car and drove off. 11. Where is the book? – It is ... the table. 12. Where is the tea? – It is ... the cup. 13. Put the plates ... the table. 14. Put the book ... the bag. 15. There is a beautiful picture ... the wall. 16. He went... the room. 17. I like to sit ... the sofa ...

my room. 18. Mother is cooking dinner ... the kitchen. 19. She went ... the room and sat down ... the sofa.

2. Translate into English using prepositions *on, in, at, to, into*

1. Мы собрали в лесу много грибов. 2. Маша открыла дверь и вошла в дом. 3. В доме никого не было. Медведи были в лесу. В комнате Маша увидела стол. Она подошла к столу. На столе она увидела три тарелки. 4. Катя была в комнате. Она стояла у книжного шкафа. На полу лежал толстый ковер. Дети сели на ковер и начали играть. 5. Где мальчишки? – Они играют во дворе. 6. Сейчас зима. На земле лежит снег. На реке лед. 7. Она подошла к доске, взяла мел и начала писать на доске. 8. Масло на столе. Поставь его в холодильник. А теперь садись за стол. В этом стакане сок. Выпей его и поставь стакан на полку. 9. Где твоя ручка? – Она в моем кармане. Положи в карман платок. 10. Он прыгнул в реку и быстро поплыл к острову. 11. Идите к доске. Напишите число на доске.

REMEMBER

ГДЕ?

At the theatre, at the cinema, at the museum, at the swimming pool, at the library, at the shop, at the institute, at the port, at the railway station, at the concert, at the exhibition, at the stadium, at the stop, at the factory, at work, at school, at the lesson.

КУДА?

To the theatre, to the cinema, to the museum, to the swimming pool, to the library, to the shop, to the institute, to the port, to the railway station, to the concert, to the exhibition, to the stadium, to the stop, to the factory, to work, to school, to the lesson.

1. Insert prepositions *in* or *to*

1. In winter I usually go ... bed at ten o'clock because I learn ... school and have to get up early. But in summer, when I don't go ... school and live ... the country, I like to go ... bed late. 2. Do you like to read ... bed? 3. We did not want to stay ... town on such a hot day, so we went ... the country. 4. It is very late. Go ... bed at once. 5. Where is your little sister? – She is ... bed. Mother always puts her ... bed at eight o'clock. 6. In summer my mother does not go ... work and I don't go ... school. We live ... the country. My father goes ... work every day, so he stays ... town. But sometimes he comes ... the country after work and goes back ... town early in the morning, when I am still ... bed.

2. Translate the following word combinations into English

В четыре часа, в половине шестого, без четверти три, на закате, в четверть пятого, в полночь, в пять минут шестого, без десяти два, в полдень, на восходе солнца, в двадцать пять третьего.

Preposition of time: ON

В воскресенье – On Sunday. Пятого марта – On the 5th of March

3. Insert prepositions *at* or *on*

1. I get up ... seven o'clock or ... a quarter past seven. 2. ... Sunday I usually get up ... nine o'clock or ... half past nine. But last Sunday I slept very long and got up only ... noon. 3. My birthday is ... the ninth of July. 4. The school year begins the first of September. 5. ... the twenty-fifth of December people celebrate Christmas. 6. ... Wednesday I usually have a lot of homework. 7. Lev Tolstoy liked to get up ... sunrise. 8. Our lessons are usually over ... twenty minutes to two. 9. They returned from the wood ... sunset. 10. I began writing my composition ... seven o'clock and finished only ... midnight.

Preposition of time: IN

В 1997 году – in 1997. В марте – in March.

Но: в этом году – this year, в прошлом году – last year, в будущем году – next year. В этом месяце – this month, в прошлом месяце – last month, в будущем месяце – next month. На этой неделе – this week, на прошлой неделе – last week, на будущей неделе – next week.

Preposition of time: BY

К пяти часам – by 5 o'clock
 К 2003 году – by 2003
 К завтрашнему дню – by tomorrow

Preposition of time: SINCE

С прошлого года – since last year
 С весны – since spring
 С 1998 года – since 1998
 С утра – since morning
 С трех часов – since 3 o'clock

8. Translate into English the following word combinations.

В пять часов, к пяти часам, с пяти часов, в полдень, к полудню, с полудня, с полуночи, к полуночи, в полночь, с прошлого года, в прошлом году, в этом году, к 2005 году, к двадцатому февраля, двадцатого февраля, с утра, к ночи, ночью, к первому ноября, в ноябре, с лета, во вторник, к пятнице, в половине третьего, к завтрашнему дню, на восходе солнца, к весне, весной, прошлой весной, с прошлой весны, к зиме, в будущем году, к будущему году, со вчерашнего дня.

3 QUESTIONS

Special and General Questions / Answers

Special questions	General questions
What are you doing?	‘Are you watching TV?’
Where do you live?	‘Do you play chess?’
Why have you done it?	‘Does she go to school?’
Who has done it?	‘Are you listening to me?’

When did you do it?	'Have you done your homework?'
Which book do you like most of all?	'Did you skate last winter?'
Whose sister is Alice?	'Will you see your friend tomorrow?'

1. The University course in the history of mathematics and mechanics / is helpful to mathematics and mechanics classes. What is helpful to classes on speciality? What course is helpful? It is the University course in the history of sciences. Is (isn't) the University course in the history of sciences helpful to classes on speciality? Yes, it is. What is it helpful to? It is helpful to classes on speciality.

2. The history of the sciences / shows / how they originate, develop, grow and change. What (what history) shows how the sciences originate, develop, grow and change? Does (doesn't) the history of the sciences show how they originate...? What does the history of the sciences do? What does the history of the sciences show?

3. Historical topics / increase / the students' interest in their speciality subjects. What increases the interest of the students in their speciality subjects? Do (don't) hisjorical topics increase the interest of the students in their speciality subjects? What do historical topics do? What do historical topics increase? Whose interest do historical topics increase? In what subjects do historical topics increase the students0 interest?

Disjunctive Questions

1. The use of the history of mathematics and mechanics gives a good understanding of the foundations of these sciences, doesn't it? It does, surely. 2. Students are interested in the 'men of mathematics' as people, aren't they? They are, indeed. 3. A historical topic can be an important tool to create insight (s), can't it? It can, in fact.

Alternative Questions

1. Can a story about the discovery and invention in mathematics increase or decrease students' interest in mathematics? It can increase it. 2. Do modern mathematicians create abstract or empirical mathematics? Abstract mathematics, sure enough. 3. Does mathematics advance through one technique or the interplay of many techniques? Of course, through many.

4 Modal Verbs and their Equivalents

can	may	must
to be able	to be allowed	need, shall, should, ought to, to be (to), to be due (to), to be bound (to), to have (to), to have got (to), to be obliged (to)

1. Translate the sentences

1. Are you able to draw a straight line without a ruler? 2. We are allowed to use only a straightedge and a compass in ruler-compass constructions. 3. Are we to define all the plane geometric figures? No, you need not. You should perform the construction first. 4. I have to make another drawing as this one is inaccurate. 5. He shall use this method of proof for the problem. 6. I have got to check my results. 7. The solution is due to be found. 8. The plan is bound to succeed. 9. He is obliged to fulfill his task. 10. She describes how the constructions are to be performed.

4 The formation of the Passive Voice

Tense	Active	Passive
Present Simple	ask(s)/give(s)	am/is/are asked/given
Past Simple	asked/gave	was/were asked/given
Future Simple	will ask/give	will be asked/given

Present Continuous	am/is/are asking/giving	am/is/are being asked/given
Past Continuous	was/were asking/giving	was/were being asked/given
Future Continuous	will be asking/giving	
Present Perfect	have/has asked/given	have/has been asked/given
Past Perfect	has asked/given	had been asked/given
Future Perfect	will have asked/given	will have been asked/given

1. Translate the following sentences paying attention to the way the predicate should be rendered in Russian

1. We **are so accustomed** to expressing relations by means of compact symbols that it **is tempting** to identify the symbols with algebra itself. 2. However, for a long time the subject matter of algebra **was written out** in common language. 3. The major task of historian seeking to understand ancient algebra **has** always **been** to express it, if possible, in modern symbols and thus to disclose its abstract form. 4. Any development toward a more compact way of displaying complex relationships **has been regarded** as a fundamental advance. 5. Such an advance in the field of algebra **was made** by the French mathematicians R. Descartes and F. Viete. 6. The concern for unambiguous terminology and symbolism **had preceded** by two centuries the concern with structures. 7. It was not until the end of the fifteenth century that algebra **was assuming** a somewhat modern form.

8. A general theory of structure (beginning with the solution of polynomial equations and the relations between their roots and coefficients) **has led** to the 'completion' of the complex-number system. 9. Due to the extension of the complex numbers by hypercomplex numbers, new algebraic structures **have been created**. 10. The domain of algebra **has been** profoundly **expanded** thanks to the change of the whole nature of algebra. 11. Early in the nineteenth century algebra **has become** a science

that could deal effectively with anything. 12. Modern algebra **is being made** to apply to situations, which at first sight in no way related to algebra.

Passive of the verbs taking prepositional objects

1) He looked *through* all the advertisements very attentively. – All the advertisements were looked *through* very attentively. 2) They have already agreed *upon* the plan. – The plan has already been agreed *upon*.

6 Complex Sentences

Тип придаточного предложения	Союзы, союзные слова	Примеры
Подлежащее	союзы: that (что; то, что), whether, if (ли) союзные слова: whom, who, whose, what, which, when, where, how, why	That she has not come is strange. It is strange that she is here. Whether he will come is not known. What she says is not true. When we shall do it is not clear.
Предикативное	те же	The question is whether he can do it. The matter is that I am not ready yet.
Дополнительное	те же	He said that he was busy. He asked me if I studied Latin.
Определительное	относит, местоимения и наречия: who, whom, whose, which, that (который), how, why, when, where	The man whom you see there is my brother. This is the house in which I live (I live in). The letter that I got yesterday came too late. The place where I was born is far from here. I don't remember the day when he left.

<p>Обстоятельственное времени</p>	<p>when (когда), while (пока, в то время как), as (когда, в то время как), till / until (пока, до тех пор, пока), after (после того как), before (перед тем как), since (с тех пор как), as soon as (как только)</p>	<p>When I come home, I take a rest. While I was reading the book, I learned many new words. I shall wait here until he comes. Before I leave I'll let you know. I haven't seen him since we finished school. I'll come to see you as soon as I have some spare time.</p>
<p>Обстоятельственное причины, места</p>	<p>because (потому что), as (так как), since (поскольку), where (где, куда)</p>	<p>I did not come yesterday because I was ill. As it was late, we returned home. Since you are free you will help us. They went where you sent them.</p>
<p>Обстоятельственное условия</p>	<p>if (если), in case (в случае если), unless (если не), provided (если только, при условии что)</p>	<p>If I am busy, I shall not do it. In case it rains, I'll stay here. I shall not finish this work unless you help me. We'll go to the theatre today provided we get tickets</p>
<p>Обстоятельственное цели</p>	<p>so that (для того, чтобы), in order that (чтобы)</p>	<p>The teacher spoke slowly so that the pupils could understand him.</p>
<p>Обстоятельственное уступки</p>	<p>though, although (хотя), even if (даже если), whatever (что бы ни), whoever (кто бы ни), in spite of the fact (несмотря на то, что), however, no matter how (как бы ни)</p>	<p>Though he is old, he looks well. Whatever happens, don't change your plan. Whoever comes, tell him I am not in. The travelers went on climbing in spite of the fact that the weather was worsening. However tired I am (No matter how tired I am), I'll do it.</p>

Обстоятельственное сравнения	than (чем), as ... as (так же как; такой как),	The concert lasted longer than I expected.
	not so ... as (не так/такой как), as if (как будто)	This language is not so easy as you think. He speaks as fast as I do. She speaks French so fluently as if she had lived in France for a long time.

1. Complete the sentences with suitable relative pronouns *who, which, that*

1. That's the computer ___ I'd like to buy. 2. A co-processor is an extra processor chip ___ does calculations at high speed. 3. The microprocessor coordinates the activities ___ take place in the computer system. 4. Last night I met someone ___ works for GM as a computer programmer. 5. A palmtop is a computer ___ is small enough to be held in the palm of one hand. 6. A megahertz is a unit of frequency ___ is used to measure processor speed. 7. Here's the DVD ___ you lent me!

2. Translate the complex sentences into Russian paying attention to various types of clauses (predicate clauses, subject clauses, adverbial clauses, object clauses)

1. A serious difficulty will be in that such compounds have not yet being considered. 2. What matters here is that in principle the problem can't be solved empirically. 3. The question remains whether this approach is applicable in all cases. 4. That it is easy to confuse the two notions is indicated by this example. 5. How the plus and minus came into use is a matter of considerable hypothesis. 6. When they advanced their hypothesis they had no adequate tool to make it practicable. 7. Although there is no generally accepted theory, there is much data. 8. You never know what you can do till you try. 9. Applications are endless, wherever high data storage capacity is required. 10. It was found that other

derivatives did not result in higher yields. 11. We learned that the results reported by these scientists were erroneous. 12. Any equation has roots and it does not matter whether its coefficients are real or imaginary. 13. In any case, it is questionable whether with small samples extreme uniformity should be a basis for making data suspect.

7 Non-finite Forms of the Verb

The Participle

	Active	Passive
Present Participle	asking	being asked
Past Participle	asked	-
Perfect Participle	having asked	having been asked

Present Participles

Present participles end in *-ing*.

Examples: boiling water, caring nature, deserving recipient.

- A *laughing* man is stronger than a *suffering* man (Gustave Flaubert, 1821-1880).
- If you pick up a *starving* dog and make him prosperous, he will not bite you. This is the principal difference between a dog and a man (Mark Twain, 1835-1910).
- The only thing that comes to a *sleeping* man is dreams (Tupac Shakur).

Past Participles

Past participles are third forms of irregular verbs or regular verbs ending in *-d*, *-ed*.

Examples: broken window, painted frame, destroyed bridge.

- A *swollen* eye is God's way of telling you to improve your interpersonal skills.
- Do not waste time staring at a *closed* door.

- I like children...if they're properly *cooked*. (W.C. Fields)

Perfect Participles

Perfect Participles are formed: having + third forms of irregular verbs or regular verbs ending in *-d, -ed*.

Examples:

Having explained everything, I want to say how sorry I am.

Having finished the letter, he went to the office.

Having settled the problem, you will find something new to worry about.

1. Translate the following Participles

Разбитая чашка, проигранная игра, разорванный конверт, проигравшая команда, проигрывающая команда, кипяченая вода, кипящая вода, испытанный метод, работающее оборудование, выбранная тема, смеющийся голос, смеявшаяся девушка, печеный картофель, найденное решение, сделанное открытие, смотрящий вдаль человек.

2. Open the brackets using the correct form of the Participle

1) A crowd of (excite) people were watching the firemen trying to save the (burn) building. 2) 'During my vacation I came across several very (interest) books' he said. 'Which ones?' she asked in an (interest) voice. 3) Why do you look so (worry)? – I've had a number of (worry) telephone calls lately. 4) I don't know what was in the (burn) letter, I didn't read it. 5) Nothing can save the (sink) ship now, all we can do is to try and save the passengers. 6) It was an (excite) incident. No wonder she spoke about it in an (excite) voice. 7) After hearing the (frighten) tale, the (frighten) children wouldn't go to sleep. 8) The doctor did his best to convince her that there was nothing seriously wrong with the boy but the (worry) mother wouldn't calm down.

3. Translate the word in brackets

1) (Рассказав все, что он знал), the man left the room. 2) (Постучав дважды и не дождавшись ответа), he came in. 3) (Толкнув дверь) he realized it was not locked. 4) (Приехав в гостиницу) she found a telegram awaiting for her. 5) (Приехав сюда) many years before he knew that countryside perfectly. 6) I felt very tired (проработав целый день) in the sun. 7) (Уронив монету на пол) he didn't care about looking for it in the darkness. 8) (Повернувшись), she smiled

The Infinitive

Forms	Active	Passive
Indefinite	to write	be written
Continuous	to be writing	
Perfect	to have written	to have been written

Use	Word List	Example
as the subject of a clause		To know you is to love you
after certain expressions (without 'to')	had better, would rather, would sooner, why not, why should I/you/... [not]	<i>Why not go</i> to the cinema?
after modal verbs (without 'to')	can, dare (also with <i>to</i>), do, help (also with <i>to</i>), let, may, must, need (also with <i>to</i>), shall, should, will	I <i>can swim</i> .
after verbs of senses	see, feel, hear, watch	
after certain verbs (with 'to')	afford, agree, appear, arrange, attempt, choose, claim, decide, demand, determine, expect, fail,	He <i>wants to swim</i> .

	happen, have, hope, learn, manage, mean, offer, ought, plan, prepare, pretend, promise, refuse, seem, stop, tend, want, wish, would like, would love, would prefer	
after certain verbs with objects (without 'to')	let, make	He <i>made her swim</i> .
after certain verbs with objects (with 'to')	advise, allow, ask, cause, encourage, expect, forbid, get, help, invite, mean, order, permit, persuade, recommend, remind, teach, tell, want, would like, would love	They <i>wanted him to swim</i> .
after certain adjectives and their comparisons	amazed, amazing, angry, astonished, astonishing, brave, clever, delighted, difficult, disappointed, easy, generous, glad, happy, hard, honest, impossible, kind, nice, rude, silly, strange, surprised, wise	It's <i>easier to swim</i> downstream

1. Complete the following sentences using appropriate infinitives

1) Our plan was 2) To act like this meant 3) The first thing he did was 4) The main problem is 5) Our next step must be 6) What I want is 7) I pretended not 8) He proposed 9) She attempted 10) They thought 11) Do you care ... ? 12) I agree 13) They made me 14) It's not easy 15) I advise you 16) I saw them 17) You'd better 18) Why don't you ... ? 19) Let the children 20) Why not ... ?

2. Translate the sentences from Russian into English using

The Infinitive as a subject

1) Сказать ему правду, означало лишить его надежды. 2) Пить из этого источника в жаркий день – одно удовольствие. 3) Неплохо было бы поехать за город завтра. 4) Побывать в Крыму и не видеть моря было очень обидно.

The Infinitive as a predicative

1) Наш план заключался в том, чтобы закончить работу к началу мая. 2) Пользоваться мобильным телефоном и электронной почтой – значит экономить время. 3) Первое, что необходимо сделать, - это посоветоваться с врачом. 4) Все, что ей удалось сделать – это узнать их номер телефона.

The Infinitive as an object

1) Где вы научились так хорошо говорить по-английски? 2) Клайд был рад познакомиться с моими друзьями. 3) Я постараюсь не забыть послать им телеграмму. 4) Они решили больше никогда об этом не упоминать. 5) Джон был счастлив, что ему дали новую работу.

The Gerund

Forms	Active	Passive
Indefinite	writing	being written
Perfect	having written	having been written

Use	Word List	Example
as the subject of a clause	-	Cycling is good for your health.
after certain adjectives	afraid of, angry about / at, bad at, busy, clever at, disappointed about, excited about, famous for, fond of, glad about, good at, impressed by, interested in, like, proud of, sorry	He's afraid of going by plane.

	about, tired of, worried about, worth	
after certain prepositions	about (in 'how/what about'), after, apart from, because of, before, by, in, in spite of, instead of, on, without	Before going to bed he turned off the lights.
after certain verbs	admit, advise, allow, appreciate, avoid, can't help, can't stand, consider, deny, dislike, enjoy, fancy, finish, go (in <i>go swimming</i>), imagine, involve, keep, mention, mind, miss, permit, practice, reject, resist, stop, suggest, understand, waste time / money	I enjoy cooking.
after certain verbs with prepositions	accuse of, adjust to, agree with, apologize for, approve of, ask about/for, believe in, be used to, blame for, care for, carry on, complain about, concentrate on, congratulate on consist of, cope with, depend on, dream about / of, escape from, feel like, forgive for, give up, insist on, keep on, look forward to, pay for, prevent sb. from, protect from, put off, rely on, spend money/time on, succeed in, suspect of, take part in, talk about/of, thank for, think of, use for, worry about	I am looking forward to seeing you again.

after certain nouns	advantage of, alternative of, chance of, choice between, danger of, difficulty in , doubt about, experience in, fun, hope of, idea of, interest in, opportunity of, place for, pleasure in, point in, possibility of, problem, reason for, trouble (in), use, way of, waste of money/time	We had problems finding our way back home.
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1. Open the brackets using the right form of the Gerund

1) He remembered (cross) the road, but he didn't remember (knock down).
 2) I am hungry in spite of (eat) 4 sandwiches. 3) He got into the house by (climb) through the window without (see) by anyone. 4) He woke up at 5 a.m. in spite of (work) late. 5) He complained of (give) a very small room at the back of the hotel. 6) The little girl isn't afraid of dogs in spite of (bite) twice. 7) The baby went to sleep a few minutes after (feed). 8) The little girl never gets tired of (ask) her mother questions, but her mother often gets tired of (ask) so many questions. 9) Mary was pleasantly surprised at (choose) to fill that vacancy. 10) I always treat people politely and insist on (treat) politely.

2. Fill in the gaps choosing between the Infinitive or Gerund

1) I wished (be) quite fair. 2) I expected (find) him in the drawing room. 3) I enjoyed (listen) to her talk of her youth. 4) Roger promised (look) in. 5) I wanted (cheer) him up. 6) She didn't mind (discuss) the problem again. 7) He didn't hesitate (employ) such methods. 8) We arranged (meet). 9) She couldn't resist (buy) such a lovely hat. 10) Last week you mentioned (meet) him in the park. 11) We can't afford (waste) our time. 12) He sat there and refused (answer). 13) He stopped (whistle) and went into the bathroom. 14) You certainly mustn't miss (see) this wonderful film.

8 ADJECTIVES And ADVERBS

Adjectives describe nouns and go before them (e.g. *an adaptive interface*). They can also be used alone after the verb *to be* and after verbs such as *look*, *smell*, *sound*, *feel*, *taste* (e.g. *Interface looks adaptive*). There are two kinds of adjectives: opinion adjectives (*beautiful*, *good*, *competent*, etc.), which show what a person thinks of somebody or something, and fact adjectives (*long*, *strong*, *young*, *plastic*, etc.), which give us factual information about age, size, colour, etc. Brand names (LG, Sony, Acer, MSI) are considered adjectives of origin / place.

Adverbs usually go after verbs, e.g. *The program crashes there*. Adverbs of frequency go after auxiliary verbs and the verb *to be*, but before main verbs: e.g. *He always comes to work on time. He is always on time for appointments.*

An adverb can be one word (*carefully*) or a phrase (*in the memory*). Adverbs show manner (how), place (where), time (when), frequency (how often), etc.: e.g.

Adverbs are formed by adding *-ly* to the adjective: e.g. *dangerous* → *dangerously*. Adjectives ending in *-le* drop the *-e* and take *-y*: e.g. *gentle* - *gently*. Adjectives ending in consonant + *y* drop the *-y* and take *-ily*: e.g. *easy* - *easily*. Adjectives ending in *-l* take *-ly*: e.g. *wonderful* - *wonderfully*.

Some adverbs have either a different form or the same one as the adjective:

Adjective	Adverb
good	well
fast	fast
hard	hard
early	early
late	late

Adjectives and adverbs have 3 forms of comparison: positive, comparative

and superlative. One-syllable and two-syllable adjectives form the comparative form by adding **-er**, and the superlative – by adding **the** and **-est**: e.g. tall – taller – the tallest, simple – simpler – the simplest, easy – easier – the easiest.

Adjectives of three or more syllables form the comparative form with **more** / **less** and the superlative with **the most** / **least**: e.g. *intelligent* – *more* / *less intelligent* – *the most* / *the least intelligent*

Some adjectives and adverbs have different forms of comparison

Positive	Comparative	Superlative
good / well	better	the best
bad / badly	worse	the worst
much / many/ a lot of	more	the most
little	less	the least
far	further / farther	the furthest / farthest
old	older / elder	the oldest / eldest

– We use *as ... adj. (positive form) ... as* to show that two things are similar in some way. In a negative sentence, we use *not as / so ... as*:

e.g. Peter is *as tall as* Tom. Tom is *not as / so strong as* Peter.

– We use *less ... adjective (positive form) ... than* to show that two things differ : e.g. This book is *less interesting than* that one.

– We use *the least ... adjective (positive form) ... of* when compare more than two things: e.g. The film we saw last night was *the least interesting of* all I've seen this month.

1 Translate the adjectives and adverbs into Russian and write their comparative and superlative forms

Small; fast; new; safe; long; late; wide; young; easy; great; dull; rich; bulky; large; vast; early; old; broad; frequent; reliable; approximate; significant; intelligent; intricate; possible; basic; remarkable; common; modern; dependent;

general; necessary; successful; scientific; universal; good; bad; little; many; actually; angrily; beautifully; carefully; carelessly; easily; fast; often; quickly; regularly; slowly; soon; well.

2 Are the words in bold adjectives or adverbs? Write *adj* or *adv*

1. Atari's platform was the most popular **early** video game console, and many developers emulated Atari games to attract customers
2. The chess game ended **early**, at the 24th move
3. On the TPS Report gaming blog, you will find reviews, a forum and a **monthly** podcast
4. The podcast is broadcast **monthly**
5. You have to work **hard** to succeed in the gaming industry
6. Some experts say that **hard** work makes people happy

3 Choose the correct adjective. Then fill in the gaps with the correct form of the adjective

1. *Light / heavy*: Laptops are ___ than desktop computers, but ___ than notebooks.
2. *Large / small*: The mainframe is the ___ type of computers. A minicomputer is ___ than a microcomputer.
3. *Common / good*: Personal computers are ___ than mainframes but mainframes are ___ than personal computers at processing very large amounts of data.
4. *Powerful / expensive*: Minicomputers are ___ than mainframes but they are also___.
5. *Fast / cheap*: New computers are ___ and sometimes ___ than older machines.
6. *Powerful / expensive*: Laptops are often ___ than PCs but they are not as ___.
7. *Slowly / fast*: Smartphones usually work ___ than PC.
8. *Often / seldom*: Users ___ use computers than programmers.

4 Complete sentences to make correct statements about the modern IT tools. E.g. *The wearable gadget* is faster than *the handheld* or even *a mobile*.

1. ... is slower than ...
2. ... is the slowest of all.
3. ... is more expensive than ...
4. ... is as fast as ...
5. ... is not as cheap as...
6. ... is not as safe as ...
7. ... is more dangerous than ...
8. ... is the most dangerous of all.
9. ... is the cheapest of all.
10. ... is not as convenient as...
11. ... is more comfortable than ...
12. ... is the safest of all.
13. ... is the most expensive of

9 QUANTITATIVE WORDS

We usually use *a lot of / lots of* in positive statements with plural countable and uncountable nouns. We omit *of* when *a lot / lots* is not followed by a noun. e.g. *Helen's got a lot of / lots of friends. There's a lot of sugar in that bowl.* But: *Have you got many photos? Yes, I've got a lot.*

We usually use *much* and *many* in questions and negations. *Much* is followed by uncountable nouns and *many* – by plural countable nouns. e.g. *Is there much milk in the fridge? There isn't much tea left. Have you got many friends? I haven't got many friends.*

We use *how much* and *how many* in questions and negations. *How much* with uncountable nouns (amount). *How many* with countable nouns (number):

e.g. 'How much sugar do you take in your tea?' 'Just a spoonful.' How many students are there in your class?' 'There are fifteen.'

We use *a few* / *few* with plural countable nouns (cars, cassettes, etc.).

A few means 'not many, but enough'. e.g. We've got *a few oranges*. We can make some juice. (= We've got enough oranges.)

Few is used with countable nouns and means 'hardly any, almost none' and can go with *very* for emphasis: e.g. *There are (very) few biscuits in the box.* (= There are only one or two biscuits.)

We use *a little* / *little* with uncountable nouns (ice, honey, flour, etc.).

A little means 'not much, but enough': e.g. *She's got a little time.*

Little means 'hardly any, almost nothing' and can go with *very* for emphasis: e.g. *We've got (very) little coffee. There's not enough for all of us.*

1. Fill In *many*, *much* or *a lot of*

1. A: I've got ___ spare time today. B: Great! Let's go shopping together.
2. A: Are there ___ cinemas in this town? B: No, there's only one.
3. A: There isn't ___ snow on the ground. B: No. the sun has melted it.
4. A: There are ___ flowers in the garden. B: Yes, they're nice, aren't they?
5. A: How ___ times did you have a shower yesterday?
6. A: I've got ___ things to do today. B: I'm busy today, too.
7. A: There isn't ___ water in that vase. The flowers will die. B: I'll put some more in.
8. A: Helen is always alone. B: No she isn't. She's got ___ friends.
9. A: Are there ___ fish in this river? B: No, not any more.
10. A: Can you lend me some money? B: No, sorry - I haven't got ___ money with me.

2 Fill in *few*, *a few*, *little* or *a little*

1. Shall I make _____ tasks for the credit test?
2. I hope there are _____ people I know in the forum.
3. Could I have _____ milk in my cup. please?
4. The train drivers are on strike. Very _____ people came to work.
5. I hope you've almost finished. There is very _____ time left.
6. It's cold. That's why there are very _____ children in the park today.
7. Do you need _____ more days to think about my proposal?
8. We must go shopping. There's very _____ food in the fridge.
9. I'm bored. There's very _____ to do on Wednesday evenings.
10. I'm sorry. I'll be _____ late. Were having problems at work.

3. Underline the correct word

1. A: When will you be back? B: Soon. I'm only going away for a *few* / *a little* days.
2. A: When can I come and visit you? B: Come on *every* / *any* Tuesday. I'm free on that day.
3. A: What would you like to eat? B: Can I have *some* / *any* of that cake, please? It looks delicious.
4. A: Who's coming to the party? B: I've invited *everyone* / *anyone* from the office.
5. A: Do you know *many/much* foreign people? B: No. Actually, I know very *few* / *a few*.
6. A: I've lost my keys. I can't find them *anywhere* / *nowhere*. B: Don't worry. I'm sure they're everywhere / *somewhere* in this room.
7. A: I asked *everyone* / *someone*, but *nobody* / *anybody* wants to help me with my project. B: Okay, I'll give you *no* / *some* help.
8. A: Did you buy the biscuits I wanted? B: No, they didn't have *any* / *no* in the supermarket.

10 THE ARTICLE

The indefinite article A/AN is used:

– with singular countable nouns after the verb *to be* when we want to say what some body / something is: e.g. *She's an actress. It's a password. This is a network;*

– with phrases of frequency: e.g. *We play computer games once a week. They go on holiday twice a year.*

The indefinite article A/AN is NOT used:

– with uncountable or plural countable nouns. We can use 'some' instead: e.g. *some bread, some programs, some software;*

– before an adjective without a noun. But if an adjective is followed by a noun we use *a* or *an* (if adjectives begin with a vowel): e.g. *It's a pad. It is green. It is a green pad. It's an interesting book;*

The definite article THE is used:

– with nouns when we are talking about something specific, that is when we can answer the question 'Who?' or 'Which?' because the object is mentioned for the second time or is already known;

– with nouns which are unique: e.g. *the Colosseum, the earth, the sky, the sun;*

– before the names of rivers (*the Amazon*), seas (*the Baltic Sea*), oceans (*the Pacific*), mountain ranges (*the Rocky Mountains*), deserts (*the Gobi*), groups of islands (*the Dodecanese*) and countries when their names include words 'state', 'kingdom', 'union' etc. (*the United States*);

– before the names of musical instruments: e.g. *the piano, the guitar;*

- before the names of hotels (*the Hilton Hotel*), theatres / cinemas (*the Apollo Theatre*), ships (*the Titanic*), organizations (*the EU*), newspapers (*The Guardian*) and museums (*the Louvre*);
- before nationality words (*the French*) and families (*the English, the Taylors*);
- before titles when the person's name is not mentioned: e.g. *the Queen, the Prince of Wales*;
- before the words *morning, afternoon, evening*: e.g. *He works in the morning.*

We don't use THE:

- with plural nouns when we talk about them in general, that is, when we cannot answer the question ‘Who?’ or ‘Which?’: e.g. *Elephants live in the jungle.* (Which elephants? Elephants in general);
- with words *this / that / these / those*, e.g. *this bag, those cars* (NOT: *a this bag*);
- with possessive adjectives or the possessive case: e.g. *That isn't my car*;
- before proper names: e.g. *This is Norton Security. This is Katerina*;
- before the names of countries (*England*), cities (*Paris*), streets (*Mason Avenue*), parks (*Central Park*), mountains (*Everest*), Islands (*Santorini*), lakes (*Lake Michigan*) and continents (*Europe*) because they are *proper names*;
- before the names of meals (*breakfast, lunch, dinner, etc.*) and games / sports (*golf, tennis, basketball, etc.*): e.g. *Golf is a relaxing sport*;
- before titles when the person's name is mentioned, e.g. *Queen Elizabeth, President Clinton*;
- with words *school, church, bed, hospital, prison* or *home* when we refer to the purpose for which they exist, e.g. a) *Mary goes to school at 8:30 in the morning.* (= Mary is a student.) *Mary's mother went to the school to get Mary's school report.* (= Mary's mother went to the school as a visitor.) b) *Grandpa is in*

hospital. (= He is a patient.) *Grandma went to the hospital to see Grandpa.*
(Grandma visited Grandpa, She isn't a patient.)

1. Fill in *a, an* or *some*

1. A: I bought ___ butter and ___ sugar. B: Are you going to make ___ cake?
2. A: Would you like ___ flashcard? B: No, thank you.
3. A: What did you have for lunch? B: ___ piece of cheese and ___ bread.
4. A: I've lost my batteries. Have you seen them? B: Actually I found ___
batteries on the floor this morning. They must be yours.
5. A: I need ___ information for my Excel project.
B: Why don't you go to the library?
6. A: I'm going to the post office. Do you need anything?
B: Could you get me ___ stamps and ___ envelope, please?

2. Fill in *a* or *the*

- A: Have you made all (1) ___ arrangements for our holiday yet?
B: Yes. I think so. I've booked (2) ___ flight to Paris.
A: Did you find (3) ___ good hotel?
B: Well, it isn't (4) ___ luxurious hotel, but it's near (5) ___ centre of (6) ___
city and each bed-room has (7) ___ private bathroom.
A: Good. Did you go to (8) ___ bank to change (9) ___ money into French
francs?
B: Yes, I've done that. Is there anything else?
A: I don't think so. I'll pack (10) ___ suitcases tomorrow night.
B: I'll book (11) ___ taxi to take us to (12) ___ airport, so we can leave our
car at home.
A: Good idea. I think we're going to have (13) ___ very good holiday.

3. Fill in *a, the* or *nothing*

Privacy on 1)___ Internet is 2)___ growing concern, especially as more and more 3)___ people are using it for their professional and personal business, socializing, and entertainment. 4) ___ social networking sites (such as MySpace, Facebook and Twitter), personal web pages, and blogs are notorious as 5)___ public sources of personal information and uncensored opinions. 6)___ good rule of thumb is to only post information you would be willing to write on 7)___ banner that is displayed in 8)___ public place. Don't provide 9) ___ personal, sensitive or confidential information to 10)___ Internet sites, surveys or forms unless you are using 11)___ trusted, secure web page. Get to these web sites by typing 12)___ web address in directly. At a minimum, look for "https" in 13)___ URL and 14)___ little padlock that appears in 15)___ URL bar or in 16)___ corner of 17)___ browser windows to indicate that there is 18)___ secure connection.

Underline the correct form

1. *Thompsons* / *The Thompsons* live on a farm.
2. This is my friend, *the Sam* / *Sam*.
3. We went on a tour of *Europe* / *the Europe* last summer.
4. *The President Obama* / *President Obama* made an interesting speech.
5. John is staying at *home* / *the home* tonight.
6. The new shopping centre was opened by *Mayor* / *the Mayor*.
7. The baby sleeps in *the evening* / *evening*.
8. That *the laptop* / *laptop* belongs to my sister.
9. Do you know how to play *violin* / *the violin*?
10. *The cycling* / *Cycling* is my favourite sport.
11. When we went to Rome, we visited *Colosseum* / *the Colosseum*.
12. They stayed at *the Hampton* / *Hampton* Hotel.

TRANSLATION APPENDIX

Translate into English short dialogues using correct tense-aspect forms of verbs and active professional vocabulary

– Ваша компания уже смонтировала плавучую самоприводную полупогружную буровую установку? – Да, демонтированное оборудование прибыло 3 месяца назад из Финляндии. – Сколько месяцев вы ее собираете? – Мы собираем ее уже 2 месяца.

– Кто демонтировал это оборудование? По договору его демонтировала Финская компания. – Кто транспортировал его и как? – Финская Aker Rauma Offshore погрузила оборудование на корабль река-море и отправила по Российским водным путям в Астрахань на судоремонтный завод.

– Когда вы начали монтажные работы? – 3 месяца тому назад. Оборудование прибыло в Астрахань и через неделю компания приступила к работе. Для монтажа мы использовали плавучий кран "Исполин".

– Каковы технические характеристики этой установки? – Эта трехпорная установка высотой 66 метров включает в себя новейшие достижения в технологии морского бурения. Там можно разместить 100 человек. Она может бурить в течение длительного периода, даже когда невозможно осуществлять доставку необходимого оборудования и продуктов из-за погодных условий.

– Недавно Британская компания сконструировала гигантскую плавучую установку, которая может бурить на глубину 5000 метров и выдерживать штормовую волну до 100 футов. – Вы видели эту установку? – Да. (Я видел ее), когда был в командировке 2 месяца тому назад.

– Чем сейчас занимается Ваша компания? – Компания уже давно разрабатывает месторождение на Каспийском побережье. Мы сейчас разрабатываем 2 площади, которые разведали 2 года тому назад. Мы

разрабатываем их уже год. – Когда вы закончите разработку? – Я думаю, что к концу следующего года мы закончим разработку и начнем эксплуатацию месторождения.

– Чем занимается ваша дочерняя фирма? – Она проводит разведочное бурение, а затем будет разрабатывать и эксплуатировать месторождение. – Где расположено это месторождение? – Морское месторождение D-222 расположено в совершенно неизученном секторе Каспия и мы сейчас осуществляем обширную разведку этой площади.

– Ваш поставщик отправил бурильные трубы? – Да, мы получили их недавно. К концу года мы закончим разведку и начнем эксплуатировать месторождение. Нефтяники будут использовать полупогружную буровую установку, как только проведут монтажные работы – Кто по договору транспортирует нефть от устья скважины? – Мы отвечаем за транспортировку по нефтепроводу Баку – Тихорецк – Новороссийск.

– Ваша компания будет еще заключать контракты с зарубежными фирмами? – Конечно. Мы недавно заключили контракт на долевое участие в добыче нефти с Британской компанией. – Кто будет финансировать геофизические исследования? – Азербайджан будет полностью (100%) финансировать эту работу. – Будет ли еще кто-либо принимать участие в проекте? – В контракте предусмотрено участие третьей стороны.

– Наконец главная Российская нефтяная компания и Финская Aker Rauma Offshore подписали контракт, на основании которого Финская фирма транспортирует буровую установку "Маравия" из Персидского залива в Каспийское море. Сегодня среда. В понедельник к нам приезжали заказчики из Финляндии. – Они заинтересованы в поставках нового оборудования? – Да, мы подписали документ о совместной разработке месторождений на Каспии и сейчас проводим сейсмические исследовательские работы на Каспийском шельфе.

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