Министерство образования Республики Беларусь

Учреждение образования
«Полоцкий государственный университет»

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АНГЛИЙСКИЙ ЯЗЫК

Учебно-методический комплекс
для студентов специальности 1-31 02 01-03
«География (геоинформационные системы)»

Новополоцк
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Построен по модульному принципу: весь курс разбит на модули, которые, в свою очередь, делятся на учебные элементы. Материал учебных элементов каждого модуля объединен тематически.

Предлагаются тесты для итогового контроля по каждому модулю, лексический минимум, приложение, содержащее комплект текстов для дополнительного чтения.

Предназначен для студентов специальности 1-31 02 01-03 «География (геоинформационные системы)».

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ВВЕДЕНИЕ

Эффективным инструментом организации самостоятельной работы является использование в учебном процессе учебно-методического комплекса (УМК). Современные УМК не имеют в своей структуре учебника, а представляют собой сжатый источник информации с целевой программой действий, методическим руководством по достижению целей и различными формами самоконтроля знаний. Такие УМК должны и могут быть созданы только при наличии и ведущей роли учебников, хрестоматий и других источников информации. К сожалению, специальность 1-31 02 01-03 «География (геоинформационные системы)», будучи новой и не широко распространенной, не привлекла до сих пор внимания ученых-педагогов. Исходя из этого, авторы пытались, сохраняя структуру и суть УМК, максимально наполнить его необходимым материалом, чтобы после изучения данного курса студентами под руководством преподавателя была достигнута основная цель обучения иностранному языку – формирование коммуникативной компетенции в сфере профессиональной деятельности.

В соответствии с новой типовой программой по иностранным языкам для высших учебных заведений неязыковых специальностей, утвержденной Министерством образования Республики Беларусь 15 апреля 2008 г. (регистрационный № ТД-СГ.013/тип), курс «Английский язык» рассчитан на 116 часов практических занятий в течение 2 семестров.

Данный УМК построен по принципу блочно-модульного подхода, что предполагает тематическое членение материала, текущий контроль качества овладения материалом, акцентирование внимания на вопросах, вызывающих у студентов особые сложности, максимальную поддержку и помощь в процессе освоения материала.

УМК предоставляет следующие возможности и условия для обеспечения самостоятельной работы студентов:

– дается программа действий для самостоятельной работы студентов;

– способствует ориентации в материале курса в целом и в каждой его части;

– обеспечивает завершенность и этапность обучения;

– обеспечивает возможность постоянного и систематического контроля качества знаний и умений, приобретаемых студентом;

– способствует выработке навыков рациональной организации учебного процесса;

– создает условия для индивидуализации обучения.

Основой УМК является учебный модуль (УМ), содержащий необходимую и достаточную информацию для управления самостоятельной учебной деятельностью студента. Данный УМК состоит из шести учебных модулей, соответствующих основным разделам учебной программы:

1. Geography as a Science.
2. Exploration and it's History.
3. The Solar System and The Universe.
4. The Earth.
5. Climate and Weather.
6. My Future Profession (Geographic Information Systems).

Логика выделения учебных модулей соответствует логике преподавания учебного курса. При этом учитываются временные затраты студента на проработку и усвоение раздела. Тематика и характер учебного содержания, представленного в УМК, обеспечивает формирование у студентов навыков профессионального общения.

Каждый модуль состоит из нескольких учебных элементов, которые имеют свою тематическую направленность и включают следующие разделы:

1. Improve your Word Power.
2. Reading Comprehension.
3. Comprehension and Word Study.
4. Speaking Practice.
5. Supplementary (Additional) Reading.

Структура УМК, помимо шести модулей, включает учебный план, итоговые тесты после каждого модуля для контроля и самоконтроля, список рекомендованной к изучению литературы и приложение с текстами для дополнительного изучения.

Желаем успехов! Good Luck!

ФОРМЫ КОНТРОЛЯ

Изучение курса «Английский язык» студентами специальности 1-31 02 01-03 «География (геоинформационные системы)» завершается экзаменом, который состоит из двух частей.

Письменная часть:

1. Лексико-грамматический тест.

2. Чтение и перевод оригинального профессионально-ориентированного текста с иностранного языка на родной со словарем. Объем – 1300 – 1500 печатных знаков. Время – 45 минут.

Устная часть:

1. Подготовленное высказывание по заданной ситуации и неподготовленная беседа с преподавателем в рамках данной ситуации (по предметно-тематическому содержанию дисциплины).

2. Реферирование аутентичного или частично адаптированного общественно-политического, культурологического, научно-популярного текста; беседа на иностранном языке по содержанию текста. Объем – 900 печатных знаков. Время – 5 – 7 минут.

Перечень тем для устного собеседования, выносимых на экзамен

1. Geography as a Science.
2. Exploration and it’s History.
3. The Solar System and The Universe.
4. The Earth.
5. Climate and Weather.
6. My Future Profession (Geographic Information Systems).

Кроме того, программа предусматривает текущий и промежуточный контроль в устной и письменной формах в виде тестирования в зависимости от требуемого уровня усвоения, а также семестровый зачет.

Зачеты носят накопительный характер, который предусматривает посещение 75 – 100 % практических занятий и усвоение 95 – 100 % программного материала.

Нормы оценки

1. Оценка перевода.

Уровни	Баллы	Чтение
	0	Отсутствие перевода или отказ от него.
I. Низкий (рецептивный)	1	Перевод текста на уровне отдельных словосочетаний и предложений при проявлении усилий и мотивации.
	2	Неполный перевод текста (менее 90 %). Допускаются грубые искажения в передаче содержания. Отсутствует правильная передача характерных особенностей стиля переводимого текста.
II. Удовлетворительный (рецептивно-репродуктивный)	3	Неполный перевод (90 %). Допускаются грубые смысловые и терминологические искажения. Нарушается правильность передачи характерных особенностей стиля переводимого текста.
	4	Полный перевод. Допускаются грубые терминологические искажения. Нарушается правильность передачи характерных особенностей стиля переводимого текста.
III. Средний (репродуктивно-продуктивный)	5	Полный перевод. Допускаются незначительные искажения смысла и терминологии. Не нарушается правильность передачи стиля переводимого текста.
	6	Полный перевод. Отсутствуют смысловые искажения. Допускаются незначительные терминологические искажения. Нарушается правильность передачи характерных особенностей стиля переводимого текста.
IV. Достаточный (продуктивный)	7	Полный перевод. Соблюдается точность передачи содержания. Отсутствуют терминологические искажения. Допускаются незначительные нарушения характерных особенностей стиля переводимого текста.
	8	Полный перевод. Отсутствуют смысловые и терминологические искажения. В основном соблюдается правильная передача характерных особенностей стиля переводимого текста.
V. Высокий (продуктивный, творческий)	9	Полный перевод. Отсутствие смысловых и терминологических искажений. Правильная передача характерных особенностей стиля переводимого текста.
	10	Полный перевод. Отсутствие смысловых и терминологических искажений. Творческий подход к передаче характерных особенностей стиля переводимого текста.

2. Оценка понимания при чтении.

Уровни	Баллы	Чтение
	0	Отсутствие ответа или отказ от ответа.
I. Низкий (рецептивный)	1	Понимание менее 30 % основных фактов и смысловых связей между ними.
	2	Понимание 30 % основных фактов и смысловых связей между ними.
II. Удовлетворительный (рецептивно-репродуктивный)	3	Понимание менее 50 % основных фактов и смысловых связей между ними.
	4	Понимание 50 % основных фактов текста и смысловых связей между ними.
III. Средний (репродуктивно-продуктивный)	5	Понимание большинства основных фактов текста, смысловых связей между ними и отдельных деталей текста.
	6	Понимание всех основных фактов текста, смысловых связей между ними и 50 % деталей текста.
IV. Достаточный (продуктивный)	7	Понимание всех основных фактов текста, смысловых связей между ними и 70 % деталей текста.
	8	Понимание всех основных фактов текста, смысловых связей между ними и 80 % деталей текста.
V. Высокий (продуктивный, творческий)	9	Понимание всех основных фактов текста, смысловых связей между ними и 90 % деталей текста.
	10	100-процентное понимание основных фактов текста, смысловых связей между ними и деталей текста.

3. Оценка письменных тестов.

Ниже представлена шкала перевода ответов в десятибалльную систему в соответствии с Приложением к постановлению Министерства образования Республики Беларусь от 1.04.2004 г. № 22.

100 % – 95 % правильных ответов	10 баллов
94,8 % – 90 % правильных ответов	9 баллов
89,6 % – 83 % правильных ответов	8 баллов
82,6 % – 75 % правильных ответов	7 баллов
74,6 % – 65 % правильных ответов	6 баллов
64,7 % – 50 % правильных ответов	5 баллов
49,7 % – 35 % правильных ответов	4 баллов
34,7 % – 20 % правильных ответов	3 баллов
19,7 % – 10 % правильных ответов	2 баллов
9,7 % – 1,8 % правильных ответов	1 баллов
1,4 % – 0 % правильных ответов	0 баллов

Наименьшая положительная оценка – 4 балла – выставляется при правильном выполнении не менее 2/3 заданий. Отсутствие работы или отказ от выполнения соответствуют оценке 0 баллов.

МОДУЛЬ 0

В настоящее время в качестве конечной цели обучения рассматривается формирование иноязычной коммуникативной компетенции, позволяющей пользоваться иностранным языком в той или иной области профессиональной деятельности.

Однако анализ имеющихся исследований свидетельствует о том, что существующая практика обучения иностранным языкам на неязыковых факультетах не способствует достижению этой цели, а приобретаемый уровень сформированности речевых навыков и умений не соответствует в полной мере требованиям, предъявляемым к будущим специалистам как участникам межкультурной коммуникации.

Основными причинами обычно называют ограниченные сроки обучения и количество часов, отводимых на изучение языка, невысокий уровень подготовки и слабую мотивацию обучаемых. Восполнить недостаток аудиторных часов может самостоятельная работа студентов. Ее организация должна быть хорошо продумана и методически обеспечена. Основной целью самостоятельной работы студентов по иностранному языку в неязыковом вузе является закрепление, углубление и совершенствование полученных знаний, навыков и умений, другими словами – достижение соответствующего уровня иноязычной компетенции. Для достижения данной цели самостоятельная работа студентов должна быть систематизированной и непрерывной. Совокупность всей самостоятельной работы студента в изучении иностранного языка может определяться как его самостоятельная деятельность, опосредованно направляемая и контролируемая преподавателем. Организация самостоятельной работы, следовательно, предусматривает управление, органическую связь с аудиторными занятиями, контроль, самоконтроль студентов, регулярность и систематичность ее проведения.

Учебный план

№ темы	Наименование темы	Количество часов
Модуль I. Geography as a Science		
1	УЭ-1	6
2	УЭ-2	6
3	УЭ-3	6
4	Test	2

Модуль II. Exploration and it's History		
1	УЭ-1	6
2	УЭ-2	4
3	УЭ-3	2
4	Test	2
Модуль III. The Solar System		
1	УЭ-1	10
2	Test	2
Модуль IV. The Earth		
1	УЭ-1	8
2	УЭ-2	6
3	УЭ-3	6
4	Test	2
Модуль V. Climate and Weather		
1	УЭ-1	7
2	УЭ-2	7
3	УЭ-3	7
4	УЭ-4	7
5	Test	2
Модуль VI. My Future Profession		
1	УЭ-1	9
2	УЭ-2	9
3	Test	2
		Итого: 116

МОДУЛЬ I. Geography as a Science

Цели:

Вы должны знать	Вы должны уметь
1. Лексика: активный словарь по теме. **2. Грамматика:** артикль (употребление определенного и нулевого артикля с географическим названием и именами собственными. **3. Содержание темы:** основные отрасли географии как науки; основные этапы развития географической науки; географические методы исследований.	1. Читать и переводить текст по теме, используя активный словарь. 2. Вести диалог и рассказывать об основных географических понятиях. 3. Высказывать полноценное суждение о географии и ее этапах развития с использованием основной терминологии. 4. Правильно употреблять артикль (в частности, с географическими названиями).

Учебный элемент 1 (УЭ-1)
Geography

I. Improve your word power.

1. Study your active vocabulary.

Active Vocabulary

account *n* доклад, сообщение, отчет
account *v* считать за; рассматривать как
~ for объяснять
accuracy *n* точность, правильность
accurate *a* точный, правильный
altitude *n* высота; высота над уровнем моря
angle *n* угол
area *n* площадь, пространство
areal *a* пространственный
circumference *n* окружность
concern *v* касаться, иметь отношение
to be concerned with заниматься, интересоваться чем-либо
crust *n* земная кора
deal (dealt) with *v* рассматривать вопрос; иметь дело
distribute *v* распределять, раздавать
distribution *n* распределение, распространение

envelope *n* оболочка
environment *n* окружающая среда
estimate *v* оценивать; подсчитывать приблизительно
estimation *n* оценка; подсчет, вычисление
exact *a* точный, строгий, верный
extend *v* простирать(-ся), тянуть(-ся)
habitat *n* среда обитания; место распространения
level *n* уровень
sea~ уровень моря
longitude *n* долгота
measure *v* измерять, мерить
obtain *v* получать, добывать
occur *v* случаться, происходить
pattern *n* образец; модель
rate *n* темп, скорость
revolve *v* вращаться вертеться
settle *v* заселять, колонизировать
soil science почвоведение
surface *n* поверхность
survey *v* обозревать, производить съемку; проводить исследования
vegetation *n* растительность.

2. Mind the pronunciation and stress.

a) complex	b) activity	c) agriculture	d) atmosphere
climate	astronomy	anthropology	biosphere
culture	geography	biologic	hydrosphere
element	geology	geologic	lithosphere
factor	ecology	geographic	characteristic
human	economy	climatology	anthropogeography
humid	activity	distribution	oceanography
nature	complexity	economical	biogeography
natural	climatic	equatorial	physiography
planet	biology	interaction	urbanization
region	phenomena	systematic	vegetation
special	position	meteorology	specialization
typical	political	metropolitan	regionalization

3. Read and translate the words and their derivatives.

N ⟶ Adj	N ⟶ N
geography – geographic	biology – biologist
geology – geologic	ecology – ecologist
geography – geographer	geology – geologist
astronomy – astronomer	meteorology – meteorologist
biology – biologic	science – scientist
economy – economic	geomorphology – geomorphologist
climate – climatic	
system – systematic	
atmosphere – atmospheric	
science – scientific	

4. Transform as in the models and translate into Russian.

Model A: *to distribute phenomena – the distribution of phenomena*.

To fix positions, to vary from place to place, to measure the temperature and rainfall, to distribute over the Earth's surface, to depend, on the results of specialized sciences, to divide into systematic fields, to estimate the environment and resources, to distribute economy and population, to describe the surface of the Earth.

Model B: *human activities – the activities of the human*.

Land surface, the Earth's crust, habitable zone, water envelope, equatorial forests, temperature measurements, climatic elements, geographic study, areal patterns, environmental factors, economic development, physical geography, human geography, regional geography, environmental studies, resource management.

5. Match English and Russian equivalents.

1) to be derived from	a) взаимодействия и взаимоотношения
2) exact and organized knowledge	b) обеспечивать среду обитания
3) the distribution of plants and animals	c) зона обитания
4) to deal with	d) плотно заселенные центральные территории
5) interactions and relationships	e) деятельность человека
6) to provide the habitat	f) иметь дело, рассматривать
7) soils and vegetation	g) многообразие окружающей среды
8) areal patterns	h) происходить
9) habitable zone	i) распространение растений и животных
10) densely settled metropolitan areas	
11) human activity	

12) to observe and describe the surface of the Earth 13) the high variability of the environment	j) точная и систематизированная наука k) наблюдать и описывать земную поверхность l) элементы территориальной структуры m) почвы и растительность

II. Reading Comprehension.

1. ***Before reading the text try to discuss the following questions.***
   What is geography about?
   What kind of science is geography?
   What does the term «geography» mean?

2. ***Read and translate the following text.***

GEOGRAPHY

Geography is the study of the surface of the Earth. The word is derived from the Greek words geo («the Earth») and graphein («to write»).

Geography is the exact and organized knowledge of the distribution of phenomena on the surface of the Earth. It deals with the form and motion of the planet so far[1] as a knowledge of these is necessary for fixing positions on the surface, more fully with the forms of the lithosphere or stony crust of the Earth, the extent of the water envelope or hydrosphere, the movements of the water and of the all surrounding atmosphere, the distribution of plants and animals and very fully with that of the human race and all the interactions and relationships between these distributions.

The surface of the Earth is the interface[2] of the atmosphere, lithosphere, and biosphere. It provides the habitat, or environment, in which humans are able to live. This habitable zone has a number of special characteristics. One of the most important is the complex interaction among many physical, biologic, and human elements of the Earth, such as land surface, climate, water, soil, vegetation, agriculture, and urbanization. Another characteristic is the high variability of the environment from place to place – hot tropics to cold polar regions, dry deserts to humid equatorial forests, vast level plains to rugged mountains and uninhabited ice caps to densely settled metropolitan areas. Yet another is the consistency[3] with which significant patterns occur, which makes possible generalizations about distributions; obvious examples are measurements of tempera-

ture and rainfall which are the most important climatic elements affecting farming and many other human activities.

Geographic study is particularly concerned with location, with areal patterns[4] with the interrelationships of phenomena (especially of the relationship between human society and the land, as in ecology), with regionalization[5], and with ties among areas. Typical areas of inquiry[6] include where people live; in what sort of patterns they are distributed over the Earth's surface; what factors of environment, resources, culture, and economic development account for[7] this distribution; whether or not significant regions can be recognized by types of population, livelihood[8], and culture, and what types of movements and relations occur among places.

Geography is a synthetic science, largely dependent for its data on the results of specialized sciences such as astronomy, physics, geology, oceanography, meteorology, biology and anthropology and always having respect to the natural regions of the world. Viewed in this light geography is a unified and definite science[9] of wide outlook and comrehensive grasp[10].

Geography is divided into systematic fields and regional specializations, which can be grouped under three main headings: physical geography, human geography and regional geography. There is a number of subdivisions, such as mathematical geography, which deals with the shape, size and movements of the earth; political geography, which studies the world's political divisions; economic geography deals with estimation of the environment and resources, distribution of economy and population; historical geography the nature of which has been interpreted in a wide variety of ways. Human geography is sometimes regarded as synonymous with anthropogeography. Physical geography, which usually includes a study of climate, natural vegetation and oceanography, is sometimes assumed, to be synonymous[11] with physiography.

The principal activities of the physical geographer include observing, measuring and describing the surface of the earth. The growing complexity of geographic inquiry has resulted in increased specialization within the field. The principal branches of physical geography are geomorphology, climatology, biogeography and soil geography. As human activity has become more able to affect the landscape and ecology of the world, two more branches have emerged: resource management and environmental studies.

Notes:

1. so far – до сих пор, пока
2. interface – отражение, взаимодействие
3. consistency – постоянство
4. areal patterns – элементы территориальной (пространственной) структуры

5. regionalization – 1. районирование; 2. региональный подход

6. areas of inquiry – области исследования

7. account for – объяснять

8. livelihood – средства к жизни

9. unified and definite science – унифицированная и точная наука

10. comprehensive grasp – здесь: всеобъемлющие знания

11. physical geography … is sometimes assumed to be synonymous with … – Иногда допускается, что термин «физическая география» является сходным по значению с …

3. Answer the following questions.

1. What language is the word «geography» derived from?
2. What does the term mean?
3. What does geography deal with?
4. How is the surface of the Earth represented in the geographic study?
5. What are the special characteristics of the habitable zone?
6. What do you mean by the term «areal patterns»?
7. What are the typical areas of inquiry of a geographer?
8. Geography depends on the results of specialized sciences, doesn't it? Give some examples of these relationships.
9. What are the subdivisions of geography?
10. What is responsible for the emergence of some new branches of geography?

III. Comprehension and Word Study.

1. Translate into Russian the following words, word combinations and sentences.

Knowledge: exact knowledge, organized knowledge, good knowledge, poor knowledge. His knowledge of geography is perfect.

Distribute: to distribute books (maps, products); to be distributed over the Earth's surface; distribution of population (resources, phenomena, economy). Geography is the exact and organized knowledge of the distribution of phenomena on the surface of the Earth.

Deal (dealt, dealt): to deal with smb., to deal with history, to deal with a problem; to deal with fires, dealer. Meteorology deals with weather and climate.

Surface: earth's surface, the surface of the Moon, the surface of the sea, surface water, on the surface. Scientists have got photographs of the surface of Mars.

Exact: exact sciences; exact time, exact data, exact memory; exactly; not exactly the same. Physics and mathematics are exact sciences.

Environment: environmental, environmental protection, environmental studies, environmental research, social environment, natural environment, man-made environment, human environment; environmentalist. The problems of environmental protection are of great importance now.

Habitat: human habitat, natural habitat, wildlife habitat; habitant, habitable zone; to in habit; inhabitable, inhabitant, inhabited locality, uninhabited ice caps. The surface of the Earth provided the habitat in which humans are able to live.

Variety: great variety, variety of reasons, variety of ways, genetic variety; various reasons, various subjects; variation, variations of temperature, daily variations, environmental variation; variability.

2. Make up word combinations and translate them.

A	**B**
1) to deal with	a) positions on the surface
2) to be divided	b) temperature and rainfall
3) to be distributed	c) the habitat or environment
4) the relationship	d) from the Greek words
5) to fix	e) under three main headings
6) the high variability	f) the lithosphere or stony crust of the Earth
7) to be concerned	g) between human society and the land
8) to provide	h) of physical geography
9) the form of	i) the form and motion of the planet
10) to be dependent	j) into systematic fields
11) measurements of	k) over the Earth's surface
12) the principal branches	l) with areal patterns
13) to be grouped	m) of the environment
14) to be derived	n) on the results of specialized sciences

3. Find the synonyms to the following words and write them down in pairs.

Environment, definite, water envelope, movement, influence, study, to be concerned with, lithosphere, motion, physiography, human geography, exact, habitat, stony crust, hydrosphere, knowledge, affect, field, anthropogeography, to deal with, branch, physical geography.

4. Find attributes to the following words.

science, geography, zone region, activity, pattern.

5. Match the words with a proper definition.

1) Geodesy	a) studies the world's political divisions
2) Economic geography	b) the subject which describes the earth's surface – its physical features, climates, vegetation, soils, products, peoples and their distribution
3) Climatology	c) the science of the measurement of the shape and size of the earth, including its weight, density, etc., and also of the surveying of such large portions of the earth's surface that the curvature of the earth has to be considered
4) Political geography	d) the science of the composition, structure, and history of the earth including the study of the materials of which the earth is made, the forces, which act upon these materials and the resulting structures, the distribution of the rocks of the earth's crust, and the history not only of the earth itself but also of the plants and animals which inhabited it throughout the different ages.
5) Geography	e) deals with estimation of the environment and resources, distribution of economy and population
6) Geology	f) the study of the physical features of the earth, or the arrangement and form of the earth's crust, and of the relationship between these physical features and the geological structures beneath
7) Geomorphology	g) deals with the shape, size and movements of the earth
8) Geophysics	h) the science which treats of the various climates of the earth and their influence on the natural environment
9) Mathematical geography	i) the study of the physical processes relating to the structure of the earth, including not only the lithosphere but also the hydrosphere and the atmosphere

6. Fill in the gaps with the proper words given in the box.

habitable; include; a number of; surface; variability; areal patterns; interface; dependent; dry deserts; is derived; physical geographer; are distributed; deals with

1. Geography is the study of the … of the Earth.
2. The word geography … from the Greek words «geo» and «graphien».
3. The surface of the Earth is the … of the atmosphere, lithosphere, hydrosphere and biosphere.
4. One of the special characteristics of the environment is its high …
5. The environment varies from hot tropics to cold Polar Regions, … to humid equatorial forests.
6. The … zone has a number of special characteristics.
7. Geographic study is particularly concerned with location, with …, with the interrelationship of phenomena.
8. The main areas of inquiry … where people live, in what sort of patterns them … over the Earth's surface.
9. Geography is a synthetic science, largely … for its data on the results of specialized sciences.
10. Economic geography … estimation of the environment and resources, distribution of economy and population.
11. Geography has … subdivisions.
12. The principal activities of … include observing, measuring and describing the surface of the Earth.

7. Give English equivalents for the following Russian ones.

происходить; распространение растений и животных; окружающая атмосфера; движение воды; обитаемая зона; сложное взаимодействие; засушливые пустыни; обширные равнины; изрезанные горы; делать обобщения; влиять на сельское хозяйство; деятельность человека; зависеть от чего-либо; иметь отношение к чему-либо; рассматриваемый в этом свете; элементы пространственной структуры; социальная география; основные отрасли физической географии; приводить к чему-либо; оценка окружающей среды; измерение и описание земной поверхности; рациональное использование и воспроизводство природных ресурсов.

IV. Speaking practice.

1. Speak on the topic «The Subject of Geography». Use the following phrases.

1. The text is about …
2. The text deals with …

3. The text is devoted to …
4. The text goes on to say …
5. It is pointed (stressed) in the text …
6. In conclusion the text touches upon such problem(s) as …

Учебный элемент 2 (УЭ-2)
Early History of Geography

I. Improve your word power.

1. Study your active vocabulary.

Active Vocabulary

accounts of travelers сообщения путешественников
perception понимание; восприятие
believed it to be a sphere полагали, что она является сферой
ingenious reasoning простые рассуждения
solstice солнцестояние
tabulation составление таблиц
latitude and longitude широта и долгота
errors ошибки
Muslim learning мусульманское учение
Crusade крестовый поход
epitome изображение в миниатюре
coin создавать

II. Reading Comprehension.

1. Read and translate the text. Consult a dictionary if necessary.

ORIGIN AND DEVELOPMENT OF GEOGRAPHY
EARLY HISTORY

Human beings have always wondered how other lands and peoples differ from their own home and folk. The first recorded knowledge of such differences came mainly from the accounts of travelers. The 5th century B.C. Greek writer Herodotus was an outstanding early example of one who carefully recorded his personal observations made during many years of extensive travel. The Greek

perception of the Earth was highly advanced: the philosophers Pythagoras and Aristotle believed it to be a sphere and the Pythagorean Philolaus taught that it revolved around a central fire. In the 3rd century B.C. Eratosthenes of Cyrene, whose Geographica was the first work to have the word geography as its title, employed ingenious reasoning and measurements to produce a remarkably accurate calculation of the circumference of the Earth. He had observed that at Syene (modern Aswan, Egypt) at noon on the summer solstice the Sun was directly overhead, while at Alexandria it cast a shadow. By calculating the angle of the shadow and using the distance between Syene and Alexandria, Eratosthenes arrived at a figure of 250,000 stadia (or stades) for the Earth's circumference.

Eratosthenes' figure, however, subsequently was rejected by classical geographers, such as Ptolemy – who calculated, erroneously, that the Earth was much smaller.

In his 17-volume work written at about the time of Christ, the Greek geographer and historian Strabo provided the most detailed summary and review of the classical knowledge of geography. The first two books were devoted to a wide-ranging discussion of the aims and methods of geography and to a review of earlier writings. Many early works of Greek or Roman authors have disappeared or have survived only in fragments and they are known today only through Strabo's critical comments in these books. The other 15 books written by Strabo provided regional descriptions. The great contribution of the 2nd century A.D. astronomer and geographer Ptolemy was the concept of the tabulation of latitude and longitude of places; these tabulations could give precision to locations, but Ptolemy's data again contained errors that were to plague geographers for centuries.

With the breakup of the Roman Empire in the West, most of the geographic knowledge of the Greeks gradually was lost in Europe, but during the 11th and 12th centuries it was preserved, revised, and enlarged by Arab geographers. Geographic study in Europe was stimulated anew by contact with Muslim learning during the Crusades, although in their reacquaintance with Greek ideas – particularly those of Ptolemy – European thinkers generally ignored the additions and corrections of the Arabs. Thus, the errors of Ptolemy were perpetuated in the West until the voyages of the 15th and 16th centuries started bringing back to Europe detailed and more accurate information of the rest of the world.

An important figure of the new learning was the German scholar Bernhardus Varenius (Bernhard Varen), whose Geographia generalis (1650, General Geography) was revised numerous times and remained a standard reference work for a century or more. Unlike many earlier writers, Varenius included ideas based on direct observations and original measurements. In the century be-

fore Varenius, the Flemish cartographer Abraham Ortelius prepared a world map in sections and bound them together in book form in his Theatrum orbis terrarium (1570, Epitome of the Theatre of the World), the first atlas. The first use of the term atlas, however, was by Ortelius' contemporary Gerardus Mercator (Gerhard de Cremer) and is said to be derived from the representation of Atlas supporting the heavens that formed a frontispiece to early atlases. Mercator, who also came from Flanders, was the leading cartographer of the 16th century.

The four generations of the Cassini family of astronomers and surveyors in France were pre-eminent in developing methods for accurately surveying the land surface. In work extending from the late 17th to the late 18th century, the Cassinis made the first detailed topographic survey of a large country, and this was used as the basis for a national atlas of France published in 1791. In the 18th century James Cook set new standards in accuracy and skill in navigation. Furhermore, his voyages had scientific missions. On his famous second voyage (1772 – 1775), which circumnavigated the globe at high southern latitudes, he was accompanied by Johann and Georg Forster, the father and son who made botanical collections and climatologically observations. Georg Forster later influenced Alexander von Humboldt to study geography.

During his travels in South and Central America (1799 – 1804) Humboldt located places with accurate latitudes and reasonably close longitudes. Through his detailed observations in the Andes he was able to provide the first systematic description of the interrelations of altitude, temperature, vegetation, and agriculture in low-latitude mountains and to provide a clear picture of vertical zonation. He plotted his data on maps and coined the term isotherm for a line joining points with the same temperatures. In his regional monograph on the economic geography of New Spain (Mexico) Humboldt presented data on population, production, trade, utilization of resources, and their interconnections.

III. Comprehension and Word Study.

1. Say if these statements are true of false. Argue them using the suggested phrases in the box.

Agreeing	Disagreeing
That's quite right. That's true. Yes, I agree … I absolutely agree. I'm of exactly the same opinion.	I don't agree. Not really. I disagree, I'm afraid … That's wrong … I don't think that's right. I can't agree … Surely not.

1. The Greek perception of the Earth was highly advanced: they thought it to be a sphere.

2. The first recorded knowledge of differences of other lands and peoples came from the book «Geographia generalis».

3. The first work to have the word geography as its title was written by Pythagoras.

4. Pythagoras and Aristotle taught that the Earth revolved around a central fire.

5. Eratosthenes produced a remarkably accurate calculation of the circumference of the Earth.

6. Eratosthenes arrived at a figure of 250,000 miles for the Earth's circumference.

7. The first two Strabo's books were devoted to the discussion of the aims and methods of geography.

8. The great contribution to geography made in the 4th century A.D. was the concept of the tabulation of latitude and longitude of places.

9. With the breakup of the Roman Empire in the West, most of the geographic knowledge of the Greeks was lost.

10. An important figure of the new learning, based on direct observations and measurements was Abraham Ortelins.

11. The first atlas was made by Geradus Mercator.

12. Alexander Humbold was influenced greatly by the knowledge of the Arabs to study geography.

13. During his travels to South and Central Africa Humboldt located places with accurate latitudes and close longitudes.

2. Complete the following sentences.

1. Human being have always wondered how …

2. The first recorded knowledge about different places came from …

3. Pythagoras taught that the Earth …

4. Eratosthenes observed that at Syene at noon the Sun was … while at Alexandria it …

5. By … Eratosthenes arrived at a figure of 250,000 stadia for the Earth's circumference.

6. Strabo's first two books were devoted to …

7. Geographic study in Europe was stimulated anew by …

8. The great contribution of the 2nd century astronomer and geographer Ptolemy was …

9. The errors of Ptolemy were perpetuated in the West until …

10. The first use of the term atlas was …

11. The Cassini family of astronomers and surveyors made …

12. In the 18 century James Cook set …

13. During his travels A. Humboldt provided not only a clear picture of vertical zonation; but he presented data on …

3. Fill in the chart below and complete it.

The stages of the development of the science of geography

Period of time	The country, the name of the scientist	Discoveries
5th century B.C.	Greece – Herodotus	Personal observations, accounts of travel
4th century B.C.	Greece – Pythagoras and Aristotle	The Earth is a sphere, it revolves around a central fire
3d century B.C.	---------- Eratosthenes	----------
2nd century A.D.	----------	----------
----------	----------	

4. Expand on the following.

1. The Greek perception of the Earth was highly advanced.

2. Eratosthenes employed ingenious reasoning and simple calculations of the circumference of the Earth.

3. The Greek geographer Strabo provided regional descriptions.

4. During the breakup of the Roman Empire most of the geographic knowledge of the Greeks was lost in Europe.

5. The 17th century brought a new figure of the new learning in Europe.

6. A. Humboldt made the first systematic description of the interrelations of altitude, temperature, vegetation and agriculture in low-latitude mountains.

IV. Speaking Practice.

1. Discuss the following.

1. Early history of geography.

2. Great contributions to the science of geography made by outstanding geographers.

3. The development of map making.

2. Complete the following sentences.

1. Human being have always wondered how …
2. The first recorded knowledge about different places came from …
3. Pythagoras taught that the Earth …
4. Eratosthenes observed that at Syene at noon the Sun was … while at Alexandria it …
5. By … Eratosthenes arrived at a figure of 250,000 stadia for the Earth's circumference.
6. Strabo's first two books were devoted to …
7. Geographic study in Europe was stimulated anew by …
8. The great contribution of the 2nd century astronomer and geographer Ptolemy was …
9. The errors of Ptolemy were perpetuated in the West until …
10. The first use of the term atlas was …
11. The Cassini family of astronomers and surveyors made …
12. In the 18 century James Cook set …
13. During his travels A. Humboldt provided not only a clear picture of vertical zonation; but he presented data on …

V. Additional Reading.

1. Read and translate the text «The Round Earth on Flat Paper» from appendix 1.

Учебный элемент 3 (УЭ-3)
Map Location and Measurement

I. Reading Comprehension.

Read the text and do some exercises after it.

MAP LOCATION AND MEASUREMENT

The map is the distinctive data bank of the geographer. Since geography deals particularly with locations, distributions, areal associations, and interrelationships of phenomena in space, accurate observation and measurement of the surface of the Earth and the recording and displaying of location on maps are of prime importance.

Latitude and longitude are commonly utilized for plotting locations on the surface of the globe. Fairly accurate measurements of latitude were made in antiquity by Greek scholars. Measurements of longitude remained rough[1], however, because of the difficulty in measuring differences in solar time (the Sun «moves» westward at the mean rate of one degree each four minutes). The perfection of the chronometer solved this problem, but for long each country had its own system for numbering the meridians. Finally, by an international agreement reached in 1884, an imaginary line from pole to pole through Greenwich, near London, was recognized as the prime meridian. Measurement of direction, was aided considerably by use of the magnetic compass, but as Christopher Columbus noted in crossing the Atlantic, the direction in which the compass pointed varied with longitude.

The measurement of distances overland could be counted in days of journey on foot, by camel, by horse, or by other means. More accurate measurements of short distances were obtained by using a chain[2], and the chain as a unit of length (66 feet) is still a traditional surveying measure in English-speaking countries.

Later, the chain itself was replaced by a steel tape, and still later electronic instruments came into use. A practical measurement of distances at sea was developed in the 16th century: a log[3] was thrown overboard and the amount of time it took the stationary log to play out a certain distance on a line marked off with knots[4] was measured. Navigation by means of satellites is now available, but a ship's speed is still measured in knots and records are kept in a logbook[5]. After the adoption of the meter as a standard unit in France in the late 18th century, it gradually replaced older local and national measures of distance over much of the world during the 19th and 20th centuries.

Maps of small areas – topographic maps, for example – can be made by a method called triangulation[6]. A base-line is measured with chains or other devices, and by using this base as one side of a triangle the other sides are calculated from the angles at the two ends of the base-line. Angles can be measured more easily and accurately than distances, and from the points on the corners of the original triangle, a network of points joined by triangles can be established. Triangulation was known to the ancient Egyptians and Greeks; with improved instruments, especially the theodolite, this method was utilized in the great national surveys of Europe and America from the 18th to the 20th century. How to represent the entire, spherical Earth or large areas of it on maps remained a problem. In 1492 the German navigator and geographer Martin Behaim completed the construction of a terrestrial globe. Shipsm following straight lines on flat maps, however, did not arrive at expected points. Mercator devised a map

projection – which became known as the Mercator projection – on which ships following straight lines would arrive at the plotted points[7]. Modern geographers use maps drawn in what is called the equal-area projection, but even this projection distorts shapes or distances, particularly toward the edges of the map.

With the increasing specialization of knowledge, measuring the shape of the Earth developed into the discipline of geodesy, plotting land positions for detailed maps became the province of surveying, and constructing numerous types of maps with appropriate projections grew into the field of cartography. Maps have remained as the basic tools in geography for plotting and analyzing a vast range of physical, biologic, historical, economic, political, and social data.

Notes:

1. rough – приблизительный
2. chain – мерная цепь длиной 66 фут. (~20 м)
3. log – лаг (навигационный прибор для измерения скорости хода судна и пройденного расстояния)
4. knot – узел (мера скорости, равная 1,87 км/ч)
5. log book – вахтенный журнал, бортовой журнал
6. triangulation – триангуляция (тригонометрическая съемка)
7. plotted points – места, участки, нанесенные на карте

1. Put the following sentences in the logical order.

1. After the adoption of the meter in the 18th century, it gradually replaced older local and national measures of distance.

2. Latitude and longitude are commonly utilized for plotting locations on the surface of the globe.

3. Maps have remained the basic tools in geography.

4. Measurement of direction was aided considerably by use of the magnetic compass.

5. Triangulation was known to the ancient Egyptians and Greeks.

6. More accurate measurements of short distances were obtained by using a chain.

7. Maps of small areas can be made by a method called triangulation.

8. Modern geographers use maps drawn in what is called the equal-area projection.

2. What problems can be discussed with the help of the following groups of words?

1) map, to plot; data bank of the geographer; to be of importance; the basic tools in geography, to deal with, geodesy and cartography;

2) latitude and longitude, to plot locations, measurements of longitude, to reach an international agreement, prime meridian, the use of the magnetic compass;

3) measurement of distances, to come into use, a chain, a steel tape, a knot, adoption of a meter, electronic instruments, the theodolite, satellite, a method of triangulation.

II. Additional Reading.

1. Read and translate the texts «Charles Robert Darwin» and «What is Science?» from appendix 1.

PROGRESS TEST 1

Part A

Join the Halves.

1. Geography is	1. geomorphology, climatology, bio-geography and soil geography
2. The surface of the Earth is	2. located places with accurate latitudes and reasonably close longitudes
3. Geographic study is	3. counted in days of journey on foot, by camel, by horse, or by other means
4. Geography is divided	4. can be made by a method called trian-gulation
5. The principal activities of geog-rapher include	5. how other lands and peoples differ from their own home and folk
6. The principal branches of physi-cal geography are	6. the exact and organized Knowledge
7. Human beings hare always won-dered	7. observing, measuring & describing the surface of the earth
8. The great contribution of Ptolemy was	8. into systematic fields and regional specializations
9. During his travels in South & Central America Humboldt	9. the interface of the atmosphere, litho-sphere and biosphere
10. Latitude and longitude	10. the concept of the tabulation of lati-tude & longitude of places

11. The measurement of distances overland could be	11. particularly with location, with areal patterns with the interrelationships of phenomena
12. Maps of small areas	12. are commonly utilized for plotting locations on the surface of the globe

Part B

Choose the best alternative to complete the following sentences.

1. The word «geography» is derived from the (Latin / Greek) words get («the Earth») and graphein («to write»).

2. Geography is the exact knowledge of the distribution of (population / phenomena) on the surface of the Earth.

3. The surface of the Earth is the (interface / distribution) of the atmosphere, lithosphere, hydrosphere and biosphere.

4. One of the special characteristics of the environment is its high (stability / variability) form place to place.

5. The most important elements affecting human activities are (movements of the planet / measurements) of temperature and rainfall.

6. Geographic study is particularly concerned with the relationship between (human society and the plants / human society and the land).

7. Geography is largely depended for its data on the results of (natural sciences / specialized sciences).

8. All regional specializations of the science of geography can be grouped under (many / three) main headings.

9. The principal activities of the (economy geographer / physical geographer) include observing, measuring and describing the surface of the Earth.

10. Human activity has become more able (to change / affect the landscape) of the world.

11. The principal branches of physical geography are (geomorphology and soil geography / mineralogy and petrology).

МОДУЛЬ II. Exploration and it's History

Цели:

Вы должны знать	Вы должны уметь
1. Лексика: активный словарь по теме. **2. Грамматика:** притяжательный падеж и притяжательные местоимения; степени сравнения прилагательных. **3. Содержание темы:** основные причины исследований знаменитых исследователей и их достижения.	1. Читать и переводить текст по теме, используя активный словарь. 2. Вести диалог об этапах в истории исследований и об известных путешественниках. 3. Вести полноценное суждение о знаменитых исследователях и роли их открытий в истории. 4. Правильно переводить конструкции с притяжательным падежом и употреблять степени сравнения прилагательных.

Учебный элемент 1 (УЭ-1)
The History of Exploration

I. Improve your word power.

1. Study your active vocabulary.

Active Vocabulary

believe *v* верить
chart *n* морская карта, таблица, чертеж
convert *v* превращать, переделывать, обращать
curiosity *n* любопытство, любознательность
determine *v* определять, решать, устанавливать
discover *v* делать открытия, открывать
explore *v* исследовать, изучать
inhabit *n* жить, обитать, населять
reason *n* причина, повод, основание
route *n* маршрут, курс, путь, дорога
sail *v* плавать, отплывать
search *n* поиски
v искать (for)
trade *n* торговля, занятие, ремесло

travel *v* путешествовать
valuable *a* ценный, дорогой
voyage *n* плавание, морское путешествие
v путешествовать по морю

2. Read the international words. Mind the stress.

accurate	practical	convert	determination
chart	polar	describe	expedition
continent	photograph	geology	generation
gravity	permanent	produce	christianity
human	route	pollution	
harmony	region	preserve	
jungle	system	result	
market	satellite	religion	
mineral		resource	
nature		universal	
origin		unique	

3. Pronounce correctly the following proper and geographical names.

Columbus [`kə`lΔmbəs]
Magellan [ma`gielən]
Christianity [kristiǽniti]
Christian [`kristjən]
Marco Polo [`makou]
Europe [`juərəp]
European [juərə`piən]
Far East
China [`tʃainə]
Japan [dʒəpǽn]
Moluccas [məu`lΔkəz]
Spice Islands
Asia [`eiʃə]
Mongol Empire [moŋ`gəul `empaiə]

II. Reading Comprehension.

1. Before reading the text try to discuss the following questions.

What were the reasons for many journeys and voyages of discovery?
What famous explorers do you know?

2. Read and translate the following text.

THE HISTORY OF EXPLORATION

Since the earliest times, people have explored their surroundings. They have crossed the hottest deserts, climbed the highest mountains, and sailed the widest seas. They have struggled through steamy jungle to find an unknown plant and brought back weird[1] creatures from the ocean floor. All explorers have in common the human trait of curiosity[2]. However, curiosity was not the only reason for many journeys of discovery. Explorers always had more practical reasons for setting out, for example to search for land or treasure.

Some hoped to find valuable trade or new routes to countries that produced the goods they wanted. There is a saying that «trade follows the flag». In other words when explorers find new lands, traders will soon follow. However, it would be better to say that «the flag follows trade»! It was the search for trade and trade routes that resulted in[3] Europe's discovery of all the world's oceans and continents during the 15th and 16th centuries. The famous voyages of explorers, such as Columbus and Magellan, arose from desire of Europeans to find a sea route to the markets of the Far East, where valuable goods like silk and spices could be bought. Columbus did not set out to discover a new continent. He was hoping to reach China and Japan, and died insisting that he had done so. Magellan did not intend to sail around the world. He was hoping to find a new route for trade with the Moluccas[4], or Spice Islands.

Some were missionaries, who felt a duty to convert people to their own religion. Unlike many other religions, Christianity claims to be universal[5]. Sincere Christians therefore believed it was their duty to convert other people to Christianity. European expeditions to the Americas included priests, whose job was not only to hold services for the European members of the expedition, but also to convert the local people.

Some were fishermen or miners or merchants, looking for a better living. One of them was Marco Polo, who made his famous journey to the East in 1271. There were many Europeans travelling across Asia, but Marco's journey was unique because he stayed in the vast Mongol Empire for 20 years. On his return to Europe he wrote a splendid book describing all that he had seen.

All explorations and discoveries have opened the world. Thanks to the determination of generations of explorers, there is almost no place on Earth that is still unknown and unnamed. We know what lies in the ocean's depths, and at the top of the highest mountain. Maps chart the dry rocks of the world's deserts and the glaciers of the coldest Polar Regions. Even the Earth's gravity has not

stopped explorers from heading out into space[6]. As distant places have become more familiar, the nature of exploration has changed. The challenge is no longer to discover the world's wild places. Today, a new adventure in exploration is beginning. Explorers are trying to understand the Earth and its climate, and the living things that inhabit its surface. Scientists hope to learn more about the Earth's geology and origins by studying and measuring the tiny shifts[7] of the bare rocks on mountaintops.

We are finding out about the surroundings of the Earth itself. Now that the Moon has been visited, space scientists today are concentrating on building space stations closer to Earth (highly accurate photographs from the «eyes in the sky» – satellites – help scientists to map the world's most remote regions, to look for mineral resources, and to track the spread of pollution[8] and crop disease[9]) and sending space probes to find out more about regions of space much farther away. Spacecraft travelling through the solar system have sent back news of other planets and one day men and women will follow them.

For millions of years, the Earth's natural systems have lived in delicately balanced harmony[10]. Exploration itself does little to upset this balance. But when people move into newly discovered areas they cause permanent changes. The explorers of the past showed our ancestors the wonders of the Earth. The duty of explorers today is to discover how to preserve these wonders for future generations.

Notes:

1. weird – странный, причудливый
2. trait of curiosity – характерная черта (здесь: любознательность)
3. resulted in – приводить к какому-либо результату
4. Moluccas – Молуккские острова
5. Christianity claims to be universal – христианство претендует на мировое господство
6. heading out into space – выход в космос
7. tiny shifts – незначительные сдвиги
8. the spread of pollution – распространение загрязнения
9. crop disease – болезнь с/х культур
10. delicately balanced harmony – тонко сбалансированная гармония

III. Comprehension and Word Study.

1. Match english and russian equivalents.

1) to explore the surroundings	a) населять
2) to struggle through steamy jungle	b) искать лучшую жизнь
3) weird creatures	c) находить неизвестные растения

4) ocean floor	d) распространение загрязнения
5) trait of curiosity	e) измерять
6) to search for land or treasure	f) пробиваться через тропические джунгли
7) valuable goods	g) решительность поколений
8) to discover a new continent	h) понять, выяснить
9) to convert	i) концентрироваться
10) to look for a better living	j) отображать на картах наиболее удаленные регионы
11) the determination of generations	k) живые существа
12) ocean's depths	l) дно океана
13) cold polar regions	m) ценные товары
14) the nature of exploration	n) любознательность
15) living things	o) болезнь с/х культур
16) to inhabit	p) обращать в другую веру
17) to measure	q) искать землю или богатства
18) to find out	r) открыть новый континент
19) to concentrate on	s) сущность исследования
20) to map the most remote regions	t) исследовать окрестности
21) crop disease	u) причудливые существа
22) spread of pollution	v) глубины океана
23) to find an unknown plants	w) холодные полярные регионы

2. Translate into Russian the following words, word combinations and sentences.

Accurate: accurate maps, accurate photographs, accurate clock, accuracy, accurately. Clocks in airports should be accurate. The earliest maps were not accurate.

Believe: believe in, make believe (that), belief, to the best of my belief, believer, believable. I believe you. I believe in God. I believe in that man. The boys made believe that they were explorers in the African forests. Christians believed that the Earth was flat. He has lost his belief in God.

Curiosity: trait of curiosity, to be dying of curiosity, curious, curious neighbours, curiously. I am curious to know what he said.

Convert: to convert people to Christianity, converting, converted, convertible, conversion (to, into).

Discover: to discover a new continent, discovery, journeys of discovery, discovered areas, discoverer. He made wonderful scientific discoveries. Columbus discovered America, but didn't explore the new continent.

Explore: explore the arctic regions, exploration, the nature of exploration, the exploration of the ocean depths, explorer, exploratory. The Great Atlas of Discovery tells the story of exploration and discovery from earliest times to the present day.

Reason: practical reason, the only reason for, to bring to reason, by reason of, by reason of its general sense, without any reason, to give reasons for smth, reasonable, a reasonable price (offer, excuse), reasonably, reasoning. The pupils understood the teacher's reasoning.

Search: to search for a land or treasure, to search one's memory, to search out an old friend, go in a search of a missing child, searching, search-light, searcher.

Trade: trade follows the flag, trade route, to trade in, to trade with, to trade off, trade mark, trade name, trade price, trader, tradesman, trading. Even today the salt trade is vital to the economy of desert peoples.

Valuable: to find valuable trade, a valuable discovery, a valuable picture. He gave me valuable information.

3. Add nouns to the following adjectives to form noun phrases.

Adjectives: 1) steamy; 2) unknown; 3) weird; 4) ocean; 5) practical; 6) trade; 7) new; 8) famous; 9) valuable; 10) local; 11) dry; 12) space; 13) mineral; 14) remote.

Nouns: a) people; b) stations; c) reasons; d) goods; e) regions; f) rocks; g) resources; h) plant; i) floor; j) explorers; k) jungle; l) creature; m) route; n) continent.

4. Pair the verbs in column A with a suitable phrase in column B.

A	**B**
1) to cross	a) people to their own religion
2) to search for	b) steamy jungle
3) to produce	c) building space stations
4) to climb	d) the spread of pollution
5) to find	e) a better living
6) to sail	f) the world's wild places
7) to feel	g) mineral resources
8) to convert	h) permanent changes
9) to look for	i) the hottest deserts
10) to struggle through	j) the goods
11) to discover	k) new lands (a sea route)

12) to concentrate on	l) a duty
13) to look for	m) the widest seas (around the world)
14) to track	n) the highest mountains
15) to cause	o) land or treasure

5. Make up nouns from the given verbs. Mind that the suffix -er (-or) denotes the doer of the action. Translate them into Russian.

Model: *to climb – climber – альпинист.*

To create, to explore, to build, to mine, to produce, to sail, to write, to find, to visit, to travel, to trade, to voyage, to discover, to seek.

6. Match the nouns with their appropriate explanations.

1) journey	a) land that is without water and trees, often sand covered
2) trade	b) season's produce of grain, grass, fruit
3) adventure	c) solid stony part of the Earth's crust
4) discovery	d) one of the main land masses
5) route	e) everything around and about a place
6) desert	f) journey by water
7) continent	g) going to a place, a distant place
8) voyage	h) something that is discovered
9) crop	i) an exciting or dangerous journey or activity
10) surroundings	j) way taken or planned from one place to another
11) rock	k) buying and selling of goods, exchange of goods for money or other goods

7. Fill in the missing words.

Expedition, trades, discovery, travellers, included, route, trade, seekers, space, voyages, set out, traders, ice desert, travel, exploration.

1. The Ancient Egyptians made ___ down the Red Sea nearly 6000 years ago.
2. The real story of _____ and _____ began with civilization.
3. The Arabs were great _____ and _____ of knowledge.
4. Salt _____ transported salt from the coasts, and island deposits, to areas where it was scarce and valuable.
5. The climbers had tried to find a new _____ to the top of the mountain.
6. Travel through _____ to other planets interests many people today.

7. Belarus _____ with many European countries.

8. Ferdinand Magellan's _____ across the Pacific made Europe aware of the vastness of the ocean on the far side of the world.

9. Earlier explorers had travelled in the hope of finding gold mines, valuable _____, fame, and land for their countries.

10. Explorers added the hope of new scientific discoveries and their expedition's _____ scientists as well as sailors, soldiers, merchants, and adventurers.

11. The first great scientist expedition to South America _____ to record the shape and size of the Earth – the science known as geodesy.

12. _____ in the Arctic was both difficult and dangerous.

13. The last place on Earth to be explored was the cold, hostile _____ of the Antarctic.

8. Give English equivalents for the following Russian ones.

Пересекать жаркие пустыни, взбираться на высокие горы, нарушать баланс, отправляться открывать новый континент, вызывать постоянные изменения, иметь много общего, приводить к чему-либо, искать лучшую жизнь, иметь аргументированные причины для, найти морской путь к рынкам, отображать на картах наиболее отдаленные регионы, искать новые земли и новые торговые пути, прослеживать распространение загрязнения, ценный товар, обращать людей в другую веру.

IV. Speaking practice.

1. Choose proper sentences from the text as expanded answers to the following questions.

1. Why did people begin to explore their surroundings?
2. What were the reasons for many journeys and voyages of discovery?
3. What is the meaning of the saying «trade follows the flag»?
4. What were the great explorers looking for and what did they find?
5. What is the practical importance of all explorations and discoveries?
6. How can space scientists help us today?
7. What is the difference between the duties of explorers of the past and those of today?

2. Complete the following sentences by adding the phrases given in the text.

1. Since the earliest times, people _____
2. All explorers have in common _____
3. Some explorers hoped to find _____

4. Columbus was hoping to reach _____
5. Magellan wanted to find _____
6. Missionaries felt a duty to _____
7. Marco's journey was unique because _____
8. Thanks to the determination of generations of explorers, there is _____
9. As distant places have become more familiar _____
10. Explorers are trying to understand _____
11. Scientists hope to learn more _____
12. The explorers of the past showed _____
13. The duty of explorers today is _____

3. Try to prove to the others that geographical discoveries and explorations were very important. Use the following phrases:

I think…
I consider…
Judging from…

4. Speak on the following topics.

1. Ancient explorers.
2. Famous voyages.
3. Exploration of desert areas.
4. Exploration of Antarctic.
5. The conquest of space.

Учебный элемент 2 (УЭ-2)
Captain Cook

I. Improve your word power.

1. Study your active vocabulary.

Active Vocabulary

to take the lead взять на себя инициативу, выступить инициатором
merchant торговый
to gain rapid promotion добиваться быстрого продвижения по службе
a collier судно для перевозки угля
to be tough крепкий, стойкий

to carve an inscription вырезать надпись
in the vicinity поблизости, около
some kind of stag какой-то вид оленя
to sail due держать курс прямо на
to chip chunks откалывать толстые куски
a scuffle драка
to stab вонзать, ранить, закалывать

II. Reading Comprehension.

1. Read and translate the text. Be ready to discuss its main points.

CAPTAIN COOK

In the 18th century Europeans knew very little about the South Pacific. Many did not believe it was an ocean at all and thought instead that the region contained a giant southern continent, which stretched across the South Pole and reached as far north as the tropics. The Solomon Islands, New Zealand, and possibly even Australia were all considered part of this huge land mass. Two nations – Great Britain and France – took the lead in exploring the South Pacific, but it was an Englishman, Captain James Cook, who solved the mystery of the Southern continent for ever.

The famous navigator was born in Yorkshire in 1728, and he spent his boyhood and learnt his seamanship there. James Cook joined the Royal Navy in 1755 at the age of 27 after serving 10 years in merchant ships. Although he joined the Navy at a low level, he was a skilled navigator and pilot and gained rapid promotion. However, he did not become an officer until 1768, when he was appointed to lead the expedition to the Pacific.

James Cook made three voyages from the British Isles to the South Seas. When he had to choose a ship to sail around the world, he chose a Whitby collier and renamed it the Endeavour. Colliers were built to carry coal, so the Endeavour was neither beautiful nor fast, but she was tough. There was enough room on board for stores and a crew of 94 men, including the wealthy young naturalist, Joseph Banks and his team of scientists.

On his first voyage, in 1768, Cook sailed to Tahiti, New Zealand and the east coast of Australia. To prove this fact his team displayed the British flag on the shore and carved a brief inscription on a nearby tree.

Captain Cook first stepped ashore on April 29th, 1770. There was a great variety of plants in the vicinity of his landing area, and that's why he called the

place Botany Bay. At Botany Bay, Joseph Banks and the other naturalists collected hundreds of plants they had never seen before. Cook's crew were the first Europeans to see an Australian Kangaroo. They were totally confused by it and couldn't decide what kind of animal it might be. It was the colour of a mouse, the size of a deer and it jumped like a hare. In the end they decided it must be «some kind of stag». That part of Australia resembled the coastline of Glamorgan and Cook gave it the name of New South Wales. After that he continued his voyage of exploration and discovered that New Guinea was completely separate from Australia. Cook's charts of the region, showing the Solomon Islands, New Zealand's North and South Islands, and the east coast of Australia, proved they were separate countries rather than a single continent.

On his second voyage, in 1772, James Cook sailed due south into Antarctic waters, and guessed correctly that there was an area of frozen land around the South Pole. Approaching Antarctica he crossed the Antarctic Circle twice. The famous navigator never actually saw Antarctica, the real Southern continent, though he was very close to it several times. «Ice mountains», as he called the icebergs, prevented him from sailing closer to it. His crew chipped chunks of ice from the icebergs to use as drinking water. Cook felt sure the ice stretched all the way to the South Pole, and wrote in his journal that he could think of no reason why any man should want to sail in these cold and dangerous waters again.

On his third voyage, in 1776, Captain Cook sailed to the North Pacific looking for an inlet that would lead him to the Arctic Ocean. On the way, he found Hawaii by chance. Cook came across the Hawaiian Islands, which he named the Sandwich Islands. He spent the winter there getting to know the islands and their inhabitants, who were very friendly. In spring he left to explore the coast of North America but had to return to Hawaii to repair a broken mast. This time the islanders did not welcome the strangers so warmly, perhaps because they were short of food. A quarrel began when some of the islanders stole one of the ship's boats. A short scuffle broke out on the beach and Cook was stabbed to death. He died in 1779.

Whitby Museum contains many souvenirs from Cook's voyages, and there are also scale models of his ships – Endeavour and Resolution, both of which were built right here in Whitby's shipyards. A splendid life-size figure of the great sailor and explorer stands facing the sea on the West Cliff above the harbour.

III. Comprehension and Word Study.

1. Say if these statements are true or false. Correct the false statements, using the following phrases:

It would be more correct to say that...
In my opinion…
As far as I know…
I don't think that's right…
I'm afraid I entirely disagree with…

1. In the 18th century two nations – Great Britain and France – didn't take part in exploring the South Pacific.
2. An Englishman, Captain James Cook, solved the mystery of the Southern continent.
3. James Cook joined the Royal Navy in 1755 at a high level and became an officer at once.
4. James Cook made two voyages from the British Isles to the South Seas.
5. On his first voyage Cook sailed to Tahiti, New Zealand and the east coast of Australia.
6. Cook's crew were the first Europeans to see an Australian Kangaroo.
7. Captain Cook discovered that New Guinea was near by Australia.
8. On his second voyage the famous navigator saw Antarctica.
9. On his third voyage Captain Cook sailed to the North Pacific looking for an inlet that would lead him to the Arctic Ocean.
10. Cook was killed at the age of 51 in a short fight.

2. Here are the answers to some questions on the text. What are the questions?

1. In the 18th century two nations – Great Britain and France – took the lead in exploring the South Pacific. (Who?)
2. An Englishman, Captain James Cook, solved the mystery of the Southern continent. (Disjunctive)
3. The famous navigator was born in Yorkshire in 1728. (Where?)
4. James Cook was a skilled navigator and pilot and gained rapid promotion. (General)
5. James Cook made three voyages from the British Isles to the South Seas. (Alternative)
6. On his first voyage, in 1768, Cook sailed to Tahiti, New Zealand and the east coast of Australia. (Where?)

7. Captain Cook discovered that New Guinea was completely separate from Australia. (Disjunctive)

8. The famous navigator never actually saw Antarctica, the real Southern continent, though he was very close to it several times. (General)

9. Captain Cook sailed to the North Pacific looking for an inlet that would lead him to the Arctic Ocean. (Why?)

10. A short scuffle broke out on the beach and Cook was stabbed to death. (How?)

11. A splendid life-size figure of the great sailor and explorer stands facing the sea on the West Cliff above the harbour. (Where?)

3. Read the following putting the verbs in brackets into the correct form. Be ready to speak on this topic.

Ferdinand Magellan 1 _____ (be) a Portuguese sailor who 2 _____ (want) to sail around the world. Emperor Charles V of Spain 3 _____ (give) him five ships and two hundred and sixty-five Spanish sailors. They 4 _____ (leave) Spain on 20th September, 1519 and 5 _____ (begin) their long and dangerous journey.

On the journey, Magellan 6 _____ (discover) the Pacific Ocean. Unfortunately, he and many of the sailors 7 _____ (die) in a battle on 27th April, 1521. After that, a Spanish sailor 8 _____ (take) control of the ships and 9 ____ (set off) to complete the voyage. Only one ship and sixteen men 10 _____ (survive) the journey. They 11 _____ (arrive) back in Spain on 6th September, 1522. They 12 _____ (be) the first men to sail around the world.

IV. Speaking Practice.

1. State the main idea of each passage of the text. Begin with the following:

This passage deals with…

2. Speak on the following topics.

1. James Cook's biography.
2. Captain Cook's voyages.
3. James Cook's greatest discoveries.

Учебный элемент 3 (УЭ-3)
The History of Maps

I. Reading Comprehension.

1. Read the text.

THE HISTORY OF MAPS

Men have been using maps for thousands of years. In ancient times little was known about the shape of the Earth. Men did not even know that the Earth is round. They never traveled far, so they did not know how large is the Earth. The earliest maps were not accurate, but still they were useful.

The first known maps were made by the Egyptians as long ago as 1300 B.C., to show the boundary lines of each man's land. But the first world maps were made by the Greeks. It is supposed that Anaximander had designed the first ones. He was a Greek scientist who lived from 611 to 547 B.C. According to Anaximander's maps, the Earth was a flat circle surrounded by one large river.

Most European maps in the Middle Ages showed the world as a flat disc. Only three continents were shown – Europe, Asia and Africa, as the existence of the Americas had been unknown. The top of the map was East, and at the exact centre of the world was Jerusalem, the Holy city. Jerusalem was placed at the centre of the Earth because that is where the Bible says it is. Maps such as those were usually published in religious books, and we should really think of them not as maps, but as religious pictures. The Christian Church taught that the Earth is flat. Although the Ancient Greeks knew better, and this knowledge never quite died out, most people believed without question that the earth was flat.

While Christians still believed that the Earth was flat, Muslim scholars knew it is round. The famous Arab geographer Al Idrisi was born in North Africa in about 1100. He traveled through much of Europe and the Near East and worked for many years for Roger II, King of Sicily. He produced a map of the world, a globe of the Earth and a huge guide for travelers. The map even showed a possible source of the Nile, which wasn't far from the true source.

World maps in the 15th century were based on the work of Claudius Ptolemaeus, known as Ptolemy, an ancient geographer who had been dead for more than 1200 years! Ptolemy map showed Europe and the Mediterranean region quite accurately, but it showed only the top half of Africa because Ptolemy had no idea how far south the continent stretched, nor if it even ended at all. The Portuguese sailors who first rounded the tip[1] of Africa kept the reports of their

voyages secret from other European nations who also wanted to find a sea route to the trade goods of the Far East.

As years passed and men learned more and more about the geography of the world, maps became better and better. During the 18th and the 19th centuries, France and England sent many explorers to new parts of the world. French and English settlers went to these new places to live. Then, as information got back to France and England, new maps were made.

During the 19th century another kind of map was developed. It was called a topographic map. A topographic map is often very detailed. It may cover as little as five square miles, but it shows just about everything there is to show about the geography of that area.

Until the end of the 19th century there were no international agreements about making world maps. The maps made in one country did not agree with the maps made in another country. But in 1913 a meeting of 34 countries was held in Paris. At the meeting a set of rules for making world maps was agreed upon. And today these rules are even more important than ever. They are important because the boundaries of countries are often changed. And changes make new maps necessary.

Notes:

1. tip – тонкий конец, кончик

II. Comprehension and Word Study.

1. Choose the one best alternative to each question. Answer all the questions on the basis of what is stated or implied in the text.

1. Which of the following does the text mainly discuss?
   a) the story of exploration;
   b) modern space voyages;
   c) full details of important discoveries;
   d) map-making;
   e) the history of maps.

2. When did the first maps appear?
   a) in the Middle Ages;
   b) in the 19th century;
   c) as long ago as 1300 B.C.;
   d) in1745;
   e) in the 20th century.

3. Who was Anaximander?
    a) a Greek scientist;
    b) a famous explorer;
    c) an ancient geographer;
    d) the greatest scientist;
    e) a famous writer.

4. How did the Earth look like according to Anaximander's maps?
    a) round;
    b) a flat circle surrounded by one large river;
    c) a flat disc;
    d) oval;
    e) square.

5. What did the famous Arab geographer Al Idrisi produce?
    a) a great atlas of discovery;
    b) a well-drawn map of the world;
    c) a religious book;
    d) a globe of the world;
    e) a guide for travelers.

6. The word *«accurate»* is closest in meaning to …
    a) important;
    b) exact;
    c) modern;
    d) detailed;
    e) right.

7. According to the text what is a topographic map?
    a) It is very detailed;
    b) It gives full details of important discoveries;
    c) It may cover as little as ten square miles;
    d) It shows about the oceanography of that area;
    e) It shows endangered animal species.

8. Which of the following isn't true about maps? Maps give information about:
    a) vegetation;
    b) countries and their boundaries;
    c) economic resources;
    d) children;
    e) navigation.

2. Fill in the missing verbs in the correct passive tense form.

publish, know, build, use, appoint, unexplore, call, change, draw

1. James Cook _____ to lead the expedition to the Pacific.
2. Colliers _____ to carry coal.
3. In the 18th century Siberia ___ still mostly _____.
4. Compasses _____ on board ship to tell sailors in which direction they were sailing.
5. The earliest sailors' maps _____ Portolan charts and _____ on goatskin.
6. Maps in the Middle Ages _____ usually _____ in religious books.
7. In ancient times little _____ about the shape of the Earth.
8. Today rules for making world maps are important because the boundaries of countries ___ often _____.

3. Read the following putting the verbs in brackets into the correct form. Be ready to speak on this topic.

Do you think Mars 1. _____ (colonize) by humans one day? The planet Mars 2. _____ (know) as «the red planet». The soil there is red and its surface 3. _____ (cover) in volcanoes. Until recently, it 4. _____ (believe) that nothing could live on Mars, but during a recent space mission, tests 5. _____ (carry out), and now it 6. _____ (think) that life on Mars might be possible one day. During the space mission, special equipment 7. ___ (use) to examine the planet. No form of life 8. _____ (find) yet, and so far the planet 9. _____ (consider) unsuitable for inhabitation. However, we 10. ____ (tell) by scientists that, by 2020, humans 11. _____ (send) to Mars, and that one day, special cities 12. _____ (build) so that we can live there. It 13. _____ (hope) that by 2150, Mars will be a wonderful place to live. If a colony 14. _____ (build) on Mars, would you like to live there?

4. Fill in the text with the appropriate word from the box.

stretched, direction, route, find, set out, exploration, sail, reach, voyage, approaching, globe, sailor, discoveries

While the Portuguese were trying to find a sea _____ to Asia by sailing around Africa, a Genoese ____ named Christopher Columbus thought of a different way of getting there. He decided to ____ west, convinced that, as the world is round, sooner or later he must _____ Asia from the opposite ____. He ____ in 1492, having persuaded the Spanish king and queen to pay for his ____. In those

days, people thought that the ____ was much smaller than it really is. They imagined that one huge piece of land – made up of Europe, Asia, and Africa – ____ most of the way around the world, and had no idea that the Americas existed. As a result, Columbus made one of the biggest mistakes, yet greatest _____, in the history of _____. He came to some islands roughly where he expected to ____ Asia and thought that he was _____ the East Indies near mainland Asia. He made four voyages across the Atlantic without realizing that instead of finding Asia, he had found a «New World».

5. Translate the text into Russian (in writing) and answer the questions following it.

ATLAS

The name *Atlas* has, with reason, been a popular one for the professional strongmen of the circus and stage, inasmuch as the first *Atlas* was powerful Greek demigod who tended the pillars that were believed to hold the heavens and earth apart. We moderns think of *Atlas* as a strong man who holds the globe on his back. This was the conventional picture printed on the covers of our grade school geographies but it represents a much later idea, for in Ancient Greece the earth was not thought of as a sphere. The picture of *Atlas* supporting the world was first used by the 16th-century geographer Mercator as a frontispiece in a collection of his own remarkable maps, and this use caused the figure of *Atlas* to appear in our later geographies and the name *atlas* to be applied to a collection of maps.

Questions:

1. Of what origin is the word Atlas?
2. What was it used for?
3. Who was Atlas according to the Greek mythology?
4. What do the modern people think of Atlas?
5. What idea does the picture of Atlas on the covers of geography textbooks represent?
6. Who used the picture of Atlas for the first time?
7. Why is the name atlas applied to a collection of maps?

III. Speaking Practice.

1. Imagine you are going to make a trip by ship from Europe to Alaska. Work with your partner and look at the maps. Make some notes about the things

that might be useful (a possible route, the things you should take possible problems that may arise) using the suggested phrases:

We can go from … to …
We should take lots of food. We should take …
We might hit an iceberg. We might …

IV. Additional Reading.

1. Read and translate the text «Navigation Tools» from appendix 1.

PROGRESS TEST 2

Part A

Join the Halves.

1. Since the earliest times people	1. explored their surroundings
1. Curiosity was not	2. the only reason for many journeys of discovery
2. There is a saying	3. that «trade follows the flag»
3. The famous voyages of explorers	4. arose from desire of Europeans to find a sed route to the markets of the Far East
4. Sincere Christians therefore believed	5. it was their duty to convert other people to Christianity
5. Thanks to the determination of generations of explorers	6. there is almost no place on Earth that is still unknown & unnamed
6. The duty of explorers today	7. is to discover how to preserve the wonders tor future generations
7. The famous navigator	8. was born in Yorkshire in 1728
8. James Cook made three voyages	9. from the British Isles to the South Seas
9. A splendid life-size figure of the great sailor and explorer	10. stands facing the sea on the West Cliff above the harbour
10. The first Known maps	11. were made by the Egyptians as long ago as 1300 B.C.
11. While Christians still believed that the Earth was flat	12. the Muslim Scholars Knew it is round
12. Until the end of the 19th century there were no international agreements	13. about making world maps

Part B

Say if these statements are true or false.

1. Since the earliest tines people have crossed the hottest deserts, climbed the highest mountains and sailed the widest seas.
2. The famous voyages of explorers, such as Columbus and Magellan, arose from desire of Europeans to find a sea route to the markets of Africa.
3. European expeditions to the Americas included priests whose job was not only to hold services, but also to convert the local people.
4. Scientists don't hope to learn more about the Earth's geology and origins.
5. When people move into newly discovered areas they cause permanent changes.
6. James Cook made two voyages from the British Isles to the South Seas.
7. On his second voyage James Cook saw Antarctica.

МОДУЛЬ III. The Solar System and the Universe

Цели:

Вы должны знать	Вы должны уметь
1. Лексика: активный словарь по теме. **2. Грамматика:** числительные; времена в Active Voice. **3. Содержание темы:** названия и основные характеристики планет Солнечной системы.	1. Читать и переводить тексты по теме, используя активный словарь. 2. Вести беседу о строении Солнечной системы. 3. Формировать логическое монологическое высказывание об истории и развитии исследований Вселенной.

Учебный элемент 1 (УЭ-1)
The Structure of the Solar System and the Universe

I. Improve your word power.

1. Read and study your active vocabulary.

Active Vocabulary

accompany *v* сопровождать
approach *v* приближаться
celestial body небесное тело
cluster *n* скопление
galactic ~ скопление галактик
stellar ~ звездное скопление
consist of *v* состоять из
contract *v* сжиматься
contraction *n* сжатие
dominate *v* господствовать
evaporate *v* испаряться
expand *v* расширять(-ся), увеличивать(-ся) в объеме
expansion *n* расширение, растяжение
gravity *n* сила тяжести
the law of universal ~ сила всемирного тяготения
include *v* включать
luminosity *n* яркость света

luminous *a* светящийся
matter *n* вещество
mean *a* средний
origin *n* 1. источник, начало; 2. происхождение
plane *n* плоскость
property *n* свойство, качество
provide *v* предоставлять
pull *v* притягивать
reflect *v* отражать
rotate *v* вращаться

2. a) Read correctly the names of the planets. Mind the stress.

Mercury	Mars	Uranus
Venus	Jupiter	Neptune
Earth	Saturn	Pluto

b) Read the following paying attention to the pronunciation of letter combinations with U. State their meaning consult the dictionary if necessary.

[ju:]	[u:]	[^]	[u]	[ɛ:]	[a]
fusion	luminous	sun	pull	turn	outside
circular	include	lump	push	burn	outer
nuclear	rule	puzzle	put	surface	countless
universe	true	substance	full	further	thousand
eventually		until	bush		around

[ju]	[ə]
Europe	figure
pure	neighbour
cure	century

3. Match English phrases and their Russian equivalents.

1) celestial body	a) закон всемирного тяготения
2) telescopic improvements	b) слияние ядер
3) the set of nine spheres	c) возвращаться
4) nuclear fusion	d) твердые планеты
5) rotation rate	e) небесное тело
6) the law of universal gravity	f) приближаться к солнцу

7) rocky planets	g) полумесяц
8) outer reaches	h) скорость вращения
9) head back	i) группа из девяти планет
10) crescent	j) отдаленные районы
11) approach the sun	k) модернизация телескопов

II. Reading Comprehension.

1. Before reading the text try to answer the following questions.

What does the Solar system consist of?

What heavenly object is the most beautiful (mysterious, important)?

2. Read and translate the text.

THE UNIVERSE AND THE SOLAR SYSTEM

The Earth and the sun and the other eight planets are isolated in space. This set of nine spheres that circles the bright sun is poised in emptiness[1] and separated by unimaginable distances from everything else in the Universe. Because the Sun is its central figure, the family of bodies that accompanies it is called the Solar system, which in its turn[2] is a part of a galaxy and eventually of the Universe.

Until the 17th century the solar system was thought to consist of only five planets besides the earth and moon. In 1609, soon after having heard of the invention of the telescope in Holland, Galileo built one of his own and was able to add four new bodies to the system: the brighter of the moons (or satellites) that revolve around Jupiter. Since Galileo's time telescopic improvements have made possible the discovery of many more members of the sun's family.

It is common knowledge now that our neighbourhood in space consists of our local star, the Sun, and its family of nine planets, nearly 70 moons, millions of comets and countless asteroids. The mean diameter of the Solar system is approximately 7 billion miles.

Dominating the entire Solar system is the Sun, which is nearly a thousand times more massive than all the planets put together. The energy the Sun generates by nuclear fusion makes it luminous and provides the rest of the Solar system with heat and light. Its gravity pulls the planets so that they move around it in almost circular orbits.

The list of planets now includes nine, in order from the Sun they are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto. All planets are divided into two groups: four small rocky ones close to the Sun and four

big gassy ones farther out. Pluto is a puzzle as it does not fit into either group. All except Mercury, Venus and Pluto have satellites.

Planets revolve around the sun and rotate on their axes. Nearly all the revolutions and rotations are in the same direction, but the rotation rate is different, slow with some planets, rapid with others. Only the rotation of Venus and the revolutions of a few satellites are in the opposite direction. Uranus is an exception of a different kind since it rotates about an axis only 80 from the plane of its orbit.

All the orbits except those of the comets lie nearly in the same plane. Planets stay on their orbits according to the law of universal gravity. All celestial bodies have an attraction of their own and pull each other. This force decreases sharply the greater the distance. At the same time the force of their movements tends to pull them away from each other. This interaction was discovered by the great British scientist Isaak Newton in the 17th century.

Astronomers have identified more than 4,000 pieces of rock, known as asteroids, orbiting the Sun. However there are probably millions of these minor planets, some only a few meters across. Most are in the Asteroid Belts lying between Mars and Jupiter.

The farthest, Chiron, orbits the Sun beyond Saturn.

The sight of a great comet hanging in the sky, looking like a ghostly dagger poised to strike[3], is an impressive spectacle. Yet, comets are all show and no substance – a «dirty snowball», or lump of ice the long, oval orbit of a comet carries it close to the sun and far away again. As it approaches the sun, the frozen surface starts to evaporate, forming a great head of gas, which the solar wind sweeps[4] into a long tail. The comet's moment of glory lasts a brief few weeks before it heads back to the icy outer reaches of the Solar system. Planets, asteroids and satellites are only visible by virtue[5] of the sunlight they reflect. What we see of any of these objects at a particular time is limited to the half that faces the sun.

Planets with orbits larger than that of the earth never come between us and the sun, so we can always see nearly the whole of their illuminated sides. Mercury and Venus, however, have orbits smaller than the earth's and are between us and the sun for a good part[6] of each revolution. In this position their dark sides are turned toward us, and we see them either not at all or as crescents.

Notes:

1. to be poised in emptiness – находиться в невесомости
2. in its turn – в свою очередь
3. a ghostly dagger poised to strike – призрачный кинжал, занесенный для удара
4. to sweep – здесь: преобразовывать
5. by virtue of smth. – посредством чего-либо
6. a good part of smth. – значительная часть чего-либо

III. Comprehension and Word Study.

1. Complete the following table. Use your dictionary if necessary.

Verb	Noun	Adjective
revolve		
	invention	
	system	
rotate		
	circle	
represent		
	orbit	
		attractive

2. Identify the meaning of the underlined words as they occur in the sentences below.

1. The *mean* density of the earth 5.5 *means* that a cubic foot of average earth-substance weighs about 5.5 times as much as a cubic foot of water.

2. Most minerals can be quickly identified by *means* of a microscope.

3. A wide range of sophisticated instruments from giant radio dishes and powerful telescopes to flying observatories and robot spacecraft has been used as a *means* of investigating the Universe.

4. Artificial earth-orbiting satellites are new *means* to make people's lives easier by forecasting the weather, assisting planes and ships with navigation, or locating deposits of oil and other minerals.

5. What do you *mean* by a solar cycle?

6. The *meaning* of the abbreviation UFO is well known to everyone.

7. By *means* of nuclear fusion the sun generates energy which makes it luminous.

8. The meteorological satellite may be equipped with sensitive photometric devices which measure by optical *means* the brightness of the earth's surface.

3. Add nouns to the following adjectives to form noun phrases.

Adjectives: unimaginable, central, minor, opposite, solar, slow, circular, outer, celestial, universal, rocky, dirty, mean, impressive, luminous, rapid.

Nouns: gravity, reaches, body, planet, snowball, spectacle, orbit, figure, direction, distances, system, wind star, rotation rate, temperature.

4. Pair the verbs in column A with a suitable phrase in column B. You must find and match for every word but there is not necessarily only one correct solution!

A	**B**
revolve	the energy
provide	into two groups
generate	the sunlight
rotate	on their own axes
approach	around Saturn
reflect	into either group
divide	the planets
fit	the sun
orbit	the outer reaches of the Solar System

5. Write out the equivalents in pairs of synonyms.

decrease	heavenly
eventually	remote
path	circle
sphere	fast
outer	about
consist of	orbit
rocky	planet
celestial	be composed of
rate	speed
mean	finally
approximately	average
rapid	shining
luminous	decline
orbit	

6. Match the verbs with their appropriate definitions.

1) to approach	a) to change into steam and disappear
2) to divide (into)	b) to throw back light, that of the sun
3) to rotate	c) to turn round a fixed point
4) to head back	d) to start to move away from another moving object
5) to evaporate	e) to come near or nearer in space
6) to attract	f) to move around a central point

7) to reflect	g) to separate into 2 or more part or groups
8) to revolve	h) to move in an opposite direction
9) to pull away	i) to draw or pull towards oneself, cause to come near

7. Find words and phrases in the text that correspond to the definitions given below.

1. All space and everything that exists in it.

2. Any of the large group of stars held together by the mutual gravitational attractions of one star for another.

3. A non-luminous body in space gravitationally bound to the sun or a star and rotating in orbit in counter clockwise direction.

4. An object in space that circles the sun in a long elliptical path and has a very bright head and a long tail.

5. A body in space that moves round a larger one, esp. a planet.

6. One of many rocky small planets between Mars and Jupiter.

7. The natural force by which objects are attracted to each other, esp. that by which a large mass pulls a smaller one to it.

8. The path followed by the earth in its annual movement around me sun.

8. Fill in the gaps with the suitable words below.

approach	discover	evaporate	approximately
luminosity	outer reaches	massive (2)	discovery
impressive spectacle	gravity	luminous	eventually
star	rate	circle	celestial bodies
mean			

1. A star cannot avoid being … because of the energy generated in the conversion of its hydrogen into helium.

2. The Southern hemisphere does not have the north's Pole star to help navigators, but its skies undeniably represent an …

3. Apart from the stars in the very centre, those in the inner regions of a spiral galaxy … it more rapidly than those in the outer regions.

4. When the comet's orbit carries it close to the Sun, surface ices … into a great head of steam.

5. Mercury feels the Sun's powerful gravity very strongly, and orbits at a breakneck … – which makes it even more difficult to spot.

6. The … distance between the Earth and its closest neighbour in space, the Moon, is … 384,000 km.

7. Comets come from the … of the Solar system, and their parts, when they reach the inner planets, are hard to predict.

8. Astronomers use imaginary lines, similar to latitude and longitude on Earth, to indicate the position of objects in the sky known as …

9. The …, temperature, and size of stars depends on their mass: the heavier the star, the larger and hotter it is and the brighter it shines.

10. Stars live a long time, but they all die … The reason is simple: they run out of fuel. But the way a star dies, and how long it lives, depends on how … it is. A … like the Sun, or one that is less …, lives for billions of years. Born 4 – 6 billion years ago, our Sun now … middle age.

11. The … of Pluto marked the end of a search that had lasted for almost 75 years. Once astronomers … Neptune they soon realized that it's … alone was not strong enough to pull Uranus away from its expected orbit.

9. Look at the table and the two paragraphs which follow. Write in the same way for Venus, Mars, Saturn, Uranus, Neptune and Pluto.

Planet	**Number of moons**	**Average distance from sun (millions of miles)**	**Equatorial diameter (miles)**	**Time of orbit round sun (Earth time)**	**Atmosphere**
Mercury	0	36	3,100	88 days	slight, composition unknown
Venus	0	67	7,700	225 days	mainly carbon dioxide
Earth	1	93	7,927	365 days	mainly nitrogen and oxygen
Mars	2	141	4,200	687 days	mainly nitrogen
Jupiter	12	483	88,700	nearly 12 years	mainly hydrogen, methane and ammonia
Saturn	9	886	75,100	over 29 years	mainly hydrogen, methane and ammonia
Uranus	5	1,783	32,000	over 84 years	mainly hydrogen and methane
Neptune	2	2,793	27,600	nearly 165 years	mainly hydrogen and methane
Pluto	0	3,670	3,600	over 248 years	probably none

10. Give the English equivalents.

Вращаться вокруг, орбиты планет, небесное тело, почти круглый, скорость вращения, среднее расстояние от Земли до Солнца, вращаться в одном направлении, закон всемирного тяготения, отражать свет, притягивать, отдаленные районы, делить на две группы, твердые планеты, впечатляющее зрелище, испаряться, ось, приблизительно.

IV. Speaking Practice.

1. Say whether the following statements are true or false. Justify your answers with information from the text using the following phrases.

really / sure / absolutely so; it can't be denied; it can be easily proved; that is only partly true; as far as I remember (from the text); as far as I know / have learnt from the contents; this is generally believed to be true; this is believed by some to be true.

1. The Universe still contains a lot of mysteries.
2. The Sun is named «central figure» of the Solar system only because of its central position.
3. All rotations and revolutions in the Solar system are in the same direction.
4. Planets, asteroids and satellites are so-called dead.
5. The Earth and the Moon are separated by short distance, 38,400 km.
6. Galileo discovered the planet Jupiter in 1609.
7. The planets revolve around the Sun in absolutely circular orbits.

2. Choose someone to act as a President of the Royal Astronomical Society and answer the visitors' questions.

What (is / are)	the movements of the planets
Could you explain to me	the planets stay on their orbits
Can you tell me about	people can see other planets, asteroids, satellites
What do you mean by	
Why	the lifetime of a comet celestial bodies
	the composition of the Solar system
	the Sun is luminous
	the mean diameter of the Solar system
	the central figure of the Solar system
	scientists discovered numerous
	celestial bodies

3. Speak on.

1. The composition of the Universe:

the set of nine spheres, to be separated by unimaginable distances, central figure, the family of bodies, accompany, isolated in space, solar system, consist of, satellites, asteroids, comets, to orbit the sun, galaxy, mean diameter.

2. Our local star:

central figure, massive, luminous, to generate energy, nuclear fusion, to provide planets with heat and light, to pull the planets, to revolve around, circular orbits.

3. Comets:

a «dirty snowball», to approach the sun, to evaporate, a head of gas, to sweep into, solar wind, a comet's tail, to head back, outer reaches, an impressive spectacle.

4. The law of universal gravity:

to lie in the same (opposite) plane, to stay on one's orbit, an attraction, to pull each other, to pull away from each other, force, to be discovered.

4. Draw a scheme of the distribution of the planets in the Solar system and compare their related position toward each other and the sun, using the words and phrases from the text.

5. Read the words in the box, make sure you understand them and predict the consequences of asteroid attacks.

asteroid, to intersect with the orbit of Earth, to bring great damage to, tsunamis, blast waves, electromagnetic changes near the surface, effects, to vary enormously, to depend on, the character of the object, speed, angle of entry, consequences, human life, natural ecosystem; atmosphere of Earth, to protect from, to burn up, to explode, at high latitudes

6. Choose one of the following items and write an essay. Use additional material.

1. A planet parade.
2. Are we alone in the Universe?
3. The Universe had a definite beginning. Will it then have a definite end?
4. Is there a tenth planet still to be discovered?

V. Additional Reading.

1. Read and translate the texts from appendix 1 (p. 119 – 125).

PROGRESS TEST 3

Part A

Join the halves.

1. Just as the Sun has got its family of planets, revolving around it, … 2. It is the comet's fail … 3. The sun's nuclear energy, in the form of light and heat, has bathed the Solar System for 5 billion years, … 4. Ceres, the largest asteroid, is a rocky body covered with dark clays … 5. Not only the entire Solar System isolated in space, … 6. There are no asteroids … 7. Astronomers discovered two moons circling Neptune … 8. The Earth rotates from west to east, … 9. The Earth takes 365 ¼ days…	1. … that we may be able to see with air naked eyes, without the aid of a telescope 2. … but each of its principal members is separated from the others by vast distances 3. … six of these planets have their own satellites which are orbiting them 4. … which intersect with the orbit of Earth and are essentially dangerous 5. … the largest one orbiting in a direction opposite to the planet's rotation 6. … to make a revolution about the Sun 7. … while its enormous gravity has kept the planets in their orbits 8. … which do not reflect sunlight 9. … making one complete turn in about 28 hours

Part B

Choose the best alternative to complete the following sentences.

1. The Moon … Earth as it moves around the Sun, orbiting our planes like a large artificial Satellite.
   a) approaches;
   b) accompanies;
   c) pulls.

2. Planets and their satellites only shine in the night sky because …
   a) they are luminous;
   b) they have «fusion reactors» to make them shine;
   c) they reflect light form the Sun.

3. Nowadays we think of a comet as an aggregate of …

a) matter that contains abundant hydrogen;

b) ice and snow and mud;

c) frozen water, ammonia, methane and some particles of a metallic and stony character.

4. The meteor' showers that we regularly receive early every August scientists believe to be …

a) the remains of a comet;

b) atmospheric phenomena;

c) asteroid attacks.

5. As the comet approaches the Sun …

a) the tail shrinks;

b) the tail heads back;

c) gets longer.

6. Different phases of the moon represent the amount of …

a) the luminous surface of it visible to us;

b) the illuminated surface of the satellite visible to us;

c) the dark surface of the moon visible to us.

7. After Uranus was discovered, astronomers realized that the planet … by an unknown gravitational force-perhaps another planet lying farther out, so the next planet Neptune was found.

a) was being divided into tiny particles;

b) was being approached rapidly;

c) was being pulled slightly off course.

8. The Moon's orbit around the Earth is not quite …

a) circular;

b) elliptical;

c) ecliptic.

МОДУЛЬ IV. The Earth

Цели:

Вы должны знать	Вы должны уметь
1. Лексика: активный словарь по теме. **2. Грамматика:** формы Passive Voice. **3. Содержание темы:** история происхождения нашей планеты, ее размеры, форма и структура.	1. Читать и переводить тексты по теме, используя активный словарь. 2. Вести беседу о происхождении планеты Земля. 3. Формировать монологическое высказывание по теме модуля, используя конструкции Passive Voice.

Учебный элемент 1 (УЭ-1)
The Earth of Ours

I. Improve your word power.

1. Read and study your active vocabulary.

Active Vocabulary

boundary *n* граница
boring *n* бурение, буровая скважина, буровые работы
constitute *v* образовывать, составлять
core *n* ядро
cover *v* покрывать, охватывать
cover *n* покров
density *n* плотность
earthquake *n* землетрясение
enclose *n* окружать
eruption *n* извержение (вулкана, лавы)
exist *v* существовать
folding *n* складкообразование
fossil *n* окаменелость, ископаемые остатки
moist *a* влажный
molten *a* расплавленный
with reference to что касается, относительно
rock *n* горная порода

sediment *n* осадок
solid *a* твердый
vast *a* обширный, огромный

2. a) Read correctly the names of the planets. Mind the stress.

Mercury	Mars	Uranus
Venus	Jupiter	Neptune
Earth	Saturn	Pluto

b) Read the following paying attention to the pronunciation of letter combinations with U.

[ju:]	[juə]	[u:]	[^]	[u]
universe	obscurity	conclusive	result	pull
eventually	during	revolution	sun	fully
unit			rush	
speculation			subject	
unique			number	
superior			crust	

[ɔ]	[au]	[ə]
quarry	mountain	temperature
	surround	

3. Match English phrases and their Russian equivalents.

1) at an extremely rapid rate	a) измерить расстояние
2) to come to a halt	b) существовать во Вселенной
3) to estimate the distance	c) образовать твердую земную кору
4) to exist in the Universe	d) окружать Землю
5) to have favorable conditions	e) для удобства
6) for convenience	f) с очень высокой скоростью
7) overflows of molten lava	g) потоки расплавленной лавы
8) to form a solid crust of rock	h) прекратиться
9) to surround Earth	i) иметь благоприятные условия

II. Reading Comprehension.

1. Before reading the text discuss the following points.

What is the Earth?
Is the Earth a perfect sphere?

2. Read and translate the text.

THE EARTH OF OURS

Earth is a minute fragment of a universe that is believed to have come into existence as a result of a cataclysmic explosion of a single mass of highly concentrated matter some ten billion years ago. Out of this explosion evolved the galaxies, such as our Milky Way, that are made up of the many billions of stars that are known to exist in the heavens.

All of these stars, of which Sun is one, have been rushing farther and farther out into space at an extremely rapid rate ever since. But this rate is now believed to be slowing down. If so, eventually this expanding movement may come to a halt and its direction may then be reversed. In that event all the separate units of the universe might be pulled back together with a resulting new explosion that would repeat the sequence.

Where Earth had its origin and how it came to be have long been subjects of much speculation among mathematicians and astronomers, geologists and biologists, physicists and chemists, and philosophers and theologians. Some of the more modern concepts of highly capable scientists especially concerned with this subject appear sufficiently conclusive to make it possible to accept them as working hypotheses. But they still leave many points to be more fully explained.

Earth, located some 93 million miles out in space from Sun and revolving around it once every 365 days at a speed of about twenty-two miles a second, is believed to be an offshoot from Sun. It came into existence largely as a gaseous mass that began to solidify into its present form some four and a half billion years ago. It is the third of a series of nine planetary satellites of Sun, of which Mercury and Venus are nearer to Sun, and Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto are increasingly farther away from it. The distance from Sun to Pluto is estimated at 3,675 million miles.

Our Solar system is not unique, and neither is Earth. Many millions of such systems are believed to exist in the universe. The number of stars, among the largest of which our Sun is a mere midget, has been estimate at 10^{20}, which

means 10 multiplied by itself 20 times. And of these millions of millions of millions of stars, some 10^8 have been estimate to have planetary systems similar to the one of which Earth is a part. From this, one may speculate that there are millions of planets that are so located with reference to the stars round which they revolve as to have conditions that are favorable for life. The living forms on these Earthlike planets may be very different from those with which we are familiar. Conceivably, the highest forms of life on some of these plants may be superior to man.

The history of Earth is recorded on part in the rocks that are exposed to view and that have been reached by quarrying and boring. For convenience, this history is divided into five eras, of which the most recent, the Cenozoic era, covers the last 60n million years, since the folding that formed the Rocky Mountains. The next earlier Mesozoic era, extending back 130 million years farther, began with the folding that formed the Appalachian Mountains. Prior to that were the Paleozoic era of 360 million years following an extended period of widespread overflows of molten lava, the Proterozoic era of 900 million years after the Laurentian revolution, and the Archeozoic era that began in obscurity. These five eras total 2,000 million years, leaving 2,500 million more years to get us back to the beginning of time on Earth. During the pre-Archeozoic era, Earth was a molten mass, the surface of which was cooling down to form a solid crust of rock. The moist vapor that originally surrounded Earth gradually condensed to form water. This existed mostly as such, but some of it joined to the minerals that formed as the molten rock cooled, and now exists in combined solid form. But the interior of Earth has remained hot down to the present time, the temperature of its central core being estimated to be, at least 1,500º C.

Notes:

1. is believed to have come into existence – полагают, что … появилась
2. is believed to be showing down – полагают, что … замедляется
3. is believed to be – полагают, что … является
4. are believed to exist – полагают, что … существует
5. have been estimated to have … – установлено, что … имеют
6. …, the temperature being estimated to be … – считается, что температура составляет…

III. Comprehension and Word Study.

1. Use your dictionary and complete the following table.

Verb	Noun	Adjective
exist		
	explosion	
	movement	
appear		
	distance	
locate		
	convenience	
		solid

2. Identify the meaning of the words as they occur in the sentences below.

1. *Long* glaciers move more rapidly than do short ones.
2. This river has *long* been used for internal traffic.
3. Air masses do not *long* remain over their source region.
4. This winter will be *long* remembered for its cold and snowy weather.
5. It has *long* been known that there are variations in the amount of radiation given off by the Sun.
6. The Dead Sea basin has *long* been regarded as rift or graben basin.
7. Heat passes to the colder body as *long* as he temperature difference exists.
8. These theories have *long* been subjects of much speculation among scientists.

3. Add nouns to the following adjectives to form noun phrases.

Adjectives: modern, capable, gaseous, present, planetary, solar, favorable, widespread, molten, solid, moist, cataclysmic, rapid, separate.

Nouns: overflows, vapor, system, concept, satellites, lava, explosion, form, scientists, units, mass, conditions, crust, rate.

4. Pair the verbs in column A with a suitable phrase in column B. You must find a match for every word but there is not necessary only one correct solution!

A	B
divide	to form water
form	Earth
exist in	into five eras
estimate	into existence
condense	a solid crust of rock
repeat	the temperature

solidify into	the sequence
the superior	to man
come	combined solid form
surround	its present form

5. Write out the equivalents in pairs.

fragment	speed
rate	concerning
off-shoot	before
distance	quick
midget	separate or incomplete part
similar	stop or pause
prior to	divided
rapid	enough
eventually	convincing
halt	branch
separate	very small
origin	in the end
sufficient	like
conclusion	starting point
with reference to	measure of space

6. Match the verbs with their appropriate explanations.

1) to evolve	a) to travel (a certain distance)
2) to exist	b) to turn something the other way
3) to accept	c) to be developed naturally and (usually) gradually
4) to solidify	d) to continue living
5) to estimate	e) to make longer
6) to speculate	f) to leave uncovered or unprotected
7) to locate	g) to go round in a circle
8) to remain	h) to receive something offered
9) to reverse	i) to make or become hard or firm
10) to revolve	j) to calculate the size (of)
11) to expose	k) to establish in a place
12) to cover	l) to form opinions (without having complete knowledge)
13) to extend	m) to be still present after a part has gone or has been away

7. How are these ideas expressed in the text?

1. A cataclysmic explosion of a single mass of highly concentrated matter.
2. The rate of the stars movement is slowing down.
3. Subjects of speculation among scientists.
4. Earth is an offshoot from Sun.
5. Planetary systems similar to the one of which Earth is a part.
6. The fire eras of the history of Earth.
7. The interior of Earth.

8. Which prepositions has been blacked out in the following article?

The distance _ the surface _ the centre of Earth is a little _ 3,950 miles. The most dependable information _ the interior _ Earth has been obtained _ studies _ earthquake waves. When the rates _ travel _ these waves were measured _ varying distances _ their points _ origin, they were found _ increase _ about eight miles a second _ a depth _ 1,800 miles, __ which they slowed down _ about five miles a second. _ this it was deduced that Earth's core is made _ of very different materials _ that constitution the remainder _ the globe. The average density _ the rocks that make up the outside shell of Earth is about 2.7. That of Earth as a whole is 5.52. _ other words, the weight of Earth is a little _ five and one-half times that _ an equal volume _ water.

From this and other evidence the conclusion has been reached that Earth is enclosed _ a shell about 550 miles thick. The outside _ this shell consists _ a relatively thin layer _ soil, some rock debris, and a variety __ solid rocks _ the type _ which we are familiar. The solid rock still lower down is probably a dark-colored igneous type, formed directly _ molten matter and known as magma, _ which little if any has ever been exposed _ view. Within this outside shell is a second shell that is made _ mostly _ iron oxide and iron sulfide and that extends 1,050 miles farther inward toward the center _ Earth. Inside this second shell is a core, _ a radius of about 2,150 miles, which is believed to consist mostly of iron and nickel, similar _ composition _ most _ the meteorites. The density of the iron oxide-sulfide inner shell is estimated _ 5.6 and that _ inner iron-nickel core at 8.0. These three divisions of Earth's interior no doubt merge _ each other rather than having distinct boundaries.

9. Translate the following sentences into Russian.

1. Air contains traces of ozone and other gases, the greater part of the ozone occurring in a layer from 24 to 40 kilometers above the earth's surface.

2. All other conditions being equal, the velocity is dependent upon temperature.

3. Canada was one of the earliest of the nations of the world to produce a national atlas, the first edition being produced in 1906.

4. The forests having been cleared, farming became one of the principal occupation of the people of this area.

5. In the past years the earth has been getting warmer, the Northern Hemisphere's temperature having risen about 10 F.

6. The moon having no atmosphere, its surface experience great extremes of temperature.

7. The major part of Ghana is covered by savannas and forests, the latter occupying more than a quarter of the total area of the country.

8. Certain volcanoes throw out very little solid matter, their products being molten lavas.

9. The drill cuttings having been examined, we could determine the nature of the rock.

10. Some of the molten material having cooled, the solid crust of the earth formed.

10. Give the English equivalents.

Расплавленная масса; складкообразование; твердая земная кора; располагаться относительно звезд; условия, благоприятные для жизни; влажный пар; по крайней мере; происхождение земли; отдельные частицы; охлаждаться; оставаться горячей до сегодняшнего времени; высшие формы жизни; в конечном итоге; отдельные частицы.

IV. Speaking Practice.

1. Say whether the following statements are true or false. Justify your answers with information from the text. For the statements you consider to be false provide the correct information. Here are the possible openings for you:

really (sure) absolutely so; it can't be denied; it can be easily proved; that is only partly true; as far as I remember (from the text); as far as I know (have learnt) from the contents; this is generally believed to be true; this is believed by some to be true.

1. Being a minute fragment of a universe Earth may have come into existence as a result of a cataclysmic explosion of a single mass of highly concentrated matter.

2. The expanding movement of the stars may come to a halt.

3. Some modern concepts are accepted as working hypotheses.

4. Earth is located some 60 million miles out in space from Sun.
5. Neither Earth nor the Solar system is unique.
6. Earth was a molten mass during the pre-Archeozoic era.

2. Which phrases from the right column complete each sentences beginning in the left column? Do you strongly agree or disagree with any of the statements?

1) The galaxies are made up of the many billions of stars that …	a) … to get us back to the beginning of time on Earth
2) All the separate units of the universe might be pulled back together …	b) … with a resulting new explosion that would repeat the sequence
3) Some of the more modern concepts of scientists leave many points …	c) … to be at least 1, 500º C
4) Earth revolves around Sun once every 365 days at a speed of …	d) … is estimated at 3,675 million miles.
5) The distance from Sun to Pluto …	e) … to be more fully explained
6) The living forms on the Earth like planets may be very different from …	f) … about twenty-two miles a second
7) The fire eras leave 2,500 million more years …	g) … those with which we are familiar
8) The temperature of the central core of Earth is estimated …	h) …are known to exist in the heavens

3. Choose someone as an astronomer and answer the visitors' questions.

What is (are)	Earth
Could you explain to me	the galaxies evolved
Can you tell me about	the rate of the stars
What do you mean by	the direction of the movement of the stars
Why	working hypotheses
How	a gaseous mass that began to solidify
	the distance of nine planetary satellites to Sun
	what scientists think about planets having favorable conditions for life

4. Speak on the following topics using the following phrases.

1. A minute fragment of a Universe:

to come into existence, as a result of, a single mass, highly concentrated matter, to evolve, to be made up of, to exist.

2. The rate of movement of the stars:

to rush, at an extremely rapid rate, to slow down, to come to a halt, to revolve, to pull back together, to repeat the sequence.

3. The origin of Earth:

to be a subject of speculation, modern concepts, to be concerned with, to appear conclusive, to make possible, to accept, to explain.

4. An offshoot from Sun:

to revolve, at a speed of, to solidify into, to be increasingly farther away from, to estimate.

5. Our Solar system is not unique:

a mere midget, to estimate, to be similar to, to speculate, to be located, conditions favorable for life, to be familiar with.

6. The history of Earth is divided into five eras:

to be recorded, for convenience, to form, to extend, prior to, widespread overflows of molten lava, to total, to cool down, to form solid crust of rock, to condense, to remain hot.

5. Read the words in the box. Make sure you understand them. Speak about the Earth's orbit.

To form, to rotate, to give a succession of day and night, to revolve, the path followed by the Earth, annual movement, the Earth's axis, to be inclined, to point to the same part of the heaven, to cause the change of seasons, vertical ray, the Tropic of Cancer, The Tropic of Capricorn.

6. Choose one of the following items and write an essay. Use additional material.

1. Shape and Size of the Earth.
2. Modern concepts of the origin of the Earth.
3. The authors of modern concepts of the origin of the Earth.

Учебный элемент 2 (УЭ-2)
Volcanic Eruptions

I. Reading Comprehension.

1. Read the text using the dictionary if necessary.

Terrifying and highly destructive volcanic eruption frequently follow earthquakes, the volcanoes belching forth great masses of molten rock, large

volumes of flaming gases, and such vast quantities of ashes that often the Sun is blotted out for many miles around. Some 2,500 volcanic eruptions have been recorded, of which over 2,000 have taken place in the Pacific Ocean region More than 450 of these eruptions have occurred within historic times. The most famous volcanic eruption was that of Mount Vesuvius in A.D. 79, which completely buried the cities of Pompeii and Herculaneum near Naples, Italy, killing thousands of people and destroying all the living things about the nearby countryside, in 1908 the city of Messina, Italy, was totally destroyed by such an eruption, some 85000 people being killed. As recently as 1943 a mountain of molten rock and ashes was piled up to height of two thousand feet within a few days in the center of what had been a prosperous fanning community near Paricutin, Mexico. About SO per cent of the known active volcanoes on Earth are of the submarine type, such as the one that shoved up a new island among the Azores in 1957. The Hawaiian Islands are of volcanic origin, having been built up at some points to a height of fourteen thousand feet above sea level from a starting base that was at least that far below it.

Associated with the high temperature that result in the volcanic eruptions that continue to occur from time and from place to place are the large amounts of steam and boiling water that come to the surface in many parts of Earth. Old Faithful Geyser in Yellowstone National Park, which erupts quite regularly about once an hour the year round and has been doing so for many years, is a good example. At Hot Springs, Arkansas, forty-seven such hot-water springs, with reputed curative values, attract many thousands of visitors every year. The most extensive and long-continued hot springs known are located in New Zealand and in Iceland, where they are of great importance because of their heal value during the cold and extended winter periods.

Earthquakes are often closely followed by what have long been termed tidal waves that have been known to travel across the ocean at speeds up to 450 miles an hour with disastrous effects when they reach a shore. This term is a misnomer in that these waves have no connection with tides. A better word, coined by the Japanese, who have great deal of experience with them, is tsunami. Japan has been hit by more than a dozen-tsunamis within the last half-dozen years, eight of them highly destructive. One of these, on June 15, 1960, is estimated to have destroyed ten thousand homes and to have killed 27,000 people. In 1883 a tsunami, originating as a result of an eruption of Mount Krakatoa in the South Pacific, had a height of well over one hundred feet as it rolled in on the adjacent islands of Sumatra and Java, drowning many thousands of people. This wave was recorded on tidal gauges as far away as the English Channel.

Earthquakes, volcanoes, and tsunamis have had far-reaching effects on the topography of the land and on the floor of the sea. But they have not had as much effect on the whole as the continuously operating cold, heat, wind, and rain. These forces break the surface rocks down into smaller and smaller pieces and have marked dissolving and transporting effects. Some idea of the rate of movement of rock and soil debris by the water that falls as ram is provided by the estimated two million tons of sediment that is being carried down to the mouth of the Mississippi River and dumped into the Gulf of Mexico every year. Thus the mountains and hills tend to be worn away and the ocean floor to be built up with the material that is carried off them The Appalachian Mountains, which came into existence as a result of a strong upward thrust from deep beneath the surface of Earth some 200 million years ago, are believed originally to have rivaled the European Alps in height.

II. Comprehension and Word Study.

1. Put questions to the following answers.

1. Over 2,000 volcanic eruptions have taken place in the Pacific Ocean region (How many?)
2. The most famous volcanic eruption of mount Vesuvius in A.D. 79 completely buried the cities of Pompeii and Herculaneum near Naples, Italy. (When?)
3. About 80 per cent of the known active volcanoes on Earth are of the Submarine type. (Of what type?)
4. The Hawaiian Islands are of volcanic origin. (Of what origin?)
5. In 1908 the city of Messina, Italy was destroyed by such an eruption. (When?)
6. The most extensive and long-continued hot springs are located in New Zealand and in Iceland. (Where?)
7. Tidal waves travel across the ocean at a speed up to 450 miles an hour. (At what speed?)
8. Japan has been hit by more than a dozen tsunamis within the last half-dozen years. (What?)
9. Earthquakes have had far-reaching effects on the topography of the land and on the floor of the sea. (What effects?)
10. One of the tsunamis destroyed about ten thousand homes on June 15, 1960. (How many?)

2. Complete the sentences.

1. The Appalachian Mountains came into existence…
2. Cold, heat, wind and rain break the surface rocks…

3. Old Faithful geyser in Yellowstone national park erupts…

4. Hot-water springs with reputed curative values attract…

5. Hot springs are of great importance because of…

6. The term «misnomer» means…

7. In 1883 a tsunami, originating as result of an eruption of Mount Krakatao…

III. Speaking Practice.

1. Expand on the following.

1. The volcanoes belch forth great masses of molten rock.

2. Associated with the high temperatures are the large amounts of steam and boiling water.

3. Earthquakes are often closely followed by tsunamis.

4. Earthquakes, volcanoes and tsunamis have not as much effect on the topography of the land as the continuously operating cold, heat, wind and rain.

2. Discuss the following.

1. The most famous volcanic eruptions.

2. Hot-water springs with curative values.

3. The most famous tsunamis, volcanoes, and tsunamis on the topography of the land and on the floor of the sea.

Учебный элемент 3 (УЭ-3)
The Shape of the Earth

I. Reading Comprehension.

1. Read and translate the text.

THE EARTH

To primitive man the Earth was a flat disc with its surface diversified by mountains, rivers and seas. It was Aristotle who used arguments showing that the earth is spherical. These arguments are: 1) a ship which is sailing away from the shore is disappearing gradually, hull first, masts later; 2) during an eclipse the Earth casts a circular shadow on the Moon and it is a spherical body that casts a circular shadow on the Moon; 3) when one is passing from place to place

on the surface of the Earth the appearance of heaven is constantly changing. But men believed that the Earth is a sphere only after the explorers sailed around the earth (circumnavigated it).

Actually the Earth is not a perfect sphere but a spheroid flattened near the poles. The circumference of the Earth at the equator is about 25,000 miles.

The Earth rotates about its polar axis and at the same time is revolving around the Sun. The sun in its turn is not fixed in space but shares in the general motion of the solar system relative to the stars.

The geological evidence shows that most of the land surface is covered with a layer of sedimentary rocks, such as sandstones and shales. In addition large areas within the continents are covered with ancient rocks like granite. Geologists believe there is a widespread granitic layer under all the continents.

Below the ocean the structure is different. There is no granitic layer and basalt comes right up to the ocean bottom.

When the Earth formed it was very hot. As it was cooling an ocean was forming and rain and rivers, denudation and sedimentary rocks came into existence. The simplest method by which we can determine the age of the earth is based on denudation. If we know the total mass of sedimentary rocks over the Earth's surface and the annual amount of sediments carried to the sea by rivers, a simple division shows that the age of the earth is between 1,500 and 3,000 million years.

From the Encyclopaedia Britannica.

2. Choose the correct variant.

1. The word circumference is closest in meaning to:
   a) calculation;
   b) measurements;
   c) distance round;
   d) circle.

2. What conclusion can be made about the simplest method of determining the age of the Earth?
   a) it is based on denudation;
   b) it is based on arguments;
   c) it is based on a recent development;
   d) it is based on travelers' data.

3. The word circular is closest in meaning to
   a) fast;
   b) round or curved in shape;

c) perfect;
d) complete.

4. According to the text, what is circumference of the Earth at the equator?
a) 20,000 miles;
b) 10,000 miles;
c) 35,000 miles;
d) 25,000 miles.

5. Who used arguments showing that the earth is spherical?
a) Eratosthenes;
b) Aristotle;
c) Parmenides;
d) Archimedes.

6. According to the text, what kind of shadow does the Earth cast on the Moon during the eclipse?
a) circular;
b) constant;
c) long;
d) round.

7. Which of the following is true about the land surface?
a) it is covered with sedimentary rocks;
b) it is covered with vapor;
c) it is covered with narrow floor;
d) it is covered with space bodies.

8. What is there under all the continents?
a) basalt;
b) sandstones;
c) granitic layer;
d) shales.

3. Read the dialogue and reproduce it:
a) abridged; b) in the form of a monologue.

Nick Kirillov, a geography student, and Prof. Smirnov, an experienced paleontologist are discussing some methods of determining the age of the Earth.

Nick K.: To discuss all the methods of determining the age of the Earth is beyond the province of this seminar. What are, to your mind, the most significant ones?

Prof. S.: They are not very numerous. The most accurate and complete method is to study radioactive minerals.

Nick K.: What is this method based on?

Prof. S.: Such radioactive elements as uranium and radium disintegrate at a constant and determinable rate. That's why it is possible to deter-mine the age of rocks if we know the rate of disintegration.

Nick K.: And what ratios have been used to form estimates of the age of rock masses that contain these metals?

Prof. S.: It is known that uranium changes to lead. And it is possible to make an estimate of the age of certain rocks containing lead and uranium.

Nick K.: As far as I know, scientists compare the rate of decomposition today with the total thickness of sedimentary rocks formed throughout all geologic time.

Prof. S.: You are right. The rates of erosion of the land surface also have been used to determine the age of the rocks. But the results obtained vary greatly.

Nick K.: To what conclusion did scientists come in estimating the age of the Earth?

Prof. S.: The scientists find that the length of the last three geologic eras as indicated by the radioactive record can be harmonized with the sedimentary record. The sedimentary records of the Proterozoic and Archeozoic eras are not well enough known to be used. So, we have only the incomplete radioactive data to determine the time represented by these very ancient eras.

2. Do the translation making further use of it in your retelling.

Возраст земной коры уже определен, хотя возраст Земли как планеты еще не известен. Определить возраст земной коры стало возможным, когда был изучен радиоактивный распад.

На скорость распада не действуют ни раскаленное состояние, ни охлаждение, ни огромное давление. При всех условиях один грамм урана выделяет ежегодно одно и то же количество свинца. Содержащийся в некоторых минералах уран распадается, а вместо него накапливается свинец. Чем меньше остается урана, тем больше становится свинца.

Значит, определяя в горной породе относительное количество урана и выделившегося из него свинца, можно определить ее возраст.

Ученые пришли к выводу, что древнейшие горные породы образовались за 1600 – 1800 миллионов лет до нашей эры.

II. Speaking Practice.

1. Speak on the topic «Methods of determining the age of the Earth».

III. Additional reading.

1. Read and translate the text «Earth: the Stuff of Life» from appendix 1.

PROGRESS TEST 4

Part A

Fill in the missing words in the sentences below. Choose from the following putting the verbs in the right tense.

estimate	expose	condense	leave
make up	record	rush	explain
come	total	may come	begin

1. The galaxies … of the many billions stars.
2. The stars … farther and farther out into space ever since.
3. Eventually this expending movement … to a halt.
4. Modern concepts … many points … .
5. Earth … into existence largely as a gaseous mass.
6. The gaseous mass … to solidify into its present form some four and one-half billion years ago.
7. The distance from Sun to Pluto … at 3,675 million miles.
8. The history of Earth … in part in the rocks that … to view.
9. The fire eras … 2,000 million years.
10. The moist vapor gradually … to form water.

Part B

Choose the best alternative to complete the following sentences.

1. Earth is a … fragment of a universe.
   a) important b) minute c) big

2. Milky Way … out of a cataclysmic explosion.
a) made up b) expanded c) evolved

3. All the separate units of the universe might … back together.
a) be pulled b) be estimated c) be believed

4. Some of the more modern concepts of scientists appear sufficiently … .
a) interesting b) conclusive c) capable

5. Our solar system in not … .
a) favorable b) conceivable c) unique

6. The highest forms of life on some of the planets like Earth may be … to man.
a) superior b) similar c) nearer

7. For … the history of Earth is divided into fire eras.
a) importance b) convenience c) similarity

8. The most recent era, the Cenozoic era, … the last 60 million years.
a) exists b) covers c) refers

9. The Mesozoic era began with the … that formed the Appalachian Mountains.
a) forming b) spreading c) folding

10. The interior of Earth has remained … down to the present time.
a) cool b) cold c) hot

МОДУЛЬ V. Climate and Weather

Цели:

Вы должны знать	Вы должны уметь
1. Лексика: активный словарь по теме. **2. Грамматика:** неличные формы глагола: причастие, герундий и инфинитив. **3. Содержание темы:** понятие климата и погоды, их основные характеристики.	1. Читать и переводить тексты по теме, используя активную лексику.

Учебный элемент 1 (УЭ-1)
Climate

I. Improve your word power.

1. Read and study your active vocabulary.

Active Vocabulary

geographic control географический фактор
earth is tilted on its axis ось Земли наклонена
with reference to относительно
land tends to heat земля имеет тенденцию нагреваться
community местность, территория
westerly wind system (westerlies) западные ветры, западный перенос
curb сдерживать
tends to have a positive influence оказывать положительное влияние
mark *v* замечать
perception *n* восприятие
concern *n* беспокойство, тревога
evidence *n* доказательство
freak *adj* необычный, странный
are likely to become вероятно, станут
ensure *v* обеспечивать, гарантировать
in evidence заметный
result in приводить к
tail-end *n* окончание, заключительная часть
veil *n* покров, завеса, пелена

may have prolonged возможно, продлили
could have been the result of возможно, произошел в результате
may have begun to create возможно, спровоцировала появление
magnitude *n* величина, размер

2. a) Pronounce correctly the following international words.

Celsius	horizontal
climate	period
continentality	region
control	system
effect	temperature
element	vertical
Farenheit	extreme
horizon	

b) Read the following paying attention to the pronunciation of letter combinations with I.

в открытом слоге	**в закрытом слоге**	**перед ld, nd**
direct	tilt	find
provide	inland	wild
science	winter	bind
time	influence	child
private	middle	mild
ice	different	wind

ig (h)	**ie перед согласной**	**в безударном слоге**
high	achieve	latitude
light	brief	precipitation
night	chief	hemisphere
right	receive	community
sigh		humid
bright		proximity

3. a) give nouns derived from the following verbs, using given suffixes:
-*tion*: relate, interact, moderate, locate, rotate, revolve, vary;
-*ence (-ance*): differ, correspond, perform, resist, refer;
-*ure*: expose, close, depart.

b) give adjectives derived from the following words using given suffixes:
-*al*: coast, season, locate, tropic, condition, continent;

-*ic(al)*: geography, geology, ecology, climate, atmosphere;
-*able*: change, consider, vary;
-*y*: rain, snow, mud, wind, fog, mist, cloud, shower, thunder, frost, drizzle, gust.

II. Reading Comprehension.

1. Read and translate the following text.

CLIMATE

Climate is the aggregate of day-to-day weather conditions over a period of many years. It is the result of the interaction of many different elements, the most important of which are temperature and precipitation.

Climatic patterns are a result of the interaction of three geographic controls. The first is latitude. The Earth is tilted on its axis with reference to the plane of its orbit around the Sun. As it makes its annual revolution around the Sun, first the Northern Hemisphere and then the Southern are exposed to the more direct rays of the Sun. During the Northern Hemisphere's summer, higher latitude locations have longer days, with far northern points experiencing a period of continuous daylight. Daylight periods during the winter months are shorter at higher latitudes, whereas more southerly locations have both longer days and exposure to more direct rays of the Sun.

The second control is based on the relationship between land and water. Land tends to heat and cool more rapidly than water. In a tendency called continentality, places far from large bodies of water experience greater seasonal extremes of temperature than do coastal communities. Parts of the northern Great Plains experience annual temperature ranges close to 65º C; annual differences of as much as 100º C (from 50º C to – 50º C) have been recorded in some locations.

The converse effect occurs at maritime locations, especially on the western coast of continents in the mid-latitudes. These locations have smaller temperature ranges as a result of what is called a maritime influence. Summer and winter extremes are moderated by the movement onshore of prevailing westerly wind systems from the ocean. Horizontal and vertical ocean currents minimize seasonal variations in the surface temperature of the water. The moderated water temperature serves to curb temperature extremes in the air mass above the surface.

Proximity to large water bodies also tends to have a positive influence of precipitation levels, with coastal locations receiving generally higher amounts. The reason for this should be obvious; large water bodies provide greater levels of evaporation and thus increase the amount of moisture in the atmosphere.

III. Comprehension and Word Study.

1. Match the English phrases and their Russian equivalents.

1) daylight period	a) водные объекты
2) high latitudes	b) обратный эффект
3) water bodies	c) Северное полушарие
4) coastal community	d) количество влаги
5) temperature range	e) океанические течения
6) maritime influence	f) продолжительность дня
7) continuous daylight	g) прибрежная территория
8) converse effect	h) количество выпадающих осадков
9) northern Hemisphere	i) смягчать климат
10) amount of moisture	j) влияние моря
11) precipitation level	k) колебание температуры
12) seasonal extremes of temperature	l) полярный день
13) ocean currents	m) высокие широты
14) moderate climate	n) сезонные перепады температуры

2. Identify the meaning of the given words as they occur in the word combinations and sentences below.

Average: Average temperatures in England and Wales vary from 4º C in January to 16º C in July and August. In Scotland averages are one or two degrees cooler. Summer months average around 25º C (77º F), increasing to as much as 32º C (90º F) as maritime influence decreases inland. When weather observations are averaged over long periods, the resulting data describe climate we may have tables giving climatic statistics for a place or, by further averaging, for a country or even a continent.

Experience: practical experience; river management experience; an experienced geographer. Some parts of the world experience a period of continuous daylight. In England one can experience almost every kind of weather except the most extreme.

Humidity: absolute humidity, relative humidity, specific humidity. The moisture content of the air is referred to as humidity. High humidity greatly affects the sensible temperatures – the temperatures we feel. Winters seem cold and damp despite the relatively mild temperatures, again because of the high humidity. The Atlantic brings warm, humid cyclone through the Baltic Sea to Russia.

Moisture: Both the Mediterranean and humid subtropical climates receive winter moisture from cyclonic storm which travel along the polar front. Where

trees appear in the Mediterranean climate they respond to moisture conditions. Situated in the mid-latitude westerly wind belt and surrounded by the open ocean, New Zealand has a temperate, moist, and maritime climate. The higher the mountains the more moisture it is lost by the wind.

Moderate: moderated water temperature; moderating oceanic influence. Usually winds are moderate in these regions, although sometimes violent gales 9 storms appear. Summer and winter extremes are moderated by ocean currents and prevailing winds. The oceans and seas of the earth serve as reservoirs of moisture and are major influences in moderating the temperatures at or near the earth's surface.

Occur: The humid subtropical climate occurs in southeastern United States. Cool rain-bearing winds occur in summer. Sea breeze known as the doctor occurs along west coast in summer. The great contrast between the Mediterranean and humid subtropical climates occurs in the summer when the humid subtropics receive substantial precipitation from convectional showers. Polar air masses can bring colder temperatures and occasional frost.

Precipitation: precipitation levels. In the south nearly half the precipitation occurs in late spring. Precipitation totals more than 20 inches annually.

Range: The average range of temperature (from winter to summer) is from 5 to 23 degrees above zero (Great Britain). In Midsummer in January, average temperatures range from 29º C in the north to 17º C in the south (Australia).

Vary: Average annual temperatures vary from about 27º C in the far north of the continent to 13º C in the far south. The elements or conditions of the atmosphere that make up climate vary greatly from place to place and from season to season. The Moroccan climate is as varied as its landscape. There are various types of temperate climate in this country (warm, cool and cold). Winds in the area tend to be light and variable. There is little seasonal variation in tropical rainy climates. As the weather changes with the wind, and Britain is visited by winds from different parts of the world, the most characteristic feature of Britain's weather is its variability. The direction of surface winds is usually at variance with wind direction aloft.

3. Add nouns to the following adjectives to form noun phrases.

Adjectives: climatic, annual, coastal, converse, maritime low horizontal, seasonal, continuous, vertical, direct, high.

Noun: currents, movement, rays, patterns, locations, latitude, effect, influence, revolution, daylight, ranges, communities, variations, extremes.

4. Pair the verbs in column A with a suitable phrase in column B.

A	*B*
1) to make	a) seasonal variations in temperature
2) to be exposed	b) the amount of moisture
3) to experience	c) to the direct rays of the sun
4) to minimize	d) a positive influence on
5) to have	e) annual revolution
6) to provide	f) a period of continuous daylight
7) to increase	g) greater levels of evaporation
8) to curb	h) temperature extremes
9) to moderate	i) temperature ranges

5. Match the verbs with their appropriate explanations.

1) moderate	a) to gain knowledge or skill by doing and seeing
2) record	things; to feel smth.
3) provide	b) to have an effect on smth. or smb.
4) minimize	c) to make or become less extreme
5) heat	d) to take place, happen, exist
6) experience	e) to make or become greater (in size, number,
7) influence	degree, etc)
8) curb	f) to give, to supply what is needed
9) increase	g) to keep smth. under control
10) occur	h) to make or become hot
	i) to set down in writing for reference; preserve for use, by writing or in other ways
	j) to reduce to the smallest possible amount or degree

6. Find words and phrases in the text that correspond to the definitions given below.

1. Rainfall, drizzle, snow, sleet, hail and dew.
2. Distance north or south of the equator measured in degrees.
3. Tiny drops of water on a surface, in the air, etc.
4. Degree of moisture, especially in the air; dampness; measure of moisture in the atmosphere.
5. Limits between which something varies.
6. Standard or level regarded as usual; result of adding several amounts together and dividing the total by the number of amounts.
7. Movement of water, air flowing in a certain direction.

7. Fill in the missing words in the sentences below. Choose from the following.

below	mean	ranging
precipitation (2)	average (2)	evaporation
hemisphere	amount	temperature
seasonal variation	annual	vary

8. Translate from Russian into English.

Встречающийся – встречая – встретив – встречаемый – встреченный.

Смягчающий – смягчая – смягчив – смягчаемый – смягченный.

Влияющий – влияя – повлияв.

Увеличивающийся – увеличивая – увеличив – увеличиваемый – увеличенный.

Испытывающий – испытывая – испытав – испытываемый.

Получающий – получая – получив – получаемый – полученный.

9. Give the English equivalents.

Температура и влажность, широта, Южное полушарие, испытывать большие перепады температур, прибрежные территории, ежегодные колебания температур, смягчать климат, океанические течения, происходить (случаться), + 35º С, – 10º С, количество осадков (осадки), средние широты, влияние моря, полярный день, высокие и низкие температуры, годовая амплитуда, температура колеблется от … до …

IV. Speaking Practice.

1. Do you strongly agree or disagree with the following statements? Explain your answers using the following phrases.

That is only partly true; on the contrary; it is absolutely wrong; really / sure / absolutely so; as far as I remember (from the text); as far as I know; it can't be denied.

1. The weather is very important to me.
2. I feel at my best when it rains cats and dogs.
3. The weather influences the way I feel in general.
4. I believe that weather conditions can influence people's well-being and their behavior.
5. It's hard to stand the heat when it's damp.
6. The weather in Belarus is very changeable.
7. Talking about the fashion is a good way to «break the ice» when you meet someone new.

2. Complete the following sentences.

1. Climate is …
2. The most important elements in determining climate are …
3. Climatic patterns depend on …
4. Continentality means …
5. Interior lands experience …
6. Maritime locations have smaller …
7. Summer and winter extremes in coastal communities are moderated by …
8. Proximity to large water bodies influences …

3. Talk to your partner and find out:

- how he / she understands the term «climate»
- what principal categories of climate he knows
- why there are different climates
- what part of the world has no winter
- In what climate trees don't grow
- what category Belarus (The UK) come in
- what continentality means
- what precipitation level depends on
- how oceans influence the climate
- how continental climates differ from marine climates
- the difference between hot and temperate climates

4. Speak on.

1. Climate and its classification:

aggregate, weather conditions, to determine, temperature and precipitation, belts (zones), to be distinguished, average temperature, rainfall.

2. Three geographic controls:

a) latitude, sun's heat, to be distributed, to be exposed to direct rays of the sun, daylight period, short, long;

b) continentality, experience, seasonal extremes of temperatures, water bodies; maritime locations, temperature ranges, extremes, to be moderated by;

c) proximity, influence, precipitation levels, water bodies, provide, evaporation, increase, the amount of moisture, coastal locations, receive.

5. Draw a scheme of climatic belts using any approach to the climate classification you know and describe it.

6. Choose one of the following items and write an essay. Use additional material.

1. Climatic change and its origin.
2. Climatic controls.
3. Ocean currents.
4. Global warming.

V. Additional Reading.

1. Read the text «Days of Abnormal Weather» (text 1) from appendix 1.

Учебный элемент 2 (УЭ-2)
The Climate of the UK

I. Improve your word power.

2. Revise your active vocabulary.

Active Vocabulary

mark *v* замечать
perception *n* восприятие
concern *n* беспокойство, тревога
evidence *n* доказательство
freak *adj* необычный, странный
are likely to become вероятно, станут
ensure *v* обеспечивать, гарантировать
in evidence заметный
result in приводить к
tail-end *n* окончание, заключительная часть
veil *n* покров, завеса, пелена
may have prolonged возможно, продлили
could have been the result of возможно, произошел в результате
may have begun to create возможно, спровоцировала появление
magnitude *n* величина, размер

II. Reading Comprehension.

1. Read and translate the text. Be ready to discuss its main points.

THE CLIMATE OF THE UK

The climate of Britain is more of less the same as that of the north-western part of the European mainland, yet its climate is much milder because of the Gulf Stream, which brings warm water and air across the Atlantic from the Gulf of Mexico. The popular belief that it rains all the time in Britain is simply not true. The image of a wet, foggy land was created two thousand years ago by the invading Romans and has been perpetuated in modern times by Hollywood. In fact, London gets no more rain in a year than most other major European cities, and less than some. Its weather may be unpredictable, but it is not particularly wet. The amount of precipitation is distributed more or less evenly throughout the year. The wind brings rain from the Atlantic to the hills of the west. This means that the western parts of Britain are wetter than the east, which is fairly sheltered. In the mountains there is heavier rainfall than in the plains of the south and last. The mild winters mean that snow is a regular feature of the higher areas only. Occasionally, a whole winter goes by in lower-lying parts without any snow at all. The winters are in general a bit colder in the east of the country than they are in the west, while in summer, the south is slightly warmer and sunnier than the north.

The mean range of temperature (from winter to summer) reaches 18 – 20º C.

Average temperatures in England and Wales vary from 4º C in January to 16º C in July and August. In Scotland averages are one or two degrees cooler, and an average July day is about as warm as Marseilles in December.

January and February are usually the coldest months, July and August the warmest. Still the wind may bring winter cold in spring or summer days. Droughts are rare.

Why has Britain's climate got such a bad reputation? Perhaps it is for the same reason that British people always seem to be talking about the weather. This is its change ability. There is a saying that Britain doesn't have a climate, it only has weather. It may not rain very much altogether, but you can never be sure of a dry; there can be cool (even cold) days in July and some quite warm days in January.

In no country other than Britain can one experience four seasons in the course of a single day! Day may break as a balmy spring morning; an hour or so later black clouds may have appeared from nowhere and the rain may be pour-

ing down. At midday conditions may be really wintry with the t down by about 8 degrees or more centigrade. And then, in the late after noon, the sky will clear, the sun will begin to shine, and for an hour or two before darkness falls, it will be summer.

And, of course, the weather's variety provides a constant topic of conversation. Even the most taciturn of the British is always prepared to discuss the weather. And, though he sometimes complains bitterly of it, he would not, even if he could, exchange it for the more predictable climate of other lands.

III. Comprehension and Word Study.

1. Think about the climate in your country and complete the table. Compare your answers in groups.

Distinguishing characteristics	Great Britain	Belarus
1. The weather is very changeable 2. There isn't enough variety 3. It's too cold in winter 4. Occasional frost is possible 5. It seldom snows heavily 6. There are too many thunderstorms 7. Wind may bring hurricanes 8. There's too much fog throughout the year 9. It's very humid in summer 10. There isn't enough rain in summer and everything gets very dry 11. Droughts are rare 12. Precipitation is distributed unevenly through out the year		

2. Read the text and guess what country is mentioned.

The country enjoys various climatic types. They range from the tropical regions to the cool temperate conditions. Climatic diversity is due to the country's great size. The precipitation is distributed unevenly throughout the year. The regular snowfalls occur in the southeast and temperatures fall below zero (freezing point). In the northern region rain occurs mainly in February and March. The country is subject to severe droughts. More than 2/3 of the area is occupied by deserts.

The average annual temperatures vary from 27º C in the far north to 13º C in the far south. The coastal locations experience smaller seasonal extremes of temperatures as a result of a maritime influence, but suffer from floods and cyclones. January and February are the hottest months, June and July are the coldest months.

Predominantly evergreen vegetation ranges from the dense bushland of the coast to the mulga and mallee scrub of inland plains.

3. Look at the table and Ex. 1. Speak in the same way for Mongolia, Italy, Egypt, New Zealand, Great Britain and Belarus.

Country	Climatic pattern	Controlling factors	Precipitation level	Average temperature ranges	Distinguishing characteristics	Related features
Mongolia	dry (steppe)	inland country surrounded by mountains	lies in a rain shadow little precipitation	cold and dry winters (for 8 months) short and dry summers (for 4 months)	low humidity cold winds	The Gobi Desert (in the south) Forests and lakes (in the north)
Italy	mediterranean (subtropical)	maritime influence	a lot of rainfall (from October to May)	warm winters (+ 9º C) hot summers (+ 30º C)	humid monsoonal air movement in summer, cyclonic storms in winter	
Egypt	dry (desert)	coastal locations; inland	rare rainfall; in some places once in 2 or 3 years	hot summers (over + 30º C near the coast; over + 40º C inland) warm winters		The Arabian Desert; The Libyan desert
New Zealand	oceanic	situated in the midlatitude westerly wind belt and surrounded by the open ocean	rainfall from moderate to abundant; annual rainfall 1850 mm heaviest 5600 mm; heavy snowfalls in the South Island mountains	from + 23º C to + 6º C summer from December to February winter from June to August	temperate, moist and maritime climate	subtropical vegetation in the north (bush, mangrove swamps) forests and grassland in the south

IV. Speaking Practice.

1. Look through the text and explain the following statements.

1. The climate of Great Britain has three main features: if is mild, humid and changeable.

2. The British love talking about the weather.

3. Doubtless, weather is the universal topic of conversation in every quarter of the world.

4. If you don't like the weather, wait a minute.

5. The English have three variants of weather: when it rains in the morning, when it rains in the afternoon or when it rains all day long.

2. Sum up the information you've learnt and compare the British and Belarusian climate.

Учебный элемент 3 (УЭ-3)
The World's Inconstant Climate

I. Reading Comprehension.

1. Read the text using your dictionaries if necessary.

THE WORLD'S INCONSTANT CLIMATE

The world's climate is not and never has been constant. Climate, the long-term behavior of weather, is inherently changeable. Not only are there gross changes over geological time scales (ice ages and interglacial warm periods) but smaller changes on much shorter time scales occur, too. Temperatures in Europe during the mediaeval warm period were on average 0,5º C warmer than they are now. But just two hundred years later it was a different story. The sixteenth, seventeenth and eighteenth centuries were up to cooler than today's average temperatures. This was the time of the so-called 'Little Ice Age'.

Recent climatic changes have been less marked than our changes in mental attitude, and our perception of the weather. During the 1980s there has been increasing concern that the weather has become more extreme, that the climate is changing for the worse, and that it's man's fault. This may be true, but there is no evidence to show that freak events are likely to become more frequent. It's unlikely, for example, that major floods are occurring with any greater fre-

quency than they have in the past, but modern reporting ensures that greater numbers of people are rapidly informed about such disasters. While freak weather is nothing new, it is a good talking-point when it does occur.

The 1780s experienced a historically interesting pattern of climatic variations which in some ways echo the changes now in evidence. Several extremes in temperature and rainfall during that decade resulted in extreme variability of the weather from year and season to season. The unstable climate began to be a major cause for concern. Complaints about sunless summers, prolonged winters, droughts and unseasonal frosts were the order of the day. Europe was experiencing the tail-end of the Little Ice Age, and beginning to warm out of this cold period. But increased volcanic activity in the late eighteenth and early nineteenth centuries produced dust veils in the upper atmosphere which may have prolonged the cold spell. The two conflicting influences were possibly the cause of the extreme variability.

Although the dust veils probably had an overall effect of keeping global temperatures down by partially blocking and scattering the sun's rays, it is not believed that volcanic activity was responsible for the climatic change which caused the Little Ice Age in the first place. Some scientists believe that the Little Ice Age could have been the result of changing solar output rather than dust in the atmosphere. The sun's output probably varies by about 0,1 % during the eleven-year solar cycle, and this fact has recently been related to sunspot activity; the fewer the sunspots, the less the sun's output. There were very few sunspots during the seventeenth century, so this is the most likely cause for the cool period.

The next Ice Age is still in the distant future, and our present concern is for the climate during the coming hundreds, rather than thousands, of years. But human concern is unavoidable. If the current global warming trend continues, and if it is due to man's activities, we could be creating major problems for our children. Climatic change is a natural phenomenon, but Man's excessive burning of fossil fuels may have begun to create climatic changes of a magnitude unprecedented in human history.

II. Comprehension and Word Study.

1. Complete the table below.

Climatic change	Origin of climatic change	Historical pattern	Consequences of climatic change

2. Draw a diagram of temperature variations described in the text and explain it.

3. Five of the ten sentences below are accurate summaries the five paragraphs in the text. Connect these five sentences to their appropriate paragraph.

a) Europe was warmer 500 years ago. b) Unstable weather conditions, which occurred 200 years ago, are similar to conditions we experience today. c) Future climatic changes are at present a cause for concern, especially as we may be responsible for them. d) Man's activities could produce a New Ice Age. e) Dust veils were mainly responsible for the Little Ice Age.	f) Unusual weather conditions are probably not on the increase, but we are much more aware of them. g) Reduced sunspot activity probably caused the Little Ice Age. h) The world's climate has always been inconsistent. i) People exaggerate because they like talking about the weather. j) The weather was much worse in the 1780s than it is now.

III. Speaking Practice.

1. Explain and expand on the following.

1. Climatic changes have been more extreme in recent years.
2. 1780s were the most significant in determining climatic changes.
3. Man is responsible for climatic changes.

Учебный элемент 4 (УЭ-4)
Weather

I. Improve your word power.

1. Decide which of these words are «hot» words and which are «cold» words.

to boil	to freeze	to shiver	to soak	to the skin
fridge	warm	harshy	frost	to brew
ice	chilly	inclement	to melt	gust
pea-souper	severe	hail	sleet	cloud-burst
shower	dry	sunshine	drought	
hurricane	haze	gale	to drizzle	
blizzard	hoar-frost	fog patches	thunderstorm	
to pour			to thaw	

«Hot» words	«Cold» words

2. a) Work in pairs. These words are used to describe weather. Add them to the chart below under the appropriate column.

gusty	sultry	violent	gentle	strong	damp
breezy	freezing	muggy	foggy	mild	rainy
drizzly	misty	blustery	windy	frosty	sunny
cloudy	wintry	cloudless	flurry	showery	muddy
thundery	unsettled	heavy	prolonged	frequent	nasty
occasional	scattered	slushy	thick	dense	dull
torrential	stifling	dense			

windy weather	cold weather	wet weather	not weather

b) Compare your answers. Can some words go under more than one column?

II. Comprehension and Word Study.

1. With a partner make a list of as many words and phrases as you can think of that can be used to talk about weather (in summer, in winter, when it rains cats and dogs, when it pours with rain, on a nasty (bright) day). Compare your list with those of the others.

2. Complete the sentences with prepositions.

1. Winter sets … … the end … of December … our parts. … a hard frost from the rivers and ponds are frozen … . When the temperature falls … 25º C … zero it gets very cold.

2. London is famous … its fog. They have fogs especially often … autumn. When a thick fog spreads … the city people can't see each other at arm's length.

3. … heavy rains we are … … a spell … good weather again.

4. It looks like rain: the sky is covered … dark clouds, a cold wind is blowing … the sea.

5. It's a lovely sight when everything is covered … hoarfrost and glistens … the sun.

6. I prefer to stay indoors … rainy weather.

7. Nature looks … its best … early spring.

8. Indian summer is a short period … warm sunny weather … the beginning … autumn.

9. The temperature has fallen … zero and it is freezing.

10. It's poring … rain. You'd better stay indoors.

11. Many people are fond … winter sports.

III. Speaking Practice.

1. The British love talking about the weather. It's a neutral topic and there's always something to say on the topic. Consequently, there are many idioms in the language based on the weather. Read the following expressions and decide which ones could replace the underlined sections of the sentences below. Make up situations with new expressions.

– a storm in a teacup;
– under a cloud;
– make heavy weather of;
– the calm before the storm;
– under the weather;
– get wind of;
– bright and breezy;
– it's an ill wind that blows nobody any good.

***

1. You're <u>very cheerful</u> for a dismal Monday morning.

2. Things are quiet at the moment but it's <u>an uneasy truce</u>.

3. It seems like a tragedy now, but <u>someone with derive some benefit a from it</u>.

4. He <u>finds doing his</u> homework very difficult indeed.

5. She is <u>not very well</u> at the moment.

6. We tried to keep the party a secret but, they've managed <u>to find out about it somehow.</u>

7. He is <u>in disgrace</u> because of the way he behaved at the party last night.

8. The whole affair is a <u>lot of fuss about nothing</u>.

2. Some people have strong reactions to the weather. What about you? Find out how other member of the group often fell.

– on a cold winter's morning;
– on a warm summer's evening with a gentle see breeze;

– on a wet and windy day;
– towards the end of a long spell of very hot humid weather;
– just before a violent thunderstorm.

3. Give profound answers to the following questions.

thunderstorm drought hurricane	blizzard typhoon	flood tornado	hail storms snow shower

Which of these events occur where you live?
Which have you (never) experienced?
Which one is most frightening?
Which does the most damage?
Which one is most mysterious?

4. Think of a specific day in the past week and describe the weather in detail. Can your classmates guess which day you're describing?

IV. Additional Reading.

1. Read and translate the texts «Days of Abnormal Weather» (text 2, 3) from appendix 1.

PROGRESS TEST 5

Part A

Choose the best alternative to complete the following sentences.

1. The existence of different climates is due to …
   a) different precipitation levels;
   b) proximity to the equator;
   c) the variation with latitude.

2. The second element affecting climate is …
   a) the influence of the oceans (maritime influence);
   b) duration of sunshine;
   c) amount of rainfall.

3. Oceans act as reservoirs of heat which … the temperature extremes of the seasons.

a) increase;
b) moderate;
c) influence.

4. Continental interiors … lower winter temperatures and higher summer temperatures than those of coastal communities (districts).

a) provide;
b) receive;
c) experience.

5. In Canada, temperatures in the city of Victoria on the Pacific Coast …from an average January minimum of 36º F to an average July maximum of 68º F.

a) change;
b) range;
c) minimize.

6. The growers of citrus crops in Florida have concentrated in the central lake district to take advantage of the moderating influence of nearby …

a) ocean currents;
b) water bodies;
c) water reservoir.

7. Like other highland areas of the British Isles, Wales is a region of heavy …

a) rainfall;
b) gales;
c) hurricanes.

8. In Britain one can experience any kind of weather except …

a) the most extreme;
b) the coldest;
c) the hottest.

9. The word clima was used by the Greek and meant a change of …

a) longitude;
b) latitude;
c) altitude.

10. Ocean currents minimize … in water surface temperature.

a) climatic conditions;
b) extreme heat;
c) seasonal variations.

11. The point is that British never can be sure when the different types of weather will …

a) appear;

b) come;

c) occur.

Part B

Say if these statements are true or false.

1. Climate is the average condition of the atmosphere.

2. There is no agreement on the approach to the classification or the kind of classification of climatic belts to be used.

3. The most important elements of any climate are humidity of the air and cloudiness.

4. Due to the daily and yearly movements of the earth the sun's heat is unevenly distributed.

5. The oceans don't influence climate.

6. Proximity to large water bodies affect precipitation levels.

7. Climate depends on position of the particular place on the Earth with respect to the sun' at different times of the year.

МОДУЛЬ VI. My Future Profession

Цели:

Вы должны знать	Вы должны уметь
1. Лексика: активный словарь по теме (профессионально-ориентированные термины). **2. Грамматика:** сложноподчиненные предложения; согласование времен; косвенная речь. **3. Содержание темы:** история геоинформационных систем, их место в народном хозяйстве, вопросы, которые они решают.	1. Читать и переводить тексты по теме. 2. Вести диалог и рассказывать о профессии специалиста по геоинформационным системам, а также об истории развития геоинформационных систем и их место в экономике страны.

Учебный элемент 1 (УЭ-1)
About my Future Profession

I. Improve your word power.

1. Study your active vocabulary.

Active Vocabulary

to study изучать
to determine определять
to solve решать
to construct строить
to design проектировать
extensively широко
investigation исследование
development развитие
national economy народное хозяйство
maintenance эксплуатация
complexity сложность
reliability надежность
activity деятельность
to deal with иметь дело, рассматривать
concerned связанный, имеющий отношение

to facilitate обличать
implementation использование
prospecting поиск
processing обработка
land management землеустройство
research *n* исследование, изыскание
structure *n* структура, устройство
efficiency *n* эффективность, продуктивность
enormous огромный
include включать (в себя)
interaction взаимодействие
applied прикладной
object предмет
spatial пространственный
data данные
combine объединять
quesy запрос
predicting прогнозирование
thematic тематический
layer слой
flexible гибкий
approach подход
vector векторный
raster растровый
to be linked быть связанным с
tools инструменты

II. Reading Comprehension.

1. Before reading the text try to discuss the following questions:

Are Geoinformation Systems new branch of our economy?

Do specialists of Geoinformation Systems have a wide range of activities?

The main task of Geoinformation System is to map and analyze realworld objects, isn't it?

2. Read and translate the following text.

MY FUTURE PROFESSION

Hello! I am Ivan Danilov. If you don't mind, I'd like to tell you a few words about my future profession. I am a student of Polotsk State University. I study at the department of applied geodesy. My future profession is a specialist of Geographic Information Systems. This profession is rather new, but it's also very popular, important and very useful nowadays. Some people don't know anything not only about this profession but even about Geoinformation Systems.

Geographic Information System (GIS) is a modern computer technology to map and analyze realworld objects occurring and projected events and phenomena. GISs are naturally represent spatial data.

GIS combines traditional operations when working with databases – query and statistical analysis – with the advantages of complete visualization and geographic (spatial) analysis which provides a map. This feature provides unique opportunities for the application of GIS to address a wide range of fasts associated with analysis of phenomena and events, predicting their likely consequences, planning, strategic decisions.

The data in geographic information systems are stored as a set of thematic layers that are combined on their geographic location. This flexible approach and the possibility of geographic information systems work with both vector and raster data models, are effective in solving any problems related to spatial in formation.

Geographic information systems are closely linked with other information systems and use these data to analyze objects.

GIS features are:

– developed analytical functions;

– ability to manage large volumes of data;

– tools for entering, processing and displaying spatial data.

I know that GISs have some key advantages. They are:

– a user-friendly mapping of spatial data. Mapping of spatial data, including a three-dimentional measurement are readable and simplifies the construction of queries and subsequent analysis;

– integration of data within an organization. Geographic information systems combine data collected in various parts of the company or even in different areas of the whole region and share and integrate them into a single data which increase its operating efficiency;

– making informed decisions. Automatization of the process of analyzing and reporting all the events related on special data. It helps to accelerate and improve decision-making procedures;

– a convenient means for creating maps. Geographic information systems make the process of reading the data of space and air-surveys easier and faster and use the existing plans, diagrams and drawings.

Specialists of Geographic Information Systems may work in different spheres of national economy and have a wide range of activity. Here are just some examples of using GIS.

They can work in administrative-territorial management, in the field of telecommunications, transport and ecology, in oil and gas industry law enforcement agencies and agriculture.

In order to become a highly-qualified specialist we study a lot of different subjects. We study geology, mathematics, physics, all types of geography, geomorphology, meteorology, soil science, irrigation and road building, astronomy, climatology and a number of other sciences.

I like my future profession and do all my best to become a good specialist.

III. Comprehension and Word Study.

1. Read the following words and try to guess their meaning. Use English-Russian dictionary if necessary.

Profession	method
design	metal
interest	civilization
production	modern
mechanical	information
engineer	empirical
practical	construction
theoretical	ventilating
machine	energy
special	economy

2. Find the appropriate English equivalents of the following Russian words.

1) включать a) improve; b) include; c) conclude; d) excuse
2) определять a) defend; b) refine; c) define; d) combine
3) эволюционировать a) evolve; b) involve; c) evaluate; d) employ

4) умение	a) drill; b) bill; c) skill; d) mill
5) выполнять	a) find out; b) look out; c) go out; d) carry out
6) эффективность	a) proficiency; b) embassy; c) accuracy; d) efficiency
7) двигатель	a) enemy; b) engine; c) energy; d) elegy
8) применение	a) application; b) appreciation; c) approbation;
9) наблюдать	a) preserve; b) observe; c) deserve; e) serve
10) прибор	a) advice; b) device; c) merchandise; d) disguise

3. Form nouns from the following verbs and translate them from English into Russian.

Note. We normally use suffixes to change a word to a different part of speech: *operate* (verb) + *or* = *operator*. Suffixes -er (-or) form nouns that describe sb's occupation or what sb (sth) does.

to drive – driver	to construct – …	to consume – …
to design – …	to perform – …	to make – …
to build – …	to generate – …	to run – …
to research – …	to distribute – …	to tell – …
to work – …	to cool – …	to speak – …
to observe – …	to operate – …	to sleep – …

4. Match English and Russian equivalents.

1) to study	a) обработка
2) investigation	b) включать
3) processing	c) предмет, объект
4) efficiency	d) прогнозирование
5) include	e) слой
6) interaction	f) эффективность
7) object	g) изучать
8) predicting	h) взаимодействие
9) layer	i) растровый
10) vector	j) исследование
11) raster	k) инструменты
12) tools	l) запрос
13) quesy	m) пространственный
14) spatial	n) векторный

5. Complete the sentences in the left column with the appropriate endings in the right column.

1. Geographic Information System is…	a) … stared as asset of thematic layers
2. GIS combines …	b) … effective in solving any problems related to spatial information
3. The data in GIS are…	c) … traditional operations when working with databases
4. This flexible approach and the possibility of GIS work with both vector and raster data models … are …	d) … ability to manage large volumes of data
5. GIS are closely linked …	e) … in different spheres of national economy
6. One of the GIS features is …	f) … a modern computer technology
7. GIS engineers may work …	g) … with other information systems and use these data to analyze objects
8. In order to become a highly-qualified specialist …	h) … study a lot of different subjects

6. Translate info English.

ГИС
составление карт
компьютерная технология
пространственные данные
базы данных
статистический анализ
набор тематических слоев
векторные и растровые модели
анализ объектов
обработка и отображение
интеграция данных
принятие обоснованных решений
удобное средство

IV. Speaking Practice.

1. Discuss the following statements.

1. The profession of a specialist of GIS is rather new.
2. The main task of GIS is to map and analyze realworld objects.

3. GIS has some features.
4. Specialists of GIS have a wide range of activities.
5. I want to become a good specialist of GIS.

Учебный элемент 2 (УЭ-2)
The History of Geographic Information System (GIS)

I. Reading Comprehension.

1. Read and translate the following text.

Geoinformation Systems is an information system intended for gathering, storage, the analyzing and graphic visualization of the spatial data, and the information connected with them about presented in GIS objects.

The term is also used in narrower sense – GIS allows users to search, analyze and edit digital cards and also the additional information about objects.

GIS includes possibilities of control systems of databases, editors of a raster and vector drawing and analytical means. It is applied in cartography, geology, meteorology, land management, ecology, municipal management, transport, economy, de fence and many other areas.

On territorial coverage they distinguish global GIS subcontinental, national, state, regional, subregional and local GIS.

GIS differ with subject domain of information modeling. For example, municipal or urban GIS, nature protection or environmental GIS and etc.

Problem orientation GIS is defined by problems solved in if. They are inventory of resources, monitoring, management and planning, decision-making support.

The history of GIS may be divided into several periods.

1. Initial stage (late 1950s – early 1970s).

Research of basic possibilities, boundary regions of know ledge and technologies, the first large – scale projects and theoretical works. Among them:

– the first artificial satellite;
– electronic computers;
– the first graphic displays and other devises;
– creation of software management of databases.

2. The period of the state initiatives (early 1970s – 1980s).

During this period the state support stimulated the development of experimental works in the field of FIS, based on the use of databases of street networks. It includes the automatic systems of navigation, the systems of export of a cite waste and garbage and the traffic in emergency situations.

3. The period of commercial development (early 1900s – the present).

This period is characterized by a wide market of various software means, expansion of area of their application and a great number of non-professional users.

4. The user period (late 1980s – present time).

The main features of this period are the raised competition among commercial geoinformation services, availability and openness of software, the increased requirement in geoinformation and the beginning of forming a world geoinformation infrastructure.

Databasis in GIS describe real objects, such as roads, buildings, fields and large forests. Real objects can be divided into two categories: discrete (houses, territorial zones) and continuous (a relief, level, annual temperatures).

GIS consists of geographical data, terrestrial surface, descriptive information, hardware maintenance, technologies and etc. GIS can answer the following questions:

1) What is there?
2) Where is it?
3) What has changed since …?
4) What structures are there …?
5) What will happen if …?

II. Speaking practice.

1. Answer the following questions.

1. Where are GISs applied in?
2. What types of GISs do they distinguish on territorial coverage?
3. How do GISs differ with subject domain of information modeling?
4. What are the main periods of the history of GIS?
5. Describe each period of the development of GIS?
6. What are the main questions which can answer GIS?

2. Discuss the most interesting and important facts for you from the text with your partner.

a) the history of GIS;
b) application of GIS;
c) the main periods of the history of GIS;
d) main questions which can GIS answer.

3. Get ready to present your future profession and its history.

PROGRESS TEST 6

Part A

Mark the following statements (True /False).

1. The profession of an engineer of GIS is rather new.
2. GIS is a modern computer technology to map and analyze realworld objects.
3. GIS combines special operations when working with databases.
4. GISs are separated from other information systems.
5. GISs haven't any key advantages.
6. Engineers of GIS may work in different spheres of national economy.
7. GIS includes gathering, storage and analysis of spatial data.
8. GISs don't differ with subject of information modeling.
9. GISs have 5 periods of the history.
10. There is only are question, which GIS can answer.

Part B

Complete the sentences in the left column with the appropriate endings in the right column.

1. GIS allows users …	a) … subcontinental GIS, national GIS, regional GIS and local GIS
2. On territorial coverage they distinguish …	b) … traditional operations when working with databases
3. This profession provides …	c) … linked with other information systems
4. The data in GIS are …	d) … to search, analyze and edit digital cards and additional information about objects
5. GIS is a …	e) … unique opportunities for the application of GIS
6. GIS-s are closely …	f) … geology, maths, geography, meteorology, soil science, astronomy and other subjects
7. Future engineers of GIS study …	g) … modern computer technology to map and analyze objects
8. GIS combines …	h) … stored as a set of thematic layers that are Combined on their geographic location

GLOSSARY

Agriculture
The science and art of cultivating the soil, raising crops and rearing livestock, it is also called farming.

Balance of Trade
The difference between the total value of a country's exports and imports. An excess of export over import makes a favourable balance of trade, and the converse an unfavourable balance.

Barter
A direct exchange of excess produce between two parties to the mutual advantages of both, without the use of tokens, credit or money in the transaction.

Census
Official enumeration of population along with certain economic and social statistics in a given territory at some time interval.

Chemical Fertilisers
Substance of natural or artificial origin containing chemical elements such as phosphorus, potassium and nitrogem that are necessary to plan life. They are added to the soil for increasing its productivity.

Contour Ploughing
Tilling or ploughing hillsides or sloping lands along the contour lines, that is, around rather than up and down a slope mainly with a view to conserving soil and water.

Crop Rotation
Growing of different crops in succession on the same field from season to season to maintain soil fertility.

Dairy Farming
A kind of agriculture in which major emphasis is on breeding and rearing milch cattle. Agriculture crops are raised mainly to feed these cattle.

Density of Population
The average number of inhabitants living within a specified unit of area, such as a sq km.

Dry Farming
A method of farming adopted in certain regions of inadequate rainfall and devoid of irrigation facilities by conserving moisture in the soil and by raising drought-enduring crops.

Economic Geography
The aspect or branch of geography which deals with the influences of the environment, both physical and cultural, on the economic activity of man, bringing out similarities and differences from place to place in the ways people make a living.

Environment
Surroundings or the conditions under which a person or things exist and develop his or its character. It covers both physical and cultural elements.

Exports
Goods despatched from one country to another.

Extensive Agriculture
Farming in which the amount of capital and labour applied to a given area is relatively small.

Fazenda
A coffee plantation in Brazil.

Foreign Exchange
The mechanism or process by which payments between any two places operating under different national currency systems are effected without passing of actual money or gold, etc.

Freeways
The wide highways on which cross-roads are avoided by providing overhead links where one turns in only one direction to ensure smooth and speedy traffic.

Harbour
An extensive stretch of deep water where vessels can anchor securely to obtain protection from sea and swell either through natural features or artificial works.

Highway
Public road connecting distant places. Such a road of national importance is called the national highway.

Horticulture
Cultivation of vegetables and fruits; often on small plots, involving higher intensiveness than in field cultivation.

Imports
Goods brought into a country from another country

Industrial Revolution
The change in manufacturing from hand-operated tools to power-driven machinery began in England during the middle of the eighteenth century.

Industry
Systematic production characterised by division of labour and extensive use of machinery.

Intensive Agriculture
Farming in which large amounts of capital and labour are applied per unit area of land, in order to obtain high yield.

Inter Cropping
It is a practice of growing two or more crops together on the same field in the same season

International Trade
Trade carried on between nations primarily to exchange their surpluses and make up their deficits.

Plantation Agriculture
A large-scale one-crop farming resembling factory production. It is usually characterised by large estate, huge capital investment, and modern and scientific techniques of cultivation and trade.

Metropolis
A very large city or agglomeration of population in a district or a country, and is often the chief centre or seat of some form of activity – administrative, commercial or industrial. It generally serves a large hinterland.

Mine
An excavation made in the earth for digging out minerals such as coal, iron-ore and precious stones. A mine usually denotes underground working except in open-pit mines.

Mineral
A substance that is found in the earth's crust, and which generally has a definite chemical composition unlike most rocks.

Mineral Fuel
Non-metallic minerals such as coal and petroleum which are used as fuel.

Mineral Oil
A mixture of hydrocarbons in solid, gaseous or liquid form found in the earth. It is commonly known as petroleum. It became a commercial product only in 1859.

Mineral Ore
Metals in their raw state as extracted from the earth.

Secondary Activity
Activities which transform the material provided by primary activities into commodities more directly useful to man.

Mining
An economic activity concerned with the extraction of commercially valuable minerals from the bowels of the earth.

Mixed Farming
A type of farming in which cultivation of crops and raising of livestock go hand in hand. Both these activities play an important part in the economy.

Natural Resources
Wealth supplied by nature-mineral deposits, soil fertility, timber, fuel, water, potential water-power, fish and wild life, etc.

Nomadism
A way of life of the people who are required to shift their dwellings frequently from place to place in search of pastures for their animals— the mainstay of their economy.

Open-cast Mine
A place where soil and its outward cover are first removed and a mineral or ore is extracted by quarrying. In a way, it is a quarry on a large scale. This method of mining is known as open-cast mining.

Pastoralism
An economy that solely depends upon animals. Whereas nomadic pastoralism is practised mainly for subsistence, the modern ranches present an example of commercial pastoralism.

Port
The commercial part of a harbour containing facilities for embarking and disembarking passengers, loading and unloading, and some facilities for the storage of cargo.

Primary Activity
Activities concerned with collecting or making available materials, provided by nature, for example, agriculture, fishing, forestry, hunting or mining.

Quarry
An open-air excavation from which stone is obtained by cutting, blasting, etc.

Ranches
Large stock farms, usually fenced in, where animals are bred and reared on a commercial scale. They are found especially in the United States.

Rotation of Crops
A systematic succession of different crops on a given piece of land carried out in order to avoid exhaustion of the soil.

Sedentary Agriculture
Farming practised more or less permanently on the same piece of land, the same as settled agriculture.

Shaft Mine
An underground excavation made deep into the earth for digging minerals like coal, precious stones and iron. Such mines contain vertical and inclined shafts and horizontal tunnels at various levels.

Shifting Agriculture
A method of farming in which a patch of ground is cultivated for a period of few years until the soil is partly exhausted or overrun by weeds, and after which the land is left to natural vegetation while cultivation is carried on elsewhere. In due course, the original patch of land is cultivated again when the natural growth has restored fertility.

Subsistence Agriculture
Farming in which its produce is mainly consumed in the farmer's household unlike commercial agriculture whose products enter into trade on a very large scale.

Transhumance
A seasonal movement of herdsmen with their livestock and from and to the mountains or between the regions of differing climates.

Transport
The action of carrying persons and goods from one place to another.

Truck Farming
Growing of vegetables around the urban centres to meet the daily demand of the people is known as truck farming. It is governed by the distance a truck can cover overnight between the farm and the market.

Urbanisation
A general movement of people from small rural or agricultural communities or villages to larger towns engaged in varied activities such as government, trade, transport and manufacture. It also indicates the concentration of an increasing proportion of total population in towns and cities.

APPENDIX 1

ADDITIONAL READING

Модуль I

TEXT 1. The Round Earth on Flat Paper

Geographers use a variety of tools to carry out their work. The tools that most people identify with geography are those that are still most important to geographers today – globes and maps. Modern geographers, however, also use tools such as aerial photographs, satellite images, and computer programs to help them analyze the interactions between people and their environments. The best tool to use often depends on the geographic theme that is the focus of the research. Globes and maps are useful models of the earth. However, globes and maps do not provide perfect representations of the earth. Each has specific advantages as well as disadvantages.

Globes. The most important advantages of globes relate to their shape. A globe is the only model of the earth in the shape of a sphere, just like the earth. A globe, then, provides the most accurate representation of the shape of the earth. Because it is true to scale, the landmasses and bodies of water the globe illustrates have the same shapes as they do on the earth's surface. When you look at Greenland on a globe, for example, its true shape is what you see. You can also compare its size to any other land body. In addition, a globe accurately represents the earth's grid of parallels and meridians, as well as direction and distance from one place to another.

Among the disadvantages of globes is that they often are not practical to use. Globes are expensive and most are too big and bulky to carry around. In addition, people can view only one-half of a globe at a time. This makes it impossible, for example, to look at Canada and India at the same time because they lie on opposite sides of the globe, just as they lie on opposite sides of the earth. Another disadvantage of globes concerns the problem of detail. Because globes represent the entire earth, the individual areas that they illustrate are relatively small. As a result, globes cannot show the detailed features of an area, such as roads, streams, forests, and parks.

The oldest preserved globe is kept and displayed to the public in a museum in Germany. This wooden globe was made in 1492. It is 15 cm in diameter. The globe maker drew on it the land and water bodies that he thought existed. What is interesting about this globe is that it shows the world as Columbus thought of it.

Maps. Maps are flat representations of the earth. Maps vary in size from small maps that appear in pocket size to huge wall maps. Maps also vary in purpose.

One of the most obvious advantages of maps over globes is that they are more convenient to use. Maps can be rolled and folded and are easy to carry around. Maps and related material can also be collected in an atlas to provide an easy-to-use reference. Another advantage of maps is that they can show all of the earth's surface at one time, or can show specific details.

Maps also can present information about a wide range of topics related to both the physical and cultural features of the earth. Using different colors and symbols, maps can illustrate many kinds of topics, including rainfall, mineral resources, and religions. Presenting such a variety of information about an area often helps geographers to see regions and relationships otherwise difficult to visualize.

On the other hand it is impossible to accurately show a three-dimensional object like the earth on a flat, two-dimensional map. For this reason all maps have one or more inaccuracies, called distortions. The problem of distortion remains the major disadvantage of maps.

Choose the one best alternative to each question.

1. Which of the following does the text mainly discuss?
   a) a variety of geographic tools;
   b) modern tools of geography;
   c) maps and globes;
   d) aerial photographs.

2. The word tool is closest in meaning to…
   a) method;
   b) instrument;
   c) apparatus;
   d) model.

3. According to the text, what are the major disadvantages of globes?
   a) A globe provides the most accurate representation of the shape of the earth;
   b) Globes make impossible to look at India and Canada at the same time;
   c) Globes represent the entire earth;
   d) They are not practical to use.

4. Which of the following is true about the major disadvantage of maps?
    a) They can show the detailed features of an area;
    b) The problem of showing a three-dimensional object;
    c) The problem of distortion;
    d) Maps vary in size to from small ones to huge wall maps.

5. Where is the oldest preserved globe kept?
    a) Greece;
    b) Italy;
    c) Russia;
    d) Germany.

6. What conclusion can be made about the most useful map properties?
    a) Maps can be rolled and folded and are easy to carry around;
    b) Maps vary in size and purpose;
    c) Maps can present a variety of information about an area;
    d) Maps illustrate many topics using different colours and symbols.

7. The word advantage is closest in meaning to…
    a) possibility;
    b) opportunity;
    c) something useful;
    d) success.

8. Why is the global grid significant?
    a) It accurately represents the direction and distance from one place to another;
    b) It represents parallels and meridians;
    c) It represents the true shape of the earth;
    d) It represents the entire earth.

9. The most important problems touched upon in the text are:
    a) The role of globes;
    b) The role of maps;
    c) The most useful map properties;
    d) The advantages and disadvantages of maps and globes.

TEXT 2. Charles Robert Darwin

The famous naturalist and thinker, Charles Darwin, (to be born) on February the 12th, 1809. The family (to live) near Shrewsbury, not far from the river Severn. Charles' father was a well-known physician, a son of scientist Erasmus Darwin. Charles' father (to hope) that his son also (to become) a Fellow of Royal Society.

As a boy Charles always (to walk) in the fields, shooting or rathunting. He was observing nature and comparing his observations with everything he (to read) in natural science books.

At sixteen Charles (to go) to Edinburgh University to become a doctor. He had no vocation for it but he was interested greatly in the natural history. During the hours of low tide he (to collect) various sea animals on the shore and (to study) them. Even while he was a student he made two minor discoveries.

After two years of Edinburgh Charles still (to take) no interest whatsoever in his future profession so his father sent him to Cambridge to work for his degree so that he (may become) a parson.

In the spring of 1831 Charles took his degree but refused to become a parson. Two of his professors (to encourage) him to make a special study of geology and in August of the same year he went to the Welsh mountains with a geological expedition.

Some time later he (to hear) that H. M. S. Beagle (to be to set off) on a trip to South America for a cartographical survey of the coast and wanted a naturalist. His biology professor's advice was to go.

The expedition was away almost five years. The Beagle (to make) a very thorough study of the waters off the east and west coasts of South America and of the adjacent islands. The Beagle also (to visit). New Zealand, Australia and the Coral Islands in the Indian Ocean and on the way home Brazil and the Azores. His work on the geology of these countries and that of coral islands (to become) the subject of volumes that he (to publish) on his return. Like most people in those days he (to think) that each species (to exist) thousands of years and never (to change). But during his travels he (to see) that different species of plants and animals, found in different parts of the earth in some ways (to be) similar.

It was when he was trying to explain the wild life of the Galapagos islands that he hit upon a solution: plants and animals (to change) to suit their surroundings.

In 1859 Darwin (to finish) his book «The Origin of Species by Means of Natural Selection». It (to cause) a sensation. So did his later book «The Descent of Man». The clergy, politicians, even some scientists came to agree with him. Darwin continued his research until his sudden death in 1882. He (to be buried) in Westminster Abbey, near I. Newton's grave.

TEXT 3. What is Science?

Science arose out of man's efforts to survive, his natural curiosity, his search for order in a seemingly capricious world. It arose from man's efforts to understand nature and himself. To science we owe most of our comforts, our leisure, our health and longevity, our ability to mold the environment, to communicate instantly and to move swiftly over the earth.

What is science? Science is first of all a human activity. It is a creative and dynamic activity. It is an expression of human experience. Science involves observation and measurement, imagination and hypothesis, communication and criticism.

In science you study nature and human nature, living nature and non-living nature. There is nothing too small or too large, too distant or too near. It is not so much what a scientist studies as how he studies it, that makes the study of science, arranged in orderly fashion. A scientist is always trying to reduce confusion to plain common sense.

A scientist observes and measures objects and phenomena of physical world. He analyses behaviour of matter and energy. He generalizes from collection of observations and measurements and relationships. He develops theories and uses them as guides to new experiments and observations. Thus, first, a scientist identifies and classifies multiple facts and data. Then, he generalizes and systematizes analogous facts of specific character. Further, he combines deduces conclusions as to general and systematic character of analogous facts. Finally, he illustrates conclusions with different facts of reality.

What distinguishes science from other activities is that it enables man to see the world «as it really is». This may mean different things to different men at different times. Over the ages, science has found the world to be flat at one time, round at another and more recently «egg-shaped», to be the centre of the universe and, later only a speck in the cosmos; to be made up of four fundamental substances and, later, of more than one hundred fundamental substances. This does not mean that science is unreliable. It means that science keeps pace with the times. Science is an occupation for people who are openminded, who are capable of putting their beliefs to many tests. There is always room for freshness, newness, brightness in it. The openness and freedom of science makes it the most advanced kind of thought mankind has so far developed.

Модуль II

Navigation Tools

Early European explorers found their way in unknown seas by sailing along the coast from one land mark to the next. Once ships began sailing out of sight of land, however, they needed more reliable methods of navigation. Navigation is the art of sailing a ship by the best course, from one place on Earth to another.

Nature provided the first navigators with some help. Before navigation instruments were invented, early explorers sailed by dead reckoning, which really means intelligent guesswork. They used their knowledge of winds and currents to estimate distance and direction. In unknown waters, clues such as floating driftwood and certain types of seabird suggested that land was not far away. For example, the frigate bird was a welcome sight in tropical waters. This bird cannot land on water, so sailors knew that when they saw one, they must be nearing land.

European sailors started to calculate their position in terms of latitude in the Middle Ages. By measuring the height of the Sun at noon or of the Polar Star at night, a sailor could work out his latitude. By the 15th century – the great age of European sea exploration – navigators had developed a few instruments to guide them. For example, the compass, allowed ships to follow a set course, and the astrolabe or quadrant helped calculate position. Many of these tools were rough and inaccurate but, as ocean voyaging became more common, navigational instruments gradually started to improve.

Sand glass. At first, time on a ship was measured by a sand glass. But this was little use on a long voyage, as it could only measure short periods of time. However, a half-minute sand glass was often used with a log line (a rope with knots tied in it at regular intervals) to measure speed. The log line was paid out behind the ship and the speed was calculated by measuring the time between knots as the line went out. A ship's speed is still given in «knots» today.

Compass. The Earth is like a giant magnet. It has two magnetic poles, which lie near the North and South Poles. Therefore a needle of magnetized iron will always point to the magnetic poles if allowed to swing freely. A magnetic compass works according to this principle. Europeans did not develop a magnetic compass until about 1200. Compasses were used on board ship to tell sailors in which direction they were sailing. Early compasses were not very reliable. A compass needle could be affected by other iron objects nearby, such as a ship's cannon, so voyages often went astray.

Quadrant. The quadrant was probably the first instrument used by navigators to measure the height of a star in order to calculate latitude. It was a quarter-circle of brass, with a plumb line hanging straight down from the point. One of the straight edges had tiny holes at each end. The navigator looked at the star through these holes. The plumb line then showed the height of the star in degrees, which were marked along the curved edge.

Astrolabe. The astrolabe was a device for measuring the height of the Sun at noon. This told the navigator his latitude. Like many other navigational instruments, it was first used by astronomers, people who study the stars. An astrolabe was a disc with degrees marked on a circular scale around the edge and a rotating arm that had a small eyehole at each end. The navigator turned the arm until the sunlight shone through the two eyeholes. The pointer at the end of the arm then indicated the height of the Sun in degrees above the horizon.

Cross-staff. The cross-staff was an instrument used for judging latitude by measuring the height of a star. The navigator lined the cross-staff up with the horizon, then moved the sliding cross-piece until the top was in line with the star. The long arm had a scale on it, which was marked with degrees, and the position of the cross-piece gave the height of the star in degrees above the horizon. The cross-staff was easier to use than an astrolabe, but was no use in daytime because the human eye cannot look directly at the sun. A more complicated version, called a back-staff or English quadrant, which was invented later, solved this problem by allowing the navigator to take a reading with his back to the Sun.

Nocturnal. The nocturnal was invented in about 1550 and was used to tell the time at night. Holding the handle at arm's length, the navigator looked at the Polar Star through the hole in the centre of the instrument. He then moved the arm until it lined up with two other stars in the Pole Star's constellation. The arm pointed to the time on a disk in the middle of the device. The nocturnal was accurate to within about 10 minutes.

Portolan chart. The earliest sailors' maps were called Portolan charts and were drawn on goatskin. The charts showed places and landmarks along the coast and were covered with direction lines and decorative compasses, known as compass «roses». These early maps were often inaccurate because their makers did not know enough geography. They were also uncertain how to show the curved surface of the Earth on a flat map. Portolan charts were used a great deal by Portuguese explorers in the 16th century.

Chronometer. The invention of the chronometer in the 18th century made sea navigation much easier. A chronometer is an accurate clock, which will keep

nearly perfect time even when tossed about in a ship at sea for months. Most importantly, it allowed navigators to measure longitude accurately, because it could be set to keep Greenwich time.

Octant. The octant was invented in about 1730. It was an improved version of the quadrant, with two mirrors. By moving the arm, the navigator brought the reflection of the star together with the reflection of the horizon. The arm then indicated the height of the star in degrees on the scale at the bottom.

Sextant. The sextant replaced the quadrant in the late 18th century and is still used today to measure a star's altitude. It is fitted with double mirrors and a telescope for greater accuracy and, unlike the quadrant or octant, it can measure angles greater than 90º. Early sextants had to be hand held, so ships' navigators often used them on the shore, rather than on board ship.

Latitude and longitude. Today navigators can pinpoint the position of any place on Earth by referring to a set of imaginary lines round the globe, called lines of latitude and longitude. Lines of latitude circle the Earth from east to west and are measured in degrees north or south of the Equator. Lines of longitude circle the Earth from north to south and are measured in degrees east or west of a line, called the prime meridian, which runs through Greenwich in England.

Modern navigation. In the 20th century, methods of navigation have improved enormously. In 1908, the gyroscopic compass was invented. This always points to the true north and is not affected by magnetism. But the biggest breakthrough in navigational equipment was the invention of radio in around 1900. The chronometer, which was so important in the 18th century, is now unnecessary because time checks are broadcast by radio. Radio also enables ships to communicate with one another. Today, a ship anywhere in the world can also check its exact position by means of a signal from a satellite in orbit.

Модуль III

The Planets

The planets seem to fall naturally into two categories. The inner planets of Mercury, Venus, Earth, and Mars are solid, relatively small, and rotate fairly slowly on their axes. The outer planets of Jupiter, Saturn, Uranus, and Neptune are gaseous, large, and rotate fairly rapidly. Although relatively little is known about Pluto, it seems to resemble the inner planets more than the outer ones despite its status as the outermost one of all.

Mercury

Mercury, smallest of the planets, has a crater-pocked surface much like that of the moon but lacking the extensive lava flows so prominent there. The Mariner 10 spacecraft detected a weak magnetic field around Mercury but no atmosphere. A bleak place, but an interesting one because the combination of a high density and little surface melting in the past suggests a quite different geologic history from that of the earth. Surface temperatures on the sunlit side are 3000º C or so, and because there is no atmosphere to transfer or retain heat, the temperature drops at night to about – 175º C.

Venus

In size and mass the planet Venus resemble s the earth more closely than any other member of the sun's family. Apart from the sun and the moon, Venus is the brightest object in the sky, and is even visible in daylight. Venus has the distinction of spinning «backward» on its axis; that is, looking downward on its north pole, Venus rotates clockwise, whereas the Earth and the other planets rotate counterclockwise. The rotation of Venus is extremely slow, so that a «day» on that planet represents 243 of our days.

The surface of Venus is obscured by thick layers of clouds. The dense atmosphere is mainly carbon dioxide, with a little nitrogen and a trace of water vapor also present. At the surface, atmospheric pressure is a hundred times that of the Earth. On the Earth carbon dioxide is an important absorber of radiation from the earth that prevents the rapid loss of heat from the ground after sunset. Venus, blanketed more effectively by far than the Earth, retains more heat; estimates based on data radioed back by spacecraft suggest an average surface temperature of about 430º C, enough to melt lead. Since the temperature is so high, the existence of life on Venus seems impossible.

Mars

The reddish planet Mars has long fascinated astronomers and laymen alike, for it is the only other known body on which surface conditions seemed suitable for life of some kind. Yet Martian climates are exceedingly severe by our standards, and the thin atmosphere does little to screen solar ultraviolet radiation. If life exists on Mars, it is adapted to an environment that would soon destroy most earthly organisms.

Mars rotates on its axis in a little over 24 h; its revolution about the sun requires nearly 2 years; and its axis is inclined to the plane of its orbit at nearly the same angle as the Earth's. These facts mean that the Martian day and night have about the same lengths as ours and that Martian seasons are 6 months long and at least as pronounced as ours. Over half again farther from the Sun than the Earth, Mars receives considerably less light and heat. Its atmosphere, largely carbon dioxide, is extremely thin, so little of the sun's heat is retained after nightfall. Daytime temperatures in summer rise to perhaps 30º C, but at nightfall drop to perhaps – 75º C.

Another difficulty that life must face on Mars is the scarcity of water. A trifle is certainly there, as water vapor in the atmosphere and possibly in the white polar caps as well, but apparently not a great deal. The polar caps, which increase in area in winter and decrease in area in summer, are believed to be almost entirely frozen carbon dioxide («dry ice»). However, water may well have once been more abundant on Mars than it is today. Some surface features photographed by the Mariner 9 spacecraft early in 1972 strongly suggest erosion by running water within the past million years or so. The earth's surface water probably was vented from volcanoes early in its history, and there seems no reason why the same process should not have occurred on Mars, whose surface is dotted with extinct volcanoes.

The fact that most terrestrial life requires liquid water and oxygen plus protection from solar ultraviolet radiation does not necessarily mean that life of some kind could not develop in their absence. Certain bacteria on the earth are known whose life processes require carbon dioxide, not oxygen, so an oxygen-containing atmosphere is not indispensable, at least for primitive forms of life. Conceivably organisms could exist which can thrive on water gleaned from traces of it in the minerals of surface rocks. And shells of some sort might protect Martian creatures from ultraviolet radiation. The absence of indications of life in photographs taken thousands of miles away from the Martian surface is in itself not significant; at such distances terrestrial life would probably not be ap-

parent to a visitor from elsewhere. (And a closer look might suggest that the car is the most conspicuous form of life on Earth.)

The pictures radioed back by Mariner 9 as it orbited Mars showed a host of intriguing geologic structures, many apparently of recent origin. The Martian landscape is extremely varied: there are regions pocked with huge craters, regions broken up into irregular short ridges and depressions, vast lava flows, channels that look as though they were carved by running water, even peculiar areas that seem to indicate glacial activity. Though rainstorms are absent – at least these days – violent winds periodically drive great clouds of dust around the planet. The surface markings so obvious through the telescope do not seem to coincide with the topographical features found by Mariner 9, and some of these markings are known to change color with the Martian seasons. Perhaps the dust storms also follow the seasons and are responsible for the color changes; perhaps some form of vegetation is the cause; perhaps the true explanation lies elsewhere.

Early in this century the Italian astronomer Giovanni Schiaparelli and the American Percival Lowell reported that the surface of Mars was covered with networks of fine lines, popularly called canals (a poor English translation of the Italian *canali*, meaning «cannels»). The apparent straightness and geometric patterns of these canals were considered evidence of the work of intelligent beings. But the pictures radioed back by the various spacecraft to pass near Mars show no signs of canals, though there do seem to be several regions where a number of craters are approximately in line. Probably the canals are optical illusions; certainly the existence of Martian creatures advanced enough to be capable of digging actual canals is highly unlikely.

Jupiter

The giant planet Jupiter, like Venus, is shrouded in clouds. The clouds occur in bands of changing color – yellow, red, brown, blue, purple, gray – and there are some semipermanent markings, such as the Red Sport some tens of thousands of kilometers across. The latter make possible a determination of the planet's period of rotation. This turns out to be less than 10 h, which means that points on Jupiter's equator travel at the enormous speed of 45,000 km/h; the earth's equatorial speed is only 1,670 km/h. Because of its rapid rotation, Jupiter bulges much more at the equator than the earth does.

The four satellites of Jupiter that Galileo discovered over 3 centuries ago are conspicuous objects in a small telescope. The largest is as big as Mercury,

and the smallest is about the size of the moon. The other eight satellites are very small (25 to 250 km in diameter), and one of them escaped detection until 1951.

Jupiter's volume is about 1,300 times that of the Earth, but its mass is only 300 times as great. The resulting low density – only a third more than that of water – means that Jupiter cannot be composed of a mixture of rock, iron, and nickel as is the Earth. Like the other giant planets (Saturn, Uranus, and Neptune), Jupiter must consist chiefly of hydrogen and helium, the two lightest elements. Probably Jupiter does not have an actual surface; instead, its atmosphere gradually becomes thicker and thicker with increasing depth until it becomes a liquid. A terrestrial analogy might be the slushy surface of a snowbank on a warm winter day.

Jupiter's interior is believed to be very hot, about 500,000º C according to some estimates, but not hot enough for nuclear reactions to occur in its hydrogen content whose release of energy would turn Jupiter into a star. But if Jupiter's mass were 30 times greater, the increased internal pressure would push the temperature to 20 million degrees C, and the result would be a miniature star.

Jupiter's atmosphere apparently contains such gases as ammonia, methane, and water vapor as well as hydrogen and helium. As mentioned earlier, laboratory experiments show that when a mixture of these gases is exposed to energy sources such as are usually present in a planetary atmosphere (for instance lightning, ultraviolet light, streams of fast ions), the various organic compounds characteristic of life are formed. It seems entirely possible – some biologists think probable – that some form of life has evolved in the dense lower atmosphere of Jupiter. It is interesting that simple microorganisms such as bacteria and yeasts are able to survive when exposed to gas mixtures that simulate the Jovian atmosphere at temperatures and pressures comparable to those on Jupiter.

The American spacecraft Pioneer 10 passed close to Jupiter late in 1973 after a journey that lasted 20 months and covered over a billion kilometers. Of the wealth of information radioed back, a few items are especially notable. For example, Jupiter has a complex magnetic field about 8 times stronger than the earth's, and this field traps high-energy protons and electrons from the sun in belts that extend many Jovian radii outward, (The Van Allen belts around the earth are similar, but 10,000 times weaker). Another important finding confirmed that Jupiter radiates over twice as much energy as it receives from the sun, which means that it has powerful internal sources of energy; by contrast, the atmospheres of Venus, Earth, and Mars are in balance, and radiate only as much energy as they get from the sun. It has been suggested that Jupiter is still contracting gravitationally, and in this contraction potential energy is turned into heat just as compressing air in a tire pump warms up the air.

Saturn

In its setting of brilliant rings, Saturn is the most beautiful of the earth's kindred. The planet itself is much like Jupiter: similarly flattened at the poles by rapid rotation, similarly possessing a dense atmosphere, its surface similarly hidden by banded clouds. Farther from the Sun than Jupiter, Saturn is considerably colder; ammonia is largely frozen out of its atmosphere, and its clouds consist mostly of methane.

The famous rings, two bright ones and a fainter inner one, surround the planet in the plane of its equator. This plane is somewhat inclined to Saturn's orbit. Hence, as Saturn moves in its leisurely 29-year journey around the Sun, we see the rings from different angles. Twice in the 29-year period the rings are edgewise to the Earth; in this position they are practically invisible, which suggests that their thickness is small, perhaps 20 km as compared with the 270,000-km diameter of the outer ring.

The rings are not the solid sheets they appear to be but instead consist of myriad small bodies ranging in size from boulders a meter or more across to dust particles, each of which revolves about Saturn like a miniature satellite. No satellite of substantial size can exist close to its parent planet because of the disruptive effect of tide-producing forces, which are proportionately less the farther distant the satellite. The Roche limit is the minimum radius that a satellite orbit must have if the satellite is to remain intact; the limit is named in honor of E. A. Roche, who investigated the origin of Saturn's rings a century ago. For Saturn the Roche limit is calculated to be 2,4 times the planet's radius, and in fact the outer rim of the outer ring is 2,3 radii from the center of Saturn and the closest satellite never approaches closer that 3,1 radii from the center. Saturn has 10 ordinary satellites outside the rings; the innermost of these was discovered in 1966.

Stellar Evolution

A star shines because it is a large, compact aggregate of matter that contains abundant hydrogen. A body of this sort cannot avoid being luminous because of the energy liberated in the conversion of its hydrogen into helium.

We may imagine as the starting point in a star's history a stage when its matter was an irregular mass of cool, diffuse gas and small, solid particles. Gravitation in such a mass would concentrate it into a smaller space. The gradual contraction would heat the gas, much as the gas in a tire pump is heated by compression. At length the temperature would grow high enough for hydrogen to be

converted into helium, and the mass would begin to glow brightly. From this time on the tendency to contract would be counterbalanced by the pressure of radiation from the hot interior, so shrinking would stop and the star would maintain a nearly constant size. The diameter of a star is thus determined by equilibrium between gravitational forces pulling its material inward and forces due to radiation pushing its material outward.

A star does not shine because some occult force has started I shining; it shines because it has a certain mass and a certain composition. If we could somehow build a star by heaping together sufficient matter of the right composition, it would start to shine of its own accord.

A star consumes its hydrogen rapidly if it is large, slowly if it is small. A fairly small star like our sun makes its supply of hydrogen last for a period of the order of 10 billion years; probably the sun is now about halfway through this part of its career. When the hydrogen supply at last begins to run low in a star like the sun, the life of the star is by no means ended but enters its most spectacular phase. Further gravitational contraction makes the interior still hotter, and other nuclear reactions become possible – particularly reactions in which atoms of heavier elements are made by a combination of helium atoms. These reactions, once started, give out so much energy that the star expands to become a giant. Energy is now being poured out at a prodigious rate, so the star's life as a giant is much shorter that the earlier part of its existence.

Eventually the new energy-producing reactions run out of fuel, and again the star shrinks – although probably not without a few last brief flare-ups, which we see from the earth as novae ("new stars") that shine brilliantly for a week or two and then subside into insignificance. The shrinking ultimately reduces the star to the white dwarf state. As a slowly contracting dwarf the star may remain luminous for billions of years more with its energy now coming from the contraction, from nuclear reactions involving elements heavier than helium, and from proton-proton reactions in a very thin outer atmosphere of hydrogen.

Stars much more massive than the sun have somewhat different histories. Eventually they become unstable and explode violently, emitting enormous amounts of material. Such explosions we observe as supernovae, flare-ups 10,000 or more times as luminous as ordinary novae. Having lost perhaps half its mass, a star of this kind can then subside like its smaller brethren into a dwarf star.

Today astronomers believe that the residual dwarfs of supernovae are different from ordinary white dwarfs because of the large mass of their parent stars. These hypothetical dwarfs are calculated to have densities far in excess of ordi-

nary dwarfs, with masses comparable to that of the sun packed into spheres perhaps 15 km (9 mi) in diameter. The matter of such a star would weigh billions of tons per cubic inch. (If the earth were this dense, it would fit into a large apartment house). Under the pressures that would be present the most stable form of matter is the neutron. Pulsars, which emit brief, intense bursts of radio waves at regular intervals, are believed to be rotating neutron stars with magnetic fields that lead to radio emission in narrow beams; as a pulsar rotates, its beams swing with it to produce the observed fluctuations. A notable pulsar is located at the center of the Crab nebula, which is the remnant of a supernova that was seen in A.D. 1054 and has been expanding and glowing brightly ever since.

Модуль IV

Earth: The Stuff of Life

The temperature of Earth's central core is higher than that of the molten rock that is poured out of the craters of live volcanoes. Nevertheless, by reason of the mass of material that surrounds it, this core is essentially solid. In this case again we are dealing only with a hypothesis, but one that is accepted as being a highly useful concept. The greatest depth to which Earth has been penetrated by drilling downward from the surface is about four miles, a superficial distance in comparison to the nearly one thousand times this that would be required to reach its center.

As Earth cooled down originally, its crust passed through a semisolid to a solid state, with great folds developing on its surface. Water collected in the valleys between these folds to form lakes and seas. Terrific tensions and pressures were built up within Earth's interior with the result that high mountain ranges, such as those of the Himalayas, the Alps, and the Rocky Mountains, were shoved up above the surrounding terrain.

Sudden underground slippages of great masses of rock frequently occurred. These opened up huge cracks, known as faults, which are horizontal displacements of soil and rock that can often be traced across the country for distances of one hundred miles or more. Proof of these and other great stresses, that developed within Earth's crust during the cooling process and subsequently, is found also in the transformation of limestone to marble, of shale to slate, and of bituminous coal to anthracite. Such metamorphoses could have taken place only under conditions of extremely high pressures and temperatures.

Undoubtedly, earthquakes were more frequent and catastrophic in the far distant past than they have been during historic time. But no person was there to see and record them. In the four thousand years of recorded history an estimated 13,000,000 people have been killed by earthquakes. During the earthquake that shattered the city of San Francisco in 1906 a great fault opened up that broke gas and water mains, resulting in terrifying fires that could not be brought under control and in much loss of life and property. In 1923 some 90,000 people lost their lives during an earthquake in Tokyo, Japan. An estimated 100,000 casualties resulted from an earthquake in northern Turkey in 1939.

Terrifying and highly destructive volcanic eruptions frequently follow earthquakes, the volcanoes belching forth great masses of molten rock, large volumes of flaming gases, and such vast quantities of ashes that often the sun is

blotted out for many miles around. Some 2,500 volcanic eruptions have been recorded, of which over 2,000 have taken place in the Pacific Ocean region. More than 450 of these eruptions have occurred within historic times. The most famous volcanic eruption was that of Mount Vesuvius in A.D. 79, which completely buried the cities of Pompeii and Herculaneum near Naples, Italy, killing thousands of people and destroying all the living things about the nearby countryside. In 1908 the city of Messina, Italy, was totally destroyed by such an eruption, some 85,-000 people being killed. As recently as 1943 a mountain of molten rock and ashes was piled up to a height of two thousand feet within a few days in the center of what had been a prosperous farming community near Paricutin, Mexico. About 80 per cent of the known active volcanoes on Earth are of the submarine type, such as the one that shoved up a new island among the Azores in 1957. The Hawaiian Islands are of volcanic origin, having been built up at some points to a height of fourteen thousand feet above sea level from a starting base that was at least that far below it.

Associated with the high temperatures that result in the volcanic eruptions that continue to occur from time to time and from place to place are the large amounts of steam and boiling water that come to the surface in many parts of Earth. Old Faithful Geyser in Yellowstone National Park, which erupts quite regularly about once an hour the year round and has been doing so for many years, is a good example. At Hot Springs, Arkansas, forty-seven such hot-water springs, with reputed curative values, attract many thousands of visitors every year. The most extensive and long-continued hot springs known are located in New Zealand and in Iceland, where they are of great importance because of their heat value during the cold and extended winter periods.

Earthquakes are often closely followed by what have long been termed tidal waves that have been known to travel across the ocean at speeds up to 450 miles an hour with disastrous effects when they reach a shore. This term is a misnomer in that these waves have no connection with tides. A better word, coined by the Japanese, who have had a great deal of experience with them, is tsunami. Japan has been hit by more than a dozen tsunamis within the last half-dozen years, eight of them highly destructive. One of these, on June 15, I960, is estimated to have destroyed ten thousand homes and to have killed 27,000 people. In 1883 a tsunami, originating as a result of an eruption of Mount Krakatoa in the South Pacific, had a height of well over one hundred feet as it rolled in on the adjacent islands of Sumatra and Java, drowning many thousands of people. This wave was recorded on tidal gauges as far away as the English Channel.

Модуль V

Days of Abnormal Weather

TEXT 1

Implacable November weather. Smoke lowering down from chimney-port, making a soft black drizzle with flakes of soot in it as big as full-grown snowflakes. Dogs, indistinguishable in mire. Horses, scarcely better. Foot passengers, jostling one another umbrellas, and losing their footholds at street corners, where tens of thousands of other foot passengers have been slipping and sliding since the day broke.

Fog everywhere. Fog up the river, where it flows among green aits and meadows; fog down the river, where it rolls defiled among the tiers of shipping, and the waterside pollution of a great (and dirty) city.

The raw afternoon is rawest, and the dense fog is densest, and the muddy streets are muddiest, near Temple Bar. And hard by Temple Bar, in Lincoln's Inn Hall, at the very heart of the fog, sits the Lord High Chancellor in his Court of Chancery.

TEXT 2

With the arrival of the monsoon Ghote was no longer able to get out of the house by taking long walks about the city. The roads he had slowly moved along in the days if stifling heat were often deep under flood water now, and where they were not blocked by a foot or more of muddy brown water, pavements and roadways were frequently swirling with the fast-flowing excess if the walls and walls of warm rain.

Indoors, everything smelt day and night of damp cotton and every surface that could hold mould was covered in greeny fungus. Out of doors, cars by the hundred were either brought to a halt in the floods or made immobile by damp in the engines. The trains were frequently unable to run where water covered the rails, and the city hundreds of thousands of commuters had to struggle in to their offices on foot, a moving mass of black umbrellas. Gallantly, they would manage to reach their destinations often as late as two in the afternoon, by which time it was only sensible to turn round and start off home again.

TEXT 3

The week before Christmas, when snow seemed to lie thickest, was the moment for carol singing.

Eight of us set out that night. A blizzard was blowing, but we were well wrapped up, with army puttees on our legs, woollen hats on our heads, and several scarves around our ears.

Steadily we worked through the length of the valley, going from house to house. It was freeing hard, yet not for a moment did we feel the cold. The snow blew into our faces, into our eyes and mouths, soaked through our puttees, got into our boots, and dripped from our woollen caps. But we did not care. The collecting box grew heavier.

We approached our last house high up on the hill, the place of Joseph the farmer. The last stretch of country to reach his farm was perhaps the most difficult of all. In these rough bare lanes, open to all winds, sheep were buried and wagons lost. Huddled together, we tramped in one another's footsteps, powdered snow blew into our screwed-up eyes, candles burnt low, some blew out altogether, and we talked loudly above the gale.

Crossing, at last, the frozen mill-stream, we climbed up to Joseph's farm. Sheltered by trees, warm on its bed of snow, it seemed always to be like this. Everything was quiet; everywhere there was the silence of the winter night. We started singing, and we were moved by the words and the trueness of our voices. We were given roast apples, and hot mince-pies, and in our wooden box, as we headed back for the village, there were gifts for all.

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