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Институт языка и литературы
Кафедра профессионального иностранного языка для естественнонаучных специальностей

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English for biological science (Bachelor level)

Английский для биологических наук (для бакалавров)

Учебно-методическое пособие
Издание второе, исправленное и дополненное

Рекомендовано УМО РАЕ по классическому университету и техническому образованию в качестве учебного пособия для студентов высших учебных заведений, обучающихся по направлению подготовки 06.03.01 «Биология»

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Настоящее учебно-методическое пособие предназначено для студентов-бакалавров, обучающихся по направлениям, связанных с биологией, биотехнологией, химией. Пособие направлено на подготовку студентов к работе со специальной литературой, обучение устным формам общения по профессиональной научной тематике на материале предложенных тем. Данное издание призвано помочь студентам расширить их активный лексический запас, подготовиться к участию в международных конференциях, усовершенствовать навыки чтения и перевода оригинальной научной литературы, подготовить устное или письменное высказывание по теме научной работы.

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Предисловие

Учебно-методическое пособие предназначено студентам-бакалаврам, обучающимся по естественнонаучным направлениям подготовки: Биология (зоология, ботаника, физиология, биология клетки, биохимия), Биотехнология, Химия и другие.

Пособие позволяет осуществлять целенаправленную языковую подготовку в вышеуказанных областях с учетом их профессиональной специфики и применение полученных знаний и умений в дальнейшей деятельности.

Учебно-методическое пособие предназначено для студентов очной формы обучения, которые продолжают изучение английского языка на основе компетенций, приобретенных в средней общеобразовательной школе.

Данное пособие содержит лексико-грамматический материал для профессионального и бытового общения и чтения научной литературы, способствует формированию у будущих специалистов умения работать самостоятельно (реферирование и аннотирование) с научно-популярными и научными текстами по данной тематике; развивает навыки научно-технического перевода и умение общаться на английском языке.

Пособие состоит из 16 глав и 2 приложений. Каждая глава начинается с общих вводных вопросов. Далее следует профессионально направленный текст общего и ознакомительного характера на определенную тематику с последующими лексическими упражнениями, для усвоения, активирования, повторения и систематизирования знаний учащихся. В главе предлагается новая лексика и термины для использования в профессиональной сфере. Упражнения способствуют расширению и закреплению активного словарного запаса, навыку говорения, развитию монологической и диалогической речи. Конечный этап

работы с текстом — это, как правило, устное изложение на заданную тему с использованием нового лексического материала.

Далее предложен ряд упражнений на повторение грамматики. Грамматические упражнения намеренно используют более простой и иногда отвлеченный словарный запас, чтобы учащиеся могли полностью сконцентрироваться только на грамматических конструкциях. В сочетании со словарным запасом они применяются в конце главы в творческих или письменных заданиях.

Каждая глава также содержит дополнительный текст, соответствующий заявленной теме, и ряд упражнений к нему.

Для полного освоения и корректного употребления лексики студентам предлагается перевести текст с русского на английский язык.

Написание эссе, письма, сочинения, доклада присутствуют практически в каждой теме, так как умение составлять и корректно оформлять их видится для будущих специалистов необходимым.

В конце каждой главы учащимся предложены творческие задания. Это может быть презентация, дискуссия, разработка проекта или ролевая игра, где студенты вырабатывают коммуникационный навык. Стоит отметить, что такие задания особенно нравятся студентам, так как они имитируют жизненные ситуации и закрепляют словарный запас в игровой форме.

Оригинальность и новизна пособия заключается в том, что оно построено по принципу усложнения не только языкового материала, но и материалов, касающихся соответствующей тематики.

В процессе достижения цели обучения, кроме практических задач, решаются воспитательные и общеобразовательные задачи, способствующие повышению общего и культурного уровня студентов, расширению их

кругозора, всестороннему развитию личности.

Наряду с аудиторными занятиями предполагается обязательная самостоятельная внеаудиторная работа студентов, включающая выполнение домашнего задания, чтение дополнительной литературы, создание презентаций, исследовательскую работу, написание академического эссе и других письменных высказываний с элементами рассуждения.

В конце пособия содержатся 2 приложения. В приложении 1 приведен вариант чтения химических формул и элементов. В приложении 2 представлены дополнительные неадаптированные тексты для перевода с английского на русский язык и наоборот.

В пособии использованы тексты и статьи из различных источников, в том числе отечественных и зарубежных учебников и энциклопедий и открытых интернет-источников. Список использованной литературы прилагается в конце данного пособия.

Notations

(n) – noun
(v) – verb
(adj) – adjective
(adv) – adverb
(prep) – preposition
etc – et cetera

Unit 1

Likes and dislikes

Every person has their likes and dislikes. Talk about the things you like and dislike in general.

Categorize your likes and dislikes according to this table and examples given below:

Category	Likes	Dislikes
Music	*Rock…*	*Pop…*
Animals		
Clothes		
Books		
Food		
School subjects		

1. You are starting to study biological sciences. Read and translate the text about the tastes of one of your mates.

Biotechnologist's favorite things

Studying biotechnology is a very high priority with me, especially as I dreamt to study biology and chemistry in complex from my childhood. So there are times when I break my rules, go absolutely crazy and escape to my laboratory and work for the whole day without any food and sleep. I really enjoy uncovering new scientific mysteries.

I've got a superb laboratory – over 200 various chemical devices as well as chemicals themselves – so you

can guess that I just adore doing experiments. I really like the entire content of my laboratory – all these test tubes, shakers, automatic dispensers and photocolorimeters. Ever since I was young I've loved looking at chemical reactions.

I'm very fond of rats and mice – I've got two white mice at home, Arethna and Flossie. I like outstanding scientists and I read their works on brilliant biotechnology. I watch scientific programs on the television as well. Some of them are wonderful.

Also, on my list of likes must be Jamaica. I love going on holidays to Jamaica and go back there as often as I can. I can find many new interesting species of flora and fauna there.

I tend to wear white overalls – maybe because I couldn't afford them when I was at school. I like wearing gloves and a mask but I can't stand when gloves are torn! One of my pet hates* is when chemist's shops don't have gloves in my size. I think that's really awful.

There are lots of other things I don't like. I detest

violence and the idea of nuclear war is very frightening indeed. I don't mind being interviewed but I get annoyed when I get too much attention. I absolutely hate when people say that biotechnology is a boring thing – such people promote ignorance. I'm also not too keen on rude people and Australian soap operas – they are dreadful.

Notes

*pet hates *BrE* /pet peeve *AmE* – something that you strongly dislike because it always annoys you.

Vocabulary

adore (v)
attractive (adj)
awful (adj)
be fond of
be keen on
break the rules
brilliant (adj)
can't stand
detest (v)
mind (v)
dispenser (n)
dreadful (adj)
enjoy (v)
entire content
fantastic (adj)
great (adj)
hate (v)
high priority
make experiments
outstanding (adj)
overalls (n)
promote ignorance
scientist (n)
scientific (adj)
species (n)
superb (adj)
tear (tore, torn) (v)
test tube (n)
violence (n)

2. Read the first 3 paragraphs of the text and write down things that a biotechnologist likes. Then read the last two paragraphs and find things that he dislikes.

3. Which of biotechnologist's likes and dislikes do you share with him? List five things that you really like and five things that you dislike.

4. In the text find eight verbs referring to ***likes*** *and* ***dislikes****. Draw a line and write most positive verb on one side of the line and most negative verb on the other side. Put the verbs along the line according to how positive or how negative they are.*

Adore — Can't stand

Most positive — **Most negative**

5. Would you like to know more about the biotechnologist's life? Ask him some questions. Remember to use ***5 types of questions****.*

6. What famous person would you like to interview? Give reasons for your choice. In pairs make your own interview with the famous person you like. Use all 5 types of questions.

7. Translate the word combinations below into Russian. Make your own sentences using these word combinations.

Great (elephant, aim, singer, lection, at painting, grandfather).

Brilliant (mathematician, humor, musician, stone, varnish, image).

8. Change the following phrases using ***the possessive key.***

Example: The son of our teacher — our teacher's son.

1) the clinic of Mr. Smith; 2) a shaker of the girls; 3) the works of Mendeleev; 4) a toy of the baby; 5) a meeting of the employees; 6) the researches of those women; 7) the orders of our boss; 8) the books of the children; 9) a laboratory of my parents; 10) a test tube of her cousin; 11) the mother of Kate and Mary; 12) the children of my aunt Ann; 13) the studies by Wöhler and Liebig; 14) the times of Ivan the Terrible; 15) research projects of Saudi Arabia.

9. Translate the word combinations using the possessive key.

1). работа Джессики, 2). имя доктора, 3).исследования Фрэнка и Джона, 4). фотоколориметр нашей лаборатории, 5). компьютер моих соседей, 6). дочь Марка и Виктории, 7). гены этих мужчин, 8). ключи моей сестры, 9). опыты моих коллег, 10).преподаватель моего университета.

10. Remember the verb tenses: ***Present Simple*** *and* ***Present Progressive****. What markers help us identify these tenses?*

Remember the markers of frequency used for Present Simple tense and put them in order from the most intensive to the least intensive.

Always Never

11. Define if the verb tenses in these sentences are used correctly.

1) I get up at seven in the morning.
2) I'm liking biochemistry.
3) He’s knowing interesting things about biotechnology.
4) I think Mexico's a beautiful country.
5) Universities are staying open late in the USA.
6) He's having a lab near the center.
7) What are you thinking of Watson?
8) Peter's in the laboratory. He makes an experiment.
9) What are you thinking about?

12. Finish the following sentences using each verb twice: Present Simple, and Present Progressive.

*Don’t forget that not all verbs can be used in the progressive tenses! Do not use:

- Verbs of mental activity (глаголы, характеризующие умственную деятельность): *know, realize, suppose, understand, believe, remember, forget, think, assume, consider, expect, agree, mean, doubt etc.;*
- Verbs of emotions (глаголы эмоций): *like, dislike, love, hate, envy, prefer, wish, want, care etc.;*
- Possessive verbs (глаголы обладания): *have, own, belong, contain etc.;*
- Sense verbs (глаголы чувств): *see, hear, smell, taste etc.*

Have: a). He _____ four cars, all of them are Rolls-Royces;

b). I _____ lunch with my mother tomorrow.

Think: a). What ____ you _____ of Stephen Spielberg's latest film?

b). You're day-dreaming. What _____you _____ about?

Expect: a). I ____ an important phone call from America. Could you tell me when it comes?

b). I _____ you're hungry after a lot of hard work. Shall I get you something?

Smell: a). Something _____ good in the kitchen. What's cooking?

b). Why_____ you _____ the meat? Do you think it's gone off?

Weigh: a). I need to know how much the meat _____ to know how long to cook it for.

b). Why _____ you _____ yourself? Do you think you've put on weight?

Look: a). It _____ as if it's going to rain.

b). What are you doing on your hands and knees? ____ you ____ for something?

13. Put the verbs in brackets into the ***Present Simple*** *or* ***the Present Progressive****.*

1) Be quiet, please. We (work) with electrophoresis camera and you (make) a lot of noise. 2) He always (go) for a walk in the evening. 3) Where is Jack? — He (do) chromatography in the laboratory. 4) She (cry). Is something wrong? 5) In the morning I (have) little time, so I always (plan) my agenda in the evening. 6) A decade (describe) a period of ten years. 7) Her brother is a Russian biologist but he (work) in Canada at present. 8) She always (dream) but (do) nothing to fulfill her dreams. 9) He (be) so suspicious about me at the moment. I wonder why. 10) Hurry up, Jane!

We all (wait) for you in the laboratory. 11) Turn off the flame. Don't you see water in the tube (boil)? 12) The rats are still ill after the experiment but they (get) better gradually. 13) Don't bother her. She (take) her Immunology lesson: she always (take) it in the morning. 14) The living standards (change). So, every month equipment (get) more expensive. 15) Tom and Mary (leave) for the Netherlands tomorrow. 16) I have just started Biochemistry courses. I (study) modification of proteins. 17) Mercury (boil) at 357.23 degrees Centigrade.

14. Translate the following sentences into English:

1) Дважды в неделю он ходит в лабораторию. 2) Студент проводит эксперимент. 3) Вся группа сидит за столом и обсуждает полученные результаты. 4) Мы держим опасные вещества в вытяжном шкафу. 5) Иногда электрофорез идёт весь день. 6) Они редко ошибаются в расчётах. 7) Студент едет в университет. 8) Они ходят в библиотеку каждый день. 9) Мальчик учится. 10)Все любят смотреть на фракталы.

15. Read the text and translate

The Circus Trees

Hobbies differ like tastes. If you choose a hobby according to your character and taste you are lucky because your life becomes more interesting. Hobby is what a person likes to do in their spare time. Many people spend a lot of time and money on their hobbies, for someone hobby is like a profession. Also some people have more unusual hobbies

than others.

Circus Tree shaping is a unique eco-art form created, developed and perfected by Peter Cook and Becky Northey from Australia. Circus tree is a dream made into a reality through inspiration, love of nature, tree finesse, persistence and understanding trees and how they grow.

It all started with Axel Erlandson, who created a roadside park called *The Tree Circus* in California in 1947. Erlandson had a vision of a horticulture theme park but it was never a commercial success. *The Tree Circus* took in about $300 for the entire year. Erlandson sold his park in 1963 for $12 and died the next year. Property owners came and went over the years. Finally, in 1985, the owner of a tree nursery bought 24 of the trees from the previous owner and transplanted them to his horticulture theme park, *Gilroy Gardens*, and they are on display today. Some of the other trees were sold and ended up at the American Visionary Art Museum.

50-plus years after Erlandson's

Tree Circus, Pete Cook proudly stands next to one of his guided creations on his home turf in South East Queensland, Australia. Pete has some very cool looking Circus Trees growing out back.

The co-founder, Becky Northey, is a famous biologist. She describes how her hobby of Circus Tree shaping developed. “The swirls in the tree were inspired by the hobby of engraving that I was doing at the time. We evolved our techniques of shaping trees in complete isolation from the rest of the world. With our techniques we know what will work or not and we can reproduce any of our pieces, which we have done with our favorites.”

You may think that a living tree sculpture is an impossible dream but professional eco-artists have perfected the techniques for centuries. However, the finished project may take years or even decades, so it is not a task for the impatient. The Circus Tree gardens allow the imagination to run wild and one’s inner child to come out to play. There are many classic forms of tree shaping but almost anything can be made. Some examples of the practice include living chairs or even a boat. The shapes are developed over time with careful training and grafting as well as knowledge of how the chosen tree species tend to grow.

16. Make your own question of different types covering the content of the text.

17. Translate the text in your own words close to the original.

Разинув рот

Как формируются вкусовые предпочтения человека? Недавние исследования показали, что даже в раннем детстве еда больше зависит от социальных факторов (мнений и поведения других людей), чем чисто биологических (вкус и полезность). В выборе пищи и формировании кулинарных симпатий и антипатий отношения между людьми играют основную роль.

Точкой отсчета исследований послужили потребности выживания: выбор пищи как минимум должен обеспечивать человека питательными веществами и не приводить к отравлению. С этой точки зрения дети слабо компетентны: хотя у них рано появляются любимые блюда, они постоянно тянут в рот несъедобные и опасные для жизни вещества.

Однако дети учатся выбирать пищу не в одиночестве. Взрослые не просто помогают разбираться в блюдах — они учат, как, когда и с кем следует есть. Исследователи подчеркивают социальный характер

употребления пищи человеком. Это подтверждается рядом наблюдений. Например, дети едят больше, когда вместе с ними за столом находятся взрослые, съедобность объекта определяют, глядя на других. Наконец, им не нравятся блюда, которые предлагают взрослые, отличающиеся антиобщественным поведением.

18. Write a "For" and "Against" essay (200-250 words) about one of the topics using the plan below.

1) All our likes and dislikes are influenced by the environment. Agree or disagree.

2) Our hobbies depend on our bringing-up. Agree or disagree.

3) The likes show the man as the morning shows the day.

4) Our tastes are inborn. Agree or disagree.

The Plan for your "For" and "Against" essay:

Introduction. § 1

– introduce the topic and state the problem

– make a general remark about it without giving your opinion.

Main Body. § 2, 3

– arguments "for" (3 points)

– arguments "against" (3 points)

(support your arguments with examples)

Conclusion. § 4

– your opinion based on the given arguments

Unit 2

Education

You study at university. Do you know when your university was founded?

Do you think you have fairly modern education? Or do you think things need to be improved?

1. Read and translate the text.

The History of Education

As long as we live we continue to learn. The education we get when we are young helps us continue learning. We study reading and writing. We learn many essential skills and how to use them later on in life.

The first teachers were fathers and mothers. Even from the early in the history of mankind children learnt from people other than their fathers and mothers.

Schools first started in Egypt 5,000 to 6,000 years ago, and it was the invention of writing which made them necessary. Reading and writing were quite different from the skills used in everyday life, and writing made it possible to accumulate knowledge which increased with every generation. So teachers were people specially trained for it.

Only the sons of nobles attended the first Egyptian

schools where they studied reading, physical education and good behavior.

In ancient India there were four castes of people. It was the priestly caste who decided what each of the four castes should study. Only the priestly caste learnt Hindu scriptures.

In China, until the 19th century, education was organized according to social classes, and consisted largely of memorizing scriptures by heart.

A clear example of the way, in which even neighboring peoples produce different types of education, came from ancient Greece. Sparta and Athens were two Greek states. Spartans, hard and warlike people, gave purely military education to their children. At the age of seven all boys of noble families left their homes and went to live in schools. They had very strict discipline and learnt hunting, military scouting, swimming and the use of weapons. Spartans despised literature, and some people think they could not even read.

At the very same time, also for the nobles only, Athenians built what we call a liberal education – one that helps a man to develop all sides of his nature, helps him to make and appreciate beautiful things and helps him to find the best way of life. They thought it was important to educate body as well as mind. They had a program of physical training which consisted of running, jumping, wrestling and throwing the discus. Also Athenian education paid special attention to reading, writing and literature. A special teacher, known as the "grammatist", taught students.

Common people were not educated; they studied craftsmanship, workmanship and trades.

Greek philosophers, or thinkers, always discussed what

education should do and what it should include. Plato wrote a book called *The Republic*, one of the best books ever written on education, and since those days Greek ideas have influenced European education, especially secondary and university education.

Romans were very good at organizing, and they were the first people to have free of charge schools run by government. Throughout their great empire, there was a network of these schools which provided for three stages of education. At the age of 6 or 7 all boys (and some girls) went to primary school, where they learned "three R's": reading, writing and arithmetic. Most children didn't study more than this; but at the age of 12 or 13, boys from rich families went to the "grammar" school to study Greek and Latin languages and literature. At 16, young nobles who wanted to enter politics or the service of their country went to schools of rhetoric to study rhetoric, or public speaking.

In Great Britain, the first teachers we read about were craftsmen. They taught children to read, write and count, to cook and mend their own shoes.

In the early 19th century, the main system of teaching was the "Monitor" system. The teacher could manage a class of 100 or more students by using older pupils or "monitors" to help him. The schools had long desks arranged in tiers so that the teacher could see every child in a large class.

Vocabulary

according to	as well as
accumulate (v)	be good at
appreciate (v)	behavior (n)
arranged (adj)	by heart

common people	invention (n)
consist of (v)	keep under a discipline
decide (v)	knowledge (n)
despise (v)	liberal education
develop (v)	pay attention to
educate (v)	possible (adv)
essential (adj)	primary school
find out (v)	produce (v)
free of charge	run (v)
hard people	skill (n)
include (v)	the use of weapons
influence (v)	throw(v)

2. *Translate into English paying attention to the words in italics.*

1) В течение всей жизни человек получает *знания*.

2) Во время занятия преподаватель *обратил особое внимание* на неправильные глаголы.

3) В некоторых странах даже *начальная школа* не является обязательной.

4) Ученый запатентовал свое оригинальное *изобретение*.

5) Вчера я читал эту поэму четыре раза и знал ее почти *наизусть*.

6) Хороший студент обладает прочными *знаниями, так же как и* дисциплинированным *поведением*.

7) Я *презирал* его за трусость и слабость.

8) В государственной школе образование *бесплатное*.

9) *Гуманитарное образование*, в отличие от естественнонаучного, касается человеческих отношений.

10) Не все студенты *преуспевают в* биохимии.

3. Give detailed answers to the questions.

1) Why do we need to study?

2) When and where did the first schools start?

3) What made it possible to accumulate knowledge?

4) Who were the pupils of the first Egyptian schools?

5) What was the organization of education in China until the 19th century?

6) What was the difference between Spartan and Athenian educational system?

7) What are the main principles of liberal education?

8) Who was the “grammatist”?

9) Were common people educated?

10) What is the impact of Greek philosophers on the history of education?

11) Who had free of charge schools run by government?

12) What were the tree stages of Roman education?

13) Who were the first teachers in Britain?

14) What was the main system of teaching in the early 19th century?

15) Who were the “monitors”?

4. Arrange the following statements in their logical order. Explain and expand them.

- Spartans gave a military education to their children.
- Only the priestly caste learnt Hindu scriptures.
- Greek ideas influenced European education.
- Schools first started in Egypt 5,000 to 6,000 years ago.

- Romans were very good at organizing.
- The “Monitor” system.
- The first teachers were fathers and mothers.
- People in India were divided into the four castes.
- In Great Britain the first teachers were craftsmen.
- Sometimes neighboring peoples produced different types of education.
- Liberal education helped a man to develop all sides of his nature.

5. Talk about the new facts you found in the text. What interested you or what information was new for you? Can you add more historical information about the history of education?

6. Think about the ways of retelling the text to attract the audience. Retell it to your group mates.

1. Find some information about modern British and American education. Compare it with the Russian education using the table below:

	American education	British education	Russian education
a. age when children start school b. stages of school b.marks d. payment e. uniform f. exams			

g. age when students go to university h. university difference g. other differences			

8. Translate the text into English using the studied words.

Образование — это целенаправленный процесс воспитания и обучения в интересах человека, общества, государства. Обычно образование подразумевает, что учитель обучает учеников чтению, письму, математике, истории и другим наукам. Преподаватели по узким специальностям, таким как астрофизика, право, география или зоология, могут обучать только данному предмету, обычно в университетах и других вузах. Существует также преподавание профессиональных навыков, например, вождения. Кроме образования в специальных учреждениях существует также самообразование, например, через Интернет, чтение, посещение музеев или личный опыт.

*9. Write **the plural form** of the following word. Make some sentences with these words.*

story, play, glass, flag, photo, child, name, wolf, match, knife, bush, chief, page, radio, goose, roof, prize, child, goose, man, wife, foot, mouse, woman, knife, sheep, person, deer, tooth, fellow-worker, merry-go-round, man-of-war, passer-by, sister-in-law, forget-me-not, room-mate.

*10. Remember **the numerals**. Answer the questions. Write the numbers in full.*

1) How many minutes are there in two hours? 2) How many kilometers are there in a mile? 3) What is your normal temperature? 4) How much do you weigh? 5) How many cents are there in $2? 6) How many days are there in a year? 7) When were you born? 8) What is your telephone number? 9) What is the number of your flat? 10) What is the approximate population of Russia?

11. Write these numbers in English.

1) 567	11) 3 August
2) 6 1/2	12) 969 64 85 (phone)
3) 3,267	13) - 3° C
4) 8.93	14) (In) 1907
5) 0.34	15) +15° F
6) 7 1/2	16) 3,000,000,000
7) 2,359,000	17) 7,082
8) 11.06	18) 40-0 (tennis game)
9) 58%	19) 37%
10) 9 May	20) 4-1 (football match)

*12. Remember **Simple Past tense**. Choose the markers*

referring to this tense.

Yesterday, now, never, 2 days ago, sometimes, for, today, 1 year before, at the present moment, the day before yesterday

13. Translate into English paying attention to ***Simple Past Tense.***

1). Он достал результаты тестов и положил их на стол. 2). Этот студент каждый день учил домашнее задание наизусть. 3). Во время каникул я провел уникальный эксперимент. 4). Он открыл автоклав, положил туда пробирку и включил вытяжку. 5). Так как большинство химических экспериментов в 19 веке проводилось без необходимого оборудования, все результаты были неточные. 6). В школе мы начали курс биологии, затем изучили химию. 7). Я люблю читать фундаментальные исследования. В прошлом году я прочел труд Д. Ивановского о вирусе табачной мозаики. 8). Я случайно уронила чашку Петри. 9). Естественнонаучное образование стало популярным в начале 21 века.

14. Think of ***Simple Past and Past Progressive****. Choose the correct underlined answer.*

1) I studied/was studying chemistry at university.
2) He studied/was studying the effects of radiation when he suddenly died.
3) When I woke up this morning it rained/was raining.
4) It rained/was raining every single day of the holidays.
5) It was 8.00 in the morning. A lot of

people stood/were standing at the bus stop, waiting to go to work.

6) A big oak tree stood/was standing in the middle of the garden.

7) I thought/was thinking his impact on science was extremely great.

8) All the evening yesterday I thought/was thinking about my lab work.

9) A: What did you do/were you doing before you took this job?

B: Nothing, actually. I only left school a few months ago.

10) A: What did you do/were you doing in my bedroom just now?

B: The light was on, so I just went in to turn it off.

15. Find Russian equivalents for the following words. Use them in the sentences of your own.

Primary school, secondary school, high school, university, undergraduate studies, liberal arts/arts/liberals (humanities), sciences, major/to major, minor, undergrad(uate) students/undergrads.

16. Translate word-combinations and sentences referring to education. Pay attention to the difference in translation.

School: a school for gifted children, to be kept after school, comprehensive school, correspondence school, divinity school, private school.

Education: broad education, compulsory education, health education, in-service education.

College: residential college, electoral college, College of Physicians.

Teach: 1). I'm teaching English to Italian students. 2). My father taught me to swim. 3). Next time he comes home late lock him out, that'll teach him a lesson!

Pass: 1). I pass the sport center on the way to work. 2). I passed my English exam yesterday. 3). Several years had passed before she realized the truth. 4). Parliament passed a series of important measures in 1994.

17. Read and translate the text.

The Kazan Institute of Biochemistry and Biophysics

The Kazan Institute of Biology was established in 1945 and in the beginning it consisted of 5 institutes. In 1998 it was renamed as the Kazan Institute of Biochemistry and Biophysics of the Kazan Scientific Center of the Russian Academy of Sciences.

The first principle of the Institute was an outstanding morphologist-evolutionist Nikolai Livanov. He was the principle of the Institute from 1945 to 1949.

A new era in the life of the Institute began when Professor Igor Tarcevsky was made the principle of the Institute in 1974. Young researchers-biologists, physicists, chemists came to work at the Institute. The researches in the

field of physical-chemical biology began to develop.

Now the principle of the institute is Aleksandr Grechkin. The main areas of researches of the Kazan Institute of Biochemistry and Biophysics of Kazan Scientific Center of the Russian Academy of Sciences are:

- Signaling systems of plant cells and their role in adaptation and immunity
- Mechanisms of plant cell growth and differentiation
- Mechanisms of molecular dynamics and intermolecular interactions in protein functioning
- Intracellular interactions. Molecular mechanisms of neuromediation and chemoreception
- Mechanisms of transport processes in animal and plant cells

The institute is located in the center of Kazan on the Lobachevsky Street, 2/31.

18. Choose the correct answer of the phrases according to this text.

a) The Kazan Institute was established in:

1. 1945 **2. 1987** **3. 2000**

b) The first director was:

1.Aleksandr Grechkin **2. Nikolai Livanov** **3. Igor Tarchevsky**

c) How many lines of investigation does the Kazan Institute have now?

1. 8 **2. 3** **3. 5**

d) The investigations in the field of physical-chemical biology began to develop from:

1.Aleksandr **2. Nikolai** **3. Igor**

Grechkin Livanov Tarchevsky

e) The Kazan Institute of Biology consisted of:

1. 9 institutes 2. 3 institutes 3. 5 institutes.

19. Make your own presentation about the biotechnological research center, institute or university you are interested in. Describe its location, infrastructure, aims and fields of research. Explain why you are interested specifically in this institute.

20. Learn about how to write a business letter.

Basic structure of a business letter

A sample letter is shown on the next page with the highlighted key elements. Listed below are further notes on the key features.

Address: The name of the postal town should be in capital letters and the Post Code on the last line. Traditionally your own address goes at the top right corner and the recipient's address underneath and at the left.

Date: It is best to write the date in full (02 June 2004) simply because using numbers varies from country to country, e.g. in the USA the month comes first.

Reference: This is not always included. If you are replying, use the reference from the original letter (if there is one) and put it after: "Your Ref". If the reference is from your own business then use "Our Ref".

Greeting & Signing off : If possible get the name of the person within the organization that you are writing to. "Dear Mr Shawcross" … ends with "Yours sincerely", other

greetings and closing that go with them are listed below.

Most formal: Dear Sir/Madam, Yours faithfully, Dear Mr/Ms Jones, Yours sincerely.

***Least formal*:** Dear Emile, Yours truly *or* Regards.

Subject or attention line: This should be in capitals or underlined.

Main body of a letter: If you are replying then at the beginning refer to the original letter. Otherwise be as precise as possible. Conclude the letter by highlighting what it is that you want from the person or company. Be specific, for example: "Please send me a price list for your computers".

Study the sample of a business letter on the next page and find all elements described above.

21. Write your letter to the Kazan Institute of Biochemistry and Biophysics. Ask about the entering exams, their requirements and dates.

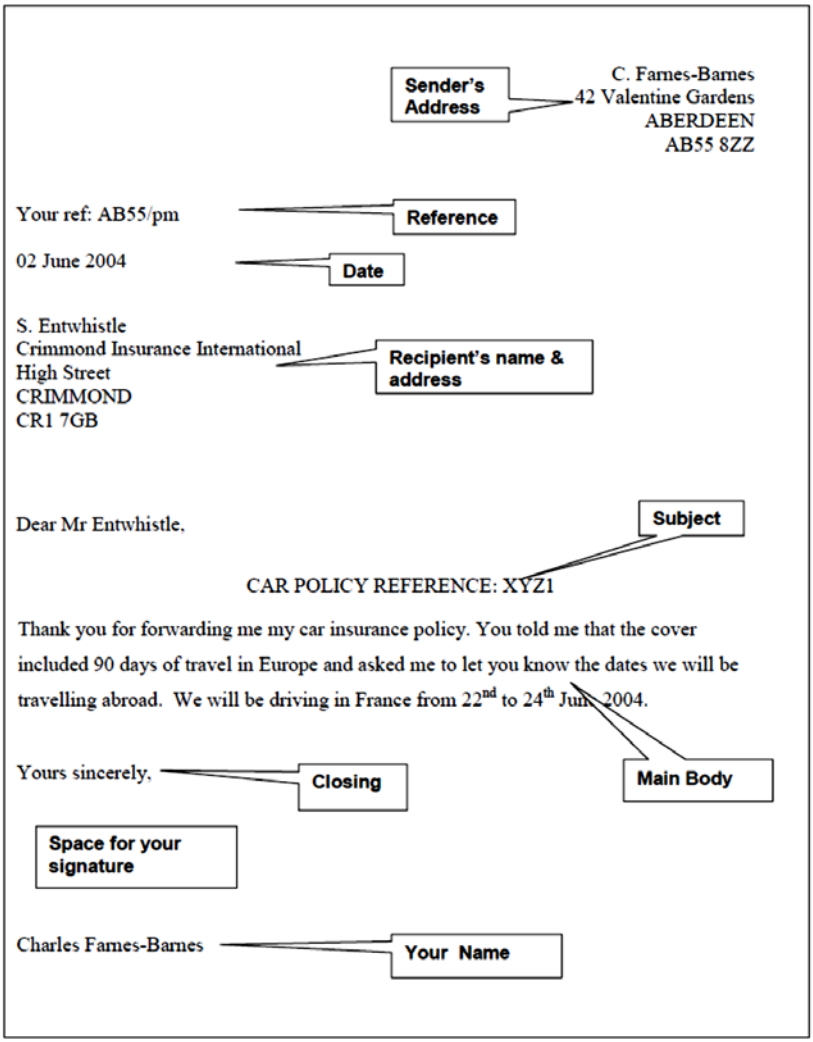
22. Write an essay (a report) or give oral discussion on one of the topics:

1) Some universities require all students to wear uniforms. Other Universities (especially Russian) permit students to decide what to wear. Which of these two school policies do you think is better?

2) If you could make one important change in you University, what change would you make?

3) All systems of education have their pluses and minuses. Compare some of them.

4) Think about modern methods and techniques of education. Is there any progress since ancient times?


Sender's Address
C. Farnes-Barnes
42 Valentine Gardens
ABERDEEN
AB55 8ZZ
Your ref: AB55/pm
Reference
02 June 2004
Date
S. Entwhistle
Crimmond Insurance International
High Street
CRIMMOND
CR1 7GB
Recipient's name & address
Dear Mr Entwhistle,
Subject
CAR POLICY REFERENCE: XYZ1
Thank you for forwarding me my car insurance policy. You told me that the cover included 90 days of travel in Europe and asked me to let you know the dates we will be travelling abroad. We will be driving in France from 22nd to 24th June 2004.
Main Body
Yours sincerely,
Closing
Space for your signature
Charles Farnes-Barnes
Your Name

Unit 3

A place to live

List the things you really like in your own city/town/village. Why do you like the place where you live?

Did your town grow naturally or was specifically planned by architects?

Do you think towns in other countries are different or the same?

1. Read and translate the text.

How to plan a town?

By George Mikes

Britain, far from being a 'decadent democracy', is a Spartan country. This is mainly due to the British way of building towns, which dispenses with the reasonable comfort enjoyed by all other weak and effeminate peoples of the world.

On the Continent doctors, lawyers, booksellers – just to mention a few examples – are sprinkled all over the city, so you can call on a good or at least expensive doctor in any district. In England the idea is that it is the address that makes the man. Doctors in London are crowded in Harley Street, solicitors in Lincoln's Inn Field, second-hand bookshops in Charring Cross Road, newspapers offices in Fleet Street, tailors in Saville Road, car-merchants in Great Portland Street, theatres around Piccadilly Circus, cinemas in Leicester Square, etc.

Now I would like to give you a little practical advice on how to build an English town.

You must understand that an English town is a vast conspiracy to mislead foreigners. You have to use century-old little practices and tricks.

1. First of all, never build a street straight. The English love privacy and do not want to see one end of the street from the other end. Make sudden curves in the streets and build them S-shaped too; the letters L, T, V, W and O are also becoming increasingly popular.

2. Never build the houses of the same street in a straight line. The British have always been a freedom-loving race and the ‘freedom to build a muddle’ is one of their most ancient civic rights.

3. Usually the peoples from the continent put even numbers on one side, odd number on the other, and you always know that small numbers start from the north to west. In England you have this system too; but you may start numbering your houses at one end, go up to a certain number on the same side, then continue on the other side, going back in the opposite direction.

You may leave out some numbers if you are superstitious; and you may continue numbering in a side street; you may also give the same number to two or three houses.

But this is far from the end. Many people refuse to have numbers altogether, and they choose names. It is very pleasant, for instance, to find a street with three hundred and fifty totally similar bungalows and look for ‘The Bungalow’. Or to arrive in a street where all the houses have a charming view of a hill and try to find ‘Hill View’. Or search for

‘Seven Oaks’ and find a house with three apple-trees.

4. Give a different name to the street whenever it bends; but if the curve is so sharp, that it really makes two different streets, you may keep the same name. On the other hand, if, owing to neglect, a street has been built in a straight line it must be called by many different names (High Holborn, New Oxford Street, Oxford Street, Noting Hill Gate and so on).

5. As some cute foreigners would be able to learn their way about even under such circumstances, some further precautions are necessary. Call streets by various names: street, road, place, mews, crescent, avenue, rise, lane, way, grove, park, gardens, alley, arch, path, walk, broadway, promenade, gate, terrace, vale, view, hill, etc. (The English have almost sixty synonyms for ‘street’!).

6. Street names should be painted clearly and distinctly on large boards. Then hide these boards carefully. Place them too high or too low, in shadow and darkness, upside down and inside out, or, even better, lock them up in a safe in your bank, otherwise they may give people some indication about names of the streets.

P.S. I have been told that my above-described theory is all wrong and is only due to my General European conceit, because the English do not care for the opinion of foreigners. In every other country people just built streets and towns following their own common sense. England is the only country of the world where there is a Ministry of Town and Country Planning. That is the real reason for the muddle.

Vocabulary

bungalow (n)	crowd (v)
circumstances (n)	curve (n)

direction (n)
distinctly (adv)
district (n)
due to
even number
foreigner (n)
hide (v)
hill (n)
indication (n)
mislead (v)
muddle (n)
number (v)
odd number
opposite (adj)
precaution (n)
refuse (v)
sprinkle (v)
straight (adv)
vast (adj)
view (n)

2. Find in the text and study how many synonyms for the word 'street' English language has. Find all Russian synonyms for the word 'улица' and choose English equivalents to them.

3. Give English equivalent to the following phrases.

Страна, далекая от «упадочной демократии», слабые и изнеженные нации, вызвать доктора, небольшой практический совет, вводить в заблуждение иностранцев, вековая практика, англичане обожают уединение, в форме буквы S, свободолюбивая раса, гражданское право, противоположное направление, можно выпустить несколько номеров, люди отказываются нумеровать дома вообще, чарующий вид на холм, оставить то же название, дальнейшие предосторожности, запереть в сейф, англичан не волнует мнение иностранцев, причина путаницы.

4. Translate the following sentences paying attention to the words ***in italics.***

1) Вам необходимо пронумеровать страницы, чтобы избежать путаницы.

2) Джон ушел в неизвестном направлении.

3) Кто спрятал мои очки?

4) Мы отказались переехать из квартиры в бунгало.

5) Указатель ввел туриста в заблуждение, но он руководствовался здравым смыслом и спросил направление у прохожих.

6) Только благодаря счастливым обстоятельствам мы купили одноэтажный домик у моря.

7) Если водитель видит крутой поворот, он должен выполнить ряд предосторожностей: снизить скорость и быть особенно внимательным.

8) Если вы пройдете прямо и поднимитесь на холм, вашему взору предстанет замечательный вид.

5. Think about the questions and give your detailed answers.

1) What is the style of the text? Is it humorous or scientific? Find the evidence in the text.

2) Why does G. Mikes call Britain ‘the Spartan country’?

3) What is the difference between Continental doctors, lawyers, booksellers etc. and people of the same profession in Britain? What is their main principle in England?

4) The author recommends building a street straight, doesn't he? Why?

5) How do the peoples from the continent place the numbers of houses on the street? Do English people do the same?

6) What does G. Mikes recommend you to do with the street name sign?

7) And, at last, how is it recommended to show the board with the name of the street?

8) According to the author's opinion, what fact proves his theory about British towns?

6. According to the story by George Mikes what can you say about towns in Britain? Retell this story and add your own information about town planning in Russia.

7. Look at the various types of houses below and match each house with its correct description.

1) terraced houses BrE/ row houses AmE

2) cottage

3) bungalow

4) semi-detached house BrE/ duplex AmE

5) detached house

6) council house

7) block of flats BrE/ apartment building AmE

8) ranch house

a) a house which is joined to another on one side only.

b) a house in a row of houses which are joined altogether.

c) a house built in one level, usually with a roof that does not slope much.

d) a house which stands alone and is not joined to any other.

e) a small house which is often on one level.

f) house which is rented from a local authority.

g) a small house in the country, usually with a garden.

h) a large building divided into separate parts.

Semi-detached house

Think over these types of houses. Which type do you think would be:

- *the most expensive?*

- *the least expensive?*

8. Work in groups. Plan your ideal town. Begin with the geographical position, climate, age of your town; include the structure of government, population, industry, art and so on. Also you can draw a plan of your ideal town. And don`t forget that your town must have everything a biologist needs.

9. Remember ***Simple tenses used with Future meaning.*** *Open the brackets and write the correct form of the verb meaning Future.*

1) There's no point in running now. We _____ (miss) the bus anyway.
2) Yes, I'll come out this evening. I _____(not/work).
3) You needn't be in a hurry. The match _____ (start) at 4.15 pm.
4) I _____ (go) to the market this afternoon. Do you want anything?
5) Are you OK, Donna? You look like you _____ (faint).
6) You realize that the boss ____ (not/like) this, don't you?
7) I _____ (cook) dinner this evening - as usual.
8) She _____ (look) for a new flat next year.
9) Don't worry. The shops ____ (not close) until eight o'clock tonight.

10. Find the difference between ***Future Simple tense*** *and* ***Future Progressive*** *tense. Translate the sentences paying attention to the forms of the verbs.*

1) Завтра я поработаю в лаборатории. 2) Завтра в пять часов я буду читать фундаментальные исследования о протеине. 3) Когда ты придешь, я буду печатать текст. 4) Мы узнаем результаты через неделю. 5) Я буду помнить этот день всю свою жизнь. 6) Завтра утром будет ярко светить солнце. 7) Он приедет снова в следующем году. 8) Она будет убирать квартиру, когда они придут.

11. Play a game to form Future tense questions.

There is a box in the center of the room. Students make paper planes, ask questions in future tense (for example, *will I be a pilot?).*Then they fly these paper planes. If they hit a box, the answer is YES.

12. Read and translate this text.

The houses of the future

Forecasting the future has been one of humankind's favorite pastimes. We're usually pretty bad at it, but in more recent times, the art of predicting the future has almost become a kind of mathematics—very disciplined and scientific.

In our nearest future we are all expecting some remarkable changes to our homes and our personal spaces. As human populations grow, our cities and homes will have to adapt; interior living spaces will change as a cloud changes, easily reconfigured and

rearranged to suit our personal tastes, or accommodate different purposes.

A drone-flying house

The houses will have walls and floors made of a malleable "skin," and embedded with tiny sensors so that the shape and size of living spaces can quickly change, or even be divided into smaller rooms. Virtual decorations will alter with changing tastes and moods; and the entire interior surface of the home will be implanted with LED technology—television screens and computer displays will form and unform in any room, as needed. Even our furniture will be adaptable, molding to custom fit our bodies, responding to changes in posture, or disappearing altogether when not needed.

It will be the ultimate evolution of the "Internet of Things." Misplaced something? Can't find your keys?

No problem. Just use an online search function to find it. Hate the color of that accent wall? Delete it. Need more storage space? Watch new shelves appear, as if by magic.

And the amenities are fantastic. Every home will come standard with a 3D printer; they'll be able to churn out just about anything you could wish, using downloadable patterns, probably including even complex electronic devices. They may even print out your meals, designed and programmed by the world's master chefs.

This is just the start. Imagine homes which building material is salted with dormant limestone-producing bacteria, which awaken upon contact with moisture and repair any cracks or structural damage.

One hundred years in the future, our houses will be semi-living, artificial organisms—closed systems with a metabolism, sensory apparatus, immune response, and an approximation to a nervous system.

We'll be living in homes that are practically alive.

13. What kind of gadgets will the houses have? What will you add to this prediction? Think over the laboratory of the future. What equipment will it have and what would you like to research in it?

14. Translate the text from Russian into English.

Город без машин

Построить город, в котором можно будет обходиться без автомобилей – непростая задача.

Решить ее взялось правительство Китая, одобрив амбициозный проект населенного пункта под названием Great City. «Великий город» представляет собой проект с нуля. Он строится в сельской местности невдалеке от Чэнду. Город будет рассчитан на 80 тысяч жителей, и любые передвижения по нему можно будет совершать пешком или на велосипеде без каких-либо сложностей. Быстро добираться в любую точку города поможет его уникальная проектировка – жилой центр будет расположен в самом центре Great City, а дороги, офисные и административные здания – вокруг него. Таким образом, чтобы добраться пешком от центра до внешнего кольца из парков, необходимо будет потратить не более 10 минут. Согласно проекту, китайский город будущего будет потреблять на 58% меньше воды и на 48% меньше электроэнергии. При этом количество отходов в нем будет ниже на 89%, чем в городах схожего размера.

15. Choose the topic and discuss it orally or in a written form.

1) What is the difference between British and Russian towns? Which towns do you prefer and why?
2) The problems of big cities and how to overcome them.
3) What kind of homes do the following people tend to choose: single people; young couples; old people? Why?
4) When people are looking for a house what are

the most important things they need to consider? What kind of house would you choose for yourself?

5) How will our future home look like? Underline both positive and negative sides of it.

Unit 4

Our nutrition

You are a student now. What is your typical food?

And what is your favorite food? How often do you eat it? Do you eat enough?

Do you go to the cafes or restaurants? If yes, how often?

1. Read and translate the text.

You are what you eat

All living things need food to sustain life. Plants can make their own food from soil, water, and sunshine. Animals eat either other animals or plants. Human beings eat all kinds of different foods from animal and plant sources, depending on what is available where they live and sometimes, too, on the restrictions of religious traditions. Food supplies nutrients, the substances needed by the body for life and growth. They are proteins, fats, carbohydrates, vitamins, minerals, and water. A healthy balanced diet must consist of all six. In prehistoric times people ate what they could find by hunting and gathering wild plants. Later they learned to keep animals and grow cereals and vegetables. Settled communities then became established. The plants that were cultivated were the plants that grew naturally in any particular climate.

Nutrition is the process by which plants and animals take in and use food. Food is needed to keep the

body running smoothly. It provides energy for work and play, for breathing, and for the heart's beating. The building material for muscles, bones, and blood comes from food. You cannot have a healthy body without healthy eating and drinking. Not enough of some foods, or too much of others, can lead to illness. Experts on nutrition are called nutritionists. The food and drink you take in are called your *diet*. (This word is sometimes used in another way, to mean eating less food than normal in order to lose weight, as in "going on a diet".) A person's diet is so important because growth and health depend on it. Dieticians are people with knowledge of special diets (dietetics), such as those used for sick people in hospital. But we should never forget that across the world 40 million people die each year from starvation and the diseases it brings. Fifteen million of them are babies and young children. For the millions more who suffer from malnutrition (not enough of the right foods), healthy eating is out of the question. It is hard enough just to stay alive.

The body needs many different nutrients. These are various substances necessary to provide energy and the

materials for growth, body building, and body maintenance. Every day millions of cells in the body die and must be replaced by new ones. Not all foods contain all nutrients. So it is not just the quantity of food eaten that is important, but also the variety. People who have enough food available may still become ill because they are eating too much of one kind of food and not enough of another. To stay healthy, we need to eat a balanced diet. This means a diet containing the right proportions of the main nutrients: carbohydrates, proteins, fats, fiber, minerals, vitamins, and fluids. Many foods are a mixture of these basic nutrients. A balanced diet also contains enough energy (in the form of food) to power the chemical reactions of living.

Some people worry that a vegetarian diet will be short of protein, but this is not the case. Plenty of protein can be obtained from the great variety of nuts, seeds, pulses, cereals, and soy products (such as tofu) which are now widely available, and from eggs and milk products. It was once thought that plant proteins were inferior to animal proteins, being deficient in some amino acids. It is now known that a mixture of plant proteins complement one another. For example, a shortage of an amino acid in one plant food, such as pulses, is counterbalanced by an excess of that amino acid in a different plant food, such as a cereal. Protein combinations such as beans on toast, rice and lentils, bean stew with pot barley, oats and nuts (as in muesli), provide very high quality protein. All other nutrients are present in adequate quantities in the lacto-vegetarian diet. If dairy products are not eaten, a supplement of

vitamin B12 becomes essential. Many vegetarian foods are fortified with this vitamin (yeast extracts, some soy milks, some breakfast cereals, and so on). Vegetarians obtain iron from dried fruit, leafy green vegetables, wholemeal flour, pulses, oats, nuts, and brown rice. They obtain calcium from cheese, nuts, sesame seeds, leafy green vegetables, and soy. Vegetarians have been responsible for the invention of foods such as peanut butter; cornflakes, muesli, and high-protein vegetable foods made to taste like meat.

Vocabulary

amino acids
available (adj)
bone (n)
carbohydrates (n)
cereals (n)
complement (v)
dairy products
diet (n)
disease (n)
dried fruit
fats (n)
fiber (n)
fluids (n)
keep the body running smoothly
maintenance (n)
malnutrition (n)
minerals (n)
nutrients (n)
nutrition (n)
oat (n)
proteins (n)
pulses (n)
responsible (adj)
seeds (n)
shortage (n)
soil (n)
source (n)
soy products
starvation (n)
substance (n)
sustain (v)
vitamins (n)

2. Give Russian equivalents for the following words:

to sustain life, restriction, supply, nutrients, proteins, fats, carbohydrates, vitamins, minerals, consist of, cereals, nutrition, take in, to keep the body running smoothly, muscles, bones, blood, illness, starvation, substance, to provide, body maintenance, replace, fiber, fluids, chemical reaction, inferior, deficient, mixture, complement, counterbalance, excess, supplement, essential.

3. Translate the sentences into English using the words you learned.

1) *Аминокислоты* — органические соединения, в молекуле которых одновременно содержатся карбоксильные и аминные группы.

2) В суточном рационе человека и животных преобладают *углеводы*.

3) Люди выращивают хлебные *зерновые культуры* на всех континентах нашей планеты.

4) *Соя* — один из богатейших белком растительных продуктов питания.

5) *Голодание* — состояние организма, вызванное недостаточным поступлением веществ, необходимых для поддержания гомеостаза.

6) Концентрация *витаминов* в тканях и суточная потребность в них невелики, но при недостаточном поступлении витаминов в организм наступают характерные и опасные патологические изменения.

7) При *недоедании* наблюдается дефицит

энергетической ценности пищи (количества калорий), также человеку может не хватать белков, витаминов, микроэлементов.

8) *Рационы питания* различных культур могут иметь существенные различия и включать или исключать конкретные продукты питания.

9) *Молочные продукты* — продукты питания, изготовленные из молока (обычно коровьего, козьего).

10) Некоторые *питательные вещества* осуществляют множество функций в организме. Например, вода и минеральные вещества регулируют разнообразные функции, но не являются источниками энергии.

4. Are the following statements true or false? Correct the false ones.

1) Human beings eat all kinds of different foods from animal and plant sources.

2) In prehistoric times people ate what they could find in the shop.

3) Nutrition is the process by which plants and animals take in and use food.

4) The building material for muscles, bones, and blood comes from fluid.

5) Experts on nutrition are called dieticians.

6) Every day millions of cells in the body die and must be replaced by new ones.

7) People who have enough food available may still become ill because they are eating too much different kind of food.

8) Plenty of protein can be obtained from meat.

9) If dairy products are not eaten, a supplement of vitamin B12 becomes essential.

10) Vegetarians have been responsible for the invention of foods such as milk, sugar, butter

5. Make questions of different types to cover the content of the whole text. Ask your group mates to answer them.

6. Make a plan with the key words and using your plan retell the text "You are what you eat".

7. Make a special diet for 3 types of people. Work out from the checklist the things you can and can't eat. Take care about all necessary vitamins and elements.

a) **Vegan**. You strongly disagree with people eating meat, fish, eggs, cheese or milk.

b) **Vegetarian**. You do not eat fish or meat but see nothing wrong in eating dairy products.

c) **Gourmet**. You love good food, including meat, fish and dairy products.

8. Divide the following words into two columns: ***countable and uncountable*** *nouns (you must get 25 uncountable nouns).*

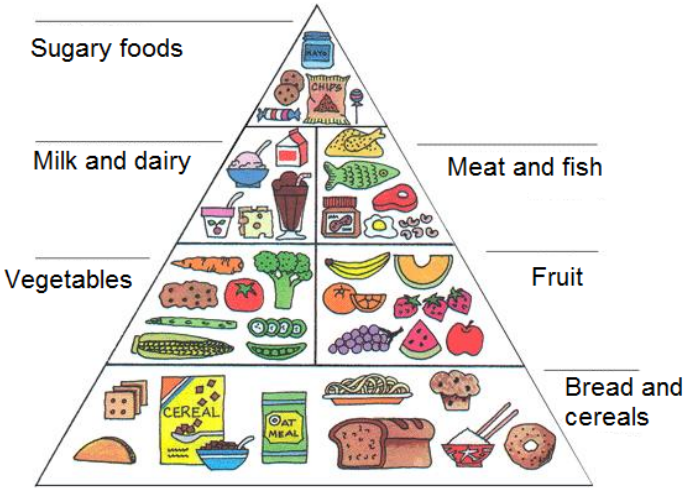
furniture, coffee, leaf, food, computer, list, blood, job, work, language, country, advice, information, money, progress, permit, permission, baggage, luggage, beach, traffic, weather, window, knowledge, air, water, holiday, damage, accommodation, scenery, scene,

pigeon, bread, mountain, kick, news, accident, laugh, flour, laughter

9. Remember the ***Quantifiers.*** *Fill in the spaces with* ***much, many, few, a few, little, a little, a lot of, plenty of, a great number of, a great amount of, a great deal of*** *(you may have several answers).*

1) The living conditions in the district were very poor and there were only __ doctors available. 2) He is a very intelligent man. Do you know that he speaks ___ foreign languages? 3) The situation was becoming worse and worse. ___projects had to be postponed. 4) The show was poor. There was ___applause. 5) There were ___ people at the meeting, but most of them left early so there aren't ___left now. 6) Have you finished the chromatography of that protein solution? There is ___solution in the fridge if you need more. 7) We haven't had___rain this summer. The garden needs watering. 8) The party was a failure. Unfortunately, they invited___interesting people. 9) He didn't know ___facts about genetic engineering. 10) Did the storm make___ damage to the crops?

10. Comment on the food pyramid and using quantifiers make conclusion about what kind of food a person need and in what amount. Share your ideas with your classmates.



11. Translate from Russian into English. Use quantifiers.

1) Он написал довольно много статей на эту тему. 2) Я не могу идти с вами сегодня в кино. У меня так много работы в лаборатории. 3) В нашей библиотеке мало книг по биотехнологии. 4) На конференции было слишком много народа. 5) В пробирке было мало воды, и он налил (pour) ещё немного. 6) Мало кто понимает его. У него слишком много ошибок. 7) В прошлом году было опубликовано мало научных статей по биохимии. 8) Премьер-министр по образованию сказал журналистам лишь несколько слов. 9) Я встречал мало хороших биохимиков в своей жизни. Но Грин, наш сосед, дает нам массу полезных советов, ведь он – доктор биологических наук. 10) Можно мне немного кофе?- Нет, он слишком крепкий для тебя.

12. Remember the use of ***articles with countable and uncountable nouns****. Talk about the difference. Fill in the blank spaces with appropriate articles where necessary.*

1) He lives in___south of___Australia. 2) In his book James Dewey Watson, ___ famous American scientist, described___main process of___human organism. 3) Nothing could break ___ silence on the lection. Suddenly there was___scream, then___second and___third. 4) Can you plan___experiment? 5) He came in one morning when we were doing___dialysis in___laboratory of___ university and introduced himself. 6)___world tour costs ___lot of money. 7) I don't believe you. I think you're telling ___lie. 8) Did you have___lovely time in___ Hague's laboratory? 9) It was ___ early evening but I was feeling sleepy. 10) He made___gross mistake. 11) Don't worry, we'll finish___experiment before___sunset. 12) I'd like to have___ salad with___oil for___breakfast. 13) My favorite subject at___school was___biology.

13. Translate into English paying attention to the articles.

1) Передай мне, пожалуйста, индикаторную бумагу. 2) Вечер был влажный и прохладный. 3)Был холодный и ветреный день. 4) Вино – типичный продукт биотехнологии. 5) Я люблю использовать в опытах агар. 6) Она нашла такую хорошую методику для проведения эксперимента. 7) Погода плохая. Ночь была очень холодная. Я не хочу идти в лабораторию в такую холодную погоду. Но нужно

доделать начатый анализ. 8) Человек открыл инсулин много лет назад. 9) Это неожиданная новость. 10) Он обладает обширными знаниями в области медицины. 11)Пущино – известный научный центр в России. 12) Она прожила трудную жизнь, но сделала много для науки. 13) Нефть используют для производства (production) бензина. 14) Где учёные остановились? — В отеле «Континенталь». Это на Хай-стрит.

14. Read and understand the menu given below.

Imagine you are having lunch at Ridgewood school cafe. Make your selection from the menu. Add up the prices. What is your bill?

15. Which items on the menu do you dislike? Why? What dish would you add? What are the ingredients? What elements and nutrients can your body get from your meal?

16. What is the menu in your university's canteen? Can you translate it in English and explain some typical Russian dishes to the foreigners?

17. Walk around the classroom and find out from other students what they know about pizza. When you have finished, sit with your partner(s) and share and talk about what you found out. Did you learn anything

new?

18. With your partner(s), talk about the food below. Rank them from the healthiest to the least healthy. Which do you eat regularly?

pizza
burgers
fried chicken
noodles
rice dishes
fish and chips

19. Talk about each of these pizza toppings. Would you choose to have them on your pizza?

mashed potato
pineapple
corn
chocolate
French fries
seaweed
curry sauce
apple and raisins

20. With your partner(s), design a new kind of pizza. What are the toppings? How is it different from a normal pizza? Have a class vote on the tastiest-sounding ones.

21. Look at the following article's headline and guess whether these sentences are true or false from your point of view:

1) Scientists have discovered a pizza that helps

you lose weight.

2) The secret to the new pizza is in how to bake the base.

3) Antioxidants in food help fight some life-threatening diseases.

4) Cooking the pizza at a low temperature means it is healthier.

5) Diet experts said the new pizza is healthier than eating fruit.

6) Another expert said people should choose their toppings carefully.

7) The expert said this research teaches us about healthy eating.

8) This study is good news for deep-pan pizza lovers.

22. Read and translate the text. Use the words below to fill in the blank spaces.

disease	leaving	welcome	heat
found	amount	different	weight
author	expert	better	although
likely	sales	outside	choose

Scientists discover healthier pizza

Food scientists and dieticians have _____ (1) new ways to make pizza that is good for you. This is very _____ (2) news for overweight pizza lovers and those who worry about their _____ (3). Researchers in the USA looked at different ways of baking the pizza base. The team

from Maryland University discovered that _____ (4) pizza dough in the oven for a longer time made it healthier to eat. They said that doubling the _____ (5) of baking time increased the levels of antioxidants in the mix by up to 100 percent. Antioxidants help fight cancer and heart _____ (6) and are found in most healthy food. Furthermore, the team experimented with _____ (7) cooking temperatures. Their results showed a higher _____ (8) also made the dough healthier to eat.

This new research may help pizza _____ (9) around the world. However, some diet experts warned that even though this research looks good, it is still _____ (10) to eat fruit and vegetables. In addition, pizza that is baked longer may not be so healthy if people _____ (11) unhealthy toppings. Jacqui Lowdon, a British diet _____ (12), warned that although the pizza base might be good for you, people might be “more _____ (13) to choose extra cheese”. She added: "This isn't teaching people about healthy eating." Nevertheless, the study’s _____ (14), Jeffrey Moore, said his findings were good for people who like deep-pan pizzas. Meanwhile, _____ (15) London’s Pizza Hut

today, pizza fan Jo Lambert said: "This new pizza sounds healthy, _____ (16) not if we have too much or have cola and fries with it."

23. Find synonyms and arrange them in pairs:

Dietician, fat, welcome, enthusiast, overweight, pastry, dough, food, furthermore, writer, diet, nutritionist, choose, conclusions, author, also, findings, good, fan, select.

24. Match the following phrases from the article (sometimes more than one combination is possible):

1. dieticians have found new ways	a). amount of baking time
2. welcome	b). the pizza base
3. different ways of baking	c). people who like deep-pan pizzas
4. doubling the	d). may not be so healthy
5. Antioxidants help fight	e). to make pizza that is good for you
6. This new research may help pizza	f). with it
7. pizza that is baked longer	e). sales around the world
8. people might be more	g). news for overweight pizza lovers
9. his findings were good for	h). cancer and heart disease
10. have cola and fries	j). likely to choose extra cheese

25. As a biologist and a specialist in nutrition express your opinion about such advanced idea of these scientists.

26. Translate the text from Russian into English.

Гусь или индейка?

Обычно декабрь ассоциируется с рождеством, и главное блюдо на рождественском столе – это большая птица, зажаренная целиком. Гусь или, чаще, индейка, фаршированная яблоками. Гусь, начиненный гречневой кашей, капустой, грибами и яблоками с давних времён считается традиционным блюдом русской кухни.

Однако, мясо гуся более жирное, чем индейки, что может грозить несварением желудка. Индейка – другое дело. В 100 граммах её богатого витамином РР мяса всего 60ккал, в нём почти не содержится жиров. Индейка – превосходный источник белка, который улучшает память и стимулирует умственную активность.

27. Choose a project you like and create it.

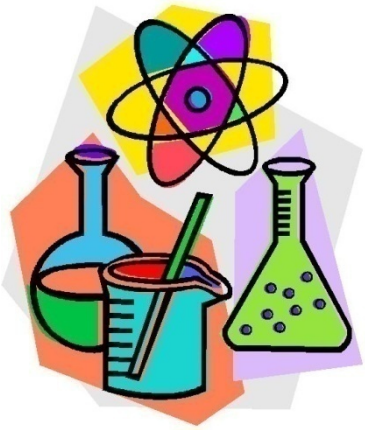
a) **Pizza poster**: Make a poster about the different types of pizza around the world – especially those in Italy. Include pizza made in your country.

b) **Magazine article**: Write a magazine article about the new healthy wonder pizza. Write about how it might change all fast food and that one day, burgers might be healthy food.

c) **Letter**: Write a personal letter to the researchers of the new pizza baking method. Give them three pieces of advice about pizza. Include three questions.

Unit 5

Chemistry and its branches



Do you like chemistry? What was your mark on chemistry at school?

What do you know about the history of chemistry?

Do you know the branches of chemistry? What branches of chemistry do you prefer and why?

1. *Read the text and translate.*

Ancient science

Chemistry is the science of matter and the changes it undergoes. Chemistry is concerned with the composition, behavior (or reaction), structure, and properties of matter, as well as the changes it undergoes during chemical reactions.

Ancient Egyptians pioneered the art of synthetic wet chemistry 4,000 years ago. Wet chemistry is a term used to refer to chemistry generally done in the liquid phase. By 1000 BC civilizations were using more complex forms of chemistry such as using plants for medicine, extracting metal from ores, fermenting wine and making cosmetics.

The genesis of chemistry can be traced to the widely

observed phenomenon of burning that led to metallurgy—the art and science of processing ores to get metals. The greed for gold led to the discovery of the process for its purification.

The earliest pioneers of chemistry, and inventors of the modern scientific method, were medieval Arab and Persian scholars. They introduced precise observation and controlled experimentation into the field and discovered numerous chemical substances. The emergence of chemistry in Europe was primarily due to the recurrent incidence of the plague and blights there during the so called Dark Ages. This gave rise to a need for medicines.

Chemistry indeed came of age when Antoine Lavoisier developed the theory of Conservation of mass in 1783; and the development of the Atomic Theory by John Dalton around 1800.The discovery of the chemical elements has a long history from the days of alchemy and culminating in the discovery of the periodic table of the chemical elements by Dmitri Mendeleev and later discoveries of some synthetic elements.

Modern disciplines within chemistry are traditionally grouped by the type of matter being studied or the kind of study. These include inorganic chemistry - the study of inorganic matter, organic chemistry - the study of carbon based matter, biochemistry - the study of substances found in biological organisms, physical chemistry - the study of chemical processes using physical concepts and analytical chemistry - the analysis of material samples to gain an understanding of their chemical composition and structure.

Many more specialized disciplines have emerged in recent years, e.g. neurochemistry – the chemical study of the nervous system.

Vocabulary

analytical chemistry
behavior (n)
biochemistry (n)
biological organisms
burning (n)
change (n)
chemical process
complex form
composition (n)
emerge (v)
extract (v)
gain (v)
give rise to
group (v)
inorganic chemistry
matter (n)
organic chemistry
physical chemistry
precise observation
property (n)
purification (n)
reaction (n)
sample (n)
substance (n)
undergo (v)
wet chemistry

2. Translate the sentences into English.

1) *Химия* изучает *вещества*, их *свойства, строение* и *изменения,* происходящие в результате *химических реакций*.

2) По признаку изучаемых *веществ* химию делят на *неорганическую и органическую.*

3) Многие химические *вещества* при трансформации могут принимать *сложные формы*.

4) Эти *образцы* мы рассматриваем под микроскопом.

5) Студенты читают статьи, посвященные результатам 3х лет *точных наблюдений* за *поведением* мультипотентных клеток *in vitro*.

6) Химия как наука *возникла* достаточно давно.

7) Соль сильной кислоты и сильного основания *не*

подвергается гидролизу.

8) Как и все *органические вещества* пенополистерол при *горении выделяет* от 1000 до 3000 Мдж/кг.

3. Give Russian equivalent for the following word combinations. Use them in the sentences of your own.

The science of matter, liquid phase, complex forms of chemistry, fermenting wine, the genesis of chemistry, widely observed phenomenon, the greed for gold, the modern scientific method, numerous chemical substances, due to the recurrent incidence, a need for medicines, the theory of Conservation of mass, the days of alchemy, the discovery of the periodic table of the chemical elements, the kind of study, carbon based matter, physical concepts, an understanding of chemical composition and structure.

4. Answer the questions to the text:

1) What phenomena are studied by chemistry?

2) Who pioneered chemistry?

3) What is “wet chemistry”?

4) What forms of chemistry did civilizations use by 1000 BC? Give examples.

5) When was the genesis of chemistry?

6) What did the greed for gold lead to?

7) Who were the earliest inventors of the modern scientific methods of chemistry? What did they do?

8) How did chemistry emerge in Europe?

9) When did chemistry indeed come of age?

10) Who discovered the periodic table of the chemical elements?

11) How are disciplines within chemistry traditionally grouped?

12) What do inorganic chemistry and organic chemistry study?

13) What do biochemistry and physical chemistry study?

5. *Read the sentences and say if they are true to the text or false. Correct the mistakes.*

1) Chemistry is the science about immune system.

2) Chemistry is concerned with the changes matter undergoes during chemical reactions.

3) Ancient Egyptians pioneered the art of dry chemistry 4,000 years ago.

4) Wet chemistry means that chemistry is done in the solid phase.

5) The genesis of chemistry can be traced to the widely observed phenomenon of cooling.

6) Starving led to the discovery of the process of purification.

7) In the XXI century an epidemic of plague gave rise to a need for medicines.

8) Gregor Mendel developed the theory of Conservation of mass.

9) Dmitri Mendeleev discovered the periodic table of the chemical elements.

10) Inorganic chemistry is the study of carbon based matter.

11) Analytical chemistry is the analysis of material samples.

6. *Retell the history of chemistry adding your own facts to it.*

7. Match the book-names of chemistry sub disciplines and their definitions.

1) Analytical chemistry
2) Biochemistry
3) Inorganic chemistry
4) Materials chemistry
5) Neurochemistry
6) Nuclear chemistry
7) Organic chemistry
8) Physical chemistry

a) is the study of the structure, properties, composition, mechanisms, and reactions of organic compounds.

b) is the study of the properties and reactions of inorganic compounds.

c) is the study of the physical and fundamental basis of chemical systems and processes.

d) is the analysis of material samples to gain an understanding of their chemical composition and structure.

e) is the study of the chemicals, chemical reactions and chemical interactions that take place in living organisms.

f) is the study of how subatomic particles come together

g) is the preparation, characterization, and understanding of substances with a useful function.

h) is the study of neurochemicals; including transmitters, peptides, proteins, lipids, sugars, and nucleic acids.

8. *Make the report about any branch of chemistry you like. Find interesting facts about the chosen branch.*

9. Make a lapbook "My favorite branch of chemistry".

A lapbook is a project book or file folder, laid out in a creative manner that fits in your lap.

Take a folder, paper, photographs, pictures, newspaper cuttings, colored pencils, felt pens, watercolor and glue. Try to create a lapbook. Gather the works of your mates and make an exibiton which is called "Our favorite branches of chemistry".

10. Study this table which is a guide to the ***adjective word order.***

OPINION	SIZE, AGE, SHAPE	COLOR	PATTERN	NATIONALITY	MATERIAL	NOUN
a smart	young			French		man
a nice		brown	spotty			dog
a chic		red			silk	scarf

11. Put the following words into the correct order.

1) suede / Italian / new / red / soft / shoes. 2) elderly / tall / Englishman. 3) oval / Venetian / ancient / valuable / glass. 4) shiny / large / expensive / brown / leather / case. 5) square / wooden / old / nice / table. 6) modern / stone / large /

beautiful / cottage. 7) porcelain / tea / blue / thin / old / cup. 8) young / blonde / handsome / tall / man. 9) old / several / English / beautiful / castles. 10) pretty / French / young / a lot of / girls. 11) dark blue / best / silk / my / shirt. 12) young / many / factory / German / workers.

12. Study the table of the ***words of Greek and Latin origin****. Add your examples to it.*

Origin	*Singular ending*	*Plural ending*	*Examples*
Greek	-is	-es	basis, crisis, axis
Greek	-on	-a	criterion
Latin	-us	-i	radius, alumnus
Latin	-a	-ae	formula, vita
Latin	-um	-a	datum, medium
Latin	-ix / -ex	-ices	index, appendix

13. Give the plural form of the following words came from Latin and Greek and give Russian translation to them.

Phenomenon, basis, bacterium, thesis, index, focus, criterion, datum, equilibrium, medium, synthesis, analysis, curriculum, symposium, spectrum, maximum, vacuum, stratum, hypothesis, nucleus.

14. Choose the correct option of the given nouns.

1) This phenomena/phenomenon follows the Newton Law.

2) Data/datum speaks in favor of this theory.

3) This hydrolysis/hydrolyses follows the above scheme.

4) Conclusive proof for the dioxin structure of IV was acquired through an independent synthesis/syntheses.

5) This thesis/theses holds for more general cases of isomerization.

6) The free proton resembles a particle consists of a nuclei/nucleus without planetary electrons.

7) The motion of a valence electron in its orbital is equivalent to the flow of a current in the loci/locus of its motion.

8) The data fit accurately into this formulae/ formula.

9) Give the report when analysis/analyses are complete.

10) These workers examined the spectra/ spectrum of seventy nitrides.

15. Make your own sentences with these words. Pay attention to the plural and singular forms.

16. Remember all simple tenses. Play a game.

Tense Game

This game is good for thinking about Past, Present and Future tense as well as for answering the questions "What did you do yesterday?", "What are you doing this weekend" etc. Divide your class into groups, allocate each group a space on the blackboard and have a piece of chalk prepared for each space. Your teacher mention only 2/3 words (time, gender, activity) - i.e. girl, basketball, yesterday then shout **Go!** One

student from each group is then to run to the board and in their allocated space write the sentence "She played basketball (yesterday)", or whatever sentence is correct for the three words your teacher mentioned. The rules are that each person in the team must have a turn and you are not allowed to write the answers on a piece of paper and then copy it onto the board. Instead you can have helpers telling you what to write.

Have fun!

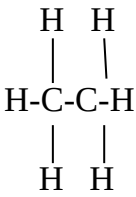
17. Open the brackets using ***Present, Past or Future Simple tense.***

1) I (to go) to the university at eight o'clock every day. 2) I (to go) to the university at ten o'clock yesterday. 3) I (to go) to the university at twelve o'clock tomorrow. 4) I (not to go) to the lab every day. 5) I (not to go) to the lab yesterday. 6) I (not to go) to the lab tomorrow. 7) You (to make) experiments every day? 8) You (to make) experiments yesterday? 9) You (to make) experiments tomorrow? 10) When you (to leave) home for university every day? 11) When you (to leave) home for university yesterday? 12) When you (to leave) home for university tomorrow? 13) My brother (to go) to work every day. He (to leave) home at a quarter past eight. He (to walk) to his office. He (not to take) a bus. Yesterday he (not to go) to work. Yesterday he (to get) up at nine o'clock. 14) What you (to buy) at the shop yesterday? - I (to buy) a note book. 15) Yesterday my father (not to read) scientific articles because he (to be) very busy. He (to read) scientific articles tomorrow.

17. Read chemical formulae and equations. You can find some information on how to read them in the appendix at the end of this text book.

$N_2O_4 \leftrightarrow 2NO_2$

$CuSO_4 \leftrightarrow Cu^{2+} + SO_4^{2-}$ (диссоциация солей)

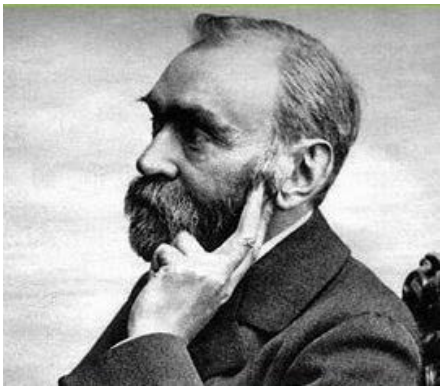


$C + O_2 \rightarrow CO_2$

$ZnCl_2 + H_2SO_4 \rightarrow ZnSO_4 + 2HCl$

$Zn + 2HCl \rightarrow ZnCl_2 + H_2\uparrow$

18. Read the text



A famous chemist

Alfred Nobel was born on October 21st, 1833 in Stockholm, Sweden. History shows that the men in his family were mostly engineers and businessmen and Alfred was quick to follow in their footsteps. In 1842, Alfred and his family

moved to St. Petersburg where his father, Immanuel Nobel, had built a factory for armament a few years earlier. His father manufactured equipment for the Tsar's army where he made good profits. All his life Alfred showed a lot of wit especially in his ability to quickly master foreign languages; he mastered four foreign languages. Alfred also showed great intelligence in natural sciences, especially in chemistry.

In 1850 he went abroad to study chemical engineering. He travelled to Sweden, France, Germany and the United States before returning to Sweden in 1863. There he devoted most of his time to the study of explosives. In particular, he was interested in the safe manufacture of a compound called nitro-glycerin. Nitro-glycerin is a highly unstable explosive. Nobel was interested in it mainly because his brother Emil was killed in an explosion caused by the substance. He added the nitro-glycerin into silica. This made the compound safer and easier to manipulate. In 1867 he perfected the science and called it dynamite. Dynamite was what made Nobel one of the most famous chemists in history. Dynamite was then used all over the world for blasting tunnels, building railways, roads and cutting canals. Nobel went on to create many other kinds of explosives and his work was recognized all over the world. He even received an honorary award from the Royal Swedish Academy of Sciences. They recognized his inventions which were of practical use to mankind. This award drove him to achieve many other science awards.

In the 1870's and 1880's Alfred was able to build some factories all over Europe that were used in the manufacturing of explosives. By the time Nobel died he had registered over 355 patents.

The final version of Nobel's will stated that all of his fortune should be reserved for presenting annual awards in the fields of chemistry, physics, medicine, literature and peace. An economics prize was also added later. Nobel died at his home in San Remo on December 10th, 1896 and was buried in Stockholm, Sweden. The contents of his will became known after his death. With this generosity and selflessness, Alfred Nobel founded the Nobel Prizes which have inspired and motivated many people in different fields.

19. Give Russian equivalents to the following phrases. Make the sentences of your own with them.

Quick to follow in somebody's footsteps, a factory for armament, make good profits, a lot of wit, master foreign languages, go abroad, safe manufacture, a highly unstable explosive, easy to manipulate, perfect the science, an honorary award, recognize the inventions, practical use to mankind, all over Europe, different fields.

20. Make the questions of different types covering the content of the text.

21. Pros and Cons discussion: Think about pluses and minuses of discovering dynamite. Discuss with your group mates and make a conclusion about it.

22. Chemistry is a fascinating science, full of unusual trivia! Here are some fun and interesting chemistry facts for you. Add your own ones.

➢ If you pour a handful of salt into a full glass of water, the water level will actually go down rather than overflowing the glass.

➢ A pure element can take many forms. For example, diamond and graphite both are forms of pure carbon.

➢ Lightning strikes produce O_3, which is ozone, and strengthen the ozone layer of the atmosphere.

➢ The element Californium is often called the most expensive substance in the world (as much as $68 million for one gram.)

➢ Hydrogen is the most abundant element in the universe, while oxygen is the most abundant element in the earth's atmosphere, crust, and oceans (about 49.5%).

➢ Helium balloons float because helium is lighter than air.

➢ Most of the human body is made up of water, H_2O, with cells consisting of 65-90% water by weight. Therefore, it isn't surprising that most of a human body's mass is oxygen. Carbon, the basic unit for organic molecules, comes in second. 99% of the mass of the human body is made up of just six elements: oxygen, carbon, hydrogen, nitrogen, calcium, and phosphorus.

➢ Gallium is a metal which melts on palm of the hand, due to its low melting point (29.76 °C).

➢ Astatine is the rarest element on Earth (approx 28g in the Earth's entire crust.)

➢ A rubber tire is actually one single giant molecule.

23. Translate the text into English.

История химии

Основы химии возникли ещё со времён появления человека разумного. Поскольку человек всегда так или иначе имел дело с химическими веществами, то его первые эксперименты с огнём, приготовлением пищи можно назвать основой практической химии. Постепенно практические знания накапливались, и в самом начале развития цивилизации люди умели готовить некоторые краски, яды и лекарства. Вначале человек использовал биологические процессы, такие, как брожение, но с освоением огня начал использовать процессы горения, сплавления. Использовались окислительно-восстановительные реакции, не протекающие в живой природе — например, восстановление металлов из их соединений.

24. Make a report or presentation about the famous chemist you know. Find out about their discoveries and their importance for humankind. Tell it to your group and vote for the most interesting report/ presentation.

25. Describe any chemical experiment you have recently carried out in details.

Unit 6

Biology

How long have you been studying biology? Do you like biology and why?

What branches of biology do you know? Which one is your favorite?

1. Read the first paragraph of the text and try to answer the questions given.

2. Read the whole text about biology and translate.

The Science of Life

How can there be seedless grapes, and how do they reproduce? Why is carbon monoxide extremely poisonous? Why can`t you tickle yourself? What causes the smell after rain? How do vitamins work? What`s all this fuss about stem cells? What`s make us yawn? Why are frogs growing extra legs out of their legs? Which came first, the chicken or the egg?

Biology is the study of living things and their vital processes. Because biology covers such a broad area, it has been traditional to separate the study of plants (botany) from that of animals (zoology), and the study of structure of organisms (morphology) from that of function (physiology). Despite their apparent differences, all the subdivisions are

interrelated by basic principles, so current practice investigates those biological phenomena that all living things have in common. The advancement of knowledge and technology has resulted in further categorizations that include: cell biology, population biology, ecology, genetics, biochemistry, molecular biology, microbiology, physical anthropology, etc.

The foundations of modern biology include four components: cell theory that life is made of fundamental units called cells; evolution, that life is not deliberately designed by rather evolves incrementally through random mutations and natural selection; gene theory, that tiny molecular sequences of DNA dictate the entire structure of an organism and are passed from parents to offspring; and homeostasis, that each organism’s body includes a complex suite of processes designed to preserve its biochemistry from the entropic effects of the external environment.

It is not known when the study of biology originated, but it can be safely assumed that early humanoids had some experimental knowledge of the animals and plants around them. One's very survival relied on the recognition of poisonous plants and on the basic understanding of the habits of predators. Many of the earliest records of biology come from the bas-reliefs left behind by the Assyrians and Babylonians. There is growing evidence from China and India as early as 2500 BC that there were general practices of therapeutic healing, silkworm use to produce silk, biological control of crops, and agricultural cultivation.

With the arrival of Greek civilization, the study of biology shifted dramatically to a belief that every event has a cause and that a particular cause produces a particular effect.

These philosophers of science assumed the existence of a natural law governing the universe. Although they established the science of biology, their greatest contribution to science was the idea of rational thought.

The basic picture in biology has stayed roughly the same since DNA was first imaged using x-ray crystallography in the 1950s, although there are constant refinements to the details, and life is so complex that it could be centuries or even millennia before we begin to understand it in its entirety. But it should be made clear that we are moving towards complete understanding: life, while complex, consists of a finite amount of complexity that only appreciably increases on relatively long timescales of hundreds of thousands or millions of years. Evolution, while creative, operates slowly.

In recent years, much excitement in biology has centered on the sequencing of genomes and their comparison, called genomics, and the creation of life with custom-written DNA programming, called synthetic biology. These fields are sure to continue grabbing the headlines in the near future.

Vocabulary

botany (n)	contribution (n)
cause (n)	dictate (v)
cell theory	establish (v)
complex (adj)	evolution (n)
complex suite	evolve (v)
consist of (v)	finite amount
constant (adj)	foundation (n)

fundamental unit	recognition (n)
gene theory	refinement (n)
homeostasis (n)	rely on (v)
in common	separate(v)
morphology (n)	shift (v)
natural selection	subdivision (n)
offspring (n)	survival (n)
operate (v)	vital processes
physiology (n)	x-ray crystallography
preserve (v)	zoology (n)

3. Give the Russian equivalents:

A broad area, apparent differences, biological phenomena, the foundations of modern biology, random mutations, tiny molecular sequences of DNA, a complex suite of processes, early humanoids, poisonous plants, the habits of predators, growing evidence, therapeutic healing, every event has a cause, a natural law, greatest contribution, rational thought, constant refinements to the details, complete understanding, finite amount of complexity, sequencing of genomes, custom-written DNA programming.

4. Translate these sentences using your vocabulary.

1) Мы смотрели передачу о том, как чистить и *разделять* на сегменты цитрусовые.

2) Наше тело – это *сложный набор* органических молекул.

3) Этот уникальный диетический продукт укрепляет иммунитет и способствует нормализации *жизненно важных процессов* в организме.

4) Способом *выживания* первобытного человека стало чувство его породнения с природной стихией.

5) На лекции мы узнали, что последовательность ДНК *определяет* структуру всего организма.

6) Ученые нашли биологическую *причину* того, что женщины находят спокойных, собранных мужчин более привлекательными.

7) Постановка и *постоянное уточнение* целей деятельности вызывают, поддерживают и переключают внимание.

8) *Рентгеновская кристаллография* использует рентгеновские лучи для выявления молекулярной структуры кристалла.

9) Михаил Васильевич Ломоносов внес *огромный вклад* в развитие науки в России.

5. Answer the following questions based on the ideas from the text.

1) What is biology?
2) How is biology traditionally separated?
3) How are the subdivisions of biology interrelated?
4) What components do the foundations of modern biology include?
5) When did the study of biology originate?
6) Who were the first people having biological knowledge?
7) Where did the first records about biology come from?
8) What practiced in China in 2500 BC?
9) What did Greek civilization bring to biological knowledge?

10) When did the picture in biology become stable?

11) When will we probably understand the biological entity?

12) What is the most developing modern area of biology?

6. Which of these statements are true and which are false? Correct any statements that you think are false.

1) Biology is the study of living things and their vital processes.

2) All the subdivisions of biology are interrelated by chemical structures of organisms.

3) The foundations of modern biology include five components.

4) Cell theory says that life is not designed by mutations and natural selection

5) Gene theory says that our genetic structure is passed from parents to offspring.

6) We definitely know when the study of biology originated

7) The earliest records of biology come only from China.

8) With the arrival of Greek civilization people started to believe in the idea of rational thought.

9) The basic picture in biology has stayed stable since x-ray crystallography was used in Russian hospitals.

10) Evolution operates fast.

11) Synthetic biology deals with new agricultural products.

7. Make a plan of this text. Add key words to your plan if necessary. Retell this text using your plan.

8. Write all your associations with the words:

1) Botany
2) Zoology
3) Morphology
4) Physiology

9. *Use colored pencils to draw out an educative poster. Write down about any biological process that you know, for example, the process of biosynthesis. Try to make it simple and educative.*

10. The Preposition. Fill in the blank spaces with the ***prepositions of time*** **in, on, at** *where necessary.*

1) I usually finish work early___Friday. I don't work ___the weekend. 2) Let's meet ___five ___Sunday, July 14. 3) I am busy___the moment. Come ___ten minutes' time, please. 4) There was a boat race in Southampton ___Easter Day. A lot of people usually come there ___Easter to see the race. 5) Can you imagine what the world will be ___.the year 2100? 6) When will you have your holiday, ___winter or___summer? — I'll have it late ___August. 7) We started the off ___midnight and reached the place of destination ___twelve hours ___noon. 8)I was in France at the conference ___ 2016. ___that time I was working as a lab assistant. 9) ___the age of sixteen he started his first research. 10)___ the day of defending his dissertation he got up ___dawn. 11) You must come and start doing electrophoresis ___next Thursday. Are you free ___Thursday? 12) I received a lot of presents ___ my birthday. 13) Jean-Baptist Lamark

lived and worked __ the Middle Ages. 14)___every day he got up early ___the morning and went to bed late ___night. 15)___ the 19th century many people died of cholera and smallpox.

11. Fill in the blank spaces with ***prepositions of place*** **at, in, on.**

1) Excuse me, can you tell me where the conference hall is? — Turn___ the right___ the roundabout. It's ___ the corner of the square. 2) Their research institute is ___ the south coast of France. 3) He lives ___ the tenth floor ___ the centre of the city. 4) There was a black spot ___ the back of the refrigerator. 5) There were no vacant chairs to sit ___ so he sat ___ the armchair __the corner. 6) Do you know that Englishmen drive ___ the left? 7) Look, how many stars there are ___the sky! 8) I'm going to the conference ___the Central Conference Hall tomorrow. 9) The delegation was met ___ the airport. 10) I don't want to sit ___the back row, let's sit ___the front. 11) At first he didn't notice his name ___the list, but then he found it ___ the bottom of the page. 12) __ my way home I saw Helen. She was standing____ the bus stop. 13) She did not want anybody to see her, so she sat ___the back of the car. 14) Our colleagues were ___ the restaurant yesterday. There were a lot of delicious things ___ the menu.

12. Fill in the blank spaces with the appropriate prepositions where necessary.

1). I'd love to be able to visit every country _____ the world. 2) "Is there a bank near here?" "Yes, there's one _____ the end of this road." 3) Tim is away at the moment.

He's _____ holiday. 4) You've got a dirty mark ____ your cheek. Have a look _____ the mirror. 5) We went _____ a party _____ Linda's house on Saturday. 6) Bombay is _____ the west coast of India. 7) Look at the leaves _____ the tree. They're a beautiful color. 8) "Have you ever been _____ Tokyo?" "No, I've never been _____ Japan." 9) Mozart died _____ Vienna in 1791 _____ the age of 35. 10) "Are you _____ this photograph?" "Yes, that's me, _____ the left." 11) We went _____ the theatre last night. We had seats _____ the front row. 12) "Where's the light switch?" "It's _____ the wall _____ the door." 13) What time did you arrive _____ the party? 14) I couldn't decide what to eat. There was nothing ___ the menu that I liked. 15) We live _____ a tower block. Our flat is _____ the fifteenth floor.

13. Fill in the blank spaces in the sentences with the prepositions given below.

above	***across***	***against***	***among***	***around***	***behind***
towards					
below	***beneath***	***beside***	***onto***	***over***	***out of***

1) The cowboy leant _____ the bar in the saloon, drinking a beer. 2) She took her purse _____ her bag and paid the taxi driver. 3) Our cat just loves to curl up _____ the fire and go to sleep. 4) The view from the top of the mountain was breathtaking. We could see the town and the river _____ us, and people who looked like ants. 5) Last night the temperature fell to three degrees _____ zero. 6) The burglar heard a noise coming from upstairs, so he hid _____ the curtains. 7) The dog jumped _____ my lap, and settled

down for a good sleep. 8) The hunter froze as the tiger started running ____ him. He had nowhere to hide. 9) She has beautiful works of art all ____ her house, even in the kitchen and the bedroom. 10) These days, politicians like to walk ____ the crowds, shaking hands and saying one or two words. 11) He climbed _____ the wall and ran _____ the field. 12) The plane took off and was soon flying _____ the clouds.

14. Do you know what cytology is and what it studies? Is the kernel of a cell a subject of cytology? Why is knowledge of cytology necessary? Where can this knowledge be applied?

15. Read this text and translate it.

Cytology as a science

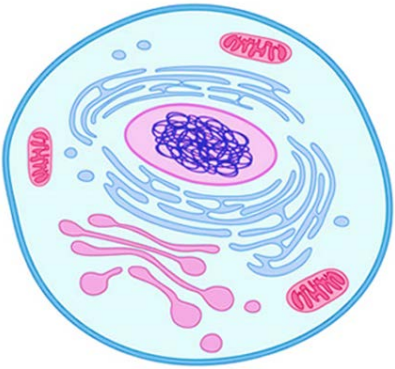
Cytology means "the study of cells". Cytology is that branch of life science, which deals with the study of cells in terms of structure, function and chemistry. Based on usage it can refer to cell biology.

Cell biology is a scientific discipline that studies cells – their physiological properties, their structure, the organelles they contain, interactions with their environment, their life cycle, division and death. This is done both on a microscopic and molecular level. Cell biology research encompasses both the great diversity of single-celled organisms like bacteria, as well as the many specialized cells in multicellular organisms such as humans.

The cell is the functional basic unit of life discovered by Robert Hooke. It is the smallest unit of life that is classified

as a living thing, and is often called the building block of life. Some organisms, such as most bacteria, are unicellular (consist of a single cell). Other organisms, such as humans, are multicellular. Humans have about 100 trillion cells; a typical cell size is 10 micrometers and a typical cell mass is 1 nanogram. The largest known cells are unfertilized ostrich egg cells, which weigh 3.3 pounds – it's about 1.5 kg.

The cell theory, first developed in 1839 by Matthias Jakob Schleiden and Theodor Schwann, states that all organisms are composed of one or more cells, that all cells come from preexisting cells, that vital functions of an organism occur within cells, and that all cells contain the hereditary information necessary for regulating cell functions and for transmitting information to the next generation of cells.



The word *cell* comes from the Latin *cellula* meaning a small room. The descriptive term for the smallest living biological structure was coined by Robert Hooke in a book he published in 1665 when he compared the cork cells he saw through his microscope to the small rooms monks lived in.

The cell consists of different proteins. Each type of protein is usually sent to a particular part of the cell. Most proteins are synthesized by ribosomes in the rough endoplasmic reticulum. This process is known as protein biosynthesis.

Appreciating the similarities and differences between

cell types is particularly important to cell and molecular biology as well as to biomedical fields such as cancer research and developmental biology. Therefore, research in cell biology is closely related to genetics, biochemistry, molecular biology, immunology and developmental biology.

16. Give the English equivalents to the following phrases.

Многоклеточные организмы, молекулярная биология, деление, клетка, наследственная информация, органеллы, яйцеклетка, исследование рака, раздел (науки), иметь дело с, бактерии, молекулярный уровень, цитология.

17. Translate the sentences into English using the words you learned.

1) *Биология клетки* — раздел биологии, изучающий живые клетки, их органоиды, их строение, функционирование, процессы клеточного размножения, старения и смерти.

2) Важнейшим дополнением *клеточной теории* явилось утверждение знаменитого немецкого натуралиста, что каждая клетка образуется в результате *деления* другой клетки.

3) *Биология развития* — раздел современной биологии, изучающий процессы индивидуального развития организма.

4) Благодаря достижениям в области *иммунологии* создаются новые технологии для диагностики и лечения заболеваний, производства и применения лекарственных

препаратов.

5) Надо рассматривать данный процесс на *молекулярном уровне*.

6) *Жизненный цикл* — закономерная смена всех поколений, характерных для данного вида живых организмов.

18. Answer the question according to the text.

1) What is cytology?
2) Is cytology and biology of a cell the same science?
3) What does cell biology study?
4) Who discovered the cell?
5) Is a cell the smallest unit of life?
6) Give examples of unicellular and multicellular organisms.
7) What are the largest known cells to man?
8) Who developed the cell theory?
9) Where does the word *cell* come from?
10) What is inside a cell?
11) What is biosynthesis?
12) What sciences are closely related to the cell biology?

19. Write down the words given in the correct order to make a sentence:

1) that studies cells / is / scientific / a / cell biology / discipline
2) basic / the / cell/ life / functional / of /is/ the / unit
3) of / called / life / the cell / often / the building block / is
4) and / 10 / mass / a / typical / size / nanogram / is / a

cell / is / 1 / cell / μm / typical

5) for / that / the next / functions / and / regulating / all / the / information / contain / for / cell / hereditary / to / necessary / generation / cells / cells / information / of / transmitting

6) provide / differences / these / unifying / similarities / and / theme fundamental / a

20. Find and write down the sentences expressing the main ideas of each paragraph of the text.

21. Draw a structure of an animal cell, name its parts and explain their functions.

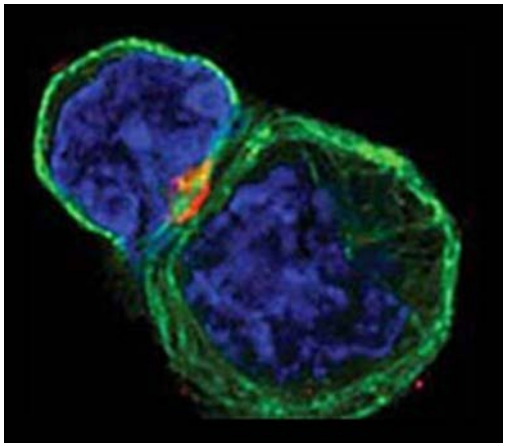
22. Read and translate the text.

Виды Т-лимфоцитов

Эта группа клеток состоит из нескольких видов, также называемых субпопуляциями лимфоцитов. Долгое время выделяли только три их вида: это Т-лимфоциты хелперы, киллеры и супрессоры. Однако в последние годы, начиная с 1990-2000-х, представление об их существующих разновидностях претерпело очередную трансформацию. Помимо известных клеток, специалисты определили существование других типов: Т-клеток памяти и клеток-амплификаторов.

Наиболее изучены на сегодняшний день Т-хелперы. Задача хелперов на первый взгляд тоже довольно очевидна. Это клетки-помощники («help» значит «помогать»). А кому или чему они помогают? Они

индуцируют, стимулируют иммунный ответ: под их влиянием усиливают свою работу цитотоксические лимфоциты. Также хелперы передают информацию о присутствии в теле чужеродного белка В-лимфоцитам, которые выделяют против них защитные антитела. Наконец, хелперы оказывают стимулирующее действие на работу фагоцитов, главным образом моноцитов.



T-helper

23. Make an educative poster about different types of cells: red blood cells, muscle cells, fat cells, nerve cells, brain cells, skin cells etc. Say where these cells can be found in the body of a human/animal/plant. Describe their shape and functions.

24. Creative project "A Fantastic Cell"

Think of an imaginary cell with new functions non-existing in real life. Describe your cell. What does it look like? What properties does it have? What organisms could it probably exist in?

23. Write an argumentative essay on the following topics:

- Me as a future famous biologist.
- New branches of biology and their impact in the future life.
- The future of cytology.
- How cytology can help the mankind?

Unit 7

Embryology

What does embryology study?

How is an embryo developing? Do you know any of the stages?

What is a zygote?

1. Read this text and translate it.

What is Embryology*?*

Embryology is the study of the formation of life, part of the studies with which developmental biology is concerned. Developmental biology examines how all forms of life begin, and how they develop into fully formed and functioning organisms.

Embryology looks at the very beginning of life from the one-celled organism, egg or sperm. Embryologists examine fertilization and track the development of the embryo until it bears a resemblance to its progenitors. For example, in human conception, embryologists would be interested in both sperm and egg, and the meeting of the two, and then would follow egg implantation and the growth of an embryo until it reaches the fetal stage. So in humans, the study of an embryo would

last until about the second month of a pregnancy.

Aristotle was one of the first to champion the theory of epigenesis, the concept that life forms develop into complex organisms from fertilization. This was not a popular concept and was largely discarded in favor of the theory of preformation, which suggested that each human sperm was already a person in waiting. In the mid-18th century, Caspar Fredriech Wolff again set forth the concept of epigenesis. Through his study of chick embryos, Wolff realized that the body of an organism has stages of development. Through vivisection, he observed the complexity of specific organs and contended that their development could not simply have occurred spontaneously, but must have developed over time.

Later scientists followed his studies, and with the development and subsequent improvements of the microscope, Wolff's theories were found to be quite accurate. Wolff is credited as the "Father of Embryology," even though he did not first conceptualize epigenesis. Today, the theories of embryology are easier to prove because of the accuracy with which we can examine DNA codes within a cell.

There are several practical applications of embryology in the modern world. Embryology has given doctors the tools to create fertilized eggs for in vitro implantation. Embryology can also identify risk factors for serious genetic conditions within the fertilized egg and select the most viable eggs for implantation. The study of embryology has led directly to the concept of cloning, either for a whole organism or parts of an organism.

Vocabulary

accuracy (n)	application (n)
accurate (adj)	bear (v)

complexity (n)
concern (v)
developmental biology
doubt (v)
egg (n)
embryo (n)
embryologist (n)
examine (v)
fertilization (n)
fetal stage
field (n)
formation (n)
growth (n)
implantation (n)
in vitro
microscope (n)
observe (v)
occur (v)
pregnancy (n)
progenitor (n)
reach (v)
resemblance (n)
theory of epigenesist
theory of preformation
tool (n)
track (v)
vivisection (n)

2. Translate the sentences into English.

1) *Эмбриология* — это наука, изучающая развитие зародыша.

2) *Зародышем* называют любой организм на ранних стадиях развития до рождения или вылупления, или до момента прорастания.

4) Различают *эмбриологию животных и человека и эмбриологию растений*.

5) Многие ученые не *сомневаются* в истинности данного предположения.

6) Во время исследования ученые обнаружили коммитированную (commited) клетку-*предшественника*.

7) На *стадии зародыша* можно оценить качество эмбриона по степени фрагментации.

8) *Оплодотворение* – это сложный биологический процесс.

3. Use your English-English dictionary and write down the definitions of the following words:

Cloning, fetal stage, fertilization, pregnancy, in vitro.

4. Read the text carefully again and say which statements are true to the fact or false.

1) Cytology is the study of the formation of life.

2) Embryology looks at the very beginning of life from the multi-celled organism, egg or sperm.

3) Embryologists examine fertilization.

4) So in humans, the study of an embryo would last until about the first month of a pregnancy.

5) Caspar Fredriech Wolff was one of the first to champion the theory of epigenesis.

6) Wolff realized that the body of an organism has stages of development.

7) Aristotle is credited as the "Father of Embryology," even though he did not first conceptualize epigenesis.

8) Today, the theories of embryology are easier to prove because of the accuracy with which we can examine RNA codes within a cell.

9) Embryology has given doctors the tools to create fertilized eggs for in vivo implantation.

5. Talk about the facts you found out in the text. What facts surprised you and what facts did you not know about before? Can you add any other information about the embryology?

6. Make a plan of this text. Add key words in it if

necessary. Retell this text using your plan and adding the information you found about embryology.

7. Choose one of the following topics you like for the presentations and make it with your partner. Talk about the history, development and new achievements in these fields.

- Ontogeny
- Embryogenesis
- Prenatal development
- Epigenesis
- Developmental biology
- Morphogenesis

*8. Remember the **pronouns** and choose the correct form of them in the brackets.*

1) What color is the litmus paper? It is so far that I can't see (it's/its/it) color. 2) They rarely drive to (their/them/ theirs) lab. They live near (it's/it/its). 3) Look at (me/ mine/my) new set of test tubes. Do you like (it/them/its)? 4) These books are (her/hers). Give (them/their/theirs) to (hers/ her). 5) Do you like (you/your/yours) new equipment? — Oh, (it's/it/its) has never let me down yet. 6)(Theirs/Their/ Them) work is much more difficult than (you/yours/ your) or (me/mine/my). 7) Why are (you/your/yours) sitting here? It is not (you/your/yours) desk, it is (me/ mine/my). 8) This colorimeter of (her/hers/she) is always out of order. — But so is (you/your/yours)! 9) She has not read a line of (you/your/yours), how can she criticize (you/your/yours) books? 10) The clock has stopped. Something may be wrong with (it's/it/its) spring.

9. Translate the sentences into English.

1) Кто сделал это исследование? — Это я. 2) Мой тестовый образец справа, а их — слева. 3)Их результаты эксперимента вернее наших. 4) Как зовут вашего кролика? — Его зовут Борис. 5) В этом районе построена новая лаборатория. Ее площадь более трех тысяч квадратных метров. 6) Это ваша чаша Петри, а это его, но где же моя? 7) Она взяла мои пробирки вместо своих. 8) Самый лучший план — ваш. 9) Чью работу будут проверять — Джона или Кэт? 10) Ее центрифуга небольшая, но мотор у нее мощный.

10. Open the brackets and give ***the comparative or superlative degree*** *of the following adjectives and adverbs. Add articles if necessary.*

1) That is (incredible) story I have ever heard. 2) It is not always (bright) students who do well in tests. 3) I think, cotton shirts are much (comfortable) to wear! 4) Which is (deep), Lake Michigan or Lake Superior? 5) She is far (self-confident) than she used to be. 6) (tall) man among the guests is a basketball player. 7) I like both of them, but I think Kate is (easy) to talk to. 8) As for this experiment, *coomassie blue* is (useful) than the other dyes. 9) She has a lot of fundamental works to read, but (sad) thing of all is that she does not know what to start from. 10) Has your research failed? You look a lot (sad) than you did last time I saw you.

11. Translate the sentences into English using the correct degree of comparison.

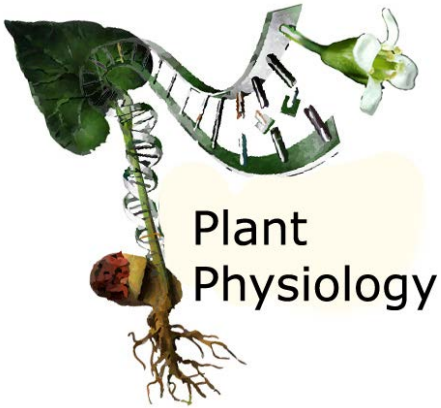
1) Возьмите эту коробку реагентов, она *легче* вашей. 2) На лекции по зоологии преподаватель приводит *самые*

интересные примеры. 3) Что находится *дальше:* холодильник или центрифуга? 4) Я думаю, что ваш ассистент *старше* меня, но *моложе* вас. 5) Это *самый талантливый* студент в нашей группе. 6) Хотя у нас было *самое старое* оборудование, наш опыт удался. 7) Где *ближайшее* почтовое отделение? 8) Последний образец был *самый удачный*.

12. What areas of physiology do you know about? Do you study physiology? Read the text.

Physiology of plants and animals

Although you may place organisms without difficulty in either the plant or the animal kingdom, it is essential to know the basic differences between these two groups. That`s why we can distinguish physiology of plants and animals.



Plant physiology. It is a subdiscipline of botany concerned with the functioning, or physiology of plants. Closely related fields include plant morphology (structure of plants), plant ecology (interactions with the environment), photochemistry (biochemistry of plants), cell biology, and molecular biology. The scope of plant physiology as a discipline may be divided into several major areas of research.

First, the study of photochemistry (plant chemistry) is included within the domain of plant physiology. To function and survive, plants produce a wide array of chemical compounds not found in other organisms. Photosynthesis requires a large array of pigments, enzymes, and other compounds to function. Secondly, plant physiology includes the study of biological and chemical processes of individual plant cells. Plant cells have a number of features that distinguish them from cells of animals, and which lead to major differences in the way that plant life behaves and responds differently from animal life. Thirdly, plant physiology deals with interactions between cells, tissues, and organs within a plant. Different cells and tissues are physically and chemically specialized to perform different functions. Fourthly, plant physiologists study the ways that plants control or regulate internal functions. Like animals, plants produce chemicals called hormones which are produced in one part of the plant to signal cells in another part of the plant to respond. Finally, plant physiology includes the study of how plants respond to conditions and variation in the environment, a field known as environmental physiology.

Animal physiology. It is the study of animal functions. Animal physiology is subdivided into the four main parts, such as general physiology, special physiology, comparative physiology and age physiology.

General physiology deals with the analysis of such universal and important processes as blood circulation, metabolism, respiration etc. Special physiology applies general physiological principles in order to investigate characteristics of a particular animal species. Comparative

physiology concentrates on similarities and differences of physiological functions of various living organisms. The problem of how physiological functions change with animal age is of special interest to age physiology.

The main approach in animal physiology is to study the evolutionary origins of the physiological mechanisms in order to understand the significance of these mechanisms for modern animals. Modern physiology which is based on chemical, physical and anatomical methods investigates biological organization of the animal body at different levels, that is, cells, tissues, organs.

One of the parts of special physiology is devoted to farm animal physiology. The aim of this science is not only to study physiological functions of the farm animal body, but to control them in order to increase the production of eggs, offspring, milk, meat and wool.

Other major branches of scientific study that have grown out of physiology research include biochemistry, biophysics, biomechanics, pharmacology, cytology as well as genetics which are known as the biological bases for rational animal husbandry.

13. Translate the sentences into English using the words from the text.

1) *Физиология растений* — это наука о функциональной активности растительных организмов.

2) Существует много задач физиологии растений: изучение закономерностей жизнедеятельности растений, разработка теоретических основ получения максимальных урожаев сельскохозяйственных культур, разработка установок для осуществления процессов

фотосинтеза в искусственных условиях.

3) *Фотосинтез* — процесс образования органических веществ из углекислого газа и воды на свету при участии фотосинтетических пигментов.

4) Физиология растений – биологическая наука, изучающая общие закономерности жизнедеятельности *растительных организмов*.

5) Сегодня *молекулярная биология* располагает обширным арсеналом методов, позволяющих решать самые передовые и самые сложные задачи, стоящие перед учёными.

6) Вся история человеческого общества - это история его борьбы за выживание, история *взаимодействия с окружающей средой*.

7) Каждая *клетка растений* данного вида содержит в своем ядре одинаковый набор (или наборы) хромосом из строго определенного числа разных.

8) *Циркуляция крови* может быть восстановлена, например, с помощью следующих пищевых добавок: Витамин С улучшает тонус сосудов и в сочетании с витамином Е улучшает эндотелиальную функцию.

9) *Возрастная физиология* – раздел физиологии человека и животных, изучающий закономерности становления и развития физиологических функций организма на протяжении онтогенеза; от оплодотворения яйцеклетки до конца жизни.

14. Fill in the blank spaces in these sentences:

1) Plant physiology is a subdiscipline of _____concerned with the functioning, or physiology of plants.

2) To function and survive, plants produce a wide array of _____not found in other organisms.

3) Plant cells have a _____which restricts the shape of plant cells and thereby limits the flexibility and mobility of plants.

4) Different cells and tissues are physically and chemically specialized to perform different _____.

5) Like animals, plants produce chemicals called _____which are produced in one part of the plant to signal cells in another part of the plant to respond.

6) Animal physiology is subdivided into the four main parts, such as_____, _____, _____ and _____.

7) The main approach in animal physiology is to study the _____of the physiological mechanisms in order to understand the significance of these mechanisms for modern animals.

15. Match English words and phrases to their Russian equivalents. Make your own sentences with them.

living organism	кровообращение
age physiology	лечить больных животных
blood circulation	дыхание
respiration	проблема, вызванная недостаточным питанием
to cure sick animals	живой организм
nutritional disorder	сравнительная физиология
comparative physiology	возрастная физиология

16. Answer the following questions based on the information in the text.

1) What does physiology study?

2) What are the main parts of physiology?

3) What stimulated the development of animal physiology?

4) What problems are of special interest to animal physiologists?

5) What are the main principles of physiological study?

6) How can the knowledge of physiological reactions help to maintain healthy farm animals?

7) What sciences are based on physiology research?

8) Describe the four main parts of animal physiology.

9) What is the main approach in animal physiology?

17. Arrange the following statements in their logical order. Explain and expand them.

- Plant physiology deals with interactions between cells, tissues, and organs within a plant.

- Plant physiology includes the study of biological and chemical processes of individual plant cells.

- Plant physiology is a subdiscipline of botany concerned with the functioning, or physiology of plants.

- Other major branches of scientific study that have grown out of physiology research.

- Plant physiology includes the study of how plants respond to conditions and variation in the environment.

- Animal physiology is the study of animal functions.

- The field of plant physiology includes the study of all the internal activities of plants

- The study of phytochemistry (plant chemistry) is included within the domain of plant physiology.

- The main approach in animal physiology is to study the evolutionary origins of the physiological mechanisms.

18. Make a plan of this text. Add key words into it if necessary. Retell this text using your plan.

19. Translate the text into English using the words you have learned.

Оплодотворение у высших видов - это слияние яйцеклетки и сперматозоида. Оно происходит в яйцеводе. Наилучшие условия для этого обычно в пределах 12 ч. после выхода яйца из яичника. Многочисленные сперматозоиды приближаются к яйцеклетке, окружают ее, вступают в контакт с ее оболочкой.

Однако в яйцеклетку проникает только один сперматозоид, после чего вокруг яйцеклетки образуется оболочка оплодотворения, препятствующая проникновению других сперматозоидов. В результате слияния двух ядер с галоидными наборами хромосом образуется диплоидная зигота (клетка, которая является одноклеточным организмом нового дочернего поколения).

20. Make a report on the topic below:

"What problems are animal and plant physiologists investigating now?"

20. When applying for certain positions in Russia, as well as jobs internationally, you may be required to submit ***a curriculum vitae (CV)*** *rather than* ***a resume****. A CV includes more information than the typical resume, including details*

of your education and academic achievements, research, publications, awards, affiliations, and more. Study how to write a CV and the CV example given below. Make conclusions about the forms of CV.

What to Include in a Curriculum Vitae

Your CV should be clear, concise, complete, and up-to-date with current employment and educational information. The elements that you include will depend on what you are applying for, so be sure to incorporate the most relevant information to support your candidacy in your CV.

- **Personal details and contact information.** Most CVs start with contact information and personal data but take care to avoid superfluous details, such as religious affiliation, children's names and so on.

- **Education and qualifications**. Take care to include the names of institutions and dates attended in reverse order; Ph.D., Masters, Bachelors.

- **Work experience/employment history**. Your career history is presented in reverse date order starting with most recent. Achievements and responsibilities are listed for each role.

- **Skills**. Include computer skills, foreign language skills, and any other recent training that is relevant to the role applied for.

What Not to Include

There is no need to include your photo, your salary history, the reason you left your previous position.

How Long Should a CV Be?

A good curriculum vitae should ideally cover no more than two pages and never more than three. Using bullet points rather than full sentences can help minimize word usage.

Curriculum Vitae Example

Allen Yan

phone: (86)1338-1111-420

e-mail: yhnasa@123.com

EDUCATION

Sept. 2016–Present, Shanghai University, BE

Candidate for Bachelor in Mechanical Engineering (ME)

- Major academic course highlights: Company Property Management, Marketing, Technology Communication, Information Management System, Modern Fabrication System

- May 2017, Certified Public Accounting Training (CPA)

EMPLOYMENT HISTORY

Dec. 2017–Present, ITT Investment, China

Application Engineer, Sales & Marketing

- Achieve sales budget goals through application support and new industry market application research.

- Pay visits to end users and DI for seminars and technical presentations with salespersons or distributors while collecting marketing information and competitor information analysis.

July 2016–Sept. 2017, Intel Products Co., Shanghai, China

CPU Assembly Engineer (Internship)

- Analyzed yield ratio trends, documented and solved current problems.

- Participated in and helped oversee the training of marketing, business process modeling, and analysis at Intel University.

- Developed and led a project review with multi-media animation, which was highly appreciated by department manager.

June 2015–July 2016, GF Fund Management Co., LTD.

Campus Intern

- Analyzed investment principles and related financially derived products.

- Formulated the scheme of market popularization and network marketing.

AWARDS

2016–2017, Scholarship for Excellent Students of Shanghai University

2015, Ambassador of Shanghai Tennis Popularization Prize

COMPETENCIES & INTERESTS

English Ability: intermediate competency

German Ability: 600 hours of German lessons at Tong Ji University

Computer Skills:

- National Computer Lever 3rd Certificate (Network Communication)

- Professional Certificate of Assistant Information Officer (AIO).

- Fluent in: C++, VBA, Provision, JMP, AutoCAD, 3Dsmax, Photoshop, Solidworks, Aftereffect

Personal Interests:

Basketball; Speed Skating; Snooker

21. Write your own CV. You can imagine yourself as a well-known scientist or write your CV from your own view.

Unit 8

Biochemistry

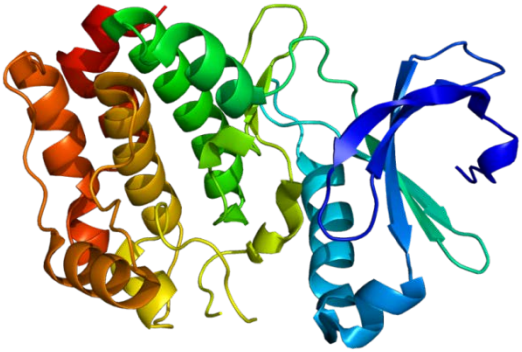
Do you know what biochemistry studies?
What is a biomolecule?
What kind of biomolecules do you know?
What is DNA? What is RNA? What is the difference between them?

1. *Read the text about biochemistry and translate it.*

Biological chemistry

Biochemistry, sometimes called biological chemistry, is the study of chemical processes in living organisms, including, but not limited to, living matter. Biochemistry governs all living organisms and living processes. By controlling information flow through biochemical signaling and the flow of chemical energy through metabolism, biochemical processes give rise to the incredible complexity of life. Much of biochemistry deals with the structures and functions of cellular components such as proteins, carbohydrates, lipids, nucleic acids and other biomolecules although increasingly processes rather than individual molecules are the main focus. Over the last 40 years biochemistry has become so successful at explaining living processes that now almost all areas of the life sciences from botany to medicine are engaged in biochemical research. Today the main focus of pure biochemistry is in understanding how biological molecules give rise to the processes that occur within living cells which in turn relates

greatly to the study and understanding of whole organisms.



Among the vast number of different biomolecules, many are complex and large molecules (called biopolymers), which are composed of similar repeating subunits (called monomers). Each class of polymeric biomolecule has a different set of subunit types. For example, a protein is a polymer whose subunits are selected from a set of 20 or more amino acids. Biochemistry studies the chemical properties of important biological molecules, like proteins, and in particular the chemistry of enzyme-catalyzed reactions.

The biochemistry of cell metabolism and the endocrine system has been extensively described. Other areas of biochemistry include the genetic code (DNA, RNA), protein synthesis, cell membrane transport, and signal transduction.

Researchers in biochemistry use specific techniques native to biochemistry, but increasingly combine these with techniques and ideas from genetics, molecular biology and biophysics. There has never been a hardline between these disciplines in terms of content and technique. Today the terms molecular biology and biochemistry are nearly interchangeable.

Vocabulary

amino acid
biopolymer (n)
cell membrane transport
complex (adj)
complexity (n)
compose (v)
content (n)
endocrine system
engage (v)
enzyme-catalyzed reaction
flow (n)
genetic code
give rise to (v)
govern (v)
in terms of
interchangeable (adj)
lipid (n)
living matter
metabolism (n)
monomer (n)
nucleic acid
occur (v)
protein (n)
subunit (n)
technique (n)
transduction (n)

2. Fill in the blank spaces in these sentences:

1) Biochemistry is the study of _____ in living organisms.

2) Much of biochemistry deals with _____of cellular components such as _____.

3) Over the last _____ years biochemistry has become so successful at explaining living processes.

4) Today the main focus of pure biochemistry is in _____ how biological molecules give rise to the processes that _____within living cells.

5) Each class of polymeric _____ has a different set of subunit types.

6) _____ is a polymer whose subunits are selected from a set of 20 or more amino acids.

7) The biochemistry of cell _____and the

_____system has been extensively described.

8) Researchers in biochemistry use specific _____ native to biochemistry.

9) Today the terms _____and biochemistry are nearly interchangeable.

3. Give the definitions to the given words below and make sentences with them:

a) govern, give rise to, engage, occur;

b) protein, amino acid, carbohydrates, lipid, amino acid, endocrine system.

4. Make 10-15 questions covering the content of the text. Ask your group mates to give detailed answers to your questions.

5. Retell this text based on your questions.

6. Make a report about the role of biochemistry in modern life. Be prepared to report it to your class. You may want to speak about the following topics:

- What is biomolecule and what is the importance of it
- Biochemical techniques and its importance
- Where can biochemistry be applied in modern life
- Interesting facts about biochemistry.

7. Give definitions for the words:

Metabolism – ……..

Protein – ……..

Enzyme-catalyzed reaction – …….
Nucleic acid – ……..
Biopolymer – …….

8. Find the worlds from the vocabulary in the following table.

b	*e*	*r*	*a*	*r*	*y*	*a*	*r*	*t*	*y*	*u*	*d*	*l*
s	*i*	*c*	*f*	*g*	*h*	*j*	*k*	*h*	*l*	*a*	*s*	*i*
b	*i*	*o*	*p*	*o*	*l*	*y*	*m*	*e*	*r*	*g*	*q*	*p*
t	*f*	*v*	*c*	*i*	*w*	*v*	*z*	*d*	*g*	*e*	*s*	*i*
r	*s*	*m*	*n*	*h*	*b*	*v*	*u*	*i*	*r*	*n*	*d*	*d*
a	*p*	*r*	*o*	*t*	*e*	*i*	*n*	*i*	*o*	*g*	*j*	*f*
n	*f*	*l*	*g*	*s*	*c*	*m*	*s*	*m*	*k*	*a*	*n*	*d*
s	*a*	*n*	*l*	*e*	*i*	*o*	*i*	*m*	*i*	*g*	*c*	*b*
d	*m*	*u*	*c*	*i*	*c*	*n*	*w*	*s*	*k*	*e*	*a*	*x*
u	*k*	*r*	*w*	*e*	*a*	*o*	*l*	*i*	*t*	*f*	*d*	*z*
c	*z*	*l*	*s*	*d*	*c*	*m*	*o*	*b*	*l*	*r*	*p*	*a*
t	*q*	*b*	*x*	*c*	*i*	*e*	*t*	*a*	*i*	*p*	*y*	*h*
i	*o*	*n*	*m*	*b*	*d*	*r*	*b*	*c*	*f*	*o*	*h*	*j*

9. Study the additional terms related to biochemistry and explain what they mean.

Chromatography
Coomassie dye
Electrophoresis
Peptides
ELISA
IgG
Enzyme

Isoelectric point
Centrifuge
Pepsin
Polyacrylamide gel
Distillated water

10. Translate the sentences using the words from the vocabulary and the exercise above.

1) Четвертичная структура белка состоит из субъединиц-доменов.

2) ИФА применяется для качественного и количественного определения биомолекул.

3) Ферменты катализируют как прямую, так и обратную реакцию.

4) Передача нервного импульса идет посредством медиаторов.

5) Хромография – метод разделения белков по массе.

6) Краситель кумасси используется для окрашивания полиакриламидного геля.

7) Изоэлектрическая точка означает электронейтральное положение белка.

8) Дистиллированная вода используется для мытья лабораторной посуды, добавления в растворы и многих других целях.

9) Нуклеиновые кислоты несут закодированную информацию.

10) При повышении температуры тела человека до 40° происходит денатурация белка.

11. Remember ***Present Perfect tense.*** *Insert the*

following markers in the correct place in the sentence and translate them into Russian.

ever, never, for, since, already, just, yet

1) He's worked there many years, 1986, I believe.

2) I have loved anything as much as I love biochemistry.

3) We've known Paul two years. Have you met him?

4) I've known this experiment I went to school, but I've carried it out.

5) It’s too much! We have used two hundred pipets and there is still a month before the new supply.

6) Have you thought of learning to fly?

7) I have received my exam result. It came ten minutes ago.

12. Find the difference between ***Present Perfect*** *and* ***Past Simple****. Explain it to your group mates.*

1) Barbara Lively_____ (write) a lot of books. She _____ (write) her first fifteen years ago.

2) _____ you ever _____ (try) GMO food?

3) I _____ never _____ (be) to Japan. When ___ you _____ (go) there?

4) I _____ (live) in London for eight years, and I don't want to move.

5) He _____ (live) in Oxford for two years, and then in 1995 he _____ (move) to London.

6) We _____ (meet) Tim and Maureen three years ago. How long _____ you _____ (know) them?

13. Translate sentences into English.

1)Я только что встретил его. 2)Я видел твоего

ассистента вчера. 3) Я еще не разговаривал с ним. 4) Я уже пообедал. 5) Он жил в Сибири в детстве. 6) Я не видел его с детства. 7) Она встала, умылась, оделась и пошла в лабораторию. 8) Он пришел в 12 вчера вечером. 9) Он позвонил мне. 10) Он уже позвонил мне. 11) Они получили новую квартиру в этом году. 12) Они уже слышали эти новости. 13) Я познакомился со своим руководителем. 14) Вы когда-нибудь были за рубежом? 15) Он окончил школу в прошлом году. 16) Вы уже видели новую статью по микробиологии? 17) Вы уже испытали оборудование? 18) Когда я услышал стук, я подошел к двери и открыл ее. 19) Я уже провёл исследование. 20) Он собирал жуков, когда был ребенком.

14. Remember ***Present Perfect*** *and* ***Present Perfect Progressive****. Choose the correct sentence from each pair.*

1) I've cut my finger! - I've been cutting my finger!

2) Have you heard Shakira's latest record? - Have you been hearing Shakira's latest record?

3) She's tired because she's worked in the lab all day. - She's tired because she's been working in the lab all day.

4) Sorry. I've broken one of your test tubes. - Sorry. I've been breaking one of your test tubes.

5) How long have you had this book? - How long have you been having this book?

6) They have lived here for three years. - They've been living here for three years.

15. Read and translate the text.

Biochemical pathways and processes

Biochemical processes mediate the interaction of cells with their environment and are responsible for most of the information processing inside the cell. Networks of interacting proteins underlie many of these processes. Three major types of biochemical processes are distinguished:

Metabolic pathways are sequences of chemical reactions, each catalyzed by enzymes, where certain product molecules are formed from other small substrates. Metabolites are usually small molecules while enzymes are proteins.

Signal transduction networks are pathways of molecular interactions that provide communication between the cell membrane and intracellular end-points, leading to some change in the cell. Signals are transduced by modification of one protein's activity or location by another protein.

Gene regulation circuits determine whether or not a particular gene is expressed at any particular time. Transcription factors, proteins that promote or repress transcription, either directly or indirectly bind regulatory DNA elements.

Metabolic, transduction and regulatory circuits are interleaved and integrated. For example, gene regulation circuits are fed by external signals transmitted by signal transduction pathways. The high complexity of these systems makes their proper understanding difficult.

16. Make 5 questions referring to the text.

17. Write down hard words and make sentences with them.

18. Name biochemical processes that you know. Choose the one you like and explain it in detail. You can use illustrations if necessary.

19. Translate the text into English

Возникнув как наука о химии жизни в конце XIX века, биохимия отличается от органической химии тем, что исследует только те вещества и химические реакции, которые имеют место в живых организмах, прежде всего в живой клетке. Согласно этому определению, биохимия охватывает также многие области клеточной биологии и включает в себя молекулярную биологию. Молекулярные биологи преимущественно работают с нуклеиновыми кислотами, изучая их структуру и функции, в то время как биохимики сосредоточились на белках, в особенности на ферментах, катализирующих биохимические реакции.

В основе биохимической методологии лежит фракционирование, анализ, изучение структуры и свойств отдельных компонентов живого вещества. Наиболее распространенными методами биохимии являются хроматография, центрифугирование и электрофорез.

С конца XX в. в биохимии всё шире применяются методы молекулярной и клеточной биологии, в особенности искусственная экспрессия и нокаут генов в

модельных клетках и целых организмах.

20. Make a report or an argumentative essay on the following topics:

1) The prospects of biochemistry in Russia.
2) Modification of proteins for various purposes.
3) Enzymes as biocatalyst.
4) What branch of biochemistry is more perspective?
5) Synthesis of proteins as a main process in our body.

21. BIMs or Biologically Important Molecules can be split into four categories: Proteins, Carbohydrates, Lipids, and Nucleic Acids. Each of these groups consists of different subunits and performs different tasks within the human body. What are the functions of each group?

**Write a story about proteins, lipids, nucleic acids and carbohydrates.*

For example:

Once proteins, lipids and carbohydrates met and decided to find out who is the most useful for …

22. Three main biochemical methods are:

- Chromatography
- Centrifugation
- Electrophoresis

With your group mates choose one method and make a detailed presentation about it.

Unit 9

Biophysics

Have you ever studied biophysics? Say in your own words what biophysics is and what it studies?

How essential is biophysics for a progress in biology and biotechnology?

Where can biophysics be applied?

Why is biophysics important nowadays?

1. Read the text and find the answers to the questions mentioned above.

The bridge between biology and physics

Biology studies life in its variety and complexity. It describes how organisms go about getting food, communicating, sensing the environment, and reproducing. On the other hand, physics looks for mathematical laws of nature and makes detailed predictions about the forces that drive idealized systems. Spanning the distance between the complexity of life and the simplicity of physical laws is the challenge of biophysics. Biophysicists study life at every level, from atoms and molecules to cells, organisms, and environments.

Biophysics discovers such questions as how atoms are arranged to work in DNA and proteins. Protein molecules perform the body's chemical reactions. They push and pull in the muscles that move your limbs. Proteins make the parts of your eyes, ears, nose, and skin that sense your environment.

They turn food into energy and light into vision. They are your immunity to illness. Proteins repair what is broken inside of cells, and regulate growth. They fire the electrical signals in your brain. They read the DNA blueprints in your body and copy the DNA for future generations. So, biophysicists discover how proteins work. Understanding these differences in people's respond to proteins opens new possibilities in drug design, diagnosis, and disease control.

Biophysics is a wellspring of innovation for our high-tech economy. The applications of biophysics depend on society's needs. In the 20th century, great progress was made in treating disease. Biophysics helped to create powerful vaccines against infectious diseases. It described and controlled diseases of metabolism, such as diabetes. And biophysics provided both the tools and the understanding for treating the diseases of growth as cancers. Today we are learning more about the biology of health and society is deeply concerned about the health of our planet.

Advanced instruments created by biophysicists provide the life-saving treatment methods of kidney dialysis, radiation

therapy, cardiac defibrillators, and pacemakers. Biophysicists invented instruments for detecting, purifying, imaging, and manipulating chemicals and materials.

Nowadays society is facing physical and biological problems of global proportions. How will we continue to get sufficient energy? How can we feed the world's population? How do we remediate global warming? How do we preserve biological diversity? How do we secure clean and plentiful water? Biophysics provides the insight and technologies for meeting these challenges, based on the principles of physics and the mechanisms of biology.

Biophysics discovers how to modify microorganisms for biofuel (replacing gasoline and diesel fuel) and bioelectricity (replacing petroleum products and coal for producing electricity). Biophysics discovers the biological cycles of heat, light, water, carbon, nitrogen, oxygen, heat, and organisms throughout our planet. Biophysics harnesses microorganisms to clean our water and to produce lifesaving drugs.

Vocabulary

advanced (adj)
arrange (v)
bioelectricity (n)
biofuel (n)
biological diversity
challenge (n)
complexity (n)
detailed predictions
detect (v)
DNA blueprint
face (v)
fire the signals
force (n)
generation (n)
image (v)
law (n)
lifesaving drugs
manipulate (v)

perform (v)
preserve (v)
pull (v)
purify (v)
push (v)
regulate (v)
remediate (v)
repair (v)
respond (v)
secure (v)
simplicity (n)
society's needs
variety (n)

2. Give an explanation to the following terms:

Kidney dialysis, radiation therapy, cardiac defibrillator, pacemaker.

3. Translate the sentences using the words from the vocabulary.

1) Важнейшей задачей любого государства является удовлетворение *потребностей общества*.

2) Лекция «Величие и *простота* законов Ньютона» была прочитана 19 сентября в Большой демонстрационной аудитории.

3) Белки *регулируют* рост клетки.

4) Без *сохранения биологического разнообразия* невозможно устойчивое развитие биосферы.

5) Существуют проекты, направленные на получение *биотоплива* из целлюлозы и различного типа органических отходов.

6) Никотин *посылает* в мозг ложные *сигналы* о сытости.

7) *Передовые* инструменты, созданные биофизиками, были применены для повышения эффективности работы.

8) В последнее время человечество чаще стало *сталкиваться* с экологическими проблемами, приобретающими глобальный характер.

4. Continue the associative chain:

Biophysics – atoms – proteins - …

5. Answer the questions using the information from the text.

1) What does biology study?
2) What does physics study?
3) How does biophysics link biology and physics?
4) What does biophysics discover about proteins?
5) Name the functions of proteins in our body.
6) What progress was made by biophysics to help the society's needs in the 20th century?
7) What instruments or tools did biophysicists create?
8) What problems does modern society face?
9) Why does society need biofuel and bioelectricity?
10) Why does biophysics harness microorganisms?

6. Put the sentences in the order they appear in the text.

1) Biophysics in the source of economical innovations.
2) Modern society faces many environmental problems.
3) Biophysics is the mixture of biology and physics.
4) Proteins' work is being discovered by biophysics.
5) Biofuel, bioelectricity, cleanup of water are the issues of biophysics.
6) Many life-saving tools are created by biophysics.

7. Write a summary of the text in your own words. Expand your summary by adding more information when retelling the text.

8. As innovations come out of physics and biology labs, biophysicists find new areas to explore where they can apply their expertise, create new tool, and learn new things. Biophysicists ask questions, such as:

- How do protein machines work?

Even though they are millions times smaller than everyday machines, molecular machines work on the same principles. They use energy to do the work. The kinesin machine shown here is carrying a load as it moves along the track. Biophysics reveals how each step is powered forward.

- How do the systems of nerve cells communicate?

Biophysicists invented colored protein tags for the chemicals used by cells. Each cell takes on a different color as it uses the tagged chemicals, making it possible to trace its various pathways.

Answer the following questions from biophysicist's point of view.

- How do proteins pack DNA into viruses?
- How do viruses invade cells?
- How do plants harness sunlight to make food?

9. Remember ***Past Perfect tense*** *and* ***Past Perfect Progressive tense****. Choose the correct sentence from each pair.*

1) I knew the facts of the case because I had read / had

been reading the report.

2) My eyes ached because I had read / had been reading for three hours.

3) The assistants were filthy. They had worked / had been working in the laboratory and their experiment went wrong.

4) I was very nervous at the beginning of my speech. I had never spoken / had never been speaking for such big audience before.

5) Donald excelled himself as a chemist. He had carried out / had been carrying a complex chemical reaction.

6) Donald was very cross. He had carried out / had been carrying a complex chemical reaction all morning, and none had offered to help.

10. Decide if the verb tenses in these sentences are used correctly.

1) He had been sitting here for 40 minutes when the telephone rang.

2) I had tried to get his colleague on the phone all day.

3) When Sarah arrived at the university, Paul had been already going home.

4) When we got back our co-worker had gone home.

5) Tom had done his homework for an hour when his friend came to see him.

6) They had hoped to finish the experiment but Ted fell suddenly ill.

7) When we got to our research center last night, we found that somebody had been breaking into the lab.

8) At eight in the morning we had been carrying out

our experiment for six hours.

11. Read and translate the text.

Three branches of biophysics

Medical Biophysics studies physics to describe or affect biological process for the purpose of medical application. Like many areas of study that have emerged in recent times, it relies on broad interdisciplinary knowledge between the so-called traditional fields such as physics (i.e. medical physics, radiation physics or imaging physics) and advanced biology fields such as biochemistry, biophysics, physiology, neuroscience etc.

Some important areas of research in medical biophysics include medical imaging (e.g. MRI*, computed tomography, and PET**), oncology and cancer diagnosis, and vasculature and circulatory system function.

Molecular biophysics is an evolving interdisciplinary area of research that combines concepts in physics, chemistry, engineering, mathematics and biology. It studies biomolecular systems and explain biological function in terms of molecular structure, structural organization, and dynamic behavior at various levels of complexity (from single

molecules to supramolecular structures, viruses and small living systems). The discipline requires specialized equipment and procedures capable of imaging and manipulating minute living structures, as well as novel experimental approaches.

Biophysical chemistry is a relatively new branch of chemistry that covers a broad spectrum of research activities involving biological systems. The most common feature of the research in this subject is to seek explanation of the various phenomena in biological systems in terms of either the molecules that make up the system or the supramolecular structure of these systems.

Biophysical chemists employ various techniques used in physical chemistry to probe the structure of biological systems. These techniques include spectroscopic methods like nuclear magnetic resonance (NMR) and X-ray diffraction. Also biophysical chemists study protein structure and the functional structure of cell membranes. For example, enzyme action can be explained in terms of the shape of a pocket in the protein molecule that matches the shape of the substrate molecule or its modification due to binding of a metal ion. Similarly the structure and function of the bio membranes may be understood through the study of model supramolecular structures as liposomes or phospholipid vesicles of different compositions and sizes.

*MRI – Magnetic Resonance Imaging

**PET – Positron Emission Tomography

12. Circle several unknown words/phrases in the article. In pairs/groups, use your dictionaries to understand the meanings. Write the definitions for 3 of them.

13. Remember how the fragments were used and complete the sentences using the article above.

1) Medical Biophysics studies physics to …

2) Medical Biophysics relies on broad interdisciplinary knowledge between…

3) Some important areas of research in medical biophysics are…

4) Molecular biophysics is a rapidly evolving interdisciplinary area of research that …

5) Biophysical chemistry is a relatively new branch of chemistry that …

6) Biophysical chemists employ various techniques used in physical chemistry to …

7) Biophysical chemists study…

8) Enzyme action can be explained in terms of …

9) Similarly the structure and function of the bio membranes may be understood through …

14. Work with your partner to summarize the article in your own words.

15. Translate the text into English using the words you have learned.

Области применения биофизики.

Биологические объекты, как правило, очень сложны и на протекающие в них процессы влияют многие факторы, которые часто зависят друг от друга. Физика позволяет создать упрощенные модели объекта, которые описываются законами термодинамики, электродинамики и т.д.

В физике имеется множество методов, которые в своей первоначальной форме не могут быть использованы для исследований биологических объектов. Поэтому ещё одной задачей биофизики является приспособление этих методов и методик для решения задач биологии. Сегодня для получения информации в биологических системах применяют различные оптические методы, рентгено-структурный анализ, ЯМР - и ЭПР-спектроскопию, различные электрометрические методы, методы хемилюминесценции, лазерную спектроскопию, метод меченых атомов и др. Это используется, в частности, для медицинской диагностики и терапии.

16. Write an opinion essay on the topic "Prospects and concerns of biophysics".

17. With the group of your classmates make a presentation about the following topics in biophysics:

- Biophysical mechanisms
- Biophysical techniques
- Molecular structure and behavior

Unit 10

In the laboratory

Do you like working in the lab?

What was your first lab experiment?

What is the average time you spend in the laboratory?

Can you give any examples of behavior in the lab instructions?

What lab equipment do you know?

1. *Read and translate the text.*

What Is a Biochemical Laboratory?

A biochemical laboratory is an area in which a biochemist studies the chemical processes within living organisms. Traditional biochemistry examines the chemistry of reactions catalyzed by enzymes, but biochemical research has expanded to cover topics of signal transduction, transport within cells, and molecular interactions.

All biochemical labs have the basic components of science research labs, such a pH meter, a balance for weighing out chemicals, a variety of buffers and other chemicals, and refrigerators and freezers for storing supplies. They also have a special freezer kept at -94° F (-70° C) for

the long-term storage of proteins and tissues. Such facilities have centrifuges and sometimes an ultracentrifuge. An ice machine is generally essential for generating ice to keep enzymes and reagents chilled and stable. Virtually all biochemical labs have gel electrophoresis supplies for examining proteins, along with the equipment for running Western blots.

For biochemistry research, a spectrophotometer is frequently necessary to measure protein concentrations or enzyme reactions. Usually, a UV-V is spectrophotometer suffices, but some labs require a fluorescence spectrophotometer for more specialized applications.

Other biochemical labs can have more specialized equipment, like particular chromatography equipment. This type of technology separates molecules. For instance, the lab may have a high performance liquid chromatography (HPLC) system to separate peptides or conduct enzyme assays on small molecules. Another type of instrument one might have is a gas chromatography (GC) system. This unit separates volatile compounds.

A protein biochemical laboratory can have a fast protein liquid chromatography (FPLC) system to purify large amounts of protein to study. It would have a variety of gel matrices, with differing chemical properties to use with the FPLC to separate the proteins. There would be glass columns of varying proportions to hold the matrices. Protein biochemistry laboratories generally have a cold room, so that proteins can be isolated and purified at cold temperatures to keep them stable.

The techniques of genetic engineering involve manipulating with DNA or RNA in microorganisms, so

sterile conditions are required. Such a lab would have a sterile hood that can be wiped down with ethanol and has a germicidal lamp. It blows sterile air across its work surface.

The lab would have agar, which forms a gel that the microorganisms grow on. There would be a variety of other of supplies for media, and antibiotics for growing up the genetically-altered microorganisms. It would have incubators and shakers that could be warmed up to grow bacteria or yeast. Also necessary is access to an autoclave, to sterilize the supplies for growth and RNA manipulation, and to destroy the recombinant material after the experiments are finished.

A medical biochemistry laboratory would have many of the items of other biochemical labs, depending on its specialty. The difference would be in the source of the material for study.

Vocabulary

amount (n)
assay (n)
balance (n)
buffer (n)
catalyze (v)
chilled (adj)
component (n)
destroy (v)
enzyme (n)
equipment (n)
examine (v)
expand (v)
freezer (n)
generate (v)
genetically-altered microorganism
incubator (n)
interaction (n)
item (n)
measure (v)
pH meter (n)
purify (v)
reagent (v)
refrigerator (n)
require (v)
separate (v)
shaker (n)
stable (adj)

sterile (adj)
storage (n)
surface (n)
tissue (n)
variety (n)
volatile (adj)
warm up (v)

2. Translate the sentences using the vocabulary from the text paying attention to the words in italics.

1) Мы уже получили достаточное *количество реагентов*.
2) Достань *охлажденную* сыворотку из *холодильника*!
3) Эти *компоненты требуют стерильных* условий.
4) *Буфер* это вещество, поддерживающее постоянное значение pH при добавлении кислот или щелочей в небольших концентрациях.
5) *Хранение* органических *тканей требует* наличие *морозильной камеры*.
6) Данный *генетически измененный микроорганизм* не так легко *разрушить*!
7) Прежде чем *нагреть* вещество, его необходимо *очистить*.
8) Уважаемые студенты, поместите образцы в *шейкер*, а после *исследуйте* их.

3. Match the English terms to their Russian equivalents.

signal transduction	буфер
transport within cells	холодильник
molecular interactions	ультрацентрифуга

buffer	центрифуга
refrigerator	сигнальная трансдукция
freezer	электрофоретический гель
centrifuge	внутриклеточный транспорт
ultracentrifuge	вестерн-блоттинг
gel electrophoresis supplies	спектрофотометр
western blots	молекулярное взаимодействие
spectrophotometer	морозильная камера
UV-Vis spectrophotometer suffices	агар
fluorescence spectrophotometer	газовая хроматография
high-pressure liquid chromatography (HPLC) system	жидкостная хроматография низкого давления
gas chromatography (GC) system	межклеточный материал
volatile compounds	бактерицидная лампа
fast-pressure liquid chromatography (FPLC) system	инкубатор

matrices	автоклав
sterile hood	аналитический спектрофотометр с видимой и ультрафиолетовой областью
germicidal lamp	шейкер
agar	стерильный вытяжной шкаф
incubator	жидкостная хроматография высокого давления
shaker	летучее соединение
autoclave	флуоресцентный спектрофотометр

What terms are new for you? What terms have you already known?

Name the devices shown above. What are they used for?

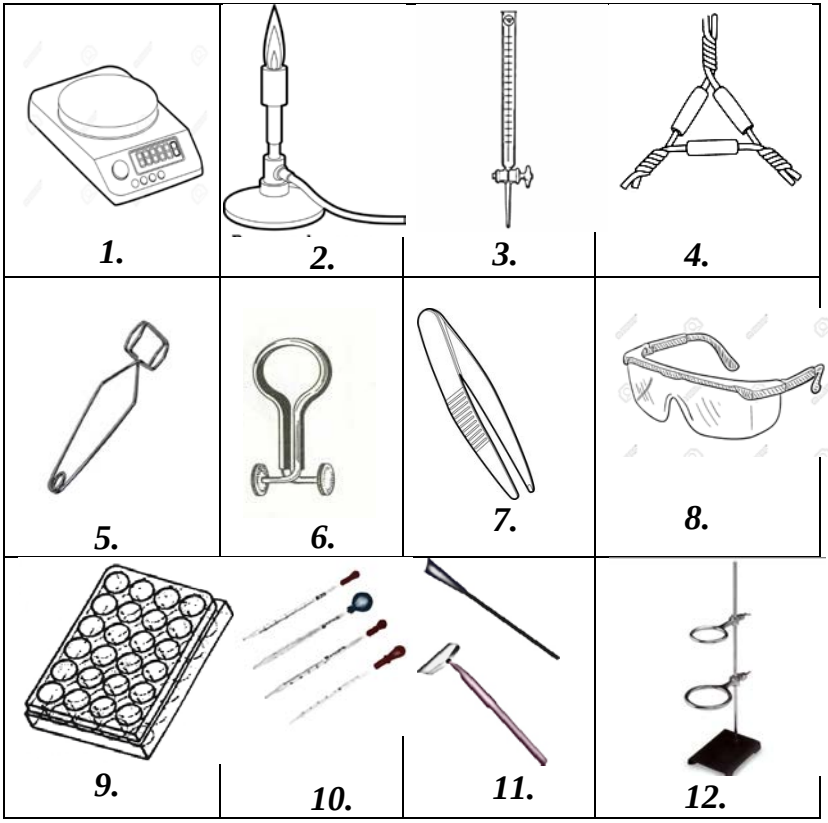
4. Write down the sentences expressing the main idea of each paragraph in the text.

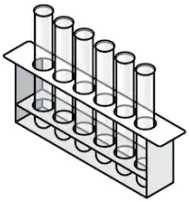
5. Describe your laboratory using as many words from the text as you can.

6. There are many laboratory devices in the biochemical laboratory. Match the names of equipment to their pictures. Explain how to use this equipment.

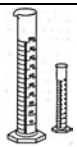
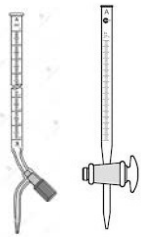
a) Scoopula
b) Balance (electronic)
c) Test Tubes in Rack
d) Bunsen Burner

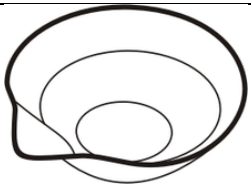
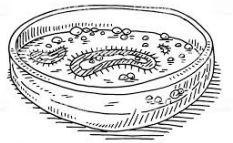
e) Forceps
f) Pinch Clamp
g) Plastic and Rubber Policemen
h) Buret
i) Clay Triangle
j) Reaction plates (multi-well plates)
k) Goggles
l) Test Tube Holder
m) Pipets and Bulbs
n) Stirring Rods
o) Watch Glasses
p) Ring Clamp & Stand



 ***13.***	 ***14.***	 ***15.***	 ***16.***

7. Now let's study chemical glassware. Look at the pictures and say how they can be used?

 **Beakers**	 **Flasks**	 **Graduated cylinders**
 **Funnels**	 **Burettes**	 **Test tubes**

 **Pipettes and droppers**	 **Bottles and jars**	 **Evaporating dishes and test plates**
 **Petri dish**	 **Mortar and pestles**	 **Crucibles**

8. Write down a plan of any laboratory experiment you like using equipment and glassware from the pictures above.

9. Do your research on chemistry. Make a plan of preparing caustic potash (NaOH) solution using the equipment mentioned above.

10. Change the verbs into the correct form in ***Future Perfect Tense*** *and translate them into Russian.*

1). By this time tomorrow, I _____ (finish) the project. 2). By 22 o'clock, the students _____ (fall) asleep. 3). By tomorrow morning, he ____ (sleep) wonderfully. 4). By next year, she _____ (receive) her promotion. 5). Robin _____ (finish) his research by next Sunday. 6). Morgan _____ (clean) the entire lab by lunch. 7). At this time tomorrow morning, they (begin)

working. 8). At this time next week, we _____ (get) the results. 9). By 2023, I _____ (live) in Manchester for 5 years. 10). In 2020, they ____ (work) here for 20 years.

11. Change the verb into the correct form in ***Future Perfect Progressive tense.***

1). By midnight, you _____ (do) your experiment for 4 hours. 2). By dinner for all her colleagues next Friday, she _____ (cook) the whole afternoon. 3). He _____ (work) there for 10 years by 2015. 4). By next year, I _____ (study) biology for 7 years. 5). By next week, we _____ (renovate) our lab for over a month. 6). In 2012, they _____ (live) here for 4 years. 7). Before December, Barbara _____ (teach) for a year. 8). By this time tomorrow, I _____ (do) this exercise for a long time. 9. Jessica _____ (assist) them for 12 months. 10). On Thursday, they _____ (fix) our centrifuge for a whole month!

12. Translate into English.

1) Боюсь, к тому времени, когда вы придете с деньгами, они уже распродадут все образцы. 2) Позвоните мне после того, как вы прочитаете эссе. 3) Мы сделаем все задания к его приходу, а затем все вместе поедем в университет. 4) Я напишу ему после того, как увижусь с его руководителем. 5) Наш исследовательский центр разработает новый реактив к концу года. 6) Не знаю, напишет ли он статью к первому сентября. Если она будет готова к этому времени, мы ее напечатаем. 7) Я уже уйду в виварий, если вы придете так поздно. 8) Боюсь, вы

опоздаете. Они уже закончат переговоры к 5 часам. 9) К сожалению, вы его не застанете. К этому времени он уже уедет на конференцию. 10) К воскресенью они закончат ремонт и переедут в новый офис.

13. Read and translate the text.

Physicochemical Methods of Analysis: What Are These?

It seems that this term can be met only in Russian. In the English-language literature, they usually speak and write about instrumental methods of analysis. The name instrumental is evidently not ideal; analytical balances or titrimeters used in classical chemical methods also belong to instruments.

Physicochemical methods of analysis have wider application. Without them it is hard to control and manage production processes and research. It should be noted that physicochemical methods of analysis solve the problems of chemical control and analysis; they constitute to one of the parts of analytical chemistry. The essence of the physical and chemical methods of analysis is to study relations between structure and properties of systems. For the analysis of substances chemical reactions are widely used. They are accompanied by changes in the physical properties of the analyzed system, for example, the color intensity of fluorescence, etc. So physicochemical methods of analysis is a field of analytical chemistry that investigates analyses using scientific instruments. There

are several types of instrumental analyses.

Spectroscopy measures the interaction of the molecules with electromagnetic radiation. Spectroscopy consists of many different applications such as atomic absorption spectroscopy, atomic emission spectroscopy, ultraviolet-visible spectroscopy, x-ray fluorescence spectroscopy, infrared spectroscopy, Raman spectroscopy, nuclear magnetic resonance spectroscopy, photoemission spectroscopy and so on.

Mass spectrometry measures mass-to-charge ratio of molecules using electric and magnetic fields. There are several ionization methods: electron ionization, chemical ionization, electrospray, fast atom bombardment, matrix-assisted laser desorption/ionization, and others.

Crystallography is a technique that characterizes the chemical structure of materials at the atomic level by analyzing the diffraction patterns of electromagnetic radiation or particles that have been deflected by atoms in the material. X-rays are most commonly used. From the raw data the relative placement of atoms in space may be determined.

Electroanalytical methods measure the electric potential in volts and/or the electric current in amps in an electrochemical cell containing the analyte. These methods can be categorized according to which aspects of the cell are controlled and which are measured. The three main categories are potentiometry (the difference in electrode potentials is measured), coulometry (the cell's current is measured over time), and voltammetry (the cell's current is measured while actively altering the

cell's potential).

Calorimetry and *thermogravimetric analysis* measure the interaction of a material and heat.

Separation processes are used to decrease the complexity of material mixtures. Chromatography and electrophoresis are representatives of this field.

Microscopy. The visualization of single molecules, single biological cells, biological tissues and nanomaterials is very important and attractive approach in analytical science.

Also, hybridization with other traditional analytical tools is revolutionizing analytical science. Microscopy can be categorized into three different fields: optical microscopy, electron microscopy, and scanning probe microscopy. Recently, this field is rapidly progressing because of the rapid development of the computer and camera industries. Combinations of the above techniques produce a "hybrid" or "hyphenated" technique. Several examples are in popular use today and new hybrid techniques are under development, for example, gas chromatography-mass spectrometry, gas chromatography-infrared spectroscopy, liquid chromatography-mass spectrometry and so on.

A general method for analysis of concentration involves the creation of a calibration curve. This allows for determination of the amount of a chemical in a material by comparing the results of unknown sample to those of a series known standards. If the concentration of element or compound in a sample is too high for the detection range of the technique, it can simply be

diluted in a pure solvent. If the amount in the sample is below an instrument's range of measurement, the method of addition can be used. In this method a known quantity of the element or compound under study is added, and the difference between the concentration added, and the concentration observed is the amount actually in the sample.

14.Translate the sentences using the words from the text.

1) *Флюоресценция* - свечение некоторых тел под влиянием освещения, по прекращении которого свечение не наблюдается.

2) *Чистый растворитель* не обладает запахом и не токсичен.

3) Достаточно знать *химический состав* вещества и его плотность, чтобы предсказать и все его прочие свойства.

4) Ученым необходимо измерить оптические линии *одиночных молекул*.

5) *Спектроскопия* обнаруживает и определяет вещества при помощи измерения их характеристических спектров.

6) После изучения теории ученые принялись *исследовать* новый материал.

7) В этом эксперименте необходимо *понизить* уровень абсорбции.

15. Fill in the blank spaces in these sentences based on the text:

1) Physicochemical methods of _____have wider application.

2) Spectroscopy measures the interaction of the molecules with _____.

3) From the raw data the relative placement of _____in space may be determined.

4) Separation processes are used to decrease the complexity of_____.

5) The visualization of single molecules, single biological cells, biological tissues and nanomaterials is very important and attractive approach in_____.

6) Microscopy can be categorized into three different fields: _____, _____, and scanning probe microscopy.

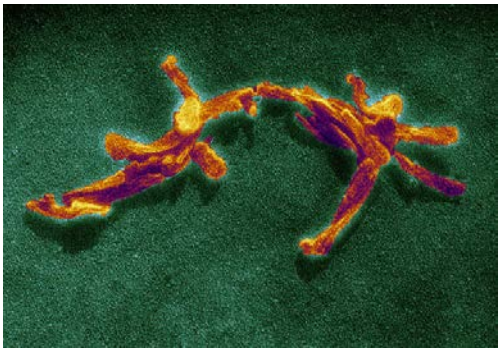
16. Write a summary of the text and retell the text in brief.

17. Choose the type of instrumental analysis and make a detailed presentation about it.

18. Translate the text into English.

Белки, как одни из основных биополимеров нашего организма, являются объектом биохимических исследований. При анализе белковых растворов одной из задач является выделение индивидуальных белков. Плазма крови, полученная путём центрифугирования, используется в таких исследованиях в качестве сырья. На первом этапе проводят электрофоретическое разделение исходной смеси.

Электрофорез с использованием полиакриламидного геля позволяет получить до 33 полос относительно индивидуальных белков.



Для подтверждения гомогенности полученных зон белков проводят хроматографическое разделение отдельных зон. Для сбора фракций используют автоматический коллектор. Обычно регистрация сигнала (оптическая плотность и т.д.) производится автоматически и также автоматически выводится хроматограмма. При отсутствии автоматической регистрации, после сбора фракций измеряется оптическая плотность отдельной фракции с использованием спектрофотометра. После этого строится графическая зависимость оптической плотности от номера фракции, т.е. хроматографический профиль или хроматограмма.

Очищенные таким образом белки могут быть использованы для дальнейших исследований. Например, иммуноглобулины входят в состав конъюгатов с ферментом пероксидазой хрена, которые используются в иммуноферментном анализе. Кроме того, белки подвергаются модификации, т.е. изменению физических и (или) химических свойств, для создания новых

биопрепаратов. Модификация проводится с использованием pH-метра для постоянного контроля изменения ионных характеристик раствора.

19. Research work. Use your laboratory to carry out any experiment. Make step-by-step photos and show them to your group to describe the process in detail.

Unit 11

Biotechnology

What fields of biotechnology do you know?

Which of these biotech fields would you like to study in future?

Say in your own words what biotechnology is.

1. Read and translate this text.

What is biotechnology?

The term "Biotechnology" (sometimes shortened to "biotech") consists of two parts. *Bio* is a Greek word for "life" and *technology* gives an indication of human intervention.

Biotechnology can be based on the pure biological sciences (genetics, microbiology, animal cell culture, molecular biology, biochemistry, embryology, cell biology). Also its interests can be outside the sphere of biology (chemical engineering, bioprocess engineering, information technology, biorobotics). Biotechnology deals with brewing, manufacture of human insulin, interferon, and human growth hormone, medical diagnostics, cell cloning and reproductive cloning, the genetic modification of crops, bioconversion of organic waste

and the use of genetically altered bacteria in the cleanup of oil spills, stem cell research and much more.

As a matter of fact, biotechnology is very ancient. Six thousand years ago, micro-organisms were used to brew beers and to produce wine, bread and cheese. Yeast makes dough rise and converts sugars into alcohol. Lactic acid bacteria in milk create cheese and yoghurt. This application of biotechnology is the directed use of organisms for the manufacture of organic products (examples include beer and milk products). In this way, *classical biotechnology* refers to the traditional techniques used to breed animals and plants, as well as to the application of bacteria, yeasts and molds to make bread or cheese.

*Modern biotechnolog*y came into being during the nineteen seventies. It has often been divided into several categories; every field of this science is sometimes connected with the definite color.

Green biotechnology is biotechnology applied to agricultural processes. An example would be the selection and domestication of plants via micro propagation. Another example is the designing of transgenic plants to grow under specific environments in the presence or absence of chemicals. One hope is that green biotechnology might produce more environmentally friendly solutions than traditional industrial agriculture, although this is still a topic of considerable debate.

Red biotechnology is applied to medical processes. Some examples are the designing of organisms to produce antibiotics, and the engineering of genetic cures

through genetic manipulation.

White biotechnology, also known as *industrial biotechnology*, is biotechnology applied to industrial processes. An example is using bacteria by the mining industry in bioleaching; so it is the designing of an organism to produce a useful chemical or destroy hazardous/polluting chemicals. White biotechnology tends to consume less in resources than traditional processes used to produce industrial goods.

Blue biotechnology is a term that has been used to describe the marine and aquatic applications of biotechnology, but its use is relatively rare.

Bioinformatics is an interdisciplinary field which deals with biological problems using computational techniques, and makes the rapid organization and analysis of biological data possible. Bioinformatics plays a key role in various areas, such as functional genomics, structural genomics, and proteomics, and forms a key component in the biotechnology and pharmaceutical sector.

In conclusion biotechnology can be referred to any technological application that uses biological systems or living organisms to make or modify products or processes for specific use.

Vocabulary

absence (n)
antibiotics (n)
bioconversion (n)
brew (v)
chemicals (n)
cleanup (n)
consume (v)
convert (v)

deal with (v)
domestication (n)
genetic manipulation
hazardous (adj)
hormone (n)
indicate (v)
interferon (n)
intervention (n)
key role
marine (adj)
molecule (n)
pharmaceutical sector
pollute (v)
presence (n)
produce (v)
rare (adj)
refer to (v)
selection (n)
solution (n)
stem cell research
technique (n)
transgenic plant

2. Translate the sentences into English using the words you've learned.

1) *Антибиотики* подавляют рост бактерий и других микробов, а также вирусов и клеток.

2) *Гормоны* есть у всех млекопитающих, включая человека.

3) Биотехнологи *производят* лекарственные препараты из трупных ядов, обычно считающихся *опасными химическими веществами*.

4) *Ключевую роль* в исследовании трансгенных растений играют последние открытия.

5) Развитие *фармацевтического сектора* указывает на увеличение открытий в сфере фармацевтики.

6) *Методика производства интерферона* не нова.

7) Разливы нефти *загрязняют морские* просторы.

8) В наши дни широко практикуется *биопереработка вредных* веществ.

3. Give detailed answers to the questions.

1) What does the term ‘biotechnology’ consist of?
2) Can you count the areas of biotechnology?
3) Is biotechnology a new science or not? Give facts to prove it.
4) What is classical and modern biotechnology?
5) When did modern biotechnology begin?
6) What is bioinformatics?
7) What biotechnology applies to agricultural processes?
8) What can green biotechnology design?
9) What does red biotechnology deal with?
10) Give examples of industrial biotechnology applications?
11) What does blue biotechnology deal with?

4. Write down the sentences showing the main idea of each paragraph of the text.

5. Expand on the summary when retelling the text.

6. Test your knowledge in biotechnology. Choose the correct answer.

1. The vector (DNA carrier) we used to put the glowing gene into the bacteria is called a…

a) Chromosome
b) Virus
c) Pipet
d) Plasmid

2. During a gel electrophoresis experiment, the small segment of DNA will move….

a) Backwards
b) Fast
c) Slow
d) Sideways

3. What tool do you use in lab to take very small samples of a liquid?

a) A beaker
b) A graduated cylinder
c) A micropipette
d) Safety glasses

4. In electrophoresis, where do the DNA samples go?

a) Straight up into the air
b) They move through the gel
c) Nowhere
d) Into a micropipette

5. What do you need to use so that you can estimate the size of the DNA bands?

a) A micropipette
b) A meter stick
c) An electronic balance
d) A DNA standard

6. When doing gel electrophoresis, how do you know that your gel is running and the electricity is on?

a) You see bubbles
b) You see sparks
c) You hear a noise
d) The light flashes

7. What makes the DNA move during gel electrophoresis?

a) Electricity
b) Gravity
c) Water
d) Wind

8. All the cells in your body have the same DNA, even though they do not look the same or have the same job.

a) True
b) False

9. Stem cells can be found in your heart.

a) True
b) False

10. DNA fingerprinting can be used to identify a criminal.

a) True
b) False

11. The DNA for the glowing gene came from:

a) Bacteria
b) Octopus
c) Fireflies
d) Jellyfish
e) Glow worms

12. A small piece of extra DNA found in bacteria is called…

a) Chromosome
b) Base pair
c) Double helix
d) Plasmid
e) Nucleus

13. The letters PCR stands for…

a) Pretty cool reaction
b) Polymerase chain reaction
c) Partly complete RNA
d) Partly complete reaction
e) Pure chain reaction

14. GEP (green fluorescent protein) makes jellyfish….

a) Reproduce
b) Glow
c) Shrink
d) Bigger
e) Sleepy

*7. Remember the **Passive Voice**. Change the sentences into Passive where necessary.*

Example: They gave her a test tube. She was given a test tube.

1) Students are doing a lot of experimental work. 2) We have already washed the pipettes. 3) His supervisor offered him the theme of his research. 4) They showed her the easiest way to do it. 5) Buffer keeps the pH constant. 6) Boris hadn't done this research before his assistant helped him. 7) Did the idea interest you? 8) The lawyer gave him the details of his uncle's will. 9) In the 19^{th} century, they started these engines by hand. Now they start them by electricity. 10) Who wrote it? 11) The Principal opened the new research center. 12) We will not admit students under sixteen.

*8. Translate into English using the **Passive Voice**.*

1) К сожалению, на конференции такие вопросы не затрагивались. 2) Кто вам сказал, что соглашение подписано? 3) Здесь говорят только на английском. 4) Химию изучают в лабораториях. 5) Посетителей принимают каждый день. 6) Лекции по биотехнологии читаются по средам и пятницам. 7) В больнице за ним ухаживали плохо. 8) На нашей улице строят новый виварий. 10) Не рассказывай свою теорию никому, а то над тобой будут смеяться. 11) Мне еще ничего об этом не говорили. 12) Мы поедем завтра на биостанцию, если будет дождь? — Да, мы должны туда поехать, нас там будут ждать. 13) Когда мы приехали сюда, это здание было только что построено. 14) К вечеру работа была закончена. 15)Когда мы вернулись, нам рассказали много интересных новостей о последних исследованиях в области биотехнологий.

9. Read and translate this text.

Medical biotechnology

Medical biotechnology is the use of living cell materials to research and produce pharmaceutical and diagnostic products that help to treat and prevent humane diseases. Most medical biotechnologists work in academic of industrial settings.

Medical and pharmaceutical biotechnology can speed diagnosis, prevention, and certain therapies. Biotech medicine includes the creation of new vaccines, nutraceuticals, cosmetics with active biological

ingredients, and medicines from transgenic animals and plants.

Due to the new basis, lack of experience and ignorance, the implementation of results of some areas of biotechnology (such as about stem cells, genetic enhancement, cell cloning, testing of new drugs in developing nations, controls of transgenic crops, and international regulation and enforcement) met severe resistance of society. Recombinant DNA and hybridoma technologies have been applied long time ago for manufacturing of rare and unique drugs (mainly protein) for human and veterinary medicine. Presently more than 150 recombinant proteins are approved or are in clinical trials for medical use.

Biotechnology met new challenges after the year 2000 when the human genome was sequenced. Although the function of 95% of the human 31 000 genes is still obscure, they all are of potential interest for the pharmaceutical biotechnology. The sequencing of human genome laid the foundations of a new branch of biotechnology called *genomic technologies*. They include not only sequencing of new genes and genomes but also development of molecular (DNA and RNA) markers and microarray chips for detecting mutant genes and methods for specific gene silencing (suppression) and/or repair of defective genes for the purposes of

gene therapy.

The fields of application of modern biotechnology techniques are medicines, vaccines, diagnostics, gene therapy, bioactive therapeutic, clinical and contract research and nutraceuticals.

10. Give Russian equivalents for the word combinations given below. Make your own sentences with 5 word combinations of your choice.

Powerful techniques, recombinant DNA, hybridoma technologies, fermentation technologies, natural materials, achievements of genetic and cell engineering, medical and pharmaceutical biotechnology, diagnosis, prevention, biotech medicine, creation of new vaccines, active biological ingredients, transgenic animals and plants, stem cells, genetic enhancement, cell cloning, veterinary medicine, recombinant proteins, human genome, pharmaceutical biotechnology, genomic technologies, development of molecular markers and microarray chips, gene therapy, bioactive therapeutic.

11. Translate these sentences into English.

1) *Трансгенный* организм это живой организм, в геном которого искусственно введен *ген* другого организма.

2) Пациенту была назначена музыкальная *терапия*.

3) Ему поставили *диагноз* – менингит.

4) В *клинических исследованиях* принимают участие ведущие медики страны.

5) Ученые должны *ускорить* темп работы,

если они хотят закончить к условленному сроку.

6) *Рекомбинантная ДНК* составлена из фрагментов разного происхождения.

7) *Рекомбинантные белки* это белки, ДНК которых была создана искусственно.

12. Give full answers to the questions based on the text.

1) What does biotech medicine include?

2) Why did some areas of biotechnology meet severe resistance of society?

3) How were recombinant DNA and hybridoma technologies used?

4) How many recombinant proteins are approved in clinics?

5) When did biotechnology meet new challenges?

6) What is *genomic technologies*?

7) List the fields of application of modern biotechnology techniques.

13. Find the difference in the definitions of the following words:

Medicine, drug, tablets, medication, remedy, cure, medicament, preparation, physic, therapeutic, doctor's stuff.

Make sentences showing the difference between these words.

15. Give a summary of this text. Check if all of the ideas from this text were used.

16. Translate this text.

Впервые термин «биотехнология» применил венгерский инженер Карл Эреки в 1917 году.

Использование в промышленном производстве микроорганизмов или их ферментов, обеспечивающих технологический процесс известны издревле.

В начале XX века активно развивалась бродильная и микробиологическая промышленность. В эти же годы были предприняты первые попытки наладить производство антибиотиков, пищевых концентратов, полученных из дрожжей, осуществить контроль ферментации продуктов растительного и животного происхождения. Первый антибиотик — пенициллин — удалось выделить и очистить до приемлемого уровня в 1940 году. Это дало новые задачи: поиск и производство лекарственных веществ, продуцируемых микроорганизмамии повышением уровня биобезопасности новых лекарственных препаратов.

17. Write an argument essay on the following topics:

- The future of biotechnology.
- What scientist will I be? And how will I help the humankind?

• What color is necessary to add to biotechnology?

** The answers to the exercise 6(1-d, 2-b, 3-c, 4-b, 5-d, 6-a, 7-a, 8-a, 9-b, 10-a, 11-d, 12-d, 13-b, 14-b).*

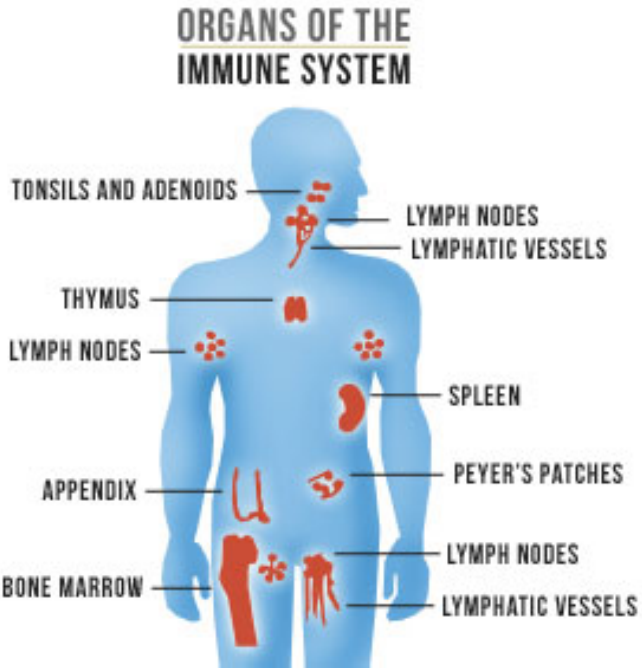
Unit 12

Immunology

What is the immune system for?

Nowadays, we have many food supplements on the market. Can they all replace our immune system?

In what context have you heard about immune system in your everyday life?



Look at the picture and say if you know all organs of the immune system. Check in the dictionary if necessary

1. Read and translate the text.

A magnificent protector

Inside your body there is an amazing protection mechanism called the immune system. It is designed to defend you against millions of bacteria, microbes, viruses, toxins and parasites that would love to invade your body. To understand the power of the immune system, all you have to do is to have a look at one's death. That sounds gross, but it will show you important things about your immune system.

When something dies, its immune system (along with everything else) shuts down. In a matter of hours, the body is invaded by all sorts of bacteria, microbes, parasites... None of these things are able to get in when your immune system is working, but the moment your immune system stops the door is wide open. Once you die it only takes a few weeks for these organisms to completely dismantle your body and carry it away, until all that's left is a skeleton. Obviously your immune system is doing something amazing to keep all of that dismantling from happening when you are alive.

When a virus or bacteria, also known generically as a germ, invades your body and reproduces, it normally causes problems. Generally the germ's

presence produces some side effect that makes you sick. For example, the strep throat bacteria (*Streptococcus*) release a toxin that causes inflammation in your throat. The polio virus releases toxins that destroy nerve cells often leading to paralysis. Some bacteria are benign or beneficial, for example, we all have millions of bacteria in our intestines and they help digest food. But many are harmful ones; they get into the body or the bloodstream.

The job of your immune system is to protect your body from these infections. The immune system protects you in three different ways. First and foremost, it creates a barrier that prevents bacteria and viruses from entering your body. Then, if a bacteria or virus does get into the body, the immune system tries to detect and eliminate it before it can make itself at home and reproduce. Thirdly, when the virus or bacteria is able to reproduce and start causing problems, your immune system is in charge of eliminating it.

There are many diseases that, if you catch them once, you will never catch again. Measles is a good example, as is chicken pox. What happens with these diseases is that they make it into your body and start reproducing. The immune system gears up to eliminate them. Cells recognize the virus and produce antibodies for it. This process takes time, but the disease runs it course and is eventually eliminated.

A vaccine is a weakened form of a disease. It is either a killed form of the disease, or it is a similar but less virulent strain. Once inside your body your immune system mounts the same defense, but because the disease is different or weaker you get few or no

symptoms of the disease. Now, when the real disease invades your body, your body is able to eliminate it immediately.

Many diseases cannot be cured by vaccines, however. The common cold and influenza are two good examples. These diseases either mutate so quickly or have so many different strains in the wild that it is impossible to inject all of them into your body. Each time you get the flu, for example, you are getting a different strain of the same disease. Thus, it's only our immune system which helps us to be protected.

Vocabulary

a matter of hours
amazing
antibody
appendix
be in charge of
benign
beneficial
bloodstream
catch a disease
cold
cure (v)
defend (v)
defense
detect (v)
digest (v)
dismantle (v)
flu
germ
harmful
infection
inflammation
influenza
invade (v)
make smb sick
mutate (v)
prevent (v)
protection
release (v)
reproduce (v)
spleen
tonsil
vaccine
virulent strain
wide

2. Translate the following sentences from Russian into English using the words from the vocabulary from the text.

1) Ученые считают, что возникновение *вредоносных* раковых опухолей – это следствие многоклеточного строения организма.

2) При попадании в организм *бактерии* начинают активно *размножаться*, а продуктами их жизнедеятельности являются *токсины*, *несущие огромный вред*.

3) У пациента поднялась температура, все симптомы говорили о *воспалении,* вызванном *инфекцией.*

4) Доктор, у меня есть риск заболеть *полиомиелитом*?

5) Еще в детстве вам должны были поставить *вакцину* против этой болезни. Если вы проходили вакцинацию, вы исключаетесь из группы риска.

6) Вирус *гриппа* быстро *мутирует*.

7) Более 30 лет назад были открыты *антитела*, и доказано, что они способствуют ускорению иммунного ответа при повторном контакте с антигеном.

3. Give the definitions to at least three of the following terms:

Adenoids, tonsils, lymph nodes, lymphatic vessels, thymus, spleen, Peyer's patches, appendix, bone marrow.

4. Fill in the blank spaces in these sentences:

1) Inside your body there is an amazing _____called the immune system.

2) Obviously your immune system is doing something

amazing to keep all of that _____ from happening when you are alive.

3) When _____ or ____ invades your body and reproduces, it normally causes problems.

4) The strep throat bacteria release a _____ that causes inflammation in your throat.

5) The job of your immune system is to protect your body from these _____.

6) If a bacteria or virus does get into the body, the immune system tries to _____ and _____ it before it can make itself at home and reproduce.

7) _____ recognize the virus and produce antibodies for it.

8) A vaccine is a weakened form of a _____.

9) Many diseases cannot be _____ by vaccines.

10) These diseases either _____ quickly or have so many different strains in the wild.

5. Answer the questions about this text.

1) What is the immune system? What is the basic function of the immune system?

2) How can we understand the power of the immune system?

3) What happens when somebody dies?

4) What are the synonyms of the word “virus”?

5) What happens when the germ invades one’s body?

6) What are benign bacteria?

7) How many ways of the immune system protection can you name?

8) Are there the diseases which you catch once and then never again?

9) What is a vaccine? How does it work?

10) Are there any diseases unable to be cured by vaccines?

11) What happens each time you get flu?

6. Talk about the facts you found in the text. What facts surprised you and what facts did you not know about before? Can you add any other information about the immune system?

7. Do you agree with the following statements? Choose one of them, explain and expand your ideas and make a short report.

1) The strep throat bacteria (*Streptococcus*) release a toxin that causes inflammation in your throat.

2) The Immune system doesn't work against viruses. It deals only with cells.

3) Bacteria have no nucleus.

4) Erythrocytes are not the part of immune system.

5) Bacteria and viruses work in the same way.

6) A vaccine is a form of a disease.

8. Make a plan of this text. Add key words in it if necessary.

9. Retell this text using your plan.

10. Remember the rules about ***the Sequence of Tenses*** *and* ***Indirect speech****. Change direct speech into indirect speech in the sentences.*

Example: "I have already finished the test," my friend

said. -> My friend said he had already finished the test.

1) “I work over my project every day,” Anthony said. 2) “They are carrying out experiments in the lab now,” Nick said. 3) “I don’t like agar,” Mary said. 4) “My group mates will come at 3,” Bella said. 5) “I phoned you many times but you were out,” Jane said. 6) “I have already finished my course work,” said Emily. 7) Mark asked: “Do you sometimes have headaches?” 8) “Are you taking any medicine now?” asked Lilia. 9) Masha asked: “Why did you come back?” 10) “What are you doing now?” asked Steve. 11) “Clean your working place in the lab!” ordered our supervisor. 12) Our teacher asked: “Don’t make noise.”

11. Fill in the blank spaces with the necessary form of verbs.

1) They noticed they __ (do) electrophoresis for three hours already. 2) Tom said that it __ (take) him an hour to get to the university. 3) She asked them if they___ (work) in the lab this afternoon. 4) Peter and John told me they ___ (study) the immune system the day before yesterday. 5) Mother said she ___ (have) a bad headache. Don't bother her. 6) Dorothy asked Margaret if she ___ (be) going to research a new strain in the nearest future. 7) They told us they ___ (visit) the Kazan research center next Sunday. 8) Jack said that he already _____ (write) the report. 9) They asked if the work _____ (finish) by tomorrow.

12. Translate the sentences given below.

1) Я знал, что он болен. 2) Я думал, что вы уехали из Англии. 3) Я думал, что ты его друг. 4) Салли сказала, что не любит мыть пробирки. 5) Он сказал, что сейчас

они просматривают результаты тестов. 6) Джек удостоверил, что сам отправит отчет. 7) Она сказала, что бывала в Казани. 8) Он сказал мне, что потерял книгу. 9) Диктор объявила, что самолет прибыл в аэропорт. 10)Он знал, что металлы проводят электричество. 11) Мы знали, что они работали в лаборатории с самого утра. 12) Я думал, что ты пойдешь в университет. 13) Я знал, что вы поймете меня. 14) Анна сказала, что она закончит задание к 7 часам. 15) Я знал, что он говорил ей, что он пишет пьесу. 16)Галилей доказал, что Земля вращается вокруг Солнца.

13. Read the text and translate.

Immunology

Immunology is a branch of biomedical science that covers the study of all aspects of the immune system in all organisms. It deals with the physiological functioning of the immune system in states of both health and disease; malfunctions of the immune system in immunological disorders; the physical, chemical and physiological characteristics of the components of the immune system in vitro, in situ, and in vivo.

Even before the concept of immunity was developed, numerous early physicians characterized organs that would later prove to be part of the immune system. When health conditions warrant, immune

system organs including the thymus, spleen, portions of bone marrow, lymph nodes and secondary lymphatic tissues can be surgically excised for examination while patients are still alive.

Classical immunology studies the relationship between the body systems, pathogens, and immunity. The earliest written mention of immunity can be traced back to the plague of Athens in 430 BC.

The study of the molecular and cellular components that comprise the immune system, including their function and interaction, is the central science of immunology.

In the 21st century, immunology has broadened its horizons with much research being performed in the more specialized niches of immunology. This includes the immunological function of cells, organs and systems not normally associated with the immune system, as well as the function of the immune system outside classical models of immunity.

14. Give the definitions to the following words:

immunology
immune system
immunity
in vitro
in vivo

15. In 1-2 sentences, summarize each paragraph of the text.

16. Check your knowledge about the immune system? Do you know the answers to these questions?

a) Is a monocyte a red or white blood cell?

b) What is the largest lymphoid structure?

c) What common allergic disorder was named for the illness first described in those exposed to the farmlands of England?

d) What is a substance that can cause a person to become sensitive to, and produce antibodies against it?

e) What type of immunity is developed through exposure to a disease?

f) Which part of the body does NOT contain lymph nodes?

g) Which organ is NOT part of the immune system?

h) What is a specialist in immunology called?

17. Talk about the facts you found about immune system. What facts surprised you and what facts did you not know about before? Can you add some other information about the history of immunology or some interesting immunological facts?

18. Read the text.

A useful vitamin

You would have to eat a couple dozen oranges to get the same effect as one Vitamin C tablet that contains 500 mg of Vitamin C. Perhaps everyone knows that vitamin C and immune system of humans are interconnected principles. Ascorbic acid is a nutrient that has been shown to have a strong jolt on human health. Researchers originally intended that considerable doses of Vitamin C can reduce the severity

and the rate of the common cold due to its using in oxidation-reduction in the human body.

Vitamin C is on the top of immune boosters list and there are many reasons for that. Perhaps, the greatest number of nutrient investigations was devoted to vitamin C and immune system. Ascorbic acid addendums are inexpensive to make, and it is very good that vitamin C is available naturally in many vegetables and fruits. There is another possibility to get Ascorbic acid - you can buy at any chemist's shop vitamin-C-fortified version. Now let's take a brief review of vitamin C and immune system benefit of it.

Ascorbic acid increases the infection-fighting production antibodies and white blood cells and increases interferon levels, the antibody that covers surface of cells, which are favorable for the viruses` entry. Vitamin C diminished the cardiovascular disease risk with the help of raising HDL level* cholesterol while decreasing blood pressure and importunate with the proceeding during which fat is transformed to plaque in the human arteries. It is also interesting about vitamin C and immune system that people who have diets with higher vitamin C concentration have

lower rates of prostate, colon and even breast cancer.

*HDL level – high density lipoproteins level

19. Retell this text in your own words without using any plan.

20. Study the list of vitamins and explain what vitamins we need for healthy lifestyle and what problems can the lack or overdose of vitamins cause.

Each vitamin is typically used in multiple reactions and, therefore, most have multiple functions.

Vitamin	Deficiency disease	Overdose disease	Good sources
Vitamin A	Night-blindness, Hyperkeratosis, and Keratomalacia	Hypervitaminosis A	Orange vegetables carrots, pumpkin, squash, spinach
Vitamin B_1	Beriberi, Wernicke-Korsakoff syndrome	Drowsiness or muscle relaxation.	Oatmeal, brown rice, vegetables, cauliflower, potatoes, liver, eggs
Vitamin B_2	Ariboflavinosis		Dairy products, bananas, popcorn, green beans, asparagus
Vitamin B_3	Pellagra	Liver damage and other	Meat, fish, eggs, many

Vitamin	Deficiency disease	Overdose disease	Good sources
		problems	vegetables, mushrooms, tree nuts
Vitamin B_5	Paresthesia	Diarrhea, nausea and heartburn.	Meat, broccoli, avocado
Vitamin B_6	Anemia, peripheral neuropathy.	Impairment of proprioception, nerve damage	Meat, vegetables, tree nuts, bananas
Vitamin B_7	Dermatitis, enteritis		Raw egg yolk, liver, peanuts, certain vegetables
Vitamin B_9	Megaloblast and Deficiency during pregnancy is associated with birth defects, such as neural tube defects	May mask symptoms of vitamin B_{12} deficiency; other effects.	Leafy vegetables, pasta, bread, cereal, liver
Vitamin B_{12}	Megaloblastic anemia	Acne-like rash	Meat and other animal products
Vitamin C	Scurvy	Blood thinning	Many fruits and vegetables, liver

Vitamin	Deficiency disease	Overdose disease	Good sources
Vitamin D	Rickets and Osteomalacia	Hypervitaminosis D	Fish, eggs, liver, mushrooms
Vitamin E	Deficiency is very rare; mild hemolytic anemia in newborn infants.	Increased congestive heart failure seen in one large randomized study.	Many fruits and vegetables
Vitamin K	Bleeding diathesis	Increases coagulation in patients taking warfarin.	Leafy green vegetables such as spinach

21. Choose any vitamin/vitamins you like to make a detailed presentation about it.

22. Translate the text into English using the vocabulary and grammar patterns you have learned.

Иммунная система — подсистема, существующая у позвоночных животных и объединяющая органы и ткани, которые защищают организм от заболеваний. Иммунная система распознает множество разнообразных возбудителей: от вирусов до паразитических червей, и отличает их от биомолекул собственных клеток. Распознавание возбудителей усложняется их адаптацией и эволюционным развитием новых методов успешного инфицирования организма-хозяина.

Конечной целью иммунной системы является уничтожение чужеродного агента. Этим достигается биологическая индивидуальность организма. В иммунной системе развитых организмов существует множество способов обнаружения и удаления чужеродных агентов, этот процесс называется иммунным ответом.

23. Make a conversation based on this situation:

You are working out a new food supplement for stimulating human's immune system. You have to assure your colleagues that your medicine is the most effective one.

Your partner's aim is to ask you as many questions as possible about the supplement`s effects on immune system.

24. Creative composition.

You are one of the white blood cells. Some antigen has infiltrated your master's body. What are your actions?

➢ *Answers to the questions in exercise 16.*

a. **White.** A monocyte is a white blood cell found in lymph nodes, the spleen, and bone marrow. It is a phagocytic cell that engulfs and kills bacteria and plays a role in killing tumor cells.

b. **Spleen.** The spleen is located in the upper left quadrant of the abdomen, behind the stomach. Red blood cells are filtered through the spleen, where old blood cells are destroyed.

c. **Hay fever.** It was originally called 'farmer's lung' and was caused by an allergic reaction to the fungi and spores in the hay.

d. **Antigen**.

e. **Acquired active immunity.** In acquired active immunity, antibodies are produced that protect the body upon second exposure.

f. **Feet.** Lymph nodes provide one of the most important defense mechanisms for the body.

g. Brain.

h. **Immunologist**. The emergence of AIDS in the 1980s has prompted extensive research and an expanded understanding of the immune system.

Unit13

Microbiology

Say in your own words what microbiology is.

How many areas of microbiology do you know?

What is the main subject of microbiological research?

1. *Read and translate this text.*

The fantastic world

Microbiology is the study of microorganisms, which are microscopic and unicellular organisms. This includes eukaryotes such as fungi, protists and prokaryotes. Viruses, though not classed as living organisms, are also studied. Microbiology typically includes the study of the immune system, or Immunology. And immune systems obviously interact with pathogenic microbes.

Microbiology includes virology, mycology, parasitology, bacteriology and other branches. Microbiological procedures usually must be aseptic, and use a variety of tools such as light microscopes with a combination of stains and dyes, agar plates in petri dishes, biochemical test and running tests against particular growth conditions.

Microbiology is researched actively. Many microbes are responsible for beneficial processes such as industrial fermentation, antibiotic production and others. Bacteria can be used for the industrial production of amino acids. *Coryne bacterium glutamicum* is one of the most important bacterial species with an annual production of more than two million tons of amino acids.

A variety of biopolymers, such as polysaccharides, polyesters, and polyamides, are produced by microorganisms. Microorganisms are used for the biotechnological production of biopolymers with tailored properties suitable for high-value medical application such as tissue engineering and drug delivery.

Microorganisms are beneficial for microbial biodegradation of domestic, agricultural and industrial wastes. The ability of each microorganism to degrade toxic waste depends on the nature of each contaminant.

There are also various claims concerning the contributions to human and animal health by consuming probiotics (bacteria potentially beneficial to the digestive system) and/or prebiotics (substances consumed to promote the growth of probiotic microorganisms). Recent research has suggested that microorganisms could be useful in the treatment of cancer.

Vocabulary

agar plate	class (v)
amino acids	contaminant (n)
beneficial (adj)	degrade (v)
biochemical test	depend on (v)
biopolymers (n)	drug delivery

dye (n)
enzyme (n)
eukaryotes (n)
growth conditions
include (v)
interact (v)
light microscope
microbial (adj)
microorganism (n)
pathogenic (adj)
prebiotics (n)
probiotics (n)
prokaryotes (n)
protists (n)
running tests
stain (n)
tailored properties
tissue engineering
virus (n)

2. Translate these sentences.

1) *Микроорганизмы* сложно увидеть невооружённым глазом (naked eye).

2) *Вирус* несет в себе наследственную информацию.

3) Инфекция это сложный биологический процесс, при котором *патогенные микробы* проникают в организм и нарушают постоянство его внутренней среды.

4) *Прокариоты* используются в медицине.

5) *Эксплуатационные испытания* приборов производятся в соответствии с государственными стандартами.

6) *Биохимические тесты* применяются для скрининга – выявления болезни на доклинической стадии.

7) У *эукариот* имеется нуклеотидный состав отдельных последовательностей ДНК.

8) *Красители* применяемые в микробиологии, являются солями двух типов: кислые красители и основные красители.

9) Химическое разрушение материалов под действием факторов окружающей среды является *биоразлагаемостью*.

3. Fill in the blank spaces in these sentences:

1) Microbiology is the study of_____, which are microscopic and unicellular organisms.

2) Viruses, though not classed as_____, are also studied.

3) Many microbes are responsible for _____such as industrial fermentation, antibiotic production and others.

4) _____are beneficial for microbial biodegradation of domestic, agricultural and industrial wastes.

5) Recent research has suggested that microorganisms could be useful in the _____of cancer.

6) Microorganisms are used for the _____of biopolymers with tailored properties suitable for high-value medical application.

4. Give the full answers to these questions:

1) What is microbiology?

2) Is microbiology connected with immunology? How?

3) Which branches of microbiology do you know?

4) Where are the microbes used?

5) What do you know about *Coryne bacterium glutamicum*?

6) What is produced by microorganisms?

7) What is probiotic? What is prebiotic? What is the difference between them?

8) How can we biodegrade different wastes?

9) Could microorganisms be useful in treatment of cancer?

5. Read the text again and say which statements are true and which are false.

a) Microbiology is the study of microorganisms.

b) Microbiology includes only the study of the immune system.

c) A virologist is a specialist in microbiology.

d) Microbiology is researched passively.

e) Bacteria can be used for the industrial production of all acids.

f) The ability of each microorganism to degrade toxic waste depends on the nature of each contaminant.

g) Probiotics are the substances consumed to promote the growth of probiotic microorganisms.

6. Write a plan of the text. Use your plan to retell this text in detail.

7. Find the appropriate definitions to the following words:

eukaryotes	small infectious agents that can replicate only inside the living cells of organisms
viruses	biological scientists who study organisms so small that, generally, they can only be seen with a microscope.
antibiotics	organisms whose cells contain complex structures enclosed within

	membranes
enzymes	a class of diseases in which a group of cells display uncontrolled growth
mycology	the branch of biology concerned with the study of fungi
cancer	organisms that lack a cell nucleus or any other membrane-bound organelles
microbiologist	proteins that catalyze (i.e., increase or decrease the rates of) chemical reactions
prokaryotes	powerful medicines that fight bacterial infections

9. *Find the worlds from the previous exercise in the below table.*

e	*p*	*o*	*m*	*g*	*e*	*m*	*j*	*a*	*s*	*g*	*s*	*p*
u	*k*	*a*	*r*	*u*	*p*	*i*	*w*	*a*	*h*	*l*	*d*	*o*
k	*v*	*i*	*t*	*o*	*r*	*e*	*b*	*c*	*a*	*w*	*z*	*k*
a	*m*	*i*	*c*	*r*	*o*	*b*	*i*	*o*	*g*	*i*	*s*	*t*
r	*y*	*p*	*a*	*p*	*k*	*h*	*l*	*o*	*k*	*e*	*e*	*u*
y	*c*	*c*	*n*	*l*	*a*	*f*	*e*	*r*	*n*	*a*	*n*	*h*
o	*o*	*a*	*c*	*i*	*r*	*o*	*g*	*i*	*s*	*r*	*z*	*i*
t	*l*	*m*	*e*	*v*	*y*	*r*	*u*	*s*	*p*	*f*	*y*	*l*
e	*o*	*y*	*r*	*u*	*o*	*t*	*i*	*c*	*a*	*f*	*m*	*u*
s	*g*	*o*	*n*	*z*	*t*	*q*	*a*	*g*	*h*	*j*	*e*	*s*
r	*y*	*u*	*t*	*s*	*e*	*d*	*o*	*i*	*n*	*u*	*s*	*o*
a	*n*	*t*	*i*	*b*	*i*	*o*	*t*	*i*	*c*	*s*	*l*	*j*
h	*o*	*v*	*i*	*r*	*u*	*s*	*e*	*s*	*o*	*c*	*e*	*k*

10. You have one minute to write down all of the different words you associate with 'microbiology'. Share your words with your partner/group and talk about them.

11. Look at the words below. Try to remember exactly how these words were used in the text:

- pathogenic microbes
- beneficial processes
- amino acids
- polyamides
- high-value medical application
- domestic
- contaminant
- the digestive system
- to promote
- treatment

12. Remember ***Modal verbs*** *and their equivalents. Fill in the blank spaces sentence b) using the modal verbs (changing the modal verbs in sentence a)). One has been done for you. Bare in mind that sometimes you need another modal verb!*

1. a) She can ski really well.
   b) She could ski really well when she was five.
2. a) I can finish it by Friday but it won't be easy.
   b) I _____ it by Friday but it wasn't be easy.
3. a) John can't live here. It's the wrong street.
   b) Shakespeare _____ in that house. It wasn't built until 1840.

4. a) I must check the oil before we leave.
b) I _____ check the oil before we left.

5. a) It must be raining. Everyone has their umbrella up.
b) It _____. The ground is wet.

6. a) Thank you very much. You needn't give me a lift, but it's very kind.
b) You _____ me a lift, but it was very kind.

7. a) He needn't collect me from the station. I'll walk.
b) He _____ me from the station. I walked.

8. a) Why don't you take the exam? You might pass.
b) Why didn't you take the exam? You _____.

9. a) He should stop smoking before it's too late.
b) He _____ stop smoking before it was too late.

10. a) I could visit you next Sunday.
b) I _____ you last Sunday. Why didn’t you ask me?

11. a) There's the phone. It'll be Paul.
b) Did he have a deep voice? It_____Paul.

12. a) He'll sit in the armchair for hours, staring into space.
b) He_____ in the armchair for hours, staring into space.

13. a) Let's take the map. We may get lost.
b) I wonder where they are. They _____.

13. Use the verbs ***could, may, must, have to, should*** *to fill in the blank spaces.*

1) Einstein’s theory predicted that the universe was not static, but _____ (be) either expending or contracting.

2) Because the universe is expanding it _____ (cool), which means that it _____ (be) much hotter when it was

young.

3) Therefore, a significant fraction of the universe ____ (consist) of non-baryonic matter.

4) There were no longer free electrons to absorb and scatter light, and photons _____ (travel) freely through the universe.

5) These fluctuations _____ (cause) by something that happened even earlier.

6) We _____, however, (be) careful about taking these models too seriously; they all _____ (be) wrong.

14. Translate into English using modal verbs and their equivalents.

1) Тебе следовало позвонить ему вчера. 2) Ей не следовало говорить с руководителем таким тоном. Ее тон, должно быть, и обидел его. 3) Это должно было произойти. Всем известна его забывчивость. 4) Она должна была выяснить все до того, как начинать работу. Теперь ей нужно многое переделывать. 5) Ей следовало принести все документы давным-давно. Теперь слишком поздно. 6) Детям нельзя смотреть фильмы ужасов.7) Мне их проводить? — Нет, тебе не нужно. Мне придется сделать это самому. 8) В чужой стране необходимо приспосабливаться к новым условиям жизни. 9) Зря ты купил это оборудование. 10) Мы, должно быть, не заметили его в этой толпе. 11) Нам не надо было спешить, поэтому мы решили пойти пешком. 12) Почему я должен это делать?

15. Read the text about Antonie van Leeuwenhoek and other pioneers of microbiology, translate and give it a title.

Add the facts you know about these famous scientists.

Antonie van Leeuwenhoek was the first to observe microorganisms using a microscope. In 1676 he observed bacteria and other microorganisms, using a single-lens microscope of his own design.

The field of bacteriology was founded in the 19th century by Ferdinand Cohn, a botanist who describes several bacteria. Cohn was also the first to formulate the taxonomic classification of bacteria and discover spores. Louis Pasteur and Robert Koch were contemporaries of Cohn's and are often considered to be the father of Microbiology and medical microbiology.

Antonie van Leeuwenhoek

Pasteur is most famous for his experiments designed to disprove the theory of spontaneous generation. Pasteur also designed methods for food preservation (pasteurization) and vaccines against several diseases such as fowl cholera and rabies. Koch is best known for his contributions to the germ theory of disease, proving that specific diseases were caused by specific pathogenic microorganisms. He developed a series of criteria that have become known as the Koch's postulates. Koch was one of the first scientists to focus on the isolation of bacteria in pure culture resulting in his description of several novel bacteria including Mycobacterium tuberculosis, the causative agent of

tuberculosis.

Martinus Beijerinck and Sergei Winogradsky are considered to be the founders of general microbiology. Beijerinck made two major contributions to microbiology: the discovery of viruses and the development of enrichment culture techniques. While his work on the Tobacco Mosaic Virus established the basic principles of virology, it was his development of enrichment culturing that had the most immediate impact on microbiology by allowing for the cultivation of a wide range of microbes. Winogradsky was the first to develop the concept of chemolithotrophy. He was responsible for the first isolation and description of nitrogen-fixing bacteria.

16. Talk about the facts you found in the text. What facts surprised you and what facts did you not know about before?

17. Make 5 questions based on this text.

18. Fill in the table about the famous scientists. Add scientists that are not mentioned in the text.

A scientist	*his impact on microbiology*

19. Choose the scientist whose impact on microbiology you appreciate the most and expand on the text with your own information (facts). Make a report or a presentation and report it to your group mates.

20. Translate the text into English word-by-word. You can use a dictionary if necessary.

Люди издревле имели представление о микробиологических процессах, однако не знали о причинах, вызывающих их. Это не мешало делать наблюдения и даже использовать эти процесс в быту. Многие философы делали умозрительные (speculative) заключения о причинах тех или иных явлений. При этом наиболее близко к открытию микромира еще в 14 веке подошел Фракасторо, предположивший, что инфекции вызывают маленькие тельца, передающиеся при контакте и сохраняющиеся на вещах больного. Однако в то время невозможно было удостовериться в правильности его идей.

21. Choose a topic below and make a presentation about it to show to other students:

- Food microbiology
- Environmental microbiology
- Eukaryote
- Bacteria
- Prokaryote
- Virology
- Archaea
- Escherichia coli

Unit 14

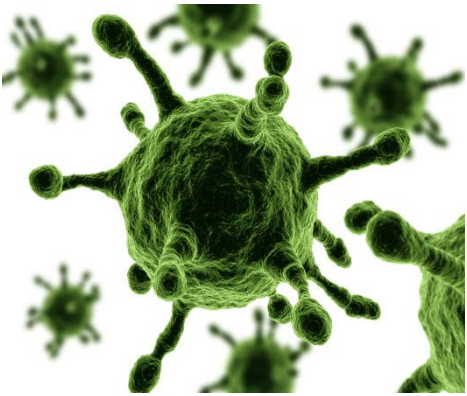
Virology

What is a virus?
Are you afraid of viruses?
Can people, living in closed spaces without any contacts with other people, be protected from viruses?
What do you know about virology?

1. Read and translate this text.

Virology and viruses

Virology is the study of viruses and virus-like agents: their structure, classification and evolution, their ways to infect and exploit cells for virus reproduction, the diseases they cause, the techniques to isolate and culture them, and their use in research and therapy. Virology is often considered as a part of microbiology.



A virus is a small infectious agent that can replicate only inside the living cells of organisms. Viruses infect all types of organisms, from animals and plants to bacteria. Since the initial discovery of the tobacco mosaic virus in 1898, about 5,000 viruses have been described in

details, although there are millions of different types. Viruses are found in almost every ecosystem on the Earth.

Virtually, all viruses can be classified according to the host cell they infect: animal viruses, plant viruses, fungal viruses, and bacteriophages (viruses infecting bacteria, which include the most complex viruses). Another classification uses the geometrical shape of their or the virus's structure (e.g. presence or absence of a lipid envelope).

Viruses range in size from about 30 nm to about 450 nm, which means that most of them cannot be seen with light microscopes. The shape and structure of viruses has been studied by electron microscopy, NMR (nuclear magnetic resonance) spectroscopy, and X-ray crystallography.

Virus particles (known as virions) consist of two or three parts: the genetic material made from either DNA or RNA, long molecules that carry genetic information; a protein coat that protects these genes; and in some cases an envelope of lipids that surrounds the protein coat when they are outside a cell. The average virus is about one one-hundredth the size of the average bacterium.

Viruses cause a number of diseases in eukaryotes. In humans, smallpox, the common cold, influenza, herpes, polio, rabies and AIDS are examples of viral diseases.

Viral infections in animals provoke an immune response that usually eliminates the infecting virus. Immune responses can also be produced by vaccines. However, some viruses including those causing AIDS and viral hepatitis evade these immune responses and result in chronic infections. Antibiotics have no effect on viruses, but several antiviral drugs have been developed.

The origins of viruses in the evolutionary history of life

are unclear: some may have evolved from plasmids – pieces of DNA that can move between cells – while others may have evolved from bacteria.

The evolution of viruses, which often occurs with the evolution of their hosts, is studied in the field of viral evolution.

While viruses reproduce and evolve, they don't engage in metabolism and depend on a host cell for reproduction. The often-debated question is whether they are alive or not.

Vocabulary

AIDS [eidz]	discovery (n)
antiviral drugs	light microscope
bacteriophage (n)	lipid envelope
capsid (n)	plasmids (n)
common cold	polio (n)
electron microscopy	protein coat
eliminate (v)	provoke (v)
engage (v)	rabies (n)
evolution (n)	replicate (v)
evolve (v)	reproduction (n)
exploit (v)	smallpox (n)
genetic material	structure (n)
host cell	tobacco mosaic virus
immune response	vaccine (n)
infect (v)	viral evolution
infectious agent	virus (n0
influenza (n)	X-ray crystallography

2. Give Russian equivalents to the following words:

Virus-like agents, is often considered as, a major branch, can be classified according to, range in size from

about …. nm to about….nm, all types of organisms, describe in details, consist of, carry genetic information, the average virus, can be produced by, have no effect on, the evolution of viruses, in the field of viral evolution, depend on.

3. Translate the following sentences from Russian into English using the words from vocabulary.

1) *Бактериофаги* используются в лечении острых кишечных *инфекций*.

2) Воспаление — одна из наиболее ранних *реакций иммунной системы* на инфекцию.

3) Ученые создали *вакцину* от менингита B.

4) Уже много лет не было эпидемий *оспы,* так как своевременная вакцинация людей провоцирует *иммунный ответ*.

5) *Полиомиелит*–это острое инфекционное заболевание, поражающее центральную нервную систему.

6) Человеческий риновирус (HRV) ответственен за 30 – 50 % случаев *общей простуды.*

7) *Световые микроскопы* могут увеличивать объект в 1500 раз, а электронные – в 20 000 раз.

8) Вирус табачной мозаики передается механическим путем от больного растения к здоровому или с семенами.

9) *Бешенство* у собак *провоцирует* развитие воспаления головного мозга

10) *Клетка-хозяин* – это клетка, несущая вирус.

4. Fill in the blank spaces in these sentences:

1) Virology is often considered as a part of_____.

2) Viruses can be classified according to _____they infect.

3) Another classification uses the geometrical shape of their ____or the virus's structure.

4) A virus is a small _____that can replicate only inside the living cells of organisms.

5) Viruses are found in almost every _____on Earth.

6) Viruses cause a number of diseases in _____.

7) Viral infections in animals provoke _____that usually eliminates the infecting virus.

8) The evolution of viruses, which often occurs in concert with the evolution of their hosts, is studied in the field of_____.

9) While viruses _____and_____, they don't engage in metabolism and depend on a host cell for reproduction.

5. Remember how the fragments of the sentences were used, and complete the sentences using the information from the text.

1) Virology is the study of viruses and virus-like agents: ...

2) Viruses can be classified according to the host cell they infect: ...

3) The shape and structure of viruses has been studied by...

4) Since the initial discovery of the tobacco mosaic virus in 1898, about 5,000 viruses have been described in detail, although...

5) Viral infections in animals provoke an immune response that...

6) Antibiotics have no effect on viruses, but …

7) The often-debated question of whether they are alive or not is a matter of definition that...

6. Find the appropriate definitions to the following words:

AIDS	a small infectious agent that can replicate only inside the living cells of organisms
Influenza	a compound or substance that kills or slows down the growth of bacteria
Virus	an infectious disease caused by RNA viruses, that affects birds and mammals
Eukaryote	a living cell in which a virus reproduces
Host cell	a disease of the human immune system caused by the human immunodeficiency virus (HIV)
Antibacterial drugs	an organism whose cells contain complex structures enclosed within membranes

7. Make 10 questions covering the content of the text.

8. Make a plan of the text. Add key words in it if necessary.

9. Retell this text using your plan.

10. Remember ***the Gerund****. Complete the following sentences using the gerund.*

1) (Be) free and alone is a good thing if you are tired of research work. 2) (Find) this sample here was a quite a surprise. 3) If this is what you intend (ask) me, stop (waste)

your time. 4) They kept on (talk) though the centrifuge began (work). 5) Everyone enjoyed (swim) in the river. 6) My fume hood needs (repair). 7) He never mentioned (live) in Prague. 8) He does not want (air) the room. 9) Just imagine (do) this research together! 10) If you postpone (get) a visa, you will miss an excellent opportunity of (go) to that conference.

11. Translate into English using the gerund where possible.

1) Я настаиваю, чтобы ты показал нам свой новый план работ. 2) Студент гордился тем, что у него такой известный руководитель. 3) Этот фильм стоит посмотреть. Вам не сможет не понравиться такое необычное объяснение происхождения вирусов. 4) Было невозможно достать билет, и ему пришлось отказаться от мысли послушать знаменитого лектора. 5) Я помню, он громко смеялся, когда рассказывал о твоей курсовой. 6) Она была уверена, что мальчики уже давно перестали работать в лаборатории. 7) Она сидела в аудитории, не говоря ни слова и не обращая внимания на болтовню своих одногруппников. 8) Не отвечая на приветствия, он быстро прошел в зал. 9) Он намеревался начать свое исследование со сбора данных. 10) Он терпеть не может, когда его хвалят.

*12. Remember the forms of **the Participle** and how to use them. Find the difference between Participles I and II. Open the brackets and change the verb into the participle.*

1) He fell asleep (exhaust) by all the experiments. 2) She entered the lab (accompany) by her supervisor. 3) A snake (sleep) in the grass will bite if anyone treads upon it. 4)

(Fill) his rack with test tubes the student was about to go. 5) It was a bright Sunday morning of early summer (promise) heat. 6) When I came home, I found the table (lay). 7) (Judge) by the dye color it should be an appropriate protein. 8) (Arrive) at a big city, I started to look for a job. 9) He had received an urgent message (ask) him to telephone Sir Matthew. 10) He looked at groups of mice (walk) one by one. 11) In the wood they sat down on a (fall) tree. 12) (See) from the magnifying glass the virus looks magnificent. 13) (Not know) what to do he asked his co-worker. 14) (Lock) in the cage the mouse started to run around.

13. Translate into English using participles where possible.

1) Будьте внимательны, когда проводите эксперимент. 2) На листе бумаги было несколько строк, написанных карандашом. 3) Получив предупреждение, студент сразу взялся за курсовую. 4) Я не знаю человека, говорящего по телефону. 5) Поставив образцы в морозильную камеру вечером, мы достали их с утра уже замороженными. 6) Полученное известие взволновало всех. 7) Я оставила ей записку, не застав ее на рабочем месте. 8) Чувствуя усталость, команда исследователей решила передохнуть. 9) Я не запомнил имя человека, написавшего этот научный труд. 10) Мы сидели в лаборатории, наслаждаясь чудесным Кумасси **С**инего, окрашивающего белки.

14. Read the text.

The history of vaccination

A very early form of vaccination known as *variolation* was developed several thousand years ago in China. It involved the application of materials from smallpox sufferers in order to immunize others. In 1796 Edward Jenner developed a safe method, using cowpox to successfully immunize a young boy against smallpox, and this practice was widely adopted. Vaccinations against other viral diseases followed, including the successful rabies vaccination by Louis Pasteur in 1886. The nature of viruses however was not clear to these researchers.

In 1892 Dimitri Ivanovski showed that a disease of tobacco plants, tobacco mosaic disease, could be transmitted by extracts that were passed through filters fine enough to exclude even the smallest known bacteria.

In 1903 it was suggested for the first time that transduction by viruses might cause cancer. Such an oncovirus in chickens was described by Francis Peyton Rous in 1911; it was later called Rous sarcoma virus 1 and understood to be a retrovirus. Several other cancer-causing retroviruses have since been described.

While plant viruses and bacteriophages can be grown comparatively easily, animal viruses normally require a living host animal, which complicates their

study immensely. In 1931 it was shown that influenza virus could be grown in fertilized chicken eggs, a method that is still used today to produce vaccines. In 1937, Max Theiler managed to grow the yellow fever virus in chicken eggs and produced a vaccine from an attenuated virus strain; this vaccine saved millions of lives and is still being used today.

The first virus that could be crystalized and whose structure could therefore be elucidated in detail was tobacco mosaic virus (TMV), the virus that had been studied earlier by Ivanovski and Beijerink. In 1935, Wendell Stanley achieved its crystallization for electron microscopy and showed that it remains active even after crystallization. Clear X-ray diffraction pictures of the crystallized virus were obtained by Bernal and Fankuchen in 1941.

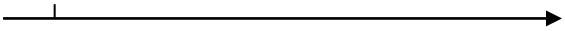
In 1975 the functioning of oncoviruses was clarified considerably. Until that time, it was thought that these viruses carried certain genes called oncogenes which, when inserted into the host's genome, would cause cancer.

A worldwide vaccination campaign led by the UN World Health Organization resulted in the eradication of smallpox in 1979.

15. Write down 15 sentences covering the whole content of the text.

16. Draw "a history line" and put the virologists' names along the line on it. Don't forget to mention their discoveries.

E. Jenner



1796
Safe method of
vaccination against smallpox

17. Remember the words you learned in this unit and translate the sentences using them.

1) Человек на протяжении всей жизни подвергается опасности заразиться и заболеть какой-либо вирусной инфекцией.

2) Размножаясь, вирусы истощают клеточные ресурсы, глубоко нарушают обмен веществ, и, в конечном счёте, являются причиной гибели клеток.

3) По своему строению и свойствам вирусы занимают промежуточное место между сложнейшими химическими веществами (полимерами, макромолекулами) и простейшими организмами (бактериями).

4) Долгое время полагали, что вирусы вызывают острые массовые заболевания. К настоящему времени накоплено много доказательств того, что вирусы являются причиной и различных хронических болезней, длящихся годами и даже десятилетиями.

5) Молекула РНК вируса табачной мозаики заключена в белковый капсид (оболочку), состоящий из 2130 идентичных полипептидных субъединиц.

6) Современная классификация вирусов основана на виде и формы их нуклеиновой кислоты.

7) Кумасси бриллиантовый синий имеет две метильные группы.

8) Люди, выживающие после оспы, могут частично или полностью терять зрение.

9) Онкоген стимулирует образование злокачественной опухоли.

10) Желтая лихорадка передаётся с укусом комаров.

18. Do you know what a retrovirus is? Can you describe the mechanism of its activity? Why can this virus be very dangerous for our cells? What are the typical diseases caused by a retrovirus? Make a poster explaining how retrovirus works and show it to your class.

19. Read and translate the text about retrovirus.

Хроническую усталость вызывает ретровирус

Бешеный ритм современной жизни легко может довести до постели, аптечки и «синдрома хронической усталости». Но медики нашли причину депрессий, усталости и снижения иммунитета офисных трудоголиков – это инфекция. Этот ретровирус XMRV, хорошо знакомый врачам и биологам, вызывает лейкемию у мышей и часто встречается в тканях опухолей у мужчин.

Причины синдрома хронической усталости искала группа ученых под руководством доктора Джуди Миковиц (Judy Mikovits) из института Уиттмора Питерсона (Whittemore Peterson Institute, Невада, США). Кровь испытуемых тестировалась на наличие антител к разного рода вирусам, в том числе к мышечному XMRV. По анализам определили присутствие вируса в организме восьми из 218 здоровых людей, что составило всего 3,7 %, в то время как среди «хронически устающих» ретровирус был обнаружен у 68 человек, а это уже 67%

выборки.

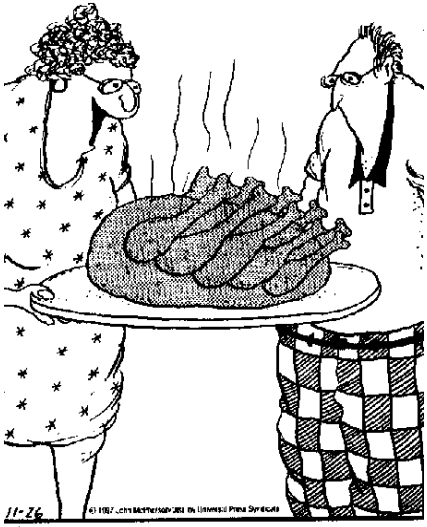
Синдром хронической усталости впервые был выведен как отдельный диагноз в конце 1980 года, его первоначальное название «грипп яппи». Однако многие медики и сегодня сомневаются в реальности существования данного синдрома. Его симптоматика расплывчата: от депрессии до обмороков, от суставных болей до анемии. Кроме того, неизвестны и причины. Психологи обвиняют во всем стрессы и давление цивилизационной жизни, клиницисты склоняются к вирусной этиологии хронической усталости, например, к вирусу Эпштейна-Барра, энтеровирусами, вирусу простого герпеса и, наконец, ретровирусу XMRV.

18. Write a creative composition "If viruses took over the world...".

19. Are you for or against vaccination? Give your arguments and express your opinion in the form of an opinion essay or have an oral discussion about this topic.

Unit 15

Genetic engineering



"Isn't genetic engineering amazing? Two years ago who would have even imagined such a thing as a Turkipede?!"

What areas of biotechnology do you know?

What does genetic engineering deal with?

Where can the products of genetic engineering be applied?

Comment on the joke on the picture. How do you understand it?

1. Read this text and translate.

The scope of genetic engineering

Progress in any scientific discipline depends on the availability of techniques and methods that extend the range and sophistication of experiments that may be performed. Over the past 35 years this has been demonstrated by the emergence of genetic engineering. In many laboratories around the world, it is now routine practice to isolate a specific DNA fragment from the genome of an organism, determine its base sequence, and assess its function. The technology is also now used in many other applications, including forensic analysis of scene-of-crime samples,

paternity disputes, medical diagnosis, genome mapping and sequencing, and the biotechnology industry.

The term genetic engineering is often thought to be rather trivial, yet it is probably the label that most people would recognize. However, there are several other terms that can be used to describe the technology, including gene manipulation, gene cloning, recombinant DNA technology, genetic modification, and the new genetics.

Although there are many diverse and complex techniques involved, the basic principles of genetic manipulation are rather simple. The basic premise of the technology is the following. Genetic information, encoded by DNA and arranged in the form of genes, is a resource that can be manipulated in various ways to achieve certain goals in both pure and applied science and medicine.

There are many areas in which genetic manipulation is of value, including the following:

- Basic research on gene structure and function
- Production of useful proteins by novel methods
- Generation of transgenic plants and animals
- Medical diagnosis and treatment
- Genome analysis by DNA sequencing

The mainstay of genetic manipulation is the ability to isolate a single DNA sequence from the genome. This is the essence of gene cloning and can be considered as a series of four steps: 1) Generation of DNA fragments; 2) Joining to a vector or carrier molecule; 3) Introduction into a host cell for amplification; 4) Selection of required sequence. Successful completion of these steps provides the genetic engineer with a specific DNA sequence, which may be used for a variety of purposes.

One questionable aspect of the new genetics is the debate surrounding the potential applications of the technology. Nowadays there are some ethical problems that exist in modern genetics, which are likely to increase in both number and complexity, as genetic engineering technology becomes more sophisticated. The use of transgenic plants and animals, investigation of the human genome, gene therapy, and many other topics are of concern – not just to the scientist, but to the population as a whole.

Additional developments in the cloning of organisms, and in areas such as in vitro fertilization and xenotransplantation, raise further questions. Research on stem cells and the potential therapeutic benefits that this research may bring, is another area of concern that is part of the general advance in genetic technology.

Taking all the potential costs and benefits into account, it remains to be seen if we can use genetic engineering for the overall benefit of mankind and avoid the misuse of technology that often accompanies scientific achievement.

Vocabulary

range (n)
emergence (n)
rapidly (adv)
routine practice
isolate (v)
sequence (n)
assess (v)
applications (n)
forensic analyses
paternity dispute
recognize (v)
gene manipulation
gene cloning
recombinant DNA technology
genetic modification
new genetics
novel (adj)

transgenic (adj)
carrier molecule
host cell
amplification (n)
required (adj)
completion (n)
sophistication (n)
sophisticated (adj)
fertilization (n)
stem cells
benefit (n)
take into account
mankind (n)
misuse (n)
achievement (n)

2. Give the definitions to the terms below. Make your own sentences with them.

Forensic analysis of scene-of-crime samples, paternity disputes, medical diagnosis, genome mapping and sequencing, transgenic plants and animals, the human genome, gene therapy, fertilization and xenotransplantation.

3. Put the words in the correct order to make the sentences:

1) to isolate/ it is now routine practice/ from the genome of an organism/ a specific DNA fragment

2) to describe/ there are several terms/ the genetic engineering technology/ that can be used

3) is of value/ there are many/ in which genetic manipulation/ scientific areas

4) from the genome/ the basis of genetic manipulation/ the ability to isolate/ is/ a single DNA sequence/

5) of organisms/ additional developments in the cloning/ raise further questions

4. Translate the following sentences paying attention to

the words ***in italics.***

1) *Появление трансгенных* овощей на российском рынке вызвало массу критики.

2) *Новая* идея использования *стволовых клеток* может спасти *человечество* от преждевременного старения.

3) *Злоупотребление* генетически модифицированными продуктами может свести на нет все *достижения* науки.

4) *Усиление* генов может быть достигнуто за счет использования соответствующих вирусных векторов и клеток-реципиентов.

5) *Технология рекомбинантной ДНК* подразумевает объединение молекул ДНК двух разных видов, которые вводятся в *клетку-хозяин* для производства новых генетических комбинаций.

6) *Диапазон и сложность* экспериментов во многом зависят от квалификации исследователя

7) В наши дни *установление отцовства* происходит в судебном порядке.

8) *Принимая во внимание выгоды* биотехнологических исследований, все больше студентов поступает на биологические направления обучения.

5. Answer the questions based on the information in the text.

1) What does progress in any scientific discipline depend on?

2) When did genetic engineering approximately appear?

3) What applications is the genetic technology used in?

4) Are there any other terms meaning *genetic*

engineering? What are they?

5) Are the basic principles of genetic manipulation simple or sophisticated?

6) What is the premise of the genetic technology?

7) What are the areas where genetic manipulation is of value?

8) What are the four steps of gene cloning?

9) What is the questionable aspect of the new genetics?

10) Who is concerned about the use of transgenic plants and animals, gene therapy, etc.?

6. According to the text, there are areas in which genetic manipulation is necessary. Name them and say how the technique can be used in these areas.

7. Read the text again and say if the following statements are true or false. Correct them if necessary.

1) Progress in any scientific discipline doesn't depend on the availability of techniques and methods that may be performed.

2) It is not routine practice to isolate a specific DNA fragment from the genome of an organism.

3) The technology can be used for paternity disputes.

4) The term genetic engineering can't be recognized by the majority of people.

5) The basic principles of genetic manipulation are rather simple.

6) Genetic information is a resource that can be changed in various ways to achieve certain goals.

7) There are no areas in which genetic manipulation is of value.

8) The mainstay of genetic manipulation is the ability to inject a single DNA sequence to the genome

9) There are no questionable aspects in the new genetics.

10) Genetic engineering technology will never become sophisticated.

11) In vitro fertilization and xenotransplantation raise debates.

12) No one knows if we can use genetic engineering for the benefit of mankind.

8. Make a plan of this text. Add the key-words in it.

9. Retell this text using your plan.

10. Remember the forms of ***the Infinitive*** *and how to use them. Open the brackets and choose the Infinitive in the Active or Passive Voice. Insert* ***to*** *where necessary.*

1) They are glad (invite/ be invited) to the conference. 2) I don't like (interrupt/ be interrupted). 3) He will be happy (see/ be seen) you. 4) I was glad (meet/ be met) in the hall. 5) Students like (tell/ be told) life stories and always (listen/ be listened) to them with interest. 6) I did not think (interrupt/ be interrupted) you. 7) He is glad (send/ be sent) abroad. 8) He likes (ask/ be asked) his professor.9) He does not like (ask/ be asked) questions because he does not know how to answer them. 10) Look, a smoke from the lab can (see/ be seen) in the distance! Can you (see/ be seen) it?

11. Remember ***the Complex Object structure****. Open the brackets and use the Complex Object where necessary.*

Example: He expected (they, arrive) at 5. — He

expected them to arrive at 5.

1) Do you want (they, stay) at the hotel or with us? 2. I'd like (the professor, look through) my report. 3) Do you want (I, show) you the basic principles of the experiment? 4) We expect (he, arrange) everything by the time we come. 5) I want (she, tell) me the news in brief. 6) He expected (the meeting, hold) in the conference hall. 7) I would like (they, make) an appointment for me for Tuesday. 8) We want (she, introduce) us to the president. 9) I don't want (they, be late) for dinner. 10) He expected (she, invite) to the Annual Researchers' Event by the Smiths. 11) I want (the experiment, finish) by Saturday.

12. Translate into English using the Complex Object.

1) Я не ожидал, что этот ученый будет таким невежливым человеком. 2) Мы бы хотели, чтобы вы доставили оборудование к концу июня. 3) Я ожидал, что ее пригласят туда. 4) Они не ожидали, что его спросят об этом. 5) Я слышал, как его имя несколько раз упоминалось на собрании. 6) Он не заметил, как мы подошли к нему. 7) Вы видели, как студенты над чем-то смеялись? 8) Мы не ожидали, что об этом исследовании объявят по радио. 9) Мне бы хотелось, чтобы она сказала нам, что она будет делать сегодня вечером. 10) Я думаю, что сегодня вы услышите, как она читает лекции.

*13. Study the **Complex Subject**. Open the brackets and use the Complex Subject structure.*

Example: He is thought (study) now. — He is thought to be studying now.

1) He is considered (be) a good scientist. 2) They are thought (go away) some days ago. 3) James is expected (make) a report next Wednesday. 4) Steve is known (help) them to solve a problem when they were in trouble. 5) Nobel is known (discover) dynamite. 6) This course work is considered (be) the worst of the year. 7) She is supposed (work) in the laboratory from 2 to 6 p.m. tomorrow. 8) They are known (make) a new discovery a month ago. 9) He is expected (manage) the business himself. 10) He is said (be) at the lab now.

14. Translate into English using the ***Complex Subject.***

1) Стивен обязательно закончит это исследование. 2) Известно, что Марк Антонович уехал в Осло. 3) Предполагают, что ректор университета выступит на конференции. 4) Эту работу считают самой интересной. 5) Кажется, она готовит новый препарат. 6) Боб, наверное, нам поможет. — Он наверняка нам поможет. 7) Полагают, что они уехали вчера. 8) По-видимому, переговоры закончатся завтра. 9) Полагают, что эта работа была выполнена успешно. 10) Вряд ли этот факт имеет большое значение. 11) Это, вероятно, случится, если ветер не переменится. 12) Говорят, что делегаты на конференцию уже приехали. 13) Известно, что этот комитет был создан несколько лет тому назад. 14) Он, по-видимому, пишет новую книгу. 15) Предполагают, что они смогут решить этот вопрос тотчас же.

15. Genetically modified foods are a touchy topic. Cloned cows or pigs haven't been approved for public consumption, obviously, but pest-resistant corn can cause its

fair share of controversy. How much do you know about genetically modified foods? Complete the test to check yourself.

1. When were the first genetically modified foods available in the United States?

a) 1970s

b) 1980s

c) 1990s

2. What was the first genetically modified food to be sold commercially?

a) corn

b) tomato

c) potato

3. What is triple-stack corn?

a) corn that has three times the kernels of regular corn

b) corn that has been genetically modified to have extra vitamin C

c) corn that has built-in insect and weed control

4. What nutrient is golden rice packed with?

a) vitamin A

b) vitamin B

c) vitamin C

5. Researchers have produced genetically engineered pigs whose meat has elevated levels of what?

a) omega-3 fatty acids

b) protein

c) antioxidants

6. What is the most commonly genetically modified crop in the United States?

a) soybeans

b) corn

c) apples

7. According to the USDA, what percentage of the soybeans grown in the United States is genetically modified?

a) 74 percent

b) 89 percent

c) 98 percent

8. How many genetically engineered food crops have been approved by the USDA?

a) About 15

b) About 25

c) About 40

9. Choose one of the ways cheese can be genetically engineered?

a) It can be made "vegetarian."

b) It can be mold-resistant.

c) It can have 20 percent extra protein.

10. In 2008, a large group of investors led a protest against what genetically engineered crop?

a) sugar beets

b) lettuce

c) broccoli

If you are not sure, check the answers at the end of this unit.

16. Read and translate the text about genetically modified food.

GM Food

One of the best-known and controversial applications of genetic engineering is the creation of genetically modified food. There are three generations of genetically modified crops. First generation crops have been commercialized and most provide protection from insects and/or resistance to herbicides. There are also fungal and virus resistant crops developed or in development. They have been developed to make the insect and weed management of crops easier and can indirectly increase crop yield.

The second generation of genetically modified crops being developed aim to directly improve yield by improving salt, cold or drought tolerance and to increase the nutritional value of the crops.

The third generation consists of pharmaceutical crops, crops that contain edible vaccines and other drugs. Some agriculturally important animals have been genetically modified with growth hormones to increase their size while others have been engineered to express drugs and other

proteins in their milk.

The genetic engineering of agricultural crops can increase the growth rates and resistance to different diseases caused by pathogens and parasites. These modified crops would also reduce the usage of chemicals, such as fertilizers and pesticides, and therefore decrease the frequency of the damages produced by chemical pollution.

Ethical and safety concerns have been raised around the use of genetically modified food. A major safety concern relates to the human health implications of eating genetically modified food, in particular whether toxic or allergic reactions could occur. Gene flow into related non-transgenic crops, off target effects on beneficial organisms and the impact on biodiversity are important environmental issues. Ethical concerns involve religious issues, corporate control of the food supply, intellectual property rights and the level of labeling needed on genetically modified products.

16. Expand this text with your knowledge about genetically modified food. Search the Internet and find some information about new GM findings. Present it to your class.

17. Read the questions below and be ready to give full answers and discuss them with your group mates.

1) Do you think GM food is safe to eat?

2) How do you think scientists can be sure about the safety of GM food when they've had so few years to test it?

3) Do you think growing GM crops will change the environment?

4) Would you be happy buying apples the size of melons?

5) What do you think of 'eco-terrorists' who cut down fields of GM crops?

6) If GM crops are resistant to pests and those pests become extinct, do you think this could seriously harm the food chain?

7) Do you think it's important to label food as containing GM crops and why?

8) What do you think of calorie-free GM junk food?

18. Read and translate the text.

Генетически модифицированные организмы создаются методами генной инженерии - науки, которая позволяет вводить в геном растения, животного или микроорганизма фрагмент ДНК из любого другого организма с целью придания ему определенных свойств. Например, томаты получили ген морозоустойчивости от арктической камбалы, картофель получил ген бактерии, чей яд смертелен для колорадского жука, рис получил ген человека, отвечающий за состав женского молока, который делает злак более питательным.

Экспериментальное создание генетически модифицированных организмов началось еще в 70-е годы XX века. С этого времени производство ГМП набирало обороты и сейчас мы можем встретить ГМ сою, кукурузу, рис, картофель, помидоры, рапс, сахарную свеклу, пшеницу, горох, подсолнечник, папайю, хлопок,

табак, коров с повышенной жирностью молока, лосося, который может жить как в соленой, так и в пресной воде и многих других организмов.

Неконтролируемое потребление генетически модифицированных продуктов может иметь непредсказуемые последствия в будущем. Чтобы полностью понять все риски употребления в пищу трансгенных продуктов, должно пройти несколько десятков лет и смениться несколько поколений, питавшихся ГМП.

Но нельзя говорить со стопроцентной уверенностью о вреде всех трансгенных продуктов. И в природе существуют организмы, непригодные в пищу для человека (ядовитые и мутагенные). Человек сам вправе выбирать, как жить и чем питаться. Главное, чтобы этот выбор был осознанным и основывался на научно доказанных фактах, а не на слухах.

19. Create the project "Genetically modified food". Choose the product you want to create and qualities you can give to your GM product. What are they? Where can you take them from? Make a poster about your product and talk through the process you follow to create such unique GM product.

20. Write a 'for-and against' essay underlining pros and cons of GM food.

**The answers to the test in ex.15*

1. The GMO movement kicked off in the '90s with

an engineered vegetable called the Flavr Savr.

2. The Flavr Savr was a rot-resistant tomato. First sold in 1994, it wasn't profitable and was on the market for only a few years.

3. Triple-stack corn has been genetically implanted with weed and insect control. It's one of the best-selling corn seeds in the United States.

4. Golden rice, which was introduced in 2000, is fortified with vitamin A. In 2005, another version came out with extra beta carotene. Neither of these products has hit the market yet, though.

5. The transgenic pigs that produce omega-3 fatty acids have not yet been approved for human consumption

6. Soybeans, which are modified to be resistant to herbicides, are the most commonly modified crop in the U.S.

7. In 2006, 89 percent of American soybeans were genetically modified, the highest percentage of any crop.

8. The USDA has approved more than 40 transgenic crops for sale in the United States.

9. Chymosin, the main enzyme in rennet, is usually extracted from animals. But now it can be genetically engineered, so the cheese is technically vegetarian.

10. The Interfaith Center on Corporate Responsibility initiated a campaign against genetically modified sugar beets, which would produce the sugar in thousands of popular foods. In September 2009, a federal court ruled against the sugar beets.

Unit 16

Cloning

Do you agree or disagree with the following statements? Why?

- People will someday be cloned for spare body parts.
- Cloning is a dangerous technology that should be illegal.
- Cloning of endangered animals will someday be an important science.
- If my pet died, I would want to clone him.
- When I die, I want to be cloned.

1. Read and translate the text about cloning.

Cloning and concerns about it

In biology, cloning is the process of producing similar populations of genetically identical individuals that occurs in nature when organisms such as bacteria, insects or plants reproduce asexually. Cloning in biotechnology refers to processes used to create copies of DNA fragments (molecular cloning), cells (cell cloning), or organisms.

Molecular cloning refers to the process of making multiple molecules. It is used in a wide array of biological experiments and practical applications ranging from genetic fingerprinting to large scale protein production.

Cloning of any DNA fragment essentially involves four steps. First is fragmentation - breaking apart a strand of DNA; second is ligation - gluing together pieces of DNA in a desired sequence; third is transfection - inserting the newly formed pieces of DNA into cells and the last is screening or selection - selecting out the cells that were successfully transfected with the new DNA. To clone a cell means to derive a population of cells from a single cell. In the case of unicellular organisms such as bacteria and yeast, this process is remarkably simple and essentially only requires the inoculation of the appropriate medium. However, in the case of cell cultures from multicellular organisms, cell cloning is an arduous task as these cells will not readily grow in standard media.

Organism cloning (also called reproductive cloning) refers to the procedure of creating a new multicellular organism, genetically identical to another. In essence this form of cloning is an asexual method of reproduction, where fertilization or inter-gamete contact does not take place. Asexual reproduction is a naturally occurring phenomenon in many species, including most plants (vegetative reproduction) and some insects. Scientists have made some major achievements with cloning, including the asexual reproduction of sheep and cows.

There is a lot of ethical debate over whether or not cloning should be used. However, in the United States, the human consumption of meat and other products from cloned animals was approved by the FDA (The Food and Drug Administration) on December 28, 2006, with no special labeling required. Cloned beef and other products have since been regularly consumed in the US without distinction.

Because of recent technological advancements, cloning of animals (and potentially humans) has been an issue. The Catholic Church and many religious organizations oppose all forms of cloning, on the grounds that life begins at conception. They concern about the protection of the identity of the individual and the right to protect one's genetic identity.

Another concern is that the biotechnologies used on animals may someday be used on humans. Researchers have found several abnormalities in cloned organisms, particularly in mice. The cloned organism may be born normal and resemble its non-cloned counterpart, but majority of the time will express changes in its genome later on in life. The concern with cloning humans is that the changes in genomes may not only result in changes in appearance, but in psychological and personality changes as well. The theory behind this is that the biological blueprint of the genes is the same in cloned animals as it is in normal ones, but they are read and expressed incorrectly. Results of these abnormally expressed genes in the cloned mice were premature death, pneumonia, liver failure and obesity.

Vocabulary

asexual reproduction
biological blueprint
break apart (v)
concern (n)
consumption (n)
counterpart (n)
derive (v)
fertilization (n)
fragment (v)
fragmentation (n)
genetic fingerprinting
glue (v)
identical (adj)
inoculation (n)
insert (v)
inter-gamete contact

large scale
ligation (n)
multicellular organism
non-coding sequence
occur (v)
oppose (v)
premature (adj)
protect (v)
randomly
resemble (v)
result (v)
strand (n)
transfect (v)
transfection (n)
unicellular organism

2. Translate into English.

1) Возможно, в будущем клонирование человека будет происходить в *больших масштабах*.

2) *Клонирование* широко распространено в природе у различных организмов.

3) Молекулярное клонирование занимается молекулами ДНК, их *фрагментами* и даже отдельными генами.

4) Принимай это лекарство регулярно, оно *защитит* тебя от рецидива болезни.

5) По мере того как *молекулярная цепь* удлиняется, меняются и свойства веществ, состоящих из этих молекул.

6) *Бесполое размножение* защищает организм от введения другой биологической программы.

7) Фрагменты ДНК будут разрезаны в *случайных местах*.

8) ДНК представляет собой несколько *цепочек*, состоящих из нуклеотидов.

9) Маша не просто *похожа на* маму, она вообще ее копия!

10) Во время *трансфекции* генетическая

информация переносится в эукариотические клетки с помощью очищенной ДНК.

3. Fill in the blank spaces in these sentences based on the text above:

1) Cloning in biotechnology refers to processes used to create copies of _____, _____, or _____.

2) Cloning is commonly used to amplify DNA fragments containing whole_____.

3) In the case of unicellular organisms such as bacteria and yeast, this process is remarkably simple and essentially only requires _____of the appropriate medium.

4) Organism cloning refers to the procedure of creating a new_____, genetically identical to another.

5) _____is a naturally occurring phenomenon in many species, including most plants and some insects.

6) Researchers have found several abnormalities in_____, particularly in mice.

4. Make sentences in Russian with the words from the vocabulary and exchange sentences with your partner to translate them into English.

5. Put these ideas in order as they appear in the text.

- Religious organizations oppose cloning
- There are 3 types of cloning
- Diseases caused by cloning
- Cloning produces similar populations or identical individuals
- Organism cloning creates new multicellular organism asexually

- Multiple molecules can be made by molecular cloning
- Cloned meat have been consumed in the US without distinction
- Cell cloning derives a population of cells from a single cell

6. Make 10 questions covering the content of the text.

7. Retell this text from the point of view of:

- Scientist
- Cloned meat producer
- Religious official

Add your reasons pro or contra cloning.

8. Read interesting facts about cloning, discuss them and find your own ones.

Did you know…?

✓ Dolly the cloned sheep was named after country singer Dolly Parton, because she started life as a mammary cell.

✓ We leave our DNA around all the time, everywhere: on the door, on the table, on the keyboard… For the moment we couldn't clone from it, but hey, perhaps later we may be able to clone you from the tiny bits of DNA you leave about!

✓ Humans have far fewer genes than expected at 35,000 to 42,000, compared to the nematode worm with 18,000 and the fruit fly with 13,000. However, scientists say we may still have more – we don't know the whole genome set yet and we may have missed some genes.

✓ The difference between humans and fruit flies or worms is that human genes work differently, are capable of multitasking, and we have more control genes.

✓ Most mutations occur in males.

✓ In each of our cells, there are six feet of DNA packed into a chromosome only 0.0004 inches across.

✓ Lining up all of the DNA in the human body, it would reach to the sun and back more than 600 times.

✓ The information would fill 200 500-page telephone directories.

✓ Our DNA is 99.9% identical to all other members of the human race.

9. Talk with your partner about cloning the people/ animals listed below. What are the pros and cons of each category? Swap partners and share your ideas.

- dogs to sniff out drugs at airports
- yourself
- super-intelligent scientists
- expert soldiers
- cows that produce lots of milk
- world class sports stars
- very kind voluntary workers
- endangered species
-

10. Remember ***the Conditional sentences****. Open the brackets in the sentences making all necessary changes. Translate these sentences into Russian.*

Example*:* If he (come) tomorrow, he will help us. — If

he comes tomorrow, he will help us.

1) If you (put) salt on ice, it will melt. 2) If she (service) the equipment, we will finish our research. 3) Unless he (do) his homework, he will stay at home. 4) If you met the well-known scientist, what you (do)? 5) If he (live) nearer, he would come to the lab earlier. 6) Where you (go) if you were on holiday? 7) She had noticed this mistake if she (be) more attentive. 8) If we (know) that you were there, we would have called you. 9) If I had known of your research, I (join) you. 10) Nobody told me about your trouble. I would have helped you if I (know) about it. 11) Unless I had finished the Faculty of Biology, I (become) a lab assistant.

11. Translate these sentences into English.

1) Ты бы расстроился, если бы я не пришел? 2) Будь он осторожнее, он бы не пролил кислоту. 3) Если бы он не приехал на машине встретить нас, нам бы самим пришлось нести все оборудование. 4) Ты бы стала работать в этом исследовательском центре, если бы он тебя пригласил? 5) Мы бы работали сегодня в виварии, если бы вы позвонили вчера вечером. 6) Если бы он мог дать положительный ответ, он бы давно начал свой проект. 7) Я бы на твоем месте не стал бы поднимать такой шум. 8) Если бы ты принял его предложение, ты бы давно работал в хорошей фирме. 9) Будь я на вашем месте, я бы пошел пораньше, чтобы застать научного руководителя. 10) Если бы он проводил электрофорез осторожнее, никакой аварии бы не произошло.

12. Read and translate this text.

Human cloning

Human cloning is the creation of a genetically identical copy of an existing or previously existing human. There are two commonly discussed types of human cloning: therapeutic cloning and reproductive cloning. Therapeutic cloning involves cloning cells from an adult for use in medicine and is an active area of research. Reproductive cloning would involve making cloned human beings. Such reproductive cloning has not been performed and is illegal in many countries. A third type of cloning called replacement cloning. It is a theoretical possibility, and would be a combination of therapeutic and reproductive cloning. Replacement cloning would entail the replacement of an extensively damaged, failed, or failing body through cloning followed by whole or partial brain transplant.

Some people and groups oppose therapeutic cloning, but most scientific, governmental and religious organizations oppose reproductive cloning. Many scientific organizations have made public statements suggesting that human reproductive cloning be banned until safety issues are resolved. Serious ethical concerns have

"Went in for a simple blood test and got cloned by mistake."

been raised by the idea that it might be possible in the future to harvest organs from clones. Some people have considered the idea of growing organs separately from a human organism - in doing this, a new organ supply could be established without the moral implications of harvesting them from humans.

The first human hybrid human clone was created in November 1998, by American Cell Technologies. It was created from a man's leg cell and a cow's egg, which DNA was removed. It was destroyed after 12 days.

On January, 2008, Wood and Andrew French, Stemagen's chief scientific officer in California, announced that they successfully created the first 5 mature human embryos using DNA from adult skin cells, aiming to provide a source of viable embryonic stem cells. It is not clear if the embryos produced would have been capable of further development, but Dr. Wood stated that if that were possible, using the technology for reproductive cloning would be both unethical and illegal. Thus, the 5 cloned embryos were destroyed.

13. Write the summary of the text in about 10 sentences. Orally enlarge it with your own information about cloning.

14. Talk about the following questions in pairs/groups. Remember to support your answers!

1) In your opinion will reproductive cloning be legal in future?

2) Grandpa just died. Would you consider cloning him? Why/ not?

3) What do you think will happen in 10 years' time with regards to cloning? 25 years? 100 years?

4) What do you think about the whole business of cloning? Will it be possible and profitable in future?

5) Would you like to have a cloned version of yourself? For spare body part or just to have a brother/ friend?

13. Write a magazine article about two people –a human and his clone. Include imaginary interviews with them.

Optional activity: interview two (three) clones.

15. Translate the text into English word-by-word. You can use a dictionary if necessary.

Проблема клонирования связана с потенциальными рисками для здоровья будущего клона, в частности, возможность его преждевременного старения. Известный ученый Алексей Оловников еще в 1971 году обратил внимание на проблему укорачивания хромосом в клетках в результате делений. Ученый предположил, что укорачивание хромосом не может идти вечно – в какой-то момент клетка состарится и потеряет способность делиться. Но почему наши хромосомы не короче хромосом наших предков? Оказалось, что на концах хромосом есть специальные участки – теломеры. При удвоении хромосом эти участки действительно укорачиваются, однако специальный фермент – теломераза, активный в некоторых клетках (например, в стволовых), может достраивать теломеры до исходного размера. Получается, что при наличии фермента

теломеразы клетки способны делиться без особых ограничений, не «стареть». Отсутствие теломеразы в большинстве клеток является одним из защитных механизмов от неконтролируемого деления, то есть рака.

16. Write a letter to a scientist involved in cloning. Give him three pieces of advice on what he should do to make sure cloning is safe. Ask him three questions about cloning. Read your letter to your group mates. Your group mates will answer your questions.

17. You have a clone. Your clone is 13 years old. Write your diary entry for one day you spent with him/her. Include the conversations you had and the advice you gave him/her.

18. Do we have a right to clone dead people? What if they didn't want to be cloned? Make a report/ essay on this topic.

19. Study the example of the official letter. Make a conclusion about the rules of letter writing.

Nikolay Petrov
34 Pushkinskayast., Apt.16
Izhevsk 426000
Udmurtia, Russia

25 April, 2009

Malcolm Anderson, ScD
25 North Road, Apt. 5

London W2 4RH
England

Dear Mr. Anderson,

The purpose of this letter is to follow up on the discussion we had in your office last week. This letter details the steps we discussed to make your project a reality.

Since my letter of December 10, there has been a number of changing circumstances that necessitate different approach is used to develop the project. Would it be possible to meet you either in Moscow or St. Petersburg to discuss this further?

I look forward to working with you on this project.

Sincerely yours,

Petrov Nikolay.

20. Write your own formal (official) letter.

On July, 10 you discussed and made a draft of a document about the problems of cloning ethics with your colleague David Bellmore from Brookline University. Since that time you have made some corrections and changes in the document. Inform your colleague about them and suggest the date of new meeting.

21. Role Play Game. You are in 2102 on the debates "Should we legalize cloning?" Choose a role for yourself and prepare to speak from the part of it.

A person who has a clone: I like my clone because he is both my friend and a guarantee against serious diseases. Moreover,…

His clone: I like my counterpart because…

An unsatisfied clone: I want to be a human because…

A doctor: Clones may have constant pain and suffering. They grow quicker, so…

A psychologist: Clones may have psychological problems, for example, the absence of parent can cause depression…

A priest: Life begins at conception…

A person who wants to have a clone because…

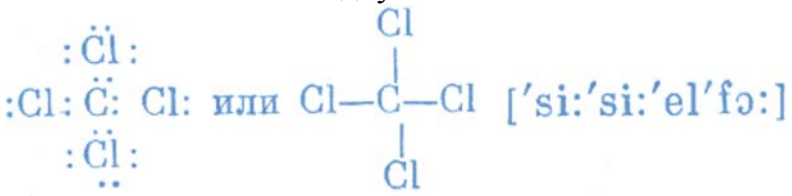
A businessman: It's great business now because…

Appendix 1

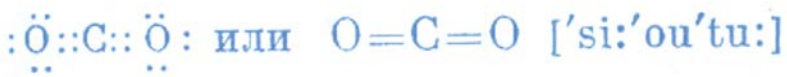
How to read chemical formulae and elements

H - [eiʧ]
Cu - [si: ju:]
H2O - [eiʧ tu: ou]
HCl — [eiʧ si: el]
HBr — [eiʧ bi: a:]
H2SO4 — [eiʧ tu: es ou fɔ:]
CF4 — [si: ef fɔ:]
Cu2O — [si: ju: tu: ou]
H^+- hydrogen ion / univalent positive hydrogen ion
Cu^{++}- divalent positive cuprum ion
Al^{+++} - trivalent positive aluminium ion
Cl^- - negative chlorine ion / negative univalent chlorine ion

Знак **–** или **:** обозначает одну связь и не читается:



Знак **=** или **: :** обозначает две связи и так же не читается:



“+” – plus/ and/ together with
“=” – give/ form
“→” – give/ pass over to/ lead to
“⇆ ” – forms/ is formed from

Ag	argentum	серебро
Al	aluminium	алюминий
Ar	argon	аргон
As	arsenic	мышьяк
Au	aurum	золото
B	boron	бор
Ba	barium	барий
Be	beryllium	бериллий
Bi	bismuth	висмут
Br	boromine	бром
C	carbon	углерод
Ca	calcium	кальций
Ce	cerium	церий
Cd	cadmium	кадмий
Cl	chlorine	хлор
Co	cobalt	кобальт
Cr	chromium	хром
Cs	caesium	цезий
Cu	copper	медь
F	fluorine	фтор
Fe	ferrum	железо
Ga	gallium	галлий
Ge	germanium	германий
H	hydrogen	водород
He	helium	гелий
Hg	hydrargyrum	ртуть
I	iodine	йод
Ir	iridium	иридий
K	kalium	калий
Li	lithium	литий

Mg	magnesium	магний
Mn	manganese	марганец
Mo	molybdenum	молибден
N	nitrogen	азот
Na	natrium	натрий
Ne	neon	неон
Ni	nickel	никель
O	oxygen	кислород
P	phosphorus	фосфор
Pb	plumbum	свинец
Pt	platnum	платина
Pu	plutonium	плутоний
Ra	radium	радий
Rb	rubidium	рубидий
S	sulphur	сера
Sb	antimony	сурьма
Sc	scandium	скандий
Se	selenium	селен
Si	silicone	кремний
Sn	stannum	олово
Sr	strotium	стронций
Te	tellurium	теллур
Th	thorium	торий
Ti	Titanium	титан
U	uranium	уран
W	wolfram	вольфрам
Zn	zinc	цинк
Zr	ziroconium	цирконий

Appendix 2

1. Устойчивость к антибиотику перешла на людей и распространяется с "шокирующей" скоростью

"Ученые обнаружили, что за 10 лет устойчивость к "антибиотику последней надежды" перекинулась с одной-единственной свинофермы в Китае на пациентов-людей на пяти континентах", - сообщает журналист The Times Оливер Муди, опираясь на публикацию в научном журнале Nature Communications.

Ранее, столкнувшись с проблемой устойчивости к лекарствам, врачи поневоле "вернули в строй" старый антибиотик колистин, хотя он может вызвать острое токсическое поражение почек. В наше время колистин применяется как "препарат последней надежды", особенно при легочных инфекциях.

"Однако в 2015 году сотрудники управления здравоохранения Англии обнаружили признаки устойчивости к колистину в трех пробах со свиноферм и еще в 12 пробах пациентов-людей в Великобритании", - сообщает издание.

Проанализировав 451 образец бактерий из 31 страны, ученые заключили, что ген mcr-1, укрепляющий защиту бактерий от колистина, ведет свой род от одного микроба, который, по всей вероятности, появился в китайской свиноводческой отрасли примерно в 2005 году. Сегодня этот ген находят в воде у бразильских пляжей, а также в больницах от Южной Африки и

Саудовской Аравии до Германии и Вьетнама, говорится в статье.

"Скорость, с которой mcr-1 распространился в глобальном масштабе, и впрямь поражает", - сказал руководитель исследования Франсуа Баллу (Университетский колледж, Лондон). Он добавил, что еще сильнее обеспокоен распространением элементов вирулентности, облегчающих инфекционное заражение.

2. Мы приближаемся к биологическим лимитам рода людского

Не стихают ожесточенные споры о наших способностях. Их цели и задачи очень важны: продолжает ли человек прогрессировать, беспрестанно раздвигая границы своих возможностей, или он их уже большей частью достиг? - задумываются ученые из Французского национального института спорта и физической культуры (INSEP) Адриан Марк и Жан-Франсуа Туссен на портале Slate.fr.

Станем ли мы в будущем более высокими? Более сильными? Будем ли жить дольше?

Происходит столкновение двух концепций. Первая укоренилась в XIX веке и обещает вечный прогресс, продолжая традиции поисков "усовершенствованного человека". В ней представлен человек, преодолевающий все свои ограничения, превосходящий свое собственное определение и даже развлекающийся созданием себя с нуля. Вторая концепция основана на установлении биологических, физических и экологических данных и предполагает ограниченный прогресс. Она доказывает,

что рост не может быть бесконечным, поясняют авторы статьи.

Анализируя исторические тенденции по трем основным показателям - мировые рекорды (максимальные физиологические достижения), рост взрослого человека и максимальная продолжительность жизни - на основе данных за последние 20 лет, мы показываем установление верхнего предела, достигнутого биологическими лимитами рода людского, пишут ученые.

Человек обусловливается двумя факторами: своей прошлой эволюцией и своим настоящим окружением. Их сочетание создает телесные структуры и образ жизни, наделенные определенными лимитами, говорится в статье.

Энергетические, технологические, медицинские, политические и социальные достижения XX века позволили человеку достичь высокого потенциала: он стал выше ростом, более атлетически сложенным и живет дольше. С 1896 по 1997 год, когда умерла Жанна Сальме, максимальная продолжительность жизни выросла со 110 до 122 лет. За тот же период средний рост взрослого человека увеличился на 8 см во всех странах мира, в то время как спортивные достижения постоянно били все рекорды (от 11 секунд до 9,58 секунды для бега на 100 метров), передают авторы.

Однако новейшие тенденции позволяют предположить наличие довольно узких пределов для нашего будущего прогресса. За два десятилетия никто не приблизился к максимуму долголетия, и последние

данные показывают значения между 115 и 120 годами, продолжают ученые.

Все более интенсивная человеческая деятельность на планете с конечными ресурсами начинает генерировать эффекты, вредные для нашего здоровья и образа жизни: глобальное потепление, снижение биологического разнообразия, недостаток ресурсов, а также окисление и повышение уровня Мирового океана могут стать лишь прелюдией. Нестабильность, порожденная этими потрясениями, уже ясно ощущается: уменьшение роста людей в странах, затронутых голодными бунтами (Египет), снижение средней продолжительности жизни для определенных групп (евроамериканские женщины в США, мужчины в России), малоподвижный образ жизни и снижение физической выносливости детей в большинстве развитых стран, отмечают Марк и Туссен.

Будущее за теми мужчинами и женщинами, которые, осознавая все опасности, будут способны принять предложения по снижению воздействия на окружающую среду, при этом поддерживая свое здоровье, долголетие и оптимизированные человеческие возможности. Во избежание непонимания наших сограждан или слишком быстрого отказа от предложенных решений, политики уже сейчас должны включить в свои программы эти цели и задачи, считают ученые.

3. Соцсети, сахар - западные пристрастия к дофамину

По мнению американского врача Роберта Ластига, профессора Калифорнийского университета, автора книг "Взлом американского сознания" и "Сахар, горькая правда", погоня за удовольствием, основанная на дофамине, является врагом счастья, которое зависит от серотонина. Интервью с экспертом записал журналист Le Monde Стефан Фукар.

"Счастье и удовольствие на самом деле не идентичны. Это различные, очень непохожие явления, и если мы этого не ощущаем, то главным образом потому, что индустрия продает свои товары или услуги, выдавая одно за другое. Я насчитал 7 существенных отличий между счастьем и удовольствием, легко понятных каждому", - сказал Ластиг.

"Удовольствие краткосрочно, счастье долгосрочно; удовольствие интуитивно, счастье духовно; удовольствия достигаешь, когда берешь, счастья - скорее, когда отдаешь; удовольствие можно получить в одиночку, счастье, как правило, достигается внутри социальной группы; удовольствие может достигаться благодаря различным веществам, а счастье - совсем другое дело. Высшее удовольствие может привести к зависимости - например, алкогольной, кокаиновой, никотиновой и в основном к поведению, способствующему добыванию немедленного удовольствия - это использование соцсетей или видеоигр, шопинг, игра, порнография... Для всего этого существует та или иная форма зависимости, однако

это не имеет ничего общего с зависимостью от счастья", - поясняет он.

"Наконец, седьмое и последнее отличие в том, что удовольствие и счастье зависят от двух различных нейромедиаторов: дофамина для удовольствия и серотонина для счастья. Удовольствие и счастье локализованы в двух различных отделах головного мозга, мобилизуют два различных принципа действия и два разных типа рецепторов", - продолжает эксперт.

"Дофамин - исключительно "возбуждающий" нейромедиатор. Конечно, нейроны созданы для того, чтобы быть раздраженными - и, кстати, для этого у них есть рецепторы! Но и им нравится, когда их приятно щекочут, а не обращаются с ними грубо: когда возбуждающий нейромедиатор поставляется в больших хронических дозах, он становится нейротоксическим", - утверждает Ластиг.

"И как следствие, чтобы произвести тот же эффект, необходимо большее количество нейромедиаторов. Это универсальный механизм, называемый "толерантность", свойственный многим типам клеток, не только нейронам. В конкретном случае с дофамином, в человеческих категориях это означает, что все время необходимо больше того, что доставляет удовольствие, для достижения того же удовлетворения. Для получения того же воздействия требуется все больше и больше усилий. Таким образом, интенсивное и хроническое удовольствие приводит к зависимости", - указывает эксперт.

"Нейромедиатор, вовлеченный в ощущение полноты и удовлетворенности, серотонин, функционирует гораздо сложнее, чем дофамин", - отмечает Ластиг.

"Речь идет о потенциальном биохимическом антагонизме между дофамином и серотонином", - продолжает он.

"Существуют пути потенциального снижения серотонина. Например, когда вы находитесь в социальном взаимодействии с кем-то, обмен взглядами с этим человеком активизирует ваши так называемые "зеркальные" нейроны - нейроны сопереживания. Такой тип взаимодействия стимулирует синтез серотонина. Но если это взаимодействие происходит посредством такой социальной сети, как Facebook, с помощью "лайков", например, то оно активизирует контур поощрения, однако отсутствие визуального контакта оставляет зеркальные нейроны бесчувственными... Отсюда потенциальное снижение уровня серотонина и меньшая способность к удовлетворенности", - считает собеседник издания.

"В случае хронического стресса, связанного с вездесущностью отдельных технологий, в частности, телефона, стресс проявляется высвобождением гормона кортизола", - поясняет врач.

"В стрессовой ситуации вы больше склонны поддаваться искушению удовольствия и более уязвимы для зависимости. Все же будьте осторожны: зависимость и депрессия не одно и то же", - указывает Ластиг.

"Кроме того, эксперименты с животными продемонстрировали, что уровень кортизола снижается, когда происходит восхождение по иерархической лестнице внутри группы. Чем ниже иерархический уровень, на котором вы находитесь, тем более вы подвержены стрессу. Исследования показывают, что у шимпанзе, которым дали возможность самим

присваивать себе кокаин, иерархически низшие особи становились явно более зависимыми, чем "альфа-самцы", - описывает ученый.

"Подобные показатели обнаруживаются и среди людей: как правило, самые бедные больше всего страдают от хронических болезней, связанных с пищевой зависимостью (тучность, диабет 2-го типа). Хронический стресс и дофамин: вот что сильнее всего изменило современное общество за последние сорок лет", - уверен Ластиг.

4. Устойчивость к антибиотику перешла на людей и распространяется с "шокирующей" скоростью

"Ученые обнаружили, что за 10 лет устойчивость к "антибиотику последней надежды" перекинулась с одной-единственной свинофермы в Китае на пациентов-людей на пяти континентах", - сообщает журналист The Times Оливер Муди, опираясь на публикацию в научном журнале Nature Communications.

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"Однако в 2015 году сотрудники управления здравоохранения Англии обнаружили признаки устойчивости к колистину в трех пробах со свиноферм и

еще в 12 пробах пациентов-людей в Великобритании", - сообщает издание.

Проанализировав 451 образец бактерий из 31 страны, ученые заключили, что ген mcr-1, укрепляющий защиту бактерий от колистина, ведет свой род от одного микроба, который, по всей вероятности, появился в китайской свиноводческой отрасли примерно в 2005 году. Сегодня этот ген находят в воде у бразильских пляжей, а также в больницах от Южной Африки и Саудовской Аравии до Германии и Вьетнама, говорится в статье.

"Скорость, с которой mcr-1 распространился в глобальном масштабе, и впрямь поражает", - сказал руководитель исследования Франсуа Баллу (Университетский колледж, Лондон). Он добавил, что еще сильнее обеспокоен распространением элементов вирулентности, облегчающих инфекционное заражение.

5. Flu could lead to Parkinson's disease, warns study as the killer 'Aussie' and 'Japanese' strains of the virus continue to spread across the UK

The flu outbreak wreaking havoc this winter could cause Parkinson's disease, a study warns as the killer 'Aussie' virus continues to spread.

Scientists have found 'evidence' swine flu, known as H1N1, can lead to the incurable neurodegenerative condition. It is currently active in the UK.

Trials on mice showed the strain, responsible for 300,000 deaths across the world in 2009, leaves sufferers susceptible to toxins known to trigger Parkinson's.

Other strains circulating the UK currently, including H3N2 - known as 'Aussie flu' and B Yamagata - branded 'Japanese flu' - could pose the same threat.

The Thomas Jefferson University study comes amid the rapid spread of flu in the UK, with H1N1 being one of the strains floating around.

The death toll across the home nations is known to have hit 97 - with more fatalities expected in the coming weeks.

The parents of an 18-year-old girl in Scotland, called Bethany Walker, attracted national attention when they revealed their daughter died from the flu last week.

Cases of flu have also soared by 35 per cent, Government figures showed yesterday as officials try to contain the outbreak that is spreading rapidly. Projections claim that the flu will become an epidemic by the end of the month, with the UK being hit by a number of strains simultaneously.

The new study found having been infected with the flu once leaves sufferers prone to the effects of toxins believed to lead to Parkinson's.

Coming down with flu at least once may also worsen the symptoms of the disease in later life, which include tremors, slow movements and stiff muscles.

Lead author Professor Richard Smeyne said: 'This study has provided more evidence to support the idea environmental factors, including influenza, may be involved in Parkinson's disease.

'Even mice who fully recover from H1N1 influenza... are later more susceptible to chemical toxins known to trigger Parkinson's in the lab.

'The H1N1 virus that we studied belongs to the family of type A influenzas, which we are exposed to on a yearly basis.

'Although the work presented here has yet to be replicated in humans, we believe it provides good reason to investigate this relationship further.'

He suggested the seasonal flu vaccine could have significant impact on long-term brain health, if the results prove true on humans.

Professor David Dexter, deputy director of research at Parkinson's UK, welcomed the findings.

He said: 'This study supports anecdotal evidence that major viral infections, such as the flu, can act as a tipping point, or speed up the onset of Parkinson's for those who have the condition but don't yet know they have it.

'This study also shows that a flu injection, for some, may reduce the damage to precious brain cells lost in Parkinson's.

'While a lot of exciting research is happening in this area, we still do not fully understand the causes of Parkinson's.'

Parkinson's disease affects one in 500 people and around 127,000 people in the UK live with the condition. It is believed one million Americans also suffer.

High-profile victims include the actor Michael J Fox, who was diagnosed at the age of only 29, and the late boxing legend Muhammad Ali.

Evidence already exists to suggest bird flu can trigger Parkinson's-like symptoms in mice.

The new study, published in net project journal Parkinson's Disease, looked at H1N1 - which is less lethal.

Researchers found it causes inflammation in the brain and triggers the release of cytokines - a protein released when the body fights an infection.

Studies have repeatedly shown that Parkinson's patients have higher levels of cytokines, while inflammation is widely considered to be a trigger of the disease.

The study also showed that mice infected with the flu had more severe Parkinson's symptoms than those which didn't.

The rocketing number of flu cases in the UK has been put down to a surge in two aggressive subtypes attacking the population simultaneously.

One includes the so-called 'Aussie flu', a strain of influenza A which triggered triple the number of expected cases in Australia during the country's winter.

Experts fear the virulent H3N2 strain, which has now reached the UK, could prove as deadly to humanity as the Hong Kong flu in 1968, which killed one million people.

The other is a strain of influenza B, called Yamagata and dubbed 'Japanese flu', which has been blamed for the majority of cases so far this winter.

Its rapid spread has raised concerns because it is not covered in a vaccine given to the elderly. However, experts claim it is less severe.

Usually, just one subtype, either influenza A or B, is responsible for the majority of cases. It spreads easily in the cold weather.

Public Health England data, released today, showed there were 4,128 confirmed cases of flu in the week ending January 14.

Some 1,785 people were found to have influenza A, 2,278 were shown to have influenza B and a further 65 were unclassified.

This winter's outbreak appears to be 16 times more severe than that of 2015/16 - when just 262 cases of flu had been recorded at the same point.

Australia - whose winter occurs during the British summer - had one of its worst outbreaks on record, with two and a half times the normal number of cases.

Some of the country's A&E units had 'standing room only' after being swamped by more than 100,000 cases of the H3N2 strain.

The elderly with their compromised immune systems are particularly susceptible, and a spike in cases among young children has also been shown.

The flu season in the UK and the rest of the Northern Hemisphere tends to mirror what has happened in Australia and the Southern Hemisphere.

The same strains of the virus will circulate north in time for the British flu season, which typically begins in November and lasts until March.

Flu viruses are constantly changing proteins on their surface to avoid detection by the body's immune system - making it more deadly.

This transformation is called an 'antigenic shift' if it's large enough, and can lead to a pandemic. This was responsible for the swine flu outbreak in 2009.

The Aussie flu is transforming quickly, but not fast enough for experts to describe it as a shift. However, it is slowly building up immunity.

6. Sugar Industry Long Downplayed Potential Harms

The sugar industry funded animal research in the 1960s that looked into the effects of sugar consumption on cardiovascular health — and then buried the data when it suggested that sugar could be harmful, according to newly released historical documents.

The internal industry documents were uncovered by researchers at the University of California, San Francisco, and described in a new report in the journal PLOS Biology on Tuesday. The report's authors say it builds on evidence that the sugar industry has long tried to mislead the public and protect its economic interests by suppressing worrisome research, a tactic used by the tobacco industry.

The documents show that in 1968 a trade group called the Sugar Research Foundation, known today as the Sugar Association, funded a research project on animals to shed light on the connection between sugar and heart health. But when the research pointed to a mechanism by which sugar might promote not only heart disease but also bladder cancer, the industry group ended the study and never published the results.

The sugar industry has long insisted that sugar has no unique role in promoting obesity, diabetes or heart disease, though numerous studies by independent researchers have concluded otherwise. Stanton Glantz, a professor of medicine at U.C.S.F. and an author of the new report, said that even though the newly discovered documents are 50 years old, they are important because they point to a decades-long

strategy to downplay the potential health effects of sugar consumption.

"This is continuing to build the case that the sugar industry has a long history of manipulating science," Dr. Glantz said.

In a statement, the Sugar Association disputed the new report, calling it "a collection of speculations and assumptions about events that happened nearly five decades ago, conducted by a group of researchers and funded by individuals and organizations that are known critics of the sugar industry." The current research was funded mainly by the National Institutes of Health and the Laura and John Arnold Foundation, a private foundation that has given money to support taxes on sugary beverages.

The statement said that sugar "consumed in moderation is part of a balanced lifestyle," and it emphasized that the Sugar Association remained "committed to supporting research to further understand the role sugar plays in consumers' evolving eating habits."

The documents described in the new report are part of a cache of internal sugar industry communications that Cristin E. Kearns, an assistant professor at the U.C.S.F. School of Dentistry, discovered in recent years at library archives at several universities.

Last year, an article in The New York Times highlighted some of the previous documents that Dr. Kearns had uncovered, which showed that the sugar industry launched a campaign in the 1960s to counter "negative attitudes toward sugar" in part by funding sugar research that could produce favorable results. The campaign was orchestrated by John Hickson, a top executive at the sugar association who later

joined the tobacco industry. As part of the sugar industry campaign, Mr. Hickson secretly paid two influential Harvard scientists to publish a major review paper in 1967 that minimized the link between sugar and heart health and shifted blame to saturated fat.

The new report on Tuesday revealed additional internal sugar industry documents from that era. They showed that Mr. Hickson was worried at the time about emerging studies indicating that calories from sugar were more detrimental to heart health than calories from starchy carbohydrates like grains, beans and potatoes. Mr. Hickson suspected this might be because microbes that reside in the gut, known collectively as the microbiota, metabolized sugar and starches differently.

In 1968, the sugar organization started what it called Project 259. The group recruited a researcher at the University of Birmingham in England, W.F.R. Pover, and paid him the equivalent of $187,000 in today's dollars to conduct a laboratory study on animals. The goal of the experiment was to test whether "germ-free" rats and guinea pigs that lacked gut bacteria would respond differently to sugar and starches than normal animals.

The initial results, described in a 1969 internal industry report as "of particular interest," raised a concern. The rats fed sucrose, the main component of cane sugar, had produced high levels of an enzyme called beta-glucuronidase, which three other studies published around that time had associated with hardened arteries and bladder cancer.

"This is one of the first demonstrations of a biological difference between sucrose and starch fed rats," the internal industry report stated.

The documents show that Dr. Pover found something else “highly significant.” The initial phase of the research appeared to confirm that sugar’s adverse effects on cholesterol and triglycerides were a result of it being metabolized and fermented by gut bacteria. Dr. Pover said at the time that he was nearing completion of Project 259 but needed an extension to prove “conclusively” that the effects he was seeing were mediated by the microbiota.

But despite having granted him a previous extension, the sugar association decided to pull the plug on Project 259 and eliminate its funding. In an internal report in 1970,

Mr. Hickson updated fellow sugar executives on studies that could “elicit useful and significant information” for the industry, and described the value of Project 259 as “nil.” The industry report suggested that Dr. Pover was disappointed, noting that he “expressed hopes of obtaining continuing support from other sources.”

He never succeeded. The research was never published, and it is not entirely clear why. Both Dr. Pover and Mr. Hickson are no longer alive.

A Sugar Association spokeswoman said that the group reviewed its research archives and determined that Dr. Pover’s study ended because it was delayed, over budget and had overlapped with an organizational restructuring.

“There were plans to continue the study with funding from the British Nutrition Foundation,” the statement said, “but for reasons unbeknown to us, this did not occur.”

But Marion Nestle, a professor of nutrition, food studies and public health at New York University, said the internal industry documents were striking because they provide rare evidence that the food industry suppressed research it did not

like, a practice that has been documented among tobacco companies, drug companies and other industries.

"From what this paper says, the sugar industry was not interested in answering open-ended questions about whether sugar might be harmful to rats or, given preliminary suggestions of possible harm, doing further studies to find out one way or the other," she said. "Instead, it stopped the research when the results looked unfavorable."

In general, research on rats and other lab animals is not considered as persuasive as data from human studies. But in the 1960s, Dr. Kearns said, animal data held much more weight. A federal law at the time banned food additives that had been shown to induce cancer in animals and in 1969, for example, the Food and Drug Administration banned cyclamate, a very popular artificial sweetener, after research showed that it caused bladder cancer in rats.

At the time the Sugar Association considered cyclamate a threat to its market share, and it had not only lobbied the F.D.A. to remove it but also funded some of the research linking it to health problems.

Mr. Hickson left the sugar industry in the early 1970s to work for the Cigar Research Council, a tobacco industry organization. In 1972, an internal tobacco industry memo on Mr. Hickson noted that he had a reputation for manipulating science to achieve his goals. The confidential tobacco memo described Mr. Hickson as "a supreme scientific politician who had been successful in condemning cyclamates, on behalf of the Sugar Research Council, on somewhat shaky evidence."

7. Plastic fibers found in tap water around the world

Microplastic contamination has been found in tap water in countries around the world, leading to calls from scientists for urgent research on the implications for health. Scores of tap water samples from more than a dozen nations were analyzed by scientists for an investigation by Orb Media, who shared the findings with the Guardian. Overall, 83% of the samples were contaminated with plastic fibers.

The US had the highest contamination rate, at 94%, with plastic fibers found in tap water sampled at sites including Congress buildings, the US Environmental Protection Agency's headquarters, and Trump Tower in New York. Lebanon and India had the next highest rates.

European nations including the UK, Germany and France had the lowest contamination rate, but this was still 72%. The average number of fibers found in each 500ml sample ranged from 4.8 in the US to 1.9 in Europe.

The new analyses indicate the ubiquitous extent of microplastic contamination in the global environment. Previous work has been largely focused on plastic pollution in the oceans, which suggests people are eating microplastics via contaminated seafood.

"We have enough data from looking at wildlife, and the impacts that it's having on wildlife, to be concerned," said Dr. Sherri Mason, a microplastic expert at the State University of New York in Fredonia, who supervised the analyses for Orb. "If it's impacting [wildlife], then how do we think that it's not going to somehow impact us?"

A separate small study in the Republic of Ireland released in June also found microplastic contamination in a

handful of tap water and well samples. “We don’t know what the [health] impact is and for that reason we should follow the precautionary principle and put enough effort into it now, immediately, so we can find out what the real risks are,” said Dr. Anne Marie Mahon at the Galway-Mayo Institute of Technology, who conducted the research.

Mahon said there were two principal concerns: very small plastic particles and the chemicals or pathogens that microplastics can harbor. “If the fibers are there, it is possible that the nanoparticles are there too that we can’t measure,” she said. “Once they are in the nanometer range they can really penetrate a cell and that means they can penetrate organs, and that would be worrying.” The Orb analyses caught particles of more than 2.5 microns in size, 2,500 times bigger than a nanometer.

Microplastics can attract bacteria found in sewage, Mahon said: “Some studies have shown there are more harmful pathogens on microplastics downstream of wastewater treatment plants.”

8. Plastic-eating enzyme accidentally created by scientists could help solve pollution crisis

Scientists have created a substance capable of “eating” plastic that could help tackle the world’s pollution problem. The substance is based on an enzyme – a “biological catalyst” – first produced by bacteria living in a Japanese recycling center that researchers suggested had evolved it in order to eat plastic.

Dubbed PETase for its ability to break down the PET plastic used to make drinks bottles, the enzyme accelerated a

degradation process that would normally take hundreds of years. Fine-tuning this naturally produced enzyme allowed a research team to produce something capable of digesting plastic more effectively than anything found in nature. By breaking down plastic into manageable chunks, the scientists suggest their new substances could help recycle millions of tons of plastic bottles.

Plastic is notoriously resistant to natural degradation, and the discovery of the Japanese plastic-eating bacteria in 2016 was heralded by experts and commentators alike as a potential natural solution to plastic pollution. While attempting to verify these claims, University of Portsmouth biologist Professor John McGeehan and his colleagues accidentally created a super-powered version of the plastic-eating enzyme. "Serendipity often plays a significant role in fundamental scientific research and our discovery here is no exception," said Professor McGeehan.

During an investigation of the enzyme's structure, the scientists made a slight tweak to the part thought to be involved with plastic digestion. Doing so ramped up the ability of the enzyme to degrade PET, and also gave it the ability to degrade an alternative form of PET known as PEF. "Although the improvement is modest, this unanticipated discovery suggests that there is room to further improve these enzymes, moving us closer to a recycling solution for the ever-growing mountain of discarded plastics," he said. "Being able to see the inner workings of this biological catalyst provided us with the blueprints to engineer a faster and more efficient enzyme." The research was led by postgraduate student Harry Austin, and published in the journal *Proceedings of the National Academy of Sciences*.

Though simply breaking down larger pieces of plastic into smaller pieces is not in itself useful – and in fact creates microplastics of the type current causing damage to marine environments – the scientists suggest their method could be employed to make plastic recycling far more effective. “This is a potentially very useful technology to support recovery and recycling of plastics,” said Professor Nilay Shah, a chemical engineer at Imperial College London who was not involved in the work. “It should allow selective deconstruction of PET into its constituent components and therefore lead to a higher value approach to recycling such materials where mechanical recycling is not possible. In such cases, current approaches involve less sophisticated methods such as incineration.”

The discovery has been welcomed enthusiastically by other scientists, who nevertheless cautioned there would be a long way to go before these enzymes are widely applied in the recycling industry. "Oil-derived plastics and polymers are resistant to degradation and their accumulation in the environment is an appalling problem,” said Professor Douglas Kell, a bioanalytical scientist at the University of Manchester. “Evolving enzymes to degrade such plastics is a high priority.”

“While there is still a way to go before you could recycle large amount of plastic with enzymes, and reducing the amount of plastic produced in the first place might, perhaps, be preferable, this is certainly a step in a positive direction and very exciting science to boot,” said Dr. Oliver Jones, an analytical chemist at RMIT University in Melbourne.

Awareness of plastic pollution has spiked in recent months, with communities across the UK implementing measures to cut down on plastic waste. These local efforts have been accompanied by Government policies to help tackle this “scourge”, including the ban on microbeads and the introduction of a bottle deposit scheme.

However, Professor McGeehan noted the role that science must also play in developing novel solutions to fight against the tide of plastic. "Few could have predicted that since plastics became popular in the 1960s huge plastic waste patches would be found floating in oceans, or washed up on once pristine beaches all over the world,” he said. "We can all play a significant part in dealing with the plastic problem, but the scientific community who ultimately created these 'wonder-materials', must now use all the technology at their disposal to develop real solutions."

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