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Министерства здравоохранения Российской Федерации
Кафедра иностранных языков
и русского языка как иностранного

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**АНГЛИЙСКИЙ ЯЗЫК
ДЛЯ ПРОФЕССИОНАЛЬНОГО ОБЩЕНИЯ.
МЕДИЦИНСКАЯ БИОХИМИЯ**

Учебно-методическое пособие

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Учебно-методическое пособие содержит разнообразные обучающие материалы для развития и совершенствования навыков профессионального общения в устной и письменной формах на английском языке по темам медико-биологического характера, а также задания для самостоятельной работы и самоконтроля.

Предназначено для студентов первого и второго курсов, обучающихся по направлению подготовки 30.05.01 Медицинская биохимия (специалист).

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ПРЕДИСЛОВИЕ

Профессионально-ориентированное обучение иностранному языку является важным компонентом в подготовке специалиста в соответствии с Федеральным государственным образовательным стандартом.

Учебно-методическое пособие «Английский язык для профессионального общения. Медицинская биохимия» предназначено для студентов первого и второго курсов, обучающихся по направлению подготовки 30.05.01 Медицинская биохимия (специалист). В его основе лежат требования к подготовке специалиста (врача-биохимика) по учебным дисциплинам «Иностранный язык» (английский) и «Основы профессиональной деятельности на иностранном языке» и рабочие программы по указанным дисциплинам, составленные в соответствии с требованиями ФГОС. При подборе материала и составлении данного пособия автор также руководствовался требованиями к формированию у обучающихся общекультурных компетенций, в частности, ОК-8 («готовность к коммуникации в устной и письменной формах на русском и иностранном языках для решения задач профессиональной деятельности»).

Одним из критериев получения зачёта по данной дисциплине является представление обучающимся монологического высказывания по теме. Монологическая речь на иностранном языке – важная составляющая в процессе подготовки любого специалиста, требующая овладения особыми навыками и умениями порождения речи, знаний профессиональной лексики, самостоятельной речемыслительной деятельности. Данные навыки и умения находят практическое применение в таких видах деятельности, как обсуждение какой-либо профессиональной темы на английском языке, выступление с докладами и презентациями, участие в конференциях. Так как дисциплина «Иностранный язык» тематически связана с предметами базовой части, темы для обсуждения на иностранном языке подбирались исходя из их профессиональной направленности. Для студентов первого курса предлагаются следующие темы: «The Department of Medical Biochemistry»/Отделение медицинской биохимии СГМУ/, «What is Biochemistry?»/Что такое биохимия?/, «The Cell»/Клетка. Её строе-

ние/, «Metabolism»/Обмен веществ (метаболизм)/ и «Vitamins»/Витамины/, а для изучения на втором курсе – «Enzymes»/Ферменты/, «Proteins, lipids and carbohydrates»/Белки, жиры и углеводы/. В каждом разделе есть подготовительные задания на формирование навыка работы с профессиональными терминами и текстами, задания для закрепления знаний лексики, задания в виде опорных моделей, схем и диаграмм для формирования и развития навыка говорения на иностранном (английском) языке, задания для развития навыков письменной речи, а также задания для самостоятельной работы и самоконтроля. В конце пособия приводятся приложения с эталонами ответов, ответами (ключами) к заданиям (Keys), в том числе для самоконтроля (Self-test/Check your knowledge). В отдельных приложениях представлены образцы примерных текстов устных тем (Abridged texts/Topics for retelling), примерные тексты с заданиями (Sample texts for test) для контроля понимания профессионального текста с ключами (Keys to sample texts for test), банк примерных предложений (Sample sentences for translation), включающий 135 предложений для перевода с русского языка на английский, и критерии оценки ответов (Evaluation criteria).

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PART I.

Unit 1. THE DEPARTMENT OF MEDICAL BIOCHEMISTRY

1. Pronounce the following words:

biochemist [ˌbaɪəʊˈkɛmɪst]

biochemistry [ˌbaɪəʊˈkɛmɪstrɪ]

biochemical [ˌbaɪəʊˈkɛmɪkəl]

Do you know any other words with the component “bio- ” ? Make a list and compare it with the other students’ lists. Who has got more words? Are the words the same?

2. Pronounce the international words. Translate the collocations from Russian into English, using the international words.

analyst [ˈænəlɪst]

analysis [əˈnælɪsɪs] (pl. analyses [əˈnælɪsiːz])

curriculum [kəˈrɪkjʊləm]

diploma [dɪpˈləʊmə]

faculty [ˈfækəltɪ]

general [ˈdʒenərəl]

laboratory [ləˈbɒrət(ə)rɪ] / [ˈlæbərətɪ]

molecular [məˈlekjʊlə/ər]

structure [ˈstrʌktʃə]

общая биохимия; медицинская биохимия; биохимический анализ; лабораторные анализы; получить диплом; факультет медицинской биохимии; работать аналитиком; молекулярная биология; молекулярная структура; университетская программа обучения; разные факультеты; учиться на факультете медицинской биохимии

3. These are some of the subjects which biochemistry students study. Choose the subjects students study in the first and second years. Choose the subjects they study in the senior course.

biology [ˌbaɪˈɒlədʒɪ]

biophysics [ˌbaɪəʊˈfɪzɪks]

clinical and laboratory diagnosis [ˈklɪnɪkəl ænd ləˈbɒrət(ə)rɪ daɪəˈɡnəʊsɪs]
 genetics [dʒɪˈnetɪks]
 hygiene and human ecology [ˈhaɪdʒɪ:n ænd ˈhju:mən i:ˈkɒlədʒɪ]
 immunology [ˌɪmjʊ:ˈnɒlədʒɪ]
 informatics [ˌɪnfəˈmætɪks]
 inorganic chemistry [ɪnəˈɡæɪnɪk ˈkɛmɪstrɪ]
 medical biotechnology [ˈmedɪkəl ˌbaɪəʊteknɒlədʒɪ]
 microbiology [ˌmaɪkrəʊbaɪˈɒlədʒɪ], virology [vaɪˈrɒlədʒɪ]
 morphology [mɔ:ˈfɒlədʒɪ]: human anatomy [ˈhju:mən əˈnætəmə], cytology [ˌsaɪˈtɒlədʒɪ], histology [hɪsˈtɒlədʒɪ]
 neurology [ˌnju:əˈrɒlədʒɪ]/psychiatry [saɪˈkaɪətrɪ]
 organic chemistry [əˈɡæɪnɪk ˈkɛmɪstrɪ]
 pharmacology [ˌfɑ:məˈkɒlədʒɪ]
 pharmacokinetics [ˌfɑ:məkəʊkɪˈnetɪks]/ [ˌfɑ:məkəʊkaɪˈnetɪks]
 physiology [ˌfɪzɪˈɒlədʒɪ]
 public health [ˈpʌblɪk helθ]

4. Look through the list again. Work with a partner. Say which of the subjects are the most interesting/necessary/motivating/difficult/easy/boring etc.

Model 1.

Student A: I think/ For me, chemistry is the most interesting subject. And what about you? /Is it the same with you? / Do you like it?

Student B: Yes, I agree with you. I like it too.

Model 2.

Student A: Biochemistry is a very difficult subject. What do you think about it? /What is your opinion?

Student B: Well, I think it is difficult. But I find it interesting too.

5. Look at your time-table. Complete the table with the appropriate information. Choose any day and describe it as in the Model.

Model: Today is I have a lecture on It starts at The lecture is over at Besides/In addition to it I have two practicals/tutorials. They are ... and One starts at ... and finishes at The other one starts at ... and finishes at

Day	Subject	Time
Monday		
Tuesday		
Wednesday		
Thursday		
Friday		
Saturday		

6. What are their professions? Form the nouns, using the suffix ‘-ist’.

Model: *He specializes in chemistry.* > *He is a chemist.*

bacteriology, virology, microbiology, physiology, biophysics, pharmacology, anatomy, cytology, histology, neurology, genetics, hygiene, immunology, allergology

7. Why did you choose a career of a biochemist? Discuss with a partner. Read the passage about the Nobel laureate. What role can the family play in choosing a career?

The 2006 Nobel Prize for Chemistry was awarded to American biochemist Roger D. Kornberg, professor of structural biology at the Stanford University School of Medicine, for work that explained how—at a molecular level—living cells copy, or transcribe, the genetic information encoded in DNA to make molecules of RNA that direct the production of proteins in the cells. This process is essential for maintaining the vast chemistry of cellular functions. Transcription is important in the formation of different cell types from nonspecialized cells called stem cells, and problems with transcription play a role in such diseases as cancer and heart disease.

Kornberg was born in St. Louis, Mo., on April 24, 1947. He earned a B.S. (1967) in chemistry from Harvard University and a Ph.D. (1972) in chemistry from Stanford University. He worked as a researcher at the Medical Research Council Laboratory of Molecular Biology at the University of Cambridge and then as an assistant professor at Harvard Medical School before he joined the faculty at Stanford’s School of Medicine in 1978. Other members of Kornberg’s family were also biochemists, including his father, Arthur Kornberg, who was awarded a share of the 1959 Nobel

Prize for Physiology or Medicine for research into how DNA molecules are produced in cells. (The younger Kornberg was the seventh Nobel laureate who was the child of a Nobel Prize winner.)

Prize for Chemistry (2006: from Nobel Prizes), a part of the article by Sarah Webb. Encyclopedia Britannica. Deluxe Edition. CD-ROM. 2008

8. Discuss the following statement with the other students. What are the other possible reasons for becoming a biochemist?

If you enjoy working in a laboratory, you should consider biochemistry.

What is a laboratory for?

What do biochemists do in a laboratory?

What other sciences are associated with such kind of work?

BEFORE YOU READ

9. Practice pronouncing the following words. Translate the collocations with them and the related words.

VOCABULARY LIST

advantage [ə`dva:ntɪdʒ] *n* преимущество; выгода, польза

the advantage of doing sth.; the chief advantage of this system; to give sb an advantage; to have a big advantage over sb; to take advantage of; disadvantage; advantageous; advantageously

apply (for/to) [ə`plai] *v* обращаться (за работой, помощью, справкой, разрешением)

to apply for a job; to apply for assistance; to apply to a university; an applicant; an application form; to fill in an application form

complete [kəm`pli:t] *v* заканчивать, завершать

to complete the course of studies; a completion date; satisfactory completion of the training course; work completion

conduct [kən`dʌkt] *v* вести, проводить
to conduct an experiment/an interview/a test/

department [dɪ`pɑ:tmənt] *n* отделение
the Biology/Chemistry department; What department do you study at?

experience [ɪk`spɪəriəns] *n* (жизненный) опыт
practical experience; to gain/get experience; lack of experience; past experience; work experience; an experienced teacher; an inexperienced beginner

facility [fæ`sɪlɪti] *n* возможности, благоприятные условия; оборудование; приспособления; аппаратура
educational facilities; medical facilities; public health facilities; sports facilities

join [dʒɔɪn] *v* присоединить, присоединиться
to join a society; to join a party; The island is joined to the mainland by bridge.

pursue [prə`sjʊ:] *n* преследовать, следовать по намеченному пути; заниматься
to pursue a career in clinical chemistry; to pursue a goal, to pursue an aim, to pursue an objective;

pursuit: in (the) pursuit of sth

relate [rɪ`leɪt] *v* устанавливать связь
to relate to an event; relation; related; closely related; directly related; related to metabolic activity; relationship between

research [rɪ`sɜ:tʃ] *n* исследование
to carry out/conduct/do research; a researcher; research work; research facilities; applied research

supervision [ˌsju:pə`vɪzən] *n* надзор, наблюдение
to supervise practice; under the supervision of

technique [tek`ni:k] *n* техника; технические приёмы; метод; способ
to use this particular technique; various techniques; modern techniques

thorough [`θlɹə] *a* полный, совершенный; основательный, доскональный; тщательный
a thorough analysis; a thorough check-up; to do sth thoroughly

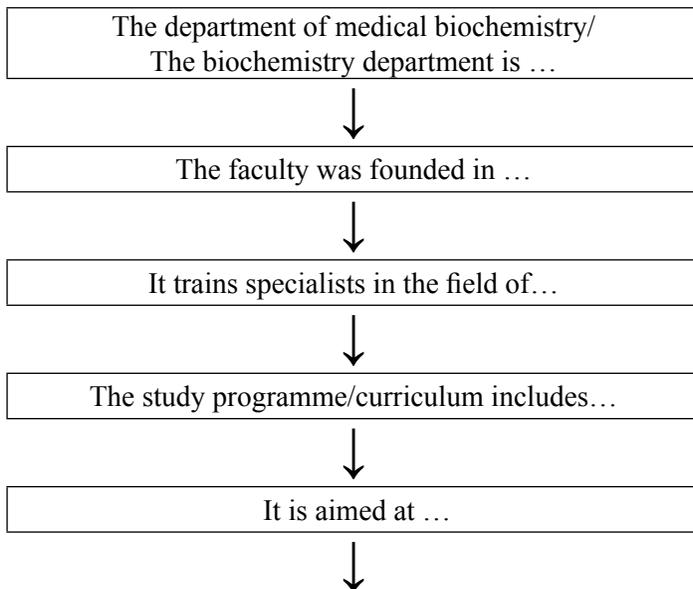
tutorial [tju:.`to:riəl] *n* консультация
the tutorial system; tutorial staff; tutorial supervision; a tutor

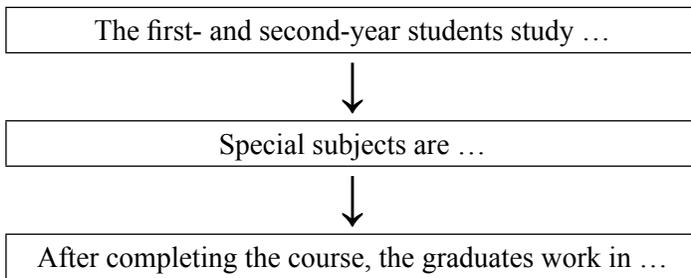
10. Match A with B.

A: supervision, to relate, facility, thorough, technique, to conduct a test, advantage, tutorial, to complete

B: to do a test, detailed, consultation, to accomplish/to finish, control, to connect, method, settings/apparatus, benefit

11. Complete the diagram about your department with the relevant information.





12. Read the text and check your answers.

Those young people who want to pursue a career in biochemistry typically apply to the university departments of medical or clinical biochemistry. The faculty of medical biochemistry at the Northern State Medical University was founded in 2003. In 2015, it was joined to the faculty of preventive medicine and now they form one faculty.

The course of training lasts six years. The focal point is, of course, biochemistry. The curriculum includes the humanities (foreign languages, including Latin, philosophy, history, psychology etc), socio-economical (economics), natural sciences (biology, ecology), mathematical (mathematics, informatics and computer science, physics, mathematical analysis, mathematical statistics etc), medical and biological sciences such as physiology, morphology, microbiology, pharmacology, clinical and experimental surgery, pediatrics, internal diseases, infectious diseases, general pathology etc and a lot of subjects related to future profession (chemistry, physical chemistry, medical biotechnology, general and medical biochemistry, general and clinical immunology, general and medical genetics, clinical laboratory diagnosis etc). All these subjects lay a thorough foundation for working in professional field.

Course work is largely lecture- and text-based. Students also have seminars and tutorials. Exams are both oral and written.

Research work and practice are essential parts in training future specialists. The students take special advantage of working in a clinical laboratory and get some laboratory experience in laboratory techniques. Here they use research equipment and facilities, do experiments and conduct a research project under the supervision of a biochemistry faculty/staff member.

After completing the course, the graduates work in clinical and diagnostic facilities as analysts, lab technicians, virologists, bacteriologists and immunologists.

AFTER YOU READ

13. Rearrange the plan items according to the text.

1. Careers in biochemistry
2. The curriculum
3. Historical background
4. Research work
5. Forms of study and activities

14. Read and translate the sentences. Find the corresponding sentence in the text.

1. The University's programme in biochemistry incorporates broad preparation in chemistry, biology and other subjects.
2. A biochemistry student spends much time working in a laboratory.
3. It takes six years or more to become a biochemist.
4. Some students are encouraged to do an undergraduate research project.
5. The possible career choices are clinical chemistry, laboratory medicine, immunology, virology and others.

15. Write some questions about the department you study. Work with a partner. Taking turns, ask and answer the questions.

1. When was ...?
2. What subjects do ...?
3. How long do ...?
4. What are ...?
5. Where do ...?
6. Why do ...?
7. How many ...?
8. How do ...?
9. What kind of ...?
10. Are there any ...?
11. Do you ...?
12. Do the students ...?

SELF-TEST
CHECK YOUR KNOWLEDGE

1. Write the related word (10 points).

research > ... (исследователь); biochemistry > ... (биохимический); advantage > ... (выгодный); to complete > ... (завершение); to supervise > ... (наблюдение); application > ... (абитуриент, подающий заявление); thorough >... (тщательно); tutor > ... (консультация); to relate > ... (родственный); experience > ... (неопытный)

2. Fill in the gaps with the word from the box (10 points).

complete, application, technique, experience, conduct, tutorial, research, thorough, facility, supervision
--

1. I need to practice a lot to get more 2. A path laboratory is a diagnostic 3. Nowadays the ... system is quite popular in Russia. 4. You should have a ... health check-up once per year. 5. He wants to ... this experiment as soon as possible. 6. Immunochemical ...s are now an essential tool (инструмент) in the investigation of many disorders (расстройства). 7. We have just received your letter of 8. She's been working at this ... project for a year. 9. The patient has been under the doctor's 10. I hope to ... my studies in four years.

3. (evaluated by your teacher) Answer the following questions (4 points).

1. What educational establishments can you apply for if you choose a career in biochemistry?
2. How long does the course of studies take?
3. What subjects are of necessity for future biochemists?
4. Why is working in a lab so important?

4. (evaluated by your teacher) Talk about the department you study at (at least 10 sentences).

5. (evaluated by your teacher) Search for the emblem of the Biochemistry department. What do you think its parts/components mean? Discuss with the other students.

SELF-WORK /PROJECT WORK (evaluated by your teacher)

1. Draw your own emblem of the Biochemistry department. Show it to the other students. Exchange your opinions. Use the prompts while talking about your emblem.

I've chosen this particular symbol/these particular symbols because ...
It means/They mean ...

I think that my emblem is ... because ...

2. Surf the Internet. Collect information about the Biochemistry department at any university in Russia or abroad. Compare the way students study at your university and there. Complete the table. Give a short presentation based on it. (PowerPoint presentation).

Comparison criteria	The Biochemistry department I study at	The Biochemistry department at/in ...
The year of foundation		
The number of students		
Course structure		
Subjects		
Research work		
Places of work		

Unit 2. WHAT IS BIOCHEMISTRY?

1. Look through the following definitions of 'biochemistry'. Write out the key words in each definition. Use them while translating the definitions in bold from Russian into English.

Biochemistry

- a) is the science of the chemistry of the living organisms.
- b) is the scientific study of the chemistry of living things.
- c) is a study of the components and composition of living things and how they come together to become life.
- d) is the study of chemical processes within and relating to living organisms.
- e) is the study of chemistry of the living world.
- f) is the field concerned with chemical substances and processes that occur in plants, animals, and microorganisms.

«Биохимия (биологическая химия) – раздел химии, изучающий химические процессы в живых организмах»

«Биохимия – наука, изучающая входящие в состав организмов химические вещества, их структуру, распределение, превращения и функции»

2. Answer the following questions in English:

- 1. What is biochemistry?
- 2. What does it study?
- 3. What sciences is it related to?
- 4. Biochemistry is an experimental science, isn't it?
- 5. What are its perspectives?

3. Read and translate some interesting facts about biochemistry. Use a dictionary. Answer the question: 'What were the ways of deriving the term 'biochemistry'?'

Do you know that

- the term 'biochemistry' itself is derived from a combination of biology and chemistry?

- in 1877, Felix Hoppe-Seyler used the German term ‘biochemie’ as a synonym for physiological chemistry in the foreword to the first issue of *Zeitschrift für Physiologische Chemie* (in English *Journal of Physiological Chemistry*) where he argued for the setting up of institutes dedicated to this field of study?
- the German chemist Carl Neuberg is often cited to have coined the word in 1903, while some credited it to Franz Hofmeister?

4. Look at the words. Single out their components. Which of them can you explain in Russian?

e.g. hydrolysis (гидролиз) – реакции обменного разложения между водой и соответствующим соединением (**hydro-** вода + **G. lysis, dissolution** растворение, разложение, распад, разрушение)

phospholipids, coenzyme, dehydrogenase, polysaccharide, carbohydrate, polynucleotide, photosynthesis, oligosaccharides, tetrapeptide

5. Pronounce the following words. Complete the table.

Biochemical compounds/substances	Chemical processes

absorption [əb` s/zo:pʃən] поглощение (абсорбция)

amino acid [ə, mi:nəʊ `æsid] аминокислота

carbohydrate [,ka:bəʊ`hardɪt] углевод

catalysis [kə`tæləsɪs] катализ

conversion [kən`vɜ:ʃn] преобразование (конверсия)

enzyme [`enzaim] фермент, энзим

hormone [`ho:məʊn] гормон

metabolism [me`tæbəlɪzm] метаболизм

lipid [`lɪpɪd] липид

nucleic acid [nju: kli:ɪk `æsid] нуклеиновая кислота

protein [`prəʊti:n] белок, протеин

release [rɪ`li:s] высвобождение; выделение

storage [`sto:ɪdʒ] хранение

synthesis [ˈsɪnθəsis] синтез (соединение)

transmission [trænzˈmɪʃən] передача (трансмиссия)

vitamin [ˈvɪtəmin] / [ˈvaɪtəmin] витамин

6. Translate the collocations from English into Russian.

- a protein chain, a fibrous protein, a synthetic protein, globular proteins, protein synthesis; the amount of protein
- polypeptide hormone, to produce hormones; sex and adrenal hormones; the hormones of the pancreas; the plant hormones
- deoxyribonucleic acid (DNA), ribonucleic acid (RNA); folic acid; nucleic acid synthesis; citric acid; citric acid cycle; small amounts of nucleic acids; absorption of free amino acids; short-chain fatty acids
- protein metabolism, glucose metabolism, metabolic processes, metabolic regulation, in the metabolism of proteins, fats/lipids and carbohydrates
- in the presence of proper enzymes, the oxidizing enzymes, enzyme-catalyzed reactions; many of the key enzymes
- a natural source of vitamins, fat-soluble vitamins, water-soluble vitamins, vitamin E deficiency, vitamin supplementation

7. Work individually. Match the name of a process and its definition. In pairs, check your answers (see 'Keys' section). Then ask each other questions and answer them.

Model:

Student A: What do we call *the process of dissolution* which water takes part in?

Student B: *The process of dissolution* in which water takes part in is called *hydrolysis*./We call this process *hydrolysis*./This is *hydrolysis*.

Process	Definition
absorption	the breakdown of a substance by micro-organisms such as yeasts and bacteria, esp. of sugar to ethyl alcohol in making beers, wines, and spirits

breakdown	the process of being converted like making structural alterations to serve a new purpose
catalysis	the process or result of building up separate elements into a connected whole, esp. into a theory or system
conversion	all the chemical processes that occur within a living organism
fermentation	the act or instance of conveying/transferring or being conveyed/transferred
metabolism	the process of passing, transferring
release	the acceleration of a reaction by a catalyst
synthesis	the process of taking in, including or incorporating as part of itself
transfer	the process of setting free, liberating
transmission	the process of analyzing into components

BEFORE YOU READ

8. Practice pronouncing the following words. Translate the collocations with them and the related words.

VOCABULARY LIST

common [ˈkɒmən] *a* общий; обычный; общепринятый, распространённый

common diseases; common symptoms; one of the most common; the commonest causes; common cold; common to all living things

compound [kəmˈpaʊnd] *n* смесь, состав; соединение

chemical compounds; many other compounds; a number of different compounds; Water is an example of a compound.

determination [dɪˌtɜːrmɪˈneɪʃən] *n* определение

determination of temperature; determination of pressure; qualitative determination; to determine the amount

goal [gəʊl] *n* цель

towards the common goal; the goal of the project; the goal of biochemistry

expand [ɪksˈpænd] *v* расширять(ся); увеличивать(ся) в объёме; излагать подробно
to expand rapidly; the rapidly expanding field; the rapid expansion; to expand on/upon

investigation [ɪnˌvestɪˈgeɪʃən] *n* (научное) исследование
to investigate; to continue the investigation; to conduct an investigation

oil [oɪl] *n* масло
essential oils; cooking oil; vegetable oil; fish oils

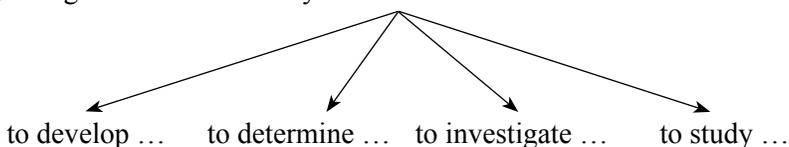
rate [reɪt] *n* темп; ход, скорость
to expand at an explosive rate; to speed up the rate of the process; at a rate of; the rate of growth; the basal metabolic rate; at a slow rate

unit [ˈjuːnɪt] *n* единица; целое
the basic unit for the synthesis of; large units; structural units; heat production per unit of body weight; subunits; The cell is a unit of all living things.

9. Use a dictionary. Find the other meanings of the words ‘determination’, ‘investigation’, ‘oil’, ‘rate’ and ‘unit’. Make your own collocations with them in Russian. Let the other students translate them into English.

10. Complete the following sentences in English. Read the text, translate it and say if your endings were the same or quite different. Which of the items are the easiest to complete?

- 1) Biochemistry is the study ...
- 2) Knowledge in biochemistry is ...
- 3) The goals of biochemistry are



4) Some fundamental biochemical substances are ...

What is biochemistry? (part 1)

Biochemistry is the study of chemistry of the living world. In other words, the relationships between chemicals and life forms are in the purview of biochemistry.

Knowledge in this field of study is expanding currently at an explosive rate. Each year scientific journals publish more articles on biochemical research than on research in any other field of chemistry or chemically related areas.

The goal of biochemistry is to develop a chemically based understanding of living cells of all types. This includes the determination of the kinds of atoms present, the investigation of how they are joined together to form the larger structural units present in cells, and the study of the chemical reactions by which living cells get the energy for the life processes or grow, movement and reproduction.

Some fundamental biochemical substances common to all living systems are fats and oils, carbohydrates, proteins, enzymes, vitamins, hormones, nucleic acids and compounds for storage and exchange of energy such as adenosine triphosphate (ATF).

From Chemistry and Society by Mark M. Jones et al. Fifth edition. Saunders College Publishing. 1987. P. 352

11. Look through the following information in the table and answer the questions.

1. When did biochemistry as a science appear?
2. What are the names of famous biochemists who contributed/did much to its development?
3. What were the most important discoveries in biochemistry in the past?

As the list of the events is not complete, collect more information about discoveries in biochemistry and be ready to present it (see 'Self-work/Project work' section).

FROM THE HISTORY OF BIOCHEMISTRY

DATE	EVENT
18 th century	The studies on fermentation and respiration conducted by Antoine Lavoisier
late 18 th century	The demonstration of photosynthesis by English chemist Joseph Priestley (1771), the Dutch physician Jan Ingenhousz (1779) and the Swiss clergyman and naturalist Jean Senebier
1828	A paper on the synthesis of urea published by Friedrich Wöhler
1833	The discovery of the first enzyme, diastase (today called amylase) made by Anselme Payen
1842	The work <i>Animal chemistry, or Organic chemistry</i> written by Justus von Liebig
1860s	Louis Pasteur's studies on fermentation of alcohol and milk
1869	A substance was isolated from the nuclei of pus cells and was called nucleic acid.
1882	The work of the German chemist Emil Fischer demonstrated that proteins are very large molecules, or polymers, built of about 24 amino acids.
1896 – 1897	The first demonstration of alcoholic fermentation in cell-free extracts made by Eduard Buchner/Büchner
1907	Eduard Buchner/Büchner got the Nobel Prize for Chemistry for studying the fermentation of carbohydrates under the action of different enzymes contained in yeast
1929	The substance adenosine triphosphate (ATP) was isolated from muscle.
1950s	The discovery of the gene and its role in the transfer of information in the cell made by James D. Watson, Francis Crick, Rosalind Franklin, and Maurice Wilkins
1950s	The determination of the first amino acid sequence for the insulin molecule
1960s	The construction of detailed atomic models of the proteins hemoglobin and myoglobin by Nobel Prize winners J.C. Kendrew and M.F. Perutz
1960s	The deciphering of the genetic code accomplished by the American biochemists Marshall W. Nirenberg, Robert W. Holley, and Har Gobind Khorana
1965	The description of the structure of an RNA molecule by R.W. Holley
...	...

BEFORE YOU READ

12. Practice pronouncing the following words. Translate the collocations with them and the related words.

VOCABULARY LIST

advance [əd`va:ns] *v* продвигаться вперёд

to advance rapidly; scientific advances; advance in knowledge; advanced learners; an advanced course

deal with [di:l] *v* иметь дело с; рассматривать вопрос

those aspects of biochemistry that deal with the chemistry of large molecules; Biochemistry deals with the chemistry of life. What problem does the paper deal with?

heredity [hi`rediti] *n* наследственность

heredity as a factor; Hereditary characteristics are called heredity or genetics. He studies the inherited disorders.

precursor [pri`kz:sə] *n* предшественник; предвестник

a precursor of; organic and inorganic precursors; the metabolic precursors of glucose; noncarbohydrate precursors; to serve as a (metabolic) precursor; Squalene is the direct precursor of the sterols. β carotene is the precursor to vitamin A.

qualitative [ˈkwɒlɪtətɪv] *a* качественный

the qualitative determination; to do a qualitative and quantitative analysis; the best quality

undergo (underwent, undergone) [ʌndə`gəʊ] *v* испытывать, переносить, подвергаться (чему-либо)

to undergo a change; to undergo an operation; to undergo a reaction; to undergo transformations; to undergo periods of heavy exercise; In yeast, where glucose is undergoing an alcoholic fermentation ...

13. Read the second part of the text. Complete the gaps in it with the collocations from the box.

electron microscopy, and molecular dynamics stimulations;
key roles in chemical reactions vital to life;
techniques common in medicine and physiology;
from a combination of biology and chemistry;
their precursors;
occur in plants, animals, and microorganisms

What is biochemistry? (part 2)

Biochemistry is the study of chemical substances and processes that _____ and of the changes they undergo during development and life. It deals with the chemistry of life.

The term 'biochemistry' itself is derived _____. It involves the qualitative determination and structural analysis of the organic compounds that make up cells (proteins, carbohydrates and lipids) and those of that play _____ (e.g. nucleic acids, vitamins and hormones).

Biochemists study cell's many complex and interrelated chemical changes. Examples include the chemical reactions by which proteins and all _____ are synthesized, food is converted to energy (metabolism), hereditary characteristics are transmitted (heredity), energy is stored and released and all biological chemical reactions are catalyzed.

Biochemistry combines the biological and physical sciences and uses many _____ as well as those of organic, analytical and physical chemistry.

Since the mid-20th century biochemistry has advanced with the development of new techniques such as chromatography, X-ray diffraction, dual polarization interferometry, nuclear magnetic resonance (NMR) spectroscopy, radioisotopic labeling, _____.

AFTER YOU READ

14. Work with a partner. Ask and answer questions as in the Model.

Model:

Biochemists study the chemical substances and processes in living things. (changes the living things undergo during life)

Student A: Biochemists study the chemical substances and processes in living things, don't they?

Student B: Yes, they do. They also study changes the living things undergo during life.

1. Biochemistry enters into the investigation of chemical changes in disease, drug action. (enters into such areas as nutrition, genetics, and agriculture)
2. Biochemists want to understand how biological molecules give rise to the processes that occur within living things. (want to study and understand the whole organism)
3. Much of biochemistry deals with the structures and functions of biological macromolecules, such as proteins, nucleic acids, carbohydrates and lipids. (deals with interactions of biological macromolecules)
4. In nutrition, biochemists study how to maintain health. (study the effects of nutritional deficiencies)
5. In agriculture, biochemists investigate soil and fertilizers. (try to discover ways to improve crop cultivation, crop storage and pest control)

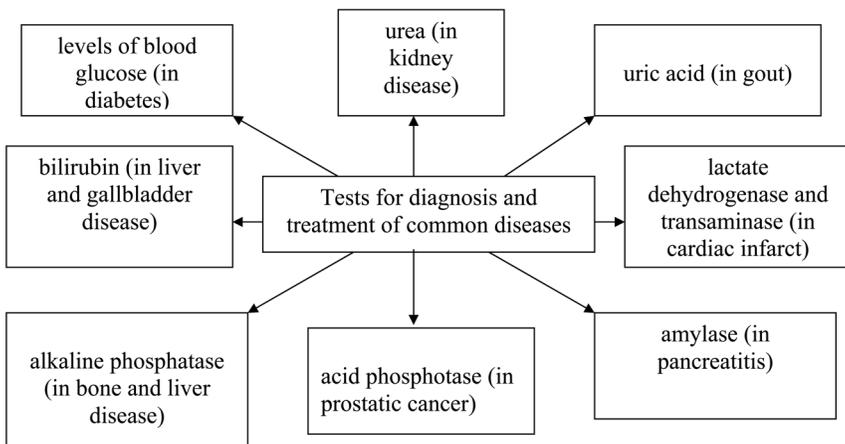
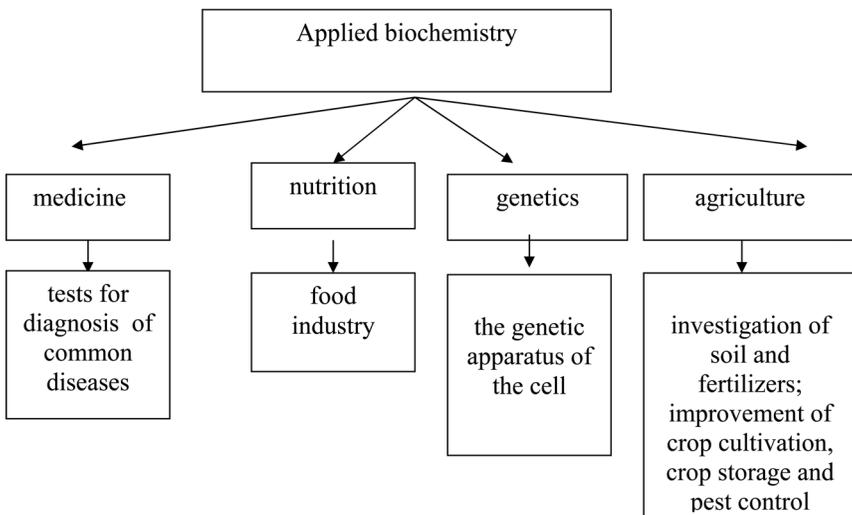
15. Talk about the areas of applied biochemistry, using the collocations and the prompts from the boxes.

Collocations: the causes and cures of disease; way of maintaining health; the effects of nutritional deficiencies; the investigation of chemical changes in disease; drug action; treatment of common diseases

Biochemists investigate ... /study... /try to discover the ways to ...

The findings in biochemistry are applied in ...

Tests are used to determine ... in ...



SELF-TEST

CHECK YOUR KNOWLEDGE

1. Translate the collocations and sentences into English, using the words from the vocabulary list in Unit 2 (13 points).

наследственная информация; механизмы наследственности; знания о наследственности; органическое соединение; расширить свои знания; общие характеристики; продвигаться с поразительной скоростью; определение параметров; ряд составных элементов; качественные характеристики; предшественник мессенджера рибонуклеиновой кислоты; Он перенёс операцию вчера. Какова цель исследования?

2. Translate the sentences from Russian into English (6 points).

1. Хотя биохимия – это молодая наука, её начала (происхождение - origins) можно проследить (to trace back) с древних времён, а именно с Древней Греции.
2. Биохимия – это экспериментальная наука. Биохимики проводят разные исследования.
3. Как и другие науки, биохимия использует методы измерения с помощью разных инструментов.
4. Клинико-диагностическая лаборатория стала неотъемлемой (indispensable) частью каждой больницы.
5. Биохимия связана со многими науками, например, молекулярной биологией.
6. Результаты (findings) следований используются в медицине, пищевой промышленности, генетике, разработке препаратов и сельском хозяйстве.

3. Answer the questions in English (5 points).

1. What are the basic biochemical substances?
2. What are the basic biochemical processes?
3. What do biochemists study?
4. What were/are the basic discoveries in biochemistry?
5. What famous biochemists contributed/did much to the development of the science?

4. Find as many words as possible in the chain (1 point for each word).

fatssugaribonulceicarbohydratenzymesacharidenergyeastriglyceride

5. (evaluated by the other students and your teacher) Make your own chain of words related to the topic. Let the other students find all the words in it (3 points).

6. (evaluated by your teacher) Compile a glossary/ a thesaurus or draw a crossword on the topic “Biochemistry as a science”. Think about 10 words and their definitions in English to include in it. Use the dictionaries and other sources of information. You may choose any form of presenting information in your glossary/ thesaurus or crossword (10 points).

7. Talk about biochemistry as a science, considering all texts from Unit 2 (evaluated by your teacher according to the evaluation criteria for retelling).

Model plan

1. *Introductory sentence/sentences.*
2. *The origins of biochemistry (at least 3 sentences).*
3. *The subject matter of the science (at least 1 sentence).*
4. *The substances and processes that biochemists study (say as many sentences as you can).*
5. *The questions they want to answer (at least 2 sentences).*
6. *Summary. The perspectives of biochemistry (at least 1 sentence).*

SELF-WORK /PROJECT WORK (evaluated by your teacher)

1. Choose any of the projects. Work individually or in small groups. Surf the Internet.

a) Collect information about the Nobel Prize winners (any year) and their work in the field of chemistry (biochemistry/medicine). Give a short presentation about the person/s (PowerPoint presentation).

b) Collect information about the outstanding biochemist/s and his/her/their work in the field of biochemistry/medicine. Give a short presentation about the person/s (PowerPoint presentation).

c) Collect information about the great discovery in the field of biochemistry/medicine. Give a short presentation about it (PowerPoint presentation).

2. Write an essay on one of the following topics:

- “Biochemistry is an interesting science”
- “Biochemistry is my future specialty”
- “Biochemistry is a science of the future”
- “The most amazing discovery/discoveries in biochemistry”

Unit 3. THE CELL

1. Answer the questions in Russian:

- What is a cell?
- What are the main cell types?
- How are they arranged (=organized) in living things?
- What shapes and sizes do most cells have?
- What common functions are performed by cells?
- How do cells do this?

2. Sentence scramble. The answers to the questions are given below. Make a sentence out of each group of words. Start with the word in bold. Some words can be used two or three times.

- a) are, basic, **cells**, of, units, life, the
b) are, types, **there**, muscle, cells (3), many, nerve, blood, of, cell, etc
c) composed, **tissues**, of, cells, are
d) shapes, sizes, varied, **their**, are, and, very
e) - to produce, principal, energy, a, **the**, function, is, of, cell
- **the**, carbohydrates, cell, fats, absorbs, proteins, and, also
- reproduction, function, is, or, important, division, the, cell (2), **another**, of

3. Make the collocations with the word 'cell' as in n+n model.

Model: деление клетки/noun+noun > cell division

клеточная теория; клеточная стенка; компоненты клетки; продукты клетки; клеточное движение; животная клетка; растительная клетка; клеточный цикл; типы клеток; биологи, изучающие клетки (цитологи)

4. Pronounce the words with the component 'cyto-' [ˈsɪtəʊ].

cytology, cytologist, cytological, erythrocyte, leukocyte, thrombocyte, lymphocyte, monocyte, phagocyte, cytoskeleton, cytosol, cytoplasm, myocyte

5. Translate the collocations from English into Russian. Which of them can you change into n+n model?

different types of cell; according to modern cell theory; cellular energy; single-celled organisms; many-celled organisms (= multicellular organisms); a cell's chemical reactions; parts of a new cell; each cell of the body; the activities of the cell; the vast majority of cells; cellular digestion; cell-to-cell communication/intercellular communication; cell-to-cell recognition

6. Practice pronouncing the names of cell parts/components.

cell membrane [ˈsel ˈmembreɪn]

centriole [ˈsentriəʊl]

chromosome [ˈkrəʊməsəʊm]

cytoplasm [ˈsaɪtəplæzəm]

endoplasm(at)ic reticulum [ˌendəˈplæzmiːk/ˌendəpləzˈmætiːk rəˈtiːkjʊləm]

Golgi apparatus [ˈgɒldʒi əpəˈreɪtəs]

mitochondrion (mitochondria) [maɪtəʊˈkɒndrɪən] / [maɪtəʊˈkɒndrɪə]

lysosome [ˈlaɪzəsəʊm]

microfilament [maɪkrəʊˈfɪləmənt]

nucleus (nuclei) [ˈnjuːklɪəs] / [ˈnjuːklɪaɪ]

nucleolus (nucleoli) [njuːˈklɪələs] / [njuːˈklɪələɪ]

ribosome [ˈraɪbəsəʊm]

vacuole [ˈvækjuəl]

7. Give the corresponding noun. Pronounce it properly.

cellular, vacuolar, membraneous, nucleolar, reticular, endoplasmic, protoplasmic, nuclear, mitochondrial, cytoplasmic, chromosomal

8. Read some interesting facts about the cell. Translate the passages. Use a dictionary.

Do you know that

- it would require a sheet of about 10,000 human cells to cover the head of a pin?
- each human being is composed of more than 75,000,000,000,000 cells?
- the Golgi complex is the organelle, first described by the Italian cy-

tologist Camillo Golgi in 1898, has a characteristic structure composed of five to eight flattened, disk-shaped, membrane-defined cisternae, or vesicles, arranged in a stack?

From The Cell by Bruce M. Alberts/Encyclopedia Britannica article. Encyclopedia Britannica Deluxe Edition. CD-ROM. 2008

- a newborn human baby contains 2 trillion cells; an adult, 60 trillion?
- when you donate blood, you give away 5.4 billion cells – and scarcely miss them?
- each day, in fact, your body sloughs off and replaces 1 percent of its cells, or about 600 billion?

From BIOLOGY! Bringing science to life by John H.Postlethwait et al. McGRAW-HILL,INC. New York. 1991. P. 51

- a person's outer barrier – the skin, mucous membranes of the eyes, nose, and throat; and the linings of respiratory passages, lungs, and intestines – all contain mast cells, specialized cells packed with 1000 or more large, globular granules. These granules account for the runny nose, watery eyes, and sneezing of hay fever; the diarrhea and stomach cramps of food allergies; and the wheezing of asthma.

From BIOLOGY! Bringing science to life by John H.Postlethwait et al. McGRAW-HILL,INC. New York. 1991. P. 376

9. Fill in the gaps in the text with the verbs from the box.

take place, controls (x2), separate, contains (x3), consists, surrounds, play

The cell

Our body _____ of a large number of cells. The main parts of the cell are the cell membrane, the cytoplasm and the nucleus. The cell

membrane is the thin membrane which _____ the cytoplasm. It _____ lipid and protein molecules and _____ what goes in and out of the cell. Most of the cell's reactions _____ in the cytoplasm, for example, the mitochondria release (выделяют) energy. The cytoplasm _____ the structures called organelles. The nucleus is _____ d by the nuclear membrane. The nucleus is a very important structure. It _____ the chromosomes. They _____ an essential part in cellular reproduction. The nucleus _____ all the cellular activities.

10. Match the cell compartment with its description. Check your answers (see 'Keys' section). What are the other parts of the cell? Write the description of any other part of the cell which is missing and let the other students guess what it is.

The cell compartment	Description
the Golgi apparatus/body/complex	are dark-staining threads in the cell nucleus which carry hereditary information in the form of genes
the nucleus	digest unwanted materials within the cell
the mitochondria	is the part of the cell covered by the cell membrane, excluding the nucleus
the endoplasmic reticulum	is the site of the modification, completion, and export of secretory proteins and glycoproteins
the cytoplasm	is a region in the cytoplasm where ingested materials are stored and transported
the lysosomes	are the sites of energy production through ATP (adenosine triphosphate) synthesis
the chromosomes	is the site of lipid and protein synthesis
the ribosomes	is the information center of the cell
the vacuole	are small structures (organelles) attached to the endoplasmic reticulum
...	...

11. Do you know the names of cell types? Complete the sentences with the word or collocation from the box.

red blood cells (RBCs), nerve cells (neurons), myocytes, osteocytes, epithelial cells, white blood cells (WBCs), hepatocyte, connective tissue cells

1. The cells of the osseous tissue which give it its strength are
2. The cells which produce antibodies and fight against infection are
3. The cells which generate and conduct electrical impulses are
4. The cells which transfer oxygen are
5. The cells which form the outer skin layer, the lining of the blood vessels and the intestine are
6. The cells which purify/disinfect/detoxify our blood are
7. The connective tissue consists of
8. The long cells which compose the skeletal muscles are

12. Do you know anything about stem cells (стволовые клетки)? Read the passage and answer the questions.

- **What is a stem cell?**
- **Why is there great interest in stem cells?**
- **What are two major types?**
- **What disorders can cell transplantation be beneficial for?**

A stem cell is an undifferentiated cell that can divide to produce some offspring cells that continue as stem cells and some cells that are destined to differentiate (become specialized). Stem cells are an ongoing source of the differentiated cells that make up the tissues and organs of animals and plants. There is great interest in stem cells because they have potential in the development of therapies for replacing defective or damaged cells resulting from a variety of disorders and injuries, such as Parkinson disease, severe burns, and damage to the spinal cord. There are two major types of stem cells: embryonic stem cells and adult stem cells, which are also called tissue stem cells. ...

Some researchers hope to devise methods of producing large quantities of cells such as dopamine-secreting neurons for the treatment of Parkinson

disease and insulin-secreting pancreatic beta cells for the treatment of diabetes. It is known that cell transplantation can be beneficial for these diseases, but the cells for this purpose have previously been obtainable only from sources in very limited supply, such as the pancreatic beta cells obtained from the cadavers of human organ donors.

*From **Stem Cell** by Jonathan M.W. Slack/Encyclopedia Britannica article. Encyclopedia Britannica Deluxe Edition. CD-ROM. 2008*

13. Read the text about a cell's functions in Russian. Match the Russian words and collocations in bold with the appropriate English word or collocation from the box.

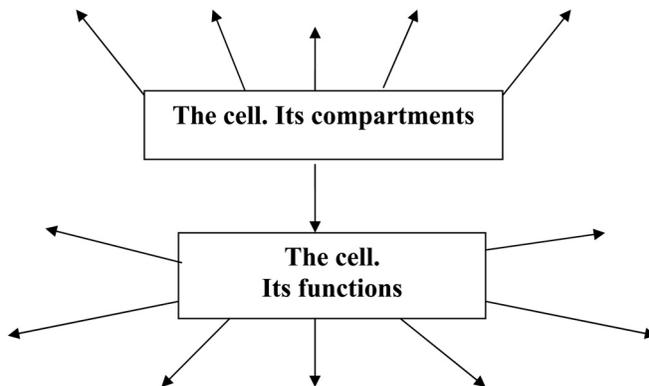
cell division, synthesis, nutrition, energy supply, export/excretion, transportation/transporting, energy exchange/metabolism, degradation, waste products, reproduction/multiplication, a number/a set of structures/compartments, intracellular transport, conversion of energy, the "brain" of cellular functioning/operation, a cell's activities

Все клетки выполняют определённые функции, что помогает им жить. Они поглощают и преобразуют энергию. Для выполнения своих функций клетки располагают **набором структур**, причём каждая отвечает за определённый участок работы, например, рибосомы вырабатывают протеины, клеточная стенка окружает и защищает клетку, митохондрии отвечают за **обеспечение энергией**, эндоплазматический ретикулум – за **внутриклеточный транспорт**.

Очень важная структура – ядро. Это своеобразный «**мозг**» **клеточного функционирования**. Эта сферическая структура содержит ДНК, контролирующую **деятельность клетки**.

Таким образом, эти компоненты необходимы для обеспечения жизнедеятельности самой клетки, а именно **синтеза** органических веществ, **транспорта, питания, энергоснабжения, энергетического обмена/обмена веществ, превращения энергии, распада и выведения продуктов жизнедеятельности**. Кроме того, клетки делятся, и **деление клетки**, а, следовательно, **размножение** – тоже важные процессы.

14. Complete the diagram and tell about a cell's functions in English. Add the material concerning the functions performed by different cell compartments. For example, the endoplasmic reticulum is involved in synthesis, accumulation and transporting the main organic substances.



15. Look through the following information in the table and answer the questions.

- Who was the first to describe the cell?
- Why did he call a cell a 'cell'?
- What did Antonie van Leewenhoek discover?
- When were a lot of discoveries in cytology made?
- What was the title of Theodore Schwann's research?
- Who is the author of the well-known quotation "omnis cellula e cellula"?
- What techniques did Walther Flemming use to see cell reproduction?

FROM THE HISTORY OF CELL THEORY AND DISCOVERIES

DATE	NAME	EVENT
1665	Robert Hooke	The description of cork and other plant tissues and introduction of the term <i>cell</i> because the cellulose walls of dead cork cells reminded him of the blocks of cells occupied by monks.

1673	Antonie/Anton van Leeuwenhoek	The discovery of blood cells, spermatozoa, and a lively world of “animalcules.” A new world of unicellular organisms was opened up.
1833	Robert Brown	The observation of the nucleus as a constant component of plant cells.
1830s		The observation of the nuclei and their recognition as such in some animal cells.
1830s		The recognition of a living substance called protoplasm within cells.
1838/1839	Theodore Schwann and Matthias Schleiden	The research <i>Microscopical Researches into the Accordance in the Structure and Growth of Animals and Plants</i> The development of cell theory: cells are the “elementary particles of organisms” in both plants and animals and some organisms are unicellular and others multicellular.
1855	Rudolf Virchow	The assertion of the correct general principle “omnis cellula e cellula” (“all cells come from cells”).
1870s	Walther Flemming	The description and interpretation of cell division. His advanced techniques of fixing and staining cells enabled him to see that cell reproduction involves the transmission of chromosomes from the parent to daughter cells by the process of mitosis and that the division of the cell body is the terminal event of that reproduction.

SELF-TEST

CHECK YOUR KNOWLEDGE

1. Say in one word (10 points).

1. a tiny unit constituting the core of all living things
2. the structure responsible for the cell’s secretory function
3. a spherical structure in the nucleus which deals with the synthesis and storage of nucleic acids.
4. a space within the cytoplasm of a cell, enclosed by a membrane and usually containing fluid.
5. a structure in the centre of the cell responsible for many cellular functions; here the cell’s hereditary material is stored
6. a network of membraneous tubules and vesicles

7. It is made up of links of protoplasm called genes joined together in a chain.
8. a tiny particle, the site of protein synthesis
9. The chemical ... was discovered in 1869. It was not until 1943 that its role in genetic inheritance was demonstrated. In 1953, J.Watson and F.Crick determined its structure.
10. the site of energy metabolism in the cell

2. Translate the sentences from Russian into English (6 points).

1. Существует около 200 различных типов клеток: округлые и продолговатые, звёздчатые и кубические (кубические), плоские и призматические, с отростками и без.
2. Множество сходных клеток объединяется в ткани.
3. Существует два типа клеточного деления: митоз и мейоз.
4. Все клетки так малы, что их можно увидеть только в микроскоп.
5. Первым клетку живого организма увидел английский учёный Роберт Гук.
6. В организме различают четыре вида тканей: эпителиальную, соединительную, нервную и мышечную.

3. (evaluated by your teacher) Answer the following questions in English (10 points).

1. What is a cell?
2. Who first saw the cell with the help of an ornate (допотопный) microscope?
3. Who developed the cell theory?
4. What are the main cell types?
5. How are they arranged in living organisms?
6. What shape and size do most cells have?
7. What are the main parts of a cell?
8. What common functions are performed by cells?
9. How do cells do this?
10. (*Write your own question about a cell. Let the other students answer it.*)

- 4. (evaluated by your teacher and fellow students) Prepare a crossword “The Cell”. Include 10 words. Let the other students guess the words.**
- 5. (evaluated by your teacher) Talk about the cell according to the plan items (10 points for 10 sentences).**

- *The definition*
- *The main parts*
- *The main types*
- *The main functions*
- *The scientists who contributed to the cell theory*

Unit 4. METABOLISM

1. Practise pronouncing the following. Translate the collocations from English into Russian.

to metabolize → metabolized → metabolizing → metabolism → metabolic → metabolite/metabolites

glucose metabolism, fat metabolism, metabolic processes, active metabolites, to metabolize certain substances, protein metabolism, metabolic diseases, carbohydrate metabolism, low metabolic rate, alcohol metabolism, to be metabolized by the liver

2. Translate different definitions of 'metabolism' into Russian. Are there any differences in the definitions? Make the list of key words.

Metabolism

- is “the chemical processes by which food is changed into energy in your body.” (*Longman Dictionary of Contemporary English. Longman. Pearson Education Limited. UK. 2003. P. 1043*)
- is “the chemical processes in a living thing by which food is used for tissue growth or energy production.” (*Soanes Catherine Oxford Dictionary of Current English. 3rd edition. Oxford University Press. UK. 2001. P. 565*)
- is “the process by which food is built up into living matter or by which living matter is broken down into simple substances.” (*Hornby AS. Oxford Student's Dictionary of Current English. М. Изд. «Просвещение». 1984. Стр. 391*)
- is “the total processes in living organism by which tissue is formed, energy produced and waste products eliminated.” (*Webster's Compact English Dictionary for home, school or office. Geddes & Grosset. 2003. P. 291*)
- is “all the chemical processes that occur within a living organism, resulting in energy production (**destructive metabolism**) and growth (**constructive metabolism**).” (Иллюстрированный словарь английского языка *Oxford*. Москва. Астрель. АСТ. 2002. С. 511)

3. Translate the following sentence into English, using the words from the sentences above. Answer the question: What are two processes that metabolism consists of?

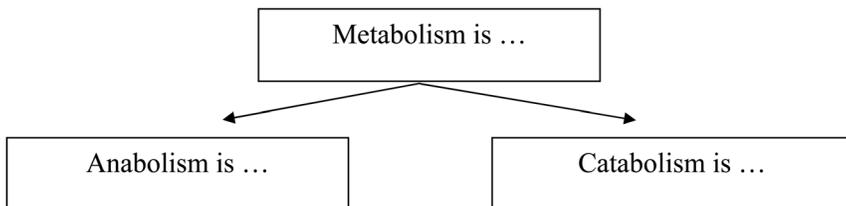
Метаболизм – «совокупность химических процессов в организме; различают анаболизм (реакции синтеза больших молекул из малых) и катаболизм (реакции расщепления больших молекул на малые), включающий разложение как эндогенных, так и чужеродных веществ.» (Англо-русский медицинский энциклопедический словарь. – М.: ГЭОТАР, 1995, стр. 390)

4. Complete the sentences, using the words and collocations from the box.

anabolism; all the physical and chemical; basal; destructive; various forms of work; catabolism; constructive, chemical and physical; the breaking down of tissues into waste products
--

Metabolism includes _____ processes by which the living body is maintained, and also those by which the energy is made available for _____. The _____ processes by which food materials are adapted for the use of body are known as _____. The _____ processes by which energy is produced with _____ are known as _____. _____ metabolism is the term applied to the energy changes necessary for such processes as beating of the heart, respiration, and maintenance of body warmth.

5. Complete the diagram in English. Think about some more boxes that you can add to it. Draw them, making the diagram complete.



BEFORE YOU READ

6. Practice pronouncing the following words. Translate the collocations with them and related words.

VOCABULARY LIST

breakdown /**break down** [ˈbreɪkdaʊn]/ [breɪk daʊn] *n/v* распад; распадаться

a product of breakdown; cellular breakdown; carbohydrate breakdown; the breakdown of food molecules; the breakdown of urea (мочевина); to stimulate breakdown of glycogen; to break down certain molecules; to break the bonds (связи) between the molecules; The unstable compound quickly breaks down. Large molecules are broken down into smaller molecules.

consume [kənˈsjʊ:m] *v* потреблять; поглощать

to consume calories; to consume a diet that is mainly starch; We consume more calories.

environment [ɪnˈvaɪrənmənt] *n* окружение, окружающая обстановка; окружающая среда

the cell's internal environment; environmental change; internal environment; external environment; aqueous environment; Biology is the study of living things and their environment.

enzyme [ˈenzaim] *n* фермент (энзим)

to control the synthesis of certain enzymes; organic catalysts known as enzymes; enzyme activity

mediate [ˈmi:diət] *v/a* посредничать; служить связующим звеном; промежуточный, посредствующий; **intermediate** промежуточный; **mediated** опосредованный

to be mediated by a specific enzyme; immunologically mediated destruction; a vitamin B12-mediated reaction; the actual mediator of metabolic change; a series of chemical intermediates between; biotin-mediated

carboxylation; protein-mediated transport; Coenzymes participate in enzyme-mediated catalysis.

obtain [əb`teɪn] *v* получать

to obtain energy from the Sun; to obtain information; to obtain the data; to obtain direct experimental evidence

provide [prə`vaɪd] *v* снабжать; обеспечивать; предоставлять, давать
to provide energy; to provide structural support; to provide waterproof coverings; to provide with food and water; to provide a powerful tool (инструмент); If no mechanism is provided...

refer [rɪ`fɜː] *v* посылать, отсылать, направлять; иметь отношение, относиться; ссылаться; **to be referred to as** называться: Metabolism is sometimes referred to as *intermediary* metabolism.

The term refers to ...; to refer to the notes: The speaker often referred to his notes. This process is often referred to as ...

release [rɪ`liːs] *n/v* освобождение; освобождать, выпускать

a release of heat; release factors; energy release upon (при) oxidation; release of energy from a chemical bond; to release heat; to release energy; to release compounds; to release oxygen elsewhere in the body; the amino acids released from these proteins

reverse [rɪ`vɜːs] *n/v/a* противоположное, обратное; задний или обратный ход; обратный; перевёрнутый; противоположный; перевёртывать; поворачивать в противоположном направлении
the reverse of the reaction; to be the reverse of; to reverse the action; Photosynthesis is the reverse of respiration.

reversible – irreversible: It's a reversible process. – It's an irreversible process.

store [stoː] *n/v* запас, резерв; запасать; хранить

to store energy; the information-storing cell nucleus; energy-storing compounds; to release energy stored in the bonds; energy storage molecules;

nutrient storage compounds; temporary storage; storage capacity; to be stored as glycogen; Genetic information is stored in the chromosomes. Energy in the muscles and liver is stored in the form of glycogen.

transfer [træns`fɜ:] *v* переносить, перемещать/[`trænsfɜ:] *n* перенос, перемещение

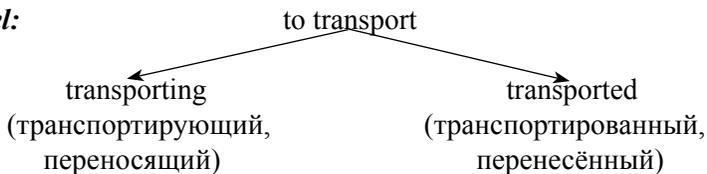
the transfer of carbon from muscle to liver; to transfer from the body; to transfer the electrons; to transfer energy within the cell; to transfer directly; to be transferred to coenzymes

7. Find a synonym for the word below from Vocabulary List.

opposite; reserve; to keep; to emit; to supply; back; to take in; emission; to transport; surroundings; degradation; to give; to carry from ... to...; to produce; transmission

8. Form the participles from the infinitives and translate them. Use them in the collocations below.

Model:



to break down; to consume; to mediate; to provide; to obtain; to refer; to release; to store; to transfer

the term (относящийся к ...); the organism (получающий питательные вещества); (распадающиеся) bonds; (транспортированные) substances; compounds (выделяющиеся из ...); (распавшиеся) bonds; people (потребляющие диету, содержащую) many refined carbohydrates; calories (потреблённые за день); (выделенные) hormones; vitamins (запасённые в ткани); fibre (распавшаяся химически); to release energy (запасённую) in the bonds; services (предоставляемые); minerals (полученные из); energy (запасённая) in organic compounds

9. Read the text about metabolism. Find the English equivalents for the following in the text: *происходить в каждой клетке; широкая сеть взаимосвязанных химических реакций*; для большинства организмов; посредством фотосинтеза; приходит от солнца; у некоторых бактерий; в особой среде; глубоководные впадины; АТФ (аденозин трифосфат). *Answer the questions in English.*

- What is metabolism? Why is it important?
- What is intermediary metabolism?
- What is the result of anabolic reactions?
- What is the result of catabolic reactions?
- What do the living things get energy from?
- What are the enzymes for?

Metabolism

Metabolism is a sum of all chemical reactions that take place in every cell of a living organism, providing energy for the processes of life and synthesizing new cellular material. The term intermediary metabolism refers to the vast web of interconnected chemical reactions by which all the cell's constituents, many rarely found outside it, are created and destroyed. Anabolic reactions use energy to build complex molecules from simpler organic compounds (e.g. proteins from amino acids, carbohydrates from sugars, fats from fatty acids and glycerol); catabolic reactions break complex molecules down into simpler ones, releasing chemical energy. For most organisms, the energy comes ultimately from the Sun, whether they obtain it by photosynthesis and store it in organic compounds or by consuming those organisms that do so. In some bacteria in special environments such as deep-sea vents, the energy comes from chemical reactions instead. Energy is transferred within the cell and the organism by ATP; anabolic reactions consume it, and catabolic reactions generate it. Every cellular chemical reaction is mediated by a specific enzyme. The process that breaks down a substance is usually not the reverse of the process that makes it, using a different enzyme.

*From **Metabolism**/Encyclopedia Britannica article. Encyclopedia Britannica 2005 Ready Reference. Сокращённое издание 32-томной «Британской энциклопедии». CD-ROM. 2005*

AFTER YOU READ

10. Match the columns, making the sentences complete. Check your answers (see 'Keys' section). Translate the sentences into Russian.

1. The term 'metabolism'	consists of two contrasting processes, anabolism and catabolism.
2. Metabolism	is a synthetic process involving the formation of new covalent bonds.
3. Metabolism	involves the oxidative degradation of complex nutrient molecules.
4. Anabolism	derives from the Greek word 'change'.
5. Catabolism	is sometimes referred to as intermediary metabolism.
6. Metabolism	consists of hundreds of enzymatic reactions.

11. Which of the following words/collocations in the box can you explain in English? If it is difficult, find the appropriate definition below.

digestion, nutrition, malnutrition, obesity, nutrients, diet, vitamin deficiency, metabolic disorders /disturbances, nutritional deficiency diseases
--

1. a condition resulting from inadequate diet or from inability to absorb or metabolize nutrients
2. diseases resulting from insufficient supply of calories, proteins or vitamin/mineral deficiency (beriberi, pellagra, rickets, scurvy)
3. processes of taking in and utilizing food substances
4. food that a person consumes
5. excessive body fat
6. insufficient amount of vitamins in the body
7. disorders/disturbances caused by imbalanced diet, abnormal metabolism or obesity/malnutrition
8. a process of taking in and utilizing food through the digestive tract
9. all useful substances like proteins, fats, carbohydrates, minerals, vitamins, dietary fibre and trace minerals

12. Answer the questions.

- Do you eat a proper diet?
- How do you know that you eat a proper diet?
- What do you normally eat?
- Do you listen to any advice that people usually give concerning this or that type of food?
- Do you calculate the number of calories you consume?
- Should all people do this?
- What diet can you recommend to a person if s/he wants to be slim?
- Do you usually follow the advice/pieces of advice that people give?

SELF-TEST

CHECK YOUR KNOWLEDGE

1. Translate the collocations and sentences from Russian into English (10 points).

метаболизм углеводов; распад углеводов; запас углеводов; химические изменения, называемые «метаболизм»; синтез ферментов; роль АТФ в метаболизме энергии; запастись большим количеством химической энергии; АТФ – молекула, несущая энергию. Энергия выделяется, когда химические связи распадаются. Клетки постоянно разрушают АТФ, чтобы получить энергию.

2. (evaluated by the other students and your teacher) Compile a glossary/ a thesaurus or prepare a crossword on the topic “Metabolism”. Include 10 words. Let the other students guess the words. (10 points).

3. (evaluated by your teacher) Talk about metabolism according to the plan items (10 points for 10 sentences).

- The definition/The definitions
- The ways of getting energy for any living thing
- Anabolism
- Catabolism
- Metabolic disorders

SELF-WORK /PROJECT WORK (evaluated by the other students and your teacher)

- 1. You want to carry out/to conduct a survey of dietary habits (in your family/ your group etc). Make a list of questions in Russian or in English, ask the other students and make a conclusion in English based on the answers either in writing or orally. Begin like that: “According to the data from the survey of dietary habits carried out by me, ...% of students” or “I’ve carried out a survey on dietary habits in my group. The survey showed that”***
- 2. Work individually or in small groups. Surf the Internet. Collect information about some common metabolic disturbances. Give a short presentation about these disorders (PowerPoint presentation).***

Unit 5. VITAMINS

1. Look through the following statements. Put a tick if you agree.

1. Vitamins are organic substances.
2. You need a lot of vitamins every day.
3. Vitamins don't act as coenzymes.
4. Vitamins provide energy.
5. You get them with food.
6. They aren't produced within the body.

2. Check your answers, using the definition from Merriam Webster's Dictionary. Correct your answers if some are incorrect.

“Vitamin (ˈvaɪtəməɪn; Brit usu ˈvɪ)

alter. of *vitamine*, fr. L. *vita* life + E amine, 1912

any of various organic substances that are essential in minute quantities to the nutrition of most animals and some plants, act esp. as coenzymes and precursors of coenzymes in the regulation of metabolic processes but do not provide energy or serve as building units, and are present in natural foodstuffs or sometimes produced within the body.”

3. Read and translate the following facts, paying attention to the words.

pigeons – голуби

fed on polished rice – питающиеся шлифованным рисом

to supplement – дополнять

rice bran – рисовые отруби

the outer husk – наружная оболочка, шелуха

a lack – нехватка

to drop – пропускать

claims for – заявки на

to multiply – множиться

Do you know that

- in 1912 a Polish scientist, Casimir Funk, demonstrated that a nerve disease (polyneuritis) produced in pigeons fed on polished rice could be cured by supplementing the birds' diet with a concentrate made from rice bran, a component of the outer husk that was removed from rice during polishing. Funk proposed that the polyneuritis arose because of a lack in the birds' diet of a vital factor (now known to be thiamin) that could be found in rice bran. Funk believed that some human diseases, particularly beriberi, scurvy, and pellagra, also were caused by deficiencies of factors of the same chemical type. Because each of these factors had a nitrogen-containing component known as an amine, he called the compounds "vital amines," a term that he later shortened to "vitamines." The final e was dropped later when it was discovered that not all of the vitamins contain nitrogen and, therefore, not all are amines?
- in 1913 (*according to some other sources [eg Chemistry and Society by Mark M. Jones et al. Fifth edition. Saunders College Publishing. 1987. P.523], as early as 1915 – Author's remark*) American researcher Elmer McCollum divided vitamins into two groups: "fat-soluble A" and "water-soluble B"? As claims for the discovery of other vitamins multiplied, researchers called the new substances C, D, and so on.

*From **Vitamin** by Margaret J. Baigent and Kenneth Carpenter/Encyclopedia Britannica article. Encyclopedia Britannica Deluxe Edition. CD-ROM. 2008*

4. Look through some more definitions of the word 'vitamin'. Compare them. Write your own one.

- A vitamin is a chemical substance in food that is necessary for good health. (*Longman Dictionary of Contemporary English. Pearson Education Limited. 2006. P. 1843*)

- Vitamin n any of a group of organic compounds essential in small amounts for many living organisms to maintain normal health and de-

velopment (Иллюстрированный словарь английского языка *Oxford*. Москва. Астрель. АСТ. 2002. P. 932)

- Vitamins are basic nutritional elements required in very small amounts for the satisfactory development of many processes of life, such as growth, immunity, various functions of blood, the function of the endocrine system, and so on. (*The Human Body*. Könemann. 2000. P. 68)

- Vitamins are organic compounds needed in small amounts for normal growth and metabolism. (*from BIOLOGY! Bringing science to life by John H. Postlethwait et al. McGRAW-HILL, INC. New York. 1991. P. 388*)

- A vitamin is an organic constituent of food that is consumed in relatively small amounts (less than 0.1 g/kg of body weight per day) and is essential to maintain life although vitamins are not synthesized by human beings. (*from Chemistry and Society by Mark M. Jones et al. Fifth edition. Saunders College Publishing. 1987. P.547*)

5. Complete the table with one of the following words: 'absorb' (x2), 'solution', 'dissolve', 'fat', 'water'. What does the word 'soluble' mean? Can you translate the following related words: to solve, solution, solvent, insoluble, solubility, insolubility?

VITAMINS	
... – soluble	... - soluble
They ... in fats and are ...ed with them.	They are ...ed in aqueous ...
Vitamin A Vitamin D Vitamin E Vitamin K	The B complex (B1, B2, B3, B5, B6, B7, B9 and B12) Vitamin C

6. Practice pronouncing the following:

abnormal [əb`no:məl] ненормальный, патологический

anemia [ə`ni:miə] анемия

decay [di`keɪ] гниение, распад

deficiency [di`fɪʃənsɪ] недостаточность

degeneration [di,dʒenə`reɪʃn] перерождение, дегенерация

pellagra [pɪ/ə`lægrə] пеллагра

rickets [`rɪkɪ/əts] рахит

sensitivity [ˌsensɪ/ə`tɪvɪ/ə tɪ] чувствительность

vision [ˈvɪʒən] зрение

7. Give the related word to fill in the gap. Translate the words.

- normal; normally; ...; abnormally; abnormality; abnormalities
- ...; anemic
- ...; decayed
- deficit; deficient; ...
- generate; generation; degenerate; ...
- sense; sensitive; ...
- ...; visual; visually; visualize

8. Read the definitions of the specific nutritional deficiency diseases. Use a dictionary. Match them with the diseases from the box.

pellagra, beriberi, rickets, anemia, tooth decay, scurvy

1. nutritional disorder caused by a dietary deficiency of niacin (also called nicotinic acid) or a failure of the body to absorb this vitamin or the amino acid tryptophan, which is converted to niacin in the body. It is characterized by skin lesions and by gastrointestinal and neurological disturbances; the so-called classical three Ds of it are dermatitis, diarrhea, and dementia.
2. nutritional disorder caused by a deficiency of thiamin (vitamin B₁) and characterized by impairment of the nerves and heart. General symptoms include loss of appetite and overall lassitude, digestive irregularities, and a feeling of numbness and weakness in the limbs and extremities. (The term is derived from the Sinhalese word meaning “extreme weakness.”)
3. disease of infancy and childhood characterized by defective bone growth and caused by a lack of vitamin D in the body.
4. *also called vitamin C deficiency* one of the oldest-known nutri-

tional disorders of humankind, caused by a dietary lack of vitamin C (ascorbic acid), a nutrient found in many fresh fruits and vegetables, particularly the citrus fruits. The disease is characterized by swollen and bleeding gums with loosened teeth, soreness and stiffness of the joints and lower extremities, bleeding under the skin and in deep tissues, slow wound healing, and anemia.

5. it is an oral infectious disease in which bacteria, primarily *Streptococcus mutans*, in the dental plaque metabolize simple sugars and other fermentable carbohydrates into acids that dissolve tooth enamel.
6. a condition in which the red blood cells (erythrocytes) are reduced in number or volume or are deficient in hemoglobin, their oxygen-carrying pigment. The most noticeable outward symptom of it is usually pallor of the skin, mucous membranes, and nail beds. Symptoms of tissue oxygen deficiency include pulsating noises in the ear, dizziness, fainting, and shortness of breath.

BEFORE YOU READ

9. Practice pronouncing the following words. Translate the collocations with them and the related words.

VOCABULARY LIST

cause [ko:z] *n/v* причина; причинять, вызывать

many different causes; a cause of disease; to cause a disease; to cause a change; to cause vitamin deficiency (hypovitaminosis); to cause an increase in ... concentration; causal

cessation [sə`se[n] *n* прекращение, остановка

cessation of growth; to cause cessation; to cause cessation of tissue growth; to cease; without cease

bleeding [ˈbli:diŋ] *n* кровотечение

a cause of nose bleeding; to cause bleeding; to control bleeding; severe/heavy bleeding; to bleed heavily

disorder [dɪˈsoːdə] *n* расстройство

order – disorder; a disorder of the brain/digestive system/liver; a heart/lung/stomach disorder; eating disorders; a mental disorder; disorderly

excessive [ɪkˈsesɪv] *a* избыточный

excessive body fat; excessive body weight; excess weight; excess water; excess fat

failure [ˈfeɪljə] *n* провал, неудача

failures and successes; exam failure; a total failure; heart/kidney/liver failure; to fail in ...; He failed the exam again; failing eyesight/heart/memory

growth [grəʊθ] *n* рост

plant growth; tissue growth; during growth; growth hormone; Growth is a process.

heal [hi:l] *v* исцелять, заживать, заживлять

to heal slowly/quickly; healing properties; healing ointment

impair [ɪmˈpeɪ] *v* нарушать, повреждать

to impair a function; to impair one's health; health impairment; impaired vision

lack [læk] *n/v* нехватка, недостаток; не хватать, недоставать

a lack of iron; a severe lack of; lack of progress/information; a total lack of; to lack some of the enzymes; The case history lacks some data. If one essential amino acid is lacking ...

maintain [meɪnˈteɪn] *v* поддерживать

to maintain a constant temperature; to maintain the equilibrium; to maintain tissue homeostasis; to maintain weight; to maintain the level of ... (in the body); to maintain high standards; maintenance

wound [wu:nd] *n/v* рана; ранить

to die of wounds; to be badly wounded; a wounded soldier; wound healing; The wound has healed.

10. Match the symptoms in English with their Russian equivalents. Practice pronouncing them in English. Add the symptoms from Activity 8 to make the list complete. Translate them into Russian.

1. fatigue [fəˈti:g]	А головокружение
2. nausea [ˈno:zjə]/[ˈno:sjə]	В рвота
3. hemorrhage [ˈheməridʒ]	С болезненность, воспаление
4. pallor [ˈpælə]	Д кровоизлияние
5. weakness [ˈwi:knəs]	Е отёк
6. vomiting [ˈvomitɪŋ]	Ф тошнота
7. dizziness [ˈdɪzɪnəs]	Г усталость, утомление
8. edema [ɪˈdi:mə]	Н нарушение свёртываемости крови
9. blood clotting disorder	І бледность
10. diarrhea [daɪəˈrɪə]	Ј понос
11. soreness [ˈso:nəs]	К слабость

11. Make the sentences complete, using the model and the information given below.

Model: Vitamin ____ is good for your _____. Vitamin ____ is found in _____. The disorders connected with its lack are _____/The lack of this vitamin causes _____./ The disorders caused by its lack are _____.

Vitamin	Sources	Disorders/diseases
Vitamin A (retinol)	Cod liver oil, halibut oil, fruits (apricots, peaches, oranges), milk, vegetables (cabbage, carrots, spinach)	Anemia, bone changes, diarrhea, excessive light sensitivity, impaired night vision, impaired brain growth, nerve degeneration in spinal column, tooth decay
Vitamin B1 (thiamine)	Breads, dairy products and milk, fruits, vegetables, soybeans, bran, corn flakes, raw peanuts, wild rice, liver, eggs	Beriberi, serious nervous disorders, muscular atrophy, serious circulatory changes
Vitamin B2 (riboflavin)	Meat, milk, fresh, dark-green, leafy vegetables, whole grains, eggs	Cracks at the corner of the mouth; sensitivity to light, cessation of tissue growth, excessive fatigue, pellagra

Vitamin B6 (pyridoxine)	Meats, vegetables (raw carrots), fruits (avocados, bananas), whole grain cereals, yeast, bran, liver, egg yolk	Abnormal brain activity, skin soreness, smooth tongue, nausea, vomiting, weakness, dizziness
Vitamin B12	Dairy products, meat, oysters, egg yolk	Anemia, poor cell division, pallor, poor coordination, nerve degeneration
Vitamin C (ascorbic acid)	Citrus fruits (oranges, lemons), dark green vegetables	Scurvy, failure of wounds to heal, gum bleeding, rough skin
Vitamin D	Sunshine/sunlight, milk (fortified with vitamin D), eggs, liver, oily fish (tuna, halibut, herring, cod)	Abnormal development of bones and teeth (rickets, tooth decay)
Vitamin E (tocopherol)	Yeast, vegetable oils, lettuce, wheat grains, meat, salmon, eggs, nuts	Edema and anemia
Vitamin K	Cabbage (cauliflower), milk, green leafy vegetables (spinach)	Unchecked bleeding, hemorrhages, slow blood clotting

Based on BIOLOGY! Bringing science to life by John H. Postlethwait et al. McGRAW-HILL, INC. New York. 1991. P. 389; The Human Body. Könemann. 2000. Pp. 68- 69; Chemistry and Society by Mark M. Jones et al. Fifth edition. Saunders College Publishing. 1987. Pp. 548 - 553

12. Complete the sentences, using the information from the previous activities.

1. A vitamin is ...
2. All living organisms require ...
3. There are ... major vitamins.
4. The word 'vitamin' derives from ... and means ...
5. They function as ...
6. Vitamins are divided into ...
7. Fat (or oil) - soluble vitamins are ...
8. They are found in such foodstuffs as .../Their sources are ...
9. Their deficiency causes ...

10. Water-soluble vitamins are ...
11. They are found in .../Their sources are ...
12. Their deficiency causes ...
13. Vitamins are good for our health because ...
14. (your own sentence)

13. Minerals are also good for your health. They play an essential part in many bodily processes such as enzymatic mechanisms, bodily growth, etc. Practice pronouncing the names of minerals.

calcium [ˈkælsɪəm] кальций

chlorine [ˈklɔːrɪn] хлор

fluorine [ˈfluəriːn] фтор

iodine [ˈaɪədiːn] йод

iron [ˈaɪən] железо

magnesium [mæɡˈniːziəm] магний

phosphorus [ˈfɒsfərəs] фосфор

potassium [pəˈtæsiəm] калий

sodium [ˈsəʊdiəm] натрий

zinc [zɪŋk] цинк

BEFORE YOU READ

14. Practice pronouncing the following words. Translate the collocations with them and the related words.

VOCABULARY LIST

amount [əˈmaʊnt] *n* количество, объём

amount of water; to determine the amount of ...; a/the small amount of; to use large amounts of; in greater amount

constituent [kənˈstɪtʃuənt] *n/a* составляющая часть целого; компонент; составной

a lot of constituents; Hydrogen is a constituent of water.

major [ˈmeɪdʒə] *a* большой; главный

major minerals; a major problem; a major factor; great/overwhelming/vast majority of; one major source of carbon; the major end products; a major source of energy

minor [ˈmaɪnə] *a* незначительный; меньший

minor minerals; to observe minor changes; minor illness/operation; a small minority

reserve [rɪˈzɜ:v] *n/v* запас, резерв; запасть

to hold in reserve; to reserve a large amount of

volume [ˈvɒljʊ:m] *n* объём

volume of fluid; to measure the volume of gas; the volume of a container

15. Read some interesting facts about minerals. Answer the question: ‘What minerals are there in the body?’

Do you know that

- *major minerals* are those elements we need in amounts greater than 0.1 g each day; *minor minerals* are those we need in amounts less than 0.01 g daily?
- an adult’s body contains about 2 kg (4.4 lb) of minerals, and of this, about three-quarters is the calcium and phosphorus in the bones and teeth?
- the minerals that give tears, blood, and sweat their salty taste are sodium, potassium, and chloride?
- sulphur is found in many proteins, and magnesium is a constituent of enzymes and, along with the calcium, is held in reserve in the bones?

From BIOLOGY! Bringing science to life by John H. Postlethwait et al. MCGRAW-HILL, INC. New York. 1991. P. 388

16. Make the sentences complete, using the model and the information given below.

Model: _____ is found in _____. It plays a role in _____./ It is responsible for _____. /It is involved in _____.

Mineral	Place in the body	Role in the body
Calcium	The skeleton	Mineralization of bone
Chlorine	Extracellular liquids of the body	Metabolism of sodium
Fluorine	Bone tissue, tooth enamel	Dental health
Iodine	The thyroid gland	The thyroid hormones
Iron	Absorption in the stomach and small intestine	The formation of hemoglobin
Magnesium	The skeleton	A regulator or catalyst for a large number of intracellular reactions
Phosphorus	In the form of phosphates	The formation of bone
Potassium	The interior of cells	Muscular contraction and relaxation, osmosis
Sodium	Electrolyte and water balance	Maintaining extracellular water volumes
Zinc	Enzymic reactions	Cellular reproduction, tissue growth and regeneration

Based on BIOLOGY! Bringing science to life by John H. Postlethwait et al. McGRAW-HILL, INC. New York. 1991. P. 390; Chemistry and Society by Mark M. Jones et al. Fifth edition. Saunders College Publishing. 1987. Pp. 540 - 543

17. Do you know any other vitamins and minerals that are essential for your health? Be ready to present information in a series of slides. (see 'Self-work/Project work' section)

18. Answer the questions.

- What can a deficiency of vitamins/minerals cause?
- Is an excess of vitamins dangerous?
- What are the basic groups of them?

- Which of the foodstuffs do you use/consume more or less regularly? (see the table ‘Vitamins’ in Activity 11)

SELF-TEST

CHECK YOUR KNOWLEDGE

1. Complete the table with the correct word (10 points).

Verb	Noun	Adjective/participle	Adverb
	maintenance	maintaining	-----
to exceed	excess		excessively
cause		causal	causally
bleed		bleeding	-----
-----	deficiency		deficiently
degenerate	degeneration		-----
grow		growing	-----
	impairment	impairing	-----
wound	wound		-----
sensitize		sensitive	sensitively

2. Say in one word, then write the word in English (5 points).

- a lack of success
- the opposite of ‘order’
- eyesight
- deficit; deficiency; shortage
- to cure

3. (evaluated by your teacher) Talk about vitamins and minerals according to the plan items (10 points for 10 sentences).

- Basic vitamins
- Their role in our life
- Vitamin deficiency/excessive use
- Basic minerals
- Their role in our life

SELF-WORK /PROJECT WORK (evaluated by the other students and your teacher)

1. Work in small groups or individually. Collect information about choline, niacin, pantothenic acid, folacin (folic acid) and biotin. Give a short presentation about them, their sources and disorders caused by their lack (PowerPoint presentation).

2. Work in small groups or individually. Collect information about some other vitamins (B3, B5, B7, B9, F, H, P). Give a short presentation about them, their sources and disorders caused by their lack (PowerPoint Presentation).

3. Work in small groups or individually. Collect information about one of/some minerals (calcium, cobalt, phosphorus, potassium, sulphur, sodium, chlorine, magnesium, manganese, molybdenum, nickel, selenium, vanadium, iron, iodine, zinc, copper, fluorine, chromium). Give a short presentation about them, their sources and disorders caused by their lack (PowerPoint Presentation).

4. Prepare a crossword on the topic "Vitamins". Include 10 words. Let the other students guess the words. (10 points).

PART II.

Unit 1. ENZYMES

1. Pronounce the word collocations, paying attention to the words ‘enzyme’ [ˈenzaim] and ‘enzymatic’ [ˌenzaiˈmætɪk]. Translate them into Russian.

a typical enzyme molecule; enzyme-catalyzed reactions; angiotensin converting enzyme; digestive enzymes; the purified enzyme; enzyme-substrate complex; the active site of an enzyme; enzyme effect on activation energy; the rates of enzyme synthesis and activity; a certain region of an enzyme; to be bound to the enzyme; enzymatic ability; enzymatic activity; enzymatic reactions; enzymatic functioning of RNA; coenzyme

2. Translate the noun phrases into English, using the word ‘enzyme’.

активность ферментов; выработка ферментов; структура фермента; кинетика фермента; синтез ферментов; специфичность ферментов; способность ферментов

3. Fill in the gaps with the collocation from the box to get some initial information about enzymes.

bacteria, yeast, and mould; proteins; reaction; a catalyst; under specific conditions of pH and temperature; industrial and medical applications

1. An enzyme acts as ...
2. Enzymes and their products were first obtained from ...
3. Enzymes are large complex ...
4. An enzyme functions as an organic catalyst ...
5. Enzymes have valuable ...
6. The fermenting of wine is an example of enzymatic ...

BEFORE YOU READ

4. Practice pronouncing the following words. Translate the collocations with them and related words.

VOCABULARY LIST

alter [ˈo:lɪtə] *v* изменять(ся); менять(ся)

to alter beyond recognition; to be altered during this process; the molecular alteration

bond /bonding [bond]/[bondɪŋ] *n* связь; связывание

chemical bonding; to form double bonds; the formation of various chemical bonds; the breakdown of a pyrophosphate bond in adenosine triphosphate or a similar nucleotide; hydrogen bonds; a conjugated double-bond system; In each methane molecule there are four CH bonds.

cleave [kli:v] *v* раскалывать(ся)

cleavage; the cleavage of these cell-wall components; by the action of the citrate cleavage enzyme; cleavage products; to cleave the substrate; cleaved into smaller fragments; to be cleaved from DNA

particular [pa:ˈtɪkjʊlə] *a* специфический, особый, особенный, индивидуальный, частный, отдельный

particular process; particular properties; particular functions; in this particular case; a particular area of research; to be of particular interest; to have a particular structure

proceed [prəˈsi:d] *v* продолжать

to proceed through a number of steps; Chemical reactions proceed. The reaction can proceed rapidly.

result [rɪˈzʌlt] *v* следовать, происходить в результате (from); кончатся, иметь результатом (in)

to result from damage; to result from an error; to result in a disease; to result in death; to result in disorders; to result in the conversion of ADP to ATP

uptake [ˈʌpteɪk] *n* скорость поглощения, усвоения

the uptake of; the rate of uptake; the uptake of amino acids; rapid/slow uptake; uptake of a water molecule; to cleave the substrate by uptake of

a water molecule; the uptake of a substrate into a cell; to measure the uptake; to take up sugar/lactose; This disorder (galactosemia) results from a lack of the transferase enzyme.

5. Find a synonym for a word in bold in the sentences below.

basic; act; results from; divided into groups; requires; speed up

1. Enzymes are protein molecules that **catalyze** chemical reactions.
2. Each chemical reaction **needs** its own particular enzyme.
3. Many vitamins **function** as coenzymes.
4. Enzymes are **classified** according to the type of reaction they catalyze.
5. There are six **major** groups of enzyme.
6. Albinism **is due to** a deficiency of a particular enzyme.

6. Do you know that

- it was not until the 19th century that such reactions as the fermenting of wine, leavening of bread, curdling of cheese, and brewing of beer were understood to be the result of the catalytic activity of enzymes?
- enzymes are named by adding the suffix “-ase” to the substrate’s name?
- only a certain region of the enzyme, called the active site, binds to the substrate?
- enzyme synthesis and activity are influenced by genetic control and distribution in a cell?
- some enzymes are not produced by certain cells, and others are formed only when required?
- enzymes are not always found uniformly within a cell; often they are compartmentalized in the nucleus, on the cell membrane, or in subcellular structures?

*From **Enzyme** /Encyclopedia Britannica article. Encyclopedia Britannica Deluxe Edition. CD-ROM. 2008*

7. Study the following facts and use them in your sentences.

Model: In ... (year/century) ... (the name of the scientist) ... discovered/ observed/ studied/showed/proved ...

The year/century	The scientist	The research
18 th century	Antoine Lavoisier	The studies on conversion of sugar into carbon dioxide and water during fermentation
the late 1800s (1860s)	Louis Pasteur	The studies on fermentation of alcohol and milk. The discovery of transformation of sugar to alcohol caused by a living organism, yeast.
1897	Edward Buchner/Büchner	A cell-free extract from yeast could result in fermentation of a sugar solution.
1926	Sumner	The isolation of the first pure crystalline enzyme (urease)

9. Read and translate the text.

ENZYME

Enzyme is a substance that acts as a catalyst, regulating the rate at which chemical reactions proceed without itself being altered in the process.

The biological processes that occur within all living organisms are chemical reactions, and most are regulated by enzymes. Without enzymes, many of these reactions would not take place at a perceptible rate. Enzymes catalyze all aspects of cell metabolism. This includes the digestion of food, in which large nutrient molecules (such as proteins, carbohydrates, and fats) are broken down into smaller molecules; the conservation and transformation of chemical energy; and the construction of cellular macromolecules from smaller precursors. Many inherited human diseases, such as albinism, result from a deficiency of a particular enzyme.

Enzymes also have valuable industrial and medical applications. The fermenting of wine, leavening of bread, curdling of cheese, and brewing of beer have been practiced for earliest times, but not until the 19th century were these reactions understood to be the result of catalytic activity of enzymes. Since then, enzymes have assumed an increasing importance

in industrial processes that involve organic chemical reactions. The uses of enzymes in medicine include killing disease-causing microorganisms, promoting wound healing, and diagnosing certain diseases.

...There are six principal categories and their reactions: (1) oxidoreductases, which are involved in electron transfer; (2) transferases, which transfer a chemical group from one substance to another; (3) hydrolases, which cleave the substrate by uptake of a water molecule (hydrolysis); (4) lyases, which form double bonds by adding or removing a chemical group; (5) isomerases, which transfer a group within a molecule to form an isomer; and (6) ligases, or synthesases, which couple the formation of various chemical bonds to the breakdown of a pyrophosphate bond in adenosine triphosphate or a similar nucleotide.

*From **Enzyme** /Encyclopedia Britannica article. Encyclopedia Britannica Deluxe Edition. CD-ROM. 2008*

AFTER YOU READ

10. Match the sentences in part A with the corresponding sentences in part B. What makes enzymes be important?

Part A

1. Enzymes catalyze all aspects of cell metabolism.
2. Enzymes play an important role in many processes such as the digestion of food, the conservation and transformation of chemical energy etc
3. Albinism results from a deficiency of a particular enzyme.
4. Enzymes are widely used in medicine.

Part B

- a) Some inherited human diseases are due to a deficiency of a particular enzyme.
- b) The uses of enzymes in medicine include killing disease-causing microorganisms, promoting wound healing, and diagnosing certain diseases.
- c) An enzyme acts as a catalyst in living organisms.
- d) Many processes are regulated by enzymes.

11. Complete the following sentences in English.

1. Enzymes act as ...
2. Enzymes regulate the ... of ... reactions.
3. Cell metabolism includes the ... of food, the ... and ... of chemical energy, and the ... of cellular macromolecules from smaller precursors.
4. The application of enzymes in medicine includes ... disease-causing microorganisms, ... wound healing, and ... certain diseases.
5. The six principal categories and their reactions are ..., ..., hydrolases, ..., isomerases and ligases, or synthetases.

SELF-TEST

CHECK YOUR KNOWLEDGE

1. Match the words close in meaning (10 points).

uptake; to alter; to cause; to be due to; cleavage; to continue; bond; to change; to cleave; particular; to proceed; to result in; certain; altered; to divide; modified; linkage; rate (of absorption); to result from; division

2. Use the English collocations instead of the Russian ones in brackets (6 points).

Enzymes are energized protein molecules found in all living cells. They consist of chains of amino acids held together by (пептидными связями). Enzymes (ускоряют и регулируют) all biochemical reactions in the human body. They also help in (пищеварении, переваривании пищи) and turn the food we eat into energy. There are two types of enzymes. They are (метаболические и пищеварительные) enzymes. (Метаболические ферменты ускоряют) the chemical reactions within the cells for energy production. (Пищеварительные ферменты) are secreted along the digestive tract to break food down into nutrients and wastes.

3. Translate the collocations into English (11 points).

биологические катализаторы; белковый компонент (апофермент); небелковая часть (кофермент); эффективность действия ферментов; образование промежуточных (intermediate) фермент-субстратных

комплексов; ферментативный катализ; высокая специфичность действия ферментов; пространственная (dimensional) структура молекулы фермента; скорость действия фермента; зависит от концентрации соответствующих (corresponding) субстратов и кофакторов, pH среды и температуры; некоторые ферменты

4. Translate the sentences into English (5 points).

1. Ферменты играют роль биологических катализаторов.
2. Ферменты бывают простыми и сложными белками.
3. Присоединение субстратов происходит в активных центрах.
4. Одна из главных особенностей ферментов – способность к направленному (directed) и регулируемому действию.
5. Биосинтез ферментов находится под контролем генов.

SELF-WORK /PROJECT WORK (evaluated by your teacher)

Work individually or in small groups. Surf the Internet. Collect information about the inherited human diseases which result from a deficiency of a particular enzyme. Give a short presentation (PowerPoint presentation).

Unit 2. PROTEINS, LIPIDS AND CARBOHYDRATES

QUIZ

Do the following quiz. Count your score. Check the results in ‘Keys’ section.

1. How much do you know about proteins, lipids and carbohydrates? Check your knowledge. Match them with the defining sentences (proteins – p; lipids – l; carbohydrates – c).

1. They include such substances as sugars, starch, and cellulose.
2. Twenty different amino acids are common to them.
3. They are greasy and insoluble in water.
4. They include edible oils.
5. Green plants produce them by photosynthesis.
6. Its active molecule has three important levels of structure: primary [ˈpraɪməri], secondary [ˈsekəndəri] and tertiary [tɜːʃəri].
7. They include fats, oils, and fat-soluble compounds.
8. They are composed of the three elements: carbon, hydrogen, and oxygen.
9. Their name from Greek means “first”.
10. They are macromolecules with molecular weights ranging from 5000 to several million.
11. Foods rich in them include whole grains, wholemeal bread and wholegrain breakfast cereals, oats, pasta, rice, potatoes.
12. The fundamental building units in them are the amino acids.

2. Match the columns.

The name of the disease/condition	The definition
Kwashiorkor [kwɒʃiːˈoːkə]	occurs if there are too much fat in the diet and too little carbohydrate. It is a combination of high blood ketones and ketones in the urine.
Uremia	is the formation of atherosclerotic plaque composed of lipids, mainly triglycerides and cholesterol in the blood vessels. They constrict, lose their elasticity.

Ketosis	is a disease characterized by elevated blood glucose, multiple hormonal and metabolic disturbances in the secretion of insulin and some other symptoms.
Atherosclerosis	is a protein-deficiency disease. To Ghanaians, who named the disease, it originally meant “the evil spirit which infects the first child when the second child is born”.
Hypoglycemia	is the presence of abnormally high amount of lipids in the circulating blood.
Galactosemia	occurs if proteins occupy too large a proportion of the intake (carbohydrates too low). It is marked by nausea, vomiting, headache, vertigo, dimness of vision, coma or convulsions, and a urinous odor of the breath and perspiration.
Diabetes mellitus	is a condition when the concentration of glucose in the blood is too low.
Lipidemia	is caused by the absence of one of the two enzymes required to convert galactose into glucose in the liver.

Based on Chemistry and Society by Mark M. Jones et al. Fifth edition. Saunders College Publishing. 1987. Pp. 532, 534, 536

PART 1. PROTEINS

1. Translate the sentences from Russian into English, using the word 'protein'.

1. Название «протеин» происходит от греческого «первый» (proteios).
2. Белки – это макромолекулы с молекулярным весом, варьирующим от 5000 до нескольких миллионов.
3. Основные единицы в белках – это аминокислоты.
4. Активная молекула белка имеет три уровня структуры: первичная, вторичная и третичная.
5. Полный гидролиз обычного белка даёт смесь из примерно 20 различных аминокислот.

2. Do you know that

- the close relationship between proteins and living organisms was first noted by the German chemist G.T. Mulder in 1835?
- proteins and amino acids are made primarily from four elements: carbon, oxygen, hydrogen, and nitrogen?
- essential amino acids are amino acids that the body needs but cannot make?
- for good nutrition we require *all* of the essential amino acids in our daily diet, but the amount required does not exceed 1.5 g per day for any of them?
- the simplest amino acid is glycine?
- of some 22 amino acids identified in human protein, 10 are considered essential in that the human body cannot synthesize these amino acids and, therefore, must obtain these amino acids from ingested food?

*From Chemistry and Society by Mark M. Jones et al.
Fifth edition. Saunders College Publishing. 1987. Pp.
358, 360, 530*

3. Would you like to know more about proteins? Complete the gaps with the English collocations from the box.

large, active animal; essential amino acids; a major constituent of ; long chains of amino acids; protein molecules; the 20 amino acids

PROTEINS: BASIC TO THE STRUCTURE AND FUNCTION OF CELLS

“The body’s structure and its vital activities depend on proteins, composed of _____. The body’s most abundant protein, collagen, is _____ skin, cartilage, tendons, and bone. Muscle tissue is largely protein, and so are hair and the cornea of the eye. Enzymes, antibodies, hemoglobin, and some hormones are composed of _____; without such proteins, most cellular activities would grind to a halt. What’s more, there is a steady turnover of protein: Enzymes and cell constituents are continuously broken down and rebuilt, and new cells are generated to replace dying cells. ...

A human is a _____ that requires about 1 g of protein per kilogram of body weight per day. ... But knowing how much protein one needs does not answer the question of what *kind* of protein to eat. The body can synthesize many of _____ it needs if nitrogen is available. The body cannot, however, manufacture eight so-called _____: These must be obtained in the diet, and all within a few hours, since free amino acids are not stored. ...”

From *BIOLOGY! Bringing science to life* by John H. Postlethwait et al. McGRAW-HILL, INC. New York. 1991. P. 387

4. Answer the following questions based on the information from Activities 1, 2 and 3.

- What is a protein?
- What is its main unit? What does a protein consist of?
- What body parts are composed of proteins?
- Why are proteins necessary for the body?
- How much of them is it required to have per day?
- What makes essential amino acids be specific?

BEFORE YOU READ

5. Practice pronouncing the following words. Translate the collocations with them and related words.

VOCABULARY LIST

capable [ˈkeɪpəbl] *a* способный

capable of (doing) sth; capable of synthesizing; incapable; incapable of understanding; capability; It's beyond my capabilities.

defence (BrE)/defense (AmE) [dɪˈfens] *n* оборона; защита

the body defence mechanisms; the first line of defence; defensive; defenseless; The immune system is the body's defence against infection. HIV viruses render the immune system defenseless against other infections.

to designate [ˈdeɪzɪneɪt] *v* определять, обозначать; указывать
These places were designated by special marks on the map. These substances were designated as ...

to feed (fed; fed) [fi:d] *v* питать(ся); кормить(ся)
feeding; Carnivores feed on herbivores. What do these animals feed on?

to ingest [ɪnˈdʒest] *v* глотать, проглатывать
ingestion; ingested; ingested lipids; ingested proteins; He may have ingested something poisonous.

latter [ˈlætə] *a* последний (из двух названных)

reasonable [ˈriːzənəbl] *a* (благо)разумный; приемлемый
It seems to be quite reasonable to ...; a reasonable explanation; a reasonable request; good food at a reasonable price; unreasonable

to replace [rɪˈpleɪs] *v* вернуть; восстановить; заменять, замещать
to be replaced daily; replaceable; irreplaceable; This piece of equipment has to be replaced. Computers have replaced people in some areas.

6. Read and translate the text.

PROTEINS

“Proteins occur in all the major regions of living cells. These compounds serve a wide variety of functions, including motion of the organism, defense mechanism against foreign substances, metabolic regulation of cellular processes, and cell structure.

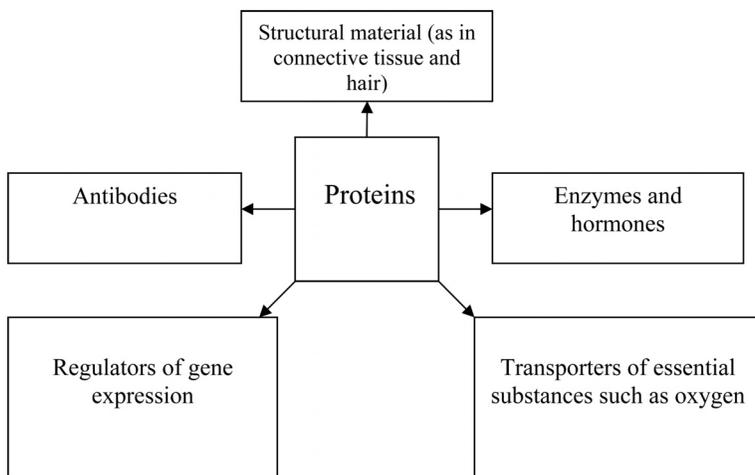
Humans must have proteins because proteins provide the structural tissue for muscles and most organs. Proteins are nearly the only source of nitrogen in the diet. An adult male has about 10 kg of protein, and about 300 g of this protein is replaced daily.

The human body is capable of synthesizing some amino acids needed for protein structure, but is unable to provide others necessary for normal growth and development. The latter are designated essential amino acids and must be ingested in the food supply.

Persons who are reasonably well fed and eat meat, fish, eggs, or dairy products have no worry about their protein intake.”

*From Chemistry and Society by Mark M. Jones et al.
Fifth edition. Saunders College Publishing. 1987. Pp.
358, 360, 530*

7. Talk about the functions of proteins, using the information from the diagram below.



PART 2. LIPIDS

1. Translate the sentences from Russian into English, using the word ‘lipid’.

1. Липиды – это органические соединения.
2. Липиды включают жиры, масла и жирорастворимые соединения.
3. Липиды не растворяются в воде.
4. Липиды растворяются в спирте, эфире, хлороформе и других растворителях.
5. Липиды также включают нейтральные жиры и масла, воски, стероиды, фосфолипиды и похожие соединения.

2. Do you know that

- fats and oils are esters of glycerol (glycerin) and fatty acid?
- the term fat is usually reserved for solid glycerol esters (butter, lard, tallow) and oil for liquid esters (castor, olive, linseed, tung etc)?
- fats are the most concentrated source of food energy in our diets, as they furnish about 9000cal/g when burned for energy as compared with about 3800 cal/g for glucose?
- the essential fatty acids are linoleic, linolenic, and arachidonic acids?

*From Chemistry and Society by Mark M. Jones et al.
Fifth edition. Saunders College Publishing. 1987. Pp.
313, 314, 315, 316*

- lipids contain more than twice as much energy (calories) per unit of weight as the other two large classes of substances (proteins and carbohydrates)?

From Encyclopedia Britannica 2005

3. Would you like to know more about lipids? Complete the gaps with the English collocations from the box.

aerobic respiration; a compact energy source; to fatty acids and other compounds; their energy storage function; long-term energy storage; as energy reserve; fat stores
--

LIPIDS: HIGHLY COMPACT ENERGY STORAGE NUTRIENTS

“Most people have only to visualize the solid white fat of a bacon slice or the slippery golden oil in salad dressing to know what a lipid is. And many have only to reach down and “pinch an inch” to see that the body stores lipids _____.

Lipids, or fats, are _____ and the form most plants and animals use for _____. When needed, the stored fats can be oxidized during _____; they provide more usable energy than an equivalent amount of carbohydrates. After a meal of eggs, oily sunflower seeds, or fatty meat, an animal’s digestive system breaks down some of the lipids _____ in these foods _____;

some of these other compounds can then enter mitochondria in cells and contribute to aerobic respiration. Without _____, walrus could not live in the Arctic, birds could not migrate long distances, carnivores would have more trouble surviving between irregular meals, and hibernators might not be able to survive the long winter without eating.

Besides _____, fats help the body absorb and use certain essential nutrients. Vitamins A, D, E, and K, for example, are fat-soluble, and lipids must be present for these vitamins to be absorbed into the circulation and delivered to cells.”

From *BIOLOGY! Bringing science to life* by John H. Postlethwait et al. McGRAW-HILL, INC. New York. 1991. Pp. 386 - 387

4. Answer the following questions based on the information from Activities 1, 2 and 3.

- What is a lipid?
- What do they include?
- What are their specific characteristics?
- Why are lipids necessary for the body?
- Why are they dangerous?
- What characteristic makes lipids be specific?

BEFORE YOU READ

5. Practice pronouncing the following words. Translate the collocations with them and related words.

VOCABULARY LIST

almost [ˈo:lməʊst] *adv* почти; едва не

Has he almost finished? I'm busy almost every day. The results are almost ready.

consider [kənˈsɪdə] *v* рассматривать; считать, полагать

Do you consider him a good specialist?

consideration: The question is under consideration.

globule [ˈglobju:l] *n* шарик; шаровидная частица; капля; глобула
in the shape of a globule; globules of fat; globular

greasy [ˈɡri:zi] *adj* сальный, жирный
grease; greaseproof paper; greasy hair; greasily; greasiness

insulate [ˈɪnsjuleɪt] *v* изолировать
to insulate sth from/against sth; insulation; insulator; Wood is an excellent insulator.

pack [pæk] *v* упаковывать(ся), запаковать(ся); заполнять, набивать
to pack things/belongings; to pack a bag/case; package; packed

various [ˈvɛəriəs] *adj* различный, разный
various substances; various compounds; for various reasons; various ways to do this; variously

6. Read and translate the text.

LIPIDS

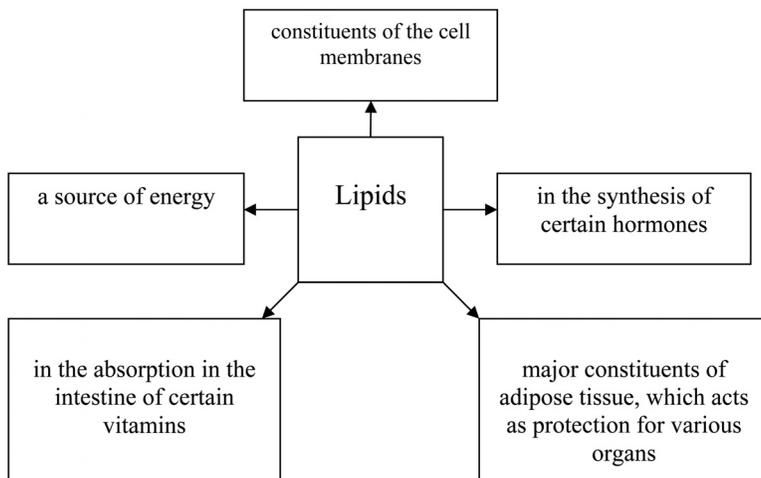
“Fats and lipids are often considered synonymous, but lipid is the larger category of compounds. A lipid is an organic substance that has a greasy feel and is insoluble in water. ... Almost all (95%) of the lipids in the diet are triglycerides. The other 5% are composed of phospholipids (lecithin is an example) and steroids (cholesterol is the major one in food).

The only true essential fatty acid is linoleic acid (must be eaten in the diet; cannot be synthesized in the body). ...

Fats are essential structural parts of cell membranes. They provide the highest energy per gram of the nutrients and serve as energy storage reservoirs in the body. They insulate thermally, pad the body, and are packing material for various organs. Fat is transported in the body by the blood and the lymph system. Fatty or adipose tissue is composed mainly of specialized cells, each consisting mainly of a large globule of triglycerides.”

*From Chemistry and Society by Mark M. Jones et al.
Fifth edition. Saunders College Publishing. 1987. Pp.
532 – 533*

7. Talk about the functions of lipids, using the information from the diagram below.



PART 3. CARBOHYDRATES

1. Translate the sentences from Russian into English, using the word 'carbohydrate'.

1. Углеводы включают такие вещества, как сахара, крахмал и целлюлозу.
2. Углеводы состоят из углерода, водорода и кислорода.
3. Углеводы делятся на три основные группы: моносахариды, олигосахариды и полисахариды.
4. Зелёные растения вырабатывают углеводы в процессе фотосинтеза.
5. Еда, богатая углеводами, включает злаковые, хлеб из непросеянной муки, цельные злаковые, овёс, рис, картофель.

2. Do you know that

- cellulose is the most abundant polysaccharide in nature?
- in Latin, *saccharum* means "sugar"?
- in Greek, *mono* means "one", *oligo* means "few" and *poly* means "many"?

- approximately 70 monosaccharides are known; 20 of these simple sugars occur naturally?
- the most common simple sugar is D-glucose?
- sugar provides a high caloric value (1794 kcal per pound)?

From Chemistry and Society by Mark M. Jones et al. Fifth edition. Saunders College Publishing. 1987. Pp. 353, 355, 357

3. Would you like to know more about carbohydrates? Complete the gaps with the English collocations from the box.

throughout the body; fluctuations in blood glucose levels; units of glucose; supplier of energy for; into the bloodstream; a rich source of energy

CARBOHYDRATES: CARBON AND ENERGY FROM SUGARS AND STARCHES

“The sugars in fruit and the starches in potatoes, rice, bread, and pasta are _____ and carbon atoms and provide the nutrients we call *carbohydrates*. Our digestive system can cleave _____ from the sugars in fruit or the starch in rice, wheat, or potatoes. After a meal, the glucose units pass _____, and the circulatory system carries them to cells _____, where the simple sugar serves as the main _____ cellular respiration. ... Cells in the brain and nerves are particularly sensitive to _____, and if starving, the body will break down first its fat stores, then its own muscle tissues and convert the subunits to glucose to provide the sensitive nervous system cells with the levels they need to stay fully active. ...”

From BIOLOGY! Bringing science to life by John H. Postlethwait et al. McGRAW-HILL, INC. New York. 1991. P. 386

4. Answer the following questions based on the information from Activities 1, 2 and 3.

- What are carbohydrates?
- What do they consist of?
- What are their main groups?
- Why are carbohydrates necessary for the body?
- What products can we find them in?
- Why should we be careful with carbohydrates?

BEFORE YOU READ

5. Practice pronouncing the following words. Translate the collocations with them and related words.

VOCABULARY LIST

beneficial [bənə`fɪʃəl] *adj* благотворный; целебный; выгодный, полезный

to have a beneficial effect on; beneficially; the beneficial function; This is highly beneficial to your health.

gum [ɡʌm] *n* камедь, гумми; смолистое выделение
plant gums; a gum tree

principal [`prɪnsɪpl] *adj* главный, основной; ведущий
his principal source of income; the principal task; principally=in the main

pulp [pʌlp] *n* мякоть плода; бумажная древесная масса; шлам; пульпа
timber grown for wood pulp; a soft pulp of leaves; Mash these fruits to a pulp.

roughage [`rʌfɪdʒ] *n* грубая пища; грубый, жёсткий материал
Roughage is the same as fiber in its action: it helps your bowels to work.

6. Read and translate the text.

CARBOHYDRATES

“Carbohydrates in foods include digestible simple sugars (glucose, fructose, galactose), disaccharides (sucrose, maltose, and lactose), and

polysaccharides (amylase, amylopectin, glycogen). Indigestible carbohydrates consumed include cellulose, insulin, hemicellulose, lignin, plant gums, sulfated polysaccharides, carrageenan, and cutin.

The only beneficial function of digestible carbohydrates is to provide energy at the rate of approximately 4 kcal per gram of glucose oxidized. Excess digestible carbohydrates are stored first as glycogen principally in the liver. Further excesses are converted into fats and stored as such. The indigestible carbohydrates serve as roughage in the diet along with bran and fruit pulp.”

*From Chemistry and Society by Mark M. Jones et al.
Fifth edition. Saunders College Publishing. 1987. P. 535*

SUMMARY

Work with the partner. Ask and answer questions, using the prompts.

Student A.
<ol style="list-style-type: none">1. What/a protein?2. What/carbohydrates/consist of?3. Why/proteins/necessary/for/ the body?4. What/the specific/characteristics/ of/lipids?5. Why/lipids/dangerous?6. What/the main/groups/ of/carbohydrates?7. What/ to make/essential/amino acids/ to be/ specific?8. How much/of/proteins/we/need/per day?9. What/characteristics/to make/lipids/to be/specific?

Student B.
<ol style="list-style-type: none">1. What/main/unit/of/a protein?2. What/lipids/include?3. What/products/we/find/carbohydrates/in?4. What/a lipid?5. What/ body parts/ composed of/proteins?6. Why/carbohydrates/necessary/ for/the body?7. What/carbohydrates?8. What/to make/lipids/necessary/for/the body?9. Why/we/be careful with/carbohydrates?

SELF-TEST

CHECK YOUR KNOWLEDGE

1. Match the words close in meaning (11 points).

beneficial; to insulate; to have and to swallow; to indicate; diverse; to nourish; defence; principal; capable; to feed; various; protection; to consider; main; almost; to designate; able; to ingest; useful; to isolate; nearly; to think

2. Say in one word. (10 points)

- a) a small drop of a liquid, or of a solid that has been melted
- b) covered in grease or oil (*adjective*)
- c) any member of a very abundant and widespread class of natural organic compounds that includes abundant sugars, starch, and cellulose
- d) the body's most abundant protein
- e) this organ is the main site of fat metabolism
- f) a substance that is stored under the skin of people and animals, that helps them to keep them warm
- g) a sweet white or brown substance that is obtained from plants and used to make food and drinks sweet
- h) the organ that glucose is the primary source of energy for
- i) a very soft substance that is almost liquid, made by crushing plants, wood, vegetables etc and is also part of the inside of a tooth
- j) a sticky substance found in the stems of some trees and also the two areas of firm pink flesh at the top and bottom of the mouth, in which the teeth are fixed

3. Read the text and match the headings (A – D) to the sections of the text (1 – 4). (4 points)

A How often you should have a meal

B Products recommended for healthy eating

C What is a balanced diet?

D The amounts of carbohydrates, fats and proteins in our diet

BALANCED DIET

- (1) “A balanced diet is one that provides the body with all its requirements, and this is achieved by eating foods each day, such as farinaceous products, fats, milk and dairy products, vegetables, meat, fish, and eggs, fruits, nuts, and the legumes.
- (2) It is recommended that daily consumption should include dairy products, bread and other starchy foods, fruits and green vegetables, meat, fish or eggs, and fats, especially vegetable fats.
- (3) A balanced diet should contain: 45 – 65 % carbohydrate, which should be divided between slow-absorption materials (starches) and rapid-absorption (greens and fruits); 15 – 20 % proteins, which, although they should be principally of animal origin due to the better nutritional quality, may also include vegetable proteins; and 25 – 35 % fats, in which vegetable fats should predominate, due to their higher content of unsaturated fatty acids.
- (4) Food intake should be spread over at least four meals daily, in amounts which, if not exactly equal, should be largely balanced. ...”

The Human Body. Könnemann. 2000. P. 74

SELF-WORK /PROJECT WORK (evaluated by your teacher)

Work individually or in small groups. Do a survey on diet of your fellow students. Think about the questions to get the answers from them. Summarize the information given. Give a mini-presentation, analyzing if their diet is healthy or not. Make some recommendations. Explain the mistakes in diet. (PowerPoint presentation).

KEYS

SELF-TEST

CHECK YOUR KNOWLEDGE

PART I.

Unit 1. The Department of Medical Biochemistry

1. Write the related word (10 points).

research > researcher; biochemistry > biochemical; advantage > advantageous; to complete > completion; to supervise > supervision; application > applicant; thorough > thoroughly; tutor > tutorial; to relate > related; experience > inexperienced

2. Fill in the gaps with the word from the box (10 points).

1. experience 2. facility 3. tutorial 4. thorough 5. conduct 6. techniques 7. application 8. research 9. supervision 10. complete

3. (evaluated by your teacher) Answer the following questions (4 points).

1. What educational establishments can you apply to if you choose a career in biochemistry?

Sample answer: I can apply to a medical university or institute where there is a biochemistry department.

2. How long does the course of studies take?

Sample answer: The course lasts 6 years.

3. What subjects are of necessity for future biochemists?

Sample answer: There are a lot of them, e.g. biochemistry, the humanities (foreign languages, including Latin, philosophy, history, psychology etc), socio-economical (economics), natural sciences (biology, ecology),

mathematical (mathematics, informatics and computer science, physics, mathematical analysis, mathematical statistics etc), medical and biological sciences such as physiology, morphology, microbiology, pharmacology, clinical and experimental surgery, pediatrics, internal diseases, infectious diseases, general pathology etc and a lot of subjects related to future profession (chemistry, physical chemistry, medical biotechnology, general and medical biochemistry, general and clinical immunology, general and medical genetics, clinical laboratory diagnosis etc)

4. Why working in a lab is so important?

Sample answer: You can get practical experience./Biochemistry is an experimental science./This can give rich laboratory experience./This helps in doing research.

What is your score? (tasks 1 – 3)

22 – 24 “excellent”

20 – 21 “good”

16 – 19 “satisfactory”

Unit 2. What is Biochemistry?

7.

Process	Definition
absorption	the process of taking in, including or incorporating as part of itself
breakdown	the process of analyzing into components
catalysis	the acceleration of a reaction by a catalyst
conversion	the process of being converted like making structural alterations to serve a new purpose
fermentation	the breakdown of a substance by micro-organisms such as yeasts and bacteria, esp. of sugar to ethyl alcohol in making beers, wines, and spirits

metabolism	all the chemical processes that occur within a living organism
release	the process of setting free, liberating
synthesis	the process or result of building up separate elements into a connected whole, esp. into a theory or system
transfer	the act or instance of conveying/transferring or being conveyed/transferred
transmission	the process of passing, transferring

13.

What is biochemistry? (part 2)

Biochemistry is the study of chemical substances and processes that **occur in plants, animals, and microorganisms** and of the changes they undergo during development and life. It deals with the chemistry of life.

The term 'biochemistry' itself is derived from **a combination of biology and chemistry**. It involves the qualitative determination and structural analysis of the organic compounds that make up cells (proteins, carbohydrates and lipids) and those of that play **key roles in chemical reactions vital to life** (e.g. nucleic acids, vitamins and hormones).

Biochemists study cell's many complex and interrelated chemical changes. Examples include the chemical reactions by which proteins and all **their precursors** are synthesized, food is converted to energy (metabolism), hereditary characteristics are transmitted (heredity), energy is stored and released and all biological chemical reactions are catalyzed.

Biochemistry combines the biological and physical sciences and uses many **techniques common in medicine and physiology** as well as those of organic, analytical and physical chemistry.

Since the mid-20th century biochemistry has advanced with the development of new techniques such as chromatography, X-ray diffraction, dual polarization interferometry, nuclear magnetic resonance (NMR) spectroscopy, radioisotopic labeling, **electron microscopy, and molecular dynamics stimulations**.

SELF-TEST

CHECK YOUR KNOWLEDGE

1. Translate the collocations and sentences into English, using the words from Unit 2/ vocabulary list (13 points).

наследственная информация – hereditary information; механизмы наследственности – the mechanisms of heredity/hereditary mechanisms; знания о наследственности – knowledge of heredity; органическое соединение – an organic compound; расширить свои знания – to expand one’s knowledge; общие характеристики – the common characteristics; продвигаться с поразительной скоростью – to advance with an amazing rate; определение параметров – the determination of parameters; ряд составных элементов – a number of units; качественные характеристики – qualitative characteristics; предшественник мессенджера рибонуклеиновой кислоты – precursor of RNK messenger/mRNK precursor; Он перенёс операцию вчера. – He underwent an operation yesterday. Какова цель исследования? – What is the goal of the investigation?

2. Translate the sentences from Russian into English (6 points).

1. Хотя биохимия – это молодая наука, её начала (происхождение - origins) можно проследить (to trace back) с древних времён, а именно с Древней Греции. >

Though biochemistry is a young science, its origins can be traced since early times as far as/as back as/ ancient Greece.

2. Биохимия – это экспериментальная наука. Биохимики проводят разные исследования. >

Biochemistry is an experimental science. Biochemists conduct/carry out/do various research.

3. Как и другие науки, биохимия использует методы измерения с помощью разных инструментов. >

Like other sciences biochemistry uses measuring techniques with the help of different instruments/tools.

4. Клинико-диагностическая лаборатория стала неотъемлемой (indispensable) частью каждой больницы. >

The clinical chemistry laboratory/The clinical diagnostic laboratory has become an indispensable part/unit of every hospital.

5. Биохимия связана со многими науками, например, молекулярной биологией. >

Biochemistry is related to many sciences, e.g. molecular biology.

6. Результаты (findings) следований используются в медицине, пищевой промышленности, генетике, разработке препаратов и сельском хозяйстве. > The findings/The results of research are used in medicine, food industry, genetics, drug development and agriculture.

3. Answer the questions in English (5 points).

1. What are the basic biochemical substances?

Sample answer: The basic biochemical substances are carbohydrates, lipids, enzymes, vitamins etc.

2. What are the basic biochemical processes?

Sample answer: The basic biochemical processes are absorption, breakdown, catalysis, hydrolysis etc.

3. What do biochemists study?

Sample answer: Biochemists study chemical and biochemical processes within the living organisms.

4. What were/are the basic discoveries in biochemistry?

Sample answer: One of the basic discoveries in biochemistry was the discovery of ... (use your own information or from the table "From the History of Biochemistry")

5. What famous biochemists contributed/did much to the development of the science?

Sample answer: Eduard Buchner, for example, was a German biochemist who was awarded the 1907 Nobel Prize for Chemistry for demonstrating that the fermentation of carbohydrates was due to the action of different enzymes contained in yeast and not the yeast itself.

What is your score? (tasks 1 – 6)

44 – 46 "excellent"

41 – 43 "good"

35 – 40 "satisfactory"

7. Retelling (evaluated by your teacher)

What is your score? (see Appendix V ‘Evaluation criteria for retelling’)

10 sentences “excellent”

8 – 9 sentences “good”

7 sentences “satisfactory”

Unit 3. The Cell

9.

The cell

Our body **consists** of a large number of cells. The main parts of the cell are the cell membrane, the cytoplasm and the nucleus. The cell membrane is the thin membrane which **surrounds** the cytoplasm. It **contains** lipid and protein molecules and **controls** what goes in and out of the cell. Most of the cell’s reactions **take place** in the cytoplasm, for example, the mitochondria release energy. The cytoplasm **contains** the structures called organelles. The nucleus is **separated** by the nuclear membrane. The nucleus is a very important structure. It **contains** the chromosomes. They **play** an essential part in cellular reproduction. The nucleus **controls** all the cellular activities.

10.

The cell compartment	Description
the Golgi apparatus/body	is the site of the modification, completion, and export of secretory proteins and glycoproteins
the nucleus	is the information center of the cell
the mitochondria	are the sites of energy production through ATP synthesis
the endoplasmic reticulum	is the site of lipid and protein synthesis
the cytoplasm	is the part of the cell covered by the cell membrane, excluding the nucleus
the lysosomes	digest unwanted materials within the cell

the chromosomes	are dark-staining threads in the cell nucleus which carry hereditary information in the form of genes
the ribosomes	are small structures (organelles) attached to the endoplasmic reticulum
the vacuole	is a region in the cytoplasm where ingested materials are stored and transported

13.

Все клетки выполняют определённые функции, что помогает им жить. Они поглощают и преобразуют энергию. Для выполнения своих функций клетки располагают набором структур (***a number/a set of structures/compartments***), причём каждая отвечает за определённый участок работы, например, рибосомы вырабатывают протеины, клеточная стенка окружает и защищает клетку, митохондрии отвечают за обеспечение энергией (***energy supply***), эндоплазматический ретикулум – за внутриклеточный транспорт (***intracellular transport***).

Очень важная структура – ядро. Это своеобразный «мозг» клеточного функционирования (***the “brain” of cellular functioning/operation***). Эта сферическая структура содержит ДНК, контролирующую деятельность клетки (***a cell’s activities***).

Таким образом, эти компоненты необходимы для обеспечения жизнедеятельности самой клетки, а именно синтеза (***synthesis***) органических веществ, транспорта (***transportation/transporting***), питания (***nutrition***), энергоснабжения (***energy supply***), энергетического обмена/обмена веществ (***energy exchange/metabolism***), превращения энергии (***conversion of energy***), распада (***degradation***) и выведения (***export/excretion/release***) продуктов жизнедеятельности (***waste products***). Кроме того, клетки делятся, и деление клетки (***cell division***), а, следовательно, размножение (***reproduction/multiplication***) – тоже важные процессы.

SEL-TEST

CHECK YOUR KNOWLEDGE

1. Say in one word (10 points).

1. a tiny unit constituting the core of all living things (cell)

2. the structure responsible for the cell's secretory function (Golgi apparatus/body)
3. a spherical structure in the nucleus which deals with the synthesis and storage of nucleic acids. (nucleolus)
4. a space within the cytoplasm of a cell, enclosed by a membrane and usually containing fluid. (vacuole)
5. a structure in the centre of the cell responsible for many cellular functions; here the cell's hereditary material is stored (nucleus)
6. a network of membraneous tubules and vesicles (endoplasmic reticulum)
7. It is made up of links of protoplasm called genes joined together in a chain. (chromosome)
8. a tiny particle, the site of protein synthesis (ribosome)
9. The chemical ... was discovered in 1869. It was not until 1943 that its role in genetic inheritance was demonstrated. In 1953, J.Watson and F.Crick determined its structure. (DNA)
10. the site of energy metabolism in the cell (mitochondria)

2. Translate the sentences from Russian into English (6 points).

1. Существует около 200 различных типов клеток: округлые и продолговатые, звёздчатые и кубические, плоские и призматические, с отростками и без. > There are about 200 cell types: round (oval-shaped), cylindrical, star-shaped (stellar), cuboidal/goblet, squamous, prismatic, with processes and without.
2. Множество сходных клеток объединяется в ткани. > Many similar cells compose/form/ are united in tissues.
3. Существует два типа клеточного деления: митоз и мейоз. > There are two types of cell division: mitosis and meiosis.
4. Все клетки так малы, что их можно увидеть только в микроскоп. > All the cells are so small that we can see them only under a microscope./ All the cells are so small that they can be seen only under a microscope.
5. Первым клетку живого организма увидел английский учёный Роберт Гук. > The first man who saw a cell was an English scientist Robert Hooke./Robert Hooke was the first scientist to see a cell./Robert Hooke was the first scientist who saw a cell.

6. В организме различают четыре вида тканей: эпителиальную, соединительную, нервную и мышечную. > Four types of tissue are distinguished in the body, i.e. epithelial, connective, nerve/nervous and muscular.

3. Answer the following questions in English (10 points).

1. What is a cell?

Sample answer: A cell is a structural unit of all living things.

2. Who first saw the cell with the help of an ornate microscope?

Sample answer: Robert Hooke was the first man who saw the cell with the help of his ornate microscope.

3. Who developed the cell theory?

Sample answer: Schwann and Schleiden developed the cell theory.

4. What are the main cell types?

Sample answer: The main cell types are: blood cells, nerve cells, muscle cells etc.

5. How are they arranged in living organisms?

Sample answer: The cells compose different tissues.

6. What shape and size do most cells have?

Sample answer: Most cells have different shape and size, i.e. oval, cuboid, star-like etc. As for size, all cells are very small in size, but among them we can distinguish very small, no more than 0.2 micrometer in length, for example in some bacteria. Prokaryotes are the smallest cells.

7. What are the main parts of a cell?

Sample answer: The main cell parts are the cell membrane, the mitochondria, Golgi complex, the nucleus etc.

8. What common functions are performed by cells?

Sample answer: The main functions of a cell are nutrition, reproduction, synthesis, excretion etc.

9. How do cells do this?

Sample answer: Each cell has a set of specific structures, or its main parts performing all these functions.

10. (*Write your own question about a cell. Let the other students answer it.*)

What is your score? (tasks 1 – 4)

34 – 36 “excellent”

31 – 33 “good”

28 – 30 “satisfactory”

5. Retelling (evaluated by your teacher)

What is your score? (see Appendix V ‘Evaluation criteria for retelling’)

10 sentences “excellent”

8 – 9 sentences “good”

7 sentences “satisfactory”

Extra task (evaluated by your teacher)

Translate the passages into Russian, using a dictionary.

Some tissues in the adult body, such as the epidermis of the skin, the lining of the small intestine, and bone marrow, undergo continuous cellular turnover. They contain stem cells, which persist indefinitely, and a much larger number of “transit amplifying cells,” which arise from the stem cells and divide a finite number of times until they become differentiated. The stem cells exist in niches formed by other cells, which secrete substances that keep the stem cells alive and active. Some types of tissue, such as liver tissue, show minimal cell division or undergo cell division only when injured. In such tissues there is probably no special stem-cell population, and any cell can participate in tissue regeneration when required.

The epidermis of the skin contains layers of cells called keratinocytes. Only the basal layer, next to the dermis, contains cells that divide. A number of these cells are stem cells, but the majority are transit amplifying cells. ...

Bone marrow contains cells called hematopoietic stem cells, which generate all the cell types of the blood and the immune system. These stem cells are anchored to osteoblasts of the trabecular bone and generate progeny that can become lymphocytes, granulocytes, red blood cells, and cer-

tain other cell types, depending on the balance of growth factors in their immediate environment.

Bone marrow transplants (also known as bone marrow grafts) represent the only type of cell therapy that is in common use. They are used to allow cancer patients to survive otherwise lethal doses of radiation therapy or chemotherapy that destroy the stem cells in bone marrow. The patient receives an infusion of bone marrow from an immunologically compatible donor, and the hematopoietic stem cells of the transplant colonize the damaged marrow and eventually repopulate the blood and the immune system with functional cells. For this procedure the patient's own marrow is usually harvested before the cancer treatment and then reinfused into the body afterward.

Work with experimental animals has shown that transplants of bone marrow or even pure hematopoietic stem cells can occasionally colonize other tissues, with the transplanted cells becoming neurons, muscle cells, or epithelia. This work has led to hopes that adult stem cells, such as hematopoietic stem cells, might be suitable for cell therapy for a variety of organs. The possibility is especially attractive to those opposed to the use of embryonic stem cells on moral grounds. However, the number of transplanted cells that switch character in this way has been shown to be exceedingly small.

Research has shown that there are also stem cells in the brain. In mammals very few new neurons are formed after birth, but some neurons in the olfactory bulbs and in the hippocampus are continually being formed. These neurons arise from neural stem cells, which can be cultured in vitro in the form of neurospheres—small cell clusters that contain stem cells and some of their progeny. This type of stem cell is being studied for use in cell therapy to treat Parkinson disease and other forms of neurodegeneration or traumatic damage to the central nervous system.

*Excerpts from **The Stem Cell** by Jonathan M.W. Slack/
Encyclopedia Britannica article. Encyclopedia Britan-
nica Deluxe Edition. CD-ROM. 2008*

Unit 4. Metabolism

4.

Metabolism includes **all the physical and chemical** processes by which the living body is maintained, and also those by which the energy is made available for **various forms of work**. The **constructive, chemical and physical** processes by which food materials are adapted for the use of body are known as **anabolism**. The **destructive** processes by which energy is produced with **the breaking down of tissues into waste products** are known as **catabolism**. **Basal** metabolism is the term applied to the energy changes necessary for such processes as beating of the heart, respiration, and maintenance of body warmth.

10.

1. The term 'metabolism'	derives from the Greek word 'change'. (Термин «метаболизм» происходит от греческого слова «изменение»)
2. Metabolism	consists of two contrasting processes, anabolism and catabolism. (Метаболизм состоит из двух противоположных процессов: анаболизм и катаболизм)
3. Metabolism	consists of hundreds of enzymatic reactions. (Метаболизм состоит из сотен ферментативных реакций)
4. Anabolism	is a synthetic process involving the formation of new covalent bonds. (Анаболизм – это процесс синтеза, включающий образование новых ковалентных связей)
5. Catabolism	involves the oxidative degradation of complex nutrient molecules. (Катаболизм включает окислительный распад сложных питательных молекул)
6. Metabolism	is sometimes referred to as intermediary metabolism. (Метаболизм иногда называют промежуточным метаболизмом)

SELF-TEST

CHECK YOUR KNOWLEDGE

1. Translate the collocations and sentences from Russian into English (10 points).

метаболизм углеводов > metabolism of carbohydrates; распад углеводов > breakdown of carbohydrates; запас углеводов > storage of carbohydrates; химические изменения, называемые «метаболизм» > chemical changes called 'metabolism'; синтез ферментов > enzyme synthesis/synthesis of enzymes; роль АТФ в метаболизме энергии > the role of ATP in energy metabolism; запастись большим количеством химической энергии > to store a large amount of chemical energy; АТФ – молекула, несущая энергию. > ATP is a energy-carrying molecule. Энергия выделяется, когда химические связи распадаются. > Energy is released when chemical bonds are broken down. Клетки постоянно разрушают АТФ, чтобы получить энергию. > Cells constantly break down ATP to obtain energy.

What is your score? (tasks 1 and 2)

19 – 20 “excellent”

17 – 18 “good”

16 “satisfactory”

5. Retelling (evaluated by your teacher)

What is your score? (see Appendix V ‘Evaluation criteria for retelling’)

10 sentences “excellent”

8 – 9 sentences “good”

7 sentences “satisfactory”

Unit 5. Vitamins

5.

VITAMINS	
Fat - soluble	Water – soluble
They dissolve in fats and are absorbed with them.	They are absorbed in aqueous solution.
Vitamin A Vitamin D Vitamin E Vitamin K	The B complex (B1, B2, B3, B6 and B12) Vitamin C

7.

normal; normally; **abnormal**; abnormally; abnormality; abnormalities

- **anemia**; anemic
- **decay**; decayed
- deficit; deficient; **deficiency**
- generate; generation; degenerate; **degeneration**
- sense; sensitive; **sensitivity**
- **vision**; visual; visually; visualize

8.

1. pellagra
2. beriberi
3. rickets
4. scurvy
5. tooth decay
6. anemia

10.

1. fatigue	А усталость, утомление
2. nausea	В тошнота
3. hemorrhage	С кровоизлияние
4. pallor	Д бледность
5. weakness	Е слабость
6. vomiting	Ф рвота
7. dizziness	Г головокружение
8. edema	Н отёк

9. blood clotting disorder 10. diarrhea 11. soreness (some more symptoms) 12. lassitude 13. digestive irregularities 14. a feeling of numbness 15. swollen and bleeding gums 16. loosened teeth 17. stiffness of joints 18. bleeding under the skin 19. slow wound healing 20. shortness of breath	I нарушение свёртываемости крови J понос K болезненность, воспаление
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SELF-TEST

CHECK YOUR KNOWLEDGE

1. Complete the table with the correct word (10 points).

Verb	Noun	Adjective/ participle	Adverb
to maintain	maintenance	maintaining	-----
to exceed	excess	excessive	excessively
cause	cause	causal	causally
bleed	bleeding	bleeding	-----
-----	deficiency	deficient	deficiently
degenerate	degeneration	degenerative	-----
grow	growth	growing	-----
impair	impairment	impairing	-----
wound	wound	wounded	-----
sensitize	sense /sensitivity	sensitive	sensitively

2. Say in one word, then write it (5 points).

- a lack of success > **failure**
- the opposite of ‘order’> **disorder**
- eyesight> **vision**

- deficit; deficiency; shortage > **lack**
- to cure > **to heal**

What is your score? (tasks 1 and 2)

- 14 – 15 “excellent”
- 13 “good”
- 12 “satisfactory

3. Retelling (evaluated by your teacher)

What is your score? (see Appendix V ‘Evaluation criteria for retelling’)

- 10 sentences “excellent”
- 8 – 9 sentences “good”
- 7 sentences “satisfactory”

PART II.

Unit 1. Enzymes

3.

1. An enzyme acts as a catalyst.
2. Enzymes and their products were first obtained from bacteria, yeast, and mould.
3. Enzymes are large complex proteins.
4. An enzyme functions as an organic catalyst under specific conditions of pH and temperature.
5. Enzymes have valuable industrial and medical applications.
6. The fermenting of wine is an example of enzymatic reaction.

5. 1 – c; 2 – d; 3 – a; 4 – b

10.

1. Enzymes catalyze all aspects of cell metabolism. =
c). An enzyme acts as a catalyst in living organisms.
2. Enzymes play an important role in many processes such as the digestion of food, the conservation and transformation of chemical energy etc =

- d). Many processes are regulated by enzymes.
3. Albinism results from a deficiency of a particular enzyme. =
- a). Some inherited human diseases are due to a deficiency of a particular enzyme.
4. Enzymes are widely used in medicine. =
- b). The uses of enzymes in medicine include killing disease-causing microorganisms, promoting wound healing, and diagnosing certain diseases.

11.

1. Enzymes act as *catalysts*.
2. Enzymes regulate *the rate* of *chemical* reactions.
3. Cell metabolism includes *the digestion* of food, *the conservation* and *transformation* of chemical energy; and *the construction* of cellular macromolecules from smaller precursors.
4. The application of enzymes in medicine includes *killing* disease-causing microorganisms, *promoting* wound healing, and *diagnosing* certain diseases.
5. The six principal categories and their reactions are *oxidoreductases*, *transferases*, hydrolases, *lyases*, isomerases and ligases, or synthetases.

SELF-TEST

CHECK YOUR KNOWLEDGE

1. Match the words close in meaning (10 points).

uptake = rate (of absorption); to alter = to change; to result in = to cause; to result from = to be due to; bond = linkage; to cleave = to divide; particular = certain; to proceed = to continue; altered = modified; cleavage = division

2. Fill in the gaps with the appropriate collocation (6 points).

Enzymes are energized protein molecules found in all living cells. They consist of chains of amino acids held together by *peptic bonds*. Enzymes *catalyze and regulate* all biochemical reactions in the human body. They

also help in *digestion* and turn the food we eat into energy. There are two types of enzymes. They are *metabolic and digestive* enzymes. *Metabolic enzymes speed up/catalyze* the chemical reactions within the cells for energy production. *Digestive enzymes* are secreted along the digestive tract to break food down into nutrients and wastes.

3. Translate the collocations into English (11 points).

биологические катализаторы > biological catalysts; белковый компонент (апофермент) > protein component (apoenzyme); небелковая часть (кофермент) > nonprotein part (coenzyme); эффективность действия ферментов > effectiveness/efficiency of enzyme action; образование промежуточных фермент-субстратных комплексов > formation of intermediate enzyme-substrate complexes; ферментативный катализ > enzyme/enzymatic catalysis; высокая специфичность действия ферментов > high specificity of enzyme action; пространственная структура молекулы фермента > dimensional structure of enzyme molecule; скорость действия фермента > rate of enzyme action/ enzyme action rate; зависеть от концентрации соответствующих субстратов и кофакторов, pH среды и температуры > to depend on the concentration of corresponding substrates and cofactors, pH (of medium) and temperature; некоторые ферменты > certain/some enzymes

4. Translate the sentences into English (5 points).

1. Ферменты играют роль биологических катализаторов. > Enzymes play a part/role of biological catalysts.
2. Ферменты бывают простыми и сложными белками. > Enzymes are classified as simple and complex proteins.
3. Присоединение субстратов происходит в активных центрах. > Binding of the substrates takes place in active sites.
4. Одна из главных особенностей ферментов – способность к направленному и регулируемому действию. > One of the main properties/features/peculiarities of enzymes is their ability for directed and regulated action.
5. Биосинтез ферментов находится под контролем генов. > Biosynthesis of enzymes is under genes' control/is controlled by genes.

What is your score?

1. 30 – 32 “excellent”
2. 28 – 29 “good”
3. 26 – 27 “satisfactory”

Unit 2. Proteins, lipids and carbohydrates

QUIZ

1. How much do you know about proteins, lipids and carbohydrates? Check your knowledge. Match them with the defining sentences (proteins – p, lipids – l; carbohydrates – c).

1. They include such substances as sugars, starch, and cellulose. (c)
2. Twenty different amino acids are common to them. (p)
3. They are greasy and insoluble in water. (l)
4. They include edible oils. (l)
5. Green plants produce them by photosynthesis. (c)
6. Its active molecule has three important levels of structure: primary, secondary and tertiary. (p)
7. They include fats, oils, and fat-soluble compounds. (l)
8. They are composed of the three elements: carbon, hydrogen, and oxygen. (c)
9. Their name from Greek means “first” (p)
10. They are macromolecules with molecular weights ranging from 5000 to several million. (p)
11. Foods rich in them include whole grains, wholemeal bread and wholegrain breakfast cereals, oats, pasta, rice, potatoes. (c)
12. The fundamental building units in them are the amino acids. (p)

2.

The name of the disease/condition	The definition
Kwashiorkor [kwɒʃi:ˈɔ:kə]	is a protein-deficiency disease. To Ghanaians, who named the disease, it originally meant “the evil spirit which infects the first child when the second child is born”.

Uremia	occurs if proteins occupy too large a proportion of the intake (carbohydrates too low). It is marked by nausea, vomiting, headache, vertigo, dimness of vision, coma or convulsions, and a urinous odor of the breath and perspiration.
Ketosis	occurs if there are too much fat in the diet and too little carbohydrate. It is a combination of high blood ketones and ketones in the urine.
Atherosclerosis	is the formation of atherosclerotic plaque composed of lipids, mainly triglycerides and cholesterol in the blood vessels. They constrict, lose their elasticity.
Hypoglycemia	is a condition when the concentration of glucose in the blood is too low.
Galactosemia	is caused by the absence of one of the two enzymes required to convert galactose into glucose in the liver.
Diabetes mellitus	is a disease characterized by elevated blood glucose, multiple hormonal and metabolic disturbances in the secretion of insulin and some other symptoms.
Lipidemia	is the presence of abnormally high amount of lipids in the circulating blood.

Based on Chemistry and Society by Mark M. Jones et al. Fifth edition. Saunders College Publishing. 1987. Pp. 532, 534, 536

What is your score?

1. 19 – 20 “excellent”
2. 17 – 18 “good”
3. 15 – 16 “satisfactory”

PART 1. PROTEINS

1. Translate the sentences from Russian into English, using the word ‘protein’.

1. The name of proteins comes from Greek and means “first” (pro-teios).

2. Proteins are macromolecules with molecular weights ranging from 5000 to several million.
3. The fundamental building units in them are the amino acids.
4. Its active molecule has three important levels of structure: primary, secondary and tertiary.
5. The complete hydrolysis of a typical protein yields a mixture of about 20 different amino acids.

4. Would you like to know more about proteins? Complete the gaps with the English collocations from the box.

PROTEINS: BASIC TO THE STRUCTURE AND FUNCTION OF CELLS

“The body’s structure and its vital activities depend on proteins, composed of long chains of amino acids. The body’s most abundant protein, collagen, is a major constituent of skin, cartilage, tendons, and bone. Muscle tissue is largely protein, and so are hair and the cornea of the eye. Enzymes, antibodies, hemoglobin, and some hormones are composed of protein molecules; without such proteins, most cellular activities would grind to a halt. What’s more, there is a steady turnover of protein: Enzymes and cell constituents are continuously broken down and rebuilt, and new cells are generated to replace dying cells. ...

A human is a large, active animal that requires about 1 g of protein per kilogram of body weight per day. ... But knowing how much protein one needs does not answer the question of what *kind* of protein to eat. The body can synthesize many of the 20 amino acids it needs if nitrogen is available. The body cannot, however, manufacture eight so-called **essential amino acids**: These must be obtained in the diet, and all within a few hours, since free amino acids are not stored. ...”

From *BIOLOGY! Bringing science to life* by John H. Postlethwait et al. McGRAW-HILL, INC. New York. 1991. P. 387

PART 2. LIPIDS

1. Translate the sentences from Russian into English, using the word 'lipid'.

1. Lipids are organic compounds.
2. Lipids include fats, oils, and fat-soluble compounds.
3. Lipids are not water-soluble.
4. Lipids are soluble in alcohol, ether, chloroform, and other fat solvents.
5. Lipids include neutral fats and oils, waxes, steroids, phospholipids, and similar compounds.

3. Would you like to know more about proteins? Complete the gaps with the English collocations from the box.

LIPIDS: HIGHLY COMPACT ENERGY STORAGE NUTRIENTS

“Most people have only to visualize the solid white fat of a bacon slice or the slippery golden oil in salad dressing to know what a lipid is. And many have only to reach down and “pinch an inch” to see that the body stores lipids as energy reserve.

Lipids, or fats, are a compact energy source and the form most plants and animals use for long-term energy storage. When needed, the stored fats can be oxidized during aerobic respiration; they provide more usable energy than an equivalent amount of carbohydrates. After a meal of eggs, oily sunflower seeds, or fatty meat, an animal’s digestive system breaks down some of the lipids in these foods to fatty acids and other compounds; some of these other compounds can then enter mitochondria in cells and contribute to aerobic respiration. Without fat stores, walruses could not live in the Arctic, birds could not migrate long distances, carnivores would have more trouble surviving between irregular meals, and hibernators might not be able to survive the long winter without eating.

Besides their energy storage function, fats help the body absorb and use certain essential nutrients. Vitamins A, D, E, and K, for example, are fat-soluble, and lipids must be present for these vitamins to be absorbed into the circulation and delivered to cells.”

From *BIOLOGY! Bringing science to life* by John H. Postlethwait et al. McGRAW-HILL, INC. New York. 1991. Pp. 386 - 387

PART 3. CARBOHYDRATES

1. Translate the sentences from Russian into English, using the word 'carbohydrate'.

1. Carbohydrates include such substances as sugars, starch, and cellulose.
2. Carbohydrates are composed of the three elements: carbon, hydrogen, and oxygen.
3. Carbohydrates are divided into three main groups: monosaccharides, oligosaccharides, and polysaccharides.
4. Green plants produce them by photosynthesis.
5. Foods rich in them include whole grains, wholemeal bread and wholegrain breakfast cereals, oats, pasta, rice, potatoes.

3. Would you like to know more about proteins? Complete the gaps with the English collocations from the box.

CARBOHYDRATES: CARBON AND ENERGY FROM SUGARS AND STARCHES

“The sugars in fruit and the starches in potatoes, rice, bread, and pasta are a rich source of energy and carbon atoms and provide the nutrients we call *carbohydrates*. Our digestive system can cleave units of glucose from the sugars in fruit or the starch in rice, wheat, or potatoes. After a meal, the glucose units pass into the bloodstream, and the circulatory system carries them to cells throughout the body, where the simple sugar serves as the main supplier of energy for cellular respiration. ... Cells in the brain and nerves are particularly sensitive to fluctuations in blood glucose levels, and if starving, the body will break down first its fat stores, then its own muscle tissues and convert the subunits to glucose to provide the sensitive nervous system cells with the levels they need to stay fully active. ...”

From *BIOLOGY! Bringing science to life* by John H. Postlethwait et al. McGRAW-HILL, INC. New York. 1991. P. 386

SELF-TEST

CHECK YOUR KNOWLEDGE

1. Match the words close in meaning (11 points).

beneficial = useful; to insulate = to isolate; to ingest = to have and to swallow; to designate = to indicate; various = diverse; to feed = to nourish; protection = defence; principal = main; capable = able; to consider = to think; almost = nearly

2. Say in one word. (10 points)

- a) a small drop of a liquid, or of a solid that has been melted (a globule)
- b) covered in grease or oil (greasy)
- c) any member of a very abundant and widespread class of natural organic compounds that includes sugars, starch, and cellulose (carbohydrate)
- d) the body's most abundant protein (collagen)
- e) this organ is the main site of fat metabolism (liver)
- f) a substance that is stored under the skin of people and animals, that helps them to keep them warm (fat)
- g) a sweet white or brown substance that is obtained from plants and used to make food and drinks sweet (sugar)
- h) the organ that glucose is the primary source of energy for (brain)
- i) a very soft substance that is almost liquid, made by crushing plants, wood, vegetables etc and is also part of the inside of a tooth (pulp)
- j) a sticky substance found in the stems of some trees and also the two areas of firm pink flesh at the top and bottom of the mouth, in which the teeth are fixed (gum)

3. Match the headings (A – D) to the passages of the text (1 – 4). (4 points)

A How often you should have a meal (4)

B Products recommended for healthy eating (2)

C What is a balanced diet? (1)

D The amounts of carbohydrates, fats and proteins in our diet (3)

What is your score?

1. 23 – 25 “excellent”
2. 20 – 22 “good”
3. 17 – 19 “satisfactory”

APPENDIX I

ABRIDGED TEXTS (TOPICS FOR RETELLING)

The department of medical biochemistry

The faculty of medical biochemistry at the Northern State Medical University was founded in 2003.

The course of training lasts six years. The focal point is, of course, biochemistry. The curriculum embraces the humanities, socio-economical subjects, natural sciences (biology, ecology), mathematical subjects, medical and biological sciences and a lot of subjects related to future profession (chemistry, physical chemistry, medical biotechnology, general and medical biochemistry, general and clinical immunology, general and medical genetics, clinical laboratory diagnosis etc). All these subjects lay a thorough foundation for working in professional field.

Course work is largely lecture- and text-based. Students also have seminars and tutorials. Exams are both oral and written.

Research work and practice are essential parts in training future specialists. The students take special advantage of working in a clinical laboratory and get some laboratory experience in laboratory techniques. Here they use research equipment and facilities, do experiments and conduct a research project under the supervision of a biochemistry faculty/staff member.

After completing the course, the graduates work in clinical and diagnostic facilities as analysts, lab technicians, virologists, bacteriologists and immunologists.

What is biochemistry?

Biochemistry is the study of chemistry of the living world. In other words, it deals with the chemistry of life. Biochemists also study chemical substances, processes and changes that occur in plants, animals, and microorganisms.

The term 'biochemistry' itself is derived from a combination of biology and chemistry. Knowledge in this field of study is expanding currently very quickly.

The goal of biochemistry is to develop a chemically based understanding of living cells of all types.

Biochemistry combines the biological and physical sciences. It uses many techniques common in medicine and physiology as well as those of organic, analytical and physical chemistry.

Biochemists study cell's many complex and interrelated chemical changes as well as some fundamental biochemical substances fats and oils, carbohydrates, proteins, enzymes, vitamins, hormones, nucleic acids and compounds for storage and exchange of energy such as adenosine triphosphate (ATF).

Since the mid-20th century biochemistry has advanced with the development of new techniques such as chromatography, nuclear magnetic resonance (NMR) spectroscopy, radioisotopic labeling, electron microscopy, and others.

The cell

Our body consists of a large number of cells. The main parts of the cell are the cell membrane, the cytoplasm and the nucleus.

The cell membrane is the thin membrane which surrounds the cytoplasm. It contains lipid and protein molecules and controls what goes in and out of the cell.

Most of the cell's reactions take place in the cytoplasm, for example, the mitochondria release energy. The cytoplasm contains the structures called organelles.

The nucleus is separated by the nuclear membrane. The nucleus is a very important structure. It is the "brain" of cellular functioning/operation. It contains the chromosomes. They play an essential part in cellular reproduction. The nucleus controls all the cellular activities.

Cells perform many vital functions in the body. They consume and convert energy. The other important functions are synthesis of organic substances, transportation, nutrition, energy exchange and conversion, release of substances and reproduction/division.

Metabolism

Metabolism is all chemical reactions that take place in every cell of a living organism. It provides energy for the processes of life and synthesizing new cellular material.

The term *intermediary metabolism* refers to the great number of interconnected chemical reactions.

Anabolic reactions use energy to build complex molecules from simpler organic compounds (e.g. proteins from amino acids, carbohydrates from sugars, fats from fatty acids and glycerol).

Catabolic reactions break complex molecules down into simpler ones, releasing chemical energy.

Some organisms obtain energy by photosynthesis. They store it in organic compounds or by consuming those organisms that do so.

For most organisms, the energy comes ultimately from the Sun. It is transferred within the cell and the organism by ATP.

Anabolic reactions consume it, and catabolic reactions generate it. Every cellular chemical reaction is mediated by a specific enzyme.

*Based on the article **Metabolism**/Encyclopedia Britannica article. Encyclopedia Britannica 2005 Ready Reference. Сокращённое издание 32-томной «Британской энциклопедии». CD-ROM. 2005*

Vitamins

Vitamins are organic substances which are necessary for performing the vital bodily functions. The human being gets them from food. About twenty different substances are considered vitamins nowadays. Their functions are very diverse.

There are two groups of vitamins: fat-soluble (A, D, E and K) and water-soluble (B vitamins, including niacin, folic acid, pantothenic acid, and riboflavin, and vitamin C). Fat-soluble vitamins can be stored in great amount in fat tissues of the body. Contrary to this, water-soluble vitamins are eliminated from the body quickly.

The major source of vitamins is vegetables and fruits. This concerns such vitamins as vitamin C, A, B9 (folic acid) and some others in smaller doses. The rest of them should be from animal fats, eggs, dairy products, vegetable oils, cereals, yeasts and other sources.

Some people develop avitaminosis because of lack of basic vitamins in their bodies.

Enzyme

Enzyme is a substance that acts as a catalyst. It regulates the rate of chemical reactions. Without enzymes, many of these reactions would not take place. Enzymes catalyze all aspects of cell metabolism. This includes the digestion of food, the conservation and transformation of chemical energy; and the construction of cellular macromolecules from smaller precursors. Many inherited human diseases, such as albinism, result from a deficiency of a particular enzyme.

Enzymes also have valuable industrial and medical applications. The fermenting of wine, leavening of bread, curdling of cheese, and brewing of beer are examples of industrial application. The uses of enzymes in medicine include killing disease-causing microorganisms, promoting wound healing, and diagnosing certain diseases.

There are six principal categories and their reactions: (1) oxidoreductases, (2) transferases, (3) hydrolases, (4) lyases, (5) isomerases and (6) ligases, or synthetases.

*Based on the article **Enzyme** /Encyclopedia Britannica article. Encyclopedia Britannica Deluxe Edition. CD-ROM. 2008*

Proteins, lipids and carbohydrates

The name of proteins comes from Greek and means “first” (proteios). Proteins are macromolecules with molecular weights ranging from 5000 to several million. The fundamental building units in them are the amino acids. Its active molecule has three important levels of structure: primary, secondary and tertiary. The complete hydrolysis of a typical protein yields a mixture of about 20 different amino acids.

Lipids are organic compounds. Lipids include fats, oils, and fat-soluble compounds. Lipids are not water-soluble. Lipids are soluble in alcohol, ether, chloroform, and other fat solvents. Lipids include neutral fats and oils, waxes, steroids, phospholipids, and similar compounds.

Carbohydrates include such substances as sugars, starch, and cellulose. Carbohydrates are composed of the three elements: carbon, hydrogen, and oxygen. Carbohydrates are divided into three main groups: monosaccharides, oligosaccharides, and polysaccharides. Green plants produce them by photosynthesis. Foods rich in them include whole grains, whole-meal bread and wholegrain breakfast cereals, oats, pasta, rice, potatoes.

APPENDIX II
SAMPLE TEXTS FOR TEST (2ND COURSE)

Тест-билет № 1

Прочтите текст. Выполните задания по содержанию текста.

Every cell in the body (except the germ cells) carries within its nucleus the forty-six chromosomes in twenty-three pairs characteristic of man. There are twenty-two pairs, the *autosomes*, not involved in sex determination and one pair of *sex chromosomes*.

Each DNA (deoxyribonucleic acid) molecule contained in the chromosomes consists of a long pair of spirally-wound strands – the double helix. This consists of a backbone of sugar (deoxyribose) and phosphate molecules with interposed purine or pyrimidine bases – adenine, thymine, guanine and cytosine.

The DNA of the cell is not all confined to the nucleus. Some is in the cytoplasm, concerned with protein synthesis, but that of the nucleus is contained in the separate chromosomes. A human DNA molecule is about a metre long and a twenty-millionth of a metre wide. The human *genome* is the total amount of DNA spread over the chromosomes of the cell, and it contains some 3 billion ‘letters’ of genetic code.

A gene is a segment of a DNA molecule that programs the formation of a particular protein. The smallest gene has a sequence of about two thousand base pairs, but most genes are much larger.

1. Расположите пункты плана в соответствии с текстом.

- A The parts of DNA
- B The gene
- C The number of chromosomes
- D The parameters of a human DNA molecule

2. Какие предложения соответствуют содержанию текста?

- A Each living thing has a different kind of DNA.
- B The double helix is formed by twin sugar-phosphate backbones.
- C The four bases are adenine, thymine, cytosine, and guanine.

D The kind of DNA a man/woman has gives him/her all the features inherited from his/her parents.

E The human genome contains genetic code.

3. Ответьте на вопрос: “How many base pairs does the smallest gene have?”

A 3,000

B 1,000

C 2,000

Тест-билет № 2

Прочтите текст. Выполните задания по содержанию текста.

Like other sciences, biochemistry aims at measuring results, sometimes with sophisticated instrumentation. The earliest approach to a study of the events in a living organism was an analysis of the materials entering an organism (foods, oxygen) and those leaving it (excretion products, carbon dioxide). For this purpose many chemical methods have been developed.

Gasometric techniques are those commonly used for measurements of oxygen and carbon dioxide. Specific colour reactions require spectrum-analyzing instruments (spectrophotometers) for quantitative measurement. An important tool in biochemical research is the centrifuge. Thus, red cells may be separated from plasma of blood, nuclei from mitochondria in cell homogenates, and one protein from another in complex mixtures.

Another property of biological molecules that has been exploited for separation and analysis is their electrical discharge. Separate proteins may be isolated and identified by electrophoresis, and the purity of a given protein may be determined. In contrast to electrophoresis, “paper chromatography” has been applied to a wide variety of biological compounds. In this technique, small amounts of substances can be separated on filter paper and identified by appropriate colour reactions.

1. Выберите подходящее название текста.

A Applied biochemistry

B Origins of biochemistry

C Methods used in biochemistry

D What is biochemistry?

2. Какой метод иллюстрирует следующее предложение: “In an electric field, such molecules adopt different rates of migration toward positively or negatively charged poles and permit separation.”?

- A paper chromatography
- B column chromatography
- C spectrophotometry
- D centrifuging
- E electrophoresis

3. Выберите оборудование, упомянутое в тексте.

- | | |
|---------------------|--------------|
| A thermostat | D centrifuge |
| B spectrophotometer | E separator |
| C spectrometer | F filter |

Тест-билет № 3

Прочтите текст. Выполните задания по содержанию текста.

The term *biochemistry* is synonymous with two somewhat older terms: physiological chemistry and biological chemistry. Those aspects of biochemistry that deal with the chemistry and function of very large molecules (e.g. proteins and nucleic acids) are often grouped under the term *molecular biology*. Biochemistry is a young science. It has been known under that term only since about 1900. Its origins, however, can be traced much further back; its early history is part of the early history of both physiology and chemistry.

Biochemistry is the study of the chemical substances and processes that occur in plants, animals, and microorganisms and of the changes they undergo during development and life. Biochemistry deals with the chemistry of life. It involves the quantitative determination and structural analysis of the organic compounds that make up cells (proteins, carbohydrates, and lipids) and of those that play key roles in chemical reactions vital to life (e.g. nucleic acids, vitamins, and hormones).

All chemical changes within the organism are known as *metabolism*. It is not surprising that biochemistry enters into the investigation of chemical changes in disease, drug action, and other aspects of medicine, as well as in nutrition, genetics, and agriculture.

1. Какие предложения соответствуют содержанию текста?

- A Biochemistry combines the biological and physical sciences.
- B Biochemistry uses many techniques common in medicine and physiology.
- C The origins of biochemistry can be traced to physiology and chemistry.
- D Biochemistry is a very interesting science.
- E Biochemistry is the study of life.

2. Завершите предложение: “The term *biochemistry* was coined ...”

- A in the eighteenth century.
- B in the nineteenth century.
- C in the twentieth century.
- D at the turn of the twentieth century.

3. Какой абзац содержит следующую информацию: “Biochemistry is the study of the chemistry of the living world.”?

- A 1-й абзац
- B 2-й абзац
- C 3-й абзац

Тест-билет № 4

Прочтите текст. Выполните задания по содержанию текста.

Cholesterol is a waxy substance that is present in the blood plasma and in all animal tissues. Chemically, cholesterol is an organic compound belonging to the steroid family and containing four rings in its structure. In its pure state it is a white, crystalline substance that is odourless and tasteless.

Cholesterol is essential to life; it is a primary component of the membrane that surrounds each cell. It circulates in the bloodstream and is synthesized by the liver and several other organs.

Cholesterol is insoluble in the blood and it circulates in it in association with transporting molecules called lipoproteins. There are two varieties of these: those of low (LDLs) and very low (VLDLs) density, and those of high density (HDLs).

LDLs transport cholesterol from its site of synthesis in the liver to the various tissues and body cells, where it is separated from the lipoprotein and is used by the cell. When the cells cannot absorb any more chole-

terol, the quantity of lipoprotein bound to cholesterol in the blood is increased; this accumulates in the arteries and causes atherosclerosis. The HDLs have the function of delivering the cholesterol to the liver, in order for it to be eliminated in the bile. So, they may actually serve to retard or reduce atherosclerotic buildup.

1. Найдите характеристики холестерина.

A is present in the blood

B has got three rings in its structure

C has a strong smell

D dissolves in water/liquids

E is a waxy organic compound

F is not soluble in the blood

2. Завершите предложение: "It is ... which are responsible for delivering the cholesterol to cells that need it."

A LDLs

B HDLs

C VLDLs

3. Расположите предложения в соответствии с содержанием 1-го, 2-го, 3-го и 4-го абзацев.

A Cholesterol circulates in the blood in compounds called lipoproteins, since it is not water-soluble alone.

B Excess cholesterol in the blood forms deposits in arteries, which can lead to coronary heart disease.

C Cholesterol is a steroid.

D Cholesterol is made in the liver and some other organs, depending on the amount recently consumed in the die

Тест-билет № 5

Прочтите текст. Выполните задания по содержанию текста.

Triglyceride is any one of an important group of naturally occurring lipids (fat-soluble components of living cells). Triglycerides are esters in which three molecules of one or more different fatty acids are linked to the alcohol glycerol; they are named according to the fatty acid components; e.g., tristearin contains three molecules of stearic acid, and oleodis-

tearin, one of oleic acid and two of stearic acid. The types of triglycerides in animals vary with the species and the composition of fats in the food.

Triglycerides in animals and probably in plant seeds function as depots of energy. In mammals they are stored in adipose tissue until needed, at which time they are broken down to a molecule of glycerol and three molecules of fatty acid. The latter combine with albumin, a protein in blood plasma, and are carried in the bloodstream to site of utilization. Triglycerides also serve as insulation and padding for organs in animals.

Many vegetable triglycerides (oils) are liquid at room temperature, unlike those of animals; in addition, they contain a greater variety of fatty acids. Vegetable oils can be hardened by treatment with hydrogen under pressure.

In alkali, triglycerides are broken down (saponified) to form glycerol and three molecules of soap (salts of the fatty acids).

1. Расположите пункты плана в соответствии с текстом.

- A Saponification
- B Functions
- C The definition
- D Vegetable triglycerides

2. Завершите предложение: “Triglycerides are named according to ...”

- A the number of molecules
- B the type of acid
- C the components of fatty acid
- D the type of tissue

3. Какие предложения соответствуют содержанию текста?

- A Triglycerides are made up of fatty acids chemically combined with glycerol.
- B The fatty acids may be classified as saturated or unsaturated fatty acids.
- C Vegetable triglycerides are different from those of animals.
- D Two essential fatty acids must be provided by food, namely linoleic acid and linolenic acid.
- E Vegetable triglycerides are oils.

Тест-билет № 6

Прочтите текст. Выполните задания по содержанию текста.

The metabolism of carbohydrates became clarified during the second quarter of the 20th century, and pathways of carbohydrate breakdown, storage and utilization were gradually outlined in terms of cycles (e.g., the Embden-Meyerhof glycolytic cycle and the Krebs cycle). The involvement of carbohydrates in respiration and muscle contraction was well worked out by the 1950s.

The classic work concerning the formation of body fat from carbohydrates was accomplished during the early 1850s. Fat absorption in the intestine, studied as early as the 1930s, still is under investigation by biochemists.

Nucleic acids were originally discovered as constituents of cell nuclei (hence their name). It was assumed for many years after their isolation in 1869 that they were found nowhere else. It was not until the 1940s when two kinds of nucleic acid were determined: DNA and RNA.

The biological significance of nucleic acids came to light during the 1940s and 1950s. Attention turned to the mechanism by which protein synthesis and genetic transmission was controlled by nucleic acids. During the 1960s, experiments were aimed at refinements of the genetic code. By the mid-1980s genetic engineering techniques had accomplished in vitro fertilization and the recombination of DNA.

1. Выберите название текста.

- A Applied biochemistry
- B Methods in biochemistry
- C Basic concepts of biochemistry
- D From the history of biochemistry

2. Расположите события в хронологическом порядке.

- A Nucleic acids were isolated.
- B Fat absorption in the intestine was studied.
- C Vitro fertilization
- D Watson and Crick described the structure of DNA.
- E Refinements of the genetic code

3. Ответьте на вопрос: “Do biochemists still continue to study fat absorption in the intestine?”

- A Yes
- B No

Тест-билет № 7

Прочтите текст. Выполните задания по содержанию текста.

The clinical chemistry laboratory now has become a major investigative arm of the physician in the diagnosis and treatment of disease and is an indispensable unit of every hospital.

Some of the older analytical methods are still the most commonly used – for example, tests for determining the levels of blood glucose, in diabetes; urea, in kidney disease; uric acid, in gout; and bilirubin, in liver and gallbladder disease.

With development of the knowledge of enzymes, determination of certain enzymes in blood plasma has been of diagnostic value, such as alkaline phosphatase, in bone and liver disease; acid phosphatase, in prostatic cancer; amylase, in pancreatitis; and lactate dehydrogenase and transaminase, in cardiac infarct. Electrophoresis of plasma proteins is commonly used to help in the diagnosis of various liver diseases and forms of cancer. Both electrophoresis and ultracentrifugation of serum constituents (lipoproteins) are used in the diagnosis of atherosclerosis and heart disease.

Analytical biochemical methods have also been applied in the food industry. Research in this area is directed particularly to preserving vitamins as well as colour and taste, all of which may suffer loss if oxidative enzymes remain in the preserved food. Tests for enzymes are used for monitoring various stages in food processing.

1. Выберите методы/ анализы, упомянутые в тексте.

- | | |
|-------------------|-----------------------|
| A blood test | E Gram staining |
| B urine test | F feces test |
| C electrophoresis | G hem agglutination |
| D bilirubin test | H ultracentrifugation |

2. Какие предложения соответствуют содержанию текста?

- A There is a clinical chemistry laboratory in every hospital.

- B Biochemical techniques have been fundamental in the development of new drugs.
- C Many specialized methods are used in biochemical analysis.
- D Testing includes studies on experimental animals.
- E Food industry is one of the fields of applied biochemistry.

3. Ответьте на вопрос: “Which method/s is/are used to diagnose heart disease?”

- A electrophoresis
- B ultracentrifugation
- C both

Тест-билет № 8

Прочтите текст. Выполните задания по содержанию текста.

Catalysis is modification (usually acceleration) of a chemical reaction rate by addition of a catalyst. The catalyst is any substance which combines with the reactants and affects the reaction rate of a chemical reaction without itself being changed or consumed.

One molecule may transform several million reactant molecules a minute. Catalysts may be gaseous, liquid, or solid; they may be inorganic compounds, organic compounds, or complex combinations. They tend to be highly specific, reacting with only one substance or a small set of substances.

Catalysts in a single phase (e.g., the catalyst is dispersed in a liquid solution or gaseous mixture with the reactants) is homogeneous; that in more than one phase (e.g., the reactants are liquids and the catalyst is a solid) is heterogeneous.

Catalysts are essential to virtually all industrial chemical reactions, especially in petroleum refining and synthetic organic chemical manufacturing. Most solid catalysts are transition elements (metals) or their oxides in finely divided or porous form. Water, especially saltwater, catalyzes oxidation and corrosion. Enzymes are among the most active and selective catalysts known.

1. Завершите предложение: “Catalysis is a process when a chemical reaction rate ...”

- A inhibits
- B speeds up
- C keeps constant
- D stops

2. Какие предложения соответствуют содержанию текста?

- A Catalysis is essential to the modern chemical industry.
- B Catalyst inhibitors are substances that reduce the effectiveness of catalysts.
- C There are homogeneous and heterogeneous types of catalysis.
- D Catalysts may be only liquid.
- E Catalyst changes at the end of reaction.

3. Укажите абзац, где можно найти иллюстрацию применения катализа на практике.

- A 1-й абзац B 2-й абзац C 3-й абзац D 4-й абзац

Тест-билет № 9

Прочтите текст. Выполните задания по содержанию текста.

The cell is the site of a constant, complex, and orderly set of chemical changes collectively called *metabolism*. Hormones, which may be regarded as regulators of metabolism, are investigated at three levels, to determine (1) their physiological effects, (2) their chemical structure, and (3) the chemical mechanisms whereby they operate.

The chemical structures of thyroxine and adrenaline are known. The chemistry of the sex and adrenal hormones, which are steroids, has also been thoroughly investigated. The hormones of the pancreas – insulin and glucagon – and the hormones of the hypophysis (pituitary gland) are peptides (i.e., compounds composed of chains of amino acids). The structures of most of these hormones have been determined. The chemical structures of the plant hormones, auxin and gibberellic acid, which act as growth-controlling agents in plants, are also known.

The first and second phases of the hormone problem have been well,

though not completely, explored, but the third phase is still under study. It seems likely that different hormones exert their effects in different ways. Some may act by affecting the permeability of membranes; others appear to control the synthesis of certain enzymes. Some hormones also control the activity of certain genes.

1. Выберите название текста.

- A Hormonal control
- B Metabolism and hormones
- C Types of hormones
- D Functions of hormones

2. К какому абзацу относится предложение?

- A 1-й абзац B 2-й абзац C 3-й абзац

1. Different hormones influence differently.
2. Metabolism takes place in the cells.
3. Insulin is the hormone of the pancreas.
4. There are three phases of the hormone problem.
5. Scientists investigate hormones at three levels.
6. Scientists have determined the structures of hormones.

3. Выберите ложное утверждение.

- A Hormones regulate metabolism.
- B Sex hormones are steroids.
- C Hormones do not affect the permeability of membranes.
- D Hormones control the synthesis of some enzymes and the activity of certain genes.

Тест-билет № 10

Прочтите текст. Выполните задания по содержанию текста.

Blood has been investigated intensively from the early days of biochemistry, and its chemical composition is known with greater accuracy and in more detail than that of any other tissue in the body. The physician takes blood samples to determine such things as the sugar content, the

urea content, or the inorganic-ion composition of the blood, since these show characteristic changes in disease.

The blood pigment *hemoglobin* has been intensively studied. Hemoglobin is confined within the blood corpuscles and carries oxygen from the lungs to the tissues. It combines with oxygen in the lungs, where the oxygen concentration is high, and releases the oxygen in the tissues, where the oxygen concentration is low.

The proteins of blood plasma also have been extensively investigated. The gamma-globulin fraction of the plasma proteins contains the antibodies of the blood and is of practical value as an immunizing agent. An animal develops resistance to disease largely by antibody production. Antibodies are proteins with the ability to combine with an antigen. When this antigen is a component of a disease-causing bacterium, the antibody can protect an organism from infection by that bacterium. The chemical study of antigens and antibodies and their interrelationship is known as immunochemistry.

1. Укажете характеристики гемоглобина.

- A It is contained in the red blood cells.
- B It protects from an infection.
- C It transports carbon dioxide.
- D It transports oxygen.
- E It takes part in cell metabolism.
- F It gives up oxygen in the tissues.
- G It does not combine with oxygen.

2. Ответьте на вопрос: “Can antibodies being proteins combine with an antigen?”

- A No
- B Yes

3. Завершите предложение: “Immunochemistry studies...”

- A hemoglobin
- B blood samples
- C blood corpuscles
- D antigens
- E antigens and antibodies

Тест-билет № 11

Прочтите текст. Выполните задания по содержанию текста.

Adenosine triphosphate (ATP) is an energy-carrying molecule found in the cells of all living things. It is not a storage molecule for chemical energy. When energy is needed by the cell, it is converted from storage molecules into ATP. ATP then serves as a shuttle, delivering energy to places within the cell.

ATP is a nucleotide that consists of three main structures: the nitrogenous base, adenine; the sugar, ribose; and a chain of three phosphate groups bound to ribose. ATP's chemical bonds store a large amount of chemical energy. Energy is released when they are broken, which occurs through the addition of a water molecule (a process called *hydrolysis*).

The central role of ATP in energy metabolism was discovered by Fritz Albert Lipmann and Herman Kalckar in 1941. Three processes of metabolism are sources of ATP and stored energy: fermentation, the tricarboxylic acid cycle, and cellular respiration (also called *oxidative phosphorylation*). All form ATP from adenosine monophosphate (AMP) or adenosine diphosphate (ADP) and inorganic phosphate. When the reaction goes in the other direction, ATP is broken down to ADP or AMP and phosphate, and the released energy is used to perform chemical electrical, or osmotic work for the cell. Cells continuously break down ATP to obtain energy.

1. Выберите подходящее название текста.

- A The discovery made in 1941.
- B Source of energy
- C ATP
- D Energy metabolism

2. Какие из утверждений ложные?

- A Energy is stored in ATP.
- B Fermentation is a process which is a source of ATP.
- C ATP is a peptide.
- D ATP functions as a carrier of chemical energy.
- E Cellular respiration is the same as oxidative phosphorylation.

3. Укажите абзац, где можно найти следующую информацию: “ATP is constantly being synthesized from ADP and phosphate through the processes of cellular respiration.”

A 1-й абзац

B 2-й абзац

C 3-й абзац

Тест-билет № 12

Прочтите текст. Выполните задания по содержанию текста.

Mitosis is a process of cell division, or reproduction, during which one cell gives rise to two genetically identical daughter cells. Strictly applied, the term describes the duplication and distribution of chromosomes, the structures that carry the genetic information.

Mitosis has four stages: prophase, metaphase, anaphase, and telophase. Mitosis begins at prophase with the thickening and coiling of the chromosomes. The nuclear membranes rupture and the cell nucleus disappears. A colourless “spindle” structure appears inside the cell.

The chromosomes, each of which is a double structure consisting of duplicate chromatids, line up along the midline of the cell at metaphase. In anaphase, each chromatid pair separates into two identical chromosomes that are pulled to opposite ends of the cell by the spindle fibres. During telophase, the chromosomes take up the shape of diffuse chromatin filaments. The nuclear membranes and nucleoli re-form. The cytoplasm of the mother cell divides to form two daughter cells, each containing the same number and kind of chromosomes as the mother cell. The stage, or phase, after the completion of mitosis is called interphase.

Mitosis is essential to life because it provides new cells for growth and for replacement of worn-out cells.

1. Какие из утверждений ложные?

A Daughter cells are different.

B Chromosomes carry the genetic information.

C Daughter cells have a different number of chromosomes compared with the mother cell.

D Interphase is the second stage of mitosis.

E Cells divide during mitosis.

2. Расположите фазы деления клетки по порядку.

A telophase C anaphase

B prophase D metaphase

3. О какой фазе митоза идёт речь?

A prophase B metaphase C anaphase D telophase

1. The nuclear membrane re-forms around each set of chromosomes.

2. The nucleolus, a rounded structure, disappears.

3. The paired chromosomes suddenly separate, forming two complete systems.

4. The chromosomes group around the centre of the spindle.

Тест-билет № 13

Прочтите текст. Выполните задания по содержанию текста.

Gene is a unit of hereditary information that occupies a fixed position on a chromosome. Genes are composed of deoxyribonucleic acid (DNA), except in some viruses, which have genes consisting of a closely related compound called ribonucleic acid (RNA). A DNA molecule is composed of two chains of nucleotides that wind about each other to resemble a twisted ladder. The sides of the ladder are made up of sugars and phosphates; the rungs are formed by bonded pairs of nitrogenous bases. These bases are adenine, guanine, cytosine, and thymine.

The sequence of bases along a strand of DNA determines the genetic code. When the product of a particular gene is needed, the portion of the DNA molecule that contains that gene splits, and a complementary strand of RNA, called messenger RNA (mRNA), forms and then passes to ribosomes, where proteins are synthesized. A second type of RNA, transfer RNA (tRNA), matches up the nucleotides on mRNA with specific amino acids. Each set of three nucleotides codes for one amino acid. The series of amino acids built according to the sequence of nucleotides forms a polypeptide chain; all proteins are made from one or more linked polypeptide chains.

1. Какая информация отсутствует в тексте?

A genetic engineering

- B gene structure
- C mRNA and tRNA
- D Human Genome Project
- E gene studies

2. Ответьте на вопрос: “What happens to the portion of the DNA molecule when the product of a particular gene is needed?”

- A It changes. B It grows. C It disappears. D It splits.

3. Завершите предложение: “The genetic code is determined by ...”

- A the number of genes
- B the sequence of bases
- C the number of strands
- D the sequence of chains

Тест-билет № 14

Прочтите текст. Выполните задания по содержанию текста.

Deoxyribonucleic acid (DNA) is organic chemical of complex molecular structure that is found in all prokaryotic and eukaryotic cells and in many viruses.

The chemical DNA was first discovered in 1869, but its role in transmitting genetic information was not demonstrated until 1943. In 1953, James Watson and Francis Crick determined that the structure of DNA is a double-helix polymer, a spiral consisting of two DNA strands wound around each other. Each strand is composed of a long chain of monomer nucleotides. The nucleotide of DNA consists of a deoxyribose sugar molecule to which is attached a phosphate group and one of four nitrogenous bases: two purines (adenine and guanine) and two pyrimidines (cytosine and thymine).

The configuration of the DNA molecule is highly stable. A segment of DNA that codes for the cell's synthesis of a specific protein is called a gene. Within a cell, DNA is organized into dense protein-DNA complexes called chromosomes. In eukaryotes, the chromosomes are located in the nucleus, although DNA is also found in mitochondria and chloroplasts. In prokaryotes, the DNA is found as a single circular chromosome in the cy-

toplasm. Some prokaryotes, such as bacteria, and a few eukaryotes have extrachromosomal DNA known as plasmids.

1. Ответьте на вопрос: “When was the chemical DNA discovered?”

- A in 1953
- B in 1943
- C in 1869
- D in 1896

2. Завершите предложение: “... the chromosomes are in the nucleus.”

- A In eukaryotes
- B In prokaryotes

3. Какие предложения соответствуют содержанию текста?

- A DNA is a complex organic compound.
- B Genetic engineering is used to produce new genetic combinations.
- C Francis Crick worked with James D Watson to construct a molecular model of DNA.
- D Maurice Wilkins and Rosalind Franklin also studied DNA.
- E DNA is found in all living cells.

Тест-билет № 15

Прочтите текст. Выполните задания по содержанию текста.

Collagen is any of a group of proteins that are components of whitish, rather inelastic fibres of great tensile strength present in tendon and ligament and in the connective tissue layer of the skin – dermis – and in dentin and cartilage. Their molecules share a triple-helix configuration. Collagenous fibres occur in bundles up to several hundred microns wide, and the individual fibres can be separated into fine fibrils.

Collagen is a scleroprotein, which is one of a family of proteins marked by low solubility in water. Collagen is especially rich in the amino acid glycine, and it is the only protein which contains a substantial proportion of hydroxyproline.

Тест-билет № 16

Прочтите текст. Выполните задания по содержанию текста.

Lipoprotein is any member of a group of substances containing both lipid (fat) and protein. They may be soluble (those in egg yolk and blood plasma) or insoluble (those in cell membranes) in water and water solutions. The lipoproteins in blood plasma have been intensively studied because they are the mode of transport for cholesterol through the bloodstream and lymphatic fluid.

Cholesterol is insoluble in the blood, and so it must be bound to lipoproteins in order to be transported. Two types of lipoproteins are involved in this function: low-density lipoproteins (LDLs) and high-density lipoproteins (HDLs). LDLs transport cholesterol from its site of synthesis in the liver to the body's cells, where the cholesterol is separated from the LDL and is then used by the cells for various purposes. HDLs probably transport excess or unused cholesterol from the body's tissues back to the liver, where the cholesterol is broken down to bile acids and is then excreted. About 70 percent of all cholesterol in the blood is carried by LDL particles.

Several hereditary genetic disorders, called hyperlipoproteinemias, involve excessive concentrations of lipoproteins in the blood. Other such diseases, called hypoproteinemias, involve abnormally reduced lipoprotein levels in the blood.

1. Укажите предложение, которое передаёт содержание текста.

- A Scientists have studied the lipoproteins.
- B Cholesterol is the cause of many diseases.
- C There are two types of lipoprotein.

2. Завершите предложение: "It is ... which are responsible for delivering the cholesterol to cells that need it."

- A HDLs B LDLs

3. Расположите предложения в соответствии с содержанием абзацев.

- A Lipoproteins in blood plasma are the mode of transport for cholesterol, insoluble by itself.

B Hyperlipoproteinemia and hypoproteinemia are linked with high or low lipoprotein level in the blood.

C Lipoprotein is any of a class of organic compounds that contain both lipid and protein.

APPENDIX III
KEYS TO SAMPLE TEXTS FOR TEST (2ND COURSE)

- Тест-билет № 1 1. CADB 2. BCE 3. C
- Тест-билет № 2 1. C 2. E 3. BD
- Тест-билет № 3 1. AC 2. D 3. B
- Тест-билет № 4 1. AEF 2. A 3. CDAB (в такой последовательности)
- Тест-билет № 5 1. CBDA 2. C 3. ACE
- Тест-билет № 6 1. D 2. ABDEC (в такой последовательности) 3. A
- Тест-билет № 7 1. ABCDH 2. ACE 3. C
- Тест-билет № 8 1. B 2. AC 3. D
- Тест-билет № 9 1. B 2. 1C 2A 3B 4C 5A 6B 3. C
- Тест-билет № 10 1. ADF 2. B 3. E
- Тест-билет № 11 1. C 2. AC 3. C
- Тест-билет № 12 1. ACD 2. BDCA (в такой последовательности) 3.
1D 2A 3C 4B
- Тест-билет № 13 1. ADE 2. D 3. B
- Тест-билет № 14 1. C 2. A 3. ACE
- Тест-билет № 15 1. D 2. A 1,4 B 2,3 3. ACDF
- Тест-билет № 16 1. C 2. B 3. CAB

APPENDIX IV
SAMPLE SENTENCES FOR TRANSLATION (2ND COURSE)

1. Translate the sentences from Russian into English. Use the verb 'to be'.

1. Клетка – структурная единица человеческого тела.
2. Важная функция клетки – вырабатывать энергию.
3. Другая важная функция клетки – это деление.
4. Ядро – это большая сферическая структура.
5. Витамин – это органическое соединение.
6. Витамин А важен для зрения.
7. Витамин К необходим для печени.
8. Некоторые фрукты и овощи – источники витамина С.
9. Эндоплазматический ретикулум является важным в синтезе белков и липидов.
10. Почти все ферменты – белки.
11. Многие ферменты специфичны для одного субстрата.
12. Брожение вина – это ферментативная реакция.
13. Гены находятся в ядре.
14. Комплекс витамина В – водорастворимый.
15. Холестерин – важный компонент мембран (оболочек) наших клеток.
16. Фермент – это белок, который действует как катализатор биохимических реакций.
17. Моносахариды – это простые сахара.
18. Ферменты – это белковые молекулы, которые ускоряют химические реакции.
19. Фотосинтез – это очень сложный процесс.
20. Глюкоза, фруктоза и галактоза – это простые сахара.
21. Жиры – необходимые структурные части клеточных мембран.
22. Фосфор необходим детям для роста костей.
23. Печень – это центральный банк питательных веществ тела.
24. Мы наблюдаем за этой реакцией сейчас.
25. Мы проводили этот опыт вчера с 10 до 11 часов.
26. Температура среды медленно понижалась.

27. Биохимик сейчас работает в лаборатории.
28. Биохимик изучает эту реакцию сейчас.
29. Он работал в лаборатории с 2 до 4 часов вчера.
30. Мы будем работать в лаборатории с 9 до 11 часов завтра.
31. Необходимое оборудование для опыта – на столе.
32. Рибосомы присутствуют в больших количествах в живых клетках.
33. Метаболизм – это химические процессы превращения еды в энергию.
34. Метаболизм – это совокупность химических процессов, происходящих в организме.
35. Биохимия – это наука, изучающая химические вещества и процессы, происходящие в растениях, животных и микроорганизмах.
36. Биохимику важно хорошо знать химию и биологию.

2. Translate the sentences from Russian into English. Use ‘there+be’.

1. Есть разные типы клеток.
2. В нашем теле есть большое количество клеток.
3. Есть много рибосом в живых клетках.
4. Есть шесть основных групп ферментов.
5. Есть шесть классов питательных веществ: углеводы, жиры, белки, витамины, минералы и вода.
6. Есть два типа ферментов: метаболические и пищеварительные.
7. Есть разные типы реакций.
8. Существуют ли другие методы определить это?
9. Было понижение температуры.
10. Был подъём температуры при этой реакции.
11. Есть способы/методы подавления роста микроорганизмов.
12. Имеется большое количество рибосом в живых клетках.

3. Translate the sentences from Russian into English. Use the verb ‘to have’.

1. Каждая клетка имеет специфическую функцию и характеристики.

2. Витамин Е имеет антиоксидантный эффект.
3. Клетка обычно имеет одно ядро.
4. У человека 23 пары хромосом.
5. Кроме активных центров некоторые ферменты имеют дополнительные.
6. У нас есть всё необходимое оборудование для проведения опыта.
7. Мы только что измерили температуру раствора.
8. Они только что провели этот опыт.
9. Она ещё не закончила свои исследования.
10. Ей придётся продолжить эту работу в следующем году.
11. Живые клетки имеют большое количество рибосом.

4. Translate the sentences from Russian into English. Use the Passive.

1. Ядро отделяется от цитоплазмы ядерной оболочкой.
2. Новые клетки образуются делением старых.
3. Во время деления хромосомы распределяются между дочерними клетками.
4. Много методов (техник) используется в биохимии.
5. Химическая структура вещества и его свойства определяются в лабораторных условиях.
6. Организмы изучаются на молекулярном уровне.
7. Витамины делят на жирорастворимые и водорастворимые.
8. Природа брожения вина была открыта Луи Пастером.
9. Всасывание кальция в кишечнике регулируется витамином D.
10. Витамин К синтезируется в кишечнике.
11. Некоторые витамины разрушаются под действием света и тепла.
12. Белок синтезируется в рибосомах.
13. Если конфигурация энзима разрушается, его активность утрачивается.
14. Энзимы используются в медицине.
15. Ферменты подразделяются на 6 основных групп.
16. Группы аминокислот связываются вместе в протеиновые структуры пептидными связями.
17. Жиры и масла сначала перевариваются в кишечном тракте.

18. Жир переносится в теле кровеносной и кровеносно – лимфатической системами.
19. Углеводы вырабатываются растениями посредством фотосинтеза.
20. Биосинтез ферментов контролируется генами.
21. Рибосомы встречаются как свободные частицы внутри клеток.
22. Небольшое количество жидкости было добавлено в раствор.

5. Translate the sentences from Russian into English. Use the modals.

1. Клетки нельзя увидеть без микроскопа.
2. Биохимики могут изучать организмы на молекулярном уровне.
3. Организм человека не способен синтезировать многие витамины.
4. Ферменты бывают простыми и сложными белками.
5. Мы можем измерить концентрацию раствора.
6. Они могли подсчитать количество клеток.
7. Мы должны провести эти исследования.
8. Можешь ли помочь мне подготовить всё для проведения опыта?
9. Мы должны получить знания по биохимии.
10. Он мог закончить эксперимент вчера, но не сделал это.
11. Как он может установить это количество?
12. Они должны были изолировать/отделить/ это вещество из соединения.
13. Вам следует определить количество жидкости.
14. Ей следует в этом случае принимать витамин А, он полезен для здоровья.

6. Translate the sentences from Russian into English.

1. Большое количество клеток составляет наше тело.
2. Клетка состоит из ядра, покрытого оболочкой и цитоплазмы.
3. Оболочка клетки содержит молекулы липидов и протеинов.
4. Ядро содержит хромосомы.
5. Цитоплазма содержит цитоскелет и цитозол.

6. Цитоплазма содержит органеллы и включения.
7. Деление начинается в ядре клетки и состоит из отдельных фаз.
8. Более крупные организмы, такие как люди, состоят из миллиардов клеток.
9. Разные клетки выполняют разную работу.
10. Большинство клеточных реакций происходит в цитоплазме.
11. Ядро контролирует жизнедеятельность клетки.
12. Ядро играет важную роль в клеточной репродукции.
13. В 1665 году Роберт Гук (Hooke) записал свои наблюдения за клеткой.
14. Основы биохимии лежат в изучении процессов брожения (ферментации).
15. Все живые организмы нуждаются в небольшом количестве витаминов.
16. Витамин D играет важную роль в метаболизме костей.
17. Витамин C участвует в образовании коллагена, что важно в исцелении ран.
18. Комплекс витамина B состоит из разных витаминов.
19. Комплекс витамина B играет важную роль во внутриклеточном метаболизме.
20. Витамин E играет роль в синтезе гемоглобина.
21. Энзимы помогают в заживлении ран и диагностике некоторых болезней.
22. Минералы играют важную роль в ферментативных процессах и развитии организма.
23. Нуклеиновые кислоты, витамины и гормоны играют ключевую роль в химических реакциях.
24. Углеводы состоят из трёх элементов: углерода, водорода и кислорода.
25. Белки и аминокислоты состоят, в основном из 4 элементов.
26. Гидролиз протеинов начинается в желудке и продолжается в тонком кишечнике.
27. Белки создают структурную ткань для мышц и большинства органов.
28. Людям нужны белки.
29. Мы определили количество вещества вчера.

30. Жиры служат энергетическими хранилищами (резервуарами) в организме.
31. Некоторые гормоны транспортные молекулы, антитела и фибриноген содержат белки.
32. В печени аминокислоты участвуют в образовании ферментов.
33. Химические изменения зависят от действия органических катализаторов, известных как ферменты.
34. Коэнзимы действуют как кофакторы в метаболических реакциях.
35. Каждый орган, каждая ткань и все клетки в теле зависят от реакции метаболических энзимов.
36. Биохимики изучают сложные химические изменения, происходящие в клетках.
37. Биохимия использует много методов, распространённых в медицине и физиологии, а также органической, аналитической и физической химии.
38. Концентрация субстрата влияет на активность ферментов.
39. Биохимики анализируют органические соединения.
40. В лабораторных условиях биохимики определяют химическую структуру вещества и его свойства.

APPENDIX V

EVALUATION CRITERIA

1. Evaluation criteria for retelling

‘Отлично’	Количество предложений – 10. Они оформлены грамматически и синтаксически правильно. Устная тема раскрыта.
‘Хорошо’	Количество предложений – 8 - 9. Есть небольшие неточности в грамматическом и синтаксическом оформлении высказывания. В целом устная тема раскрыта.
‘Удовлетворительно’	Количество предложений – 8. Есть неточности (до 5) в грамматическом и синтаксическом оформлении высказывания.
‘Неудовлетворительно’	Количество предложений < 8. Есть много неточностей в грамматическом и синтаксическом оформлении высказывания или предложения оформлены грамматически и синтаксически неправильно.

2. Evaluation criteria for answering questions

‘Отлично’	Предложения на английском языке оформлены грамматически и синтаксически правильно.
‘Хорошо’	Есть небольшие неточности в грамматическом и синтаксическом оформлении предложений на английском языке.
‘Удовлетворительно’	Есть неточности (до 3) в грамматическом и синтаксическом оформлении предложения на английском языке.
‘Неудовлетворительно’	Предложения оформлены грамматически и синтаксически неправильно.

3. Evaluation criteria for crossword /thesaurus with definitions in English.

‘Отлично’	Количество слов в кроссворде/словаре – 10. Определения к ним составлены без лексических, грамматических и синтаксических ошибок. Определения понятны и отражают значение слова.
‘Хорошо’	Количество слов в кроссворде/словаре – 10. Есть небольшие лексические, грамматические и синтаксические неточности в определениях. В целом, определения понятны и отражают значение слова.

‘Удовлетворительно’	Количество слов в кроссворде/словаре – 10. Есть лексические, грамматические и синтаксические ошибки в определениях. В целом, определения отражают значение слова.
‘Неудовлетворительно’	Количество слов в кроссворде/словаре – 10. Есть много лексических, грамматических и синтаксических ошибок в определениях.

4. Evaluation criteria for translating sentences from Russian into English

‘Отлично’	Предложения переведены на английский язык правильно. Орфографических, лексических, грамматических и синтаксических ошибок нет.
‘Хорошо’	Есть небольшие неточности в предложениях, переведённых на английский язык, в виде орфографических, лексических, грамматических и синтаксических ошибок. В целом, они не искажают перевод.
‘Удовлетворительно’	Есть орфографические, лексические, грамматические и синтаксические ошибки в предложениях, переведённых на английский язык. Количество предложений с такими ошибками составляет 25 – 30%.
‘Неудовлетворительно’	Есть много орфографических, лексических, грамматических и синтаксических ошибок в предложениях, переведённых на английский язык. Количество предложений с такими ошибками – более 30%.

5. Evaluation criteria for writing an essay

‘Отлично’	Предложения оформлены грамматически и синтаксически правильно. Тема раскрыта. Количество предложений 10 и более.
‘Хорошо’	Предложения содержат до 3 неточностей в грамматическом и синтаксическом оформлении. В целом, тема раскрыта и мнение автора понятно.
‘Удовлетворительно’	Предложения содержат до 5 неточностей в оформлении. Тема изложена, мнение автора понятно.
‘Неудовлетворительно’	Предложения оформлены грамматически и синтаксически неправильно. Тема не раскрыта, мнение автора не понятно.

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